1. Rational Numbers

Exercise 1A

1. (i) False, (ii) True, (iii) False, (iv) True.

2. (i) $\frac{12}{23}$

Numerator $= 12$

(ii) $\frac{6}{-5}$

Numerator $= 6$

(iii) $\frac{-15}{41}$

Numerator $= -15$

(iv) $\frac{-67}{-167}$

Numerator $= -67$

3. (i) $\frac{-5}{7}$

Denominator $= 7$

(ii) $\frac{22}{49}$

Denominator $= 49$

(iii) $\frac{-7}{-9}$

Denominator $= -9$

(iv) $\frac{5}{-9}$

Denominator $= -9$

4. (i) $20 = \frac{5}{20}$

(ii) $36 = \frac{9}{36}$

(iii) $-80 = \frac{-20}{-80}$

(iv) $4000 = \frac{1000}{4000}$

(v) $-100 = \frac{-25}{-100}$

5. (i) $\frac{-32}{70}$, HCF of 32 and 70 is 2.

So, $\frac{-32}{70} = \frac{-32/2}{70/2} \Rightarrow \frac{-32}{70} = \frac{-16}{35}$

(ii) $\frac{150}{-650}$, HCF of 150 and 650 is 50.

So, $\frac{150}{-650} = \frac{150/50}{-650/50} \Rightarrow \frac{150}{-650} = \frac{-3}{13}$

(iii) $\frac{-65}{143}$, HCF of 65 and 143 is 13.

So, $\frac{-65}{143} = \frac{-65/13}{143/13} = \frac{-5}{11}$

(iv) $\frac{-102}{187}$, HCF of 102 and 187 is 17.

So, $\frac{-102}{187} = \frac{-102/17}{187/17} = \frac{-6}{11}$

6. (i) $\frac{2}{10}$, HCF of 2 and 10 is 2.

So, $\frac{2}{10} = \frac{2/2}{10/2} = \frac{1}{5}$

(ii) $\frac{-36}{180}$, HCF of 36 and 180 is 36.

So, $\frac{-36}{180} = \frac{-36/36}{180/36} = \frac{-1}{5}$

(iii) $\frac{91}{364}$, HCF of 91 and 364 is 91.

So, $\frac{91}{364} = \frac{91/91}{364/94} = \frac{1}{4}$

(iv) $\frac{15}{25}$, HCF of 15 and 25 is 5.

So, $\frac{15}{25} = \frac{15/5}{25/5} = \frac{3}{5}$

(v) $\frac{44}{428}$, HCF of 44 and 428 is 4.

So, $\frac{44}{428} = \frac{44/4}{428/4} = \frac{11}{107}$

7. (i) $\left|\frac{-11}{13}\right| = \frac{11}{13}$ (ii) $\left|\frac{15}{-23}\right| = \frac{15}{23}$

(iii) $\left|\frac{-17}{18}\right| = \frac{17}{18}$ (iv) $\left|\frac{-31}{-37}\right| = \frac{31}{37}$

Exercise 1B

1. (i) $\frac{7}{15} + 0 = \frac{7}{15}$ (additive identity)

(ii) $\frac{-15}{23} + \frac{13}{42} = \frac{13}{42} + \left(\frac{-15}{23}\right)$ (commutative)

(iii) $\frac{-13}{29} + \frac{13}{29} = 0$ (additive inverse)

(iv) $\frac{5}{6} + \left(\frac{-2}{9} + \frac{1}{4}\right) = \frac{5}{6} + \left(\frac{-2}{9}\right) + \frac{1}{4}$ (associative)

2. (i) $\frac{3}{17} + \frac{-5}{34} + \frac{8}{51} = \frac{3 \times 2 + (-5) \times 1}{34} + \frac{8}{51}$

$= \frac{6 - 5}{34} + \frac{8}{51} = \frac{1}{34} + \frac{8}{51}$

$= \frac{1 \times 3 + 8 \times 2}{102} = \frac{3 + 16}{102} = \frac{19}{102}$

(ii) $\frac{2}{3} + \frac{5}{18} + \frac{-17}{24} = \frac{2 \times 6 + 5 \times 1}{18} - \frac{17}{24}$

$= \frac{12 + 5}{18} - \frac{17}{24} = \frac{17}{18} - \frac{17}{24}$

$= \frac{17 \times 4 - 17 \times 3}{72} = \frac{68 - 51}{72} = \frac{17}{72}$

(iii) $\frac{-9}{22} + \frac{7}{11} + \frac{-8}{33} = \frac{7}{11} - \frac{9}{22} - \frac{8}{33}$

$= \frac{7 \times 2 - 9}{22} - \frac{8}{33} = \frac{14 - 9}{22} - \frac{8}{33}$

$= \frac{5}{22} - \frac{8}{33} = \frac{5 \times 3 - 8 \times 2}{66}$

$= \frac{15 - 16}{66} = \frac{-1}{66}$

3. Do it yourself.

4. Do it yourself.

5. (i) $\frac{4}{7} + 0 + \frac{-8}{9} + \frac{-13}{7} + \frac{17}{21}$

$= \frac{4}{7} - \frac{13}{7} - \frac{8}{9} + \frac{17}{21} = \frac{4 - 13}{7} - \frac{8}{9} + \frac{17}{21}$

$= \frac{-9}{7} - \frac{8}{9} + \frac{17}{21} = \frac{-9 \times 9 - 8 \times 7}{63} + \frac{17}{21}$

$$= \frac{-81-56}{63} + \frac{17}{21} = \frac{-137}{63} + \frac{17}{21}$$
$$= \frac{-137+17\times 3}{63} = \frac{-137+51}{63} = \frac{-86}{63}$$

(ii) $\frac{2}{5} + \frac{8}{3} + \frac{-11}{15} + \frac{4}{5} - \frac{2}{3}$

$$= \frac{8}{3} - \frac{2}{3} + \frac{2}{5} + \frac{4}{5} - \frac{11}{15}$$
$$= \frac{8-2}{3} + \frac{2+4}{5} - \frac{11}{15}$$
$$= \frac{6}{3} + \frac{6}{5} - \frac{11}{15} = \frac{6\times 5+6\times 3}{15} - \frac{11}{15}$$
$$= \frac{30+18}{15} - \frac{11}{15} = \frac{48}{15} - \frac{11}{15}$$
$$= \frac{48-11}{15} = \frac{37}{15}$$

6. (i) $0 + \frac{7}{11} = \frac{7}{11}$

(ii) $\frac{13}{17} + 0 = \frac{13}{17}$

(iii) $\frac{3}{5} + 0 = \frac{3}{5}$

(iv) $\frac{-12}{5} + 0 = \frac{-12}{5}$

7. (i) $\frac{1}{4}$

$$\frac{1}{4} - \frac{1}{4} = 0$$

Then $\frac{-1}{4}$ is the additive inverse of $\frac{+1}{4}$.

(ii) $\frac{-3}{4}$

$$\frac{-3}{4} + \frac{3}{4} = 0$$

Then $\frac{+3}{4}$ is the additive inverse of $\frac{-3}{4}$.

(iii) $\frac{-7}{-9}$

$$\frac{-7}{-9} - \frac{7}{9} = 0$$

Then $\frac{-7}{9}$ is the additive inverse of $\frac{-7}{-9}$.

(iv) $\frac{16}{-15}$

$$\frac{-16}{15} + \frac{16}{15} = 0$$

Then $\frac{16}{15}$ is the additive inverse of $\frac{-16}{15}$.

Exercise 1C

1. (i) False, (ii) True, (iii) True, (iv) False, (v) True, (vi) False.

2. (i) $\frac{-5}{26}$ (ii) $\frac{-9}{14}$

(iii) $\frac{34}{9}$ (iv) $\frac{77}{23}$

3. (i) $\frac{6}{17} - \frac{5}{17} = \frac{6-5}{17} = \frac{1}{17}$

(ii) $\frac{-3}{19} - \frac{15}{38} = \frac{-3 \times 2 - 15}{38} = \frac{-6-15}{38} = \frac{-21}{38}$

(iii) $\frac{-5}{18} - \frac{(-3)}{40} = \frac{-5}{18} + \frac{3}{40}$

$$= \frac{-5 \times 20 + 3 \times 9}{360} = \frac{-100 + 27}{360} = \frac{-73}{360}$$

4. (i) $2\frac{3}{5}$ from $\frac{-3}{7} = \frac{-3}{7} - \frac{13}{5} = \frac{-3 \times 5 - 13 \times 7}{35}$

$$= \frac{-15-91}{35} = \frac{-106}{35} = -3\frac{1}{35}$$

(ii) $\frac{-4}{9}$ from $3\frac{5}{8} = \frac{29}{8} + \frac{4}{9} = \frac{29 \times 9 + 4 \times 8}{72}$

$$= \frac{261+32}{72} = \frac{293}{72} = 4\frac{5}{72}$$

(iii) $-3\frac{1}{5}$ from $-4\frac{7}{9} = \frac{-43}{9} + \frac{16}{5}$

$$= \frac{-43 \times 5 + 16 \times 9}{45}$$

$$= \frac{-215+144}{45} = \frac{-71}{45} = -1\frac{26}{45}$$

5. (i) $\frac{-2}{3} + \frac{5}{9} - \frac{-7}{6} = \frac{-2}{3} + \frac{5}{9} + \frac{7}{6}$

$$= \frac{-2 \times 3 + 5}{9} + \frac{7}{6}$$

$$= \frac{-6+5}{9} + \frac{7}{6}$$

$$= \frac{-1}{9} + \frac{7}{6} = \frac{-1\times 2 + 7\times 3}{18}$$

$$= \frac{-2+21}{18} = \frac{19}{18}$$

(ii) $\frac{3}{8} - \frac{-2}{9} + \frac{-1}{36} = \frac{3}{8} + \frac{2}{9} - \frac{1}{36} = \frac{3\times 9 + 2\times 8}{72} - \frac{1}{36}$

$$= \frac{27+16}{72} - \frac{1}{36} = \frac{43}{72} - \frac{1}{36}$$

$$= \frac{43\times 1 - 1\times 2}{72} = \frac{43-2}{72} = \frac{41}{72}$$

(iii) $\frac{1}{6} + \frac{-2}{5} - \frac{-2}{15} = \frac{1}{6} - \frac{2}{5} + \frac{2}{15} = \frac{1\times 5 - 2\times 6}{30} + \frac{2}{15}$

$$= \frac{5-12}{30} + \frac{2}{15} = \frac{-7}{30} + \frac{2}{15}$$

$$= \frac{-7\times 1 + 2\times 2}{30} = \frac{-1}{10}$$

(iv) $\frac{1}{12} + \frac{-5}{18} - \frac{7}{24} = \frac{1}{12} - \frac{5}{18} - \frac{7}{24} = \frac{1\times 3 - 5\times 2}{36} - \frac{7}{24}$

$$= \frac{3-10}{36} - \frac{7}{24} = \frac{-7}{36} - \frac{7}{24}$$

$$= \frac{-7\times 2 - 7\times 3}{72} = \frac{-14-21}{72} = \frac{-35}{72}$$

6. Let rational number $= x$

$$\frac{-3}{22} - x = \frac{-5}{33}$$

$$x = \frac{5}{33} - \frac{3}{22}$$

$$x = \frac{5\times 2 - 3\times 3}{66}$$

$$x = \frac{10-9}{66}$$

$$x = \frac{1}{66}$$

7. Let rational number $= x$

$$\frac{-9}{25} - x = \frac{7}{10}$$

$$x = \frac{-9}{25} - \frac{7}{10} = \frac{-9\times 2 - 7\times 5}{50} = \frac{-18-35}{50}$$

$$x = \frac{-53}{50}$$

8. Let rational number $= x$

$$\frac{-7}{18} + x = \frac{11}{24}$$

$$x = \frac{+7}{18} + \frac{11}{24} = \frac{+7 \times 4 + 11 \times 3}{72} = \frac{+28 + 33}{72}$$

$$x = \frac{61}{72}$$

9. Let rational number $= x$

$$\frac{-3}{10} + x = -6$$

$$x = -6 + \frac{3}{10} = \frac{-6 \times 10 + 3}{10} = \frac{-60 + 3}{10}$$

$$x = \frac{-57}{10}$$

10. Let rational number $= x$

$$\frac{8}{57} + x = \frac{-6}{19}$$

$$x = \frac{-6}{19} - \frac{8}{57} = \frac{-6 \times 3 - 8 \times 1}{57} = \frac{-18 - 8}{57}$$

$$x = \frac{-26}{57}$$

Exercise 1D

1. (i) -4 (ii) $\frac{-63}{108}$

(iii) $\frac{4}{5}, \frac{4}{5}$ (iv) $\frac{-5}{2}$

(v) not defined (vi) 1 and -1

(vii) x^2 (viii) 1

(ix) A negative rational number

2. (i) $\frac{3}{11} \times \frac{2}{5} = \frac{6}{55}$ (ii) $\frac{3}{7} \times \left(\frac{-2}{5}\right) = \frac{-6}{35}$

(iii) $\frac{9}{8} \times \frac{32}{3} = 12$ (iv) $\frac{25}{-9} \times \frac{3}{-10} = \frac{5}{6}$

(v) $\left(\frac{-6}{11}\right) \times \frac{44}{13} = \frac{-24}{13}$ (vi) $\left(\frac{9}{-11}\right) \times \left(\frac{22}{-27}\right) = \frac{2}{3}$

(vii) $\left(\frac{-8}{25}\right) \times \left(\frac{-5}{16}\right) = \frac{1}{10}$ (viii) $\frac{-36}{5} \times \frac{20}{-3} = 48$

3. (i) $\frac{4}{15} \times \frac{9}{5} \times \frac{50}{3} = \frac{4}{15} \times 3 \times 10 = 8$

(ii) $\left(\frac{-3}{2} \times \frac{4}{5}\right) + \left(\frac{9}{5} \times \frac{-10}{3}\right) - \left(\frac{1}{2} \times \frac{3}{4}\right)$

$= \left(\frac{-6}{5}\right) + (-6) - \frac{3}{8}$

$= \frac{-6 \times 8 - 3 \times 5}{40} - 6$

$= \frac{-48 - 15}{40} - 6 = \frac{-63}{40} - 6$

$= \frac{-63 - 6 \times 40}{40} = \frac{-63 - 240}{40}$

$= \frac{-303}{40} = -7\frac{23}{40}$

(iii) $\frac{23}{5} \times \frac{17}{-22} \times \frac{-11}{69} \times \frac{60}{17} = 2$

(iv) $\frac{4}{5} \times \frac{5}{-9} \times \frac{-18}{-45} \times \frac{7}{4} = \frac{-14}{45}$

(v) $\frac{3}{4} \times \frac{-7}{12} \times \frac{-16}{21} \times \frac{-1}{2} = \frac{-1}{6}$

4. (i) $\left(\frac{12}{8} \times \frac{16}{10}\right) + \left(\frac{-3}{9} \times \frac{18}{-16}\right) = \frac{12}{5} + \frac{3}{8}$

$= \frac{12 \times 8 + 3 \times 5}{40}$

$= \frac{96 + 15}{40} = \frac{111}{40}$

(ii) $\left(\frac{16}{15} \times \frac{-20}{4}\right) + \left(\frac{20}{15} \times \frac{-6}{5}\right) = \frac{-16}{3} - \frac{8}{5}$

$= \frac{-16 \times 5 - 8 \times 3}{15} = \frac{-104}{15}$

(iii) $\left(\frac{-4}{15} \times \frac{-5}{-8}\right) - \left(\frac{3}{5} \times \frac{6}{-15}\right) + \left(\frac{5}{-8} \times \frac{16}{15}\right)$

$= \left(\frac{-1}{6}\right) + \frac{6}{25} - \frac{2}{3} = \frac{-1}{6} - \frac{2}{3} + \frac{6}{25}$

$= \frac{-1 - 2 \times 2}{6} + \frac{6}{25} = \frac{-1 - 4}{6} + \frac{6}{25}$

$= \frac{-5}{6} + \frac{6}{25}$

$= \frac{-5 \times 25 + 6 \times 6}{150} = \frac{-125 + 36}{150} = \frac{-89}{150}$

(iv) $1-\frac{3}{8}\times\frac{18}{-35}\times\frac{7}{-9}$

$$=1-\frac{42}{280}=\frac{280-42}{280}=\frac{238}{280}=\frac{17}{20}$$

5. (i) $\frac{2}{5}\times\frac{-3}{7}-\frac{1}{14}-\frac{3}{7}\times\frac{3}{5}$

$$=\frac{-6}{35}-\frac{1}{14}-\frac{9}{35}=\frac{-6}{35}-\frac{9}{35}-\frac{1}{14}$$

$$=\frac{-15}{35}-\frac{1}{14}=\frac{-15\times2-5\times1}{70}$$

$$=\frac{-30-5}{70}=\frac{-35}{70}=\frac{-1}{2}$$

(ii) $\frac{8}{9}\times\frac{4}{5}+\frac{32}{45}-\frac{5}{6}\times\frac{72}{65}$

$$=\frac{32}{45}-\frac{72}{45}+\frac{5}{6}=\frac{32-72}{45}+\frac{5}{6}$$

$$=\frac{-40}{45}+\frac{5}{6}=\frac{-40\times2+5\times15}{90}$$

$$=\frac{-80+75}{90}=\frac{-5}{90}=\frac{-1}{18}$$

(iii) $\frac{-3}{7}\times\frac{14}{15}\times\frac{7}{12}\times\left(\frac{-30}{35}\right)=\frac{-14}{60}\times\frac{-30}{35}=\frac{7}{35}=\frac{1}{5}$

6. Do it yourself.

7. Given : Average speed of train $=65\frac{1}{3}$ km/h $=\frac{196}{3}$ km/h

Time $=6$ hours

We know that : Let distance $=x$

$$\text{Speed}=\frac{\text{Distance}}{\text{Time}}$$

$$\frac{196}{3}=\frac{x}{6}$$

$$x=392\text{ km}$$

8. Given : milk $=3\frac{5}{7}$ litre $=\frac{26}{7}$ litre

Per litre cost $=₹16\frac{1}{2}=₹\frac{33}{2}$

Total cost $=\frac{26}{7}\times\frac{33}{2}=\frac{429}{7}$

Total cost $=₹61\frac{2}{7}$

9. Do it yourself.

10. Do it yourself.

11. (i) 15

$$\text{Multiplicative inverse} = \frac{1}{15}$$

(ii) -16

$$\text{Multiplicative inverse} = \frac{-1}{16}$$

(iii) $\frac{5}{6}$

$$\text{Multiplicative inverse} = \frac{6}{5}$$

(iv) $\frac{3}{7} \times \frac{4}{9} = \frac{4}{21}$

$$\text{Multiplicative inverse} = \frac{21}{4}$$

Exercise 1E

1. Do it yourself.

2. (i) $\frac{4}{9} \div \left(\frac{-5}{12}\right) = \frac{4}{9} \times \left(\frac{-12}{5}\right) = \frac{-16}{15}$

(ii) $\frac{-4}{6} \div \frac{3}{2} = \frac{-4}{6} \times \frac{2}{3} = \frac{-4}{9}$

(iii) $\frac{-15}{7} \div (-30) = \frac{-15}{7} \times \frac{-1}{30} = \frac{1}{14}$

(iv) $-25 \div \left(\frac{-5}{6}\right) = -25 \times \frac{-6}{5} = 30$

(v) $\left(\frac{-16}{25}\right) \div \left(\frac{-15}{14}\right) = \frac{-16}{25} \times \frac{-14}{15} = \frac{224}{375}$

(vi) $\left(\frac{-5}{7}\right) \div \left(\frac{-15}{28}\right) = \left(\frac{-5}{7}\right) \times \left(\frac{-28}{15}\right) = \frac{4}{3}$

(vii) $\frac{-72}{35} \div \frac{48}{-49} = \frac{-72}{35} \times \frac{-49}{48} = \frac{21}{10}$

(viii) $\left(\frac{-7}{12}\right) \div \left(\frac{-2}{3}\right) = \left(\frac{-7}{12}\right) \times \left(\frac{-3}{2}\right) = \frac{7}{8}$

3. (i) $\frac{9}{8} \div (\text{—}) = \frac{6}{5}$

Let Value of bracket $= x$

$$\frac{9}{8} \div x = \frac{6}{5}$$

$$\frac{9}{8} \times \frac{1}{x} = \frac{6}{5}$$

$$x = \frac{45}{48}$$

(ii) $(\quad) \div \left(\frac{-9}{15}\right) = \frac{25}{35}$

Let value of bracket $= x$

$$x \div \left(\frac{-9}{15}\right) = \frac{25}{35}$$

$$x \times \frac{-15}{9} = \frac{25}{35}$$

$$x = \frac{-3}{7}$$

(iii) $(\quad) \div (-5) = \frac{-15}{30}$

Let value of bracket $= x$

$$x \div (-5) = \frac{-15}{30}$$

$$x \times \frac{-1}{5} = \frac{-15}{30}$$

$$x = \frac{5}{2}$$

(iv) $(-15) \div (\quad) = \frac{-6}{5}$

Let value of bracket $= x$

$$(-15) \div x = \frac{-6}{5}$$

$$-15 \times \frac{1}{x} = \frac{-6}{5}$$

$$x = \frac{25}{2}$$

4. Do it yourself.

5. Let

$$x = \frac{\frac{65}{13} + \frac{5}{7}}{\frac{65}{13} - \frac{5}{7}}$$

$$x = \frac{\frac{65 \times 7 + 5 \times 13}{91}}{\frac{65 \times 7 - 5 \times 13}{91}}$$

$$x = \frac{65(7+1)}{65(7-1)} = \frac{8}{6}$$

$$x = \frac{4}{3}$$

6. Let
$$x = \frac{\frac{13}{5} + \frac{-6}{15}}{\frac{-29}{7} \times \frac{1}{-2}} = \frac{13 \times 3 - 6 \times 1}{\frac{15}{\frac{29}{14}}}$$

$$= \frac{39-6}{15} \times \frac{14}{29} = \frac{33}{15} \times \frac{14}{29}$$

$$x = \frac{154}{145}$$

7. Let x is the number

$$\frac{-35}{6} \div x = \frac{-15}{2}$$

$$\frac{-35}{6} \times \frac{1}{x} = \frac{-15}{2}$$

$$x = \frac{7}{9}$$

8. Let other number = x

$$x \times -12 = -15$$

$$x = \frac{15}{12}$$

$$x = \frac{5}{4}$$

9. Let other number = x

$$\frac{-4}{3} \times x = \frac{-16}{9}$$

$$x = \frac{4}{3}$$

10. Given :

$$\text{Cost of } 3\frac{2}{5} \text{ metres of cloth} = ₹ 65\frac{1}{2}$$

$$\frac{17}{5} \text{ metres} = ₹ \frac{131}{2}$$

$$1 \text{ metres} = ₹ \frac{131}{2} \times \frac{5}{17}$$

$$= ₹ \frac{655}{34}$$

$$1 \text{ metres} = ₹ 19\frac{9}{34}$$

11. Given :

25 pairs of shirts of cloth = 60 metres

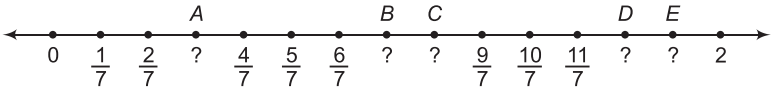
1 pair of shirts of cloth = $\frac{60}{25}$ metres

1 pair of shirts of cloth = 2.4 metres

Exercise 1F

1. Do it yourself.

2. (i)



$A = \frac{3}{7}, \quad B = 1, \quad C = \frac{8}{7}, \quad D = \frac{12}{7}, \quad E = \frac{13}{7}$

(ii) $T = \frac{-3}{2}, \quad S = \frac{-11}{8}, \quad R = \frac{-7}{8}, \quad Q = \frac{-1}{2}, \quad P = \frac{-3}{8}$

3. (i) $\frac{-5}{7} < \frac{6}{13} = \frac{-5}{7}, \frac{6}{13}$ LCM $7, 13 = 91$

$= \frac{-65, 42}{91} = \frac{-65}{91} < \frac{42}{91}$

(ii) $\frac{-4}{5} > \frac{-5}{6}$

(iii) $\frac{-7}{8} = \frac{21}{-24}$

(iv) $\frac{-9}{-10} > \frac{8}{9}$

4. (i) Do it yourself. (ii) $\frac{-16}{20}$ and $\frac{20}{-25}$

We first write the given numbers so that the denominators are positive

$\frac{-16}{20} = \frac{-16}{20}$ and $\frac{20}{-25} = \frac{-20}{25}$

Now, $\frac{-16}{20}, \quad \frac{-20}{25} = \frac{-80, -80}{100}$ (LCM of 20 and 25 is 100)

$\therefore \quad \frac{-80}{100}, \frac{-80}{100}$ (Compare the numerators)

$\therefore \quad \frac{-16}{20}$ and $\frac{20}{-25}$ are equal

(iii) and (iv) Do it yourself.

5. (i) Let greater number = $x = \frac{-4}{11}, \frac{3}{11}$

LCM of 11, 11 $= 11 = \frac{-4 \times 11}{11}, \frac{3 \times 11}{11} = -4, 3$

$x = \frac{3}{11}$

(ii) $\frac{-5}{8}, \frac{-3}{4}$

Let greater number $= x$

$= \frac{-5}{8}, \frac{-3}{4}$

LCM of 8, 4 is 8.

$= \frac{-5 \times 8}{8}, \frac{-3 \times 8}{4} = -5, -6$

$x = \frac{-5}{8}$

(iii) $\frac{-7}{12}, \frac{5}{-8}$

Let greater number $= x$

LCM of 12, 8 is 24.

$= \frac{-7 \times 24}{12}, \frac{5 \times 24}{-8}$

$= -14, -15$

$x = \frac{-7}{12}$

(iv) $\frac{-4}{9}, \frac{-3}{-7}$

Let greater number $= x$

LCM of 9, 7 is 63.

$= \frac{-4 \times 63}{9}, \frac{3 \times 63}{7} = -28, 27$

$x = \frac{-3}{-7}$

6. (i) $\frac{-4}{7}, \frac{5}{-7}$ Let smaller number $= x$

LCM of 7, 7 is 7.

$= \frac{-4 \times 7}{7}, \frac{5 \times 7}{-7} = -4, -5$

$x = \frac{5}{-7}$

(ii) $\frac{6}{13}, \frac{-7}{-13}$

Let smaller number $= x$

LCM of 13, 13 is 13.

$$= \frac{6 \times 13}{13}, \frac{7 \times 13}{13} = 6, 7$$

$$x = \frac{6}{13}$$

(iii) $\frac{16}{-5}, 3$

Let smaller number = x

LCM of 5, 1 is 5.

$$= \frac{16 \times 5}{-5}, \frac{3 \times 5}{1} = -16, 15$$

$$x = \frac{-16}{5}$$

(iv) $\frac{-4}{-3}, \frac{-8}{7}$

Let smaller number = x

LCM of 3, 7 is 21.

$$= \frac{4 \times 21}{-3}, \frac{8 \times 21}{7} = -28, 24$$

$$x = \frac{4}{-3}$$

7. Do it yourself.

8. (i) $\frac{3}{-2}, \frac{3}{8}, \frac{-7}{4}, \frac{1}{10}$

Arrange in ascending order = $\frac{-7}{4}, \frac{3}{-2}, \frac{1}{10}, \frac{3}{8}$

(ii) $\frac{3}{5}, \frac{-7}{10}, \frac{1}{2}, \frac{8}{-15}$

Arrange in ascending order = $\frac{-7}{10}, \frac{8}{-15}, \frac{1}{2}, \frac{3}{5}$

9. (i) $\frac{-7}{2}, \frac{2}{-3}, \frac{5}{6}, \frac{2}{3}$

Arrange in descending order.

$$= \frac{5}{6}, \frac{2}{3}, \frac{2}{-3}, \frac{-7}{2}$$

(ii) $\frac{-15}{27}, \frac{8}{9}, 0, \frac{13}{45}$

Arrange in descending order.

$$= \frac{8}{9}, \frac{13}{45}, 0, \frac{-15}{27}$$

10. Do it yourself.

Exercise 1G

1. Do it yourself.

2. A rational number between -5 and $-4 = \frac{-9}{2}$

3. Two rational number between 3 and 4 = 3.25 and 3.50

4. Three rational number between -2 and $-1 = \frac{-7}{4}, \frac{-3}{2}, \frac{-5}{4}$

5. Five rational numbers which are smaller than -4.

$$= \frac{-9}{2}, -5, \frac{-11}{2}, -6, \frac{-13}{2}$$

6. Six rational number between $\frac{-1}{2}$ and $\frac{5}{4}$ is

$$= \frac{-1}{4}, 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1$$

7. Ten rational number which are greater than 0

$$= \frac{1}{2}, 1, \frac{3}{2}, 2, \frac{5}{2}, 3, \frac{7}{2}, 4, \frac{9}{2}, 5$$

Exercise 1H

1. Quantity of paint that Rahul had $= \frac{3}{4}$ L

Quantity of paint used by Rahul for a room $= \frac{1}{2}$ L

Quantity of paint Rahul left $= \frac{3}{4}\text{L} - \frac{1}{2}\text{L} = \frac{3\text{ L} - 2\text{ L}}{4} = \frac{1}{4}$ L

Let A L paint need to made it $= \frac{4}{5}$ L

Then, $\frac{1}{4} + A = \frac{4}{5}$

$$A = \frac{4}{5} - \frac{1}{4} = \frac{16 - 5}{20}$$

$$A = \frac{11}{20}\text{L}$$

2. Total quantity of sugar with Neha $= \frac{7}{9}$ cup

(i) Quantity of sugar that she used altogether

$$= \frac{1}{2} + \frac{1}{4} = \frac{2 + 1}{4} = \frac{3}{4}\text{ cup}$$

(ii) Quantity of sugar she had left $= \frac{7}{9} - \frac{3}{4} = \frac{28 - 27}{36} = \frac{1}{36}$ cup

3. The total weight of fruits = 20 kg

$$\text{Weight of oranges} = 7\frac{1}{6}\text{ kg} = \frac{43}{6}\text{ kg}$$

$$\text{Weight of apples} = 8\frac{2}{3}\text{ kg} = \frac{26}{3}\text{ kg}$$

$$\text{Weight of grapes} = 20 - \frac{43}{6} - \frac{26}{3}$$

$$= 20 - \frac{43 \times 1 - 26 \times 2}{6}$$

$$= 20 - \frac{43 - 52}{6} = 20 - \frac{95}{6}$$

$$= \frac{20 \times 6 - 95}{6} = \frac{120 - 95}{6}$$

$$= \frac{25}{6}\text{ kg}$$

$$\text{Weight of grapes} = 4\frac{1}{6}\text{ kg.}$$

4. The population of a city = 663432

$$\text{Adult males} = \frac{1}{2}\text{ of population} = \frac{1}{2} \times 663432$$

$$\text{Adult males} = 331716$$

$$\text{Adult females} = \frac{1}{3}\text{ of population} = \frac{1}{3} \times 663432$$

$$\text{Adult females} = 221144$$

Number of children in city = 663432 − 331716 − 221144

Number of children in city = 110572.

5. Ankur spent a total time $= \frac{49}{6}$ h

Visit to old person's $= \frac{24}{7}$ h

$$\text{Remaining time} = \frac{49}{6} - \frac{24}{7} = \frac{343 - 144}{42}$$

(i) blind persons $= \frac{199}{42}$ h

(ii) Longer time difference between blind persons and old person

$$= \frac{199}{42} - \frac{24}{7} = \frac{55}{42}\text{ h}$$

6. (i) Total time spent by Pulkit $= \frac{1}{4}\text{ h} + \frac{2}{5}\text{ h} = \frac{5\text{ h} + 8\text{ h}}{20} = \frac{13}{20}$ hrs.

(ii) Time spent in cleaning the second classroom

$$= \frac{2}{5}\text{h} - \frac{1}{4}\text{h} = \frac{8\text{h} - 5\text{h}}{20} = \frac{3}{20}\text{h}$$

7. (i) Bill of flour $= \frac{3}{4}\text{kg} \times ₹\frac{21}{2} = ₹\frac{63}{8}$

(ii) Bill of sugar $= \frac{2}{5}\text{kg} \times ₹\frac{31}{2} = ₹\frac{62}{10}$

(iii) Bill of salt $= \frac{1}{4}\text{kg} \times ₹\frac{20}{3} = ₹\frac{20}{12}$

Total bill $= ₹\frac{63}{8} + ₹\frac{62}{10} + ₹\frac{20}{12}$

$$= \frac{63 \times 15 + 62 \times 12 + 20 \times 10}{120} = \frac{945 + 744 + 200}{120}$$

$$= ₹\frac{1889}{120}$$

8. Cost of 1 L milk $= ₹\frac{4}{5}$

Cost of $\frac{15}{28}$ L milk $= \frac{4}{5} \times \frac{15}{28} = ₹\frac{3}{7}$

9. Fraction of plank that is sawn off $= \frac{1}{5}$

Remaining part of plank $= 1 - \frac{1}{5} = \frac{4}{5}$

Fraction of plank that thrown away $= \frac{4}{5} \times \frac{3}{8} = \frac{3}{10}$

Fraction of the original plank remained

$$= \frac{4}{5} - \frac{3}{10} = \frac{8-3}{10} = \frac{5}{10} = \frac{1}{2}$$

10. Let other number $= x$

Product of two number $= \frac{6}{5}$

$$\frac{1}{5} \times x = \frac{6}{5}$$

$$x = 6$$

(i) Sum of two number $= \frac{1}{5} + 6 = \frac{1+30}{5} = \frac{31}{5}$

(ii) Difference of two number $= 6 - \frac{1}{5} = \frac{30-1}{5} = \frac{29}{5}$

11. Rohit had a rope $= 325\frac{4}{5}\text{m} = \frac{1629}{5}\text{m}$

Rohit cut off $= 150\frac{3}{5}\text{m} = \frac{753}{5}\text{m}$

$$\text{Rest rope} = \frac{1629}{5} - \frac{753}{5} = \frac{876}{5}$$

$$\text{Length of each part} = \frac{\frac{876}{5}}{3} = \frac{876}{5 \times 3} = \frac{292}{5}\text{ m} = 58\frac{2}{5}\text{ m}$$

12. $3\frac{1}{2}$ L of petrol costs $= ₹\,270\frac{3}{8}$

$$1\text{ L of petrol costs} = ₹\frac{2163}{8} \times \frac{2}{7}$$

$$1\text{ L of petrol cost} = ₹\frac{309}{4}$$

$$4\text{ L of petrol cost} = ₹\frac{309}{4} \times 4$$

$$4\text{ L of petrol cost} = ₹\,309$$

13. Rajesh earns per month = ₹ 40,000

He spend $\frac{3}{8}$ of income on food $= \frac{40000 \times 3}{8} = 15000$

Rest amount of Rajesh = 25000

He spend $\frac{1}{5}$ of rest on LIC $= \frac{25000}{5} = 5000$

Rest amount of Rajesh = 20000

He spend $\frac{1}{2}$ of rest on expenses $= \frac{1}{2} \times 20000 = 10000$

Rest amount of Rajesh = 10000.

14. Let the bill $= x$

P paid $\frac{1}{2}$ of bill $= \frac{x}{2}$

Q paid $\frac{1}{5}$ of bill $= \frac{x}{5}$

$$\text{Rest bill} = x - \frac{x}{2} - \frac{x}{5} = \frac{2x - x}{2} - \frac{x}{5}$$

$$= \frac{x}{2} - \frac{x}{5} = \frac{5x - 2x}{10}$$

$$\text{Rest bill} = \frac{3x}{10}$$

Rest bill divide by R, S, T.

Fraction of bill paid by each $= \frac{3x}{10} \times \frac{1}{3} = \frac{x}{10}$

Fraction value $= \frac{1}{10}$.

15. Let total number of students = x

Number of students come by car = $\frac{2x}{5}$

Number of students come by bus = $\frac{x}{4}$

$$\text{Remaining students} = x - \frac{2x}{5} - \frac{x}{4}$$

$$= \frac{5x - 2x}{5} - \frac{x}{4}$$

$$= \frac{3x}{5} - \frac{x}{4}$$

$$= \frac{12x - 5x}{20} = \frac{7x}{20}$$

$\frac{1}{3}$ of remaining students walk = $\frac{7x}{20} \times \frac{1}{3} = 224$

$$\frac{7x}{60} = 224 \Rightarrow \frac{x}{60} = 32$$

$$x = 1920$$

16. Given :

$$F + S_1 + S_2 = ₹\,60000 \quad \ldots(i)$$

$$S_1 = \frac{3}{8} \text{ of } F$$

$$S_1 = \frac{3}{8}F$$

$$S_2 = \frac{1}{2}F = \frac{F}{2}$$

$$F + \frac{3}{8}F + \frac{F}{2} = ₹\,60000$$

$$\frac{8F + 3F}{8} + \frac{F}{2} = ₹\,60000$$

$$\frac{11F}{8} + \frac{F}{2} = ₹\,60000$$

$$\frac{11F + 4F}{8} = ₹\,60000$$

$$\frac{15F}{8} = ₹\,60000$$

(i) $$F = 32000$$

$$S_1 = 32000 \times \frac{3}{8}$$

(ii) $$S_1 = 12000$$

$$S_2 = 32000 \times \frac{1}{2}$$

(iii) $$S_2 = 16000$$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. (i) Let x

$$\frac{2}{5} = \frac{x}{135}$$

$$x = 2 \times 27 \quad \Rightarrow \quad x = 54$$

(ii) $$\frac{5}{x} = \frac{90}{216}$$

$$x = \frac{216}{18} \quad \Rightarrow \quad x = 12$$

(iii) $$\frac{25}{35} = \frac{5}{x}$$

$$x = \frac{35}{5} \quad \Rightarrow \quad x = 7$$

(iv) $$\frac{49}{56} = \frac{7}{x}$$

$$x = \frac{56}{7} \quad \Rightarrow \quad x = 8$$

(v) $$\frac{72}{81} = \frac{8}{x}$$

$$x = \frac{81}{9} \quad \Rightarrow \quad x = 9$$

3. (i) $\dfrac{-144}{-504}$

Standard form $= \dfrac{2}{7}$.

(ii) $\dfrac{140}{490}$

Standard form $= \dfrac{2}{7}$.

(iii) $\dfrac{240}{-840}$

Standard form $= \dfrac{-2}{7}$.

(iv) $\dfrac{225}{625}$

Standard form $= \dfrac{9}{25}$

4. (i) $\frac{6}{11}$ and $\frac{-9}{11}$

$$\text{Addition} = \frac{6}{11} - \frac{9}{11} = \frac{6-9}{11} = \frac{-3}{11}$$

(ii) $\frac{5}{-26}$ and $\frac{8}{39}$

$$\text{Addition} = \frac{-5}{26} + \frac{8}{39} = \frac{-5\times 3 + 8\times 2}{78}$$
$$= \frac{-15+16}{78} = \frac{1}{78}$$

(iii) $\frac{5}{-6}$ and $\frac{2}{3}$

$$\text{Addition} = \frac{-5}{6} + \frac{2}{3} = \frac{-5\times 1 + 2\times 2}{6} = \frac{-5+4}{6} = \frac{-1}{6}$$

(iv) -2 and $\frac{2}{5}$

$$\text{Addition} = -2 + \frac{2}{5} = \frac{-2\times 5 + 2}{5} = \frac{-10+2}{5} = \frac{-8}{5}$$

5. (i) $\frac{5}{9} + \frac{-7}{6} = \frac{5}{9} - \frac{7}{6} = \frac{5\times 2 - 7\times 3}{18}$

$$= \frac{10-21}{18} = \frac{-11}{18}$$

(ii) $4 + \frac{3}{-5} = 4 - \frac{3}{5} = \frac{4\times 5 - 3}{5} = \frac{20-3}{5} = \frac{17}{5}$

(iii) $\frac{1}{-15} + \frac{5}{-12} = \frac{-1}{15} - \frac{5}{12} = \frac{-1\times 4 - 5\times 5}{60}$

$$= \frac{-4-25}{60} = \frac{-29}{60}$$

(iv) $\frac{5}{9} + \frac{3}{-4} = \frac{5}{9} - \frac{3}{4} = \frac{5\times 4 - 3\times 9}{36} = \frac{20-27}{36} = \frac{-7}{36}$

6. (i) $\frac{3}{7} + \frac{-4}{9} + \frac{-11}{7} + \frac{7}{9} = \frac{3}{7} - \frac{4}{9} - \frac{11}{7} + \frac{7}{9}$

$$= \frac{3\times 9 - 4\times 7}{63} - \left(\frac{11\times 9 - 7\times 7}{63}\right)$$
$$= \frac{27-28}{63} - \frac{(99-49)}{63}$$
$$= \frac{-1}{63} - \frac{50}{63} = \frac{-1-50}{63} = \frac{-51}{63} = \frac{-17}{21}$$

(ii) $\frac{2}{3} + \frac{-4}{5} + \frac{1}{3} + \frac{2}{5} = \frac{2}{3} - \frac{4}{5} + \frac{1}{3} + \frac{2}{5}$

$$= \frac{2 \times 5 - 4 \times 3}{15} + \frac{1 \times 5 + 2 \times 3}{15}$$

$$= \frac{10 - 12}{15} + \frac{5 + 6}{15}$$

$$= \frac{-2}{15} + \frac{11}{15} = \frac{-2 + 11}{15} = \frac{9}{15} = \frac{3}{5}$$

(iii) $\frac{4}{7} + 0 + \frac{-8}{9} + \frac{-13}{7} + \frac{17}{9}$

$$= \frac{4}{7} - \frac{8}{9} - \frac{13}{7} + \frac{17}{9}$$

$$= \frac{4 \times 9 - 8 \times 7}{63} - \left(\frac{13 \times 9 - 17 \times 7}{63} \right)$$

$$= \frac{36 - 56}{63} - \left(\frac{117 - 119}{63} \right)$$

$$= \frac{-20}{63} + \frac{2}{63} = \frac{-20 + 2}{63} = \frac{-18}{63} = \frac{-2}{7}$$

(iv) $\frac{3}{8} + \frac{-5}{12} + \frac{3}{7} + \frac{3}{12} + \frac{-5}{8} + \frac{-2}{7}$

$$= \frac{3}{8} - \frac{5}{12} + \frac{3}{7} + \frac{3}{12} - \frac{5}{8} - \frac{2}{7}$$

$$= \frac{3 \times 3 - 5 \times 2}{24} + \frac{3 \times 12 + 3 \times 7}{84} - \left(\frac{5 \times 7 + 2 \times 8}{56} \right)$$

$$= \frac{9 - 10}{24} + \frac{36 + 21}{84} - \left(\frac{35 + 16}{56} \right)$$

$$= \frac{-1}{24} + \frac{57}{84} - \frac{51}{56} = \frac{-1 \times 7 + 57 \times 2}{168} - \frac{51}{56}$$

$$= \frac{-7 + 114}{168} - \frac{51}{56}$$

$$= \frac{107}{168} - \frac{51}{56} = \frac{107 - 51 \times 3}{168}$$

$$= \frac{107 - 153}{168} = \frac{-46}{168} = \frac{-23}{84}$$

7. (i) $\frac{-3}{8}$

Additive inverse of $\frac{-3}{8} = \frac{3}{8}$

(ii) $\frac{4}{-9}$

Additive inverse of $\frac{4}{-9} = \frac{4}{9}$

(iii) $\frac{-7}{5}$

Additive inverse of $\frac{-7}{5} = \frac{7}{5}$

(iv) $\frac{-4}{-13}$

Additive inverse of $\frac{-4}{-13} = \frac{-4}{13}$

(v) 0

Additive inverse of $0 = 0$

(vi) -2

Additive inverse of $-2 = 2$

8. (i) $\frac{-3}{8} - \frac{5}{8} = \frac{-3-5}{8} = \frac{-8}{8} = -1$

(ii) $\frac{4}{11} - \left(\frac{-8}{11}\right) = \frac{4}{11} + \frac{8}{11} = \frac{12}{11}$

(iii) $\frac{-5}{9} - \frac{4}{9} = \frac{-5-4}{9} = \frac{-9}{9} = -1$

(iv) $\frac{-3}{8} - \frac{1}{4} = \frac{-3\times 1 - 1\times 2}{8} = \frac{-3-2}{8} = \frac{-5}{8}$

9. (i) $\frac{2}{3} - \frac{4}{5} = \frac{2\times 5 - 4\times 3}{15} = \frac{10-12}{15} = \frac{-2}{15}$

(ii) $\frac{-4}{9} - \frac{2}{-3} = \frac{-4}{9} + \frac{2}{3} = \frac{-4\times 1 + 2\times 3}{9} = \frac{-4+6}{9} = \frac{2}{9}$

(iii) $-1 - \frac{4}{9} = \frac{-1\times 9 - 4\times 1}{9} = \frac{-9-4}{9} = \frac{-13}{9}$

(iv) $\frac{-2}{7} - \frac{3}{-14} = \frac{-2\times 2 + 3\times 1}{14} = \frac{-4+3}{14} = \frac{-1}{14}$

10. (i) $\frac{2}{3} + \frac{-4}{5} - \frac{1}{3} - \frac{2}{5} = \frac{2}{3} - \frac{4}{5} - \frac{1}{3} - \frac{2}{5}$

$= \frac{2\times 5 - 4\times 3}{15} - \left(\frac{1\times 5 + 2\times 3}{15}\right)$

$= \frac{10-12}{15} - \left(\frac{5+6}{15}\right)$

$= \frac{-2}{15} - \frac{11}{15} = \frac{-2-11}{15} = \frac{-13}{15}$

(ii) $\frac{4}{7} - \frac{-8}{9} - \frac{-13}{7} + \frac{17}{9}$

$= \frac{4}{7} + \frac{8}{9} + \frac{13}{7} + \frac{17}{9}$

$$= \frac{4 \times 9 + 8 \times 7}{63} + \frac{13 \times 9 + 17 \times 7}{63}$$

$$= \frac{36 + 56}{63} + \frac{117 + 119}{63}$$

$$= \frac{92}{63} + \frac{236}{63} = \frac{92 + 236}{63}$$

$$= \frac{328}{63} = 5\frac{13}{63}$$

11. Given :

Sum of two rational number $= \frac{9}{20}$

One number $= \frac{2}{5}$

Let other number $= x$

$$x + \frac{2}{5} = \frac{9}{20}$$

$$x = \frac{9}{20} - \frac{2}{5} = \frac{9 \times 1 - 2 \times 4}{20} = \frac{9 - 8}{20}$$

$$x = \frac{1}{20}$$

12. Let rational number $= x$

$$\frac{-5}{6} - x = \frac{4}{9}$$

$$x = \frac{-5}{6} - \frac{4}{9} = \frac{-5 \times 3 - 4 \times 2}{18} = \frac{-15 - 8}{18}$$

$$x = \frac{-23}{18}$$

13. Let other rational number $= x$

Sum of rational number $= \frac{-2}{3}$

$$\frac{-8}{15} + x = \frac{-2}{3}$$

$$x = \frac{-2}{3} + \frac{8}{15} = \frac{-2 \times 5 + 8 \times 1}{15} = \frac{-10 + 8}{15}$$

$$x = \frac{-2}{15}$$

14. (i) Let subtracted $= x$

$$-2 - x = \frac{3}{8}$$

$$x = -2 - \frac{3}{8} = \frac{-2 \times 8 - 3 \times 1}{8}$$

$$= \frac{-16-3}{8} = \frac{-19}{8}$$

(ii) Let added $= x$

$$-2 + x = \frac{3}{8}$$

$$x = \frac{3}{8} + 2 = \frac{3 \times 1 + 2 \times 8}{8} = \frac{3+16}{8}$$

$$x = \frac{19}{8}$$

15. (i) $\frac{-8}{22} \times \frac{11}{16} \times \frac{3}{10} = \frac{-1}{2} \times \frac{1}{2} \times \frac{3}{10} = \frac{-3}{40}$

(ii) $\frac{-19}{50} \times \frac{75}{38} \times \frac{-12}{25} = \frac{-1}{50} \times \frac{3}{2} \times -12 = \frac{9}{25}$

(iii) $\frac{11}{12} \times \frac{-7}{8} \times \frac{-16}{22} = \frac{1}{12} \times \frac{-7}{1} \times \frac{-2}{2} = \frac{7}{12}$

16. (i) $\frac{-3}{8} \times \left(\frac{5}{9} + \frac{-7}{18}\right) = \frac{-3}{8} \times \left(\frac{5}{9} - \frac{7}{18}\right)$

$$= \frac{-3}{8} \times \left(\frac{5 \times 2 - 7 \times 1}{18}\right)$$

$$= \frac{-3}{8} \times \left(\frac{10-7}{18}\right) = \frac{-3}{8} \times \frac{3}{18} = \frac{-1}{16}$$

(ii) $\frac{5}{7} \times \left(\frac{-14}{25} + \frac{21}{50}\right) = \frac{5}{7} \times \left(\frac{-14 \times 2 + 21 \times 1}{50}\right)$

$$= \frac{5}{7} \times \left(\frac{-28+21}{50}\right)$$

$$= \frac{5}{7} \times \frac{-7}{50} = \frac{-1}{10}$$

(iii) $\frac{-5}{8} \times \frac{7}{9} + \frac{5}{12} \times \frac{1}{40} + \frac{7}{9} \times \frac{-3}{5}$

$$= \frac{-35}{72} + \frac{5}{480} + \frac{(-21)}{45}$$

$$= \frac{-35 \times 20 + 5 \times 3 - 21 \times 32}{1440}$$

$$= \frac{-700 + 15 - 672}{1440} = \frac{-1357}{1440}$$

17. Do it yourself.

18. (i) $\frac{3}{5} \times \frac{2}{3}$

Reciprocal of $\frac{3}{5} \times \frac{2}{3} = \frac{5}{2}$

(ii) $\frac{-8}{3} \times \frac{13}{-7}$

Reciprocal of $\frac{8}{3} \times \frac{13}{7} = \frac{21}{104}$

(iii) $\frac{-3}{5} \times \frac{-1}{13}$

Reciprocal of $\frac{3}{5} \times \frac{1}{13} = \frac{65}{3}$

19. (i) $\frac{-5}{12} \div \frac{1}{16} = \frac{-5}{12} \times 16 = \frac{-20}{3}$

(ii) $\frac{-21}{26} \div \left(\frac{-7}{8}\right) = \frac{-21}{26} \times \frac{8}{-7} = \frac{12}{13}$

(iii) $0 \div \left(\frac{-4}{7}\right) = 0 \times \left(\frac{7}{-4}\right) = 0$

(iv) $\frac{8}{-5} \div \frac{24}{25} = \frac{8}{-5} \times \frac{25}{24} = \frac{1}{-5} \times \frac{25}{3} = \frac{-5}{3}$

20. (i) -2 by $\left(\frac{-1}{2}\right) = -2 \div \left(\frac{-1}{2}\right) = -2 \times -2 = 4$

(ii) 0 by $\frac{7}{-9} = 0 \div \left(\frac{-7}{9}\right) = 0 \times \left(\frac{9}{-7}\right) = 0$

(iii) $\frac{-5}{8}$ by $\frac{1}{4} = \frac{-5}{8} \div \frac{1}{4} = \frac{-5}{8} \times 4 = \frac{-5}{2}$

(iv) $\frac{-3}{4}$ by $\frac{-9}{16} = \frac{-3}{4} \div \frac{-9}{16} = \frac{-3}{4} \times \frac{-16}{9} = \frac{4}{3}$

21. $\left[\frac{3}{7} + \left(\frac{-5}{14}\right)\right] \div \frac{-1}{2} = \left(\frac{3}{7} - \frac{5}{14}\right) \times -2$

$= \left(\frac{3 \times 2 - 5 \times 1}{14}\right) \times -2$

$= \left(\frac{6 - 5}{14}\right) \times -2 = \frac{1}{14} \times -2 = \frac{-1}{7}$

22. (i) $m = \frac{2}{3}$ and $n = \frac{3}{2}$

$= (m + n) \div (m - n)$

$= \left(\frac{2}{3} + \frac{3}{2}\right) \div \left(\frac{2}{3} - \frac{3}{2}\right)$

$= \left(\frac{4 + 9}{6}\right) \div \left(\frac{2 \times 2 - 3 \times 3}{6}\right)$

$= \frac{13}{6} \div \left(\frac{4 - 9}{6}\right) = \frac{13}{6} \div \left(\frac{-5}{6}\right)$

$$= \frac{13}{6} \times \frac{-6}{5} = \frac{-13}{5}$$

(ii) $m = \frac{3}{4}$ and $n = \frac{4}{3}$

$$= (m + n) \div (m - n)$$

$$= \left(\frac{3}{4} + \frac{4}{3}\right) \div \left(\frac{3}{4} - \frac{4}{3}\right)$$

$$= \left(\frac{3 \times 3 + 4 \times 4}{12}\right) \div \left(\frac{3 \times 3 - 4 \times 4}{12}\right)$$

$$= \left(\frac{9 + 16}{12}\right) \div \left(\frac{9 - 16}{12}\right)$$

$$= \frac{25}{12} \div \left(\frac{-7}{12}\right)$$

$$= \frac{25}{12} \times \frac{-12}{7} = \frac{-25}{7}$$

(iii) $m = \frac{4}{5}$ and $n = \frac{-3}{10}$

$$= (m + n) \div (m - n)$$

$$= \left(\frac{4}{5} + \left(\frac{-3}{10}\right)\right) \div \left(\frac{4}{5} - \left(\frac{-3}{10}\right)\right)$$

$$= \left(\frac{4}{5} - \frac{3}{10}\right) \div \left(\frac{4}{5} + \frac{3}{10}\right)$$

$$= \left(\frac{4 \times 2 - 3 \times 1}{10}\right) \div \left(\frac{4 \times 2 + 3 \times 1}{10}\right)$$

$$= \frac{(8 - 3)}{10} \div \left(\frac{8 + 3}{10}\right)$$

$$= \frac{5}{10} \times \frac{10}{11} = \frac{5}{11}$$

23. $\left(\frac{5}{8} + \left(\frac{-11}{12}\right)\right) \div \left(\frac{3}{7} - \frac{5}{14}\right)$

$$= \left(\frac{5}{8} - \frac{11}{12}\right) \div \left(\frac{3}{7} - \frac{5}{14}\right)$$

$$= \left(\frac{5 \times 3 - 11 \times 2}{24}\right) \div \left(\frac{3 \times 2 - 5 \times 1}{14}\right)$$

$$= \left(\frac{15 - 22}{24}\right) \div \left(\frac{6 - 5}{14}\right)$$

$$= \frac{-7}{24} \times \frac{14}{1} = \frac{-7}{12} \times 7 = \frac{-49}{12}$$

24. Do it yourself.

25. (i) $\frac{1}{4}$ and $\frac{1}{3}$

One rational number between them.

We find the mean of $\frac{1}{4}$ and $\frac{1}{3}$

$$=\left(\frac{1}{4}+\frac{1}{3}\right)\div 2=\frac{7}{12}\div 2=\frac{7}{12}\times\frac{1}{2}$$

One rational number $=\frac{7}{24}$

i.e. We find that $\frac{1}{4}<\frac{7}{24}<\frac{1}{3}$

Thus, the rational number between

$$\frac{1}{4} \quad \text{and} \quad \frac{1}{3}=\frac{7}{24}$$

(ii) $\frac{-1}{4}$ and 1

We find mean of $\frac{-1}{4}$ and 1.

$$=\left(\frac{-1}{4}+1\right)\div 2$$

$$=\left(\frac{-1+4}{4}\right)\div 2=\frac{3}{4}\times\frac{1}{2}=\frac{3}{8}$$

i.e., We find that $\frac{-1}{4}<\frac{3}{8}<1$

Thus, the rational number between $\frac{-1}{4}$ and $1=\frac{3}{8}$

(iii) $\frac{-2}{5}$ and $\frac{1}{10}$

We find mean of $\frac{-2}{5}$ and $\frac{1}{10}$

$$=\left(\frac{-2}{5}+\frac{1}{10}\right)\div 2=\left(\frac{-2\times 2+1\times 1}{10}\right)\div 2$$

$$=\left(\frac{-4+1}{10}\right)\div 2=\frac{-3}{10}\times\frac{1}{2}=\frac{-3}{20}$$

Thus, the rational number between $\frac{-2}{5}$ and $\frac{1}{10}=\frac{-3}{20}$.

(iv) $\frac{3}{10}$ and $\frac{7}{12}$

We find mean of $\frac{3}{10}$ and $\frac{7}{12}$

$$= \left(\frac{3}{10} + \frac{7}{12}\right) \div 2 = \left(\frac{3 \times 6 + 7 \times 5}{60}\right) \div 2$$

$$= \left(\frac{18 + 35}{60}\right) \div 2 = \frac{53}{60} \div 2$$

$$= \frac{53}{60} \times \frac{1}{2} = \frac{53}{120}$$

i.e., we find that $\frac{3}{10} < \frac{53}{120} < \frac{7}{12}$.

Thus, the rational number between $\frac{3}{10}$ and $\frac{7}{12} = \frac{53}{120}$.

26. Given : –3 and 5

We find mean of –3 and 5

$$= (-3 + 5) \div 2 = 2 \div 2 = 1$$

i.e., $-3 < 1 < 5$

Now, a rational number between –3 and $1 = \frac{1}{2}(-3 + 1)$

$$= \frac{1}{2}(-2) = -1$$

i.e., $-3 < -1 < 1 < 5$

Now, a rational number between –3 and $-1 = \frac{1}{2}(-3 - 1)$

$$= \frac{1}{2}(-4) = -2$$

i.e., $-3 < -2 < -1 < 1 < 5$

Now, a rational number between –1 and $5 = \frac{1}{2}(-1 + 5)$

$$= \frac{1}{2}(4) = \frac{4}{2} = 2$$

Thus, we get $-3 < -2 < -1 < 1 < 2 < 5$.

$\therefore$ Four rational numbers between –3 and 5 is =

$\Rightarrow$ –2, –1, 1, 2

27. Given :

A hall 8 m by $\frac{11}{2}$ m.

$$\text{Area of hall} = \text{Length} \times \text{Width}$$

$$= 8 \times \frac{11}{2} = \frac{88}{2} = 44 \text{ m}^2$$

$1\ m^2$ of cost required $= ₹\frac{21}{4}$

$44\ m^2$ of cost required $= ₹\frac{21}{4} \times 44 = ₹\,231 = ₹\,231$

28. Given :

A car cover distance in $4\frac{1}{5}$ L petrol $= 82$ km

$4\frac{1}{5}$ L petrol $= 82$ km

$\frac{21}{5}$ L petrol $= 82$ km

1 L petrol $= \frac{82 \times 5}{21}$ km $= \frac{410}{21}$ km

1 L petrol $= 19\frac{11}{21}$ km

29. The cost of 12 balls $= ₹205\frac{1}{7}$

12 balls $= ₹\frac{1436}{7}$

The cost of 1 ball $= ₹\frac{1436}{12 \times 7} = ₹\frac{359}{3 \times 7} = ₹\frac{359}{21}$

Thus, the cost of 1 ball $= ₹17\frac{2}{21}$.

30. Given :

Length of wire $= 50$ m

Two pieces of wire cut off $= 10\frac{3}{4} + 22\frac{1}{5}$

Remaining wire $= 50 - 10\frac{3}{4} - 22\frac{1}{5}$

$= 50 - \frac{43}{4} - \frac{111}{5}$

$= 50 - \left(\frac{43 \times 5 + 111 \times 4}{20}\right)$

$= 50 - \frac{(215 + 444)}{20}$

$= 50 - \frac{659}{20} = \frac{50 \times 20 - 659}{20}$

Remaining wire $= \frac{1000 - 659}{20} = \frac{341}{20} = 17\frac{1}{20}$ m

2. Exponents and Radicals

Exercise 2A

1. (i) $5^{1/4}$

Express as radical = $\sqrt[4]{5}$

(ii) $21^{2/3}$

Radical form = $\sqrt[3]{21^2}$

(iii) $2^{5/6}$

Radical form = $\sqrt[6]{2^5}$

(iv) $\left(\frac{5}{17}\right)^{1/9}$

Radical form = $\sqrt[9]{\left(\frac{5}{17}\right)}$

(v) $\left(\frac{17}{21}\right)^{2/5}$

Radical form = $\sqrt[5]{\left(\frac{17}{21}\right)^2}$

(vi) $(-215)^{1/7}$

Radical form = $\sqrt[7]{(-215)}$

2. (i) $\sqrt[4]{37}$

Exponential form = $(37)^{1/4}$

(ii) $\sqrt[5]{27}$

Exponential form = $(27)^{1/5}$

(iii) $\sqrt[7]{(29)^2}$

Exponential form = $(29)^{2/7}$

(iv) $\sqrt[6]{\frac{8}{9}}$

Exponential form = $\left(\frac{8}{9}\right)^{1/6}$

(v) $\sqrt[3]{\left(\frac{2}{3}\right)^2}$

Exponential form = $\left(\frac{2}{3}\right)^{2/3}$

(vi) $\sqrt[3]{2^{-6}}$

Exponential form $= 2^{-6/3} = 2^{-2}$

3. (i) $3 \times 16^{3/4} = 3 \times (2^4)^{3/4} = 3 \times (2)^{\frac{4 \times 3}{4}}$

$= 3 \times 2^3 = 3 \times 8 = 24$

(ii) $2 \times (27)^{-2/3} = 2 \times (3^3)^{-2/3} = 2 \times (3)^{\frac{-3 \times 2}{3}}$

$= 2 \times 3^{-2} = 2 \times \frac{1}{3^2} = \frac{2}{9}$

(iii) $5^2 \times 5^{-4} = 5^2 \times \frac{1}{5^4} = \frac{1}{5^4 \times 5^{-2}}$

$= \frac{1}{5^{4-2}} = \frac{1}{5^2} = \frac{1}{25}$

(iv) $[(8)^{2/3}]^{-3/2} = [(2)^{\frac{3 \times 2}{3}}]^{-3/2}$

$= [2^2]^{-3/2} = 2^{\frac{2 \times -3}{2}} = 2^{-3} = \frac{1}{2^3} = \frac{1}{8}$

4. (i) $(0.04)^{3/2} = \left(\frac{004}{100}\right)^{3/2} = \left(\frac{4}{100}\right)^{3/2} = \left(\frac{2^2}{10^2}\right)^{3/2}$

$= \frac{(2)^{\frac{2 \times 3}{2}}}{(10)^{\frac{2 \times 3}{2}}} = \frac{2^3}{10^3} = \frac{8}{1000} = 0.008$

(ii) $(0.008)^{2/3} = \left(\frac{8}{1000}\right)^{2/3} = \left(\frac{2^3}{10^3}\right)^{2/3}$

$= \frac{(2^3)^{2/3}}{(10^3)^{2/3}} = \frac{2^{\frac{3 \times 2}{3}}}{10^{\frac{3 \times 2}{3}}}$

$= \frac{2^2}{10^2} = \frac{4}{100} = 0.04$

(iii) $(0.000064)^{5/6} = \left(\frac{64}{1000000}\right)^{5/6} = \left(\frac{2^6}{10^6}\right)^{5/6}$

$= \frac{(2^6)^{5/6}}{(10^6)^{5/6}} = \frac{2^{\frac{6 \times 5}{6}}}{10^{\frac{6 \times 5}{6}}}$

$$= \frac{2^5}{10^5} = \frac{32}{100000} = 0.00032$$

(iv) $(6.25)^{3/2} = \left(\frac{625}{100}\right)^{3/2} = \left[\frac{(25)^2}{(10)^2}\right]^{3/2}$

$$= \frac{(25)^{\frac{2\times3}{2}}}{(10)^{\frac{2\times3}{2}}} = \frac{(25)^3}{(10)^3}$$

$$= \frac{15625}{1000} = 15.625$$

5. (i) $64^{1/2} \times (64^{1/2} + 1)$

$= (8)^{\frac{2\times1}{2}} \times [(8^2)^{1/2} + 1] = (8)^{\frac{2\times1}{2}} \times [(8)^{\frac{2\times1}{2}} + 1]$

$= 8 \times (8 + 1) = 8 \times 9 = 72$

(ii) $27^{-1/3} \times (27^{1/3} - 27^{2/3})$

$= (3^3)^{-1/3} \times [(3^3)^{1/3} - (3^3)^{2/3}]$

$= (3)^{\frac{3\times-1}{3}} \times [(3)^{\frac{3\times1}{3}} - (3)^{\frac{3\times2}{3}}]$

$= (3)^{-1} \times [(3)^1 - (3)^2]$

$= \frac{1}{(3)} \times [3 - 9]$

$= \frac{1}{3} \times [-6] = \frac{-6}{3} = -2$

(iii) $4 \times (81)^{-1/2} \times [(81)^{1/2} + (81)^{3/2}]$

$= 4 \times (9^2)^{-1/2} \times [(9^2)^{1/2} + (9^2)^{3/2}]$

$= 4 \times 9^{\frac{2\times-1}{2}} \times [9^{\frac{2\times1}{2}} + 9^{\frac{2\times3}{2}}]$

$= 4 \times 9^{-1} \times [9 + 9^3]$

$= \frac{4 \times 1}{9} \times [9 + 729]$

$= \frac{4}{9} \times [738]$

$= \frac{4}{9} \times 738$

$= 4 \times 82 = 328$

(iv) $\frac{(36)^{7/2} - (36)^{9/2}}{(36)^{5/2}} = \frac{(6^2)^{7/2} - (6^2)^{9/2}}{(6^2)^{5/2}}$

$$= \frac{6^{\frac{2\times 7}{2}} - 6^{\frac{2\times 9}{2}}}{6^{\frac{2\times 5}{2}}} = \frac{6^7 - 6^9}{6^5} = \frac{6^7[1-6^2]}{6^5}$$

$$= 6^7 \times 6^{-5}[1-6^2] = 6^{7-5}[1-36]$$

$$= 6^2[-35] = 36 \times -35 = -1260$$

6. (i) $[(2)^{-1} + (4)^{-1} + (3)^{-1}]^{-1}$

$$= \left[\frac{1}{(2)} + \frac{1}{(4)} + \frac{1}{3}\right]^{-1} = \left[\frac{1}{2} + \frac{1}{4} + \frac{1}{3}\right]^{-1}$$

$$= \left[\frac{1\times 6 + 1\times 3 + 1\times 4}{12}\right]^{-1}$$

$$= \left[\frac{6+3+4}{12}\right]^{-1} = \left(\frac{13}{12}\right)^{-1}$$

$$= \frac{1}{\left(\frac{13}{12}\right)} = \left(\frac{12}{13}\right)$$

(ii) $[(4)^{-1} - (5)^{-1}]^2 \times \left(\frac{5}{8}\right)^{-1}$

$$= \left[\frac{1}{4} - \frac{1}{5}\right]^2 \times \frac{1}{\left(\frac{5}{8}\right)} = \left[\frac{5-4}{20}\right]^2 \times \left(\frac{8}{5}\right)$$

$$= \left(\frac{1}{20}\right)^2 \times \left(\frac{8}{5}\right) = \frac{1}{20} \times \frac{1}{20} \times \frac{8}{5}$$

$$= \frac{1}{10} \times \frac{1}{5} \times \frac{1}{5} = \frac{1}{250}$$

(iii) $[4^0 + 4^2 - 2^3] \times 3^{-2}$

$$= [1 + 16 - 8] \times \frac{1}{3^2} = \frac{(9)\times 1}{3^2} = \frac{9}{9} = 1$$

(iv) $\left[(5)^2 - \left(\frac{1}{4}\right)^{-2}\right] \times \left(\frac{3}{4}\right)^{-2} = \left[25 - \frac{1}{(4)^{-2}}\right] \times \frac{1}{\left(\frac{3}{4}\right)^2}$

$$= [25 - (4)^2] \times \frac{1}{\frac{9}{16}}$$

$$= [25 - 16] \times \frac{16}{9}$$

$$= 9 \times \frac{16}{9} = 16$$

7. (i) $(x^{-4})^3$

Positive exponent $= (x)^{-4 \times 3} = (x)^{-12} = \dfrac{1}{(x)^{12}}$

(ii) $2(x)^{1/6} \times 2(x)^{-7/6}$

Positive exponent $= 4(x)^{1/6} \times (x)^{-7/6}$

$$= 4[(x)^{1/6 - 7/6}] = 4[(x)^{\frac{-6}{6}}]$$

$$= 4[(x)^{-1}] = 4\left(\frac{1}{x}\right) = \frac{4}{x}$$

(iii) $x^{-7} \times y^{-7} = \dfrac{1}{x^7} \times \dfrac{1}{y^7} = \dfrac{1}{x^7 y^7} = \dfrac{1}{(xy)^7}$

(iv) $x^{5/7} \div x^{12/7} = \dfrac{(x)^{5/7}}{(x)^{12/7}} = (x)^{5/7} \times (x)^{-(12/7)}$

$$= (x)^{\left(\frac{5}{7} - \frac{12}{7}\right)} = (x)^{\left(\frac{-7}{7}\right)}$$

$$= (x)^{-1} = \frac{1}{x}$$

8. (i) $(3^2 + 4^2)^{1/2} = [9 + 16)^{1/2} = [25]^{1/2}$

$$= (5^2)^{1/2} = 5^{\frac{2 \times 1}{2}} = 5$$

(ii) $(5^2 + 12^2)^{1/2} = (25 + 144)^{1/2}$

$$= (169)^{1/2} = (13^2)^{1/2}$$

$$= (13)^{\frac{2 \times 1}{2}} = 13$$

(iii) $(8^2 + 15^2)^{1/2} = (64 + 225)^{1/2}$

$$= (289)^{1/2} = (17^2)^{1/2}$$

$$= (17)^{\frac{2 \times 1}{2}} = 17$$

(iv) $(1^3 + 2^3 + 3^3)^{1/2}$

$$= (1 + 8 + 27)^{1/2}$$

$$= (36)^{1/2} = (6^2)^{1/2}$$

$$= 6^{\frac{2 \times 1}{2}} = 6$$

9. (i) $5^3 \times \left(\frac{4}{5}\right)^3 = (5^3) \times \frac{4^3}{(5)^3} = 4^3$

Negative exponent $= \frac{1}{4^{-3}}$

(ii) $\left[\left(\frac{3}{7}\right)^{-2}\right]^{-3} = \left[\frac{(3)^{-2}}{(7)^{-2}}\right]^{-3} = \left[\frac{(3)^{-2\times-3}}{(7)^{-2\times-3}}\right]$

$= \left[\frac{3^6}{7^6}\right] = \left(\frac{3}{7}\right)^6$

$=$ Negative exponent $= \left(\frac{7}{3}\right)^{-6}$

(iii) $\left(\frac{5}{9}\right)^{-2} \times \left(\frac{5}{3}\right)^2 \div \left(\frac{1}{5}\right)^{-2}$

$= \left(\frac{5}{9}\right)^{-2} \times \left(\frac{5}{3}\right)^2 \times \frac{1}{\left(\frac{1}{5}\right)^{-2}}$

$= \left(\frac{5}{9}\right)^{-2} \times \left(\frac{5}{3}\right)^2 \times \left(\frac{1}{5}\right)^2$

$= \frac{(5)^{-2}}{(3^2)^{-2}} \times \frac{(5)^2}{(3)^2} \times \frac{1}{(5)^2}$

$= \frac{(5)^{-2}}{(3^{-4}) \times 3^2} = \frac{(5)^{-2} \times 1}{3^{-2}} = \frac{5^{-2}}{3^{-2}}$

Negative exponent $= \left(\frac{5}{3}\right)^{-2}$.

(iv) $2^{-1}\left[\left(\frac{5}{3}\right)^4 + \left(\frac{3}{5}\right)^{-2}\right] \div \frac{17}{9}$

$= \frac{1}{2}\left[\left(\frac{5}{3}\right)^4 + \frac{1}{\left(\frac{3}{5}\right)^2}\right] \div \frac{17}{9}$

$= \frac{1}{2}\left[\left(\frac{5}{3}\right)^4 + \left(\frac{5}{3}\right)^2\right] \div \frac{17}{9}$

$$= \frac{1}{2}\left(\frac{5}{3}\right)^2\left[\left(\frac{5}{3}\right)^2 + 1\right] \div \frac{17}{9}$$

$$= \frac{1}{2} \times \frac{25}{9}\left[\frac{25}{9} + 1\right] \div \frac{17}{9}$$

$$= \frac{25}{18}\left[\frac{25+9}{9}\right] \times \frac{9}{17} = \frac{25}{18} \times \frac{34}{9} \times \frac{9}{17}$$

$$= \frac{25}{18} \times 2 = \frac{25}{9} = \left(\frac{5}{3}\right)^2 = \frac{1}{\left(\frac{5}{3}\right)^{-2}}$$

Negative exponent $= \left(\frac{3}{5}\right)^{-2}$.

(v) $(-7)^3 \times \left(\frac{1}{-7}\right)^{-9} \div (-7)^{10}$

$$= (-7)^3 \frac{1}{(-7)^{-9}} \times \frac{1}{(-7)^{10}}$$

$$= (-7)^3 \times (-7)^9 \times \frac{1}{(-7)^{10}}$$

$$= (-7)^{3+9} \times (-7)^{-10}$$

$$= (-7)^{-12} \times (-7)^{-10}$$

$$= (-7)^{12-10} = (-7)^2 = (7^2)$$

Negative exponent $= \frac{1}{(7)^{-2}}$.

10. $\left(\frac{-2}{3}\right)^{-13} \times \left(\frac{3}{-2}\right)^8 = \left(\frac{-2}{3}\right)^{-2x+1}$

$$= \frac{(-2)^{-13}}{(3)^{-13}} \times \frac{(3)^8}{(-2)^8} = \frac{(-2)^{-2x+1}}{(3)^{-2x+1}}$$

$$= \frac{(-2)^{13} \times (-2)^{-8}}{(3)^{-13} \times (3)^{-8}} = \frac{(-2)^{-2x+1}}{(3)^{-2x+1}}$$

$$= \frac{(-2)^{-21}}{(3)^{-21}} = \frac{(-2)^{-2x+1}}{(3)^{-2x+1}}$$

Compare both side : $-21 = -2x + 1$

$x = 11$

Exercise 2B

1. (i) 6250000000

Number in standard form $= 6.25 \times 10^9$.

(ii) 71960000000000000

Number in standard form $= 7.196 \times 10^{16}$.

(iii) 0.0000000213

$$= \frac{0000000213}{10^{10}} = 213 \times 10^{-10}$$

Number in standard form $= 2.13 \times 10^{-8}$.

(iv) 0.0000000925

$$= \frac{0000000925}{10^{10}} = \frac{925}{10^{10}}$$

$$= 925 \times 10^{-10}$$

Number in standard form $= 9.25 \times 10^{-8}$.

2. (i) 9.67×10^5

$$\text{Number in usual form} = \frac{967}{10^2} \times 10^5 = 967 \times 10^{5-2}$$

$$= 967 \times 10^3 = 967000$$

(ii) 8.37×10^8

$$\text{Number in usual form} = \frac{837}{10^2} \times 10^8$$

$$= 837 \times 10^{8-2} = 837 \times 10^6$$

$$= 837000000$$

(iii) 9.42×10^{-4}

$$\text{Number in usual form} = \frac{942}{10^2} \times 10^{-4}$$

$$= 942 \times 10^{-4} \times 10^{-2}$$

$$= 942 \times 10^{-6}$$

$$= \frac{942}{10^6}$$

$$= 0.000942$$

(iv) 6.75×10^{-7}

$$\text{Number in usual form} = \frac{675}{10^2} \times 10^{-7}$$

$$= 675 \times 10^{-7} \times 10^{-2}$$

$$= 675 \times 10^{-9}$$

$$= \frac{675}{10^9}$$

$$= 0.000000675$$

3. (i) Thickness of a piece of paper $= 0.0016$ cm. $= \frac{16}{10^4}$

$= 16 \times 10^{-4} = 16 \times 10^{-4} \times \frac{10}{10}$

Thickness of paper in standard form

$= 1.6 \times 10^{-4+1}$

$= 1.6 \times 10^{-3}$ cm.

(ii) A helium atom has diameter

$= \frac{22}{100000000000} = 22 \times 10^{-11}$

$= 22 \times 10^{-11} \times \frac{10}{10} = 2.2 \times 10^{-11+1}$

Atom diameter in standard form

$= 2.2 \times 10^{-10}$ m.

(iii) Mass of molecule of hydrogen

$= 0.00000000000000000000334$

$= \frac{334}{10^{23}} = 334 \times 10^{-23}$

$= 334 \times 10^{-23} \times \frac{10^2}{10^2}$

$= 3.34 \times 10^{-23+2}$

Hydrogen mass in standard form $= 3.34 \times 10^{-21}$ tons.

(iv) Speed of light $= 300{,}000{,}000$ m/sec

Speed of light in standard form $= 3 \times 10^8$ m/sec.

(v) 3 years in seconds

$= 3$ years $\times$ 365 days $\times$ 24 hours $\times$ 60 minutes $\times$ 60 seconds

$= 3 \times 365 \times 24 \times 60 \times 60 = 94608000$

$= 94608000 \times \frac{10^7}{10^7}$

3 years in second in standard form $= 9.46 \times 10^7$ sec.

(vi) A sugar factory has annual sales $= 3$ billion 720 million kg

$= 3000000000 + 720000000$

$= 3720000000 = 372 \times 10^7$

Standard form of sugar $= 372 \times 10^7 \times \frac{100}{100}$

$= 3.72 \times 10^7 \times 10^2$

$= 3.72 \times 10^{7+2} = 3.72 \times 10^9$ kg

4. Distance of moon from earth in standard form

$$= 384{,}467{,}000 = 384467000 \times \frac{10^8}{10^8}$$

$$= 3.84 \times 10^8 \text{ m}$$

5. Size of bacterium in standard form

$$= 0.0000005 = \frac{5}{10^7} = 5 \times 10^{-7} \text{ m}$$

6. Mass of sun in standard form

$= 1.989 \times 10^{30}$ kg

= 1,989, 000, 000, 000, 000, 000, 000, 000, 000, 000, 000 kg.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $16^{1/2}$

Radical form = $\sqrt{16}$

(ii) $(125)^{1/3}$

Radical form = $\sqrt[3]{125}$

(iii) $\left(\frac{6}{17}\right)^{1/9}$

Radical form = $\sqrt[9]{\left(\frac{6}{17}\right)}$

(iv) $\left(\frac{11}{17}\right)^{1/11}$

Radical form $\sqrt[11]{\left(\frac{11}{17}\right)}$

(v) $\left(\frac{61}{325}\right)^{1/17}$

Radical form = $\sqrt[17]{\left(\frac{61}{325}\right)}$

2. (i) $\sqrt{5}$

Exponential form = $(5)^{1/2}$

(ii) $\sqrt[3]{7}$

Exponential form = $(7)^{1/3}$

(iii) $\sqrt[9]{1100}$

Exponential form = $(1100)^{1/9}$

(iv) $\sqrt[4]{\frac{3}{4}}$

Exponential form $= \left(\frac{3}{4}\right)^{1/4}$

(v) $\sqrt[8]{\frac{61}{1123}}$

Exponential form $= \left(\frac{61}{1123}\right)^{1/8}$

3. (i) $(3^{-1} \times 9^{-1}) \div 3^{-2}$

$$= \left(\frac{1}{3} \times \frac{1}{9}\right) \times \frac{1}{3^{-2}} = \frac{1}{3} \times \frac{1}{9} \times 3^2$$

$$= \frac{1}{3} \times \frac{1}{9} \times 9 = \frac{1}{3}$$

(ii) $(3^{-1} \times 4^{-1}) \div 6^{-1}$

$$= \left(\frac{1}{3} \times \frac{1}{4}\right) \times \frac{1}{6^{-1}}$$

$$= \left(\frac{1}{3} \times \frac{1}{4}\right) \times 6 = \frac{1}{3} \times \frac{1}{2} \times \frac{1}{2} \times 6 = \frac{1}{2}$$

(iii) $(2^{-1} + 3^{-1})^3 = \left(\frac{1}{2} + \frac{1}{3}\right)^3 = \left(\frac{3+2}{6}\right)^3$

$$= \left(\frac{5}{6}\right)^3 = \frac{125}{216}$$

(iv) $(3^{-1} \div 4^{-1})^2 = \left(\frac{1}{3} \times \frac{1}{4^{-1}}\right)^2 = \left(\frac{1}{3} \times 4\right)^2 = \left(\frac{4}{3}\right)^2 = \frac{16}{9}$

4. (i) $\left(\frac{-3}{5}\right)^4 \times \left(\frac{5}{6}\right)^2 = \frac{(-3)^4}{(5)^4} \times \frac{(5)^2}{(3)^2 \times (2)^2}$

$$= \frac{(3)^{4-2}}{(5)^{4-2} \times (2)^2} = \frac{3^2}{5^2} \times \frac{1}{2^2}$$

$$= \frac{9}{25 \times 4} = \frac{9}{100}$$

(ii) $\left(\frac{-4}{7}\right)^5 \times \left(\frac{4}{-7}\right)^{-6} \times \left(\frac{4}{-7}\right)^2$

$$= \frac{(-4)^5}{(7)^5} \times \frac{(4)^{-6}}{(-7)^{-6}} \times \frac{(4)^2}{(-7)^2}$$

$$= \frac{(-4)^5 \times 4^{-6+2}}{(7)^5 \times (-7)^{-6+2}} = \frac{(-4)^5 \times 4^{-4}}{(7)^5 \times (-7)^{-4}}$$

$$= \frac{(-4)^{5-4}}{(7)^{5-4}} = \left(\frac{-4}{7}\right)$$

(iii) $\left(\frac{8}{7}\right)^{-6} \div \left(\frac{8}{7}\right)^{5} = \left(\frac{8}{7}\right)^{-6} \times \frac{1}{\left(\frac{8}{7}\right)^{5}} = \left(\frac{8}{7}\right)^{-6} \times \left(\frac{8}{7}\right)^{-5}$

$$= \left(\frac{8}{7}\right)^{-6-5} = \left(\frac{8}{7}\right)^{-11}$$

$$= \frac{1}{\left(\frac{8}{7}\right)^{11}} = \left(\frac{7}{8}\right)^{11}$$

(iv) $\left[\left(\frac{3}{7}\right)^{2}\right]^{-2} \times \left[\left(\frac{3}{7}\right)^{-3}\right]^{2}$

$$= \left(\frac{3}{7}\right)^{2\times -2} \times \left(\frac{3}{7}\right)^{-3\times 2}$$

$$= \left(\frac{3}{7}\right)^{-4} \times \left(\frac{3}{7}\right)^{-6}$$

$$= \left(\frac{3}{7}\right)^{-4-6} = \left(\frac{3}{7}\right)^{-10}$$

$$= \frac{1}{\left(\frac{3}{7}\right)^{10}} = \left(\frac{7}{3}\right)^{10}$$

5. (i) $(3^{-1} + 4^{-1}) + (4^{-1} + 5^{-1})$

$$= \left(\frac{1}{3} + \frac{1}{4}\right) + \left(\frac{1}{4} + \frac{1}{5}\right)$$

$$= \left(\frac{4+3}{12}\right) + \left(\frac{5+4}{20}\right)$$

$$= \frac{7}{12} + \frac{9}{20}$$

$$= \frac{7\times 5 + 9\times 3}{60}$$

$$= \frac{35+27}{60} = \frac{62}{60} = \frac{31}{30} = 1\frac{1}{30}$$

(ii) $(6^{-1} - 7^{-1})^{-1} + (6^{-1} + 7^{-1})^{-1}$

$$= \left(\frac{1}{6} - \frac{1}{7}\right)^{-1} + \left(\frac{1}{6} + \frac{1}{7}\right)^{-1}$$

$$= \left(\frac{7-6}{42}\right)^{-1} + \left(\frac{7+6}{42}\right)^{-1}$$

$$= \left(\frac{1}{42}\right)^{-1} + \left(\frac{13}{42}\right)^{-1} = \frac{1}{\left(\frac{1}{42}\right)^{1}} + \frac{1}{\left(\frac{13}{42}\right)^{1}}$$

$$= \frac{42}{1} + \frac{42}{13} = \frac{(42 \times 13 + 42 \times 1)}{13}$$

$$= \frac{546 + 42}{13} = \frac{588}{13}$$

(iii) $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-3} + \left(\frac{1}{4}\right)^{-4} = \frac{1}{\left(\frac{1}{2}\right)^{2}} + \frac{1}{\left(\frac{1}{3}\right)^{3}} + \frac{1}{\left(\frac{1}{4}\right)^{4}}$

$$= (2)^2 + (3)^3 + (4)^4$$

$$= 4 + 27 + 256 = 287$$

(iv) $\left(\frac{2}{5}\right)^{-3} \times \left(\frac{2}{5}\right)^{-6} \div \left(\frac{2}{5}\right)^{4}$

$$= \left(\frac{2}{5}\right)^{-3} \times \left(\frac{2}{5}\right)^{-6} \times \frac{1}{\left(\frac{2}{5}\right)^{4}}$$

$$= \frac{(2)^{-3}}{(5)^{-3}} \times \frac{(2)^{-6}}{(5)^{-6}} \times \frac{(5)^4}{(2)^4}$$

$$= (2)^{-3-6-4} \times (5)^{4+6+3}$$

$$= (2)^{-13} \times (5)^{13} = \frac{(5)^{13}}{(2)^{13}} = \left(\frac{5}{2}\right)^{13}$$

6. (i) $\left(\frac{3}{5}\right)^{2x} \times \left(\frac{3}{5}\right)^{x+8} = \left[\left(\frac{3}{5}\right)^{2}\right]^{3}$

$$= \left(\frac{3}{5}\right)^{2x+x+8} = \left(\frac{3}{5}\right)^{2 \times 3}$$

$$= \left(\frac{3}{5}\right)^{3x+8} = \left(\frac{3}{5}\right)^{6}$$

Compare both side :

$$3x + 8 = 6 \quad \Rightarrow \quad 3x = 6 - 8$$

$$3x = -2 \quad \Rightarrow \quad x = \frac{-2}{3}$$

(ii) $\dfrac{2^{2x}}{2^{3x-4}} = 4^{-2}$

$$2^{2x} \times (2)^{-(3x-4)} = (2^2)^{-2}$$

$$(2)^{(2x-(3x-4))} = 2^{2\times -2}$$

$$(2)^{(2x-3x+4)} = 2^{-4}$$

$$(2)^{-x+4} = 2^{-4}$$

Compare both side :

$$-x + 4 = -4 \quad \Rightarrow \quad x = 4 + 4 = 8$$

7. (i) $(64)^{-5/6} = (2^6)^{-5/6} = 2^{\frac{6\times -5}{6}}$

$$= 2^{-5} = \frac{1}{2^5} = \frac{1}{32}$$

(ii) $(3125)^{-2/5} = (5^5)^{-2/5} = (5)^{\frac{5\times -2}{5}}$

$$= (5)^{-2} = \frac{1}{(5)^2} = \frac{1}{25}$$

(iii) $\left(\dfrac{1331}{343}\right)^{-2/3} = \left[\left(\dfrac{11}{7}\right)^3\right]^{-2/3} = \left(\dfrac{11}{7}\right)^{\frac{3\times -2}{3}}$

$$= \left(\frac{11}{7}\right)^{-2} = \frac{1}{\left(\frac{11}{7}\right)^2}$$

$$= \left(\frac{7}{11}\right)^2 = \frac{49}{121}$$

(ii) $\left(\dfrac{625}{81}\right)^{-1/4} = \left(\dfrac{5^4}{3^4}\right)^{-1/4} = \left(\dfrac{5}{3}\right)^{4\times -1/4}$

$$= \left(\frac{5}{3}\right)^{-1} = \frac{1}{\frac{5}{3}} = \frac{3}{5}$$

8. Let number $= x$

$$\left(\frac{-4}{5}\right)^3 \times x = \left(\frac{-4}{5}\right)^{-4}$$

$$x = \frac{\left(\frac{-4}{5}\right)^{-4}}{\left(\frac{-4}{5}\right)^{3}}$$

$$x = \left(\frac{-4}{5}\right)^{-4} \times \left(\frac{-4}{5}\right)^{-3}$$

$$x = \left(\frac{-4}{5}\right)^{-4-3} = \left(\frac{-4}{5}\right)^{-7}$$

9. Let number $= x$

$$\left[\left(\frac{2}{9}\right)^{-3}\right]^{2} \div x = \left(\frac{9}{2}\right)^{4}$$

$$\left(\frac{2}{9}\right)^{-3\times 2} \times \frac{1}{x} = \left(\frac{9}{2}\right)^{4}$$

$$\frac{(2)^{-6}}{(9)^{-6}} \times \frac{1}{x} = \frac{(9)^{4}}{(2)^{4}}$$

$$x = \frac{(2)^{-6} \times (2)^{4}}{(9)^{-6} \times (9)^{4}} = \frac{(2)^{-6+4}}{(9)^{-6+4}}$$

$$x = \frac{(2)^{-2}}{(9)^{-2}} = \left(\frac{2}{9}\right)^{-2}$$

10. (i) 6500000000

Standard form $= 65 \times 10^{8}$

$$= 65 \times 10^{8} \times \frac{10}{10} = 6.5 \times 10^{9}$$

(ii) 39120000000000

Standard form $= 3912 \times 10^{10}$

$$= \frac{3912 \times 10^{10} \times 10^{3}}{10^{3}}$$

$$= 3.912 \times 10^{13}$$

(iii) $0.00000825 = \frac{0.00000825 \times 10^{8}}{10^{8}} = 825 \times 10^{-8}$

$$= 825 \times 10^{-8} \times \frac{10^{2}}{10^{2}}$$

$$= 8.25 \times 10^{-6}$$

(iv) $0.000000694 = 0.000000694 \times \frac{10^9}{10^9}$

$= 694 \times 10^{-9} \times \frac{10^2}{10^2}$

$= 6.94 \times 10^{-9+2}$

$= 6.94 \times 10^{-7}$

11. (i) $6.32 \times 10^4 = \frac{632 \times 10^4}{10^2}$

$= 632 \times 10^{4-2}$

$= 632 \times 10^2$

$= 63200$

(ii) $5.96 \times 10^{-4} = \frac{596}{10^2} \times 10^{-4} = 596 \times 10^{-4-2}$

$= \frac{596}{10^6} = 0.000596$

(iii) $3.94 \times 10^{-8} = \frac{394}{10^2} \times 10^{-8} = 394 \times 10^{-8-2}$

$= \frac{394}{10^{10}} = 0.0000000394$

(iv) $6.24 \times 10^7 = \frac{624}{10^2} \times 10^7$

$= 624 \times 10^{7-2}$

$= 624 \times 10^5 = 62400000$

3. Squares and Square Roots

Exercise 3A

1. Do it yourself.

2. (i) 100

Factorising 100 by division method,

We get,

$100 = \underline{2 \times 2} \times \underline{5 \times 5}$

Which can be grouped into pairs of equal factors and no factor is left.

Therefore, 100 is a perfect square.

2	100
2	50
5	25
5	5
	1

(ii) 1000

Factorising 1000 by division method.

We get,

$$1000 = \underline{2 \times 2} \times 2 \times \underline{5 \times 5} \times 5$$

Which can be grouped into pairs of equal factors, we find that 2, 5 is left.

Therefore, 1000 is not a perfect square.

2	1000
2	500
2	250
5	125
5	25
5	5
	1

(iii) 330550

Factorising 330550 by division method.

We get,

$$330550 = 2 \times \underline{5 \times 5} \times 11 \times 601$$

Which can be grouped into equal factor.

We find that 2, 11, 601 is left.

Therefore, 330550 is not a perfect square.

2	330550
5	165275
5	33055
11	6611
601	601
	1

3. 121

Factorising 121 by division method.

We get,

$$121 = \underline{11 \times 11}$$

Which can be grouped into equal factor.

No. factor is left.

Therefore, 121 is a perfect square.

11	121
11	11
	1

4. 121, 225, 256, 1296, 6561

Even number of perfect square is

$$256 = \underline{16 \times 16}$$

$$1296 = \underline{36 \times 36}$$

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

5. (i) 425

Square of 425 $= (425)^2 = 425 \times 425 = 180625$

The unit place of square is 5.

(ii) 637

Square of 637 $= (637)^2 = 637 \times 637 = 405769$

The unit place of square = 9.

(iii) 896

Square of 896 $= (896)^2 = 896 \times 896 = 802816$

The unit place of square = 6.

(iv) 1741

Square of 1741 $= (1741)^2 = 1741 \times 1741 = 3031081$

The unit place of square = 1.

6. (i) 529

Factorising 529 by division method.

23	529
23	23
	1

We get, $529 = 23 \times 23$

Therefore, 529 is a odd number perfect square.

(ii) 361

Factorising 361 by division method.

19	361
19	19
	1

We get, $361 = 19 \times 19$

Therefore, 361 is a odd number perfect square.

7. (i) $35^2 - 34^2$

Using formula :

$$(n+1)^2 - n^2 = 2n + 1$$
$$= (34+1)^2 - 34^2 = 2 \times 34 + 1$$
$$= 68 + 1 = 69$$

(ii) $54^2 - 53^2$

We know that :

Formula $= (n+1)^2 - n^2 = 2n + 1$
$$= (53+1)^2 - 53^2 = 2 \times 53 + 1$$
$$= 106 + 1 = 107$$

(iii) $68^2 - 67^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$
$$= (67+1)^2 - 67^2 = 2 \times 67 + 1$$
$$= 134 + 1 = 135$$

(iv) $84^2 - 83^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$
$$= (83+1)^2 - 83^2 = 2 \times 83 + 1$$
$$= 166 + 1 = 167$$

(v) $78^2 - 77^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$
$$= (77+1)^2 - 77^2 = 2 \times 77 + 1$$

$= 154 + 1 = 155$

(vi) $106^2 - 105^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$

$= (105 + 1)^2 - 105^2 = 2 \times 105 + 1$

$= 210 + 1 = 211$

(vii) $208^2 - 207^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$

$= (207 + 1)^2 - 207^2 = 2 \times 207 + 1$

$= 414 + 1 = 415$

(viii) $311^2 - 310^2$

Using formula $= (n+1)^2 - n^2 = 2n + 1$

$= (310 + 1)^2 - 310^2 = 2 \times 310 + 1$

$= 620 + 1 = 621$

8. (i) $1 + 3 + 5 + 7 + 9 + 11 + 13$

Sum of digit without adding = Total number of square

$= (7)^2 = 49$

(ii) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$

Sum of digit without adding = Total number of square

$= (9)^2 = 81$

(iii) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

Sum of digit without adding = Total number of square

$= (11)^2 = 121$

(iv) $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25 + 27$

Sum of digit without adding = Total number of square

$= (14)^2 = 196$

9. Do it yourself.

10. (i) 6

Pythagorean triplet is $(2m, m^2 - 1, m^2 + 1)$

Let $2m = 6 \Rightarrow m = 3$

So, $m^2 - 1 = (3)^2 - 1 = 9 - 1 = 8$

and $m^2 + 1 = (3)^2 + 1$

$= 9 + 1 = 10$

Pythagorean triplet is (6, 8, 10).

(ii) 12

Pythagorean triplet is $(2m, m^2 - 1, m^2 + 1)$

Let $2m = 12 \Rightarrow m = 6$

So, $m^2 - 1 = (6)^2 - 1$

$= 36 - 1 = 35$

and $m^2 + 1 = (6)^2 + 1$

$= 36 + 1 = 37$

Pythagorean triplet is (12, 35, 37).

(iii) 18

Pythagorean triplet is $(2m, m^2 - 1, m^2 + 1)$

Let $2m = 18 \Rightarrow m = 9$

So, $m^2 - 1 = (9)^2 - 1$

$= 81 - 1 = 80$

And $m^2 + 1 = (9)^2 + 1$

$= 81 + 1 = 82$

Pythagorean triplet is (18, 80, 82).

(iv) 30

Pythagorean triplet is $(2m, m^2 - 1, m^2 + 1)$

Let $2m = 30 \Rightarrow m = 15$

So, $m^2 - 1 = (15)^2 - 1 = 225 - 1 = 224$

And $m^2 + 1 = (15)^2 + 1 = 225 + 1 = 226$

Pythagorean triplet is (30, 224, 226).

11. (i) 1296

Factorising 1296 by division method.

We get, $1296 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3}$

Which can be grouped into pairs of equal factors and no factor is left.

Therefore, 1296 is a perfect square.

2	1296
2	648
2	324
2	162
3	81
3	27
3	9

(ii) 2401

Factorising 2401 by division method.

We get, $2401 = \underline{7 \times 7} \times \underline{7 \times 7}$

Which can be grouped into pairs of equal factors and no factor is left.

Therefore, 2401 is a perfect square.

7	2401
7	343
7	49
7	7
	1

(iii) 9216

Factorising 9216 by division method.

We get, 9216

$= \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

Which can be grouped pairs of equal factor and no pair is left.

Therefore, 9216 is perfect square.

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

(viii) 9801

Factorising 9801 by division method.

We get, $9801 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{11 \times 11}$

Which can be grouped pairs of equal factor and no pair is left.

Therefore, 9801 is perfect square.

3	9801
3	3267
3	1089
3	363
11	121
11	11
	1

12. (i) (15, 36, 39)

Pythagorean triplets

$\Rightarrow \quad (39)^2 = (36)^2 + (15)^2$

$\Rightarrow \quad 1521 = 1296 + 225$

$\Rightarrow \quad 1521 = 1521$

It's proof that triplet Pythagorean.

(ii) Do it yourself.

13. Square of all natural number between 80 and 90.

81, 82, 83, 84, 85, 86, 87, 88, 89

$(81)^2 = 6561$ $\quad (82)^2 = 6724$

$(83)^2 = 6889$ $\quad (84)^2 = 7056$

$(85)^2 = 7225$ $\quad (86)^2 = 7396$

$(87)^2 = 7569$ $\quad (88)^2 = 7744$

$(89)^2 = 7921$

Exercise 3B

1. Do it yourself.

2. (i) 676

Factorising 676 by division method.

We get, $676 = 2 \times 2 \times 13 \times 13$

$= 2 \times 13 = 26$

So, square root of 676 is 26.

2	676
2	338
13	169
13	13
	1

(ii) 784

Factorising 784 by division method.

We get, $784 = 2 \times 2 \times 2 \times 2 \times 7 \times 7$

$= 2 \times 2 \times 7$

$= 28$

So, square root of 784 is 28.

Then similarly,

2	784
2	392
2	196
2	98
7	49
7	7
	1

(iii) Square root of 1849 = 43

(iv) Square root of 3025 = 55

(v) Square root of 3364 = 58

(vi) Square root of 4096 = 64

(vii) Square root of 9216 = 96

(viii) Square root of 7396 = 86

3. The smallest square number which is exactly divisible by 10, 12, 18 and 24.

First we will find the LCM of 10, 12, 18, 24.

So, LCM $= 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

To be a perfect square, it should be having prime factors.

Therefore, multiplication by 10 is necessary.

Thus, $= 360 \times 10 = 3600$

2	10, 12, 18, 24
2	5, 6, 9, 12
2	5, 3, 9, 6
3	5, 3, 9, 3
3	5, 1, 3, 1
5	5, 1, 1, 1
	1, 1, 1, 1

4. 451634

The least number must be subtracted from 451634 to make it a perfect square.

Hence, 451634 lies between $(672)^2$ and $(673)^3$.

To make it a perfect square the least number that should be subtracted is 2734 – 2684 = 50.

	672
6	45 16 34
	36
127	916
	889
1342	2734
	2684
	50

5. 131023

Hence, 131023 lies between $(361)^2$ and $(362)^2$.

To make it a perfect square the least number that should be added is

$$1444 - 1423 = 21$$

	362
3	13 10 23
	9
66	410
	396
722	1423
	−1444
	21

6. 66029

Hence, 66029 lies between $(256)^2$ and $(257)^2$.

To make it a perfect square the least number that should be added is $3549 - 3529 = 20$.

	257
2	6 60 29
	4
45	260
	225
507	3529
7	3549
	20

7. 9408

We get, $9408 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 3 \times \underline{7 \times 7}$

Therefore, divided by 3.

Then, number $= \dfrac{9408}{3} = 3136$

Square root of $3136 = 56$

2	9408
2	4704
2	2352
2	1176
2	588
2	294
3	147
7	49
7	7
	1

8. A school collected fees = ₹ 2304

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

Factors of $2304 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

Square root of $2304 = 2 \times 2 \times 2 \times 2 \times 3 = 48$

Hence, students in school = 48.

Exercise 3C

1. (i) $\sqrt{\frac{841}{1521}} = \sqrt{\frac{29 \times 29}{3 \times 3 \times 13 \times 13}} = \sqrt{\frac{29 \times 29}{39 \times 39}} = \frac{29}{39}$

(ii) $\sqrt{8\frac{257}{529}} = \sqrt{\frac{4489}{529}} = \sqrt{\frac{529 \times 8 + 257}{529}} = \sqrt{\frac{67 \times 67}{23 \times 23}} = \frac{67}{23} = 2\frac{21}{23}$

(iii) $\sqrt{16\frac{169}{441}} = \frac{\sqrt{441 \times 16 + 169}}{441} = \sqrt{\frac{7225}{441}} = \frac{85}{21} = 4\frac{1}{21}$

(iv) $\sqrt{\frac{16}{25}} = \sqrt{\frac{4 \times 4}{5 \times 5}} = \frac{4}{5}$

(v) $\sqrt{(0.09)} = \sqrt{\frac{9}{100}} = \sqrt{\frac{3 \times 3}{10 \times 10}} = \frac{3}{10} = 0.3$

(vi) $\sqrt{(0.0004)} = \sqrt{\frac{4}{10000}} = \sqrt{\frac{2 \times 2}{100 \times 100}} = \frac{2}{100} = 0.02$

(vii) $\sqrt{\frac{169}{289}} = \sqrt{\frac{13 \times 13}{17 \times 17}} = \frac{13}{17}$

(viii) $\sqrt{\frac{121}{10000}} = \sqrt{\frac{11 \times 11}{100 \times 100}} = \frac{11}{100}$

(ix) $\sqrt{0.0625} = \sqrt{\frac{625}{10000}} = \sqrt{\frac{25 \times 25}{100 \times 100}} = \frac{25}{100} = 0.25$

(x) $\sqrt{0.0324} = \sqrt{\frac{324}{10000}} = \sqrt{\frac{18 \times 18}{100 \times 100}} = \frac{18}{100} = 0.18$

2. (i) $\sqrt{\frac{625}{1296}} = \sqrt{\frac{25 \times 25}{36 \times 36}} = \frac{25}{36}$

(ii) $\sqrt{4\frac{29}{49}} = \sqrt{\frac{49 \times 4 + 29}{49}} = \sqrt{\frac{225}{49}} = \sqrt{\frac{15 \times 15}{7 \times 7}} = \frac{15}{7} = 2\frac{1}{7}$

(iii) $\sqrt{2\frac{137}{196}} = \sqrt{\frac{529}{196}} = \sqrt{\frac{23 \times 23}{14 \times 14}} = \frac{23}{14} = 1\frac{9}{14}$

(iv) $\sqrt{23\frac{26}{121}} = \sqrt{\frac{121 \times 23 + 26}{121}} = \sqrt{\frac{2809}{121}} = \sqrt{\frac{53 \times 53}{11 \times 11}} = \frac{53}{11} = 4\frac{9}{11}$

(v) $\sqrt{52\frac{857}{2116}} = \sqrt{\frac{2116 \times 52 + 857}{2116}}$

$= \sqrt{\frac{110889}{2116}} = \sqrt{\frac{333 \times 333}{46 \times 46}} = \frac{333}{46} = 7\frac{11}{46}$

(vi) $\sqrt{75\frac{46}{49}} = \sqrt{\frac{49 \times 75 + 46}{49}} = \sqrt{\frac{3721}{49}} = \sqrt{\frac{61 \times 61}{7 \times 7}} = \frac{61}{7} = 8\frac{5}{7}$

(vii) $\sqrt{5.774409} = \sqrt{\frac{5774409}{1000000}} = \sqrt{\frac{2403 \times 2403}{1000 \times 1000}} = \frac{2403}{1000} = 2.403$

(viii) $\sqrt{0.00053361} = \sqrt{\frac{53361}{100000000}} = \sqrt{\frac{231 \times 231}{10000 \times 10000}}$

$= \frac{231}{10000} = 0.0231$

(ix) $\sqrt{804609} = \sqrt{897 \times 897} = 897$

(x) $\sqrt{\frac{1}{4}} = \sqrt{\frac{1}{2 \times 2}} = \frac{1}{2}$

Exercise 3D

1. (i) $\sqrt{4489} = 67$

	67
6	44 89
	36
127	889
	889
	×

(ii) $\sqrt{9801} = 99$

	99
9	98 01
	81
189	1701
	1701
	×

(iii) $\sqrt{44100} = 210$

	210
2	44 100
	4
41	41
	41
	×

(iv) $\sqrt{54756} = 234$

	234
2	5 47 56
	4
43	147
	129
464	1856
	1856
	×

(v) $\sqrt{99856} = 316$

	316
3	99 8 56
	9
61	98
	61
626	3756
	3756
	×

(vi) $\sqrt{390625} = 625$

	625
6	39 06 25
	36
122	306
	244
1245	6225
	6225
	×

(vii) $\sqrt{1234321} = 1111$

	1111
1	1 23 43 21
	1
21	23
	21
221	243
	221
2221	2221
	2221
	×

(viii) $\sqrt{21224449} = 4607$

	4607
4	21 22 44 49
	16
86	522
	516
9207	64449
7	64449
	×

(ix) $\sqrt{82264900} = 9070$

	9070
9	82 26 64 9 00
	81
1807	12649
	12649
	×

(x) $\sqrt{62504836} = 7906$

	7906
7	62 50 48 36
	49
149	1350
	1341
15806	94836
	94836
	×

(xi) $\sqrt{3915380329} = 62573$

	62573
6	39 15 38 03 29
	36
122	315
	244
1245	7138
	6225
12507	91303
	87549
125143	375429
	375429
	×

(xii) $\sqrt{3226694416} = 56804$

	56804
5	3226694416
	25
106	726
	636
1128	9069
	9024
113604	454416
	454416
	×

2. 2361

	48
4	23 61
	16
88	761
	704
	57

Hence, 2361 lies between $(48)^2$ and $(49)^2$.

To make it a perfect square the least number that should be subtracted is $761 - 704 = 57$

3. 4931

	71
7	49 31
	49
141	31
	141
	110

Hence, 4931 lies between $(70)^2$ and $(71)^2$.

To make it a perfect square the least number that should be added is $141 - 31 = 110$.

4. 18265

	135
1	1 82 65
	1
23	82
	69
265	1365
	1325
	40

Hence, 18265 lies between $(135)^2$ and $(136)^2$.

To make it a perfect square the least number that should be subtracted is $1365 - 1325 = 40$.

5. 4515600

	2125
2	4 51 56 00
	4
41	51
	41
422	1056
	844
4245	21200
	–21225
	–25

Hence, 4515600 lies between $(2115)^2$ and $(2125)^2$.

To make it a perfect square the least number that should be added is $21225 - 21200 = 25$.

6. Least number of four digits = 1000

	31
3	1 00 0
	9
61	100
	61
	39

	32
3	10 00
	9
62	100
	124
	−24

The difference of $124 - 100 = 24$

Hence, the smallest number of four digits which is a perfect square is $1000 + 24 = 1024$.

7. The greatest number of six digits is 999999

	999
9	99 99 99
	81
189	1899
	1701
1989	19899
	17901
	1998

Hence, the greatest number of six digits which is a perfect square is $999999 - 1998 = 998001$.

Exercise 3E

1. (i) $\sqrt{\frac{361}{625}} = \sqrt{\frac{19 \times 19}{25 \times 25}} = \frac{19}{25}$

(ii) $\sqrt{5\frac{19}{25}} = \sqrt{\frac{25 \times 5 + 19}{25}} = \sqrt{\frac{144}{25}} = \sqrt{\frac{12 \times 12}{5 \times 5}} = \frac{12}{5} = 2\frac{2}{5}$

(iii) $\sqrt{34\frac{15}{49}} = \sqrt{\frac{49 \times 34 + 15}{49}} = \sqrt{\frac{1681}{49}} = \sqrt{\frac{41 \times 41}{7 \times 7}} = \frac{41}{7} = 5\frac{6}{7}$

(iv) $\sqrt{84\frac{37}{121}} = \sqrt{\frac{84 \times 121 + 37}{121}} = \sqrt{\frac{10201}{121}}$

$= \sqrt{\frac{101 \times 101}{11 \times 11}} = \frac{101}{11} = 9\frac{2}{11}$

(v) $\sqrt{23\frac{394}{729}} = \sqrt{\frac{729 \times 23 + 394}{729}} = \sqrt{\frac{17161}{729}}$

$= \sqrt{\frac{131 \times 131}{27 \times 27}} = \frac{131}{27} = 4\frac{23}{27}$

(vi) $\sqrt{21\frac{51}{169}} = \sqrt{\frac{169 \times 21 + 51}{169}} = \sqrt{\frac{3600}{169}}$

$= \sqrt{\frac{60 \times 60}{13 \times 13}} = \frac{60}{13} = 4\frac{8}{13}$

(vii) $\sqrt{10\frac{151}{225}} = \sqrt{\frac{225 \times 10 + 151}{225}} = \sqrt{\frac{2401}{225}}$

$= \sqrt{\frac{49 \times 49}{15 \times 15}} = \frac{49}{15} = 3\frac{4}{15}$

(viii) $\sqrt{332\frac{61}{169}} = \sqrt{\frac{169 \times 332 + 61}{169}} = \sqrt{\frac{56169}{169}}$

$= \sqrt{\frac{237 \times 237}{13 \times 13}} = \frac{237}{13} = 18\frac{3}{13}$

2. (i) $\sqrt{27.3529} = 5.23$

	5.23
5	27 . 35 29
	25
102	235
	204
1043	3129
	3129
	×

(ii) $\sqrt{40.5769} = 6.37$

	6.37
6	40 . 57 69
	36
123	457
3	369
1267	8869
	8869
	×

(iii) $\sqrt{0.00038809} = \sqrt{\frac{38809}{100000000}}$

$= \sqrt{\frac{197 \times 197}{10000 \times 10000}} = \frac{197}{10000} = 0.0197$

	197
1	3 88 09
	1
29	288
	261
387	2709
	2709
	×

(iv) $\sqrt{3873.8176} = 62.24$

	62.24
6	38 73 . 81 76
	36
122	273
	244
1242	2981
	2484
12444	49776
	49776
	×

(v) $\sqrt{0.00059049} = \sqrt{\frac{59049}{100000000}} = \sqrt{\frac{243 \times 243}{10000 \times 10000}}$

$= \frac{243}{10000} = 0.0243$

	243
2	5 90 49
	4
44	190
	176
483	1449
	1449
	×

(vi) $\sqrt{170.0416} = 13.04$

	1304
1	1̲7̲0̲ . 0̲4̲ 1̲6̲
	1
23	70
	69
2604	10416
	10416
	×

(vii) $\sqrt{7286.3296} = 85.36$

	85.36
8	7̲2̲ 8̲6̲ . 3̲2̲ 9̲6̲
	64
165	886
	825
1703	6132
	5109
17066	102396
	102396
	×

(viii) $\sqrt{4003.0929} = 63.27$

	63.27
6	4̲0̲ 0̲3̲ . 0̲9̲ 2̲9̲
	36
123	403
	369
1262	3409
	2524
12647	88529
	88529
	×

3. (i) $$\frac{\sqrt{462.25} - \sqrt{33.64}}{\sqrt{462.25} + \sqrt{33.64}} = \frac{\sqrt{21.5 \times 21.5} - \sqrt{5.8 \times 5.8}}{\sqrt{21.5 \times 21.5} + \sqrt{5.8 \times 5.8}}$$

$$= \frac{21.5 - 5.8}{21.5 + 5.8} = \frac{15.7}{27.3} = \frac{157}{273}$$

(ii) $\dfrac{\sqrt{1281.64}+\sqrt{166.41}}{\sqrt{1281.64}-\sqrt{166.41}}=\dfrac{\sqrt{35.8\times 35.8}+\sqrt{12.9\times 12.9}}{\sqrt{35.8\times 35.8}-\sqrt{12.9\times 12.9}}$

$=\dfrac{35.8+12.9}{35.8-12.9}=\dfrac{48.7}{22.9}=\dfrac{487}{229}$

4. A decimal fraction $= x$

Let multiplied $= x$

The product $= 251953.8025$

$x\times x = 251953.8025$

$x^2 = 251953.8025$

$x = \sqrt{251953.8025}$

$x = \sqrt{501.95\times 501.95}$

$x = 501.95$

Therefore, fraction value is 501.95.

5. Let fraction $= x$

Let multiplied $= x$

Product $= 227.798649$

$x\times x = 227.798649$

$x^2 = 227.798649$

$x = \sqrt{227.798649}$

$x = \sqrt{15.093\times 15.093}$

$x = 15.093$

Therefore, fraction is 15.093.

6. A decimal fraction $= x$

Let multiplied $= x$

The product $= 0.00431649$

$x\times x = 0.00431649$

$x^2 = 0.00431649$

$x = \sqrt{0.00431649} = \sqrt{\dfrac{431649}{100000000}}$

$= \sqrt{\dfrac{657\times 657}{10000\times 10000}} = \dfrac{657}{10000}$

$x = 0.0657$

7. The decimal fraction $= x$

Let multiplied $= x$

Product $= 0.00279841$

$x\times x = 0.00279841$

$x^2 = 0.00279841$

$x = \sqrt{0.00279841}$

$$x = \sqrt{\frac{279841}{100000000}}$$

$$x = \sqrt{\frac{529 \times 529}{10000 \times 1000}}$$

$$x = \frac{529}{10000} = \mathbf{0.0529}$$

Exercise 3F

1. (i) 1.7

Square root of $1.7 = \sqrt{1.7} = 1.304$

(ii) 23.1

Square root of $23.1 = \sqrt{23.1} = 4.806$

(iii) 5

Square root of $5 = \sqrt{5} = 2.236$

(iv) 237.615

Square root or $237.615 = \sqrt{237.615} = 15.415$

(v) 0.9

Square root of $0.9 = \sqrt{0.9} = 0.948$

(vi) 20

Square root of $20 = \sqrt{20} = 4.472$

(vii) 0.1

Square root of $0.1 = \sqrt{0.1} = 0.316$

(viii) 0.016

Square root of $0.016\ \sqrt{0.016} = \sqrt{\frac{16}{1000}} = \frac{4}{31.622} = 0.126$

(ix) 0.00064

Square root of $0.00064 = \sqrt{0.00064} = 0.025$

(x) $\frac{7}{8}$

Square root of $\frac{7}{8} = \sqrt{\frac{7}{8}} = \frac{2.645}{2.828} = 0.935$

(xi) 15.3215

Square root of $15.3215 = \sqrt{15.3215} = 3.914$

(xii) $287\frac{5}{8}$

Square root of $287\frac{5}{8} = \sqrt{\frac{287 \times 8 + 5}{8}}$

$= \sqrt{\frac{2301}{8}} = \sqrt{287.625} = 16.960$

2. 12.0068

Square root of 12.0068 to four decimal places

$$= \sqrt{12.0068} = \sqrt{\frac{120068}{10000}}$$

$$= \sqrt{3.4651 \times 3.4651} = 3.4651$$

3. $\sqrt{2}$

The value of $\sqrt{2}$ upto three places of decimal

$$= \sqrt{2} = 1.414$$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. Do it yourself.

3. (i) 81

Square root of 81 = $\sqrt{81} = 9$

Number of digits in square root = 1

(ii) 169

Square root of 169 = $\sqrt{169} = 13$

Number of digits in square root = 2

(iii) 4761

Square root of 4761 = $\sqrt{4761} = 69$

Number of digits in square root = 2

(iv) 27889

Square root of 27889 = $\sqrt{27889} = 167$

Number of digits in square root = 3

(v) 525625

Square root of 525625 = $\sqrt{525625} = 725$

Number of digits in square root = 3

4. (i) 2304

Ones place of digit of square root = $\sqrt{04} = 2$

Square root of 2304 = $\sqrt{2304} = 48$

Ones place digit of 48 = 8

Therefore, answer = (2, 8)

(ii) 1225

Ones place of digit of squre root = $\sqrt{25} = 5$

Square root of 1225 = $\sqrt{1225} = 35$

Ones place digit of 35 = 5

Therefore, answer = (5, 5)

(iii) 8649

Ones place of digit of square root = $\sqrt{49} = 7$

Square root of 8649 = $\sqrt{8649} = 93$

Ones place of 93 = 3

Therefore, answer = (3, 7)

(iv) 9801

Ones place of digit of sqaure root = $\sqrt{01} = 1$

Square root of 9801 = $\sqrt{9801} = 99$

Ones place of 99 = 9

Therefore, answer = (1, 9)

5. (i) 2401

	49
4	2401
	16
89	801
	801
	×

Square root of 2401 = 49

(ii) 4489

	67
6	4489
	36
127	889
	889
	×

Square root of 4489 = 67

(iii) 106929

	327
3	106929
	9
62	169
	124
647	4529
	4529
	×

Square root of 106929 = 327

(iv) 167281

	409
4	167281
	16
809	7281
	7281
	×

(v) 53824

	232
2	53824
	4
43	138
	129
462	924
	924
	×

Square root of 53824 = 232

(vi) 213444

	462
4	213444
	16
86	534
	516
922	1844
	1844
	×

Square root of 213444 = 462

6. (i) 51.84

	7.2
7	51. 84
	49
142	2.84
	2.84
	×

Square root of 51.84 = 7.2

(ii) 42.25

	6.5
6	42. 25
	36
125	6.25
	6.25
	×

Square root of 42.25 = 6.5

(iii) 18.4041

	4.29
4	18. 4041
	16
82	2.40
	1.64
849	7641
	7641
	×

Square root of 18.4041 = 4.29

(iv) 5.774409

	2.403
2	5. 77 4409
	4
44	177
	176
4803	14409
	14409
	×

Square root of 5.774409 = 2.403

7. (i) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21

First total number of digit = 11

Sum = Square of number of digit

Sum = $(11)^2 = 121$

(ii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23 + 25

First total number of digit = 13

Sum = Square of total number of digit

Sum = $(13)^2$

Sum = 169

8. 46080

Factorising 46080 by division method.

We get, $46080 = \underline{2\times 2} \times \underline{2\times 2} \times \underline{2\times 2}$
$\times \underline{2\times 2} \times \underline{2\times 2} \times \underline{3\times 3} \times 5$

Which can be grouped into pairs of equal factor and 5 is left.

Therefore, $= 46080 \div 5 = 9216$

Square root of $9216 = 96$

Hence, answer $= (5, 96)$

2	46080
2	23040
2	11520
2	5760
2	2880
2	1440
2	720
2	360
2	180
2	90
3	45
3	15
5	5
	1

9. 6328

Hence, 6328 lies between $(79)^2$ and $(80)^2$.

To make it a perfect square the least number that should be added is.

$6400 - 6328 = 72$

	79
7	6328
	49
149	1428
	1341
	87

10. Given : Cost of grassing a square park = ₹ 89,520.64

At rate of ₹ 2.56 m^2

$$\text{Area of square field} = \frac{\text{Total cost}}{\text{Per } m^2 \text{ cost}} = \frac{89{,}520.64}{2.56} = 34969 \text{ } m^2$$

Since Area of square field $= \text{side}^2$

$\text{Side}^2 = 34969$

$\text{Side} = \sqrt{34969}$

$\text{Side} = 187 \text{ m}$

Perimeter of square field $= 4 \times \text{side} = 4 \times 187 = 748 \text{ m}$

11. Given :

The students of class VIII for picnic rupees = ₹ 2304

Let number of students $= x$

Each student collected rupees = x

Then, $x \times x =$ ₹ 2304

$x^2 = 2304$

$x = \sqrt{2304}$

Hence, $x = 48$

Number of students in class = 48

4. Cubes and Cube Roots

Exercise 4A

1. (i) 7

$$\text{Cube of } 7 = 7 \times 7 \times 7 = 49 \times 7 = 343$$

(ii) 12

$$\text{Cube of } 12 = 12 \times 12 \times 12 = 144 \times 12 = 1728$$

(iii) 21

$$\text{Cube of } 21 = 21 \times 21 \times 21 = 441 \times 21 = 9261$$

(iv) 100

$$\text{Cube of } 100 = 100 \times 100 \times 100$$
$$= 10000 \times 100 = 10{,}00{,}000$$

(v) 302

$$\text{Cube of } 302 = 302 \times 302 \times 302$$
$$= 91204 \times 302 = 27543608$$

(vi) 15

$$\text{Cube of } 15 = 15 \times 15 \times 15 = 225 \times 15 = 3375$$

(vii) -18

$$\text{Cube of } -18 = -18 \times -18 \times -18$$
$$= +324 \times -18 = -5832$$

(viii) $\frac{3}{11}$

$$\text{Cube of } \frac{3}{11} = \frac{3}{11} \times \frac{3}{11} \times \frac{3}{11} = \frac{9}{121} \times \frac{3}{11} = \frac{27}{1331}$$

(ix) $\frac{-8}{17}$

$$\text{Cube of } \frac{-8}{17} = \frac{-8}{17} \times \frac{-8}{17} \times \frac{-8}{17}$$
$$= \frac{64}{289} \times \frac{-8}{17} = \frac{-512}{4913}$$

2. (i) 64

Factorising 64 by division method.

2	64
2	32
2	16
2	8
2	4
2	2
	1

$$64 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$$

Grouping the factors in triplets of equal factors.
Therefore, 64 is a perfect cube.

(ii) 216

2	216
2	108
2	54
3	27
3	9
3	3
	1

Factorising 216 by division method.

$$216 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$$

Grouping the factors in triplets of equal factors.
Therefore, 216 is a perfect cube.

(iii) 3375

3	3375
3	1125
5	375
5	75
5	15
3	3
	1

Factorising 3375 by division method

$$3375 = 3 \times 3 \times 3 \times 5 \times 5 \times 5$$

Grouping the factors in triplets of equal factors.
Therefore, 3375 is a perfect cube.

(iv) 3675

3	3675
5	1225
5	245
7	49
7	7
	1

Factorising 3675 by division method.

$$3675 = 3 \times 5 \times 5 \times \underline{7 \times 7}$$

Grouping pair are not in triplet form.

Therefore, 3675 is not perfect cube.

(v) 42875

5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

Factorising 42875 by division method.

$$42875 = \underline{5 \times 5 \times 5} \times \underline{7 \times 7 \times 7}$$

Grouping the factors in triplets of equal factors.
Therefore, 42875 is a perfect cube.

(vi) 4096

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

Factorising 4096 by division method

$4096 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$

Grouping the factors in triplets of equal factors.

Therefore, 4096 is a perfect cube.

(viii) 1728

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

Factorising 1728 by division method.

$1728 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

Grouping the factors in triplets of equal factors.

Therefore, 1728 is a perfect cube.

(ix) Do it yourself.

3. Do it yourself.

4. Do it yourself.

5. Do it yourself.

6. Do it yourself.

7. 5184

2	5184
2	2592
2	1296
2	648
2	324
2	162
3	81
3	27
3	9
3	3
	1

Factorising 5184 by division method.

$5184 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times 3$

Grouping the factors in equal pairs and 3 is left.

Then, 9 is multiple. Hence, answer is 9.

$= 5184 \times 9 = 46656$

Cube root of $46656 = 36$

8. 197568

2	197568
2	98784
2	49392
2	24696
2	12348
2	6174
3	3087
3	1029
7	343
7	49
7	7
	1

Factorising 197568 by division method.

$197568 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3 \times 3 \times \underline{7 \times 7 \times 7}$

Grouping factors is equal pairs and 9 is left.

Therefore, 9 is divided to get perfect cube.

9. 392

2	392
2	196
2	98
7	49
7	7
	1

Factorising 392 by division method.

$392 = \underline{2 \times 2 \times 2} \times 7 \times 7$

Grouping factors is equal pairs and 49 is left.

Therefore, 7 is multiplied to get perfect cube.

10. Given :

$$\begin{aligned} \text{One side of cube} &= 13 \text{ m} \\ \text{Volume of cube} &= (\text{Side})^3 \\ &= (13)^3 \\ &= 13 \times 13 \times 13 \\ &= 169 \times 13 \\ &= 2197 \text{ m}^3 \end{aligned}$$

11. 8640

2	8640
2	4320
2	2160
2	1080
2	540
2	270
3	135
3	45
3	15
5	5
	1

Factorising 8640 by division method.

$8640 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times 5$

Grouping factors is equal pairs and 5 is left.

Therefore, 5 is divided to get perfect cube.

Exercise 4B

1. (i) $1000 = \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5}$

2	1000
2	500
2	250
5	125
5	25
5	5
	1

Cube root of $1000 = 2 \times 5 = 10$

(ii) $2744 = \underline{2 \times 2 \times 2} \times \underline{7 \times 7 \times 7}$

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

Cube root of $2744 = 2 \times 7$

$= 14$

(iii) 32768

2	32768
2	16384
2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$

$\times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$

$\times \underline{2 \times 2 \times 2}$

Cube root of 32768

$= 2 \times 2 \times 2 \times 2 \times 2$

$= 32$

(iv) 13824

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

Cube root of $13824 = 2 \times 2 \times 2 \times 3$

$= 24$

2	13824
2	6912
2	3456
2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

(v) $54872 = \underline{2 \times 2 \times 2} \times \underline{19 \times 19 \times 19}$

2	54872
2	27436
2	13718
19	6859
19	361
19	19

Cube root of $54872 = 2 \times 19 = 38$

(vi) $74088 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3} \times \underline{7 \times 7 \times 7}$

2	74088
2	37044
2	18522
3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

Cube root of $74088 = 2 \times 3 \times 7 = 42$

(vii) $125000 = \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5} \times \underline{5 \times 5 \times 5}$

2	125000
2	62500
2	31250
5	15625
5	3125
5	625
5	125
5	25
5	5
	1

Cube root of $125000 = 2 \times 5 \times 5 = 10 \times 5 = 50$

(viii) 884736

2	884736
2	442368
2	221184
2	110592
2	55296
2	27648
2	13824
2	6912
2	3456
12	1728
12	144
12	12
	1

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$
$\times \underline{12 \times 12 \times 12}$

Cube root of $884736 = 2 \times 2 \times 2 \times 12$

$= 4 \times 2 \times 12$

$= 8 \times 12 = 96$

(ix) 48228544

2	48228544
2	24114272
2	12057136
2	6028568
2	3014284
2	1507142
7	753571
7	107653
7	15379
13	2197
13	169
13	13
	1

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{7 \times 7 \times 7}$
$\times \underline{13 \times 13 \times 13}$

Cube root of $48228544 = 2 \times 2 \times 7 \times 13$

$= 4 \times 7 \times 13$

$= 28 \times 13 = 364$

(x) 74088000

2	74088000
2	37044000
2	18522000
2	9261000
2	4630500
2	2315250
3	1157625
3	385875
3	128625
5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$\times \underline{5 \times 5 \times 5} \times \underline{7 \times 7 \times 7}$

Cube root of 74088000 $= 2 \times 2 \times 3 \times 5 \times 7$

$= 4 \times 3 \times 5 \times 7$

$= 12 \times 5 \times 7$

$= 60 \times 7$

$= 420$

2. 137592

2	137592
2	68796
2	34398
7	1799
7	2457
13	351
3	27
3	9
3	3
	1

Factorising 137592 by division method.

$137592 = \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$\times 7 \times 7 \times 13$

Which have factors in equal pairs and 49×13 is left.

Hence, multiplied $= 7 \times 13 \times 13 = 1183$

Perfect cube $= \sqrt[3]{137592 \times 1183} = 546$

3. 26244

Factorising 26244 by division method.

$$26244 = 2 \times 2 \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times 3 \times 3$$

2	26244
2	13122
3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

Grouping the factors in equal pairs and 4×9 is not a pair.

Hence, divide by 36.

Therefore, perfect cube $= \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

Perfect cube root $= 3 \times 3 = 9$

There will be answer is (36, 9)

4. Given : Cube $= 512\ \text{m}^3$

Length of side of cube $= \sqrt[3]{512} = \sqrt[3]{8 \times 8 \times 8} = 8\ \text{m}$

Length of side of cube $= 8\ \text{m}$

5. Given :

Volume of cube $= 10648\ \text{cm}^3$

We know that,

Length of edge $= \sqrt[3]{\text{Volume of cube}} = \sqrt[3]{10648}$

$= \sqrt[3]{22 \times 22 \times 22}$

Length of edge $= 22\ \text{cm}.$

6. 216 Cube root of 216 $= \sqrt[3]{216}$

$= \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3}$

$= 2 \times 3 = 6$

2	216
2	108
2	54
3	27
3	9
3	3
	1

Exercise 4C

1. (i) -125

Factorising -125 by division method.

$$-125 = \underline{-5 \times -5 \times -5}$$

Cube root of $-125 = -5$

5	125
5	25
5	5
	1

(ii) -39304

2	39304
2	19652
2	9826
17	4913
17	289
17	17
	1

Factorising -39304 by division method

$$-39304 = \underline{2 \times 2 \times 2} \times \underline{17 \times 17 \times 17}$$

$$\text{Cube root of } -39304 = 2 \times 17$$
$$= -34$$

(iii) -46656

2	46656
2	23328
2	11664
2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Factorising -46656 by division method.

$$-46656 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$$

$$\times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$$

$$\text{Cube root of } -46656 = 2 \times 2 \times 3 \times 3$$

$$= 4 \times 3 \times 3$$

$$= 12 \times 3 = -36$$

(iv) -5832

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

Factorising -5832 by division method

$$-5832 = \underline{2 \times 2 \times 2}$$
$$\times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$$

$$\text{Cube root of } -5832 = 2 \times 3 \times 3$$

$$= 6 \times 3 = -18$$

(v) -17576

2	17576
2	8788
2	4394
13	2197
13	169
13	13
	1

Factorising -17576 by division method.

$$-17576 = \underline{2 \times 2 \times 2} \times \underline{13 \times 13 \times 13}$$

$$\text{Cube root of } -17576 = 2 \times 13 = -26$$

(vi) -2744000

2	2744000
2	1372000
2	686000
2	343000
2	171500
2	85750
5	42875
5	8575
5	1715
7	343
7	49
7	7
	1

Factorising -2744000 by division method.

$$-2744000 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{5 \times 5 \times 5} \times \underline{7 \times 7 \times 7}$$

$$\text{Cube root of } -2744000 = 2 \times 2 \times 5 \times 7$$

$$= 4 \times 5 \times 7$$

$$= 20 \times 7 = -140$$

2. Do it yourself.

3. (i) $(8) \times (64)$

2	8
2	4
2	2
	1

2	64
2	32
2	16
2	8
2	4
2	2
	1

$$(\underline{2 \times 2 \times 2}) \times (\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2})$$

$$\text{Cube root of } 8 \times 64 = (2) \times (2 \times 2)$$

$$= 2 \times 4 = 8$$

(ii) -216×1728

2	216
2	108
2	54
3	27
3	9
3	3
	1

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

$= (\underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}) \times (\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3})$

Cube root of $-216 \times 1728 = -(2 \times 3) \times (2 \times 2 \times 3)$

$= -6 \times 12 = -72$

(iii) $27 \times (-2744)$

3	27
3	9
3	3
	1

2	2744
2	1372
2	686
7	343
7	49
7	7
	1

$= (\underline{3 \times 3 \times 3}) \times (\underline{2 \times 2 \times 2} \times \underline{7 \times 7 \times 7})$

Cube root of $27 \times (-2744) = -3 \times (2 \times 7)$

$= -3 \times 14 = -42$

(iv) $(-125) \times (-3375)$

5	125
5	25
5	5
	1

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

$= (5 \times 5 \times 5) \times (3 \times 3 \times 3 \times 5 \times 5 \times 5)$

Cube root of $-(127) \times (-2744) = -5 \times -(3 \times 5)$

$= 15 \times 5 = 75$

(v) $(729) \times (15625)$

3	729
3	243
3	81
3	27
3	9
3	3
	1

5	15625
5	3125
5	625
5	125
5	25
5	5
	1

$= (\underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}) \times (\underline{5 \times 5 \times 5} \times \underline{5 \times 5 \times 5})$

Cube root of $(729) \times (15625) = 3 \times 3 \times 5 \times 5$

$= 9 \times 5 \times 5 = 225$

(vi) $-456533 = (\underline{11 \times 11 \times 11} \times \underline{7 \times 7 \times 7})$

11	456533
11	41503
11	3773
7	343
7	49
7	7
	1

Cube root of $-456533 = -11 \times 7 = -77$

(vii) -474552

$= \underline{2 \times 2 \times 2} \times \underline{3 \times 3 \times 3}$

$\times \underline{13 \times 13 \times 13}$

Cube root of -474552

$= -2 \times 3 \times 13$

$= -6 \times 13$

$= -78$

2	474552
2	237276
2	118638
3	59319
3	19773
3	6591
13	2197
13	169
13	13
	1

(viii) -5832000

$= \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$

$\times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

$\times \underline{5 \times 5 \times 5}$

Cube root of -5832000,

$= -2 \times 2 \times 3 \times 3 \times 5$

$= -4 \times 9 \times 5 = -180$

2	5832000
2	2916000
2	1458000
2	729000
2	364500
2	182250
3	91125
3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

4. (i) $\sqrt[3]{81} \times \sqrt[3]{72000}$

3	81
3	27
3	9
3	3
	1

2	72000
2	36000
2	18000
2	9000
2	4500
2	2250
3	1125
3	375
5	125
5	25
5	5
	1

$= \sqrt[3]{3 \times 3 \times 3 \times 3} \times \sqrt{\underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3 \times 3 \times \underline{5 \times 5 \times 5}}$

$= 3 \times \sqrt[3]{3} \times 2 \times 2 \times 5 \times \sqrt[3]{3} \times \times \sqrt[3]{3}$

$= 3 \times 2 \times 2 \times 5 \times 3 = 180$

(ii) $\sqrt[3]{16} \times \sqrt[3]{4000}$

2	16
2	8
2	4
2	2
	1

2	4000
2	2000
2	1000
2	500
2	250
5	125
5	25
5	5
	1

$= \sqrt[3]{2 \times 2 \times 2 \times 2} \times \sqrt[3]{\underline{2 \times 2 \times 2} \times 2 \times 2 \times \underline{5 \times 5 \times 5}}$

$= 2 \times \sqrt[3]{2} \times 5 \times 2 \times \sqrt[3]{2} \times \sqrt[3]{2}$

$= 2 \times 2 \times 5 \times 2 = 40$

(iii) $\sqrt[3]{968} \times \sqrt[3]{1375}$

2	968
2	484
2	242
11	121
11	11
	1

5	1375
5	275
5	55
11	11
	1

$$= \sqrt[3]{2 \times 2 \times 2 \times 11 \times 11} \times \sqrt{5 \times 5 \times 5 \times 11}$$
$$= 2 \times 5 \times \sqrt[3]{11} \times \sqrt[3]{11} \times \sqrt[3]{11}$$
$$= 2 \times 5 \times 11 = 110$$

(iv) $\sqrt[3]{729} \times \sqrt[3]{1331} = \sqrt[3]{9 \times 9 \times 9} \times \sqrt[3]{11 \times 11 \times 11}$

9	729
9	81
9	9
	1

11	1331
11	121
11	11
	1

5. (i) $\dfrac{-2197}{-9261} = \dfrac{2197}{9261} = \dfrac{13 \times 13 \times 13}{\underline{3 \times 3 \times 3} \times \underline{7 \times 7 \times 7}}$

$$= 9 \times 11 = 99$$

3	9261
3	3087
3	1029
7	343
7	49
7	7
	1

13	2197
13	169
13	13
	1

Cube root of $\dfrac{2197}{9261} = \dfrac{13}{3 \times 7} = \dfrac{13}{21}$

(ii) $\dfrac{729}{2197} = \dfrac{9 \times 9 \times 9}{13 \times 13 \times 13}$

13	2197
13	169
13	13
	1

9	729
9	81
9	9
	1

Cube root of $\frac{729}{2197} = \frac{9}{13}$

(iii) $\frac{512}{8000} = \frac{8 \times 8 \times 8}{20 \times 20 \times 20}$

20	8000
20	400
20	20
	1

8	512
8	64
8	8
	1

Cube root of $\frac{512}{8000} = \frac{8}{20}$

(iv) $\frac{1728}{9261} = \frac{12 \times 12 \times 12}{21 \times 21 \times 21}$

21	9261
21	441
21	21
	1

12	1728
12	144
12	12
	1

Cube root of $\frac{1728}{9261} = \frac{12}{21}$

6. (i) $32.768 = \frac{32768}{1000} = \frac{32 \times 32 \times 32}{10 \times 10 \times 10}$

10	1000
10	100
10	10
	1

32	32768
32	1024
32	32
	1

Cube root of $32.768 = \frac{32}{10} = 3.2$

(ii) $12.167 = \frac{12167}{1000} = \frac{23 \times 23 \times 23}{10 \times 10 \times 10}$

10	1000
10	100
10	10
	1

23	12167
23	529
23	23
	1

Cube root of $12.167 = \frac{23}{10} = 2.3$

(iii) $10.648 = \frac{10648}{1000} = \frac{22 \times 22 \times 22}{10 \times 10 \times 10}$

10	1000
10	100
10	10
	1

22	10648
22	484
22	22
	1

Cube root of $10.648 = \frac{22}{10} = 2.2$

(iv) $46.656 = \frac{46656}{1000} = \frac{36 \times 36 \times 36}{10 \times 10 \times 10}$

10	1000
10	100
10	10
	1

36	46656
36	1296
36	36
	1

Cube root of $46.656 = \frac{36}{10} = 3.6$

7. Given :

Volume of cubical box $= 32.768\,\text{m}^3$

We know that,

Volume of cubical box $=$ (length of side of box)^3

Let length of side $= x$

$x^3 = 32.768$

$x = \sqrt[3]{32.768}$

$x = 3.2$

Length of side $= 3.2$ m

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) 5

Cube of $5 = (5)^3 = 5 \times 5 \times 5 = 125$

(ii) 11

Cube of $11 = (11)^3 = 11 \times 11 \times 11 = 121 \times 11 = 1331$

(iii) 16

Cube of $16 = (16)^3 = 16 \times 16 \times 16 = 256 \times 16 = 4096$

(iv) 23

Cube of $23 = (23)^3 = 23 \times 23 \times 23 = 529 \times 23 = 12167$

(v) 31

Cube of $31 = (31)^3 = 31 \times 31 \times 31 = 961 \times 31 = 29791$

(vi) 40

Cube of $40 = (40)^3 = 40 \times 40 \times 40 = 1600 \times 40 = 64000$

2. Do it yourself.

3. (i) 243

Factorising 243 by division method.

$243 = \underline{3 \times 3 \times 3} \times 3 \times 3$

Complete pairs to multiply by 3.

We get, $= \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3}$

$= 729 = (9)^3$

Therefore 3 is multiplied

3	243
3	81
3	27
3	9
3	3
	1

(ii) $3072 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 2 \times 3$

Complete pair to multiply by $2 \times 2 \times 3 \times 3$

We get $= (110592)$

$= (48)^3$

Therefore 36 is multiplied.

2	3072
2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

(iii) $11979 = 3 \times 3 \times \underline{11 \times 11 \times 11}$

Complete pair to multiply by 3.

We get, $35937 = (33)^3$

Therefore, 3 is multiplied.

3	11979
3	3993
11	1331
11	121
11	11
	1

(iv) $19652 = 2 \times 2 \times 17 \times 17 \times 17$

2	19652
2	9826
17	4913
17	289
17	17
	1

Complete pair to multiply by 2.

$= 19652 \times 2$

$= 39304$

$= (34)^3$

Therefore, 2 is multiplied.

4. (i) $1536 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 3$

2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

Complete pair to divide by 3.

$= \dfrac{1536}{3}$

$= (512)$

$= (8)^3$

Therefore, 3 is divided.

(ii) $10985 = 5 \times \underline{13 \times 13 \times 13}$

5	10985
13	2197
13	169
13	13
	1

Complete pair to divide by 5.

$= \dfrac{10985}{5} = 2197 = (13)^3$

Therefore, 5 is divided.

(iii) $28672 = \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2}$

$\times \underline{2 \times 2 \times 2} \times \underline{2 \times 2 \times 2} \times 7$

2	28672
2	14336
2	7168
2	3584
2	1792
2	896
2	448
2	224
2	112
2	56
2	28
2	14
7	7
	1

Complete pair to divide by 7.

$= \dfrac{28672}{7} = 4096$

Therefore, 7 is divided.

(iv) $13718 = 2 \times 19 \times 19 \times 19$

2	13718
19	6859
19	361
19	19
	1

Complete pair to divide by 2.

$$= \frac{13718}{2} = 6859 = (19)^3$$

Therefore, 2 is divided.

5. Assume, we need x cuboids.

$$\text{Volume of cuboid} = 3 \times 3 \times 5 = 45$$
$$\text{Volume of } x \text{ cuboid} = 45 \times x = 45x$$

$45x$ is a perfect cube.

Therefore, we know that $45x$ is multiply of 5 and 3.

Hence, $45x = (15)^3 = 3375$

$$45x = 3375$$
$$x = 75 \text{ (cuboids)}$$

6. Given :

Surface area of cubical box $= 486\ \text{cm}^2$

$$6a^2 = 486$$
$$a^2 = 81$$
$$a = 9\,\text{cm}$$
$$\text{Volume of cubical box} = a^3$$
$$= (9)^3 = 9 \times 9 \times 9$$
$$= 81 \times 9 = 729\,\text{cm}^3$$

7. (i) 27

$$\text{Volume of cube} = 27$$
$$a^3 = 27$$
$$a = \sqrt[3]{27}$$
$$a = 3$$

3 is odd natural number.

(ii) 216

$$\text{Volume of cube} = 216$$
$$a^3 = 216$$
$$a = \sqrt[3]{216}$$
$$a = 6$$

6 is even natural number.

(iii) 1000

$$\text{Volume of cube} = 1000$$

$$a^3 = 1000$$
$$a = \sqrt[3]{1000}$$
$$a = 10 \text{ is even natural number.}$$

(iv) 2197

$$\text{Volume of cube} = 2197$$
$$a^3 = \sqrt[3]{2197}$$
$$a = 13$$

13 is odd natural number.

(v) 4096

$$\text{Volume of cube} = 4096$$
$$a^3 = 4096$$
$$a = \sqrt[3]{4096}$$
$$a = 16$$

16 is even natural number.

(vi) 6859

$$\text{Volume of cube} = 6859$$
$$a^3 = 6859$$
$$a = \sqrt[3]{6859}$$
$$a = 19$$

19 is odd natural number.

8. (i) 512

$$\text{Cube root or } 512 = \sqrt[3]{512}$$
$$= \sqrt[3]{8 \times 8 \times 8}$$
$$= 8$$

8	512
8	64
8	8
	1

(ii) 729

$$\text{Cube root or } 729 = \sqrt[3]{729}$$
$$= \sqrt[3]{9 \times 9 \times 9}$$
$$= 9$$

9	729
9	81
9	9
	1

(iii) 1728

$$\text{Cube root of } 1728 = \sqrt[3]{1728}$$
$$= \sqrt[3]{12 \times 12 \times 12}$$
$$= 12$$

12	1728
12	144
12	12
	1

(iv) 4913

17	4913
17	289
17	17
	1

Cube root of 4913 $= \sqrt[3]{4913}$

$= \sqrt[3]{17 \times 17 \times 17}$

$= 17$

(v) 4096

16	4096
16	256
16	16
	1

Cube root of 4096 $= \sqrt[3]{4096}$

$= \sqrt[3]{16 \times 16 \times 16}$

$= 16$

(vi) 8000

20	8000
20	400
20	20
	1

Cube root of 8000 $= \sqrt[3]{8000}$

$= \sqrt[3]{20 \times 20 \times 20}$

$= 20$

9. (i) $\frac{-64}{125}$

4	64
4	16
4	4
	1

5	125
5	25
5	5
	1

Cube root of $\frac{-64}{125} = -\sqrt[3]{\frac{64}{125}} = -\sqrt[3]{\frac{4 \times 4 \times 4}{5 \times 5 \times 5}} = \frac{-4}{5}$

(ii) $\frac{-27}{343}$

3	27
3	9
3	3
	1

7	343
7	49
7	7
	1

Cube root of $\frac{-27}{343} = -\sqrt[3]{\frac{27}{343}} = -\sqrt[3]{\frac{3 \times 3 \times 3}{7 \times 7 \times 7}} = \frac{-3}{7}$

(iii) $\frac{-512}{343}$

8	512
8	64
8	8
	1

7	343
7	49
7	7
	1

Cube root of $\frac{-512}{343} = -\sqrt[3]{\frac{8\times 8\times 8}{7\times 7\times 7}} = \frac{-8}{7}$

(iv) -2197

13	2197
13	169
13	13
	1

Cube root of $-2197 = -\sqrt[3]{2197}$

$= -\sqrt[3]{13\times 13\times 13}$

$= -13$

(v) -5822

18	5832
18	324
18	18
	1

Cube root of $-5832 = -\sqrt[3]{5832}$

$= -\sqrt[3]{18\times 18\times 18}$

$= -18$

(vi) -2744000

14	2744
14	196
14	14
	1

Cube root of -2744000

$= -\sqrt[3]{2744000}$

$= -\sqrt[3]{14\times 14\times 14\times 10\times 10\times 10}$

$= -14\times 10 = -140$

10. (i) -216×1728

Cube root of -216×1728

$= -\sqrt[3]{216\times 1728}$

$= -\sqrt[3]{6\times 6\times 6\times 12\times 12\times 12}$

$= -6\times 12 = -72$

(ii) -27×-125

Cube root of

$27\times 125 = \sqrt[3]{27\times 125}$

$= \sqrt[3]{3\times 3\times 3\times 5\times 5\times 5}$

$= 3\times 5 = 15$

(iii) $\frac{-27}{64}$

Cube root of $\frac{-27}{64} = -\sqrt[3]{\frac{27}{64}}$

$= -\sqrt[3]{\frac{3\times 3\times 3}{4\times 4\times 4}} = \frac{-3}{4}$

(iv) $\frac{729}{-1331}$

Cube root of $-\frac{729}{1331} = -\sqrt[3]{\frac{729}{1331}}$

$$= -\sqrt[3]{\frac{9 \times 9 \times 9}{11 \times 11 \times 11}} = -\frac{9}{11}$$

(v) 250.047

Cube root of 250.047 $= \sqrt[3]{250.047}$

$$= \sqrt[3]{6.3 \times 6.3 \times 6.3} = 6.3$$

(vi) –166375

Cube root of –166375 $= -\sqrt[3]{166375}$

$$= -\sqrt[3]{55 \times 55 \times 55} = -55$$

11. (i) $\frac{27}{64}$

Cube root of $\frac{27}{64} = \sqrt[3]{\frac{27}{64}} = \sqrt[3]{\frac{3 \times 3 \times 3}{4 \times 4 \times 4}} = \frac{3}{4}$

(ii) $\frac{64}{343}$

Cube root of $\frac{64}{343} = \sqrt[3]{\frac{64}{343}} = \sqrt[3]{\frac{4 \times 4 \times 4}{7 \times 7 \times 7}} = \frac{4}{7}$

(iii) $\frac{343}{512}$

Cube root of $\frac{343}{512} = \sqrt[3]{\frac{343}{512}}$

$$= \sqrt[3]{\frac{7 \times 7 \times 7}{8 \times 8 \times 8}} = \frac{7}{8}$$

(iv) 512×729

Cube root of $512 \times 729 = \sqrt[3]{512 \times 729}$

$$= \sqrt[3]{8 \times 8 \times 8 \times 9 \times 9 \times 9}$$

$$= 8 \times 9 = 72$$

(v) 64×27

Cube root of $64 \times 27 = \sqrt[3]{64 \times 27}$

$$= \sqrt[3]{4 \times 4 \times 4 \times 3 \times 3 \times 3}$$

$$= 4 \times 3 = 12$$

(vi) 1331×8000

Cube root of

$1331 \times 8000 = \sqrt[3]{1331 \times 8000}$

$$= \sqrt[3]{11 \times 11 \times 11 \times 20 \times 20 \times 20}$$

$$= 11 \times 20 = 220$$

12. (i) 1.728

Cube root of $1.728 = \sqrt[3]{1.728}$

$= \sqrt[3]{1.2 \times 1.2 \times 1.2} = 1.2$

(ii) 9.261

Cube root of $9.261 = \sqrt[3]{9.261} = \sqrt[3]{2.1 \times 2.1 \times 2.1} = 2.1$

(iii) 0.000027

Cube root of $0.000027 = \sqrt[3]{\frac{27}{1000000}} = \sqrt[3]{\frac{3 \times 3 \times 3}{100 \times 100 \times 100}}$

$= \frac{3}{100} = 0.03$

(iv) –0.512

Cube root of $-0.512 = -\sqrt[3]{\frac{512}{1000}} = -\sqrt[3]{\frac{8 \times 8 \times 8}{10 \times 10 \times 10}}$

$= -\frac{8}{10} = -0.8$

(v) –15.625

Cube root of $-15.625 = -\sqrt[3]{15.625}$

$= -\sqrt[3]{2.5 \times 2.5 \times 2.5} = -2.5$

(vi) 125×8000

Cube root of $125 \times 8000 = \sqrt[3]{125 \times 8000}$

$= \sqrt[3]{5 \times 5 \times 5 \times 20 \times 20 \times 20}$

$= 5 \times 20 = 100$

13. 30375

3	30375
3	10125
3	3375
3	1125
3	375
5	125
5	25
5	5
	1

Factorising 30375 by division method

$30375 = \underline{3 \times 3 \times 3} \times 3 \times 3 \times \underline{5 \times 5 \times 5}$

Grouping the factors in triplets of equal factors and 3 is left.

Clearly to make it a perfect cube.

It must be multiplied by 3.

14. 26244

2	26244
2	13122
3	6561
3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

Factorising 26244 by division method

$$26244 = 2 \times 2 \times \underline{3 \times 3 \times 3} \times \underline{3 \times 3 \times 3} \times 3 \times 3$$

Grouping the factors in triplets of equal factor.

Therefore, 36 is divide to make perfect cube.

15. Given :

$$\text{Volume of cubical box} = 21952 \text{ m}^3$$

$$\text{Let length of side of box} = x$$

$$x^3 = 21952 = \sqrt[3]{21952}$$

$$x = \sqrt[3]{28 \times 28 \times 28}$$

$$x = 28 \text{ m}$$

16. Given :

Three number = 3 : 4 : 5

Product of their number = 480

$$3x \times 4x \times 5x = 480$$

$$x \times 4x \times 5x = 480$$

$$x \times 20 \times x^2 = 160$$

$$x^3 = 8$$

$$x = \sqrt[3]{8} = 2$$

$$\text{Three number} = 3 \times 2, 4 \times 2, 5 \times 2 = 6, 8, 10$$

17. Two number ratio = 4 : 5

Difference of their cubes = 61

$$(5x)^3 - (4x)^3 = 61$$

$$125x^3 - 64x^3 = 61$$

$$61x^3 = 61$$

$$x^3 = 1$$

$$x = \sqrt[3]{1} = 1$$

$$\text{Two number is} = 4 \times 1, 5 \times 1 = 4, 5$$

5. Playing with Numbers

Exercise 5A

1. (i) 78

Number in generalised form $= 10 \times 7 + 8$

(ii) 95

Number in generalised form $= 10 \times 9 + 5$

(iii) 228

Number in generalised form $= 100 \times 2 + 10 \times 2 + 8$

(iv) 934

Number in generalised form $= 100 \times 9 + 10 \times 3 + 4$

2. (i) $10 \times 3 + 8$

Number in usual form $= 10 \times 3 + 8$

$= 30 + 8 = 38$

(ii) $10 \times 9 + 7$

Number in usual form $= 10 \times 9 + 7$

$= 90 + 7 = 97$

(iii) $100 \times 5 + 10 \times 4 + 7$

Number in usual form $= 100 \times 5 + 10 \times 4 + 7$

$= 500 + 40 + 7$

$= 540 + 7 = 547$

(iv) $100 \times 8 + 10 \times 9 + 2$

Number in usual form $= 100 \times 8 + 10 \times 9 + 2$

$= 800 + 90 + 2$

$= 890 + 2 = 892$

3. Let two digit number $= 10a + b$

Where a = tens digit

b = unit digit

According to question $= 10a + b = (a + b) + 27$

$10a + b - a - b = 27$

$9a = 27$

$a = 3$ …(i)

Given : $b = 2a$

Put in eqn. (i)

$b = 2 \times 3 = 6$

Therefore, two digit number

$= 10 \times 3 + 6 = 36$

4. Let two digit number $= 10a + b$

Interchange number $= 10b + a$

Difference between two digit number and interchange number

$$10a + b - (10b + a) = 27$$
$$9a - 9b = 27$$
$$a - b = 3 \quad \ldots(i)$$

Ratio of number $= a : b :: 1 : 2$

Put in eqn. (i) $\Rightarrow 2x - x = 3$

$$x = 3$$

Sum of digit $= (1 + 2) \times 3 = 3 \times 3 = 9$

Difference of digit $= (2 - 1) \times 3 = 3 \times 1 = 3$

Difference between sum of digit and difference of digit

$$9 - 3 = 6$$

5. Let two digit number $= 10a + b$

Interchange digit number $= 10b + a$

Given :

$$10b + a = \frac{4}{7}(10a + b)$$
$$70b + 7a = 40a + 4b$$
$$70b - 4b = 40a - 7a$$
$$66b = 33a$$
$$b = \frac{1}{2}a$$
$$a = 2b \quad \ldots(i)$$

Put $a - b = 3 \quad \ldots(ii)$

$$2b - b = 3$$
$$b = 3$$
$$a = 2 \times 3 = 6$$

Hence, the number is

$$10a + b = 10 \times 6 + 3 = 60 + 3 = 63$$

6. Let two digit number $= 10a + b$

Interchange digit number $= 10b + a$

Given :

$$10a + b - (10b + a) = 9$$
$$9a - 9b = 9$$
$$a - b = 1 \quad \ldots(i)$$

According to question,

$$a + b = 11$$
$$\underline{a - b = 1}$$
$$2a = 12$$
$$a = 6$$
$$6 - b = 1$$

$b = 5$

Hence, numberd $= 10 \times a + b$

$= 10 \times 6 + 5$

$= 60 + 5 = 65$

Exercise 5B

1. (i) 26

26 is even number. So, it is divisible by 2.

(ii) 88

88 is even number. So, it is divisible by 2.

(iii) 95

95 is odd number. So, it is not divisible by 2.

(iv) 47

47 is odd number. So, it is not divisible by 2.

(v) 188

188 is even number. So, it is divisible by 2.

(vi) 194

194 is even number. So it is divisible by 2.

(vii) 362

362 is even number. So, it is divisible by 2.

(viii) 693

693 is odd number. So, it is not divisible by 2.

2. (i) 33

Sum of digits of $33 = 3 + 3 = 6$

So, it is divisible by 3.

(ii) 93

Sum of digits of $93 = 9 + 3 = 12$

So, it is divisible by 3.

(iii) 83

Sum of digits of $83 = 8 + 3 = 11$

So, it is not divisible by 3.

(iv) 65

Sum of digits of $65 = 6 + 5 = 11$

So, it is not divisible by 3.

(v) 928

Sum of digits of $928 = 9 + 2 + 8 = 19$

So, it is not divisible by 3.

(vi) 165

Sum of digits of $165 = 1 + 6 + 5 = 12$

So, it is divisible by 3.

(vii) 936

Sum of digits of 936 = 9 + 3 + 6 = 18

So, it is divisible by 3.

(viii) 127

Sum of digits of 127 = 1 + 2 + 7 = 10

So, it is not divisible by 3.

3. (i) 57

Unit digit of 57 = 7

So, it is not divisible by 5.

(ii) 65

Unit digit of 65 = 5

So, it is divisible by 5.

(iii) 70

Unit digit of 70 = 0

So, it is divisible by 5.

(iv) 93

Unit digit of 93 = 3

So, it is not divisible by 5.

(v) 125

Unit digit of 125 = 5

So, it is divisible by 5.

(vi) 690

Unit digit of 690 = 0

So, it is divisible by 5.

(vii) 524

Unit digit of 524 =4

So, it is not divisible by 5.

(viii) 895

Unit digit of 895 = 5

So, it is divisible by = 5

4. (i) 88

Sum of digits of 88 = 8 + 8 = 16

So, it is not divisible by 9.

(ii) 99

Sum of digits of 99 = 9 + 9 = 18

So, it is divisible by 9.

(iii) 188

Sum of digits of 188 = 1 + 8 + 8 = 17

So, it is not divisible by 9.

(iv) 459
Sum of digits of $459 = 4 + 5 + 9 = 18$
So, it is divisible by 9.

(v) 149
Sum of digits of $149 = 1 + 4 + 9 = 14$
So, it is not divisible by 9.

(vi) 846
Sum of digits of $846 = 8 + 4 + 6 = 18$
So, it is divisible by 9.

(vii) 639
Sum of digits of $639 = 6 + 3 + 9 = 18$
So, it is divisible by 9.

(viii) 865
Sum of digits of $865 = 8 + 6 + 5 = 19$
So, it is not divisible by 9.

5. $52x$
$52x$ is divisible by 2.
Hence, possible number of $x = 0, 2, 4, 6, 8$

6. $76x$
$76x$ is divisible by 3.
Therefore, sum of digits of $76x$
It is divisible by 3.
Hence, possible number of $x = 2, 5, 8$

7. $65y$
Sum of digits of $65y = 6 + 5 + y = 11 + y$
Therefore, possible number of $y = 7$
Hence, 657 is divisible by 9.

8. $18z$
Unit digit of $18z = 0$
Then, $18z$ is divisible by 10.
Therefore, z is 0.

Exercise 5C

1. (i)
$$\begin{array}{r} A\ 1 \\ +\ 1\ B \\ \hline B\ 0 \end{array}$$
First : We check unit column addition.
$1 + B$, we get a number whose unit digit is 0.
The digit $B = 9$
And digit $A = 7$

$$\begin{array}{r} \overset{1}{} \\ 7\ 1 \\ +\ 1\ 9 \\ \hline 9\ 0 \end{array}$$

Hence, required digit $A = 7, B = 9$.

(ii)
$$\begin{array}{r} 2\ A\ B \\ +\ A\ B\ 1 \\ \hline B\ 1\ 8 \end{array}$$

We check unit column addition $1 + B$.
We get a number whose unit digit is 8.
The digit $B = 7$
and digit $A = 4$

$$\begin{array}{r} \overset{1}{} \\ 2\ 4\ 7 \\ +\ 4\ 7\ 1 \\ \hline 7\ 1\ 8 \end{array}$$

Hence, required digit $A = 4, B = 7$.

(iii)
$$\begin{array}{r} 1\ 2\ A \\ +\ 6\ A\ B \\ \hline A\ 0\ 9 \end{array}$$

We check unit column addition $A + B$.
We get a number whose unit digit is 9.
The digit $A = 8$
And digit $B = 1$

$$\begin{array}{r} \overset{1}{} \\ 1\ 2\ 8 \\ +\ 6\ 8\ 1 \\ \hline 8\ 0\ 9 \end{array}$$

Hence, required digit $A = 8, B = 1$.

(iv)
$$\begin{array}{r} A\ 2\ 4\ 6 \\ -\ 5\ 2\ B\ 7 \\ \hline 1\ C\ 1\ D \end{array}$$

We check unit column subtraction $6 - 7$.
We get a number whose unit digit $D = 9$
The digit $A = 6$
$B = 2$
$C = 0$
$D = 9$

$$\begin{array}{r} 6\ 2\ 4\ 6 \\ -\ 5\ 2\ 2\ 7 \\ \hline 1\ 0\ 1\ 9 \end{array}$$

Hence, required digit $A = 6, B = 2, C = 0, D = 9$.

(v)
$$\begin{array}{r} 2\ A\ 6 \\ -\ C\ 2\ B \\ \hline 0\ 1\ 2 \end{array}$$

We check unit column subtraction $6 - B$.
We get a number whose unit digit is 2.
The digit $A = 3$
$B = 4$
$C = 2$

$$\begin{array}{r} 2\ 3\ 6 \\ -\ 2\ 2\ 4 \\ \hline 0\ 1\ 2 \end{array}$$

Hence, required number $A = 3, B = 4, C = 2$

(vi)
$$\begin{array}{r} 3\ A\ 9 \\ -\ B\ 2\ C \\ \hline 1\ 3\ 6 \end{array}$$

We check unit column subtraction $9 - C$.
We get a number whose unit digit is 6.
The digit $A = 5$
$B = 2$
$C = 3$

$$\begin{array}{r} 3\ 5\ 9 \\ -\ 2\ 2\ 3 \\ \hline 1\ 3\ 6 \end{array}$$

Hence, required number $A = 5, B = 2, C = 3$.

2. (i)
$$\begin{array}{r} 1\ A \\ \times\ A \\ \hline 9\ A \end{array}$$

We check unit column of multiplication $A \times A$.
We get a number whose unit digit A.
The digit $A = 6$

$$\begin{array}{r} 1\ 6 \\ \times\ 6 \\ \hline 9\ 6 \end{array}$$

Hence, required number $A = 6$.

(ii)
$$\begin{array}{r} A\ B \\ \times\ 6 \\ \hline B\ B\ B \end{array}$$

We check unit column of multiplication $B \times 6$.
We get a number whose unit digit B.

The digit $A = 7$

$B = 4$

$$\begin{array}{r} 7\ 4 \\ \times\ 6 \\ \hline 4\ 4\ 4 \\ \hline \end{array}$$

Hence, required number $A = 7, B = 4$.

(iii)
$$\begin{array}{r} A\ B \\ \times\ 3 \\ \hline C\ A\ B \\ \hline \end{array}$$

We check unit digit column of multiplication $B \times 3$.

We get a number whose unit digit B.

The digit $A = 5$

$B = 0$

$C = 1$

$$\begin{array}{r} 5\ 0 \\ \times\ 3 \\ \hline 1\ 5\ 0 \\ \hline \end{array}$$

Hence, required number $A = 5, B = 0, C = 1$.

(iv)
$$\begin{array}{r} B\ C\ A \\ \times\ 3 \\ \hline 1\ 3\ 9\ 5 \\ \hline \end{array}$$

We check unit digit column of multiplication $A \times 3$.

We get a number whose unit digit 5.

The digit $A = 5$

$B = 4$

$C = 6$

$$\begin{array}{r} 4\ 6\ 5 \\ \times\ 3 \\ \hline 1\ 3\ 9\ 5 \\ \hline \end{array}$$

Hence, required number $A = 5, B = 4, C = 6$.

(v)
$$\begin{array}{r} 1\ 2\ A \\ \times\ B\ 1\ 5 \\ \hline C\ 2\ 5 \\ D\ E\ F\ 0 \\ 2\ G\ 0\ 0\ 0 \\ \hline H\ 6\ 8\ I\ J \\ \hline \end{array}$$

We check unit column of multiplication $A \times 5$.

We get a number whose unit digit 5, 0, 0, J.

The digit $A = 5$
$B = 2$
$C = 6$
$D = 1$
$E = 2$
$F = 5$
$G = 5$
$H = 2$
$I = 7$
$J = 5$

$$\begin{array}{cccc} & 1 & 2 & 5 \\ \times & 2 & 1 & 5 \\ \hline & 6 & 2 & 5 \\ 1 & 2 & 5 & 0 \\ 2 & 5 & 0 & 0 \\ \hline 2 & 6 & 8 & 7 & 5 \end{array}$$

Hence, required number is $A = 5, B = 2, C = 6, D = 1$
$E = 2, F = 5, G = 5, H = 2, I = 7, J = 5$.

(vi)
$$\begin{array}{cccc} & B & A \\ \times & B & 3 \\ \hline 5 & 7 & A \end{array}$$

We check unit column of multiplication $A \times 3$.
We get a number A.

$A = 5,\ B = 2$

$$\begin{array}{cccc} & 2 & 5 \\ \times & 2 & 3 \\ \hline 5 & 7 & 5 \end{array}$$

3.

3

3 3

3 9 3

3 27 27 3

3 81 729 81 3

3 243 59049 59049 243 3

Blank is completed with numbers.

4. Do it yourself.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) 68
Generalised form of 68 $= 10 \times 6 + 8$

(ii) 35
Generalised form of $35 = 10 \times 3 + 5$

(iii) 968

Generalised form of $968 = 100 \times 9 + 10 \times 6 + 8$

(iv) 347

Generalised form of $347 = 100 \times 3 + 10 \times 4 + 7$

2. (i) $10 \times 7 + 8$

Usual form of $10 \times 7 + 8 = 10 \times 7 + 8 = 70 + 8 = 78$

(ii) $10 \times 9 + 5$

Usual form of $10 \times 9 + 5 = 10 \times 9 + 5 = 90 + 5 = 95$

(iii) $100 \times 5 + 10 \times 3 + 7$

Usual form of $100 \times 5 + 10 \times 3 + 7 = 500 + 30 + 7 = 537$

(iv) $100 \times 7 + 10 \times 9 + 2$

Usual form of $100 \times 7 + 10 \times 9 + 2 = 700 + 90 + 2 = 792$

3. Given : $a + b = 9$ …(i)

Let, two digit number $= 10a + b$

Reversing digit number $= 10b + a$

According to question,

$$10a + b - (10b + a) = 45$$
$$9a - 9b = 45$$
$$a - b = 5 \quad \ldots(ii)$$

Taking eqn. (i) and (ii),

$$a + b = 9$$
$$\underline{a - b = 5}$$
$$2a = 14$$
$$a = 7, b = 2$$

Hence, two digit number $= 10a + b = 10 \times 7 + 2 = 72$

4. (i) 89

Unit digit of 89 odd.

So, it is not divisible by 2.

(ii) 64

Unit digit of 64 even.

So, it is divisible by 2.

(iii) 128

Unit digit of 128 is even.

So, it is divisible by 2.

(iv) 862

Unit digit of 862 is even.

So, it is divisible by 2.

5. (i) 719

Sum of digits of $719 = 7 + 1 + 9 = 17$

So, it is not divisible by 3 or 9.

(ii) 635

Sum of digits of 635 = 6 + 3 + 5 = 14

So, it is not divisible by 3 or 9.

(iii) 519

Sum of digits of 519 = 5 + 1 + 9 = 15

So, it is divisible by 3 or 9.

(iv) 8901

Sum of digits of 8901 = 8 + 9 + 0 + 1 = 18

So, it is divisible by 3 and 9.

6. (i) 786

Unit digit of 786 = 6

So, it is not divisible by 5 and 10.

(ii) 915

Unit digit of 915 = 5

So, it is divisible by 5.

(iii) 420

Unit digit of 420 = 0

So, it is divisible by 5 and 10.

(iv) 6840

Unit digit of 6840 = 0

So, it is divisible by 5 and 10.

7. $314x$

Sum of digits of $314x = 3 + 1 + 4 + x = 8 + x$

The possible number of $x = 1$

Hence, 3141 is divisible by 9.

8. Given :

In a three digit number.

Unit digit, ten's digit and hundred's digit are ratio = 1 : 2 : 3

Let three digit number $= 100a + 10b + c$

Reversing digit number $= 100c + 10b + a$

Difference $= 100a + 10b + c - (100c + 10b + a)$

$594 = 99a - 99c$

$(a - c)\,(99) = 594$

$a - c = 6$ …(i)

Put in eqn. (i),

$3x - x = 6$

$2x = 6 \quad \Rightarrow \quad x = 3$

$\Rightarrow \quad 1 \times 3 \qquad 2 \times 3 \qquad 3 \times 3$

$3, \qquad 6, \qquad 9$

Therefore, three digit number = $100 \times 9 + 6 \times 10 + 3 = 963$

9. Let three digit number= $100a + 10b + c$

Now, obtain new numbers by changing the order of digits cyclically *i.e.*,$100b + 10c + a$ and $100c + 10a + b$

$$\text{Sum} = 100a + 10b + c + 100b + 10c + a + 100c + 10a + b$$

$$111a + 111b + 111c = 2664 \quad \ldots(\text{i})$$

Given : $c = a + 1$

$b = a - 1$

Put in eqn. (i), $111a + 111(a - 1) + 111(a + 1) = 2664$

$$333a = 2664$$

$$a = 8$$

$$c = 8 + 1 = 9$$

$$b = 8 - 1 = 7$$

Therefore, three digit number

$$= 100a + 10b + c$$

$$= 100 \times 8 + 10 \times 7 + 9$$

$$= 800 + 700 + 9 = 879$$

10. (i)

$$\begin{array}{r} A\ A \\ +\ A\ A \\ \hline B\ A\ 8 \end{array}$$

We check unit digit of column of addition.

We get a number whose unit digit is 8.

The digit $A = 9$

$B = 1$

$$\begin{array}{r} 9\ 9 \\ +\ 9\ 9 \\ \hline 1\ 9\ 8 \end{array}$$

Hence, required $A = 9, B = 1$

(ii)

$$\begin{array}{r} 1\ 8\ A \\ +\ B\ A\ 7 \\ \hline C\ B\ 2 \end{array}$$

We check unit digit of column of addition $A + 7$

We get a number whose unit digit is 2.

The digit $A = 5$

$B = 4$

$C = 6$

$$\begin{array}{r} 1\ 8\ 5 \\ +\ 4\ 5\ 7 \\ \hline 6\ 4\ 2 \end{array}$$

Hence, required number $A = 5, B = 4, C = 6$.

(iv)
$$\begin{array}{r} B\ 3\ 4\ 5 \\ +\ C\ 9\ B\ A \\ \hline 8\ B\ A\ 2 \end{array}$$

We check unit digit column of addition = $5 + A$

We get a number whose unit digit = 2

The digit $A = 7$

$B = 2$

$C = 5$

$$\begin{array}{r} 2\ 3\ 4\ 5 \\ +\ 5\ 9\ 2\ 7 \\ \hline 8\ 2\ 7\ 2 \end{array}$$

Hence, required number $A = 7, B = 2, C = 5$.

(v)
$$\begin{array}{r} A\ B \\ -\ B\ 6 \\ \hline 4\ 7 \end{array}$$

We check unit digit column of substraction = $B - 6$

We get a number whose unit digit = 7

The digit $A = 8$

$B = 3$

$$\begin{array}{r} 8\ 3 \\ -\ 3\ 6 \\ \hline 4\ 7 \end{array}$$

Hence, required number $A = 8, B = 3$.

(vi)
$$\begin{array}{r} 2\ A\ 3\ B\ 5 \\ -\ 5\ C\ 7\ D \\ \hline 1\ 6\ 6\ 6\ 6 \end{array}$$

We check unit digit column of substraction = $5 - D$

We get a number whose unit digit = 6.

The digit $A = 2$

$B = 4$

$C = 6$

$D = 9$

$$\begin{array}{r} 2\ 2\ 3\ 4\ 5 \\ -\ 5\ 6\ 7\ 9 \\ \hline 1\ 6\ 6\ 6\ 6 \end{array}$$

Hence, required number $A = 2, B = 4, C = 6, D = 9$.

(vii)
$$\begin{array}{r} A\ B \\ \times\ A\ B \\ \hline 6\ A\ B \end{array}$$

We check unit digit column of multiplication = $B \times B$

We get a number whose unit digit = 6.

The digit $A = 2$

$B = 5$

$$\begin{array}{r} 2\ 5 \\ \times\ 2\ 5 \\ \hline 6\ 2\ 5 \end{array}$$

Hence, required number $A = 2, B = 5$.

(viii)
$$\begin{array}{r} A\ A \\ \times\ 4\ A \\ \hline 9\ A\ 4 \end{array}$$

We check unit digit of column multiplication $A \times A$.
We get number whose unit digit is 4.
The digit $A = 2$.

$$\begin{array}{r} 2\ 2 \\ \times\ 4\ 2 \\ \hline 9\ 2\ 4 \end{array}$$

Hence, required number $A = 2$

(ix)
$$\begin{array}{r} B\ 9 \\ \times\ B \\ \hline A\ A\ 3 \end{array}$$

We check unit digit of column multiplication $9 \times B$.
We get number whose unit digit is 3.
The digit $A = 5$

$B = 7$

$$\begin{array}{r} 7\ 9 \\ \times\ 7 \\ \hline 5\ 5\ 3 \end{array}$$

Hence, required number $A = 5, B = 7$.

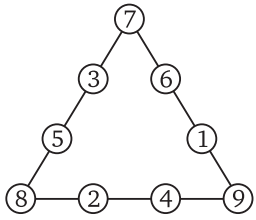
11. (i)
$$\begin{array}{r} \boxed{6}\ 6\ 3 \\ 7\ \boxed{9}\ 2 \\ +\ 5\ 8\ \boxed{7} \\ \hline \boxed{2}\ 0\ 4\ 2 \end{array}$$

(ii)
$$\begin{array}{r} \boxed{3}\ 2\ \boxed{4} \\ \times\ \boxed{5}\ 7 \\ \hline 2\ 2\ \boxed{6}\ 8 \\ \boxed{1}\ 6\ \boxed{2}\ 0 \\ \hline 1\ \boxed{8}\ 4\ 6\ \boxed{8} \end{array}$$

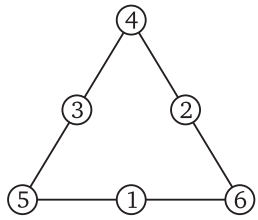
(iii)
$$\begin{array}{r} \boxed{1}\ 0\ \boxed{5}\ \boxed{0}\ 3 \\ -\ \boxed{9}\ 7\ 2\ \boxed{6} \\ \hline 7\ 7\ 7 \end{array}$$

(iv)
$$\begin{array}{r|l} & \boxed{2}\ \boxed{8} \\ \hline 28 & \boxed{7}\ \boxed{8}\ 4 \\ & \boxed{5}\ \boxed{6} \\ & \boxed{2}\ \boxed{2}\ 4 \\ \hline & \boxed{2}\ \boxed{2}\ 4 \end{array}$$

12.



13.



14. Do it yourself.

15. Do it yourself.

6. Algebraic Expressions and Their Factorization

Exercise 6A

1. (i) $5y^2 - 6y^4 + 8$

Degree of $5y^2 - 6y^4 + 8 = 4$

(ii) $9mn^2 + 5m^3n^2 + 81$

Degree of $9mn^2 + 5m^3n^2 + 81 = 3 + 2 = 5$

(iii) $\frac{-6}{17}x^2 + 5x^2y^3 - 19$

Degree of $\frac{-6}{17}x^2 + 5x^2y^3 - 19 = 2 + 3 = 5$

(iv) $8p^2 + 5m^2x^2p^3 - 6$

Degree of $8p^2 + 5m^2x^2p^3 - 6 = 2 + 2 + 3 = 7$

2. (i) $5x^2 + 7y - z$

This expression is trinomial.

(ii) $7y^2 + 8z^2$

This expression is binomial.

(iii) $\frac{-17x^3y^2}{5}$

This expression is monomial.

(iv) $4mn + 8m^2 - 6n^2 + 14$

This expression is polynomial.

3. (i) $5y^2x^2, -6xy, 8x^2y^2, 3xy$

$$\text{Addition} = 5y^2x^2 - 6xy + 8x^2y^2 + 3xy$$
$$= 13x^2y^2 - 3xy$$

(ii) $\frac{-17}{3}mn, 8m^2n, -6mn, 5nm^2$

$$\text{Addition} = \frac{-17}{3}mn + 8m^2n - 6mn + 5nm^2$$
$$= 13m^2n - \left[6mn + \frac{17}{3}mn\right]$$
$$= 13m^2n - \left[\frac{18mn + 17mn}{3}\right]$$
$$= 13m^2n - \frac{35mn}{3}$$

(iii) $3a^2b, -6a^2b^2, 8ba^2, 5b^2a^2$

$$\text{Addition} = 3a^2b - 6a^2b^2 + 8ba^2 + 5b^2a^2$$
$$= -a^2b^2 + 11ba^2 = 11ba^2 - a^2b^2$$

(iv) $\frac{-3}{17}xyz, \frac{4}{5}zyx, \frac{8}{3}y^2x^2, \frac{-7}{6}x^2y^2$

$$\text{Addition} = \frac{-3}{17}xyz + \frac{4}{5}zyx + \frac{8}{3}y^2x^2 - \frac{7}{6}x^2y^2$$
$$= \frac{8}{3}y^2x^2 - \frac{7}{6}x^2y^2 + \frac{4}{5}xyz - \frac{3}{17}xyz$$
$$= \frac{8 \times 2y^2x^2 - 7x^2y^2}{6} + \frac{4 \times 17xyz - 3 \times 5xyz}{5 \times 17}$$
$$= \frac{16x^2y^2 - 7x^2y^2}{6} + \frac{68xyz - 15xyz}{85}$$
$$= \frac{9x^2y^2}{6} + \frac{53xyz}{85}$$
$$= \frac{3x^2y^2}{2} + \frac{53}{85}xyz$$

4. (i) $(x + 8)(x - 2)$

$$\text{Product} = (x + 8)(x - 2)$$
$$= x^2 - 2x + 8x - 16$$
$$= x^2 + 6x - 16$$

(ii) $(z-3)(z-5)$

$$\text{Product} = (z-3)(z-5)$$
$$= z^2 - 3z - 5z + 15$$
$$= z^2 - 8z + 15$$

(iii) $(p-9)(p+2)$

$$\text{Product} = (p-9)(p+2)$$
$$= p^2 - 9p + 2p - 18$$
$$= p^2 - 7p - 18$$

(iv) $\left(x+\frac{4}{3}\right)\left(x+\frac{3}{4}\right)$

$$\text{Product} = \left(x+\frac{4}{3}\right)\left(x+\frac{3}{4}\right)$$
$$= x^2 + \frac{3}{4}x + \frac{4}{3}x + \frac{4}{3}\times\frac{3}{4}$$
$$= x^2 + \frac{9x+16x}{12} + 1$$
$$= x^2 + \frac{25x}{12} + 1$$

(v) $(y-9)(y-2)$

$$\text{Product} = (y-9)(y-2)$$
$$= y^2 - 9y - 2y + 18$$
$$= y^2 - 11y + 18$$

(vi) $(z^2+2)(z^2-3)$

$$\text{Product} = (z^2+2)(z^2-3)$$
$$= (z^4 + 2z^2 - 3z^2 - 6)$$
$$= z^4 - z^2 - 6$$

5. (i) 102×106

$$= (100+2)\times(100+6)$$
$$= (100+2)\times 100 + (100+2)\times 6$$
$$= (100\times 100 + 2\times 100) + (100\times 6 + 2\times 6)$$
$$= 10000 + 200 + 600 + 12$$
$$= 10812$$

(ii) 103×96

$$= (100+3)\times(100-4)$$
$$= (100+3)\times 100 - (100+3)\times 4$$
$$= (100\times 100 + 3\times 100) - (100\times 4 + 3\times 4)$$
$$= 10000 + 300 - 400 - 12 = 9{,}888$$

(iii) 95×97

$= (100 - 5) \times (100 - 3)$

$= (100 - 5) \times 100 - (100 - 5) \times 3$

$= (100 \times 100 - 5 \times 100) - (100 \times 3 - 5 \times 3)$

$= 10000 - 500 - 300 + 15$

$= 9215$

(iv) 53×55

$= (50 + 3) \times (50 + 5)$

$= (50 + 3) \times 50 + (50 + 3) \times 5$

$= 50 \times 50 + 3 \times 50 + (50 \times 5 + 3 \times 5)$

$= 2500 + 150 + 250 + 15 = 2915$

(v) 34×36

$= (30 + 4) \times (30 + 6)$

$= (30 + 4) \times 30 + (30 + 4) \times 6$

$= 30 \times 30 + 4 \times 30 + 30 \times 6 + 4 \times 6$

$= 900 + 120 + 180 + 24$

$= 1224$

(vi) 109×107

$= (100 + 9) \times (100 + 7)$

$= (100 + 9) \times 100 + (100 + 9) \times 7$

$= 100 \times 100 + 9 \times 100 + 100 \times 7 + 7 \times 9$

$= 10000 + 900 + 700 + 63$

$= 11663$

6. (i) $(x + 2y + 3z)^2$

We know that,

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

Similarly

$= x^2 + (2y)^2 + (3z)^2 + 2(x \times 2y + 2y \times 3z + 3z \times x)$

$= x^2 + 4y^2 + 9z^2 + 2(2xy + 6yz + 3xz)$

$= x^2 + 4y^2 + 9z^2 + 4xy + 12yz + 6xz$

(ii) $(x + y - 2z)^2$

$= x^2 + y^2 + (-2z)^2 + 2(x \times y - y \times 2z - 2z \times x)$

$= x^2 + y^2 + 4z^2 + 2(xy - 2yz - 2xz)$

$= x^2 + y^2 + 4z^2 + 2xy - 4yz - 4xz$

(iii) $(2p + 2q - 3r)^2$

$= [(2p)^2 + (2q)^2 + (-3r)^2 + 2(2p \times 2q - 2q \times 3r - 3r \times 2p)]$

$= 4p^2 + 4q^2 + 9r^2 + 2[4pq - 6qr - 6pr]$

$= 4p^2 + 4q^2 + 9r^2 + 8pq - 12qr - 12pr$

(iv) $(p - 3q - 2z)^2$

$= [p^2 + (-3q)^2 + (-2z)^2 + 2(p \times -3q + 3q \times 2z - 2z \times p)]$

$= [p^2 + 9q^2 + 4z^2 + 2(-3pq + 6qz - 2pz)]$

$= p^2 + 9q^2 + 4z^2 - 6pq + 12qz - 4pz$

(v) $(x - 5y + 2z)^2$

$= [x^2 + (-5y)^2 + (2z)^2 + 2(x \times -5y - 5y \times 2z + 2z \times x)]$

$= [x^2 + 25y^2 + 4z^2 + 2(-5xy - 10yz + 2xz)]$

$= x^2 + 25y^2 + 4z^2 - 10xy - 20yz + 4xz$

(vi) $(9x - 2y - 3z)^2$

$= [(9x)^2 + (-2y)^2 + (-3z)^2 + 2(9x \times -2y + 2y \times 3z - 9x \times 3z)]$

$= 81x^2 + 4y^2 + 9z^2 + 2[-18xy + 6yz - 27xz]$

$= 81x^2 + 4y^2 + 9z^2 - 36xy + 12yz - 54xz$

(vii) $(-3m - 5n + 2p)^2$

$= [(-3m)^2 + (-5n)^2 + (2p)^2 + 2(3m \times 5n - 5n \times 2p - 2p \times 3m)]$

$= [9m^2 + 25n^2 + 4p^2 + 2(15mn - 10np - 6mp)]$

$= 9m^2 + 25n^2 + 4p^2 + 30mn - 20np - 12mp$

(viii) $\left(3x - \frac{1}{2}p + 2q\right)^2$

$= (3x)^2 + \left(\frac{-1}{2}p\right)^2 + (2q)^2 + 2\left[3x \times \frac{-1}{2}p - \frac{1}{2}p \times 2q + 2q \times 3x\right]$

$= 9x^2 + \frac{1}{4}p^2 + 4q^2 + 2\left[\frac{-3xp}{2} - \frac{pq}{2} + 6xq\right]$

$= 9x^2 + \frac{1}{4}p^2 + 4q^2 - \frac{6xp}{2} - \frac{2pq}{2} + 12xq$

$= 9x^2 + \frac{1}{4}p^2 - 3xp - 2pq + 12xq + 4q^2$

$= 9x^2 + \frac{1}{4}p^2 + 4q^2 - 3xp - 2pq + 12xq$

(ix) $(5x^2 + y + z)^2$

$= [(5x^2)^2 + y^2 + z^2 + 2(5x^2 \times y + y \times z + z \times 5x^2)]$

$= 25x^4 + y^2 + z^2 + 2[5x^2y + yz + 5x^2z]$

$= 25x^4 + y^2 + z^2 + 10x^2y + 2yz + 10x^2z$

7. Do it yoyurself.

8. (i) $(x + y + z)^2 + (x + y - z)^2$

$= x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$+ x^2 + y^2 + z^2 + 2(xy - yz - zx)$

$= 2x^2 + 2y^2 + 2z^2 + 2xy + 2yz + 2zx + 2xy - 2yz - 2zx$

$= 2x^2 + 2y^2 + 2z^2 + 4xy$

(ii) $(2x + p - c)^2 - (2x - p + c)^2$

$= [4x^2 + p^2 + c^2 + 2(2x \times p - pc - 2x \times c)]$

$- [4x^2 + p^2 + c^2 + 2(-2x \times p - pc + 2xc)]$

$= [4x^2 + p^2 + c^2 + 4xp - 2pc - 4xc - 4x^2 - p^2 - c^2$

$+ 4xp + 2pc - 4xc]$

$= 8xp - 8xc$

Exercise 6B

1. (i) $(3x - 2y)^3$

$= (3x)^3 + (-2y)^3 + 3 \times 3x \times -2y\ (3x - 2y)$

$= 27x^3 - 8y^3 - 18xy\ (3x - 2y)$

$= 27x^3 - 8y^3 - 54x^2y + 36xy^2$

(ii) $(x + 3y)^3$

$= (x)^3 + (3y)^3 + 3 \times x \times 3y\ (x + 3y)$

$= x^3 + 27y^3 + 9xy\ (x + 3y)$

$= x^3 + 27y^3 + 9x^2y + 27xy^2$

(iii) $(px + 2z)^3$

$= (px)^3 + (2z)^3 + 3 \times px \times 2z\,(px + 2z)$

$= p^3x^3 + 8z^3 + 6pxz\,(px + 2z)$

$= p^3x^3 + 8z^3 + 6p^2x^2z + 12pxz^2$

(iv) $(x^2 + y)^3$

$= (x^2)^3 + (y)^3 + 3 \times x^2 \times y\,(x^2 + y)$

$= x^6 + y^3 + 3x^2y\,(x^2 + y)$

$= x^6 + y^3 + 3x^4y + 3x^2y^2$

(v) $(2x - y^2)^3$

$= (2x)^3 + (-y^2)^3 + 3 \times 2x \times -y^2\,(2x - y^2)$

$= 8x^3 - y^6 - 6xy^2\,(2x - y^2)$

$= 8x^3 - y^6 - 12x^2y^2 + 6xy^4$

(vi) $(7x + 9y)^3$

$= [(7x)^3 + (9y)^3 + 3 \times 7x + 9y\,(7x + 9y)]$

$= 343x^3 + 729y^3 + 189xy\,(7x + 9y)$

$= 343x^3 + 729y^3 + 1323x^2y + 1701xy^2$

(vii) $\left(\frac{2}{3}x - \frac{5}{3}z\right)^3$

$= \left[\left(\frac{2}{3}x\right)^3 + \left(\frac{-5}{3}z\right)^3 + 3 \times \frac{2}{3}x \times \frac{-5z}{3}\left(\frac{2}{3}x - \frac{5}{3}z\right)\right]$

$= \left[\frac{8}{27}x^3 - \frac{125}{27}z^3 - \frac{10xz}{3}\left(\frac{2}{3}x - \frac{5}{3}z\right)\right]$

$= \left[\frac{8}{27}x^3 - \frac{125}{27}z^3 - \frac{20x^2z}{9} + \frac{50xz^2}{9}\right]$

(viii) $(2z - 7y)^3$

$= [(2z)^3 + (-7y)^3 + 3 \times 2z \times -7y\,(2z - 7y)]$

$= [8z^3 - 343y^3 - 42yz\,(2z - 7y)]$

$= 8z^3 - 343y^3 - 84yz^2 + 294y^2z$

2. (i) $(3x + 2y) = 14$ and $xy = 8$

Cube on the both side :

$(3x + 2y)^3 = (14)^3$

$(3x)^3 + (2y)^3 + 3 \times 3x \times 2y\,(3x + 2y) = 2744$

$27x^3 + 8y^3 + 18xy\,(3x + 2y) = 2744$

Put above value :

$27x^3 + 8y^3 + 18 \times 8 \times 14 = 2744$

$27x^3 + 8y^3 + 2016 = 2744$

$27x^3 + 8y^3 = 2744 - 2016$

$27x^3 + 8y^3 = 728$

Hence, value of $27x^3 + 8y^3$ is 728.

(ii) $(3x + 2y) = 20$ and $xy = \frac{14}{9}$

Cube on the both side :

$$(3x + 2y)^3 = (20)^3$$

$$(3x)^3 + (2y)^3 + 3 \times 3x \times 2y\,(3x + 2y) = 8000$$

$$27x^3 + 8y^3 + 18xy\,(3x + 2y) = 8000$$

Put above value :

$$27x^3 + 8y^3 + 18 \times \frac{14}{9} \times 20 = 8000$$

$$27x^3 + 8y^3 + 560 = 8000$$

$$27x^3 + 8y^3 = 8000 - 560$$

$$27x^3 + 8y^3 = 7440$$

Value of $27x^3 + 8y^3$ is 7440.

3. (i) $p - q = -8$ and $pq = -12$

Cube on the both side :

$$(p - q)^3 = (-8)^3$$

$$p^3 - q^3 + 3 \times p \times -q(p - q) = -512$$

$$p^3 - q^3 - 3pq\,(p - q) = -512$$

Put above value :

$$p^3 - q^3 - 3 \times -12 \times -8 = -512$$

$$p^3 - q^3 = -512 + 288 = -224$$

(ii) $p - q = \frac{10}{9}$ and $pq = \frac{5}{3}$

Cube on the both side :

$$(p - q)^3 = \left(\frac{10}{9}\right)^3$$

$$p^3 - q^3 + 3 \times p \times -q(p - q) = \frac{1000}{729}$$

$$p^3 - q^3 - 3pq(p - q) = \frac{1000}{729}$$

Put above value :

$$p^3 - q^3 - 3 \times \frac{5}{3} \times \frac{10}{9} = \frac{1000}{729}$$

$$p^3 - q^3 = \frac{1000}{729} + \frac{50}{9}$$

$$p^3 - q^3 = \frac{1000 + 50 \times 81}{729}$$

$$p^3 - q^3 = \frac{1000 + 4050}{729}$$

$$p^3 - q^3 = \frac{5050}{729}$$

4. (i) $4x - 5z = 16$ and $xz = 12$

Cube on the both side :

$$(4x - 5z)^2 = (16)^3$$

$$(4x)^3 + (-5z)^3 + 3 \times 4x \times -5z\,(4x - 5z) = 4096$$

$$64x^3 - 125z^3 - 60xz\,(4x - 5z) = 4096$$

Put above value :

$$64x^3 - 125z^3 - 60 \times 12 \times 16 = 4096$$

$$64x^3 - 125z^3 = 4096 + 11520$$

$$64x^3 - 125z^3 = 15616$$

(ii) $4x - 5z = \frac{3}{5}$ and $xz = 6$

Cube on the both side :

$$(4x - 5z)^3 = \left(\frac{3}{5}\right)^3$$

$$(4x)^3 + (-5z)^3 + 3 \times 4x \times -5z\,(4x - 5z) = \frac{27}{125}$$

$$64x^3 - 125z^3 - 60xz\,(40x - 5z) = \frac{27}{125}$$

$$64x^3 - 125z^3 - 60 \times 6 \times \frac{3}{5} = \frac{27}{125}$$

$$64x^3 - 125z^3 = \frac{27}{125} + 216$$

$$64x^3 - 125z^3 = \frac{27 + 216 \times 125}{125}$$

$$= \frac{27 + 27000}{125}$$

$$64x^3 - 125z^3 = \frac{27027}{125}$$

5. (i) $(105)^3$

$= (100 + 5)^3$

$= (100)^3 + (5)^3 + 3 \times 100 \times 5\,(100 + 5)$

$= 1000000 + 125 + 1500(100 + 5)$

$= 1000000 + 125 + 150000 + 7500$

$= 1157625$

(ii) $(99)^3$

$= (100 - 1)^3$

$= (100)^3 + (-1)^3 + 3 \times 100 \times -1\,(100 - 1)$

$= 1000000 - 1 - 300(100 - 1)$

$= 1000000 - 1 - 30000 + 300$

$= 970299$

(iii) $(505)^3$

$= (500 + 5)^3$

$= (500)^3 + (5)^3 + 3 \times 500 \times 5\,(500 + 5)$

$= 125000000 + 125 + 7500(500 + 5)$

$= 125000000 + 125 + 3750000 + 37500$

$= 128787625$

(iv) $(1005)^3$

$= (1000 + 5)^3$

$= (1000)^3 + (5)^3 + 3 \times 1000 \times 5\,(1000 + 5)$

$= 1000000000 + 125 + 15000(1000 + 5)$

$= 1000000000 + 125 + 15000000 + 75000$

$= 1015075125$

(v) $(999)^3$

$= (1000 - 1)^3$

$= (1000)^3 + (-1)^3 + 3 \times 1000 \times -1\,(1000 - 1)$

$= (1000)^3 - 1 - 3000(1000 - 1)$

$= 1000000000 - 1 - 3000000 + 3000$

$= 997002999$

(vi) $(601)^3 = (600 + 1)^3$

$= (600)^3 + (1)^3 + 3 \times 600 \times 1\,(600 + 1)$

$= 216000000 + 1 + 1800\,(600 + 1)$

$= 216000000 + 1 + 1080000 + 1800$

$= 217081801$

(vii) $(599)^3 = (600 - 1)^3$

$= (600)^3 + (-1)^3 + 3 \times 600 \times -1\,(600 - 1)$

$= (600)^3 - 1 - 1800\,(600 - 1)$

$= 216000000 - 1 - 1080000 + 1800$

$= 214921799$

(viii) $(403)^3 = (400 + 3)^3$

$= (400)^3 + (3)^3 + 3 \times 400 \times 3\,(400 + 3)$

$= (400)^3 + 27 + 3600\,(400 + 3)$

$= 64000000 + 27 + 1440000 + 10800$

$= 65450827$

6. (i) $(2x + 3p)^3 + (2x - 3p)^3$

$= [(2x)^3 + (3p)^3 + 3 \times 2x \times 3p\,(2x + 3p)]$

$+ [(2x)^3 + (-3p)^3 + 3 \times 2x \times -3p\,(2x - 3p)]$

$= 8x^3 + 27p^3 + 18xp\,(2x + 3p) + 8x^3$

$- 27p^3 - 18xp\,(2x - 3p)$

$= 8x^3 + 27p^3 + 36x^2p + 54xp^2 + 8x^3 - 27p^3$

$- 36x^2p + 54xp^2$

$= 16x^3 + 108xp^2$

(ii) $(x + 2p)^3 - (x - 2p)^3$

$= x^3 + 8p^3 + 3 \times x \times 2p\,(x + 2p)$

$- [x^3 - 8p^3 + 3 \times x \times -2p\,(x - 2p)]$

$= x^3 + 8p^3 + 6xp\,(x + 2p) - [x^3 - 8p^3 - 6xp\,(x - 2p)]$

$= x^3 + 8p^3 + 6x^2p + 12xp^2 - [x^3 - 8p^3$

$- 6x^2p + 12xp^2]$

$= x^3 + 8p^3 + 6x^2p + 12xp^2 - x^3 + 8p^3 + 6x^2p - 12xp^2$

$= 16p^3 + 12x^2p$

(iii) $(2x - z)^3 + (2x + z)^3$

$= [(2x)^3 + (-z)^3 + 3 \times 2x \times -z\,(2x - z)] + [(2x)^3 + (z)^3$

$+ 3 \times 2x \times z\,(2x + z)]$

$= 8x^3 - z^3 - 6xz\,(2x - z) + 8x^3 + z^3 + 6xz\,(2x + z)$

$= 8x^3 - z^3 - 12x^2z + 6xz^2 + 8x^3 + z^3 + 12x^2z + 6xz^2$

$= 16x^3 + 12xz^2$

(iv) $(7t - 5n)^3 - (7t + 5n)^3$

$= (7t)^3 + (-5n)^3 + 3 \times 7t \times -5n\,(7t - 5n)$

$- [(7t)^3 + (5n)^3 + 3 \times 7t \times 5n\,(7t + 5n)]$

$= 343t^3 - 125n^3 - 105tn\,(7t - 5n)$

$- [343t^3 + 125n^3 + 105tn\,(7t + 5n)]$

$= 343t^3 - 125n^3 - 735t^2n + 525tn^2$

$-[343t^3 + 125n^3 + 735t^2n + 525tn^2]$

$= 343t^3 - 125n^3 - 735t^2n + 525tn^2 - 343t^3$

$-125n^3 - 735t^2n - 525tn^2$

$= -250n^3 - 1470t^2n$

(v) $\left(\frac{x}{3} + \frac{y}{5}\right)^3 - \left(\frac{x}{3} - \frac{y}{5}\right)^3$

$= \left[\left(\frac{x}{3}\right)^3 + \left(\frac{y}{5}\right)^3 + 3 \times \frac{x}{3} \times \frac{y}{5}\left(\frac{x}{3} + \frac{y}{5}\right)\right]$

$-\left[\left(\frac{x}{3}\right)^3 + \left(\frac{-y}{5}\right)^3 + 3 \times \frac{x}{3} \times \frac{-y}{5}\left(\frac{x}{3} - \frac{y}{5}\right)\right]$

$= \frac{x^3}{27} + \frac{y^3}{125} + \frac{xy}{5}\left(\frac{x}{3} + \frac{y}{5}\right) - \left[\frac{x^3}{27} - \frac{y^3}{125} - \frac{xy}{5}\left(\frac{x}{3} - \frac{y}{5}\right)\right]$

$= \frac{x^3}{27} + \frac{y^3}{125} + \frac{x^2y}{15} + \frac{xy^2}{25} - \left[\frac{x^3}{27} - \frac{y^3}{125} - \frac{x^2y}{15} + \frac{xy^2}{25}\right]$

$= \frac{x^3}{27} + \frac{y^3}{125} + \frac{x^2y}{15} + \frac{xy^2}{25} - \frac{x^3}{27} + \frac{y^3}{125} + \frac{x^2y}{15} - \frac{xy^2}{25}$

$= \frac{2y^3}{125} + \frac{2x^2y}{15}$

7. Do it yourself.

8. (i) $(1 - x)(1 + x + x^2)$

$= (1 + x + x^2 - x - x^2 - x^3)$

$= (1 - x^3)$

(ii) $(x + 2)(x^2 - 2x + 4)$

$= (x^3 - 2x^2 + 4x + 2x^2 - 4x + 8)$

$= (x^3 + 8)$

(iii) $(3x + 5)(9x^2 - 15x + 25)$

$= [27x^3 - 45x^2 + 75x + 45x^2 - 75x + 125)$

$= 27x^3 + 125$

(iv) $(7y - 5z)(49y^2 + 35yz + 25z^2)$

$= (343y^3 + 245y^2z + 175yz^2 - 245y^2z - 175yz^2$

$-125z^3)$

$= 343y^3 - 125z^3$

(v) $(0.9x + 0.7y)(0.81x^2 - 0.63xy + 0.49y^2)$

$= 0.729x^3 - 0.441xy^2 - 0.567x^2y + 0.441xy^2$

$\qquad + 0.567x^2y + 0.343y^3$

$= 0.729x^3 + 0.343y^3$

(vi) $\left(\frac{2x}{5} - \frac{3y}{7}\right)\left(\frac{4x^2}{25} + \frac{9y^2}{49} + \frac{6xy}{35}\right)$

$= \frac{8x^3}{125} + \frac{18xy^2}{245} + \frac{12x^2y}{175} - \frac{12yx^2}{175} - \frac{27y^3}{343} - \frac{18xy^2}{245}$

$= \frac{8x^3}{125} - \frac{27y^3}{343}$

9. Do it yourself.

Exercise 6C

1. (i) $25m^2 + 40m + 16$

$= (5m)^2 + 2 \times 5m \times 4 + (4)^2$

We know that :

$a^2 + b^2 + 2ab = (a + b)^2$

$= (5m + 4)^2 = (5m + 4)(5m + 4)$

(ii) $16x^2 + 25 + 40x = (4x)^2 + (5)^2 + 2 \times 5 \times 4x$

$= (4x + 5)^2 = (4x + 5)(4x + 5)$

(iii) $16x^2y^2 - 40xyz + 25z^2$

$= (4xy)^2 - 2 \times 4xy \times 5 + (5z)^2$

$= (4xy - 5z)^2$

$= (4xy - 5z)(4xy - 5z)$

(iv) $49x^4 - 168x^2y^2 + 144y^4$

$= (7x^2)^2 - 2 \times 7x^2 \times 12y^2 + (12y^2)^2$

$= (7x^2 - 12y^2)^2$

$= (7x^2 - 12y^2)(7x^2 - 12y^2)$

(v) $1 - 8xy + 16x^2y^2$

$= 1 - 2 \times 4xy \times 1 + (4xy)^2$

$= (1 - 4xy)^2$

$= (1 - 4xy)(1 - 4xy)$

(vi) $\frac{x^2}{4y^2} - \frac{1}{3} + \frac{y^2}{9x^2}$

$$= \left(\frac{x}{2y}\right)^2 - \frac{y}{3x} \times 2 \times \frac{x}{4y} + \left(\frac{y}{3x}\right)^2$$

$$= \left(\frac{x}{2y} - \frac{y}{3x}\right)^2 = \left(\frac{x}{2y} - \frac{y}{3x}\right)\left(\frac{x}{2y} - \frac{y}{3x}\right)$$

2. (i) $25x^2 - 16y^2 = (5x)^2 - (4y)^2$

We know that :

$$a^2 - b^2 = (a + b)(a - b)$$

$$= (5x - 4y)(5x + 4y)$$

(ii) $m^2 - \frac{n^2}{100} = (m)^2 - \left(\frac{n}{10}\right)^2$

$$= \left(m - \frac{n}{10}\right)\left(m + \frac{n}{10}\right)$$

(iii) $16m^5 - 144m^3 = 16m^3 (m^2 - 9)$

$$= 16m^3 (m^2 - 3^2)$$

$$= 16m^3 (m + 3)(m - 3)$$

(iv) $25a^2 - 30ab + 9b^2 - 121$

$$= (5a)^2 - 2 \times 5a \times 3b + (3b)^2 - (11)^2$$

$$= (5a - 3b)^2 - (11)^2$$

$$= (5a - 3b + 11)(5a - 3b - 11)$$

(v) $2x^4 - 32 = 2[(x^2)^2 - 4^2]$

$$= 2(x^2 + 4)(x^2 - 4)$$

$$= 2(x^2 + 4)(x^2 - 2^2)$$

$$= 2(x^2 + 4)(x + 2)(x - 2)$$

(vi) $(x + y)^2 - (x - y)^2$

$$= (x + y + x - y)(x + y - x + y)$$

$$= (2x)(2y) = 4xy$$

3. (i) $y^2 + 5y + 6 = y^2 + (2 + 3)y + 6$

$$= y^2 + 2y + 3y + 6$$

$$= y(y + 2) + 3(y + 2)$$

$$= (y + 3)(y + 2)$$

(ii) $x^2 + 7x + 12 = x^2 + (3 + 4)x + 12$

$$= x^2 + 3x + 4x + 12$$

$= x(x+3) + 4(x+3)$

$= (x+4)(x+3)$

(iii) $x^2 - 4x - 5 = x^2 - (5-1)x - 5$

$= x^2 - 5x + x - 5$

$= x(x-5) + 1(x-5)$

$= (x-5)(x+1)$

(iv) $x^2 - 2x - 24 = x^2 - (6-4)x + 24$

$= x^2 - 6x + 4x - 24$

$= x(x-6) + 4(x-6)$

$= (x-6)(x+4)$

(v) $m^2 - 21m + 68 = m^2 - (17+4)m + 68$

$= m^2 - 17m - 4m + 68$

$= m(m-17) - 4(m-17)$

$= (m-17)(m-4)$

(vi) $y^2 + 19y - 150 = y^2 + (25-6)y - 150$

$= y^2 + 25y - 6y - 150$

$= y(y+25) - 6(y+25)$

$= (y+25)(y-6)$

(vii) $y^2 - 10y + 16 = y^2 - (8+2)y + 16$

$= y^2 - 8y - 2y + 16$

$= y(y-8) - 2(y-8)$

$= (y-8)(y-2)$

(viii) $x^2 - 11x - 102 = x^2 - (17-6)x - 102$

$= x^2 - 17x + 6x - 102$

$= x(x-17) + 6(x-17)$

$= (x-17)(x+6)$

(ix) $48 + 22x - x^2 = 48 + (24-2)x - x^2$

$= 48 + 24x - 2x - x^2$

$= 24(2+x) - x(2+x)$

$= (x+2)(24-x)$

4. (i) $x^2 + 4y^2 + z^2 + 4xy - 2xz - 4yz$

$= (x)^2 + (2y)^2 + (-z)^2 + 2(x \times 2y - 2y \times z - zx)$

$= (x + 2y - z)^2$

$\because \quad a^2 + b^2 + c^2 + 2(ab + bc + ca) = (a+b+c)^2$

(ii) $4p^2 + 9q^2 + 4r^2 + 12pq + 12qr + 8pr$

$= (2p)^2 + (3q)^2 + (2r)^2 + 2(2p \times 3q + 3q \times 2r + 2r \times 2p)$

$= (2p + 3q + 2r)^2$

(iii) $4x^2 + y^2 + 9z^2 - 4xy + 6yz - 12zx$

$= (2x)^2 + (-y)^2 + (-3z)^2 + 2(2x \times -y - y \times -3z \times 3z - 2x)$

$= (2x - y - 3z)^2$

(iv) $2x^2 + 4y^2 + 3z^2 + 4\sqrt{2}xy - 4\sqrt{3}yz - 2\sqrt{6}xz$

$= (\sqrt{2}x)^2 + (2y)^2 + (-\sqrt{3}z)^2 + 2(2\sqrt{2}xy - 2\sqrt{3}yz - \sqrt{6}xz)$

$= (\sqrt{2}x + 2y - \sqrt{3}z)^2$

5. (i) $27x^3 - 8y^3 - 54x^2y + 36xy^2$

$= (3x)^3 + (-2y)^3 + 3 \times 3x \times -2y(3x - 2y)$

$= (3x - 2y)^3$ $[\because\ a^3 + b^3 + 3ab(a + b) = (a + b)^3]$

(ii) $x^3 + 64y^3 + 12x^2y + 48xy^2$

$= (x)^3 + (4y)^3 + 3 \times x \times 4y(x + 4y)$

$= (x + 4y)^3$

(iii) $8y^3 - 125z^3 - 60y^2z + 150yz^2$

$= (2y)^3 - (5z)^3 + 3 \times 2y \times -5z(2y - 5z)$

$= (2y - 5z)^3$

(iv) $x^3 + 125z^3 + 75xz^2 + 15x^2z$

$= (x)^3 + (5z)^3 + 3 \times x \times 5z(x + 5z)$

$= (x + 5z)^3$

6. (i) $p^3 + 27$

$= (p)^3 + (3)^3$ $[\because\ a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$

$= (p + 3)(p^2 - 3p + 3^2) = (p + 3)(p^2 - 3p + 9)$

(ii) $y^3 + 125 = (y)^3 + (5)^3$

$= (y + 5)(y^2 - 5y + 25)$

(iii) $1 - 27z^3 = (1)^3 + (-3z)^3$

$= (1 - 3z)(1 + 3z + 9z^2)$

(iv) $8x^3y^3 + 27z^3 = (2xy)^3 + (3z)^3$

$= (2xy + 3z)(4x^2y^2 - 6xyz + 9z^2)$

(v) $64x^3 - y^3 = (4x)^3 - (y)^3$

$= (4x - y)(16x^2 + 4xy + y^2)$

(vi) $m^3 - 27n^3 = (m)^3 + (-3n)^3$

$= (m - 3n)(m^2 + 3nm + 9n^2)$

(vii) $\frac{1}{216}p^3 - 8q^3 = \left(\frac{p}{6}\right)^3 - (2q)^3$

$= \left(\frac{p}{6} - 2q\right)\left(\frac{p^2}{36} + \frac{pq}{3} + 4q^2\right)$

7. (i) $10xy^4 - 10x^4y = 10xy(y^3 - x^3)$

$= 10xy(y - x)(y^2 + xy + x^2)$

(ii) $54x^6y + 2x^3y^4 = 2x^3y(27x^3 + y^3)$

$= 2x^3y[(3x)^3 + (y)^3]$

$= 2x^3y[(3x + y)(9x^2 - 3xy + y^2)]$

(iii) $(p - 2q)^3 - (8q)^3$

$= (p - 2q - 8q)[(p - 2q)^2 + (p - 2q)(8q) + (8q)^2]$

$= (p - 10q)(p^2 + 4q^2 - 4qp + 8pq - 16q^2 + 64q^2)$

$= (p - 10q)(p^2 + 52q^2 - 4qp + 8pq)$

$= (p - 10q)(p^2 + 52q^2 + 4pq)$

(iv) $27(x - 1)^3 + m^3$

$= [3(x - 1)^3 + m^3]$

$= [3(x - 1) + m][3(x - 1)^2 - 3m(x - 1) + m^2)]$

$= (3x - 3 + m)[9(x^2 + 1 - 2x) - 3mx + 3m + m^2]$

$= (3x - 3 + m)[9x^2 + 9 - 18x - 3mx + 3m + m^2]$

$= (3x - 3 + m)[9x^2 + m^2 - 18x - 3mx + 3m + 9]$

8. (i) $p^3 + 8q^3 + 64r^3 - 24pqr$

$= (p)^3 + (2q)^3 - 3 \times p \times 2q \times 4r + (4r)^3$

$= (p + 2q + 4r)(p^2 + (2q)^2 + (4r)^2 - 2pq - 8qr - 4pr$

$= (p + 2q + 4r)(p^2 + 4q^2 + 16r^2 - 2pq - 8qr - 4pr)$

(ii) $8x^3 - 27y^3 + z^3 + 18xyz$

$= (2x)^3 + (-3y)^3 + (z)^3 + 3 \times 2x \times z \times 3y$

$= (2x - 3y + z)[(2x)^2 + (-3y)^2 + z^2 + 6xy + 3yz - 2xz]$

$= (2x - 3y + z)(4x^2 + 9y^2 + z^2 + 6xy + 3yz - 2xz)$

(iii) $l^3 + m^3 - n^3 + 3lmn$

$= (l + m - n)(l^2 + m^2 + n^2 - lm + mn + \ln)$

(iv) $-27x^3 + y^3 - z^3 - 9xyz$

$= (-3x)^3 + (y)^3 + (-z)^3 - 3 \times 3x \times y \times z$

$= (-3x + y - z)(9x^2 + y^2 + z^2 + 3xy + yz - 3xz)$

(v) $x^3 - 8y^3 - 64z^3 - 24xyz$

$= (x)^3 + (-2y)^3 + (-4z)^3 - 3 \times x \times 2y \times 4$

$= (x - 2y - 4z)(x^2 + 4y^2 + 16z^2 + 2xy - 8yz + 4xz)$

(vi) $\frac{1}{27}x^3 - y^3 + 125z^3 + 5xyz$

$= \left(\frac{1}{3}x\right)^3 + (-y)^3 + (5z)^3 + 3 \times \frac{x}{3} \times y \times 5z$

$= \left(\frac{1}{3}x - y + 5z\right)\left(\frac{x^2}{9} + y^2 + 25z^2 + \frac{xy}{3} + 5yz - \frac{5}{3}xz\right)$

9. (i) $(3x - 5y)^3 + (5y - qz)^3 + (9z - 3x)^3$

If $a + b + c = 0$

then $a^3 + b^3 + c^3 = 3abc$

According to formula :

$3x - 5y + 5y - 9z + 9z - 3x = 0$

$(3x - 5y)^3 + (5y - 9z)^3 + (9z - 3x)^3$

$= 3(3x - 5y)(5y - 9z)(9z - 3x)$

(ii) $(p - 3q)^3 + (3q - 7r)^3 + (7r - p)^3$

Similarly,

$p - 3q + 3q - 7r + 7r - p = 0$

$(p - 3q)^3 + (3q - 7r)^3 + (7r - p)^3$

$= 3(p - 3q)(3q - 7r)(7r - p)$

(iii) $(5x - 6p)^3 + (7z - 5x)^3 + (6p - 7z)^3$

$5x - 6p + 7z - 5x + 6p - 7z = 0$

$(5x - 6p)^3 + (7z - 5x)^3 + (6p - 7z)^3$

$= 3(5x - 6p)(7z - 5x)(6p - 7z)$

(iv) $\left(\frac{1}{2}x - 3y\right)^3 + (3y - \sqrt{3}z)^3 + \left(\sqrt{3}z - \frac{1}{2}x\right)^3$

$\frac{1}{2}x - 3y + 3y - \sqrt{3}z + \sqrt{3}z - \frac{1}{2}x = 0$

$\left(\frac{1}{2}x - 3y\right)^3 + (3y - \sqrt{3}z)^3 + \left(\sqrt{3}z - \frac{1}{2}x\right)^3$

$= 3\left(\frac{1}{2}x - 3y\right)(3y - \sqrt{3}z)\left(\sqrt{3}z - \frac{1}{2}x\right)$

10. (i) $(55)^3 - (25)^3 - (30)^3$

If $a + b + c = 0$

then $a^3 + b^3 + c^3 = 3abc$

According to formula :

$55 - 25 - 30 = 0$

$(55)^3 - (25)^3 - (30)^3 = 3 \times 55 \times 25 \times 30 = 123750$

(ii) $(47)^3 + (29)^3 - (76)^3$

$47 + 29 - 76 = 0$

$(47)^3 + (29)^3 - (76)^3 = -3 \times 47 \times 29 \times 76$

$= -310764$

(iii) $(9.8)^3 - (11.3)^3 + (1.5)^3$

$\Rightarrow \quad 9.8 - 11.3 + 1.5 = 0$

$(9.8)^3 - (11.3)^3 + (1.5)^3 = -3 \times 9.8 \times 11.3 \times 1.5$

$= -498.33$

(iv) $(2.7)^3 - (1.6)^3 - (1.1)^3$

$2.7 - 1.6 - 1.1 = 0$

$(2.7)^3 - (1.6)^3 - (1.1)^3 = 3 \times 2.7 \times 1.6 \times 1.1 = 14.256$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $\frac{2}{5}x^4 - \sqrt{3}x^2 + 5x - 1$

This is polynomial and degree is 4.

(ii) $7x^3 - \frac{3}{x^2} + \sqrt{5}$

This is not a polynomial.

(iii) $4a^3b^2 - 3ab^4 + 5ab + \frac{2}{3}$

This is polynomial and degree is 5.

(iv) $2x^2y - \frac{3}{xy} + 5y^3 + \sqrt{3}$

This is not a polynomial.

2. (i) Addition $= ab - bc + bc - ca + ca - ab = 0$

(ii) Addition $= 5p^2q^2 + 4pq + 7 + 3 + 9pq - 2p^2q^2$

$= 3p^2q^2 + 13pq + 10$

(iii) Addition $= l^2 + m^2 + n^2 + lm + mn + mn + nl + nl + lm$

$= l^2 + m^2 + n^2 + 2(lm + nl + mn)$

(iv) Addition

$= 4x^3 - 7x^2 + 9 + 3x^2 - 5x + 4 + 7x^3 - 11x + 1 + 6x^2 - 13x$

$= 11x^3 + 2x^2 - 29x + 14$

3. (i) Subtraction $= (14a - 5ab + 7b - 5) - (8a + 3ab - 2b + 7)$

$= 14a - 5ab + 7b - 5 - 8a - 3ab + 2b - 7$

$= 6a - 8ab + 9b - 12$

(ii) Subtraction

$= (12xy - 3yz - 4zx + 5xyz) - (8xy + 4yz + 5zx)$

$= 12xy - 3yz - 4zx + 5xyz - 8xy - 4yz - 5zx$

$= 4xy - 7yz - 9zx + 5xyz$

(iii) Subtraction $= (18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q)$

$- (4p^2q - 3pq + 5pq^2 - 8p + 7q - 10)$

$= 18 - 3p - 11q + 5pq - 2pq^2 + 5p^2q - 4p^2q + 3pq - 5pq^2 + 8p - 7q + 10$

$= p^2q - 7pq^2 + 8pq + 5p - 18q + 28$

4. (i) $(3x - 5y + 7z) \times -3yxz$

$= -9x^2yz + 15xy^2z - 21xyz^2$

(ii) $(2p^2 - 3pq + 5q^2 + 5) \times -2pq$

$= -4p^3q + 6p^2q^2 - 10pq^3 - 10pq$

(iii) $\left(\frac{2}{3}a^2b - \frac{4}{5}ab^2 + \frac{2}{7}ab + 3\right) \times 35ab$

$= \frac{70}{3}a^3b^2 - 28a^2b^3 + 10a^2b^2 + 105ab$

(iv) $(4x^2 - 10xy + 7y^2 - 8x + 4y + 3) \times 3xy$

$= 12x^3y - 30x^2y^2 + 21xy^3 - 24x^2y + 12xy^2 + 9xy$

5. (i) $(x^2 + 3)(x - 3) + 9$

$= x^3 - 3x^2 + 3x - 9 + 9$

$= x^3 - 3x^2 + 3x$

(ii) $(x + 3)(x - 3)(x + 4)(x - 4)$

$= (x^2 - 9)(x^2 - 16)$

$= x^4 - 16x^2 - 9x^2 + 144$

$= x^4 - 25x^2 + 144$

(iii) $(x + 5)(x + 6)(x + 7)$

$= (x^2 + 5x + 6x + 30)(x + 7)$

$= (x^2 + 11x + 30)(x + 7)$

$= x^3 + 11x^2 + 30x + 7x^2 + 77x + 210$

$= x^3 + 18x^2 + 107x + 210$

(iv) $(p + q - 2r)(2p - q + r) - 4qr$

$= 2p^2 - pq + pr + 2pq - q^2 + qr - 4pr + 2qr - 2r^2 - 4qr$

$= 2p^2 - q^2 - 2r^2 + pq - qr - 3pr$

(v) $(p + q)(r + s) + (p - q)(r - s) - 2(pr + qs)$

$= pr + ps + qr + qs + pr - ps - qr + qs - 2pr - 2qs$

$= 0$

(vi) $(x + y + z)(x - y + z) + (x + y - z)(-x + y + z) - 4zx$

$= x^2 - xy + xz + xy - y^2 + yz + zx - zy + z^2 - x^2$

$+ xy + xz - xy + y^2 + yz + zx - zy - z^2 - 4zx$

$= 0$

6. (i) $(x + 7)(x + 3) = x^2 + 3x + 7x + 21$

$= x^2 + 10x + 21$

(ii) $(3x + 4)(3x - 5) = 9x^2 - 15x + 12x - 20$

$= 9x^2 - 3x - 20$

(iii) $(p^2 + 2q)(p^2 - 3q)$

$= p^4 - 3p^2q + 2p^2q - 6q^2$

$= p^4 - p^2q - 6q^2$

(iv) $(abc + 3)(abc - 5) = a^2b^2c^2 - 5abc + 3abc - 15$

$= a^2b^2c^2 - 2abc - 15$

7. (i) $203 \times 204 = (200 + 3)(200 + 4)$

$= 40000 + 800 + 600 + 12$

$= 41412$

(ii) $8.2 \times 8.7 = (10 - 1.8)(10 - 1.3)$

$= 100 - 18 - 13 + 2.34 = 71.34$

(iii) $107 \times 93 = (100 + 7)(100 - 7)$

$= (100)^2 - (7)^2 = 10000 - 49 = 9951$

8. (i) $(53)^2 - (47)^2 = (53 + 47)(53 - 47)$

$= 100 \times 6 = 600$

(ii) $(2.05)^2 - (0.95)^2 = (2.05 + 0.95)(2.05 - 0.95)$

$= (3)(1.1) = 3.3$

(iii) $(14.3)^2 - (5.7)^2 = (14.3 + 5.7)(14.3 - 5.7)$

$= (20)(8.6) = 172$

9. Given : $x^2 + \frac{1}{x^2} = 23$

We know that :

$$\left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2$$

$$= 23 + 2$$

$$\left(x + \frac{1}{x}\right)^2 = 25$$

$$\left(x + \frac{1}{x}\right) = \pm\sqrt{25}$$

$$\left(x + \frac{1}{x}\right) = \pm 5$$

10. Given : $a + b = 9, ab = 10$

$$(a + b)^2 = a^2 + b^2 + 2ab$$

$$a^2 + b^2 = (a + b)^2 - 2ab$$

$$= (9)^2 - 2 \times 10 = 81 - 20$$

$$a^2 + b^2 = 61$$

11. Given : $a - b = 6$ and $a^2 + b^2 = 42$

We know that :

$$(a - b)^2 = a^2 + b^2 - 2ab$$

$$ab = \frac{(a^2 + b^2) - (a - b)^2}{2}$$

$$= \frac{42 - (6)^2}{2} = \frac{42 - 36}{2}$$

$$ab = \frac{6}{2} = 3$$

12. Given : $a^2 + b^2 = 41$ and $ab = 4$

(i) $(a + b)^2 = a^2 + b^2 + 2ab$

$= 41 + 2 \times 4 = 41 + 8 = 49$

$(a + b) = \pm\sqrt{49}$

$(a + b) = \pm 7$

(ii) $(a - b)^2 = a^2 + b^2 - 2ab$

$= 41 - 2 \times 4 = 41 - 8$

$(a - b)^2 = 33$

$(a - b) = \pm\sqrt{33}$

13. (i) $x^2 + 3x + 2 = x^2 + (2 + 1)x + 2$

$= x^2 + 2x + x + 2$

$= x(x + 2) + 1(x + 2)$

$= (x + 1)(x + 2)$

(ii) $z^2 + 10z + 24 = z^2 + (6 + 4)z + 24$

$= z^2 + 6z + 4z + 24$

$= z(z + 6) + 4(z + 6)$

$= (z + 4)(z + 6)$

(iii) $y^2 - 7y + 12 = y^2 - (3 + 4)y + 12$

$= y^2 - 3y - 4y + 12$

$= y(y - 3) - 4(y - 3)$

$= (y - 4)(y - 3)$

(iv) $m^2 - 23m + 42 = m^2 - (21 + 2)m + 42$

$= m^2 - 21m - 2m + 42$

$= m(m - 21) - 2(m - 21)$

$= (m - 2)(m - 21)$

(v) $y^2 - 5y - 24 = y^2 - (8 - 3)y - 24$

$= y^2 - 8y + 3y - 24$

$= y(y - 8) + 3(y - 8)$

$= (y + 3)(y - 8)$

(vi) $t^2 + 23t - 108 = t^2 + (27 - 4)t - 108$

$= t^2 + 27t - 4t - 108$

$= t(t + 27) - 4(t + 27)$

$= (t - 4)(t + 27)$

(vii) $3x^2 + 14x + 8 = 3x^2 + (12 + 2)x + 8$

$= 3x^2 + 12x + 2x + 8$

$= 3x(x + 4) + 2(x + 4)$

$= (3x + 2)(x + 4)$

(viii) $3y^2 + 10y + 8 = 3y^2 + (6 + 4)y + 8$

$= 3y^2 + 6y + 4y + 8$

$= 3y(y + 2) + 4(y + 2)$

$= (3y + 4)(y + 2)$

14. (i) $x^2 - 3xy - 40y^2 = x^2 - (8 - 5)xy - 40y^2$

$= x^2 - 8xy + 5xy - 40y^2$

$= x(x - 8y) + 5y(x - 8y)$

$= (x + 5y)(x - 8y)$

15. (i) $(a+b)^2 - 11(a+b) - 42$

$= a^2 + b^2 + 2ab - 11a - 11b - 42$

$= a^2 + ab - 14a + ab + b^2 - 14b + 3a + 3b - 42$

$= a(a+b-14) + b(a+b-14) + 3(a+b-14)$

$= (a+b-14)(a+b+3)$

(ii) $8 + 6(p+q) - 5(p+q)^2$

$= 8 + 6p + 6q - 5(p^2 + q^2 + 2pq)$

$= 8 + 6p + 6q - 5p^2 - 5q^2 - 10pq$

$= 8 + 10p + 10q - 4p - 5p^2 - 5qp - 4q - 5qp - 5q^2$

$= 2(4 + 5p + 5q) - p(4 + 5p + 5q) - q(4 + 5p + 5q)$

$= (4p + 5q + 4)(2 - p - q)$

16. (i) $(x-2y)^2 - 6(x-2y) + 5$

$= x^2 + 4y^2 - 4xy - 6x + 12y + 5$

$= x^2 - 2xy - 5x - 2xy + 4y^2 + 10y - x + 2y + 5$

$= x(x-2y-5) - 2y(x-2y-5) - 1(x-2y-5)$

$= (x-2y-5)(x-2y-1)$

(ii) $7 + 10(2x-3y) - 8(2x-3y)^2$

$= 7 + 20x - 30y - 8(4x^2 + 9y^2 - 12xy)$

$= 7 + 20x - 30y - 32x^2 - 72y^2 + 96xy$

$= 7 + 28x - 42y - 8x - 32x^2 + 48xy + 12y + 48xy - 72y^2$

$= 7(1 + 4x - 6y) - 8x(1 + 4x - 6y) + 12y(1 + 4x - 6y)$

$= (1 + 4x - 6y)(7 - 8x + 12y)$

7. Division of Algebraic Expressions

Exercise 7

1. (i) $9x^2yz \div 3xy = \dfrac{9x^2yz \times 1}{3xy} = 3xz$

(ii) $25m^2n^3 \div 5m^2n^2 = \dfrac{25m^2n^3}{5m^2n^2} = 5n$

(iii) $x^2 - y^2 \div x + y = \dfrac{x^2 - y^2}{(x+y)} = \dfrac{(x+y)(x-y)}{(x+y)} = (x-y)$

2. (i) $\dfrac{20m^3y^2}{4m^2y} = 5my$

(ii) $\dfrac{x^2+4x+4}{x+2}=\dfrac{(x+2)(x+2)}{(x+2)}=(x+2)$

(iii) $\dfrac{16m^2-9n^2}{4m-3n}$

$=\dfrac{(4m)^2-(3n)^2}{(4m-3n)}=\dfrac{(4m+3n)(4m-3n)}{(4m-3n)}=(4m+3n)$

(iv) $\dfrac{125x^3+64}{25x^2-20x+16}$

$=\dfrac{(5x)^3+(4)^3}{25x^2-20x+16}=\dfrac{(5x+4)(25x^2-20x+16)}{(25x^2-20x+16)}$

$=(5x+4)$

(v) $\dfrac{9x^2-24xy+16y^2}{3x-4y}$

$=\dfrac{(3x)^2-2\times 3x\times 4y+(4y)^2}{3x-4y}$

$=\dfrac{(3x-4y)(3x-4y)}{(3x-4y)}=(3x-4y)$

(vi) $\dfrac{216z^3-343p^3}{6z-7p}$

$=\dfrac{(6z)^3-(7p)^3}{6z-7p}=\dfrac{(6z-7p)(36z^2+42zp+49p^2)}{(6z-7p)}$

$=(36z^2+42zp+49p^2)$

3. (i) $-39pq^2r^5\div -24p^3q^3r=\dfrac{-39pq^2r^5}{-24p^3q^3r}=\dfrac{13r^4}{8p^2q}$

(ii) $\dfrac{\frac{-3}{4}a^2b^3}{\frac{6}{7}a^3b^2}=\dfrac{-3}{4}\times\dfrac{7}{6}\dfrac{b}{a}=\dfrac{-7}{8}\dfrac{b}{a}$

(iii) $\dfrac{9x^4-8x^3-12x+3}{3x}=3x^3-\dfrac{8}{3}x^2-4+\dfrac{1}{x}$

(iv) $\dfrac{14p^2q^3-32p^3q^2+15pq^2-22p+18q}{-2p^2q}$

$=-7q^2+16pq-\dfrac{15}{2}\dfrac{q}{p}+\dfrac{11}{pq}-\dfrac{9}{p^2}$

4. (i) $\dfrac{6x^2 + 13x + 5}{(2x + 1)}$

$$
\begin{array}{r}
3x + 5 \\
2x + 1 \overline{)\,6x^2 + 13x + 5} \\
6x^2 + 3x \\
\hline
10x + 5 \\
10x + 5 \\
\hline
0
\end{array}
$$

Quotient $= 3x + 5$

Remainder $= 0$

(ii) $1 + y \overline{)\,1 + y^3}$

$$
\begin{array}{r}
y^2 - y + 1 \\
1 + y \overline{)\,1 + y^3} \\
y^2 + y^3 \\
\hline
1 - y^2 \\
-y - y^2 \\
\hline
1 + y \\
1 + y \\
\hline
0
\end{array}
$$

Quotient $= y^2 - y + 1$

Remainder $= 0$

(iii) $x + 1 \overline{)\,-2x^2 + x + 5}$

$$
\begin{array}{r}
-2x + 3 \\
x + 1 \overline{)\,-2x^2 + x + 5} \\
-2x^2 - 2x \\
\hline
3x + 5 \\
3x + 3 \\
\hline
2
\end{array}
$$

Quotient $= 3 - 2x$

Remainder $= 2$

(iv) $x^3 - 6x^2 + 12x - 8 \div x - 2$

$$
\begin{array}{r}
x^2 - 4x + 4 \\
x-2 \overline{)\, x^3 - 6x^2 + 12x - 8} \\
x^3 - 2x^2 \\
\hline
-4x^2 + 12x \\
-4x^2 + 8x \\
\hline
4x - 8 \\
4x - 8 \\
\hline
0
\end{array}
$$

Quotient $= x^2 - 4x + 4$

Remainder $= 0$

5. (i)

$$
\begin{array}{r}
2x^2 + 5x + 3 \\
3x-7 \overline{)\, 6x^3 + x^2 - 26x - 25} \\
6x^3 - 14x^2 \\
\hline
15x^2 - 26x \\
15x^2 - 35x \\
\hline
9x - 25 \\
9x - 21 \\
\hline
-4
\end{array}
$$

Quotient $= 2x^2 + 5x + 3$

Remainder $= -4$

(ii)

$$
\begin{array}{r}
m^2 - 5m - 5 \\
m-1 \overline{)\, m^3 - 6m^2 + 7} \\
m^3 - m^2 \\
\hline
-5m^2 + 7 \\
-5m^2 + 5m \\
\hline
\end{array}
$$

$$
\begin{array}{r}
-5m+7 \\
-5m+5 \\
\hline
+\quad - \\
\hline
2
\end{array}
$$

Quotient $= m^2 - 5m - 5$

Remainder $= 2$

(iii) $a^2 + a + 1 \overline{)\, a^3 + 2a^2 + 2a + 1}$ $\quad a + 1$

$$
\begin{array}{r}
a^3 + a^2 + a \\
\hline
-\quad -\quad - \\
\hline
a^2 + a + 1 \\
a^2 + a + 1 \\
\hline
+\quad -\quad - \\
\hline
0
\end{array}
$$

Quotient $= a + 1$

Remainder $= 0$

(iv) $3x^2 - 2x + 5 \overline{)\, 12x^3 - 17x^2 + 26x - 18}$ $\quad 4x - 3$

$$
\begin{array}{r}
12x^3 - 8x^2 + 20x \\
\hline
-\qquad +\qquad - \\
\hline
-9x^2 + 6x - 18 \\
-9x^2 + 6x - 15 \\
\hline
+\qquad -\qquad + \\
\hline
-3
\end{array}
$$

Quotient $= 4x - 3$

Remainder $= -3$

6. (i) $\dfrac{9m^5 + 12m^4 - 6m^2}{3m^2} = 3m^3 + 4m^2 - 2$

(ii) $\dfrac{x^2 + 7x + 12}{x + 3} = \dfrac{x^2 + 3x + 4x + 12}{x + 3}$

$= \dfrac{x(x + 3) + 4(x + 3)}{x + 3}$

$= \dfrac{(x + 3)(x + 4)}{(x + 3)}$

$= x + 4$

(iii) $$\frac{4y^2+3y+\frac{1}{2}}{2y+1}=\frac{4y^2+2y+y+\frac{1}{2}}{2y+1}$$

$$=\frac{2y(2y+1)+\frac{1}{2}(2y+1)}{(2y+1)}$$

$$=\frac{\left(2y+\frac{1}{2}\right)(2y+1)}{(2y+1)}=\left(2y+\frac{1}{2}\right)$$

(iv) $$\frac{4z^3+6z^2-z}{-1/2z}=-8z^2-12z+2$$

(v)
$$\begin{array}{r|l} & 3m^2-2m+9 \\ \hline m+2 & 3m^3+4m^2+5m+18 \\ & 3m^3+6m^2 \\ & - \quad - \\ \hline & -2m^2+5m \\ & -2m^2-4m \\ & + \quad + \\ \hline & 9m+18 \\ & 9m+18 \\ & - \quad - \\ \hline & 0 \end{array}$$

$$\frac{3m^3+4m^2+5m+18}{m+2}=3m^2-2m+9$$

(vi)
$$\begin{array}{r|l} & 3y^2+3y+2 \\ \hline y^2-2y & 3y^4-3y^3-4y^2-4y \\ & 3y^4-6y^3 \\ & - \quad + \\ \hline & 3y^3-4y^2 \\ & 3y^3-6y^2 \\ & - \quad + \\ \hline & 2y^2-4y \\ & 2y^2-4y \\ & - \quad + \\ \hline & 0 \end{array}$$

$$\frac{3y^4 - 3y^3 - 4y^2 - 4y}{y^2 - 2y} = 3y^2 + 3y + 2$$

7. (i)

$$\begin{array}{r} 2x + 3 \\ 7x - 4 \overline{)\, 14x^2 + 13x - 15} \\ 14x^2 - 8x \\ \hline 21x - 15 \\ 21x - 12 \\ \hline -3 \end{array}$$

Quotient $= 2x + 3$

Remainder $= -3$

(ii)

$$\begin{array}{r} 5z^2 + \frac{10z}{3} + 11 \\ 3z - 6 \overline{)\, 15z^3 - 20z^2 + 13z - 12} \\ 15z^3 - 30z^2 \\ \hline 10z^2 + 13z \\ 10z^2 - 20z \\ \hline 33z - 12 \\ 33z - 66 \\ \hline 54 \end{array}$$

Quotient $= 5z^2 + \frac{10z}{3} + 11$

Remainder $= 54$

(iii) $6y^5 - 28y^3 + 30y - 9 \div 2y^2 - 6$

$$\begin{array}{r} 3y^3 - 5y + \frac{3}{2} \\ 2y^2 - 6 \overline{)\, 6y^5 - 28y^3 + 3y^2 + 30y - 9} \\ 6y^5 - 18y^3 \\ \hline -10y^3 + 3y^2 \\ -10y^3 + 30y \\ \hline \end{array}$$

$$3y^2 - 30y$$
$$3y^2 - 9$$
$$- \quad +$$
$$-3y - 9$$

Quotient $= 3y^3 - 5y + \frac{3}{2}$

Remainder $= -3y - 9$

(iv) $34x - 22x^3 - 12x^4 - 10x^2 - 75 \div 3x + 7$

$$3x + 7 \overline{)-12x^4 - 22x^3 - 10x^2 + 34x - 75}$$

$$-4x^3 + 2x^2 - 8x + 30$$

$$-12x^4 - 28x^3$$
$$+ \quad +$$
$$6x^3 - 10x^2$$
$$6x^3 + 14x^2$$
$$- \quad -$$
$$-24x^2 + 34x$$
$$-24x^2 - 56x$$
$$+ \quad +$$
$$90x - 75$$
$$90x + 210$$
$$- \quad -$$
$$-285$$

Quotient $= -4x^3 + 2x^2 - 8x + 30$

Remainder $= -285$

8. Do it yourself.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $\frac{-84a^3}{14a^2} = -6a$ (ii) $\frac{24x^3y^3}{-8y^2} = -3x^3y$

(iii) $\frac{15a^4b}{-5a^3b} = -3a$

(iv) $\frac{-24x^4d^3}{-2x^2d^5} = \frac{12x^2}{d^2}$

(v) $\frac{63a^4b^5c^6}{-9a^2b^4c^3} = -7a^2bc^3$

(vi) $\frac{8x - 10y + 6c}{2} = 4x - 5y + 3c$

(vii) $\frac{-14x^6y^3 - 21x^4y^5 + 7x^5y^4}{7x^2y^2} = -2x^4y - 3x^2y^3 + x^3y^2$

(viii) $\frac{a^2 + 7a + 12}{a + 4}$

$= \frac{a^2 + (3 + 4)a + 12}{a + 4} = \frac{a^2 + 3a + 4a + 12}{a + 4}$

$= \frac{a(a + 3) + 4(a + 3)}{(a + 4)} = \frac{(a + 3)(a + 4)}{(a + 4)}$

$= (a + 3)$

(ix) $\frac{x^2 + 3x - 54}{x - 6}$

$= \frac{x^2 + (9 - 6)x - 54}{x - 6} = \frac{x^2 + 9x - 6x - 54}{x - 6}$

$= \frac{x(x + 9) - 6(x + 9)}{x - 6} = \frac{(x - 6)(x + 9)}{(x - 6)}$

$= (x + 9)$

(x) $\frac{12x^2 + 7xy - 12y^2}{3x + 4y}$

$= \frac{12x^2 + (16 - 9)xy - 12y^2}{3x + 4y}$

$= \frac{12x^2 + 16xy - 9xy - 12y^2}{3x + 4y}$

$= \frac{4x(3x + 4y) - 3y(3x + 4y)}{(3x + 4y)} = \frac{(4x - 3y)(3x + 4y)}{(3x + 4y)}$

$= (4x - 3y)$

(xi) $\frac{x^6 - 8}{x^2 - 2} = \frac{(x^2)^3 - (2)^3}{x^2 - 2}$

$= \frac{(x^2 - 2)(x^4 + 2x^2 + 4)}{(x^2 - 2)}$

$= x^4 + 2x^2 + 4$

(xii) $2x^2 - x - 6 \overline{)6x^3 - 13x^2 - 13x + 30}$ $\quad 3x - 5$

$6x^3 - 3x^2 - 18x$

$- \quad + \quad +$

$-10x^2 + 5x + 30$

$-10x^2 + 5x + 30$

$+ \quad - \quad -$

0

$$= \frac{6x^3 - 13x^2 - 13x + 30}{2x^2 - x - 6}$$

$$= (3x - 5)$$

2. $\dfrac{14x^2(3x^2 - 19x + 30)}{4x(3x - 10)}$

$$= \frac{14x^2[3x^2 - (9 + 10)x + 30]}{4x(3x - 10)}$$

$$= \frac{14x^2}{4x} \frac{[3x^2 - 9x - 10x + 30]}{(3x - 10)}$$

$$= \frac{7x}{2} \frac{[3x(x - 3) - 10(x - 3)]}{(3x - 10)}$$

$$= \frac{7x}{2} \frac{(3x - 10)(x - 3)}{(3x - 10)}$$

$$= \frac{7x(x - 3)}{2}$$

3. $\dfrac{(21m^2 - 10m^3 + m^4)}{(3 - m)}$

$$= \frac{m^2(21 - 10m + m^2)}{(3 - m)} = \frac{m^2(21 - 7m - 3m + m^2)}{(3 - m)}$$

$$= \frac{m^2[7(3 - m) - m(3 - m)]}{(3 - m)}$$

$$= \frac{m^2(7 - m)(3 - m)}{(3 - m)} = m^2(7 - m)$$

4. $\dfrac{48(2y^4 - 36y^2 + 162)}{4(y - 3)^2}$

$$= \frac{48 \times 2}{4}\left(\frac{y^4 - 18y + 81}{(y-3)^2}\right)$$

$$= \frac{24[(y^2)^2 - 2 \times 9 \times y + (9)^2]}{(y-3)^2}$$

$$= \frac{24(y^2-9)^2}{(y-3)^2} = \frac{24(y^2-9)(y^2-9)}{(y-3)^2}$$

$$= \frac{24(y+3)(y-3)(y+3)(y-3)}{(y-3)^2}$$

$$= 24(y+3)^2$$

5. $\dfrac{44(5x^2 - 20x - 8y + 2xy)}{(5x+2y)}$

$$= \frac{44[x(5x+2y) - 4(5x+2y)]}{(5x+2y)}$$

$$= \frac{44(x-4)(5x+2y)}{(5x+2y)} = 44(x-4)$$

6. $\dfrac{(x-2)^2 + 9(x-2)}{(x+7)}$

$$= \frac{(x-2)[(x-2)+9]}{(x+7)} = \frac{(x-2)(x+7)}{(x+7)}$$

$$= (x-2)$$

7. $\dfrac{(16c^2 - 4a^2 - 12ab - 9b^2)}{(2a+3b+4c)} = \dfrac{(4c-2a-3b)(4c+2a+3b)}{(2a+3b+4c)}$

$$= (4c - 2a - 3b)$$

8. (i)

$$\begin{array}{r|l} & a^2 - 6a + 14 \\ \hline a+1 & a^3 - 5a^2 + 8a + 15 \\ & a^3 + a^2 \\ & \text{– –} \\ & -6a^2 + 8a \\ & -6a^2 + 6a \\ & + \quad + \\ & 14a + 15 \\ & 14a + 14 \\ & \text{– –} \\ & 1 \end{array}$$

Quotient $= a^2 - 6a + 14$

Remainder $= 1$

(ii)
$$x-3\overline{)3x^4+6x^3-6x^2+2x-7}\quad\Big|\quad 3x^3+15x^2+39x+119$$

$3x^4 - 9x^3$

$- \quad +$

$15x^3 - 6x^2$

$15x^3 - 45x^2$

$- \quad +$

$39x^2 + 2x$

$39x^2 - 117x$

$- \quad +$

$119x - 7$

$119x - 357$

$- \quad +$

350

Quotient $= 3x^3 + 15x^2 + 39x + 119$

Remainder $= 350$

(iii) $\dfrac{6x^2 + x - 15}{3x + 5}$

$$3x+5\overline{)6x^2+x-15}\quad\Big|\quad 2x-3$$

$6x^2 + 10x$

$- \quad -$

$-9x - 15$

$-9x - 15$

$+ \quad +$

0

Quotient $= 2x - 3$

Remainder $= 0$

9. Area of rectangle $= x^3 - 8x^2 + 7$

One side $= x - 1$

Length of adjacent side $= \dfrac{x^3 - 8x^2 + 7}{x - 1}$

$$
\begin{array}{r}
x^2 - 7x - 7 \\
x - 1 \overline{)\, x^3 - 8x^2 + 7} \\
x^3 - x^2 \\
\hline
-7x^2 + 7 \\
-7x^2 + 7x \\
\hline
-7x + 7 \\
-7x + 7 \\
\hline
0
\end{array}
$$

Therefore, length of adjacent side $= x^2 - 7x - 7$

10. Product of two number $= 16x^4 - 1$

One number $= 2x - 1$

Let other number $= A$

$A \times (2x - 1) = 16x^4 - 1$

$$A = \frac{(2x)^4 - 1}{(2x - 1)}$$

$$
\begin{array}{r}
8x^3 + 4x^2 + 2x + 1 \\
2x - 1 \overline{)\, 16x^4 - 1} \\
16x^4 - 8x^3 \\
\hline
8x^3 - 1 \\
8x^3 - 4x^2 \\
\hline
4x^2 - 1 \\
4x^2 - 2x \\
\hline
2x - 1 \\
2x - 1 \\
\hline
0
\end{array}
$$

Therefore, other number $= 8x^3 + 4x^2 + 2x + 1$

11. $$\frac{x^6 - y^6}{(x-y)(x^2+xy+y^2)} = \frac{(x^3)^2 - (y^3)^2}{(x-y)(x^2+xy+y^2)}$$

$$= \frac{(x^3 - y^3)(x^3 + y^3)}{(x-y)(x^2+xy+y^2)}$$

$$= \frac{(x^3 + y^3)(x-y)(x^2+xy+y^2)}{(x-y)(x^2+xy+y^2)}$$

$$= (x^3 + y^3)$$

8. Linear Equations in One Variable

Exercise 8A

1. (i) $3x + 4 = 16$

$3x = 16 - 4 = 12$

$3x = 12$

$x = 4$

(ii) $\frac{x}{5} + 3 = 7$

$\frac{x}{5} = 7 - 3$

$\frac{x}{5} = 4 \Rightarrow x = 4 \times 5$

$x = 20$

(iii) $\frac{5x}{4} + \frac{2}{3} = \frac{1}{5}$

$\frac{5x}{4} = \frac{1}{5} - \frac{2}{3}$

$\frac{5x}{4} = \frac{3 \times 1 - 2 \times 5}{15}$

$\frac{5x}{4} = \frac{-7}{15}$

$x = \frac{-7 \times 4}{15 \times 5}$

$x = \frac{-28}{75}$

(iv) $3y + 5 = 6y - 10$

$5 + 10 = 6y - 3y$

$3y = 15$

$y = 5$

(v) $5(m-7)=10$

$5m-35=10$

$5m=10+35$

$5m=45$

$m=9$

(vi) $\frac{y}{4}-\frac{1}{3}=\frac{y}{5}+\frac{2}{7}$

$\frac{y}{4}-\frac{y}{5}=\frac{2}{7}+\frac{1}{3}$

$\frac{5y-4y}{20}=\frac{2\times 3+1\times 7}{21}$

$\frac{y}{20}=\frac{6+7}{21}$

$\frac{y}{20}=\frac{13}{21}$

$y=\frac{13\times 20}{21}$

$y=\frac{260}{21}$

2. (i) $\frac{2y+6}{y+4}=1$

$2y+6=(y+4)\times 1$

$2y+6=y+4$

$2y-y=4-6$

$y=-2$

(ii) $\frac{3x+5}{2x+7}=4$

$(3x+5)=4(2x+7)$

$3x+5=8x+28$

$-28+5=8x-3x$

$5x=-23$

$x=\frac{-23}{5}$

(iii) $\frac{2x+1}{3x-2}=\frac{5}{9}$

$(2x+1)9=5(3x-2)$

$18x+9=15x-10$

$18x-15x=-10-9$

$3x=-19$

$$x = \frac{-19}{3}$$

(iv) $$\frac{5z-3}{2z} = \frac{8}{9}$$

$$(5z-3)9 = 8(2z)$$
$$45z - 27 = 16z$$
$$45z - 16z = 27$$
$$29z = 27$$
$$z = \frac{27}{29}$$

(v) $$\frac{1-9y}{19-3y} = \frac{5}{8}$$

$$8(1-9y) = 5(19-3y)$$
$$8 - 72y = 95 - 15y$$
$$8 - 95 = -15y + 72y$$
$$-87 = 57y$$
$$y = \frac{-29}{19}$$

3. (i) $$\frac{5y-3}{2y+1} = \frac{2}{5}$$

$$5(5y-3) = 2(2y+1)$$
$$25y - 15 = 4y + 2$$
$$25y - 4y = 15 + 2$$
$$21y = 17$$
$$y = \frac{17}{21}$$

(ii) $$\frac{0.4z-3}{1.5z+9} = \frac{-7}{5}$$

$$5(0.4z-3) = -7(1.5z+9)$$
$$2z - 15 = -10.5z - 63$$
$$2z + 10.5z = -63 + 15$$
$$2 \times 12.5z = -48 \times 2$$
$$25z = -96$$
$$z = \frac{-96}{25}$$

(iii) $$\frac{3y+5}{3-2y} = \frac{5}{3}$$

$$3(3y+5) = 5(3-2y)$$
$$9y + 15 = 15 - 10y$$
$$9y + 10y = 15 - 15$$

$$19y = 0$$
$$y = 0$$

(iv) $$\frac{2x}{3x+1} = -3$$

$$2x = -3(3x+1)$$
$$2x = -9x - 3$$
$$2x + 9x = -3$$
$$11x = -3$$
$$x = \frac{-3}{11}$$

(v) $$\frac{17(2-x) - 5(x+12)}{1-7x} = 8$$

$$17(2-x) - 5(x+12) = 8(1-7x)$$
$$34 - 17x - 5x - 60 = 8 - 56x$$
$$34 - 22x + 56x = 8 + 60$$
$$34x = 68 - 34$$
$$34x = 34$$
$$x = 1$$

(vi) $$\frac{y-(7-8y)}{9y-(3+4y)} = \frac{2}{3}$$

$$3[y-(7-8y)] = 2[9y-(3+4y)]$$
$$3(y-7+8y) = 2(9y-3-4y)$$
$$3(9y-7) = 2(5y-3)$$
$$27y - 21 = 10y - 6$$
$$27y - 10y = 21 - 6$$
$$17y = 15$$
$$y = \frac{15}{17}$$

4. (i) $$\frac{5y-7}{3y} = 2$$

$$(5y-7) = 3y \times 2$$
$$5y - 7 = 6y$$
$$6y - 5y = -7$$
$$y = -7$$

(ii) $$\frac{2x-4}{3x+2} = \frac{-2}{3}$$

$$3(2x-4) = -2(3x+2)$$
$$6x - 12 = -6x - 4$$
$$6x + 6x = -4 + 12$$
$$12x = 8$$

$$x = \frac{2}{3}$$

(iii) $$\frac{0.4x - 3}{1.5x + 9} = \frac{7}{5}$$

$$5(0.4x - 3) = 7(1.5x + 9)$$
$$2x - 15 = 10.5x + 63$$
$$-15 - 63 = 10.5x - 2x$$
$$2 \times 8.5x = -78 \times 2$$
$$17x = -156$$
$$x = \frac{-156}{17}$$

(iv) $$\frac{m - 3}{m + 4} = \frac{m + 1}{m - 2}$$

$$(m - 3)(m - 2) = (m + 1)(m + 4)$$
$$m^2 - 3m - 2m + 6 = m^2 + m + 4m + 4$$
$$m^2 - 5m + 6 = m^2 + 5m + 4$$
$$6 - 4 = 5m + 5m$$
$$10m = 2$$
$$m = \frac{1}{5}$$

(v) $$\frac{x^2 - 9}{x^2 + 5} = \frac{-5}{9}$$

$$(x^2 - 9) \times 9 = -5 \times (x^2 + 5)$$
$$9x^2 - 81 = -5x^2 - 25$$
$$9x^2 + 5x^2 = 81 - 25$$
$$14x^2 = 56$$
$$2x^2 = 8$$
$$x^2 = 4 \quad \Rightarrow \quad x = \sqrt{4}$$
$$x = 2$$

(vi) $$\frac{x + 3}{7} - \frac{2x - 5}{3} = \frac{4x - 2}{5} - 4$$

$$\frac{3(x + 3) - 7(2x - 5)}{21} = \frac{4x - 2}{5} - 4$$

$$\frac{3x + 9 - 14x + 35}{21} = \frac{4x - 2}{5} - 4$$

$$\frac{-11x + 44}{21} = \frac{4x - 2}{5} - 4$$

$$5(-11x + 44) = 21[(4x - 2) - 20]$$

$$-55x + 220 = 84x - 42 - 420$$
$$84x + 55x = 220 + 42 + 420$$
$$139x = 262 + 420$$
$$139x = 682$$
$$x = \frac{682}{139}$$

5. (i) $4x + 5 = 13$

$$4x = 13 - 5$$
$$4x = 8$$
$$x = 2$$

(ii) $5z - 3 = 2z + 4$

$$5z - 2z = 4 + 3$$
$$3z = 7$$
$$z = \frac{7}{3}$$

(iii) $7x + 11 = \frac{3}{4} + 2x$

$$7x - 2x = \frac{3}{4} - 11$$
$$5x = \frac{3 - 11 \times 4}{4}$$
$$5x = \frac{3 - 44}{4}$$
$$5x = \frac{-41}{4}$$
$$x = \frac{-41}{20}$$

(iv) $\frac{4y}{9} = \frac{3y + z}{4}$

$$4y \times 4 = 9(3y + 2)$$
$$16y = 27y + 18$$
$$27y - 16y = -18$$
$$11y = -18$$
$$y = \frac{-18}{11}$$

(v) $5(x + 2) = 2(x - 1)$

$$5x + 10 = 2x - 2$$
$$5x - 2x = -10 - 2$$
$$3x = -12$$
$$x = -4$$

(vi) $$\frac{4x}{5}-\frac{2x}{15}=\frac{3}{10}$$

$$\frac{1}{5}\left[4x-\frac{2x}{3}\right]=\frac{3}{10}$$

$$\frac{4x\times 3-2x}{3}=\frac{3\times 5}{10}$$

$$\frac{12x-2x}{3}=\frac{3}{2}$$

$$\frac{10x}{3}=\frac{3}{2}$$

$$x=\frac{9}{20}$$

Exercise 8B

1. Let three consecutive multiple of 5 be x, $x+5$ and $x+10$.
According to given condition.

$$x+x+5+x+10=180$$
$$3x=180-15$$
$$3x=165$$
$$x=55$$

Three number is 55, 60, 65.

2. Let three even consecutive number x, $x+2$ and $x+4$.
According to given condition

$$x+x+2+x+4=246$$
$$3x=246-6$$
$$3x=240$$
$$x=80$$

Three number is 80, 82, 84.

3. Let Unit place $=y$
Tens place $=x$
According to condition,

$$x-y=3 \quad \ldots(i)$$

Two digit number $=10x+y$
Reverse number $=10y+x$

$$10x+y-10y-x=27 \quad \ldots(ii)$$

Taking equations (i) and (ii)

$$x=7$$
$$y=4$$

The number is 74.

4. Let unit place be x.

$$\begin{aligned}\text{Tens place} &= 7 - x\\ \text{Original number} &= 10 \times (7 - x) + x = 70 - 10x + x\\ &= 70 - 9x\\ \text{Reversing order number} &= 10x + (7 - x)\\ &= 10x + 7 - x = 9x + 7\end{aligned}$$

According to Question :

$$\begin{aligned}9x + 7 - (70 - 9x) &= 9\\ 9x + 7 - 70 + 9x &= 9\\ 18x &= 72\\ x &= 4\\ \text{Tens place} &= 7 - 4 = 4\\ \text{Number} &= 10 \times 3 + 4\\ &= 30 + 4 = 34\end{aligned}$$

5. Let the speed of first train = x km/hr

Then the speed of other train = $x + 5$

$\longleftarrow$ 340 K $\longrightarrow$ km

$\longleftarrow$ $2x + 30 \longrightarrow 2(x + 5)$ $\longrightarrow$

According to given,

$$\begin{aligned}2x + 30 + 2(x + 5) &= 340\\ 2x + 30 + 2x + 10 &= 340\\ 4x &= 340 - 40\\ 4x &= 300\\ x &= 75\,\text{km/h}\\ \text{One train of speed} &= 75 + 5 = 80\,\text{km/h}\\ \text{Other train of speed} &= 75\,\text{km/h}\end{aligned}$$

6. Given condition :

$$\frac{3(x-3)}{x+20} = \frac{1}{8}$$

$$\begin{aligned}24(x-3) &= 1(x+20)\\ 24x - 72 &= x + 20\\ 24x - x &= 72 + 20\\ 23x &= 92\\ x &= 4\\ \text{Number} &= \frac{x-3}{x} = \frac{4-3}{4} = \frac{1}{4}\end{aligned}$$

7. Given :

$$\text{Width of rectangular} = \frac{2}{3}\text{ length or rectangular}$$

Let length of rectangular = x

$$\text{Width} = \frac{2}{3}x$$

Perimeter of rectangular $= 2(l + b)$

$$220 = 2\left(x + \frac{2}{3}x\right)$$

$$220 = 2\left(\frac{3x + 2x}{3}\right)$$

$$220 = \frac{2 \times 5x}{3}$$

$$220 = \frac{10x}{3}$$

$$x = 66 \text{ m}$$

$$\text{Length} = 66 \text{ m}$$

$$\text{Width} = \frac{2}{3} \times 66 = 2 \times 22$$

$$\text{Width} = 44 \text{ m}$$

8. Given :

Ratio of ages of Aman and Virat $= \frac{5}{7}$

$$\frac{5x + 4}{7x + 4} = \frac{3}{4}$$

$$4(5x + 4) = 3(7x + 4)$$

$$20x + 16 = 21x + 12$$

$$21x - 20x = 16 - 12$$

$$x = 4$$

Present age $\Rightarrow 5x, 7x = 20, 28$

9. Given :

$$\text{Juhi} = 4 \times \text{daughter}$$

Let daughter age $= x$

$$(4x + 5) = 3(x + 5)$$

$$4x + 5 = 3x + 15$$

$$4x - 3x = 15 - 5$$

$$x = 10$$

$$\text{Present age} = 4x,\ x = 4 \times 10,\ 10 = 40, 10$$

10. Let ₹ 5 of coins $= x$

₹ 2 of coins $= 3x$

₹ 1 of coins $= 160 - x - 3x = 160 - 4x$

According to condition :

$$1 \times (160 - 4x) + 2 \times (3x) + 5 \times x = 300$$

$$160 - 4x + 6x + 5x = 300$$

$$160 + 7x = 300$$
$$7x = 300 - 160$$
$$7x = 140$$
$$x = 20$$

Therefore,

₹ 5 of coins $= 20$

₹ 2 of coins $= 3 \times 20 = 60$

₹ 1 of coins $= 160 - 4 \times 20 = 80$

11. Given : $\frac{x}{x+8} =$ Rational number

$$\frac{x+17}{x+8-1} = \frac{3}{2}$$
$$\frac{x+17}{x+7} = \frac{3}{2}$$
$$2x + 34 = 3x + 21$$
$$3x - 2x = 34 - 21$$
$$x = 13$$

Therefore, Rational Number $= \frac{13}{13+8} = \frac{13}{21}$

12. The rational number $= \frac{x-4}{x}$

Given condition :

$$\frac{x-4+2}{x+2} = \frac{5}{9}$$
$$\frac{x-2}{x+2} = \frac{5}{9}$$
$$9(x-2) = 5(x+2)$$
$$9x - 18 = 5x + 10$$
$$9x - 5x = 10 + 18$$
$$4x = 28$$
$$x = 7$$

Therefore, rational number $= \frac{7-4}{7} = \frac{3}{7}$

13. Let Parul's grandfather age $= x$

Parul's father age $= x - 26$

Parul's age $= x - 26 - 29$

Sum of age $= 135$

$$x + x - 26 + x - 26 - 29 = 135$$
$$3x = 135 + 26 + 26 + 29$$

$$3x = 216$$

Present ages : $x = 72$

Grandfather $= 72$

Father $= 72 - 26 = 46$

Parul $= 72 - 26 - 29 = 17$

14. Given :

₹ 5 of coins $= x$

₹ 2 of coins $= 3x$

According to condition :

$$2 \times 3x + 5 \times x = 154$$

$$6x + 5x = 154$$

$$11x = 154$$

$$x = 14$$

₹ 5 of coins $= 14$

₹ 2 of coins $= 3 \times 14 = 42$

15. Let speed of boat $= x$ km/h

We know that $\left(\frac{\text{distance}}{\text{time}} = \text{speed}\right)$

(i) In down stream :

$$\frac{d}{5} = x + \frac{3}{2}$$

$$\frac{d}{5} = \left(\frac{2x+3}{2}\right)$$

$$d = \frac{5}{2}(2x+3) \quad \ldots(i)$$

(ii) In upstream :

$$\frac{d}{\frac{11}{2}} = x - \frac{3}{2}$$

$$d = \frac{11}{4}(2x-3) \quad \ldots(ii)$$

Taking eqn. (i) and (ii),

$$\frac{5}{2}(2x+3) = \frac{11}{4}(2x-3)$$

$$22x - 20x = 30 + 33$$

$$x = \frac{63}{2} = 31.5 \text{ km/h}$$

16. Let speed of stream $= x$ km/h

(i) Speed of boat $= 8$ km/h

In down stream :

We know that

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

According to condition :

$$8 + x = \frac{d}{6}$$

$$d = 6(x + 8) \quad \ldots(\text{i})$$

(ii) In up stream :

$$s = \frac{d}{t}$$

$$8 - x = \frac{d}{9}$$

$$d = 9(8 - x) \quad \ldots(\text{ii})$$

Taking eqn. (i) and (ii),

$$6(x + 8) = 9(8 - x)$$

$$6x + 48 = 72 - 9x$$

$$15x = 72 - 48$$

$$15x = 24$$

$$x = \frac{24}{15}$$

$$x = \frac{8}{5}$$

$$x = 1\frac{3}{5}\ \text{km/h}$$

17. Let speed of streams $= x$km/h

Speed of stream $= 2$ km/h

(i) In downstream

$$s = \frac{d}{t}$$

$$x + 2 = \frac{d}{4}$$

$$d = 4(x + 2) \quad \ldots(\text{i})$$

(ii) In up stream,

$$s = \frac{d}{t}$$

$$x - 2 = \frac{d}{5}$$

$$d = 5(x - 2) \quad \ldots(\text{ii})$$

Taking equation (i) and (ii),

$$4(x + 2) = 5(x - 2)$$

$$4x + 8 = 5x - 10$$
$$5x - 4x = 8 + 10$$
$$x = 18\,\text{km/h}$$

Therefore, speed of stream is 18 km/h.

18. Let first price value = x

$$\text{Second prize value} = \frac{5}{6}x$$
$$\text{Third prize value} = \frac{4}{5} \times \frac{5}{6}x = \frac{2}{3}x$$

According to given condition :

$$\text{Value of three prize} = ₹\ 150$$
$$x + \frac{5}{6}x + \frac{2}{3}x = 150$$
$$\frac{6x + 5x + 2 \times 2x}{6} = 150$$
$$\frac{15x}{6} = 150$$
$$x = 60$$

Therefore,

$$\text{First prize value} = ₹\ 60$$
$$\text{Second prize value} = \frac{5}{6} \times 60 = ₹\ 50$$
$$\text{Third prize value} = \frac{2}{3} \times 60 = ₹\ 40$$

19. Let the angle of triangle = $x°$

The two angles be $4x°$ and $x°$

Therefore, third angle $= 4x° + 5x° = 9x°$

The sum of the angle of a triangle is 180°

Therefore,

$$4x° + 6x° + 9x° = 180°$$
$$18x° = 180°$$
$$x = 10°$$

Thus, the angle of triangle are

$$4 \times 10° = 40°$$
$$5 \times 10° = 50°$$
$$9 \times 10° = 90°$$

20. Let number = x

Other number = $(2490 - x)$

According to given condition :

$$x \times \frac{6.5}{100} = (2490 - x)\frac{8.5}{100}$$

$$x \times 13 = (2490 - x) \times 17$$

$$13x = 2490 \times 17 - 17x$$

$$13x + 17x = 2490 \times 17$$

$$30x = 2490 \times 17$$

$$x = 83 \times 17$$

One number $x = 1411$

Other number $= 2490 - 1411 = 1079$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $\dfrac{3-2x}{2x+5} = \dfrac{-3}{11}$

$$11(3-2x) = -3(2x+5)$$

$$33 - 22x = -6x - 15$$

$$22x - 6x = 33 + 15$$

$$16x = 48$$

$$x = 3$$

(ii) $\dfrac{5p+2}{8-2p} = \dfrac{7}{6}$

$$6(5p+2) = 7(8-2p)$$

$$30p + 12 = 56 - 14p$$

$$30p + 14p = 56 - 12$$

$$44p = 44$$

$$p = 1$$

(iii) $\dfrac{5}{x} = \dfrac{7}{x-4}$

$$5(x-4) = 7(x)$$

$$5x - 20 = 7x$$

$$7x - 5x = -20$$

$$2x = -20$$

$$x = -10$$

(iv) $\dfrac{4}{2x+3} = \dfrac{5}{x+4}$

$$4(x+4) = 5(2x+3)$$

$$4x + 16 = 10x + 15$$

$$10x - 4x = 16 - 15$$
$$6x = 1$$
$$x = \frac{1}{6}$$

(v) $$\frac{2x-3}{2x-1} = \frac{3x-1}{3x+1}$$

$$(2x-3)(3x+1) = (3x-1)(2x-1)$$
$$6x^2 + 2x - 9x - 3 = 6x^2 - 3x - 2x + 1$$
$$-7x - 3 = -5x + 1$$
$$7x - 5x = -4$$
$$2x = -4$$
$$x = -2$$

(vi) $$\frac{2y+3}{3y+2} = \frac{4y+5}{6y+7}$$

$$(2y+3)(6y+7) = (4y+5)(3y+2)$$
$$12y^2 + 14y + 18y + 21 = 12y^2 + 8y + 15y + 10$$
$$32y + 21 = 23y + 10$$
$$32y - 23y = 10 - 21$$
$$9y = -11$$
$$y = \frac{-11}{9}$$

2. Given : Two number ratio $= 5 : 3$

Number $= 5x, 3x$

Difference of number $= 28$

$$5x - 3x = 28$$
$$2x = 28$$
$$x = 14$$

Therefore, number are $= 5 \times 14 = 70$

$$3 \times 14 = 42$$

3. Let three consecutive multiples of 4 be,
$x, x + 4, x + 8$

According to condition :

$$x + x + 4 + x + 8 = 144$$
$$3x = 144 - 12$$
$$3x = 132$$
$$x = 44$$

The number are $x = 44$

$$x + 4 = 44 + 4 = 48$$
$$x + 8 = 44 + 8 = 52$$

Hence, required number are 44, 48, 52.

4. Let age of Lipika $= x$

Age of Lipika's mother $= 5x$

According to condition :

$$(x + 5) = \frac{1}{3}(5x + 5)$$

$$3(x + 5) = (5x + 5)$$

$$3x + 15 = 5x + 5$$

$$5x - 3x = 15 - 5$$

$$2x = 10$$

$$x = 5$$

Hence, age of Lipika $= 5$ year

Age of Lipika's mother $= 5 \times 5 = 25$ year

5. Let age of Naman $= x$

Age of Rohit $= x + 15$

According to condition :

$$8(x - 3) = (x + 15 + 3)$$

$$8x - 24 = x + 18$$

$$8x - x = 18 + 24$$

$$7x = 42$$

$$x = 6$$

Present age 6, 21 years.

6. Let number x and y

According to given condition :

$$x - y = 3 \quad \ldots(i)$$

The two digit number $= 10x + y$

Reverse number $= 10y + x$

Sum of number $= 143$

$$10x + y + 10y + x = 143$$

$$11x + 11y = 143$$

$$x + y = 13 \quad \ldots(ii)$$

Taking Eqn. (i) and (ii),

$$x - y = 3$$

$$x + y = 13$$

$$2x = 16$$

$$x = 8$$

$$y = 5$$

The number is 58 or 85.

7. Let unit place $= x$

Tens placle $= y$

According to condition :

$$x + y = 11 \quad \ldots(i)$$

$$\text{Two digit number} = 10y + x$$

$$\text{Reverse number} = 10x + y$$

$$10x + y - (10y + x) = 63$$

$$9x - 9y = 63$$

$$x - y = 7 \quad \ldots(ii)$$

Taking eqn. (i) and (ii),

$$\begin{array}{r} x + y = 11 \\ x - y = 7 \\ \hline 2x = 18 \\ x = 9 \\ y = 2 \end{array}$$

Thus, two digit number 29.

8. Given : Riya's age $= 4 \times$ Sandeep's age

Let Sandeep's age $= x$

Riya's age $= 4x$

According to conditions :

$$\begin{aligned} 4x + 4 &= 2(x + 4) \\ 4x + 4 &= 2x + 8 \\ 4x - 2x &= 8 - 4 \\ 2x &= 4 \\ x &= 2 \end{aligned}$$

Thus, Riya's age $= 4 \times 2 = 8$ years

Sandeep's age $= 2$ years.

9. Let unit place number $= x$

Tens place number $= y$

According to condition :

$$y = 3x \quad \ldots(i)$$

$$10x + y + 10y + x = 88$$

$$11x + 11y = 88$$

$$x + y = 8 \quad \ldots(ii)$$

Taking eqn. (i) and (ii),

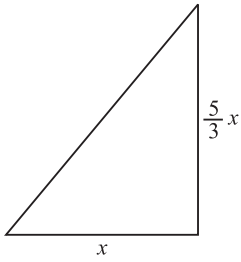
$$\begin{aligned} x &= 2 \\ y &= 6 \end{aligned}$$

Thus, number is 62.

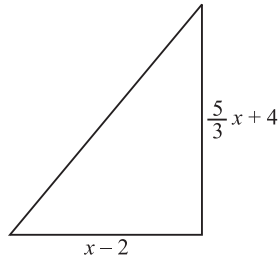
10. Let the base of triangle be x.

Altitude of triangle be $\frac{5}{3}x$

Case I



Case II



$$\text{Area of triangle} = \frac{1}{2}\text{base} \times \text{altitude}$$

$$\frac{5}{3}x \times \frac{x}{2} = \frac{1}{2} \times (x-2)\left(\frac{5}{3}x+4\right)$$

$$\frac{1}{2} \times x \times \frac{5x}{3} = \frac{1}{2}(x-2)\left(\frac{5}{3}x+4\right)$$

$$\frac{5x^2}{3} = (x-2)\left(\frac{5x+4\times 3}{3}\right)$$

$$5x^2 = (x-2)(5x+12)$$

$$5x^2 = 5x^2 + 12x - 10x - 24$$

$$2x = 24$$

$$x = 12\,\text{cm}$$

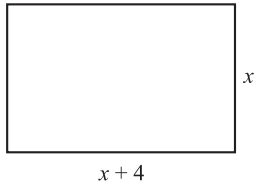
$$\text{Thus, base of triangle} = 12\,\text{cm}$$

$$\text{Altitude of triangle} = 12 \times \frac{5}{3} = 20\,\text{cm}$$

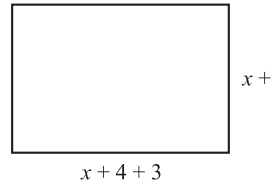
11. Let the breadth of rectangle $= x$

$$\text{length of rectangle} = x + 4$$

Case I



Case II



Now, according to question :

$$\text{Area of rectangle} = l \times b$$

$$x(x+4) + 81 = (x+3)(x+7)$$

$$x^2 + 4x + 81 = x^2 + 3x + 7x + 21$$

$$10x - 4x = 81 - 21$$

$$6x = 60$$

$$x = 10\,\text{cm}$$

Thus, breadth of rectangle $= 10\,\text{cm}$

Length of rectangle $= 10 + 4 = 14\ \text{cm}$

12. Let the volume of iron piece be $= x$

Volume of cppper piece be $= 2x$

According to conditions :

$$x \times 7.8 + 2x \times 8.9 = 1280$$
$$x \times 7.8 + 17.8x = 1280$$
$$25.6x = 1280$$
$$x = \frac{12800}{256}$$
$$x = 50$$

Thus, volume of iron piece $= 50\ \text{cm}^3$

Volume of copper piece $= 2 \times 50 = 100\ \text{cm}^3$

13. Let the land which can be ploughed in one day be x

According to condition :

$$14 \times x = (x + 20) \times 10$$
$$14x = 10x + 200$$
$$14x - 10x = 200$$
$$4x = 200$$
$$x = 50\,\text{hectares}$$

Area of field $= 14 \times 50$

$= 700\,\text{hectares}$

14. Let supplementary angle,

$$\angle A + \angle B = 180°$$

According to conditions :

$$x + x + 50° = 180°$$
$$2x + 50° = 180°$$
$$2x = 180° - 50°$$
$$2x = 130°$$
$$x = 65°$$

Thus, angle is $65°, 65° + 50° = 115°$

15. Let three angle$= 5x, 6x, 7x$

Sum of angle of triangle $= 180°$

$$5x + 6x + 7x = 180°$$
$$18x = 180°$$
$$x = 10°$$

Thus, angle of triangle is

$$5 \times 10° = 50°$$
$$6 \times 10° = 60°$$
$$7 \times 10° = 70°$$

9. Ratios and Percentages

Exercise 9

1. (i) First convert both rupees in same unit :
So, $5 \times 100 = 500$ paise
Thus, required ratio 500 : 50
$10 : 1$

(ii) First convert both distance in same unit :
So, $10 \times 1000 = 10{,}000$ m
Thus, required ratio = 5 : 10,000
$1 : 2{,}000$

(iii) First convert both time in same unit :
So, $30 \times 24 = 720$ hours
Thus, required ratio = 720 : 36
$20 : 1$

(iv) First convert weight in same unit :
So, $15 \times 1000 = 15{,}000$ gm
Thus, required ratio, 15,000 : 210
$500 : 7$

2. (i) ₹ $1 = 1 \times 100 = 100$ paise
Required percentage $= \left(\frac{30}{100} \times 100\right) = 30\%$

(ii) $1 \text{ km} = 1 \times 1000 = 1000$ m
Required percentage $= \frac{45}{1000} \times 100 = 4.5\%$

(iii) $1 \text{ kg} = 1 \times 1000 = 1000$ gm
Required percentage $= \frac{1000}{800} \times 100 = 125\%$

3. (i) $1 \text{ hour} = 1 \times 60 = 60$ minutes
Required percentage $= \frac{45}{60} \times 100 = 75\%$

(ii) $1 \text{ year} = 1 \times 12 = 12$ months
Required percentage $= \frac{4}{12} \times 100 = 33\frac{1}{3}\%$

(iii) $5m = 5 \times 100 = 500$ cm
Required percentage $= \frac{335}{500} \times 100 = 67\%$

(iv) Required percentage $= \frac{60}{360} \times 100 = \frac{100}{6} = 16\frac{2}{3}\%$

4. Given,

Total students $= 36$

Passing students $= 30$

(i) Fraction of students passed $= \frac{30}{36} = \frac{5}{6}$

(ii) Percentage of students passed $= \frac{36}{36} \times 100 = \frac{500}{6} = 83\frac{1}{3}\%$

5. (i) $2\frac{1}{2}\% = \frac{5}{2}\%$

Fraction of percentage $= \frac{5}{2} \times \frac{1}{100} = \frac{1}{40}$

(ii) $16\frac{2}{3}\% = \frac{50}{3}\%$

Fraction of percentage $= \frac{50}{3} \times \frac{1}{100} = \frac{1}{6}$

6. (i) Percentage of fraction $= \frac{9}{20} \times 100 = 45\%$

(ii) Percentage of fraction $= 1\frac{1}{4} = \frac{5}{4} \times 100 = 125\%$

7. (i) Fraction of decimal $= \frac{3}{4} = 0.75$

Fraction of percentage $= \frac{3}{4} \times 100 = 75\%$

(ii) Fraction of decimal $= \frac{5}{8} = 0.625$

Fraction of percentage $= \frac{5}{8} \times 100 = 62.5\%$

8. (i) Fraction of decimal $= \frac{5}{6} = 0.8333$

Fraction of percentage $= \frac{5}{6} \times 100 = 83.33\%$

(ii) Fraction of decimal $= \frac{4}{7} = 0.5714$

Fraction of percentage $= \frac{4}{7} \times 100 = 57.14\%$

9. New number $= \left(1 - \frac{37\frac{1}{2}}{100}\right) \times 216$

$$= \left(\frac{100 - 37\frac{1}{2}}{100} \right) \times 216 = \frac{62\frac{1}{2}}{100} \times 216$$

$$= \frac{125}{200} \times 216 = \frac{5}{8} \times 216 = 5 \times 27$$

$$\text{Result} = 135$$

10. $$\text{New number} = \left(1 + \frac{125}{100}\right) \times 28 = \left(\frac{100 + 125}{100}\right) \times 28$$

$$= \frac{225}{100} \times 28 = \frac{9}{4} \times 28 = 9 \times 7$$

$$\text{Result} = 63$$

11. Let $\text{number} = x$

According to condition :

$$161 = \left(1 + \frac{15}{100}\right) \times x$$

$$161 = \left(\frac{100 + 15}{100}\right) x$$

$$161 = \frac{115}{100} \times x$$

$$161 = \frac{23}{20} x$$

$$7 = \frac{1}{20} \times x$$

$$x = 140$$

Thus, number = 140

12. Let $\text{number} = x$

According to question :

$$192 = \left(1 - \frac{20}{100}\right) \times x$$

$$192 = \frac{80}{100} \times x$$

$$24 = \frac{1}{10} \times x$$

$$x = 24 \times 10$$

$$x = 240$$

13. Let the price today = ₹ x

According to conditions :

$$x = \left(1 + \frac{36}{100}\right) \times 19{,}00{,}000$$

$$= \frac{136}{100} \times 19{,}00{,}000$$
$$= 136 \times 19 \times 1000$$
$$= ₹\ 25{,}84{,}000$$

14. Let the rent many $= ₹\ x$

$$x = \frac{26}{100} \times 880 = 26 \times 8.8$$
$$x = ₹\ 228.80$$

15. Given :

$$\text{Total candidates} = 8000$$
$$\text{Boys} = \frac{8000 \times 60}{100} = 4800$$
$$\text{Girls} = \frac{8000 \times 40}{100} = 3200$$
$$\text{Fail Boys} = \frac{4800 \times 20}{100} = 960$$
$$\text{Fail Girls} = \frac{3200 \times 10}{100} = 320$$
$$\text{Total failed candidates} = 960 + 320 = 1280$$

16. Let original prize $= ₹\ x$

16% Increasing prize $= ₹\ 1479$

$$\frac{116}{100} \times x = 1479$$
$$x = 12.75 \times 100$$
$$x = ₹\ 1275$$

17. Let earlier weight $= x$

15% reduce weight $= 59.5$

$$x \times \left(1 - \frac{15}{100}\right) = 59.5$$
$$\frac{x \times 85}{100} = 59.5$$
$$x = 0.7 \times 100$$
$$x = 70\,\text{kg}$$

18. Let houses sold in 2006 $= x$

20% more houses $= x$

$$x = \left(1 + \frac{20}{100}\right) \times 4260$$
$$= \frac{120}{100} \times 4260$$
$$x = 5112$$

19. Let value of car after two year = x

$$x = 4{,}20{,}000\left(1 - \frac{20}{100}\right)\left(1 - \frac{90}{100}\right)$$

$$= 4{,}20{,}000\left(\frac{80}{100}\right)\left(\frac{90}{100}\right)$$

$$= 42 \times 80 \times 90$$

$$x = ₹\,3{,}02{,}400$$

20. In 2005, a train carried 8% more passengers than in 2004.
In 2006, a train carried 8% more passenger than in 2005.
Let total percentage = x
We know that

$$x\% = a + b + \frac{ab}{100} = 8 + 8 + \frac{8 \times 8}{100}$$

$$= 16 + \frac{64}{100} = 16 + 0.64$$

$$x = 16.64\%$$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $x = 15\frac{1}{2}\% \times 640$

$$= \frac{31}{2} \times \frac{640}{100} = \frac{9920}{100}$$

$$x = ₹\,99.20$$

(ii) $x = 6.5\% \times 5000$

$$= \frac{65}{100 \times 10} \times 5000$$

$$x = 325 \text{ persons}$$

(iii) $x = 80\% \times 4.5$

$$= \frac{80}{100} \times 4.5 = \frac{8}{10} \times \frac{45}{10}$$

$$x = \frac{360}{100} = 3.6 \text{ kg}$$

(iv) $x = 125\% \times 50$

$$= \frac{125}{100} \times 50 = \frac{125}{2}$$

$$x = 62.5 \text{ m}$$

(v) $x = 30.6\% \times 300\,\text{kg}$

$= \frac{306}{10} \times \frac{1}{100} \times 300$

$x = \frac{918}{10} = 91.8\,\text{kg}$

(vi) $x = 60.5\% \times 8\,\text{hours}$

$= \frac{605}{10} \times \frac{1}{100} \times 8$

$x = \frac{4840}{1000} = 4.84\,\text{hours}$

2. (i) 17 : 20

$x = \frac{17}{20} \times 100$

$x = 17 \times 5 = 85\%$

(ii) $x = \frac{13}{18} \times 100$

$= \frac{1300}{18} = \frac{650}{9}$

$x = 72\frac{2}{9}\%$

3. (i) $x = \frac{2}{100} = 0.02$

(ii) $x = \frac{3\frac{1}{4}}{100} = \frac{13}{400} = 0.0325$

4. (i) $x = \frac{27}{100} \times ₹\ 50$

$x = \frac{27}{2} = ₹\ 13.50$

(ii) $x = 6\frac{1}{4}\% \times 25\,\text{kg}$

$= \frac{25}{4} \times \frac{1}{100} \times 25$

$x = \frac{25}{16} = 1\frac{9}{16}\,\text{kg}$

(iii) $x = \frac{300\,g}{2\ \text{kg}} \times 100$

$x = \frac{300}{2 \times 1000} \times 100 = \frac{30}{2} = 15\%$

(iv) $x = \frac{7.5}{6} \times 100 = \frac{750}{6} = 125\%$

5. (i) $x = \frac{65}{50} \times 100 = 65 \times 2 = 130\%$

(ii) $x = \frac{4}{9} \times 100 = \frac{400}{9} = 44\frac{4}{9}\%$

6. (i) Let number $= x$

$$16\frac{2}{3}\% \times x = 25$$

$$\frac{50}{3} \times \frac{1}{100} \times x = 25$$

$$x = 25 \times 6 = 150$$

(ii) Let number $= x$

$$13.25\% \times x = 159$$

$$\frac{1325}{100} \times \frac{1}{100} x = 159$$

$$x = \frac{159}{1325} \times 100 \times 100$$

$$= 0.12 \times 100 \times 100$$

$$x = 1200$$

(iii) Let result $= x$

$$x = \left(1 + \frac{30}{100}\right) \times 60$$

$$x = \frac{130}{100} \times 60 = 13 \times 6 = 78$$

(iv) Let result $= x$

$$x = \left(1 - \frac{10}{100}\right) \times 750$$

$$x = \frac{90}{100} \times 750 = 9 \times 75 = 675$$

(v) Let number $= x$

$$\left(1 + \frac{15}{100}\right) \times x = 299$$

$$\frac{115}{100} \times x = 299$$

$$x = \frac{299 \times 20}{23}$$

$$x = 13 \times 20 = 260$$

(vi) Let number $= x$

$$\left(1 - \frac{18}{100}\right) \times x = 697$$

$$\frac{82}{100} \times x = 697$$

$$x = \frac{697}{82} \times 100 = 8.5 \times 100$$

$$x = 850$$

7. Let income = ₹ x

After spending 88% of income = ₹ 2160

$$\left(1 - \frac{88}{100}\right) \times x = ₹\ 2160$$

$$\frac{12}{100} \times x = 2160$$

$$x = 180 \times 100$$

$$x = ₹\ 18{,}000$$

8. Let the bill = ₹ x

10% reduced bill = ₹ 58.50

$$\left(1 - \frac{10}{100}\right) \times x = 58.50$$

$$\frac{90}{100} \times x = 58.50$$

$$x = 6.5 \times 10$$

$$x = ₹\ 65$$

9. Let new height = x m

$$x = \left(1 + \frac{12.5}{100}\right) \times 4.8 = \frac{112.5}{100} \times 4.8$$

$$x = \frac{540}{100} = 5.4 \text{ m}$$

10. Let decrease percentage = x

$$x = \frac{500}{10000} \times 100$$

$$x = 5\%$$

11. Let new salary = ₹ x

$$x = \left(1 + \frac{10}{100}\right) \times 50000$$

$$= \frac{110}{100} \times 50000$$

$$x = ₹\ 55{,}000$$

12. Let total strength = x

60% boys = 480

$$\frac{60}{100} x = 480$$

$$x = 80 \times 10$$
$$x = 800$$

13. Let money = ₹ x

After spending 60% of money = ₹ 8000

$$\left(1 - \frac{60}{100}\right) \times x = ₹\ 8000$$
$$\frac{40}{100} \times x = 8000$$
$$x = 200 \times 100$$
$$x = ₹ 20{,}000$$

14. Let new prize = ₹ x

$$x = \left(1 + \frac{12}{100}\right) \times 60000$$
$$= \frac{112}{100} \times 60000$$
$$x = ₹\ 67{,}200$$

15. Let week students = x

Given : 30% of 50 students are goods in maths

$$x = 70\% \times 50$$

70% week.

$$x = \frac{70}{100} \times 50 = 35$$

16. Let weight of tin = x

$$x = 90 \times \frac{45}{55}$$
$$x = 73.63 \text{ kg}$$

17. Let percentage = x

$$x = \left(\frac{1080 - 960}{960}\right) \times 100 = \frac{120}{960} \times 100$$
$$x = 12.5\%$$

18. Let total number of voters = x

Loser polled 42%

Winner polled 58%

According to conditions :

$$58\%\ x - 42\%\ x = 14400$$
$$16\% x = 14400$$
$$\frac{x}{100} \times 16 = 14400$$
$$x = 900 \times 100$$
$$x = 90{,}000$$

Percentage of voters did not vote = x

$$x = \left(\frac{100{,}000 - 90{,}000}{100{,}000}\right) \times 100$$

$$= \frac{10{,}000}{100{,}000} \times 100$$

$$x = 10\%$$

10. Profit and Loss

Exercise 10A

1. Given :

$$\text{SP} = ₹\ 3240$$

$$\text{P\%} = 8$$

$$\text{C.P.} = ?$$

We know that, Let C.P. = x

$$\text{SP} = \text{C.P.} \times \left(\frac{100 + P}{100}\right)$$

$$3240 = \text{C.P.} \times \left(\frac{100 + 8}{100}\right)$$

$$3240 = \text{C.P.} \times \frac{108}{100}$$

$$\text{C.P.} = \frac{3240}{108} \times 100$$

$$\text{C.P.} = 30 \times 100 = ₹\ 3000$$

2. Given :

$$\text{Pens} = ₹\ 200$$

$$\text{Pencils} = ₹\ 50$$

$$\text{Total amount} = 200 + 50 = 250$$

$$\text{10\% gain pens} = \frac{200 \times 110}{100} = 220$$

$$\text{20\% Loss pencils} = 50 \times \left(1 - \frac{20}{100}\right) = \frac{50 \times 80}{100} = 40$$

Total amount = 220 + 40 = 260

$$P\% = \left(\frac{260 - 250}{250}\right) \times 100 = \frac{10}{250} \times 100$$

$$P\% = 4\%$$

3. Given,

$$\text{SP} = ₹\ 1320$$

$$\text{L} = 12\%$$

$$\text{C.P.} = ?$$

$$\text{S.P.} = \text{C.P.} \times \left(\frac{100 - \text{L}}{100}\right)$$

$$1320 = \text{C.P.} \times \frac{(100 - 12)}{100}$$

$$1320 = \frac{\text{C. P.} \times 88}{100}$$

$$\text{CP} = \frac{1320}{88} \times 100 = ₹\ 1500$$

4. Let Rajesh C.P. $= x$

$$x = 1200 \times \left(\frac{110}{100}\right) \times \left(\frac{112}{100}\right)$$

$$= \frac{1200 \times 110 \times 112}{100 \times 100}$$

$$x = ₹\ 1478.4$$

5. Cost of 20 quires $= 250$,

$$\text{Cost of 1 quires} = \frac{250}{20} = ₹\ 12.5$$

Gain $= 20\%$, C.P. $= ₹\ 12.5$

$$\text{S.P.} = 12.5 \times \frac{(100 + 20)}{100} = \frac{120 \times 12.5}{100}$$

S.P. $= ₹\ 15$

6. Given : Cost of book $= ₹\ 450$

Spent $= ₹\ 20$

Total C.P. $= 450 + 20 = ₹\ 470$

P $= 15\%$

$$\text{S.P.} = 470\left(1 + \frac{15}{100}\right)$$

$$\text{S.P.} = 470 \times \frac{115}{100} = ₹\ 540.5$$

$$\text{S.P. of one book} = \frac{540.5}{10} = ₹\ 54.05$$

7. Given : S.P. of Sofa $= ₹\ 1750$

L $= 30\%$

C.P. $= ?$

$$\text{S.P.} = \text{C.P.} \times \left(1 - \frac{30}{100}\right)$$

$$1750 = \text{C.P.} \times \frac{70}{100}$$

C.P. $= ₹\ 250.0$

Then, $\text{S.P.} = 2500 \times \left(1 + \frac{20}{100}\right)$

$= 2500 \times \frac{120}{100}$

$\text{S.P.} = ₹\ 3{,}000$

8. Given :

$\text{S.P. of fan} = ₹\ 360$

$\text{L} = 10\%$

If $\text{S.P. of fan} = ₹\ 460$

$\text{L/P\%} = ?$

We know that :

$$\text{S.P.} = \text{C.P.} \frac{(100 - \text{L})}{100}$$

$$\text{C.P.} = \frac{\text{S. P.} \times 100}{(100 - 10)}$$

$$= \frac{360 \times 100}{90} \quad \ldots(\text{i})$$

$$\text{C.P.} = \frac{460 \times 100}{(100 \pm x)} \quad \ldots(\text{ii})$$

Eqn. (i) and (ii),

$$\frac{460 \times 100}{(100 \pm x)} = \frac{360 \times 100}{90}$$

$$46 \times 90 = 36\,(100 \pm x)$$

$$4140 = 3600 + 36x$$

$$36x = 540$$

$$x\% = 15\%$$

Thus, 15% profit.

9. 180 oranges selling.

20 oranges lost.

$$\text{Loss percentage} = \frac{20}{(180 + 20)} \times 100$$

$$\text{L\%} = \frac{20 \times 100}{200} = 10\%$$

$$\text{S.P. of one orange} = ₹\ \frac{270}{200} = ₹\ 1.35$$

10. $\text{S.P. of 4 oranges} = \text{C.P. of 3 oranges}$

$\text{S.P.} \times 4 = \text{C.P.} \times 3$

$$\frac{\text{S. P.}}{\text{C. P.}} = \frac{3}{4}$$

We know that

$$L\% = \left(\frac{C.P. - S.P.}{C.P.}\right) \times 100$$

$$= \left(\frac{4-3}{4}\right) \times 100 = \frac{1}{4} \times 100$$

$$L\% = 25\%$$

11. Given, C.P. of article = ₹ 2000

S.P. of article = ₹ 2500

Let P = Profit percentage

$$P\% = \left(\frac{S.P. - C.P.}{C.P.}\right) \times 100$$

$$= \left(\frac{2500 - 2000}{2000}\right) \times 100$$

$$= \frac{500}{2000} \times 100$$

$$P\% = 25\%$$

12. Given : C.P. of scooter = ₹ 3000

Repairing amounts = ₹ 2000

Total C.P. = ₹ 5000

S.P. = ₹ 8000

$$\text{Profit \%} = \left(\frac{8000 - 5000}{5000}\right) \times 100$$

$$= \frac{3000}{5000} \times 100$$

$$\text{Profit\%} = 60\%$$

13. Given : C.P. of 8 article = S.P. of 10 article

$$C.P. \times 8 = S.P. \times 10$$

$$\frac{C.P.}{S.P.} = \frac{10}{8}$$

$$L\% = \left(\frac{C.P. - S.P.}{C.P.}\right) \times 100$$

$$= \left(\frac{10 - 8}{10}\right) \times 100$$

$$L\% = \frac{2}{10} \times 100 = 20\%$$

14. Given :

C.P. of 20 articles = S.P. of 12 articles

$$C.P. \times 20 = S.P. \times 12$$

$$\frac{\text{C. P.}}{\text{S. P.}} = \frac{12}{20}$$

$$\text{Profit\%} = \left(\frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}}\right) \times 100$$

$$= \left(\frac{20 - 12}{12}\right) \times 100 = \frac{8}{12} \times 100$$

$$\text{P\%} = 66.67\%$$

15. Given :

$$\text{S.P. of LED} = ₹\ 18000$$

$$\text{L\%} = 10\%$$

$$\text{let S.P. of LED} = x$$

$$\text{P\%} = 30\%$$

We know that

$$\frac{\text{S. P.} \times 100}{(100 - \text{L})} = \frac{\text{S. P.} \times 100}{(100 + \text{P})}$$

$$\frac{18{,}000 \times 100}{(100 - 10)} = \frac{x \times 100}{(100 + 30)}$$

$$\frac{18000}{90} = \frac{x}{130}$$

$$200 \times 130 = x$$

$$x = 26{,}000$$

$\therefore$ $\text{S.P.} = ₹\ 26{,}000$

16. Given,

$$\text{C.P.}_1 \text{ of tea} = 40 \times 150 = ₹\ 6000$$

$$\text{C.P.}_2 \text{ of tea} = 60 \times 100 = ₹\ 6000$$

$$\text{Total C.P.} = 6000 + 6000 = ₹\ 12{,}000$$

$$\text{S.P. of tea} = (40 + 60) \times 130 = ₹\ 13000$$

$$\text{Profit\%} = \frac{(13000 - 12{,}000)}{12000} \times 100$$

$$= \frac{1000}{12000} \times 100$$

$$\text{P\%} = \frac{100}{12} = 8.33\%$$

17. Given, $\text{S.P. of laptop} = x$

$$\text{Profit \%} = 20\%$$

$$\text{S.P. of laptop} = x + 1000$$

$$\text{Profit\%} = 25\%$$

We know that

$$\text{S.P.} = \text{C.P.} \frac{(100 + 20)}{100} \qquad \ldots(i)$$

$$\text{S.P.} + 100 = \frac{\text{C. P.}\,(100 + 25)}{100} \qquad \ldots(\text{ii})$$

Taking eqn. (i) and (ii),

$$\frac{\text{S. P.}}{\text{S. P.} + 1000} = \frac{\text{C. P.}\,(100 + 20)}{100} \times \frac{100}{\text{C. P.}\,(100 + 25)}$$

$$\frac{\text{S. P.}}{\text{S. P.} + 1000} = \frac{120}{125}$$

$$\frac{\text{S. P.}}{\text{S. P.} + 1000} = \frac{24}{25}$$

$$25\ \text{S.P.} = 24\ \text{S.P.} + 24000$$

$$\text{S.P.} = 24000$$

Put in eqn. (i)

$$24000 = \frac{\text{C. P.}\,(120)}{100}$$

$$\text{C.P.} = 20 \times 1000$$

$$\text{C.P.} = 20{,}000$$

18. Given :

$$\text{S.P. of fan} = ₹\,644$$

$$\text{P\%} = \frac{1}{6}\,\text{C.P.}$$

We know that

$$\text{S.P.} = \text{C.P.} + \text{P}$$

$$644 = \text{C.P.} + \frac{\text{C. P.}}{6}$$

$$644 = \frac{6\,\text{C. P.} + \text{C. P.}}{6}$$

$$\text{C.P.} = \frac{6 \times 644}{7} = 92 \times 6 = ₹\,252$$

$$\text{Profit\%} = \left(\frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}}\right) \times 100$$

$$= \left(\frac{644 - 552}{552}\right) \times 100$$

$$= \frac{92}{552} \times 100 = \frac{1}{6} \times 100$$

$$\text{P\%} = 16.67\%$$

19. Case I.

$$\text{C.P.} = 8000 \times \frac{3}{4} = 600, \quad \text{Loss} = \frac{600 \times 10}{100} = 60$$

$$\text{Loss} = \text{C.P.} - \text{S.P.}$$

$$60 = 600 - \text{S.P.}$$

$$\text{S.P.} = ₹\,540$$

Case II.

$$\text{C.P.} = 800 \times \frac{1}{4} = 200, \quad \text{Profit} = \frac{200 \times 10}{100} = 20$$

$$\text{S.P.} = 200 + 20 = 220$$

$$\text{Total S.P.} = 540 + 220 = ₹\ 760$$

$$\text{Total C.P.} = 600 + 200 = ₹\ 800$$

$$\text{Loss} = \text{C. P.} - \text{S. P.} = 800 - 760 = ₹\ 40$$

20. S.P. of bed-sheet $= ₹\ 48$

Loss $= 4\%$

$SP_2 = ?$

Profit $= 20\%$

We know that

$$\frac{48 \times 100}{96} = \frac{\text{S. P.} \times 100}{120}$$

$$\text{S.P.} = ₹\ 60$$

Exercise 10 (B)

1. (i) Given :

$$\text{MP} = ₹\ 85$$

$$\text{Discount} = 20\%$$

We know that

$$\text{S.P.} = \text{M.P.} \times \left(\frac{100 - \text{D}}{100}\right)$$

$$= 85 \times \frac{(100 - 20)}{100} = \frac{85 \times 80}{100}$$

$$= \frac{85 \times 4}{5} = 17 \times 4 = ₹\ 68$$

(ii) $\text{M.P.} = ₹\ 990$

$$\text{Discount} = 15\%$$

$$\text{S.P.} = \frac{990 \times (100 - 15)}{100}$$

$$= \frac{99}{10} \times 85 = \frac{99 \times 17}{2} = ₹\ 841.50$$

2. (i) Given,

$$\text{S.P.} = ₹\ 1860$$

$$\text{Discount} = 7\%$$

We know that

$$\text{S.P.} = \frac{\text{M. P.}\,(100 - \text{D})}{100}$$

$$1860 = \frac{\text{M. P.}\,(100 - 7)}{100}$$

$$1860 = \frac{\text{M.P.}(93)}{100}$$

$$\text{M.P.} = 2{,}000$$

(ii) $\text{S.P.} = ₹\ 1056$, Discount $= 4\%$

$$\text{S.P.} = \text{M.P.} = \frac{(100 - \text{D})}{100} = \frac{\text{M.P.} \times (100 - 4)}{100}$$

$$1056 = \frac{\text{M.P.} \times 96}{100}$$

$$\text{M.P.} = 11 \times 100 = ₹\ 1100$$

3. (i) $\text{M.P.} = ₹\ 40$, $\text{S.P.} = ₹\ 34$

$$\text{Discount} = \text{M.P.} - \text{S.P.} = 40 - 34 = 6$$

$$\text{D}\% = \frac{6}{40} \times 100 = 15\%$$

(ii) $\text{M.P.} = ₹\ 12.5$, $\text{S.P.} = 10.5$

$$\text{Discount} = \text{M.P.} - \text{S.P.} = 12.5 - 10.5 = ₹\ 2$$

$$\text{D}\% = \frac{2}{12.5} \times 100 = 2 \times 8 = 16\%$$

4. Given :

M.P. of desert cooler $= ₹\ 8{,}000$

Discount $= 24\%$

$$\text{S.P.} = \frac{\text{M.P.} \times (100 - \text{D})}{100} = \frac{8{,}000 \times (100 - 24)}{100}$$

$$= 80 \times 76$$

$$\text{S.P.} = ₹\ 6080$$

5. Given :

S.P. of almirah $= ₹\ 13{,}120$

Discount $= 18\%$

$$\text{S.P.} = \frac{\text{M.P.} \times (100 - \text{D})}{100} = \frac{\text{M.P.}\ (100 - 18)}{100}$$

$$13120 = \frac{\text{M.P.} \times 82}{100}$$

$$\text{M.P.} = 160 \times 100 = ₹\ 16{,}000$$

6. Let C.P. of goods $= ₹\ 100$

M.P. of goods $= 100 + 30 = 130$

Discount $= 10\%$

$$\text{S.P.} = \frac{130 \times (100 - 10)}{100} = \frac{130 \times 90}{100}$$

$$\text{S.P.} = 117$$

$$\text{Profit}\% = \left(\frac{\text{S.P.} - \text{C.P.}}{\text{C.P.}}\right) \times 100 = \frac{117 - 100}{100} \times 100$$

Profit% = 17%

7. C.P. of Suit = ₹ 16,000

Discount = 20%

Profit% = 30%

$$S.P. = \frac{16000 \times (130)}{100} \quad \ldots(i)$$

$$S.P. = \frac{M.P. \times 80}{100} \quad \ldots(ii)$$

Both eqns. (i) and (ii),

$$16000 \times 130 = M.P. \times 80$$

$$M.P. = ₹\ 26,000$$

8. M.P. of bicycle = ₹ 5000

Discount = 10%

Profit = 40%

We know that

$$S.P. = \frac{C.P. \times (100 + P)}{100}$$

$$= \frac{C.P. \times (100 + 40)}{100} \quad \ldots(i)$$

$$S.P. = \frac{M.P. \times (100 - D)}{100}$$

$$= \frac{5000 \times (100 - 10)}{100} \quad \ldots(ii)$$

Taking eqns. (i) and (ii),

$$\frac{C.P. \times 140}{100} = \frac{5000 \times 90}{100}$$

$$C.P. = \frac{5000 \times 9}{14}$$

$$= \frac{45000}{14} = ₹\ 3214.28$$

9. Given,

Let price of an article = ₹ 100

$$\text{So, single discount} = 100\left(1 - \frac{40}{100}\right)$$

$$= ₹\ 60$$

$$\text{Two successive discounts} = 100 \times \left(1 - \frac{20}{100}\right)\left(1 - \frac{20}{100}\right)$$

$$= 100 \times \frac{80 \times 80}{100 \times 100} = ₹\ 64$$

So, single discount is better.

10. S.P. $= ₹\ 54$

Discount $= 10\%$

$$\text{S.P.} = \frac{\text{M. P.} \times (100 - 10)}{100} = \frac{\text{M. P.} \times 90}{100}$$

$$54 = \frac{\text{M. P.} \times 90}{100}$$

$$\text{M.P.} = 6 \times 10 = ₹\ 60$$

11. S.P. of table $= 405 - 30 = 375$

Profit $= 25\%$

$$\text{S.P.} = \frac{\text{C. P.} \times (100 + 25)}{100}$$

$$375 = \frac{\text{C. P.} \times 125}{100}$$

$$\text{C.P.} = \frac{375 \times 4}{5}$$

$$\text{C.P.} = 75 \times 4 = ₹\ 300$$

12. Let cost price $= ₹\ 100$

$$\text{M.P.} = 100 + 25 = 125$$

$$\text{S.P.} = \frac{\text{M. P.} \times (100 - 20)}{100}$$

$$= \frac{125 \times 80}{100} = \frac{5}{4} \times 80$$

$$\text{S.P.} = ₹\ 100$$

Thus, no loss no profit.

13. Discount $= 12\%$

M.P. $= ₹\ 5400$

Profit $= 8\%$

$$\text{S.P.} = \frac{\text{C. P.} \times (100 + 8)}{100} \quad \ldots(i)$$

$$\text{S.P.} = \frac{\text{M. P.} \times (100 - 12)}{100} \quad \ldots(ii)$$

Taking eqns. (i) and (ii)

$$\text{C.P.} \times \frac{108}{100} = \frac{5400 \times 88}{100}$$

$$\text{C.P.} = \frac{5400}{108} \times 88 = 50 \times 88$$

$$\text{C.P.} = ₹\ 4400$$

14. $d_1 = 12\%, d_2 = 4\%$

M.P. $= ₹\ 800$

$$\text{S.P.} = \frac{800 \times (100 - 12)}{100} \times \frac{(100 - 4)}{100}$$

$$= \frac{800 \times 88}{100} \times \frac{96}{100} = \frac{8 \times 88 \times 96}{100}$$

$$= \frac{704 \times 96}{100} = \frac{67584}{100}$$

S.P. = ₹ 675.84

15. Discount = 10%

Profit = 8%

Let C.P. = ₹ 100

$$\frac{100 \times (100 + 8)}{100} = ₹\ 108 = \frac{\text{M. P.} \times 90}{100}$$

$\because$ S.P. = M.P.

$$\text{S.P.} = \frac{108}{90} \times 100 = ₹\ 120$$

$$\text{Profit\%} = \left(\frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}}\right) \times 100$$

$$= \left(\frac{120 - 100}{100}\right) \times 100 = \frac{20}{100} \times 100$$

Profit = 20%

Exercise 10 (C)

1. (i) A Towel price = ₹ 50

$$5\%\ \text{add} = ₹\ 50 + \frac{50 \times 5}{100} = 50 + 2.5$$

Add price = ₹ 52.50

(ii) Price of 5 kg = ₹ 15×5 = ₹ 75

$$5\%\ \text{Add price} = 75 + \frac{75 \times 5}{100}$$

$$= 75 + 3.75 = ₹\ 78.75$$

2. (i) Price of a T.V. = ₹ 12,000

$$5\%\ \text{of adding price} = 12000 + \frac{5 \times 12000}{100}$$

$$= 12000 + 600 = ₹\ 12600$$

(ii) Price of leather coat = ₹ 1800

$$5\%\ \text{adding price} = 1800 + \frac{1800 \times 5}{100}$$

$$= 1800 + 90 = ₹\ 1890$$

(iii) Price of two bars = 25×2 = ₹ 50

$$5\%\ \text{adding price} = 50 + \frac{50 \times 5}{100} = 50 + 2.5 = ₹\ 52.5$$

(iv) Price of air cooler = ₹ 3300

$$5\%\text{ adding price} = 3300 + \frac{3300 \times 5}{100}$$
$$= 3300 + 165 = ₹\ 3465$$

3. Purchased a commodity $= ₹\ 2500$

Paid amount $= ₹\ 2700$

Sales Tax $= 2700 - 2500 = ₹\ 200$

$$\text{Sales Tax\%} = \frac{200}{2500} \times 100 = 8\%$$

4. (i) Price a sampoo $= ₹\ 208$

$$4\%\text{ GST adding price } \left(\frac{104}{100}\right)x = 208$$
$$x = \frac{208 \times 100}{104}$$
$$x = 2 \times 100$$
$$x = ₹\ 200$$

(ii) Price of bicycle $= ₹\ 3120$

$$4\%\text{ GSt adding}\left(\frac{104}{100}\right)x = 3120$$
$$x = 30 \times 100$$

Original price $x = ₹\ 3{,}000$

5. Price of air-conditioner $= ₹\ 33{,}000$ with 10% including tax

Let original price $= ₹\ x$

According to conditions

$$\left(\frac{100 + 10}{100}\right)x = 33000$$
$$\frac{110}{100} \times x = 33000$$
$$x = \frac{33000 \times 100}{110}$$
$$x = ₹\ 30{,}000$$

Thus, original price is 3,0000

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) C.P. $= ₹\ 400$, S.P. $= ₹\ 468$

$$\text{Profit\%} = \frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}} \times 100$$

$$= \left(\frac{468-400}{400}\right) \times 100$$

$$= \frac{68}{400} \times 100 = \frac{68}{4}$$

Profit% = 17%

(ii) C.P. = ₹ 13600, S.P. = ₹ 12104

$$\text{Loss\%} = \left(\frac{\text{C. P.} - \text{S. P.}}{\text{C. P.}}\right) \times 100$$

$$= \left(\frac{13600-12104}{13600}\right) \times 100$$

$$= \frac{1496}{13600} \times 100 = 0.11 \times 100$$

Loss% = 11%

2. (i) M.P. = ₹ 780, S.P. = ₹ 721.50

Discount = 780 – 721.5 = 58.5

$$\text{D\%} = \frac{58.5}{780} \times 100$$

D% = 0.075 × 100 = 7.5%

(ii) Advertised price = ₹ 28500, S.P. = ₹ 24510

Discount = 28500 – 24510 = ₹ 3990

$$\text{D\%} = \frac{3990}{28500} \times 100 = \frac{\text{D}}{\text{M. P.}} \times 100$$

D% = 0.14 × 100 = 14%

3. S.P. = ₹ 1636.25

Profit = ₹ 96.25

C.P. = S.P. – P = 1636.25 – 96.25 = ₹ 1540

$$\text{Profit\%} = \frac{96.25}{1540} \times 100 = 0.0625 \times 100$$

Thus, profit% = 6.25%

4. S.P. = ₹ 770, Loss = ₹ 110

C.P. = S.P. + Loss = 770 + 110 = ₹ 880

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C. P.}} \times 100$$

Thus, $\text{Loss\%} = \frac{110}{880} \times 100 = \frac{100}{8} = 12.5\%$

5. C.P. of 25 dozen eggs = 9.6 × 25 = ₹ 240

Total eggs = 300

30 broken them

Left eggs = 300 – 30 = 270

S.P. of eggs = 270 × ₹ 1 = ₹ 270

$$\text{Profit\%} = \left(\frac{270-240}{240}\right) \times 100$$

$$= \frac{30}{240} \times 100 = \frac{1}{8} \times 100$$

Thus, profit% = 12.5%

6. Cost price of article = ₹ 20,000

₹ 1400 repairing charges

$$\text{Total C.P.} = 20{,}000 + 1400 = ₹\,21400$$

$$\text{Profit\%} = 20\%$$

$$\text{S.P.} = \frac{\text{C. P.} \times (100+20)}{100}$$

$$\text{S.P.} = \frac{21400 \times 120}{100} = ₹\ 25{,}680$$

Thus, S.P. of article is ₹ 25,680.

7. C.P. of 200 bicycles $= 1200 \times 200 = ₹\ 2{,}40{,}000$

₹ 30 per bicycles transportation charges $= 200 \times 30 = 6000$

Advertising $= 4{,}000$

Total C.P. of bicycle $= 2{,}40{,}000 + 6{,}000 + 4000 = 2{,}50{,}000$

S.P. of bicycle $= 200 \times 1350 = 2{,}70{,}000$

Profit $= \text{S. P.} - \text{C. P.}$

$$= 2{,}70{,}000 - 2{,}50{,}000 = 20{,}000$$

$$\text{Profit \%} = \frac{20{,}000}{2{,}50{,}000} \times 100 = 0.08 \times 100$$

Thus, profit% = 8%

8. M.P. of = ₹ 30

Dozen books price = ₹ 30×12 = ₹ 360

Discount = 15%

$$\text{S.P.} = \frac{\text{M. P.} \times 100 - \text{D}}{100} = \frac{360 \times (100-15)}{100}$$

$$\text{S.P.} = \frac{360 \times 85}{100} = ₹\ 306$$

Thus, S.P. of books is ₹ 306.

9. S.P. of fan = ₹ 728

Discount = 9%

$$\text{S.P.} = \text{M. P.} \times \left(\frac{100-\text{D}}{100}\right)$$

$$728 = \text{M. P.} \times \left(\frac{100-9}{100}\right) = \frac{\text{M. P.} \times 91}{100}$$

$$\text{M.P.} = 8 \times 100 = ₹\ 800$$

Thus, M.P. of fan is ₹ 800.

10. (i) C.P. of ₹ 650, Discount = 20%, Profit = 20%

$$\text{S.P.} = 650 \times \frac{(100 + 20)}{100}$$

$$\text{S.P.} = \frac{650 \times 120}{100} = ₹\ 780$$

$$\text{S.P.} = \frac{\text{M. P.} \times 80}{100}$$

$$780 = \frac{\text{M. P.} \times 80}{100}$$

$$\text{M.P.} = 9.75 \times 100$$

(ii) $\text{M.P.} = ₹\ 975$

Thus, S.P. of article is ₹ 780 and M.P. is ₹ 975.

11. Rate of 12 for ₹ 10

$$\text{Profit} = 20\%$$

$$\text{Rate of 1} = ₹\ \frac{10}{12}$$

$$\text{S.P.} = \text{C.P.} \times \left(\frac{100 + 20}{100}\right)$$

$$\text{S.P.} = \frac{10}{12} \times \frac{120}{100} = ₹\ \frac{1}{1}$$

Thus, S.P. is ₹ 1 each.

12. $\text{S.P. of radio} = ₹\ 360$

$$\text{Lost} = 25\%$$

$$\text{Profit} = 25\%$$

$$\text{S.P.} = \text{C. P.} \times \frac{(100 - 25)}{100}$$

$$360 = \text{C. P.} \times \frac{75}{100}$$

$$\text{C.P.} = ₹\ 480$$

$$\text{S.P.} = \frac{480 \times 125}{100} = \frac{480 \times 5}{4} = 120 \times 5$$

$$\text{S.P.} = ₹\ 600$$

13. Let $\text{S.P. of chairs} = x$

$$\text{S.P.} = 17 \text{ chair}$$

$$\text{Loss} = 3 \text{ chairs}$$

$$\text{C.P.} = \text{S. P.} + \text{Loss}$$

$$\text{C.P.} = 17 + 3 = 20 \text{ chair}$$

$$\text{Loss\%} = \frac{\text{Loss}}{\text{C. P.}} \times 100 = \frac{3}{20} \times 100$$

$$= \frac{300}{20} = \frac{30}{2}$$

$$\text{Loss\%} = 15\%$$

Loss of chair is 15%.

$$\therefore \quad \text{S.P. of one chair} = \frac{3400}{20}$$

$$= ₹\ 170$$

14. $$\text{S.P. of 4 fans} = \text{C.P. of 5 fans}$$

$$\text{S.P.} \times 4 = \text{C.P.} \times 5$$

$$\frac{\text{S. P.}}{\text{C. P.}} = \frac{5}{4}$$

$$\text{Profit\%} = \left(\frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}}\right) \times 100$$

$$= \left(\frac{5-4}{4}\right) \times 100 = \frac{1}{4} \times 100$$

$$\text{Profit\%} = 25\%$$

15. $$\text{S.P. of 3 oranges} = \text{C. P. of 4 oranges}$$

$$\text{S.P.} \times 3 = \text{C. P.} \times 4$$

$$\frac{\text{S. P.}}{\text{C. P.}} = \frac{4}{3}$$

$$\text{Profit\%} = \left(\frac{\text{S. P.} - \text{C. P.}}{\text{C. P.}}\right) \times 100 = \left(\frac{4-3}{3}\right) \times 100$$

$$\text{Profit\%} = \frac{1}{3} \times 100 = 33\frac{1}{3}\%$$

16. $$\text{S.P.} = \frac{\text{C. P.} \times (100 - 5)}{100} \qquad \ldots(i)$$

$$\text{S.P.} + 375 = \frac{\text{C. P.} \times (100 + 10)}{100} \qquad \ldots(ii)$$

Taking eqns. (i) and (ii),

$$\frac{\text{S. P.}}{\text{S. P.} + 375} = \frac{(100 - 5)}{100} \times \frac{100}{(110)}$$

$$110\text{S. P.} = 95\ \text{S. P.} + 95 \times 375$$

$$15\ \text{S. P.} = 95 \times 375$$

$$\text{S.P.} = 2375$$

Put in eqns. (i)

$$\text{C.P.} = \frac{2375 \times 100}{95}$$

$$\text{C.P.} = 25 \times 100 = ₹\ 2500$$

Thus, C.P. of T.V. is 2500.

17. Case I

$$\text{S.P.} = ₹\ 67.50,\ \text{Loss} = 10\%,\ \text{C.P.} = ?$$

$$\text{C.P.} = \frac{100}{(100-10)} \times 67.50$$

$$\text{C.P.} = \frac{100}{90} \times 67.50$$

$$\text{C.P.} = ₹\ 75$$

Case II

$$\text{S.P.} = 82.50 \text{ and C.P.} = ₹\ 75$$

$$\text{Profit} = 82.50 - 75 = 7.5$$

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{C. P.}} = \frac{7.5 \times 100}{75}$$

$$\text{Profit\%} = \frac{750}{75} = 10\%$$

Thus, profit of stool is 10%.

18.
$$\text{Profit \%} = \left(\frac{\frac{\text{C. P.}}{5} \times 100}{\text{C. P.}} \right)$$

$$= \frac{1}{5} \times 100$$

$$= 20\%$$

19. Two buffaloes of S.P. of = ₹ 60,000 (each)

$$\text{Profit\%} = 30\%$$

$$\text{Loss\%} = 10\%$$

$$\text{S.P.} = \text{C. P.} \times \frac{(100+30)}{100}$$

$$60{,}000 = \frac{\text{C. P.} \times (130)}{100}$$

$$\text{C.P.}_1 = 46153.8 \qquad \ldots(i)$$

$$\text{S.P.}_2 = \frac{\text{C. P.}_2 \times (100-10)}{100}$$

$$\text{S.P.}_2 = \frac{\text{C. P.}_2 \times 90}{100}$$

$$\text{C.P.}_2 = 66666.66$$

$$\text{Total C.P.} = 46153.8 + 66666.66$$

$$= ₹\ 112820.44$$

$$\text{Total S.P.} = 2 \times 60{,}000 = ₹\ 1{,}20{,}000$$

$$\text{Profit} = 1{,}20{,}000 - 1{,}12{,}820.44 = 7179.56$$

$$\text{Profit\%} = \frac{7179.56}{1{,}12{,}820} \times 100 = 0.0636 \times 100$$

$$\text{Profit\%} = 6.36\%$$

20. S.P. $= ?$

Loss% $= 8\%$

If $= \text{S.P.} + 150$

Than profit% $= 12\%$

$$\text{S.P.} = \frac{\text{C.P.} \times (100 - 8)}{100} \quad \ldots(i)$$

$$\text{S.P.} + 150 = \text{C.P.} \times \left(\frac{100 + 12}{100}\right) \quad \ldots(ii)$$

Taking eqn. (i) and (ii),

$$\frac{\text{S.P.}}{\text{S.P.} + 150} = \frac{(100 - 8)}{100} \times \frac{100}{(100 + 12)}$$

$$\frac{\text{S.P.}}{\text{S.P.} + 150} = \frac{92}{112}$$

$$\frac{\text{S.P.}}{\text{S.P.} + 150} = \frac{23}{28}$$

$$28\ \text{S.P.} = 23\ \text{S.P.} + 23 \times 150$$

$$28\ \text{S.P.} - 23\ \text{S.P.} = 23 \times 150$$

$$5\ \text{S.P.} = 23 \times 150$$

$$\text{S.P.} = 23 \times 30$$

$$\text{S.P.} = ₹\ 690$$

Thus, S.P. of leather purse is ₹ 690.

11. Compound Interest

Exercise 11A

1. Given :

Rate of Interest $= 10\%$

Principal $= 5{,}000$

Time $= 2$ years

We know that

$$\text{Compound Interest} = \text{Amount} - \text{Principal} \quad \ldots(i)$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 5000\left(1 + \frac{10}{100}\right)^2$$

$$= 5000 \times \frac{110}{100} \times \frac{110}{100}$$

$$= \frac{5000 \times 11 \times 11}{100}$$

$$= 121 \times 50$$

$$\text{Amount} = ₹\ 6050$$

$$\text{Compound Interest} = \text{Amount} - \text{Principal}$$

$$= 6050 - 5000 = ₹\ 1050$$

2. $\text{Principal} = ₹\ 3000$

$$R = 5\%$$

$$\text{Time} = 2 \text{ years}$$

$$\text{Amount} = 3000\left(1 + \frac{5}{100}\right)^2$$

$$= 3000\left(\frac{21}{20} \times \frac{21}{20}\right)$$

$$\text{Amount} = \frac{441 \times 30}{4}$$

$$= ₹\ 3307.5$$

$$\text{C.I.} = \text{Amount} - \text{Principal}$$

$$= 3307.5 - 3000$$

$$\text{C.I.} = ₹\ 307.5$$

3. $P = ₹\ 625, R = 4\%$, Time $= 2$ years

$$\text{Amount} = 625\left(1 + \frac{4}{100}\right)^2$$

$$= 625 \times \frac{26}{25} \times \frac{26}{25}$$

$$\text{Amount} = \frac{625 \times 26 \times 26}{625} = ₹\ 676$$

$$\text{C.I.} = A - P = 676 - 625$$

$$\text{C.I.} = ₹\ 51$$

4. $P = ₹\ 8000, R = 15\%$, Time $= 3$ years

$$A = 8000\left(1 + \frac{15}{100}\right)^3$$

$$= 8000\left(\frac{23}{20} \times \frac{23}{20} \times \frac{23}{20}\right)$$

$$= \frac{8000}{8000} \times 529 \times 23$$

$$A = ₹\ 12{,}167$$

$$\text{C.I.} = A - P$$

$$= 12{,}167 - 8000$$

$$\text{C.I.} = ₹\ 4167$$

5. $P = ₹\ 2000, R = 4\%$, Time $= 3$ years

$$A = 2000\left(1 + \frac{4}{100}\right)^3 = 2000\left(\frac{104}{100}\right)^3$$

$$= 2000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$= \frac{16 \times 26 \times 26 \times 26}{125}$$

$$A = \frac{281216}{125} = ₹\ 2249.728$$

$$\text{C.I.} = A - P = 2249.728 - 2000$$

$$\text{C.I.} = ₹\ 249.728 = ₹\ 249.73$$

6. Given : $P = ₹\ 4000, R = 2\frac{1}{2}\%$, Time $= 2$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 4000 \times \left(1 + \frac{5}{200}\right)^2$$

$$= 4000 \times \frac{205}{200} \times \frac{205}{200}$$

$$A = \frac{2 \times 205 \times 205}{20} = ₹\ 4202.5$$

$$\text{C.I.} = A - P = 4202.5 - 4000$$

Thus, $\text{C.I.} = ₹\ 202.5$

7. $P = 8000, R = 5\%, T = 3$ years

$$A = 8000\left(1 + \frac{5}{100}\right)^3$$

$$= 8000\left(\frac{105}{100}\right)^3$$

$$= 8000\left(\frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}\right)$$

$$A = 441 \times 21 = ₹\ 9261$$

$$\text{C.I.} = A - P = 9261 - 8000$$

Thus, $\text{C.I.} = ₹\ 1261$

8. $P = ₹\ 16{,}000, R = 15\%, T = 3$ years

$$\text{Amount} = 16000\left(1 + \frac{15}{100}\right)^3$$

$$= 16000\left(\frac{115}{100}\right)^3 = 16000 \times \left(\frac{23}{20}\right)^3$$

$$= 16000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20}$$

$$= 2 \times 23 \times 23 \times 23$$

Thus, pay amount = ₹ 24334

9. P = ₹ 46,875, R = 4%, T = 3 years

(i) Interest for first year $= \frac{P \times R \times T}{100} = \frac{46{,}875 \times 4 \times 1}{100}$

$$= \frac{46{,}875}{25} = ₹\ 1875$$

(ii) Amount of 2nd year $= 46875\left(1 + \frac{4}{100}\right)^2$

$$= 46875\left(\frac{104}{100}\right)^2$$

$$= 46875 \times \frac{26}{25} \times \frac{26}{25} = 75 \times 26 \times 26$$

Amount = ₹ 50700

C.I. = A − P

= 50700 − 46875

= ₹ 3825

(iii) Amount $= 46875\left(1 + \frac{4}{100}\right)^3 = 46875\left(\frac{104}{100}\right)^3$

$$= 46875 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$= 3 \times 26 \times 26 \times 26 = ₹\ 52728$$

C.I. = A.P. = 52728 − 46875

C.I. = ₹ 5853

Interest for third year = 5853 − 3825 = ₹ 2028

10. P = ₹ 6000, R = 10%, T = 3 years

C.I. for first year $= \frac{6000 \times 10 \times 1}{100} = ₹\ 600$

C.I. of second year $= \frac{(6000 + 600) \times 10 \times 1}{100}$

$$= \frac{6600 \times 10}{100} = ₹\ 660$$

C.I. of third year $= \frac{(6600 + 660) \times 10}{100}$

$$= 7260 \times \frac{1}{10} = ₹\ 726$$

C.I. for 3 years = 600 + 660 + 726 = ₹ 1986

Amount = 6000 + 1986 = ₹ 7986

11. $P = ₹\ 5000, R_1 = 6\%, R_2 = 8\%, T = 2$ years

$$\text{Amount} = 5000\left(1 + \frac{6}{100}\right)\left(1 + \frac{8}{100}\right)$$

$$= 5000 \times \frac{106}{100} \times \frac{108}{100}$$

$$\text{Amount} = \frac{5}{10} \times 11448 = ₹\ 5724$$

$$\text{C.I.} = A - P$$

$$= 5724 - 5000 = ₹\ 724$$

12. $P = 20{,}000, R = 8\%, T = 2$ years

We know that

$$\text{Difference between C.I. and S.I.} = P\left(\frac{R}{100}\right)^2$$

$$= 20{,}000\left(\frac{8 \times 8}{100 \times 100}\right)$$

$$= \frac{20{,}000 \times 64}{100 \times 100} = 64 \times 2$$

$$\text{Difference} = ₹\ 128$$

Thus, difference between compound interest and simple interest.

Exercise 11 B

1. Principal = ₹ 625, Rate = 4%, Time = 2 years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 625\left(1 + \frac{4}{100}\right)^2 = 625 \times \left(\frac{104}{100}\right)^2$$

$$\text{Amount} = 625 \times \frac{26}{25} \times \frac{26}{25} = ₹\ 676$$

2. $P = ₹\ 2000, R = 4\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 2000\left(1 + \frac{4}{100}\right)^3$$

$$= 2000\left(\frac{104}{100}\right)^3$$

$$= 2000 \times \frac{26}{25} \times \frac{26}{25} \times \frac{26}{25}$$

$$= \frac{3.2 \times 26 \times 26 \times 26}{25} = \frac{56243.2}{25}$$

$$\text{Amount} = ₹\ 2249.728 = ₹\ 2249.73$$

3. $P = ₹\ 3000, R = 5\%, T = 2$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 3000\left(1 + \frac{5}{100}\right)^2$$

$$= 3000\left(\frac{105}{100}\right)^2 = 3000 \times \frac{21}{20} \times \frac{21}{20}$$

$$= 7.5 \times 21 \times 21$$

$$\text{Amount} = ₹\ 3307.5$$

4. $P = ₹5000, R = 10\%, T = 2$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 5000\left(1 + \frac{10}{100}\right)^2$$

$$= 5000\left(\frac{110}{100}\right)^2 = 5000 \times \left(\frac{11}{10}\right)^2$$

$$= 5000 \times \frac{11}{10} \times \frac{11}{10} = 50 \times 121$$

$$\text{Amount} = ₹\ 6050$$

5. $P = ₹\ 8000, R = 15\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 8000\left(1 + \frac{15}{100}\right)^3$$

$$= 8000 \times \left(\frac{115}{100}\right)^3 = 8000 \times \left(\frac{23}{20}\right)^3$$

$$= 8000 \times \frac{23}{20} \times \frac{23}{20} \times \frac{23}{20}$$

$$= 23 \times 23 \times 23$$

$$\text{Amount} = ₹\ 12167$$

6. $P = ₹\ 1000, R = 10\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 1000\left(1 + \frac{10}{100}\right)^3$$

$$= 1000 \times \left(\frac{110}{100}\right)^3 = 1000 \times \left(\frac{11}{10}\right)^3$$

$$= \frac{1000 \times 11 \times 11 \times 11}{10 \times 10 \times 10}$$

$$= 11 \times 11 \times 11$$

$$\text{Amount} = ₹\ 1331$$

Thus, Palak will pay amount ₹ 1331.

7. $P = ₹\ 4000, R = 2.5\%, T = 2$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 4000\left(1 + \frac{2.5}{100}\right)^2$$

$$= 4000 \times \left(\frac{1025}{1000}\right)^2 = 4000 \times \left(\frac{41}{40}\right)^2$$

$$= 4000 \times \frac{41}{40} \times \frac{41}{40}$$

$$= \frac{10 \times 41 \times 41}{4} = \frac{16810}{4}$$

$$\text{Amount} = ₹\ 4202.5$$

8. $P = ₹\ 1{,}80{,}000, R = 11\frac{1}{4}\%, T = 2\frac{1}{2}$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^1 \left(1 + \frac{R}{100}\right)^{1/2}$$

$$= 1{,}80{,}000\left(1 + \frac{45}{400}\right)^2 \left(1 + \frac{45}{4 \times 2 \times 100}\right)$$

$$= 1{,}80{,}000\left(1 + \frac{9}{80}\right)^2 \left(1 + \frac{9}{160}\right)$$

$$= 1{,}80{,}000\left(\frac{89}{80} \times \frac{89}{80}\right)\left(\frac{169}{160}\right)$$

$$= \frac{180}{8 \times 8 \times 16} \times 89 \times 89 \times 169$$

$$= \frac{240956820}{64 \times 16} = \frac{3764950.31}{16}$$

$$\text{Amont} = ₹\ 235309.39$$

9. $P = ₹\ 1{,}20{,}000, R = 12\%, T = 4$ years

$$\text{Simple Interest} = \frac{P \times R \times T}{100} = \frac{1{,}20{,}000 \times 12 \times 4}{100}$$

$$= 1200 \times 12 \times 4$$

$$\text{S.I.} = ₹\ 57600 \quad \ldots(i)$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 1{,}20{,}000\left(1 + \frac{12}{100}\right)^4$$

$$= 1{,}20{,}000\left(\frac{112}{100}\right)^4$$

$$= 1{,}20{,}000 \times \left(\frac{28}{25}\right)^4$$

$$= 1{,}20{,}000 \times \frac{28}{25} \times \frac{28}{25} \times \frac{28}{25} \times \frac{28}{25}$$

$$\text{Amount} = ₹\ 188822.32$$

$$\text{C.I.} = A - P = 188822.32 - 1{,}20{,}000$$

$$\text{C.I.} = ₹\ 68822.32 \quad \ldots(ii)$$

Difference between C.I. and S.I.

$$= 68822.32 - 57600 = ₹\ 11222.32$$

10. $P = ₹\ 1{,}00{,}000, R_1 = 6\frac{1}{2}\%, R_2 = 8\frac{1}{4}\%, R_3 = 10\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 100000\left(1 + \frac{13}{200}\right)\left(1 + \frac{33}{400}\right)\left(1 + \frac{10}{100}\right)$$

$$= 100{,}000\left(\frac{213}{200}\right) \times \left(\frac{433}{400}\right)\left(\frac{110}{100}\right)$$

$$\text{Amount} = \frac{213 \times 433 \times 110}{80} = ₹\ 126814.88$$

11. $P = ₹\ 60{,}000, R = 10\%, T = 3\frac{1}{2}$ years

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{60{,}000 \times 10 \times 7}{2 \times 100}$$

$$\text{S.I.} = 3000 \times 7 = ₹\ 21000$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^3 \left(1 + \frac{R}{200}\right)^{1/2}$$

$$= 60{,}000\left(1 + \frac{10}{100}\right)^3 \left(1 + \frac{1}{2} \times \frac{10}{100}\right)$$

$$= 60{,}000\left(\frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}\right)\left(\frac{21}{20}\right)$$

$$= \frac{6 \times 11 \times 11 \times 11 \times 21}{2} = ₹\ 83853$$

$$\text{C.I.} = A - P = 83853 - 60{,}000 = ₹\ 23853$$

Difference between C.I. and S.I. $= 23853 - 21000 = ₹\ 2853$

12. $P = ₹\ 18{,}000, A = ₹\ 20{,}480, T = 2$ years, $R = ?$

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$20480 = 18000\left(1+\frac{R}{100}\right)^2$$

$$\frac{20480}{18000} = \left(1+\frac{R}{100}\right)^2$$

$$\frac{1024}{900} = \left(1+\frac{R}{100}\right)^2$$

$$\left(\frac{32}{30}\right)^2 = \left(1+\frac{R}{100}\right)^2$$

Comparing both side :

$$\frac{32}{30} = 1+\frac{R}{100}$$

$$\frac{32}{30}-1 = \frac{R}{100}$$

$$\frac{2}{30} = \frac{R}{100} \Rightarrow R = \frac{2\times 100}{30}$$

$$R = \frac{20}{3}\%$$

Exercise 11C

1. $P = ₹\ 4096, R = 12\frac{1}{2}\%, T = 18$ months for half yearly

$$R = \frac{25}{2}\times\frac{1}{2}, T = 18\times 2 = 36 \text{ month} = 3 \text{ years}$$

$$A = P\left(1+\frac{R}{100}\right)^T = 4096\left(1+\frac{25}{4\times 100}\right)^3$$

$$= 4096\left(1+\frac{1}{4\times 4}\right)^3 = 4096\left(1+\frac{1}{16}\right)^3$$

$$= 4096\times\frac{17}{16}\times\frac{17}{16}\times\frac{17}{16}$$

$$\text{Amount} = 17\times 17\times 17 = ₹\ 4913$$

2. $P = ₹\ 700, R = 20\%, T = 1 \text{ year} = \frac{1}{2}$ year

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^1\left(1+\frac{R}{100}\right)^{1/2}$$

$$= 700\left(1+\frac{20}{100}\right)\left(1+\frac{1}{2}\times\frac{20}{100}\right)$$

$$= 700 \times \left(\frac{6}{5}\right)\left(\frac{11}{10}\right)$$

$$\text{Amount} = 14 \times 6 \times 11 = ₹\ 924$$

$$\text{C.I.} = A - P = 924 - 700$$

$$\text{C.I.} = ₹\ 224$$

3. $P = ₹\ 1000, R = 2\%, T = 1$ year (Take half yearly)

$$R = \frac{2}{2} = 1\%,\ T = 2 \times 1 = 2 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 1000\left(1 + \frac{1}{100}\right)^2$$

$$= 1000 \times \frac{101}{100} \times \frac{101}{100}$$

$$\text{Amount} = \frac{101 \times 101}{10} = ₹\ 1020.1$$

4. $P = ₹\ 256, R = 12\frac{1}{2}\% = \frac{25}{2}\%, T = 1$ year (half-yearly)

$$R = \frac{\frac{25}{2}}{2} = \frac{25}{4}\%, T = 2 \times 1 = 2 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 256\left(1 + \frac{25}{4 \times 100}\right)^2$$

$$= 256\left(1 + \frac{1}{4 \times 4}\right)^2 = 256\left(\frac{17}{16} \times \frac{17}{16}\right)$$

$$= 17 \times 17$$

$$\text{Amount} = ₹\ 289$$

5. $P = ₹\ 8000, R = 10\%, T = 1\frac{1}{2} = \frac{3}{2}$ years

$$R = \frac{10}{2} = 5\%, T = \frac{3}{2} \times 2 = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 8000\left(1 + \frac{5}{100}\right)^3$$

$$= 8000\left(\frac{105}{100}\right)^3 = 8000 \times \left(\frac{21}{20}\right)^3$$

$$= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$\text{Amount} = 21 \times 21 \times 21 = ₹\ 9261$$

6. $P = ₹\ 8192, R = 12.5\%, T = 1\frac{1}{2}$ years (half-yearly)

$$R = \frac{12.5}{2} = \frac{25}{4}\%, T = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 8192\left(1 + \frac{25}{4 \times 100}\right)^3$$

$$= 8192\left(1 + \frac{1}{4 \times 4}\right)^3 = 8192 \times \left(\frac{17}{16}\right)^3$$

$$= \frac{8192 \times 17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$= 2 \times 17 \times 17 \times 17$$

$$\text{Amount} = ₹\ 9826$$

7. $P = ₹\ 64{,}000, R = 5\%, T = \frac{3}{2}$ years (half-yearly)

$$R = \frac{5}{2}\%, T = \frac{2 \times 3}{2} = 2 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^2 = 64{,}000\left(1 + \frac{5}{2 \times 100}\right)^3$$

$$= 64{,}000\left(\frac{41}{40}\right)^3$$

$$= 64{,}000 \times \frac{41}{40} \times \frac{41}{40} \times \frac{41}{40}$$

$$\text{Amount} = 41 \times 41 \times 41 = ₹\ 68921$$

$$\text{C.I.} = A - P = 68921 - 64000$$

$$\text{C.I.} = ₹\ 4921$$

8. $P = ₹\ 40{,}960, R = 12.5\%, T = \left(\frac{3}{2} \text{ years}\right)$ (half-yearly)

$$R = \frac{12.5}{2} = \frac{25}{4}\%, T = 2 \times \frac{3}{2} = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 40960\left(1 + \frac{25}{4 \times 100}\right)^3$$

$$= 40960\left(1 + \frac{1}{4 \times 4}\right)^3 = 40960\left(\frac{17}{16}\right)^3$$

$$= \frac{40960 \times 17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$\text{Amount} = 10 \times 17 \times 17 \times 17 = ₹\ 49130$$

$$\text{C.I.} = A - P = 49130 - 40960$$

$$\text{C.I.} = ₹\ 8170$$

Exercise 11D

1. (i) $P = ₹\ 1{,}56{,}250, R = 8\%, T = \frac{3}{2}$ years (half-yearly)

$$R = \frac{8}{2} = 4\%, T = 2 \times \frac{3}{2} = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 156250\left(1 + \frac{4}{100}\right)^3$$

$$= 1{,}56{,}250\left(1 + \frac{1}{25}\right)^3 = 156250 \times \left(\frac{26}{25}\right)^3$$

$$= 10 \times 26 \times 26 \times 26$$

$$\text{Amount} = ₹\ 175760$$

$$\text{C.I.} = A - P = 175760 - 156250$$

$$\text{C.I.} = ₹\ 19510$$

(ii) $P = 1{,}00{,}000, R = 4\%, T = 9$ months (quarterly)

$$R = \frac{4}{4} = 1\%, T = 9 \times 4 = 36 \text{ months} = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 100000\left(1 + \frac{1}{100}\right)^3$$

$$= 100000 \times \left(\frac{101}{100}\right)^3$$

$$\text{Amount} = \frac{101 \times 101 \times 101}{10} = ₹\ 103030.1$$

$$\text{C.I.} = A - P = 103030 - 100000$$

$$\text{C.I.} = ₹\ 3030$$

2. $P = ₹\ 2500, R = 4\%, T = 2$ years (semi-annually)

$$R = \frac{4}{2} = 2\%, T = 2 \times 2 = 4 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 2500\left(1 + \frac{2}{100}\right)^4 = 2500 \times \left(\frac{51}{50}\right)^4$$

$$= 2500 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50}$$

$$\text{Amount} = \frac{6765201}{2500} = ₹\ 2706.08$$

$$\text{C.I.} = A - P = 2706.08 - 2500$$

$$\text{C.I.} = ₹\ 206.08$$

$$\text{S.I.} = \frac{P \times R \times T}{100} = \frac{2500 \times 2 \times 4}{100} = ₹\ 200$$

Difference between C.I. and S.I. $= 206.08 - 200 = ₹\ 6.08$

3. $P = ₹\ 3125, R_1 = 4\%, R_2 = 5\%, R_3 = 6\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 3125\left(1 + \frac{4}{100}\right)\left(1 + \frac{5}{100}\right)\left(1 + \frac{6}{100}\right)$$

$$= 3125 \times \frac{26}{25} \times \frac{21}{20} \times \frac{106}{100}$$

$$= \frac{125 \times 26 \times 21 \times 106}{2000} = \frac{3617250 \times 2}{2000}$$

$$\text{Amount} = ₹\ 3617.25$$

$$\text{C.I.} = A - P = 3617.25 - 3125$$

$$\text{C.I.} = ₹\ 492.25$$

4. $A = ₹\ 4913, R = 12\frac{1}{2}\%, T = \frac{3}{2}$ years (half-yearly)

$$R = \frac{25}{4}\%, T = 2 \times \frac{3}{2} = 3 \text{ years}$$

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$4913 = P\left(1 + \frac{25}{4 \times 100}\right)^3$$

$$4913 = P\left(1 + \frac{1}{4 \times 4}\right)^3 = P \times \frac{17}{16} \times \frac{17}{16} \times \frac{17}{16}$$

$$P = 16 \times 16 \times 16 = ₹\ 4096$$

5. $P = ₹\ 2000$, C.I. $= ₹\ 163.2, R = 4\%, T = ?$

$$\text{C.I.} = A - P$$

$$A = \text{C.I.} + P = 2000 + 163.2 = ₹\ 2163.2$$

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$2163.2 = 2000\left(1 + \frac{4}{100}\right)^T \quad \Rightarrow \quad \frac{2163.2}{2000} = \left(\frac{104}{100}\right)^T$$

$$= \frac{21632}{20000} = \left(\frac{104}{100}\right)^T \quad \Rightarrow \quad \frac{10816}{10000} = \left(\frac{104}{100}\right)^T$$

$$\left(\frac{104}{100}\right)^2 = \left(\frac{104}{100}\right)^T$$

$\Rightarrow$ comparing both side, $T = 2$ years

6. $P = ?$, C.I. = ₹ 331, $R = 10\%$, $T = 3$ years

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$A = P\left(1 + \frac{10}{100}\right)^3 \qquad \ldots(i)$$

$$\text{C.I.} = A - P$$

$$A = \text{C.I.} + P = 331 + P$$

Put in eqn. (i),

$$331 + P = P\left(1 + \frac{1}{10}\right)^3$$

$$331 + P = P\left(\frac{11}{10}\right)^3$$

$$331 + P = P\left(\frac{1331}{1000}\right)$$

$$331 \times 1000 + 1000P = 1331P$$

$$1331P - 1000P = 331 \times 1000$$

$$331P = 331 \times 1000$$

$$P = ₹\ 1000$$

Thus, principal is ₹ 1000.

7. C.I. = 1290, $P = ?$, $R = 15\%$, $T = 2$ years.

$$A = P\left(1 + \frac{15}{100}\right)^2 \qquad \ldots(i)$$

$$\text{C.I.} = A - P \quad \Rightarrow \quad A = \text{C.I.} + P = 1290 + P$$

Put in eqn. (i),

$$1290 + P = P\left(1 + \frac{3}{20}\right)^2$$

$$1290 + P = P\left(\frac{23}{20}\right)^2$$

$$1290 \times 400 + 400P = 529P$$

$$129P = 1290 \times 400$$

$$P = 10 \times 400 = ₹\ 4000$$

8. $P = ₹\ 8000, A = ₹\ 9261, R = 10\%$ (half-yearly), $T = ?$

$$R = \frac{10}{2} = 5\%$$

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$\frac{9261}{8000} = \left(1 + \frac{5}{100}\right)^T$$

$$\frac{9261}{8000} = \left(1 + \frac{1}{20}\right)^T$$

$$\frac{9261}{8000} = \left(\frac{21}{20}\right)^T$$

$$\left(\frac{21}{20}\right)^3 = \left(\frac{21}{20}\right)^T$$

Comparing both side and taking half-yearly

$$T = \frac{3}{2} \text{ years} = 1\frac{1}{2} \text{ years}$$

9. $P = ₹\ 1000, A = ₹\ 1331, T = 3$ years, $R = ?$

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$1331 = 1000\left(1 + \frac{R}{100}\right)^3$$

$$\frac{1331}{1000} = \left(1 + \frac{R}{100}\right)^3$$

$$\left(\frac{11}{10}\right)^3 = \left(1 + \frac{R}{100}\right)^3$$

Comparing both side,

$$\frac{11}{10} = 1 + \frac{R}{100}$$

$$\frac{11}{10} - 1 = \frac{R}{100}$$

$$\frac{1}{10} = \frac{R}{100}$$

$$R = 10\%$$

Thus, Rate is 10%

10. $P = ₹\ 26400, R = 15\%, T = 2 \text{ year } \frac{4}{12} = 2 + \frac{1}{3} = 2\frac{1}{3}$ years

$$\text{Amount} = P\left(1+\frac{R}{100}\right)^2\left(1+\frac{R}{100}\right)^{1/3}$$

$$= 26400\left(1+\frac{15}{100}\right)^2\left(1+\frac{15}{3\times 100}\right)$$

$$= 26400\left(1+\frac{3}{20}\right)^2\left(1+\frac{3}{3\times 20}\right)$$

$$= 26400\left(\frac{23}{20}\right)^2\times\left(\frac{21}{20}\right)$$

$$= \frac{26400\times 23\times 23}{20\times 20}\times\frac{21}{20}$$

$$= \frac{33\times 23\times 23\times 21}{10} = \frac{366597}{10}$$

$$\text{Amount} = ₹\ 36659.7$$

11. $P = ₹\ 18000, R = 8\%, T = 2$ years

$$\text{S.I.} = \frac{P\times R\times T}{100} = \frac{18000\times 8\times 2}{100} = ₹\ 2880$$

$$\text{Amount} = 18000\left(1+\frac{8}{100}\right)^2 = 18000\left(1+\frac{2}{25}\right)^2$$

$$= 18000\times\frac{27}{25}\times\frac{27}{25} = 288\times 27\times 27$$

$$A = ₹\ 20995.2$$

$$\text{C.I.} = A - P = 20995.2 - 18000$$

$$\text{C.I.} = ₹\ 2995.2$$

Difference between C.I. and S.I. $= 2995.2 - 2880 = ₹\ 115.2$

12. $P = 86000, R = 5\%, T = 2$ years

$$\text{S.I.} = \frac{P\times R\times T}{100} = \frac{86000\times 5\times 2}{100} = ₹\ 8600$$

$$\text{Amount} = 86000\left(1+\frac{5}{100}\right)^2 = 86000\times\frac{21}{20}\times\frac{21}{20}$$

$$= 215\times 21\times 21$$

$$A = ₹\ 94815$$

$$\text{C.I.} = A - P = 94815 - 86000$$

$$\text{C.I.} = ₹\ 8815$$

Difference between C.I. and S.I. $= 8815 - 8600 = ₹\ 215$

Exercise 11E

1. $P = ₹\ 16{,}000, R = 5\%, T = 2$ years

$$\text{Value of boat} = P\left(1-\frac{R}{100}\right)^T = 16{,}000\left(1-\frac{5}{200}\right)^2$$

$$= 16{,}000\left(1-\frac{1}{20}\right)^2 = 16{,}000\left(\frac{19}{20}\times\frac{19}{20}\right)$$

$$= 40\times 19\times 19$$

$$\text{Value of boat} = ₹\ 14440$$

2. $P = ₹\ 100{,}000,\ R = 10\%,\ T = 3$ years

$$\text{Value of residential flat} = P\left(1-\frac{10}{100}\right)^3 = 100000\left(1-\frac{1}{10}\right)^3$$

$$= 100000\left(\frac{9}{10}\times\frac{9}{10}\times\frac{9}{10}\right)$$

$$= 100\times 729$$

$$\text{Value or residential flat} = ₹\ 72900$$

3. $P = 1250,\ R = 20\%,\ T = 3$

$$\text{Number of dogs in city} = P\left(1-\frac{R}{100}\right)^T = 1250\left(1-\frac{20}{100}\right)^3$$

$$= 1250\left(1-\frac{1}{5}\right)^3 = 1250\left(\frac{4}{5}\times\frac{4}{5}\times\frac{4}{5}\right)$$

$$= 10\times 4\times 4\times 4$$

$$\text{Number of dogs in city} = ₹\ 640$$

4. $P = 8000,\ R = 10\%,\ T = 3$ years

$$\text{Blood donors} = P\left(1+\frac{R}{100}\right)^T = 8000\left(1+\frac{10}{100}\right)^3$$

$$= 8000\left(\frac{11}{10}\times\frac{11}{10}\times\frac{11}{10}\right)$$

$$= 8\times 1331 = 10648$$

$$\text{New registrations} = 10648 - 8000 = 2648$$

5. $P = ₹\ 9{,}000,\ R = 5\%,\ T = 2$ years

$$\text{Cost of refrigerator after two year} = P\left(1-\frac{R}{100}\right)^2$$

$$= 9000\left(1-\frac{5}{100}\right)^2$$

$$= 9000\left(1-\frac{1}{20}\right)^2$$

$$= 9000\left(\frac{19}{20}\times\frac{19}{20}\right)$$

$$= \frac{90}{4} \times 19 \times 19 = 22.5 \times 19 \times 19$$

$$= 8122.5$$

Total depreciation value $= 9000 - 8122.5 = ₹\ 877.5$

6. Produced quintals $= 2187$, $R = 8\%$, $T = 2$ years

$$2187 = P\left(1 + \frac{8}{100}\right)^2 = P\left(1 + \frac{2}{25}\right)^2$$

$$2187 = P\left(\frac{27}{25} \times \frac{27}{25}\right)$$

$$P = \frac{2187}{27 \times 27} \times 25 \times 25 = 3 \times 25 \times 25$$

$$P = 1875$$

Thus, two years ago produce quintal is 1875.

7. Present value $= ₹\ 411540$, $R = 5\%$, $T = 3$ years

$$411540 = P\left(1 - \frac{5}{100}\right)^3$$

$$411540 = P\left(1 - \frac{1}{20}\right)^3$$

$$411540 = P \times \frac{19}{20} \times \frac{19}{20} \times \frac{19}{20}$$

$$60 = \frac{P}{8000}$$

$$P = 4{,}80{,}000$$

Thus, value is three year ago is ₹ 480,000.

8. $P = ₹\ 16{,}000$, depreciates value $= ₹\ 14440$, $R = ?$, $T = 2$

$$14440 = 16000\left(1 - \frac{R}{100}\right)^2$$

$$\frac{14440}{16000} = \left(1 - \frac{R}{100}\right)^2$$

$$\left(\frac{38}{40}\right)^2 = \left(1 - \frac{R}{100}\right)^2$$

Comparing both side :

$$\frac{38}{40} = 1 - \frac{R}{100}$$

$$\frac{R}{100} = 1 - \frac{38}{40}$$

$$\frac{R}{100} = \frac{2}{40}$$

$$R = 5\%$$

Thus, Rate is 5%

9. $P = ₹\ 80{,}000$ to 92,610, $R = ?, T = 3$

$$92610 = 80000\left(1 + \frac{R}{100}\right)^3$$

$$\frac{9261}{8000} = \left(1 + \frac{R}{100}\right)$$

$$\left(\frac{21}{20}\right)^3 = \left(1 + \frac{R}{100}\right)^3$$

Comparing both side :

$$\frac{21}{20} = 1 + \frac{R}{100}$$

$$\frac{21}{20} - 1 = \frac{R}{100}$$

$$\frac{1}{20} = \frac{R}{100}$$

$$R = 5\%$$

10. $P = 4{,}000, R_1 = 5\%$ (increase), $R_2 = 5\%$ (decrease), $R_3 = 10\%$ (decrease)

$$\text{Travellers} = 4000\left(1 + \frac{5}{100}\right)\left(1 - \frac{5}{100}\right)\left(1 - \frac{10}{100}\right)$$

$$= 4000\left(\frac{21}{20} \times \frac{19}{20} \times \frac{9}{10}\right)$$

$$= \frac{4000}{4000} \times 21 \times 19 \times 9$$

$$= 21 \times 19 \times 9 = 3591$$

Thus, number of ticketless travellers is 3591.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. $P = ₹\ 1000, R = 10\%, T = 3$ years

$$\text{Amount} = 1000\left(1 + \frac{10}{100}\right)^3$$

$$= 1000\left(1 + \frac{1}{10}\right)^3$$

$$= 1000\left(\frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}\right)$$

$$= 1000 \times \frac{11 \times 11 \times 11}{1000} = 11 \times 11 \times 11$$

Amount $= ₹\ 1331$

C.I. $= A - P = 1331 - 1000 = ₹\ 331$

3. $P = ₹\ 16{,}000, R = 12\frac{1}{2}\%, T = 3$ years.

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T$$

$$= 16{,}000\left(1 + \frac{25}{200}\right)^3$$

$$= 16000\left(1 + \frac{1}{8}\right)^3 = 16000 \times \frac{9}{8} \times \frac{9}{8} \times \frac{9}{8}$$

$$= 31.25 \times 9 \times 81$$

$A = ₹\ 22781.25$

C.I. $= A - P = 22781.25 - 16000$

C.I. $= ₹\ 6781.25$

4. $P = ₹\ 2400, R = 20\%, T = 3$ years

$$A = P\left(1 + \frac{R}{100}\right)^T = 2400\left(1 + \frac{20}{100}\right)^3$$

$$= 2400\left(1 + \frac{1}{5}\right)^3 = 2400 \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5}$$

$A = 19.2 \times 36 \times 6 = ₹\ 4147.2$

C.I. $= A - P = 41472.2 - 2400$

Mohit will pay C.I. $= 1747.2$

5. $P = ₹\ 50{,}000, R = 12\%, T = 2\frac{1}{2}$ years

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$= 50{,}000\left(1 + \frac{12}{100}\right)^2\left(1 + \frac{12}{100}\right)^{1/2}$$

$$= 50{,}000 \times \frac{28}{25} \times \frac{28}{25} \times \left(1 + \frac{1}{2} \times \frac{12}{100}\right)$$

$$= 80 \times 28 \times 28 \times \left(\frac{53}{50}\right)$$

$A = ₹\ 66483.2$

$$\text{C.I.} = A - P = 66483.2 - 50{,}000$$
$$\text{C.I.} = ₹\ 16483.2$$

6. $P = 130{,}000$, Rate $= 10\%$, $T = 15$ month (quarterly)

$$R = \frac{10}{4} = 2.5\%, T = 4 \times 15 = \frac{60}{12} = 5 \text{ years}$$

$$A = P\left(1 + \frac{R}{100}\right)^T$$

$$= 130{,}000\left(1 + \frac{2.5}{100}\right)^5$$

$$= 130{,}000\left(1 + \frac{1}{40}\right)^5 = 130{,}000\left(\frac{41}{40}\right)^5$$

$$= \frac{130{,}000 \times 41 \times 41 \times 41 \times 41 \times 41}{40 \times 40 \times 40 \times 40 \times 40}$$

$$= \frac{0.0126 \times 41 \times 41 \times 41 \times 41 \times 41}{10}$$

$$A = ₹\ 147083.07$$

Thus, amount is ₹ 147083.07.

7. $P = ₹\ 2{,}20{,}000$, $R = 12\%$, $T = 2\frac{1}{2}$ years

$R = \frac{12}{2} = 6\%$, $T = 2 \times \frac{5}{2} = 5$ years (half-yearly)

$$A = 2{,}20{,}000\left(1 + \frac{12}{100}\right)^2 \left(1 + \frac{12}{100}\right)^{1/2}$$

$$= 2{,}20{,}000\left(\frac{28}{25} \times \frac{28}{25}\right)\left(1 + \frac{1}{2} \times \frac{12}{100}\right)$$

$$= 352 \times 28 \times 28 \times \frac{53}{50}$$

$$= 7.04 \times 28 \times 28 \times 53$$

$$A = 292526.08$$
$$\text{C.I.} = A - P = 292526.08 - 2{,}20{,}000$$
$$\text{C.I.} = ₹\ 72526.08$$

For half-yearly

$$A = 2{,}20{,}000\left(1 + \frac{6}{100}\right)^5$$

$$= 2{,}20{,}000 \times \left(\frac{53}{50}\right)^5 = ₹\ 294409.62$$

$$\text{C.I.} = A - P = 74409.62$$
$$\text{Difference} = 74409.62 - 72526.08 = ₹\ 1883.54$$

8. $A = ₹\ 197018.63, R = 12\%, T = \frac{3}{2}$ years

$$R = \frac{12}{4} = 3\%, T = \frac{4 \times 3}{2} = 6 \text{ years (quarterly)}$$

$$197018.63 = P\left(1 + \frac{3}{100}\right)^6 = P\left(1 + \frac{3}{100}\right)^6$$

$$197018.63 = P \times \left(\frac{103}{100}\right)^6$$

$$P = \frac{197018.63 \times (100)^6}{(103)^6}$$

$$P = ₹\ 165000$$

Thus, money required is ₹ 165000.

9. $P = ₹\ 1600, A = 1852.2, T = \frac{3}{2}$ years, $R = 9$

$$= 2\frac{3}{2} = 3 \text{ (half yearly)}$$

$$1852.2 = 1600\left(1 + \frac{R}{100}\right)^3$$

$$\frac{1852.2}{16000} = \left(1 + \frac{R}{100}\right)^3$$

$$\frac{9261}{8000} = \left(1 + \frac{R}{100}\right)^3$$

$$\left(\frac{21}{20}\right)^3 = \left(1 + \frac{R}{100}\right)^3$$

Comparing both side :

$$\frac{21}{20} - 1 = \frac{R}{100}$$

$$\frac{1}{20} = \frac{R}{100}$$

$R = 5\%$, but half-yearly $= 10\% = 5 \times 2$

10. $P = ₹\ 2400, R = 20\%, T = 3$ years

$$A = P\left(1 + \frac{R}{100}\right)^T = 2400\left(1 + \frac{20}{100}\right)^3$$

$$= 2400\left(1 + \frac{1}{5}\right)^3 = 2400 \times \frac{6}{5} \times \frac{6}{5} \times \frac{6}{5}$$

$$= 19.2 \times 216$$

$$A = ₹\ 4147.2$$

11. $P = ₹\ 16{,}000, R = \frac{25}{2}\%, T = 3$ years

$$A = P\left(1 + \frac{R}{100}\right)^T = 16000\left(1 + \frac{25}{2 \times 100}\right)^3$$

$$= 16000\left(1 + \frac{1}{2 \times 4}\right)^3$$

$$= 16000\left(\frac{9}{8} \times \frac{9}{8} \times \frac{9}{8}\right)$$

$$= 31.25 \times 729$$

$$A = ₹\ 22781.25$$

Thus, amount payable is ₹ 22781.25

12. $P = ₹\ 8000, R = 5\%, T = 3$ years

$$\text{Amount} = P\left(1 + \frac{R}{100}\right)^T = 8000\left(1 + \frac{5}{100}\right)^3$$

$$= 8000\left(1 + \frac{1}{20}\right)^3 = 8000\left(\frac{21}{20}\right)^3$$

$$= 8000 \times \frac{21}{20} \times \frac{21}{20} \times \frac{21}{20}$$

$$= 21 \times 21 \times 21$$

$$\text{Amount} = ₹\ 9261$$

Thus, amount of Sachin is ₹ 9261.

12. Direct and Inverse Variation

Exercise 12 A

1. Do it yourself.

2. Do it yourself.

3. Let charge for a journey = ₹ x

We know that

$$\frac{100}{1800} = \frac{120}{x}$$

$$x = 120 \times 18$$

$$x = ₹\ 2160$$

Thus, cost of 120 km is ₹ 2160.

4. Let articles $= x$

$$\frac{27}{1890} = \frac{x}{1750}$$

$$x = \frac{27 \times 175}{189}$$

$$x = 25$$

Thus, article of ₹ 1750 is 25.

5. Let rice $= x$ kg

$$\frac{7}{1120} = \frac{x}{3680}$$

$$x = \frac{7 \times 368}{112}$$

$$x = 23 \text{ kg}$$

Thus, weight of rice is 23 kg.

6. Let cost of notebooks $=$ ₹ x

$$\frac{6}{156} = \frac{54}{x}$$

$$x = \frac{54 \times 156}{6}$$

$$x = ₹\ 1404$$

Thus, cost of note-books is ₹ 1404.

7. Let men dig $= x$

We know that

$$\frac{MDH}{W} = \frac{MDH}{W}$$

$$\frac{22 \times 1}{27} = \frac{x \times 1}{135}$$

$$x = \frac{22 \times 135}{27}$$

$$x = 110$$

Thus, men is 110.

8. Let money $=$ ₹ x

$$\frac{73}{1000} = \frac{x}{100}$$

$$x = \frac{73 \times 100}{1000}$$

$$x = ₹\ 7.3$$

Thus, money of ₹ 100 is ₹ 7.3.

9. Let bottles $= x$

$$\frac{8}{5} = \frac{x}{40}$$

$$x = \frac{8 \times 40}{5} = 64 \text{ bottles}$$

Thus, bottles of 40 children is 64.

10. Let stamps $= x$

$$\frac{5}{18} = \frac{x}{36}$$

$$x = \frac{5 \times 36}{18}$$

$$x = 10 \text{ stamps}$$

Thus, stamps of ₹ 36 is 10.

11. Let tools $= x$

$$\frac{5}{120} = \frac{20}{x}$$

$$x = \frac{20 \times 120}{5}$$

$$x = 480 \text{ tools}$$

Thus, tools of 20 hours is 480.

12. Let thickness $= x$ cm.

$$\frac{500}{3.5} = \frac{275}{x}$$

$$x = \frac{275 \times 3.5}{500}$$

$$x = 1.925 \text{ cm}$$

Thus, thickness of 275 sheets is 1.925 cm.

13. Let words $= x$

$$\frac{\frac{540}{60}}{2} = \frac{x}{6}$$

$$x = \frac{540 \times 6}{30} = 108$$

Thus, words types in 6 minutes is 108.

14. Let distance $= x$ m

$$\frac{125}{100} = \frac{315}{x}$$

$$x = \frac{315 \times 4}{5} = 252 \text{ m}$$

Thus, distance of 315 steps is 252 m.

15. Let cost $= ₹\ x$

$$\frac{93}{1395} = \frac{105}{x}$$

$$x = \frac{105 \times 1395}{93}$$

$$x = ₹\ 1575$$

Thus, cost of 105 m is ₹ 1575.

Exercise 12B

1. Do it yourself. **2.** Do it yourself.

3. Let $\text{days} = x$

$$15 \times 50 = 60 \times x$$

$$x = \frac{15 \times 50}{60} = 12.5 \text{ days}$$

Thus, days of 60 cows graze is $12\frac{1}{2}$ days.

4. Let $\text{time} = x \text{ hours}$

$$20 \times 12 = 45 \times x$$

$$x = \frac{240}{45} = 5\frac{1}{3} \text{ hours}$$

Thus, time of 45 pumps is $5\frac{1}{3}$ hours.

5. Let $\text{speed} = x \text{ km/h}$

$$12 \times 20 = x \times 15$$

$$x = \frac{240}{15} = 16 \text{ km/h}$$

Thus, speed of 15 minutes is 16 km/h.

6. Let $\text{days} = x$

$$72 \times 25 = x \times 30$$

$$x = \frac{72 \times 25}{30} = 60 \text{ days}$$

Thus, days of 30 men is 60 days.

7. Let $\text{workers} = x$

$$56 \times 180 = x \times 70$$

$$x = \frac{56 \times 180}{70} = 144$$

Thus, workers of 70 hours is 144.

8. Let $\text{time} = x \text{ hours}$

$$6 \times 50 = x \times 75$$

$$x = \frac{300}{75} = 4 \text{ hours}$$

Thus, time of 75 km is 4 hours.

9. Let $\text{person} = x$

$$1800 \times 40 = x \times 24$$

$$x = \frac{72000}{24} = 3000 \text{ persons}$$

Thus, persons of 24 days is 3000.

10. Let time $= x$ weeks

$500 \times 8 = x \times 400$

$x = 10$ weeks.

Thus, weeks of 400 persons is 10.

11. Let bats $= x$

$39 \times 58 = (58 + 20) \times x$

$39 \times 58 = 78 \times x$

$$x = \frac{39 \times 58}{78}$$

$x = 29$ bats.

Thus, bats of ₹ 78 is 29.

12. Given : Persons $= 567$

Let extra persons $= x$

We know that,

$$\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}$$

$$567 \times 9 = (567 + x) \times 7$$

$$\frac{567 \times 9}{7} = (567 + x)$$

$$81 \times 9 = 567 + x$$

$$729 = 567 + x$$

$$x = 729 - 567$$

$x = 162$ persons

Thus, extra persons is 162.

Exercise 12C

1. Neeraj work = 10 days

Aman work = 12 days

Neeraj, Aman and Virat work = 4 days

Virat work = ?

We know that

$$\frac{1}{10} + \frac{1}{12} + \frac{1}{x} = \frac{1}{4}$$

$$\frac{1}{x} = \frac{1}{4} - \left(\frac{1}{10} + \frac{1}{12}\right)$$

$$= \frac{1}{4} - \left(\frac{6+5}{60}\right) = \frac{1}{4} - \frac{11}{60}$$

$$\frac{1}{x} = \frac{15-11}{60} = \frac{4}{60}$$

$$x = \frac{60}{4} = 15 \text{ days}$$

Thus, Viraj work in 15 days.

2. $$\text{Rajesh and Rahul work} = \frac{1}{20} \text{ parts}$$

$$\text{After 8 days} = \frac{8}{20} \text{ parts}$$

$$\text{Remaining work} = 1 - \frac{8}{20} = \frac{12}{20}$$

$$\text{Rahul whole work in 30 days} = \frac{12}{20} \times 30 = 18 \text{ days}$$

3. $$\text{A work} = 15 \text{ days}$$

$$\text{B work} = 20 \text{ days}$$

We know that

$$\text{A} + \text{B} = \frac{1}{15} + \frac{1}{20} = \frac{4+3}{60} = \frac{7}{60}$$

$$\text{After 6 days} = \frac{7}{60} \times 6 = \frac{42}{60}$$

$$\text{Remaining work} = 1 - \frac{42}{60} = \frac{60-42}{60} = \frac{18}{60}$$

$$\text{A completed work} = x \text{ days}$$

$$\frac{18}{60} = \frac{x}{15}$$

$$x = \frac{18}{4} = 4\frac{1}{2} \text{ days.}$$

Thus, a completed work $4\frac{1}{2}$ days.

4. $$\text{A} + \text{B} = \frac{1}{10}$$

$$\text{B} + \text{C} = \frac{1}{15}$$

$$\text{C} + \text{A} = \frac{1}{20}$$

$$2(A + B + C) = \frac{1}{10} + \frac{1}{15} + \frac{1}{20}$$

$$2(\text{A} + \text{B} + \text{C}) = \frac{6+4+3}{60}$$

$$\text{A} + \text{B} + \text{C} = \frac{13}{60} \times \frac{1}{2} = \frac{13}{120}$$

Thus, together work in $\frac{120}{13} = 9\frac{3}{13}$ days.

$$A = 24 \text{ days}$$

$$B = 17\frac{1}{7} \text{ days}$$

$$C = 120 \text{ days}$$

5. $$\text{Riya} + \text{Megha} = \frac{1}{6}$$

$$\text{Megha} + \text{Ekta} = \frac{1}{8}$$

$$\text{Ekta} + \text{Riya} = \frac{1}{4}$$

$$2\,(\text{Riya} + \text{Megha} + \text{Ekta}) = \frac{1}{6} + \frac{1}{8} + \frac{1}{4}$$

$$= \frac{4 + 3 + 6}{24} = \frac{13}{24}$$

$$\text{Riya} + \text{Megha} + \text{Ekta} = \frac{13}{48}$$

Thus, Riya + Megha + Ekta work

$$= \frac{48}{13} = 3\frac{9}{13} \text{ days}$$

$$\text{Megha work} = \frac{13}{48} - \frac{1}{4} = \frac{13 - 12}{48}$$

$$= \frac{1}{48} \text{ parts} = 48 \text{ days}$$

$$\text{Ekta work} = \frac{13}{48} - \frac{1}{6} = \frac{13 - 8}{48} = \frac{5}{48}$$

$$= \frac{48}{5} = 9\frac{3}{5} \text{ days}$$

$$\text{Riya work} = \frac{13}{48} - \frac{1}{8} = \frac{13 - 6}{48} = \frac{7}{48}$$

$$= \frac{48}{7} = 6\frac{6}{7} \text{ days.}$$

6. $$A \text{ work} = 40 \text{ days} = \frac{1}{40} \text{ parts}$$

$$8 \text{ days work} = 8 \times \frac{1}{40} = \frac{8}{40}$$

$$\text{Remaining work} = 1 - \frac{8}{40} = \frac{40 - 8}{40} = \frac{32}{40} = \frac{4}{5}$$

$$\text{Complete work} = \frac{4}{5}x = 16$$

$$B \text{ finish} = x = 20 \text{ days}$$

Together work,

$$A + B = \frac{1}{40} + \frac{1}{20} = \frac{1+2}{40} = \frac{3}{40}$$

$$A + B = \frac{40}{3} = 13\frac{1}{3}\text{ days}$$

Thus, together work in $13\frac{1}{3}$ days.

7. $A + B = \frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

$$A\text{ work} = \frac{5}{10} = \frac{1}{2}$$

$$\text{Remaining work} = \frac{\frac{1}{6}}{\frac{1}{2}} = \frac{1}{6} \times \frac{2}{1} = \frac{1}{3}$$

Thus, A and B worked together is 3.

8. Given : $3W \times 17 = 5G \times 17$

Let $\text{days} = x$

$$(7W + 11G) \times x = 3W \times 17$$

$$\left(7W + \frac{11 \times 3}{5}W\right) \times x = 3W \times 17$$

$$\left(\frac{35W + 33W}{5}\right)x = 51W$$

$$68W \times x = 255W$$

$$x = \frac{255}{68} = \frac{15}{4} = 3\frac{3}{4}\text{ days}$$

Thus, $(7W + 11G)$ work in $3\frac{3}{4}$ days.

9. $A + B + C = \frac{1}{2} + \frac{1}{6} + \frac{1}{3} = \frac{3+1+2}{6} = \frac{6}{6} = 1$

$$A + B + C = 1\text{ day}$$

$6 \longrightarrow ₹\ 960$

$1 \longrightarrow ₹\ 160$

$$A\text{ get} = 3 \times 160 = ₹\ 480$$

$$B\text{ get} = 1 \times 160 = ₹\ 160$$

$$C\text{ get} = 2 \times 160 = ₹\ 320$$

10. $A + B + C = \frac{1}{15}$

$$A\text{ days} = \frac{1}{15} - \left(\frac{1}{30} + \frac{1}{40}\right)$$

$$= \frac{1}{15} - \left(\frac{4+3}{120}\right) = \frac{1}{15} - \frac{7}{120}$$

$$\text{A days} = \frac{8-7}{120} = \frac{1}{120}$$

Thus, A days 120.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself. **2.** Do it yourself.

3. Do it yourself.

4.
$$12 \text{ pencils cost} = ₹\ 21$$
$$1 \text{ pencils cost} = \frac{21}{12}$$
$$1 \text{ score pencils} = 20$$
$$\text{Cost of one score pencils} = \frac{21}{12} \times 20$$
$$\text{Cost of one score pencils} = ₹\ 35$$

5. Labourer earns in one week = ₹ 672
$$7 \text{ days} = ₹\ 672$$
$$1 \text{ days} = ₹\ \frac{672}{7}$$
$$18 \text{ days} = ₹\ \frac{672}{7} \times 18$$
$$18 \text{ days} = 96 \times 18 = ₹\ 1728$$

6. Let
$$\text{dollars} = x$$
$$\frac{175}{7350} = \frac{x}{24024}$$
$$\frac{1}{42} = \frac{x}{24024}$$
$$x = \frac{24024}{42} = 572$$

Thus, dollars is 572.

7. Let
$$\text{distance} = x \text{ km}$$
$$\frac{67.5}{4.5} = \frac{x}{26.4}$$
$$15 = \frac{x}{26.4}$$
$$x = 15 \times 26.4 = 396 \text{ km}$$

Thus, distance in 26.4 Ltr is 396 km.

8. Let speed of car $= x$ km/h

$$60 \times 6 = x \times 5$$
$$x = \frac{60 \times 6}{5}$$
$$x = 12 \times 6$$
$$x = 72 \text{ km/h}$$

Thus, speed of car in 5 hours is 72 km/h.

9. Let Time $= x$ days

$$28 \times 20 = (28 - 4) \times x$$
$$28 \times 20 = 24 \times x$$
$$7 \times 10 = 3 \times x$$
$$x = \frac{70}{3}$$
$$= 23\frac{1}{3} \text{ days.}$$

10. Let time $= x$

$$8 \times 30 = 6 \times x$$
$$8 \times 5 = x$$
$$x = 40 \text{ min.}$$

Thus, time of 6 period is 40 minutes.

11. Let time $= x$ days

$$40 \times 30 = 25 \times x$$
$$8 \times 6 = x$$
$$x = 48 \text{ days}$$

Thus, 25 persons of days is 48.

12. A $\frac{1}{5}$ th of work $= 2$ days

$$\text{A of day} = 10 \text{ days}$$
$$\text{B } \frac{2}{3}\text{rd of work} = 8 \text{ days}$$
$$\text{B of days} = 12 \text{ days}$$
$$\text{A} + \text{B} = \frac{1}{10} + \frac{1}{12}$$
$$= \frac{6 + 5}{60}$$
$$= \frac{11}{60}$$
$$\text{(A + B) of days} = \frac{60}{11} = 5\frac{5}{11} \text{ days.}$$

13. One tap fills $= 20$ minutes

Another tap fill $= 12$ minutes

$$\text{Both of time} = \frac{1}{20} + \frac{1}{12} = \frac{3+5}{60} = \frac{8}{60}$$

$$\text{Both of time} = \frac{60}{8} = \frac{15}{2} = 7\frac{1}{2} \text{ minutes}$$

Thus, both top fills in $7\frac{1}{2}$ minutes.

14.

$$\text{A work} = 6 \text{ days}$$

$$\text{B work} = 8 \text{ days}$$

$$\text{A} + \text{B} = \frac{1}{6} + \frac{1}{8}$$

$$= \frac{4+3}{24}$$

$$= \frac{7}{24}$$

$$\text{2 days work both} = \frac{2 \times 7}{24} = \frac{14}{24} = \frac{7}{12}$$

$$\text{Remaining work} = 1 - \frac{7}{12} = \frac{5}{12}$$

$$\text{A require days} = \frac{\frac{5}{12}}{\frac{1}{6}}$$

$$= \frac{5}{12} \times \frac{6}{1}$$

$$= \frac{5}{2} = 2\frac{1}{2}$$

15.

$$\text{A farmer} = 10 \text{ days}$$

$$\text{Wife} = 8 \text{ days}$$

$$\text{Both work} = \frac{1}{8} + \frac{1}{10}$$

$$= \frac{5+4}{40}$$

$$= \frac{9}{40}$$

$$\text{Both work} = \frac{40}{9}$$

$$= 4\frac{4}{9} \text{ days}$$

Thus, both of work in $4\frac{4}{9}$ days.

13. Understanding Quadrilaterals

Exercise 13A

1. Do it yourself.

2. (i) 12

$$\text{Diagonals of polygons} = \frac{n(n-3)}{2}$$
$$= \frac{12(12-3)}{2}$$
$$= \frac{12 \times 9}{2}$$
$$= 6 \times 9$$
$$= 54$$

(ii) 24

$$\text{Diagonals of polygons} = \frac{n(n-3)}{2}$$
$$= \frac{24(24-3)}{2}$$
$$= \frac{24 \times 21}{2}$$
$$= 12 \times 21$$
$$= 252$$

(iii) 30

$$\text{Diagonals of polygons} = \frac{n(n-3)}{2}$$
$$= \frac{30(30-3)}{2}$$
$$= 15 \times 27 = 405$$

3. (i) 12

$$\text{Sum of interior angles of polygons} = (n-2) \times 180$$
$$= (12-2) \times 180$$
$$= 10 \times 180$$
$$= 1800^\circ$$

(ii) 16

Sum of interior angles of polygons
$$= (n-2) \times 180$$
$$= (16-2) \times 180$$
$$= 14 \times 180$$
$$= 2520^\circ$$

(iii) 20

Sum of interior angle of polygon

$$= (n-2) \times 180$$
$$= (20-2) \times 180$$
$$= 18 \times 180$$
$$= 3240^\circ$$

4. (i) 12

$$\text{Each interior angle of polygons} = \left(\frac{n-2}{n}\right) \times 180^\circ$$
$$= \left(\frac{12-2}{12}\right) \times 180$$
$$= \frac{10}{12} \times 180$$
$$= 150^\circ$$

(ii) 18

$$\text{Each interior angle of polygons} = \left(\frac{n-2}{n}\right) \times 180$$
$$= \left(\frac{18-2}{18}\right) \times 180$$
$$= \frac{16}{18} \times 180$$
$$= 16 \times 10 = 160^\circ$$

(iii) 24

$$\text{Each interior angles of polygons} = \left(\frac{n-2}{n}\right) \times 180$$
$$= \left(\frac{24-2}{24}\right) \times 180$$
$$= \frac{22}{24} \times 180$$
$$= 165^\circ$$

5. (i) 8

$$\text{Each exterior angle of polygons} = \frac{360}{n} = \frac{360}{8} = 45^\circ$$

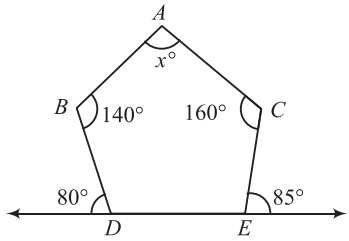
(ii) 12

$$\text{Each exterior angle of polygons} = \frac{360}{n} = \frac{360}{12} = 30^\circ$$

(iii) 24

$$\text{Each exterior angle of polygons} = \frac{360}{n} = \frac{360}{24} = 15^\circ$$

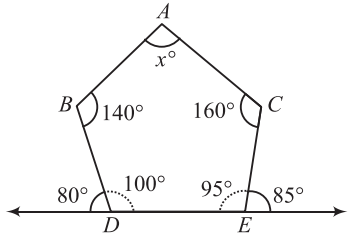
6. $\square BCDE + \angle ABC = 180 + 360$



$100 + 95 + 160 + 140 + x = 540°$

$x = 540 - 495$

$x = 45°$



7. Two angles $= 140 + 160$

Remaining four angles $= x$

Sum of hexagon angles $= 720$

$4x + 300 = 720$

$4x = 720 - 300$

$4x = 420$

$x = 105°$

Each angles of hexagon is 105°.

8. Each exterior angle $= 40°$

Let sides $= x$

We know that

$$\text{Number of sides of regular polygon} = \frac{360°}{\text{Exterior angle}}$$

$$= \frac{360}{40} = 9$$

Thus, number of sides is 9.

9. Given :

Each interior angle $= 160°$

Let sides $= x$

$$\text{Number of interior angle} = \frac{(n-2) \times 180}{n}$$

$$\frac{(x-2)\times 180}{x} = 160$$

$$x \times 180 - 360 = 160x$$

$$x \times 180 - 160x = 360$$

$$20x = 360 = 18$$

Thus, number of interior angle is 18.

10. Interior angles of pentagon $= 4x, 5x, 6x, 7x, 5x$

We know that

$$\text{Sum of pentagon} = 540$$

$$4x + 5x + 6x + 7x + 5x = 540$$

$$27x = 540$$

$$x = 20°$$

Thus,

$$4 \times 20 = 80°$$

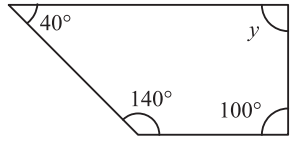
$$5 \times 20 = 100°$$

$$6 \times 20 = 120°$$

$$7 \times 20 = 140°$$

$$5 \times 20 = 100°$$

11. (i) We know that



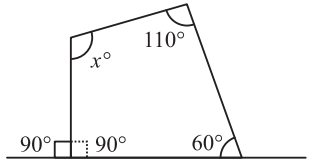
Sum of angles of figure $= 360°$

$$40 + y + 140 + 100 = 360°$$

$$y = 360 - 280°$$

$$y = 80°$$

(ii) Sum of angles of figure $= 360°$

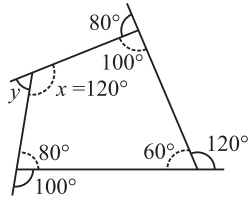


$$110 + x + 90 + 60° = 360°$$

$$x = 360° - 260°$$

$$x = 110°$$

12. (i) Sum of angles of figure $= 360°$



$$x + 100 + 60 + 80 = 360°$$

$$x = 360° - 240°$$

$$x = 120°$$

Then,

$$x + y = 180°$$

$$120 + y = 180°$$

$$y = 180 - 120$$

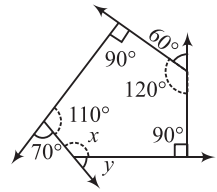
$$y = 60°$$

(ii) Sum of angles of figure $= 540°$

$90 + 120 + 90 + x + 110 = 540°$

$x = 540 - 410$

$x = 130°$



Then, $x + y = 180°$

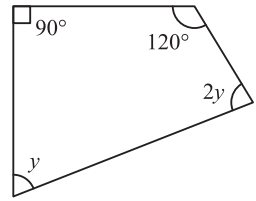
$130 + y = 180°$

$y = 180 - 130$

$y = 50°$

Exercise 13B

1. (i) Sum of angles of figure $= 360°$



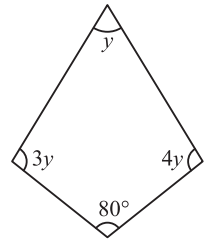
$90 + 120 + 2y + y = 360°$

$3y = 360° - 210°$

$3y = 150°$

$y = 50°$

(ii) Sum of angles of figure $= 360°$



$y + 3y + 80 + 4y = 360°$

$8y = 360° - 80°$

$8y = 280°$

$y = 35°$

2. Four angles of quadrilateral $= 3x, 7x, 5x, 9x$

Sum of angles of quadrilateral $= 360°$

$3x + 7x + 5x + 9x = 360°$

$24x = 360°$

$x = 15°$

Thus, angles $3 \times 15 = 45°$

$7 \times 15 = 105°$

$5 \times 15 = 75°$

$9 \times 15 = 135°$

3. Do it yourself.

4. Two angles of quadrilateral is 75° and 105°

Let one angle $= x$

Other angle $= 2x$

Sum of angles of quadrilateral $= 360°$

$75 + 105 + x + 2x = 360°$

$$3x = 360 - 180$$
$$3x = 180$$
$$x = 60°$$

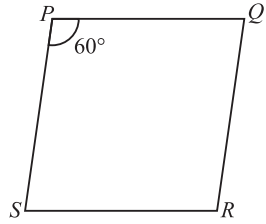
Thus, remaining angles 60°, 120°

5. One angle of quadrilateral is 150°.

$$\text{Other three are equal} = x$$
$$\text{Sum of angles of quadrilateral} = 360°$$
$$x + x + x + 150° = 360°$$
$$150 + 3x = 360°$$
$$3x = 360 - 150°$$
$$3x = 210$$
$$x = 70°$$

Thus, angle is 70°

6. Let

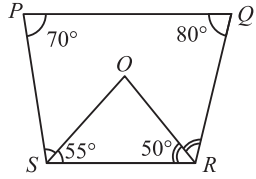


$$\angle R = x$$
$$\angle Q = 2x$$
$$\angle S = 2x$$
$$\text{Sum of angles of figure} = 360°$$
$$x + 2x + 2x + 60 = 360°$$
$$5x = 360 - 60$$
$$5x = 300$$
$$x = 60°$$

Thus, angle of

$$\angle R = 60°$$
$$\angle Q = 2 \times 60 = 120°$$
$$\angle S = 2 \times 60 = 120°$$

7.

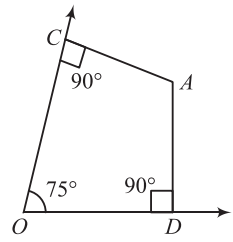


$$\angle P = 70°, \angle Q = 80°$$
$$\angle ROS = ?$$

We know that

$$80 + \angle R = 180°$$
$$\angle R = 100°$$
$$70 + \angle S = 180°$$
$$\angle S = 180 - 70$$
$$= 110°$$
$$\angle ROS = 180 - 55 - 50$$
$$= 75°$$

8. Sum of angles of quadrilateral = 360°



$$75 + 90 + 90 + \angle A = 360°$$

$$\angle A = 360 - 255$$

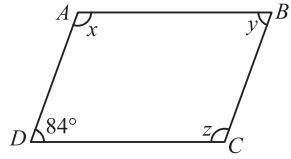
$$\angle A = 105°$$

Thus, $\angle CAD$ is 105°.

Exercise 13C

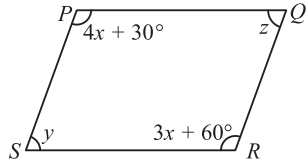
1. Do it yourself.

2. (i) We know that



$$x + 84 = 180°$$
$$x = 180 - 84$$
$$x = 96°$$
$$96 + y = 180°$$
$$y = 180 - 96$$
$$y = 84°$$
$$84 + z = 180°$$
$$z = 180 - 84$$
$$z = 96°$$

(ii) We know that



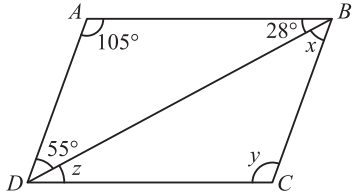
$$z + 3x + 60 = 180° \ldots (i)$$
$$z + 4x + 30 = 180° \ldots (ii)$$

Taking eqn. (i) and (ii),

$$x + 30 = 0$$
$$x = 30°, y = 30°, z = 30°$$

Thus, angles is $x = 30°$
$y = 30°$
$z = 30°$

3. We know that

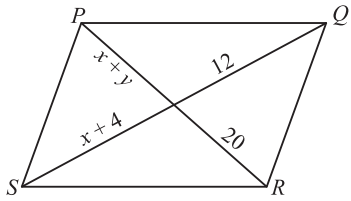


$$105 + 55 + z = 180°$$
$$z = 180 - 160$$
$$z = 20°$$

$$55 + 20 + y = 180°$$
$$y = 180 - 75$$
$$y = 105°$$
$$20 + 105 + x = 180°$$
$$x = 180 - 125$$
$$x = 55°$$

Thus, angles $x = 55°$, $y = 105°$, $z = 20°$

4. $x + 4 = 12$

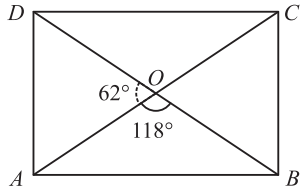


$$x = 8$$
$$x + y = 20$$
$$y = 20 - 8$$
$$y = 12$$

Thus, value is $x = 8, y = 12$.

5. (i) We know that,

$$\angle ABO + \angle BAO = -118 + 180$$
$$\therefore \quad \angle ABO = \angle BAO$$
$$\angle ABO + \angle ABO = -118 + 180$$
$$2\angle ABO = -118 + 180$$
$$2\angle ABO = 62$$
$$\angle ABO = 31°$$



Thus, angle of $\angle ABO$ is 31°.

(ii) $\angle ADO + \angle DAO = 180 - 62$

$$\angle ADO + \angle DAO = 118°$$

$\therefore \quad \angle ADO = \angle DAO$

$\angle ADO + \angle ADO = 118°$

$2\angle ADO = 118°$

$\angle ADO = 59°$

Thus, angle of $\angle ADO = 59°$.

6. Given : $x = 8$

$y = 6$

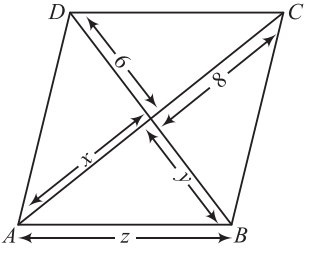
$z = \sqrt{x^2 + y^2}$

$= \sqrt{8^2 + 6^2}$

$= \sqrt{64 + 36}$

$= \sqrt{100}$

$z = 10$



7. Given : $\angle A : \angle D = 5 : 7$

$5x + 7x = 180°$

$12x = 180°$

$x = 15°$

$\angle A = 5 \times 15$

$= 75°$

$\angle D = 7 \times 15 = 105°$

$\angle B + \angle C = 180°$

$3x + 11 + 5x - 31 = 180°$

$8x - 20° = 180°$

$8x = 180 + 20 = 200°$

$x = 25°$

$\angle B = 3 \times 25 + 11 = 86°$

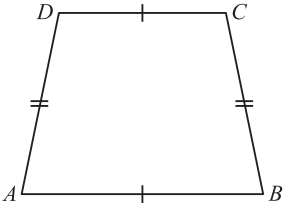
$\angle C = 5 \times 25 - 31 = 94°$

Thus, angles $\angle A = 75°$

$\angle B = 86°$

$\angle C = 94°$

$\angle D = 105°$



8. $\angle C = 102°$

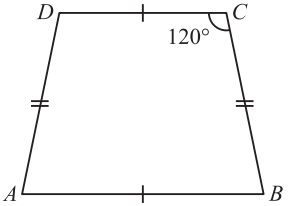
$\angle C + \angle B = 180°$

$\angle B = 180° - 102°$

$\angle B = 78°$

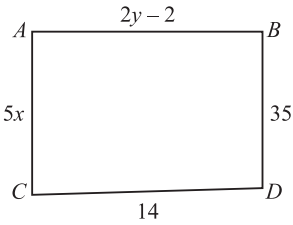
We given, $\angle A = \angle B = 78°$

$\angle C = \angle D = 102°$



9.

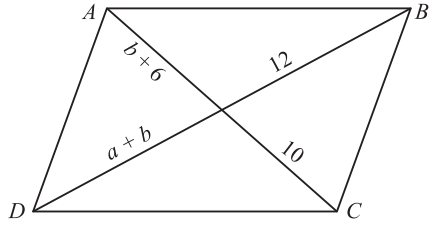
$$\begin{aligned} 5x &= 35 \\ x &= 7 \\ 2y - 2 &= 14 \\ 2y &= 14 + 2 \\ &= 16 \\ y &= 8 \end{aligned}$$



Thus, value of x and y is 7 and 8

10. Given :

$$\begin{aligned} b + 6 &= 10 \\ b &= 10 - 6 \\ b &= 4 \\ a + b &= 12 \\ a + 4 &= 12 \\ a &= 12 - 4 \\ a &= 8 \end{aligned}$$

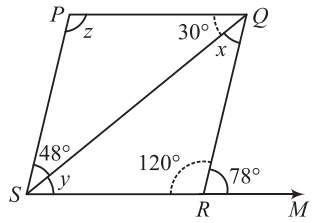


Thus, value of a and b is 8 and 4.

11. We know that

$$\begin{aligned} \angle P &= \angle R \\ 102 &= \angle P \quad \therefore \quad z = 102^\circ \\ 102 + 48 + y &= 180^\circ \\ y &= 180 + 50 \\ y &= 30^\circ \\ 30 + x + 102 &= 180^\circ \\ x &= 48^\circ \end{aligned}$$

Thus, angles $x = 48^\circ$, $y = 30^\circ$, $z = 102^\circ$



Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. Do it yourself.

3. (i) 540°

Let Number of sides in polygon = n

Sum of interior angles = 540°

$$\begin{aligned} (n - 2) \times 180^\circ &= 540^\circ \\ (n - 2) &= 3 \\ n &= 3 + 2 = 5 \end{aligned}$$

Thus, number of sides is 5.

(ii) $720°$

Sum of interior angles $= 720°$

$$(n-2) \times 180° = 720°$$
$$(n-2) = 4$$
$$n = 4 + 2 = 6$$

Thus, number of sides is 6.

(iii) $1620°$

Sum of interior angles $= 1620°$

$$(n-2) \times 180° = 1620°$$
$$(n-2) = 9$$
$$n = 9 + 2 = 11$$
$$n = 11$$

(iv) 16 right angles

Sum of interior angles $= 16 \times 90°$

$$(n-2) \times 180° = 1440°$$
$$(n-2) = 8$$
$$n = 8 + 2$$
$$n = 10$$

4. Do it yourself.

5. Given :

Sum of interior angles $= 6 \times$ exterior angles

$$(n-2) \times 180° = 6 \times 360°$$
$$(n-2) = 6 \times 2$$
$$(n-2) = 12$$
$$n = 12 + 2 = 14$$

Thus, number of sides is 14.

6.
$$\frac{\text{Exterior angle}}{\text{Interor angle}} = \frac{360/n}{\frac{(n-2) \times 180}{n}}$$
$$= \frac{360}{(n-2) \times 180°}$$
$$\frac{360}{(n-2) \times 180} = \frac{2}{7}$$
$$7 = (n-2)$$
$$n = 7 + 2$$
$$n = 9$$

Thus, number of sides is 9.

7. One angle of parallelogram $(A) = 80°$

Other angle $(B) = 180 - 80 = 100°$

Similarly $C = 80°$

$D = 180°$

8. One angle of quadrilateral $= 65°$

Each angle $= 180° - 65°$

Each angle $= 115°$

9. Angle of quadrilateral $= 2x, 3x, 5x, 8x$

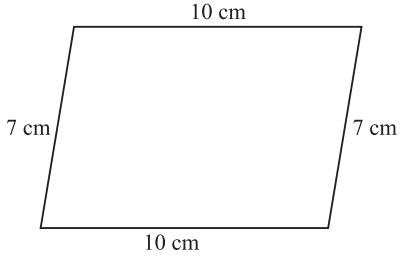
We know that

$$2x + 3x + 5x + 8x = 360°$$
$$18x = 360°$$
$$x = 20°$$

Thus, angles is $2 \times 20 = 40°, 3 \times 20 = 60°$

$5 \times 20 = 100°, 8 \times 20° = 160°$

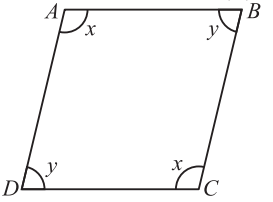
10. Two sides of parallelogram is 7 cm and 10 cm



Perimeter $= 7 + 10 + 7 + 10 = 34$ cm

11. Given :

$$x - y = 30° \quad \ldots(i)$$
$$x + y = 180° \quad \ldots(ii)$$



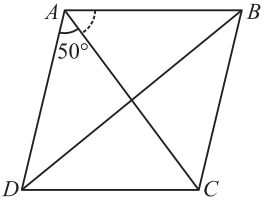
Taking eqn. (i) and (ii),

$$2x = 210$$
$$x = 105°$$
$$y = 75°$$

Thus, angles is 105°, 75°, 105°, 75°.

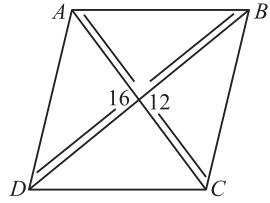
12.

$$\angle A = 50°$$
$$\angle B = 180° - 50°$$
$$\angle B = 130°$$
$$\angle C = 180 - 50$$
$$\angle C = 130°$$
$$\angle D = 50°$$



Thus, angles is 50°, 130°, 50°, 130°.

13. Diagonal 16 and 12 cm



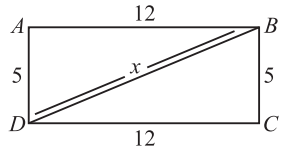
$$\text{Sides} = \sqrt{\left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2}$$

$$= \sqrt{\left(\frac{16}{2}\right)^2 + \left(\frac{12}{2}\right)^2}$$

$$= \sqrt{100}$$

$$\text{Each sides} = 10\,\text{cm}$$

14. We know that



$$BD^2 = BC^2 + DC^2$$

$$BD^2 = (5)^2 + (12)^2$$

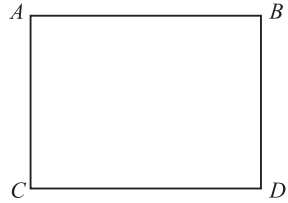
$$= 25 + 144$$

$$BD^2 = 169$$

$$BD = 13\,\text{cm}$$

Thus, length of diagonal is 13 cm.

15. Given :



$$\text{Rectangle of side ratio} = \frac{2}{3}$$

$$\text{Perimeter} = 20\,\text{cm}$$

$$2(2x + 3x) = 20$$

$$5x = 10$$

$$x = 2\,\text{cm}$$

Thus, sides of rectangles is

$$2 \times 2 = 4\,\text{cm}$$

$$2 \times 3 = 6\,\text{cm}.$$

14. Practical Geometry

Do it yourself.

15. Visuolising Solid Shapes

Do it yourself.

16. Areas of Rectilinear Figures

Exercise 16A

1. Given :

(i) Diagonal or rectangle = 34 cm

Breadth of rectangle = 16 cm

We know that

$$d = \sqrt{l^2 + b^2}$$

$$34 = \sqrt{l^2 + (16)^2}$$

$$(34)^2 = l^2 + 256$$

$$1156 - 256 = l^2$$

$$l^2 = 900$$

$$l = \sqrt{900} = 30 \text{ cm}.$$

Thus, length is 30 cm.

(ii) Area of rectangular $= l \times b = 30 \times 16 = 480 \text{ cm}^2$

Thus, area of rectangle is 480 cm^2.

2. Given :

Perimeter of rectangle = 46 m

$$\text{Length} = 15 \text{ m}$$

$$\text{Perimeter} = 2(l + b)$$

$$46 = 2(15 + b)$$

$$15 + b = 23$$

$$b = 23 - 15 = 8$$

$$b = 8 \text{ m}$$

Thus, breadth of rectangle is 8 m.

$$d = \sqrt{l^2 + b^2} = \sqrt{(15)^2 + (8)^2}$$

$$= \sqrt{225 + 64}$$

$$d = \sqrt{289} = 17 \text{ m}$$

Thus, breadth and diagonal are 8 m and 17 m.

3. Given :

$$\text{Area of square} = 729 \text{ m}^2$$

We know that

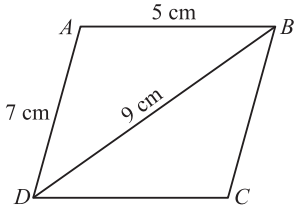
$$a^2 = 729$$

$$a = \sqrt{729}$$

$$a = 27 \text{ m}$$

Thus, side of square is 27 m.

4. $$l = \frac{5+7+9}{2} = \frac{21}{2} \text{ cm.}$$



$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{3}{2} \times \frac{7}{2}} = \frac{21}{4}\sqrt{11} \text{ cm}^2$$
$$\text{Area of } ABCD = 2 \times \frac{21}{4}\sqrt{11} = \frac{21}{2} \times \sqrt{11} = 34.83 \text{ cm}^2$$

5. Given :

$$A_1 = 5.76\text{m} \times 3.1\text{m}$$
$$A_1 = 17.856 \text{ m}^2$$
$$A_2 = \frac{24 \times 10}{100 \times 100} = \frac{24}{1000} \text{ m}^2$$
$$\text{Tiles size} = \frac{17.856}{\frac{24}{1000}} = \frac{0.744}{\frac{1}{1000}}$$
$$= 0.744 \times 1000 = 744$$
$$\text{Cost of tiles} = 1.5 \times 744 = ₹ 1116$$

6. $$\text{Area of rhombus} = 10.2 \text{ cm}^2$$
$$\text{Sides} = 6 \text{ cm}$$
$$\text{Let altitude} = x$$
$$x \times 6 = 10.2$$
$$x = \frac{10.2}{6} = 1.7 \text{ cm}$$

Thus, altitude is 1.7.

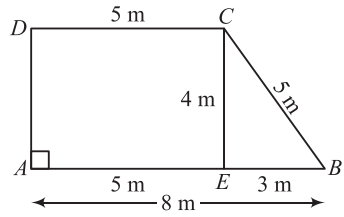
7. $$\text{Area of rhombus} = 28 \text{ cm}^2$$
$$\text{Perimeter} = 28 \text{ cm}$$
$$4a = 28$$
$$a = 7 \text{ cm}$$

We know that

$$a \times h = 28$$
$$h = \frac{28}{7} = 4 \text{ cm}$$

Thus altitude is 4 cm.

8. Area of quadrilateral



$$A = 2(5 + 8)$$
$$= 2(13)$$
$$A = 26 \text{ m}^2$$

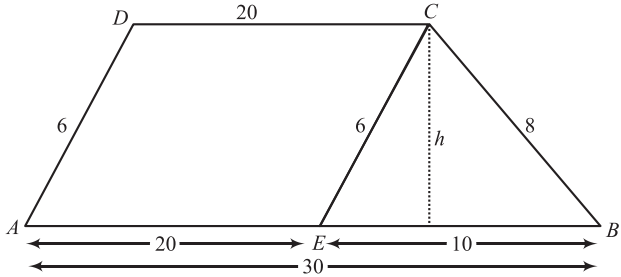
Thus, area is 26 m^2

9. $$\text{Area} = \frac{1}{2} (\text{sum of parallel}) \times \text{height}$$
$$= \frac{1}{2} \times (a + b)h$$
$$91 = \frac{1}{2}(a + a + 8) \times 7$$
$$13 = \frac{1}{2}(2a + 8)$$
$$(2a + 8) = 26$$
$$2a = 26 - 8$$
$$2a = 18$$
$$a = 9 \text{ cm}$$

Parallel side is 17 cm.

10. Do it yourself.

11.



$$\text{In } \Delta EBC, s = \frac{a + b + c}{2}$$
$$= \frac{6 + 8 + 10}{2}$$
$$= \frac{24}{2} = 12 \text{ cm}$$
$$\text{Area of } \Delta EBC = \sqrt{s(s - a)(s - b)(s - c)}$$
$$= \sqrt{12(12 - 6)(12 - 8)(12 - 10)}$$
$$= \sqrt{12 \times 6 \times 4 \times 2}$$
$$= \sqrt{6 \times 2 \times 6 \times 4 \times 2} = 6 \times 4 = 24 \text{ m}^2$$

$$\text{Area of } \Delta EBC = \frac{1}{2} \times \text{base} \times \text{height}$$

$$24 = \frac{1}{2} \times 10 \times h$$

$$h = \frac{24 \times 2}{10}$$

$$= 4.8 \text{ m}$$

$$\text{Area of } DABC = \frac{1}{2}(a + b) \times h$$

$$= \frac{1}{2}(20 + 30) \times 4.8$$

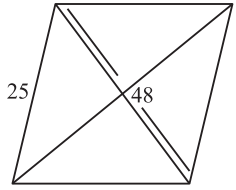
$$= \frac{1}{2}(50) \times 4.8$$

$$= 25 \times 4.8$$

$$= 120 \text{ m}^2$$

12. One diagonal $= 48$ m

One side $= 25$ m



$$\text{Other diagonal} = 2\sqrt{(25)^2 - (24)^2}$$

$$= 2\sqrt{625 - 576}$$

$$= 2\sqrt{(49)}$$

$$= 2 \times 7 = 14 \text{ m}$$

$$\text{Area of rhombus} = \frac{1}{2} \times 14 \times 48 = 336 \text{ m}^2$$

13. $$\text{Area of quadrilateral} = \frac{1}{2}(a + b) \times h$$

$$= \frac{1}{2}(7.2 + 8.8) \times 28.4$$

$$= \frac{1}{2} \times 16 \times 28.4$$

$$= 227.2 \text{ m}^2$$

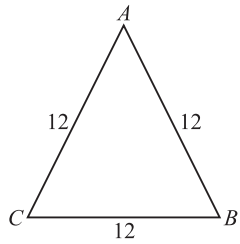
14. $$\text{Area of quadrilateral} = \frac{1}{2}(a + b) \times h$$

$$= \frac{1}{2}(8.5 + 7.5) \times 24$$

$$= \frac{1}{2} \times 16 \times 24$$

$$= 192 \text{ cm}^2$$

15. $$s = \frac{a+b+c}{2} = \frac{36}{2} = 18$$



$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{18 \times 6 \times 6 \times 6} = 36\sqrt{3}$$
$$= 36 \times 1.732 = 62.35 \text{ cm}^2$$

16. $$s = \frac{12+10+10}{2} = \frac{32}{2} = 16$$

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{16(4) \times 6 \times 6}$$
$$= 4 \times 4 \times 3 = 48 \text{ cm}^2$$

17. 10 cm, 24 cm, 26 cm

$$\text{Right angle of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$
$$= \frac{1}{2} \times 10 \times 24 = 120 \text{ cm}^2$$

18. $$s = \frac{25+39+56}{2} = \frac{120}{2} = 60$$

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$
$$= \sqrt{60 \times 4 \times 21 \times 35}$$
$$= \sqrt{15 \times 4 \times 4 \times 7 \times 3 \times 7 \times 5}$$
$$= 15 \times 4 \times 7$$
$$\frac{1}{2} \times 56 \times \text{height} = 15 \times 4 \times 7$$
$$\text{height} = 15 \text{ cm}$$

Thus, altitude is 15 cm.

Exercise 16B

Do it yourself.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Given :

$$\text{Area} = 120 \text{ cm}^2, \text{ Breadth} = 8 \text{ cm}$$

We know that

$$\text{Area of rectangle} = l \times b$$
$$120 = l \times 8$$
$$l = 15 \text{ cm}$$
$$\text{Perimeter} = 2(l + b) = 2(15 + 8)$$
$$= 2(23) = 46 \text{ cm}$$

Thus, length and perimeter are 15 cm and 46 cm.

2.
$$l \times b = 84 \text{ cm}^2$$
$$l - b = 5 \text{ m}$$
$$(l + b)^2 = (l - b)^2 + 4lb$$
$$= (5)^2 + 4 \times 84$$
$$(l + b)^2 = 361$$
$$l + b = \sqrt{361} = 19$$
$$\text{Perimeter} = 2(l + b) = 2 \times 19 = 38 \text{ cm}$$

3.
$$\text{Perimeter} = 36 \text{ cm}$$
$$4a = 36$$
$$a = 9 \text{ cm}$$
$$\text{Area of square} = a^2 = (9)^2 = 81 \text{ cm}^2$$

Thus, area is 81 cm^2.

4.
$$\text{Area of square} = a^2$$
$$a^2 = 1.69 \text{ m}^2$$
$$a = 1.3 \text{ m}$$
$$\text{Perimeter of square } 4a = 4 \times 1.3 = 5.2 \text{ m}$$

5.
$$\text{Diagonal of square} = a\sqrt{2}$$
$$a\sqrt{2} = 12$$
$$a = 6\sqrt{2} \text{ cm}$$
$$a = 8.48 \text{ cm}$$
$$\text{Area of square} = a^2 = (6\sqrt{2})^2 = 72 \text{ cm}^2$$

6.
$$\text{Diagonal of square} = a\sqrt{2}$$
$$a\sqrt{2} = 15$$
$$a = \frac{15}{\sqrt{2}} = 10.6 \text{ m}$$
$$\text{Perimeter} = 4a = 4 \times 10.6 = 42.4 \text{ m}.$$

7. Area of square $= a^2$

$a^2 = 169$

(i) $a = 13$ cm

(ii) Perimeter $= 4a = 4 \times 13 = 52$ cm

8. Length of rectangle $= 16$ cm

$2(l + b) = 4a$

$2(16 + b) = 4 \times 12.5$

$2(16 + b) = 50$

$16 + b = 25$

$b = 25 - 16$

$b = 9$ cm

Area of rectangle $= l \times b$

$= 16 \times 9 = 144$ cm^2

9. Perimeter of square $=$ Area of square

$4a = a^2$

$a = 4$

Area of square $= a^2 = (4)^2 = 16$ square

10. (i) 10 cm, 24 cm, 26 cm

Area of triangle $= \frac{1}{2} \times 10 \times 24 = 120$ cm^2

(ii) 18 m, 24 m, 30 m

Area of triangle $= \frac{1}{2} \times 18 \times 24 = 216$ m^2

11. (i) Area of triangle $= \frac{1}{2} \times 6 \times 4 = 12$ cm^2

(ii) $\frac{1}{2} \times 8 \times h = \frac{1}{2} \times 6 \times 4$

$h = 3$ cm

Height is 3 cm.

12. 16 cm, 12 cm and 20 cm.

(i) Area of triangle $= \frac{1}{2} \times 16 \times 12 = 96$ cm^2

(ii) $\frac{1}{2} \times 16 \times 12 = \frac{1}{2} \times 20 \times h$

$h = \frac{192}{20} = 9.6$ cm.

Thus, height is 9.6 cm.

13. (i) Area of triangle $= \frac{1}{2} \times 4.8 \times 6 = 14.4 \text{ m}^2$

$$\frac{1}{2} \times 6.4 \times h = \frac{1}{2} \times 4.8 \times 6$$

$$h = \frac{4.8 \times 6}{6.4} = 4.5 \text{ m}$$

Thus, height is 4.5 m.

14. $(4x + 5x + 3x) = 96$

$$12x = 96$$

$$x = 8$$

Lengths $= 4 \times 8, 5 \times 8, 3 \times 8 = 32, 40, 24$

Area of triangle $= \frac{1}{2} \times 32 \times 24 = 384 \text{ cm}^2$

15. Perimeter $= 50$

$\therefore$ $s = \frac{a + b + c}{2} = \frac{13 + 13 + 24}{2}$

$$= \frac{50}{2} = 25 \text{ cm}$$

Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{25 \times 12 \times 12 \times 1}$$

$$= 5 \times 12 = 60 \text{ cm}^2$$

16. Perimeter of rhombus $= 40$ cm.

One diagonal $= 16$ cm

(i) Other diagonal $= \frac{40 - 16}{2} = \frac{24}{2} = 12$ cm

(ii) Area of rhombus $= \frac{1}{2} d_1 \times d_2$

$$= \frac{1}{2} \times 16 \times 12 = 96 \text{ cm}^2$$

Thus, diagonal and rhombus are 12 and 96.

17. Area of rhombus $= x \times h = 18 \times 12 = 216 \text{ cm}^2$

18. $d_1 = 4x$

$d_2 = 3x$

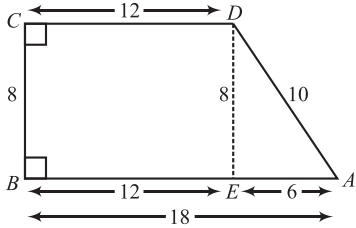
$$\frac{1}{2} \times 4x \times 3x = 384$$

$$x^2 = 64$$

$$x = 8 \text{ cm}$$

$$d_1 = 4 \times 8 = 32 \text{ cm}$$
$$d_2 = 3 \times 8 = 24 \text{ cm}$$
$$\text{Sides} = \sqrt{\left(\frac{32}{2}\right)^2 + \left(\frac{24}{2}\right)^2}$$
$$= \sqrt{256 + 144} = \sqrt{400}$$
$$\text{Sides} = 20 \text{ cm}$$

19.



Area pf Trapezium, $ABCD = \frac{1}{2}(a + b) \times h$

$$= \frac{1}{2}(12 + 18) \times 8$$
$$= \frac{1}{2} \times 30 \times 8$$
$$= 30 \times 4 = 120 \text{ cm}^2$$

20.
$$\text{Area of trapezium} = \frac{1}{2}(a + b) \times h$$
$$279 = \frac{1}{2}(a + a + 5) \times 18$$
$$\frac{31}{2} = \frac{1}{2}(a + a + 5)$$
$$31 = 2a + 5$$
$$2a = 31 - 5 = 26$$
$$a = 13 \text{ cm}$$
$$\text{Other sides} = a + 5 = 13 + 5 = 18 \text{ cm}$$

Thus, sides 13 cm and 18 cm.

17. Circumference and Area of a Circle

Exercise 17A

1. (i)
$$C = 7.7 \text{ m}$$
$$\text{Circumference} = 2\pi r$$

$$2 \times \frac{22}{7} \times r = 7.7$$

$$\frac{77}{10} = \frac{44r}{7}$$

$$r = 1.225 \text{ m}$$

$$\text{diameter} = 2 \times r$$

$$d = 2 \times 1.225 = 2.45 \text{ m}$$

(ii) $\text{Circumference} = 2\pi r$

$$= 2 \times \frac{22}{7} \times 2.8$$

$$C = 17.6 \text{ m}$$

$$d = 2r = 2 \times 2.8$$

$$d = 5.6 \text{ m}$$

(iii) $d = 2r$

$$r = \frac{d}{2} = \frac{4.2}{2} = 2.1 \text{ m}$$

$$C = 2\pi r = 2 \times \frac{22}{7} \times 2.1$$

$$C = 13.2 \text{ m}$$

2. (i) $C = 2\pi r = 2 \times \frac{22}{7} \times 7 = 44 \text{ cm}$

(ii) $C = 2\pi r = 2 \times \frac{22}{7} \times 5 = \frac{220}{7} \text{ m}$

(iii $C = 2\pi r = 2 \times \frac{22}{7} \times 2 = \frac{88}{7} \text{ km}$

3. (i) $C = 2\pi r = 2 \times \frac{22}{7} \times 3.5 = 22 \text{ cm}$

(ii) $C = 2\pi r = 2 \times \frac{22}{7} \times 2.1 = 13.2 \text{ m}$

(iii) $C = 2\pi r = 2 \times \frac{22}{7} \times 5.6 = 35.2 \text{ km}$

4. (i) $C = 2\pi r = 6.28$

$$2 \times \frac{22}{7} \times r = 6.28$$

$$r = 1 \text{ cm}$$

$$d = 2r = 2 \times 1 = 2 \text{ cm}$$

(ii) $2\pi r = 44$

$$2 \times \frac{22}{7} \times r = 44$$

$$r = 7$$

$$d = 2r = 2 \times 7 = 14 \text{ m}$$

(iii) $2\pi r = 5.5\,\text{km}$

$$2 \times \frac{22}{7} \times r = 5.5$$

$$r = 0.875\,\text{km}$$

$$d = 2r = 2 \times 0.875 = 1.75\,\text{km}$$

5. (i) $2\pi r = 26.4$

$$2 \times \frac{22}{7} \times r = 26.4$$

$$r = 4.2\,\text{cm}$$

(ii) $2\pi r = 35$

$$2 \times \frac{22}{7} \times r = 35$$

$$r = 5.57\,\text{m}$$

(iii) $2\pi r = 6.6\,\text{km}$

$$2 \times \frac{22}{7} \times r = 6.6$$

$$r = 1.05\,\text{km}$$

6. (i) $\text{Area} = \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5$

$$A = 38.5\ \text{cm}^2$$

(ii) $\text{Area} = \pi r^2 = \frac{22}{7} \times 4.2 \times 4.2$

$$A = 55.44\ \text{m}^2$$

(iii) $\text{Area} = \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154\,\text{km}^2$

7. (i) $\text{Area} = \pi r^2 = \frac{22}{7} \times 2.1 \times 2.1$

$$A = 13.86\,\text{cm}^2$$

(ii) $\text{Area} = \pi r^2 = \frac{22}{7} \times 5.6 \times 5.6$

$$A = 98.56\,\text{m}^2$$

(iii) $\text{Area} = \pi r^2 = \frac{22}{7} \times \frac{3.5}{2} \times \frac{3.5}{2}$

$$A = 9.625\,\text{km}^2$$

8. (i) $\pi r^2 = \pi\,\text{cm}^2$

$$r = 1\,\text{cm}$$

(ii) $\pi r^2 = 55.44$

$$\frac{22}{7} \times r^2 = 55.44$$

$$r = 4.2\,\text{m}$$

(iii) $\pi r^2 = 1.54 \text{ km}^2$

$$\frac{22}{7} \times r^2 = 1.54$$

$$r^2 = 0.49$$

$$r = 0.7 \text{ km}$$

9. $\text{Area} = \pi r^2 = 3.14 \times \frac{5}{2} \times \frac{5}{2}$

$$A = \frac{3.14 \times 25}{4} = 19.625 \text{ cm}^2$$

10. $\pi r^2 = 154$

$$\frac{22}{7} \times r^2 = 154$$

$$r^2 = 49$$

$$r = 7 \text{ m}$$

$$C = 2\pi r = 2 \times \frac{22}{7} \times 7$$

$$C = 44 \text{ m}$$

11. $4a = 44 \text{ cm}$

$$a = 11$$

$$\text{Area} = a^2 = (11)^2 = 121 \text{ cm}^2$$

$$2\pi r = 44$$

$$2 \times \frac{22}{7} \times r = 44$$

$$r = 7$$

$$\text{Area} = \pi r^2 = \frac{22}{7} \times 49 = 154 \text{ cm}^2$$

$$\text{Circle is big} = 154 - 121 = 33 \text{ cm}^2$$

12. $\frac{r_1}{r_2} = \frac{3}{2}$

$$\frac{2\pi r_1}{2\pi r_2} = \frac{3}{2}$$

$$r_1 : r_2 = 3 : 2$$

13. Perimeter equilateral triangle $= 2\pi r$

$$3 \times 66 = 2 \times \frac{22}{7} \times r$$

$$r = 3.15 \text{ cm}$$

$$d = 2r$$

$$d = 2 \times 3.15$$

$$= 6.3 \text{ cm}$$

14. Radius of wheel $= 35\,\text{cm}$

One complete round $= 2\pi r$

24 complete round $= 24 \times 2\pi r$

$$= 24 \times 2 \times \frac{22}{7} \times 35 = 5280\,\text{cm}$$

15. $$2\pi r_1 = 2 \times \frac{22}{7} \times 105 = 660\ \text{m}$$

$$2\pi r_2 = 2 \times \frac{22}{7} \times 112 = 704\ \text{m}$$

Second circle longer by $= 704 - 660 = 44\ \text{m}$

16. $$C = 2\pi r$$

$$66 \times 400 = 2 \times \frac{22}{7} \times r$$

$$r = \frac{66 \times 400 \times 7}{44}$$

$$r = 4200\,\text{cm}$$

$$d = 2r = 2 \times 4200$$

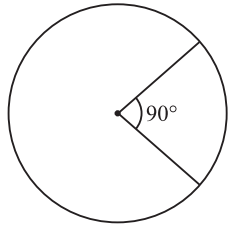
$$d = 8400\ \text{cm}$$

Exercise 7B

1. (i) Area of sector $= \pi r^2 \dfrac{\theta^\circ}{360^\circ}$

$$= \frac{22}{7} \times \frac{14 \times 14 \times 90}{360}$$

$$= 154\ \text{cm}^2$$



Area of right angle $= \dfrac{1}{2} \times 14 \times 14 = 98\ \text{cm}^2$

Area of segment $= 154 - 98 = 56\ \text{cm}^2$

(ii) Do it yourself.

(iii) Do it yourself.

2. (i) Length of Arc $= \dfrac{2\pi r\ \theta^\circ}{360} = \dfrac{2 \times 22 \times 28}{7} \times \dfrac{90}{360}$

$$= 4.4\,\text{cm}$$

(ii) Do it yourself.

(iii) Do it yourself.

3. (i) $\text{Area of sector} = \frac{\pi r^2 \times \theta}{360} = \frac{22}{7} \times \frac{3.5 \times 3.5 \times 60}{360} = 6\frac{5}{12}\text{ cm}$

(ii) Do it yourself.

(iii) Do it yourself.

4. $$\text{Area of sector} = \frac{22}{7} \times \frac{2 \times 2 \times 45^\circ}{360^\circ}$$
$$= \frac{22 \times 4}{7 \times 8} = 1.571\text{ cm}^2$$
$$\text{Area of disc} = \pi r^2 = \frac{22}{7} \times 2 \times 2 = \frac{88}{7} = 12.57\text{ cm}^2$$
$$\text{Area of remaining part} = 12.57 - 1.57 = 11\text{ cm}^2$$

5. $$\frac{\pi r^2 \theta}{360} = \frac{1}{10}\pi r^2$$
$$\theta = \frac{360}{10} = 36^\circ$$

Thus, angle is 36°.

6. $$\frac{2\pi r\theta}{360^\circ} = 22$$
$$2 \times \frac{22}{7} \times r \times \frac{18}{360} = 22$$
$$r = \frac{20 \times 7}{2} = 70\text{ m}$$
$$C = 2\pi r = 2 \times \frac{22}{7} \times 70$$
$$C = 440\text{ m}$$

7. $$\frac{\pi r^2 \theta}{360^\circ} = 3.85$$
$$\frac{22}{7} \times \frac{r^2 \times 36}{360} = 3.85$$
$$r^2 = 12.25,\ r = \sqrt{12.25}$$
$$r = 3.5\text{ cm}$$
$$\text{Length of arc} = \frac{2\pi r\theta}{360}$$
$$= 2 \times \frac{22}{7} \times \frac{3.5}{360} \times 36$$
$$\text{Length of arc} = 2.2\text{ cm}$$

8. Given : Arc of length $= 5\,\text{cm}$

Radius $= 10\,\text{cm}$

Arc of length $= 5\,\text{cm}$

Radius $= 20\,\text{cm}$

Thus, Arc of the circle of radius is 10 cm

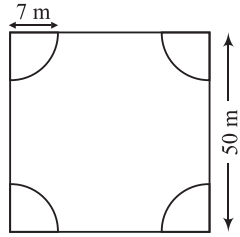
9. One area of Arc $= \frac{22}{7} \times \frac{7 \times 7 \times 90}{360}$

$= \frac{22}{7} \times \frac{7 \times 7}{4} = \frac{154}{4}$

For 4 area of Arc $= 4 \times \frac{154}{4} = 154\ \text{m}^2$

Area of square $= (a)^2 = (50)^2$

$= 2500\ \text{m}^2$



Area of remaining part of park

$= 2500 - 154 = 2346\ \text{m}^2$

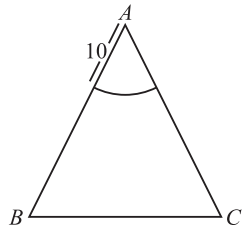
10. In equilateral triangle every angle be 60°

Area of sector $= \frac{\pi r^2 \times x}{360°}$

$= \frac{22}{7} \times \frac{10 \times 10 \times 60}{360}$

$= \frac{22}{7} \times \frac{10 \times 10}{6}$

Area of sector $= 52.38\ \text{m}^2$



Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) $C = 2\pi r$

$31.4 = 2 \times \frac{22}{7} \times r$

$2 \times 3.14 \times r = 31.4$

$r = 5\ \text{m}$

Area of circle $= \pi r^2 = 3.14 \times 5 \times 5 = 78.5\ \text{m}^2$

(ii) Area $= \pi r^2$

$\frac{22}{7} \times r^2 = 50.24$

$r^2 = 16$

$r = 4\,\text{m}$

$$\text{Circumference} = 2\pi r$$
$$= 2 \times 3.14 \times 4 = 25.12 \text{ m}$$

(iii) $$C = 2\pi r = 2 \times 3.14 \times 2.5 = 15.7 \text{ m}$$
$$\text{Area of} = \pi r^2 = 3.14 \times 2.5 \times 2.5$$
$$A = 19.625 \text{ m}^2$$

2. (i) $$\pi r^2 = 154$$
$$\frac{22}{7} \times r^2 = 154$$
$$r^2 = 49$$
$$r = 7 \text{ cm}$$
$$2\pi r = 2 \times \frac{22}{7} \times 7$$
$$C = 44 \text{ cm}$$

(ii) $$\pi r^2 = 616$$
$$\frac{22}{7} \times r^2 = 616$$
$$r^2 = 196$$
$$r = 14 \text{ m}$$
$$C = 2\pi r = 2 \times \frac{22}{7} \times 14$$
$$C = 88 \text{ m}$$

3. (i) $$2\pi r = 132$$
$$2 \times \frac{22}{7} \times r = 132$$
$$r = 21 \text{ cm}$$
$$A = \pi r^2 = \frac{22}{7} \times 21 \times 21$$
$$A = 1386 \text{ cm}^2$$

(ii) $$2 \times \frac{22}{7} \times r = 22$$
$$r = \frac{7}{2} \text{ m}$$
$$A = \pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$$
$$A = 38.5 \text{ m}^2$$

4. $$\pi r^2 = 1386$$
$$\frac{22}{7} \times r^2 = 1386$$

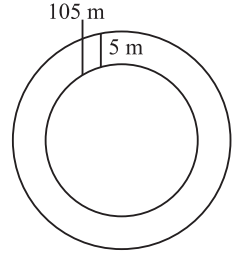
$$r^2 = 441$$
$$r = 21$$
$$2\pi r = 2 \times \frac{22}{7} \times 21$$
$$2\pi r = 132 \text{ cm}$$

5.
$$2\pi r = 88$$
$$2 \times \frac{22}{7} \times r = 88$$
$$r = 14 \text{ m}$$
$$\pi r^2 = \frac{22}{7} \times 14 \times 14$$
$$\pi r^2 = 616 \text{ m}^2$$

6. (i) $$\text{Area of track} = \pi r_1^2 - \pi r_2^2 = \frac{22}{7}[(70)^2 - (63)^2]$$
$$= \frac{22}{7}(4900 - 3969)$$
$$= \frac{22}{7} \times 931 = 22 \times 133 = 2926 \text{ m}^2$$

(ii) Length of two circumference of track $= 2\pi r_1 - 2\pi r_2$
$$= 2 \times \frac{22}{7}(70 - 63)$$
$$= 2 \times \frac{22}{7} \times 7 = 44 \text{ m}$$

7.
$$\text{Area of path} = \pi r_1^2 - \pi r_2^2$$
$$= \frac{22}{7}[(105)^2 - (100)^2]$$
$$= \frac{22}{7}[11025 - 10000]$$
$$= \frac{22}{7} \times 1025 = \frac{22550}{7}$$
$$\text{Area of path} = 3221\frac{3}{7} \text{ m}^2$$



8.
$$\text{Area of face} = \pi r_1^2 - \pi r_2^2$$
$$= \pi[(4)^2 - (2)^2]$$
$$= \frac{22}{7}[16 - 4]$$
$$= \frac{22}{7} \times 12 = \frac{264}{7}$$
$$\text{Area of face} = 37.71 \text{ cm}^2$$

9. Area of rectangular sheet $= 36 \times 24 = 864 \text{ cm}^2$

Area of each buttons $= \pi r^2 = \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2}$

Area of 64 button $= \frac{9\pi}{4} \times 64 = 16 \times 9\pi = 452.16 \text{ cm}^2$

Remaining Area $= 864 - 452.16 = 411.84 \text{ cm}^2$

10. $\pi r_1^2 = 100\,\pi r_2^2$

$r_1 = 10 r_2$

$\frac{c_1}{c_2} = \frac{2\pi r_1}{2\pi r_2}$

$= \frac{10 r_2}{r_2} = \frac{10}{1}$

Ratio of circumference is 10 :1.

11. Area of two plates $= \pi r_1^2 + \pi r_2^2 = \pi[r_1^2 + r_2^2]$

$= \pi[(5)^2 + (12)^2]$

$= \pi[25 + 144] = 169\pi \text{ cm}^2$

New plate area $= \pi R^2$

$\pi R^2 = 169\pi$

$R^2 = 169$

$R = 13 \text{ cm}$

Diameter of new plate is $2 \times 13 = 26 \text{ cm}$

12. Area of square $= a^2$

$a^2 = 196 \text{ cm}^2$

$a = 14 \text{ cm}$

$4a = 2\pi r$

$4 \times 14 = 2 \times \frac{22}{7} \times r$

$r = \frac{14 \times 7}{11} \text{ cm}$

Area of circle $= \pi r^2$

$= \frac{22}{7} \times \frac{14 \times 7}{11} \times \frac{14 \times 7}{11}$

$A = 249.45 \text{ cm}^2$.

18. Volumes and Surface Areas of Solids

Exercise 18A

1. Do it yourself.

2. (i) Volume of cuboid $= l \times b \times h$
$= 3.6 \times 5.5 \times 3.5 = 69.3 \text{ m}^2$

Capacity of volume $= 69.3 \times 1000$
$= 69300$ litres.

(ii) Volume of cuboid $= l \times b \times h$
$= 2.7 \times 4.75 \times 2.6$
$= 33.345 \text{ m}^3$

Capacity of volume $= 33.345 \times 1000$
$= 33345$ litres

(iii) Do it yourself.

(iv) Do it yourself.

3. Volume of cuboid $= l \times b \times h$
$= 30 \times 24 \times 18$
$= 12960 \text{ cm}^3$

4. The volume of rectangular tank whose side are
$l = 65$ cm, $b = 40$ cm, $h = 54$ cm

Volume of rectangular tank $= l \times b \times h$
$= 65 \times 40 \times 54$
$= 140400 \text{ cm}^3$

Number of glasses of sugarcane $= \dfrac{140400}{200} = 702$

5. Capacity of water in water tank $= 4.8$ L
$= 4.8 \times 1000 = 4800 \text{ cm}^3$

Volume of water tank $= l \times b \times h$

$4800 = 20 \times 15 \times h$

$h = 16$ cm

Total surface area of cuboid $= 2(lb + bh + hl)$
$= 2(20 \times 15 + 15 \times 16 + 16 \times 20)$
$= 2(860) = 1720 \text{ cm}^2$

6. The volume of solid cube $= 64 \text{ cm}^3$

$a^3 = 64$

$$a = 4\,\text{cm}$$

$$\text{Total surface area of solid} = 6(a)^2$$

$$= 6(4)^2 = 6 \times 16 = 96\,\text{cm}^2$$

7. $$\text{Total surface area of solid} = 6a^2$$

$$6a^2 = 600$$

$$a^2 = 100$$

$$a = 10\,\text{cm}$$

$$\text{Volume of cube} = a^3 = (10)^3 = 1000\ \text{cm}^3$$

8. $$\text{Volume of cube} = 729\ \text{cm}^3$$

$$a^3 = 729$$

$$a = 9\,\text{cm}$$

$$\text{Total surface} = 6a^2 = 6 \times (a)^2$$

$$= 6 \times 81 = 486\ \text{cm}^2$$

$$\text{Lateral surface area} = 2(l + b) \times h$$

$$= 2(9 + 9) \times 9$$

$$= 18 \times 18 = 324\ \text{cm}^2$$

9. $$\text{Volume of cube} = a^3 = (9)^3 = 729\ \text{cm}^3$$

$$V_1 + V_2 + V_3 = 729$$

$$a_1^3 + a_2^3 + a_3^3 = 729$$

$$(6)^3 + (8)^3 + (a_3)^3 = 729$$

$$(a_3)^3 = 729 - 216 - 512$$

$$= 729 - 728$$

$$(a_3^3) = 1$$

$$a_3 = 1$$

$$a_3 = 1\,\text{cm}$$

Edge of third volume is 1 cm.

10. $$\text{Number of cubical box} = \frac{(4.5)^3}{(0.15)^3} = \frac{91.125}{0.003375}$$

Number of cubical box = 27000

11. $$\text{Area of open tank} = 2\,h\,(l + b) + lb$$

$$= 2 \times 3\,(15 + 12) + 15 \times 12$$

$$= 162 + 180 = 342\ \text{m}^2$$

$$\text{Length of iron sheet} = \frac{342}{4} = 85.5\ \text{m}^2$$

$$\text{Cost of iron sheet} = 22.50 \times 85.5$$

$$= ₹\ 1923.75$$

12. Total surface area or cubical $= 6a^2 = 6(14)^2$

$= 6 \times 196 = 1176 \text{ cm}^2$

Exercise 18B

1. (i) Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 15 = 2310 \text{ cm}^3$

(ii) Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 2.8 \times 2.8 \times 15$

$= 396.6 \text{ m}^3$

2. (i) Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 20$

$= 6930 \text{ cm}^3$

(ii) Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$

$= 462 \text{ m}^3$

3. Area of base cylinder $= \pi r^2$

$\pi r^2 = 154$

$\frac{22}{7} \times r^2 = 154$

$r^2 = 49$

$r = 7 \text{ cm}$

Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 15$

$= 2310 \text{ cm}^3$

4. $2\pi r = 132$

$2 \times \frac{22}{7} \times r = 132$

$r = 21 \text{ cm}$

Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 21 \times 21 \times 25$

$= 34650 \text{ cm}^2$

5. First pack volume $= \text{Area of base} \times \text{Height}$

$= 5 \times 5 \times 12$

$= 300 \text{ cm}^2$

Second pack volume $= \text{Area of base} \times \text{Height}$

$= \frac{22}{7} \times \frac{35 \times 35}{100} \times 10$

$= 385 \text{ cm}^2$

Difference $= 385 - 300 = 85 \text{ cm}^2$

6. Volume of cylinder $= \pi r^2 h$

$\pi r^2 h = l \times b \times h$

$\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 20 = 22 \times 14 \times h$

$h = \frac{770}{14 \times 22}$

$h = 2.5 \text{m}$

Thus, height of platform is 2.5 m.

7. Volume of roof $= \frac{18 \times 16.5 \times 10}{100} = 29.7 \text{ m}^3$

Volume of roof $=$ Volume of cylinder tank

$29.7 = \pi r^2 h$

$29.7 = \frac{22}{7} \times 4 \times 4 \times h$

$h = \frac{29.7 \times 7}{22 \times 16}$

$= 0.5906 \text{ m}$

$= 59.06 \text{ cm}$

8. Thickness $= 2$ cm, Height $= 35$ cm, $R = 12 + 2 = 14$ cm, $r = 12$ cm

Volume of wood required cylinder form,

$= \pi R^2 h - \pi r^2 h = \pi h (R^2 - r^2)$

$= \frac{22}{7} \times 35 (14^2 - 12^2)$

$= \frac{22}{7} \times 35 (196 - 144)$

$= 5720 \text{ cm}^3$

9. Total surface area of cylinder $= 2\pi r (h + r)$

$= 2 \times \frac{22}{7} \times 5(5 + 15)$

$$= 2 \times \frac{22}{7} \times 5 \times 20 = \frac{4400}{7}$$

$$= 628.57 \text{ cm}^2$$

10. Circumference of cylinder $= 2\pi r$

$$2 \times \frac{22}{7} \times r = 176$$

$$r = \frac{16}{4} \times 7$$

$$r = 28 \text{ cm}$$

Lateral surface area $= 2\pi rh$

$$= \frac{176 \times 1}{100}$$

$$= 1.76 \text{ cm}^2$$

11. Lateral surface area $= 2\pi rh = 2 \times \frac{22}{7} \times \frac{3 \times 80}{10}$

$$150.857 = 150.86 \text{ cm}^2$$

12. Area of roller $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times 42 \times 120 = 31680$$

Area of playground $= 3168 \text{ m}^2$

13. Curved surface area $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10$$

$$= \frac{22}{7} \times 35 = 110 \text{ m}^2$$

The cost of plastaring $= 110 \times 4 = ₹ 440$

14. Total surface area of cylinder $= 2\pi r\,(h + r)$

$$= 2 \times \frac{22}{7} \times 21(21 + 100)$$

$$= 2 \times \frac{22}{7} \times 21 \times 121$$

$$= 132 \times 121 = 15972 \text{ cm}^2$$

15. Surface area $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{1}{2} \times 21$$

$$= 66 \text{ m}^2$$

Cost of painting $= 4 \times 66 = ₹ 330$

16. Total Surface Area $= 2\pi rh + \pi r^2$

$$= 2 \times \frac{22}{7} \times 10 \times 14 + \frac{22}{7} \times 10 \times 10$$

$$= 880 + \frac{2200}{7}$$

$$= 1194.28 \text{ cm}^2$$

For 100 m^2 surface of area $= 11.94 \text{ m}^2$

Cost of tin-plating $= \frac{50}{100} \times 11.94 = ₹ 5.97$

17. Curved surface $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{25}{100} \times 3.5$$

$$= 5.5 \text{ m}^2$$

Cost of washing $= 1.25 \times 5.5$

$= ₹ 6.88$

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. Volume of cuboid $= l \times b \times h$

$$= 3 \times 2.2 \times 1.6 = 10.56 \text{ m}^3$$

Capacity of cuboid $= 10.56 \times 1000$

$= 10560$ litres

3. Surface area of cuboid $= 2(lb + bh + hl)$

$$= 2(896 + 504 + 576)$$

$$= 2(1976) = 3952 \text{ m}^2$$

Area of 15 tin sheet $= 15 \times 3952 = 59280 \text{ m}^2$

4. Volume of cuboid $= l \times b \times h$

$$\frac{160 \times 1000}{1000} = 10 \times 4 \times h$$

$$h = \frac{160}{40} = 4 \text{ m}$$

Thus, depth of tank is 4 m.

5. Diagonal of cube $= a\sqrt{3}$

$a\sqrt{3} = 8\sqrt{3}$

(i) $a = 8$ cm

(ii) Surface area $= 6a^2 = 6(8)^2 = 384\ \text{cm}^2$

(iii) Volume of cube $= a^3 = (8)^3 = 512\ \text{cm}^3$

6. Volume of cube $= a^3$

$(6)^3 + (10)^3 + (x)^3 = (12)^3$

$216 + 1000 + x^3 = 1728$

$x^3 = 1728 - 1216$

$x^3 = 512$

$x = 8\ \text{cm}$

7. Volume of cube $= a^3$

$a^3 = (6)^3 + (8)^3 + (10)^3$

$= 216 + 512 + 1000$

$a^3 = 1728$

$a = 12\ \text{cm}$

8. (i) Volume of cuboid $= 4 \times x \times 15$

$(6)^3 = 4 \times x \times 15$

$216 = 4 \times x \times 15$

$x = 3.6\ \text{cm}.$

(ii) Total surface of cuboid

$= 2(lb + bh + hl)$

$= 2(4 \times 3.6 + 3.6 \times 15 + 15 \times 4)$

$= 2(14.4 + 54 + 60)$

$= 2 \times 128.4 = 256.8\ \text{cm}^2$

(iii) Total surface of cube $= 6(a)^2$

$= 6(6)^2 = 6 \times 36$

$= 216\ \text{cm}^2$

9. (i) Total surface area $= \frac{6}{6}\left(\frac{3}{2}\right)^2 = 9 : 4$

(ii) Volume of cube $\left(\frac{3}{2}\right)^3 = a^3 = \frac{27}{8} = 27 : 8$

10. Volume of rectangle $= 5.2\ \text{m}^3$

$h \times 2.6 \times 10^4\ \text{cm}^2 = 5.2 \times 100 \times 100$

$h = \frac{5.2}{2.6} = 2\ \text{m}$

Thus, height is 2 m.

11. Volume of cuboid $= l \times b \times h$

$= 120 \times 90 \times 75$

$= 810000 \text{ cm}^3$

Volume of cube $= (a)^3$

$= (30)^3 = 27000$

Number of cubes $= \dfrac{810000}{27000} = 30$

12. Volume of tank $= 480$ KL

$10 \times 6 \times h = \dfrac{480 \times 1000}{1000}$

$h = 8$ m

13. (i) Volume of cube $= a^3$

When $a = 2a$

Volume of cube $= (2a)^3 = 8a^3$

(ii) Surface of cube $= 6\,(a)^2$

When $a = 2a$

Surface of cube $= 6\,(2a)^2 = 4 \times 6\,(a)^2$

Thus, surface is 4 times increase.

Volume is 8 times increase.

14. Area of swimming pool = Area of four walls + Area of base

$= 2h\,(l + b) + l \times b$

$= 2 \times 3.2\,(52 + 38) + 52 \times 38$

$= 2 \times 3.2 \times 90 + 1976$

$= 576 + 1976 = 2552 \text{ m}^2$

Cost of pool $= 56 \times 2552 =$ ₹ 142912

15. Area of four walls $= 120 \text{ m}^2$

$2\,(l + b) \times h = 120$ $\quad \therefore \quad l = 2b$

$2\,(2b + b) \times 4 = 120$

$2\,(3b) \times 4 = 120$

$3b = 15$

$b = 5$

$l = 2b = 2 \times 5 = 10$

Area of floor $= l \times b = 10 \times 5 = 50 \text{ m}^2$

16. Circumference $= 2\pi r$

$2\pi r = 132$

$2 \times \dfrac{22}{7} \times r = 132$

$r = 21$ cm

$$\text{Volume of clinder} = \pi r^2 h$$
$$= \frac{22}{7} \times 21 \times 21 \times 36 = 49896 \text{ cm}^3$$
$$\text{Capacity of cylinder} = \frac{49896}{1000} = 49.896 \text{ L}$$

17. $$\text{Volume of cylinder} = 550 \text{ cm}^3$$
$$\pi r^2 h = 550$$
$$\frac{22}{7} \times 5x \times 5x \times 7x = 550$$
$$x^3 = \frac{550}{22 \times 25}$$
$$x^3 = 1$$
$$x = 1$$
$$\text{Radius} = 5 \times 1 = 5 \text{ cm}$$
$$\text{Height} = 7 \times 1 = 7 \text{ cm}$$

18. Total surface area of cylinder $= 660 \text{ cm}^2$
$$2\pi r(h + r) = 660 \text{ cm}^2$$
$$2 \times \frac{22}{7} \times 5(h + 5) = 660$$
$$(h + 5) = 21$$
$$h = 21 - 5 = 16 \text{ cm}$$

Thus, height is 16 cm

19. $$\text{Volume of earth} = 75 \text{ m}^3$$
$$8 \times 4.8 \times h = 75$$
$$h = \frac{75}{8 \times 4.8} = 1.95 \text{ m}$$

Thus, height/depth is 1.95 m.

20. $$\text{Number of wheat bags} = \frac{\text{Volume of godown}}{\text{Volume of bags}}$$
$$= \frac{60 \times 40 \times 15 \times 100}{1.8 \times 1.2 \times 40}$$
$$= \frac{60 \times 15 \times 100}{1.8 \times 1.2}$$
$$= \frac{60 \times 15 \times 100 \times 100}{18 \times 12}$$
$$= \frac{5 \times 5 \times 100 \times 100}{6} = \frac{250000}{6}$$
$$\text{Number of wheat bags} = 41666$$

19. Data Handling

Exercise 19A

1. (i) Data as an array in descending order,
11.5, 10.6, 9.1, 8.3, 5.6, 3.7

(ii) Data as an array in descending order,
5, 4, 3, 3, 2, 2, 1, 0

2. (i) Data as an array in ascending order,
4.7, 5.6, 5.9, 6.3, 9.8, 12.3

(ii) Data as an array in ascending order,
5, 7, 10, 11, 12, 15, 16

3. (i) Frequency table for data

Data	Tally Marks	Frequency
1	|||	3
2	𝍸	5
3	||	2
4	||||	4
5	||||	4

(ii) Frequency table for data

Data	Frequency	Tally Marks
5	||||	4
6	||||	4
7	|||	3
8	𝍸	5
9	|||	3
10	|||	3

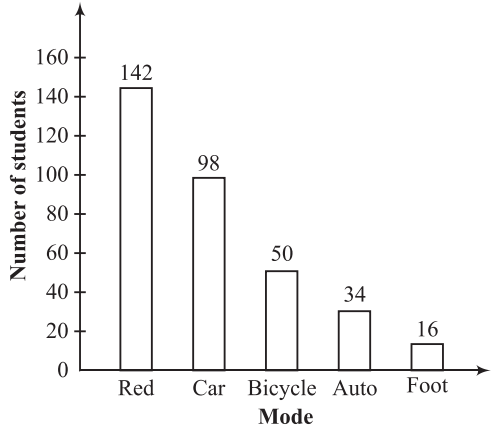
4. Do it yourself.

5. Do it yourself.

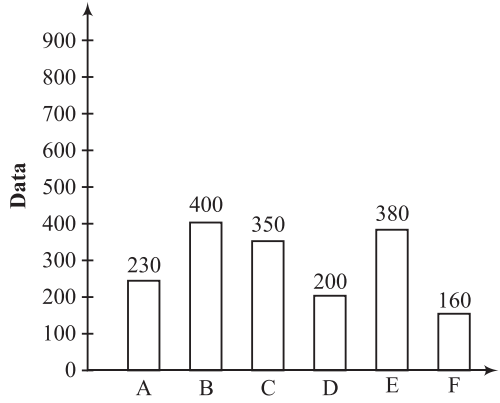
6. Do it yourself.

Exercise 19B

1. Bar graph between mode and students.



2.



3. $60 + 45 + 42 + 75 = 270$

$$\text{Central angle for Hindi} = \frac{60}{270} \times 360 = 80°$$

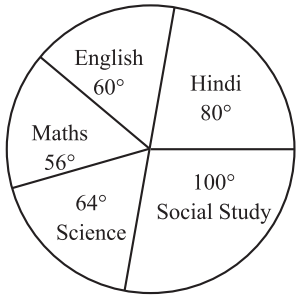
$$\text{Central angle for English} = \frac{45}{270} \times 360 = 60°$$

$$\text{Central angle for Math} = \frac{42}{270} \times 360 = 56°$$

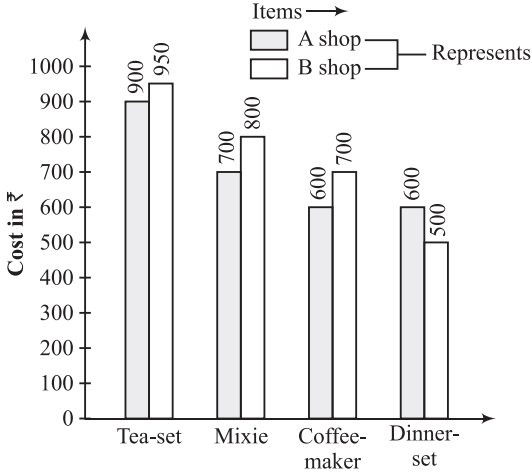
$$\text{Central angle for Science} = \frac{48}{270} \times 360 = 64°$$

$$\text{Central angle for Social Study} = \frac{75}{270} \times 360 = 100°$$

Required pie-graph is as shown along side.



4. Bar graph between cost and items.



5.

$$\text{Angle of } A = \frac{35}{100} \times 360° = 126°$$

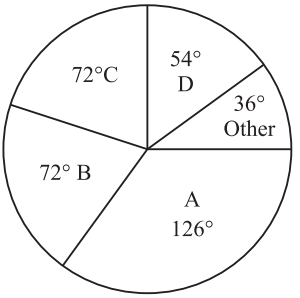
$$\text{Angle of } B = \frac{20}{100} \times 360° = 72°$$

$$\text{Angle of } C = \frac{20}{100} \times 360° = 72°$$

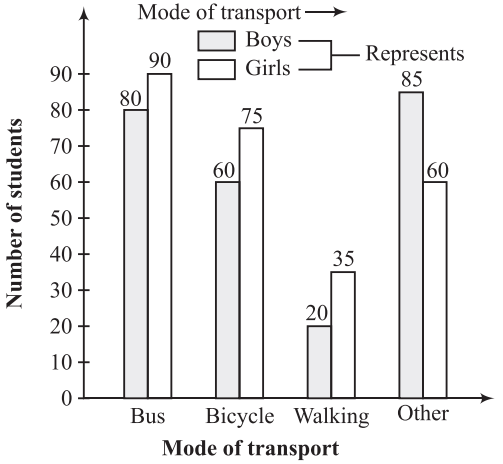
$$\text{Angle of } D = \frac{15}{100} \times 360° = 54°$$

$$\text{Angle of others} = \frac{10}{100} \times 360° = 36°$$

Represent pie-chart



6. Bar graph between students and mode of transport.



7. Do it yourself.

8. Do it yourself.

Exercise 19C

1. Do it yourself.

2. (i) An even number and a multiple of 3 of probability (P) 1, 2, 3, 4,

5, 6

$$\text{even} = 2, 4, 6$$

$$(P) = \frac{1}{\text{Total Number}} = \frac{1}{6}$$

(ii) $1, 2, 3, 4, 5, 6 = 6$

$$\text{Number less than } 5 = 1, 2, 3, 4 = 4$$

$$\text{Probability } (P) = \frac{4}{6} = \frac{2}{3}$$

(iii) 1, 2, 3, 4, 5, 6, = 6

Number greater than 3 = 4, 5, 6 = 3

Probability $(P) = \frac{3}{6} = \frac{1}{2}$

(iv) 1, 2, 3, 4, 5, 6 = 6

A number between 3 and 6 = 4, 5 = 2

Probability $(P) = \frac{2}{6} = \frac{1}{3}$

3. (i) Three unbiased coins $(A) = HHT, TTH, HHT$

$$P(A) = \frac{3}{8}$$

$$B = THT, TTH, HHT$$

(ii) $P(B) = \frac{3}{8}$

4. 2-coins

(i) $1 \to H, 1 \to T \quad HT/TH$

$$(P) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

(ii) At least one head- $HT/TH/HH$

$$(P) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$$

(iii) No head $(A) = TT$

$$P = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

5. (i) Probability or Red $= \frac{26}{52} = \frac{1}{2}$

(ii) Probability of a red king $= \frac{2}{52} = \frac{1}{26}$

(iii) Probability of red face card $= \frac{6}{52} = \frac{3}{26}$

(iv) Probability of '10' a black suit $= \frac{2}{52} = \frac{1}{26}$

6. (i) One dics = 1, 2, 3, 4, 5, 6

more dics = 1, 2, 3, 4, 5, 6

Probability of sum as prime no. $= \frac{5}{12}$

(ii) Probability of even no. $= \frac{1}{12}$

(iii) Probability of same no. on both dice *i.e.*, a doublet $= \frac{2}{12} = \frac{1}{6}$

(iv) Probability of multiple of 3 as sum,

$$(P) = \frac{4}{12} = \frac{1}{3}$$

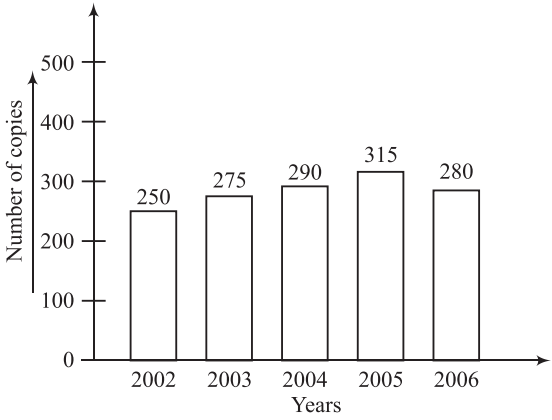
Multiple Choice Questions

Do it yourself.

Revision Exercise

1. Do it yourself.

2. Bar graph between copies and years.



3. (i) Percentage of students of badminton

$$P\% = \frac{50}{150} \times 100$$

$$P\% = \frac{1}{3} \times 100 = 33\frac{1}{3}\%$$

(ii) Ratio of students of table tennis and badminton

$$= 40 : 50$$

$$T : B = 4 : 5$$

4. Do it yourself.

5.

$$\text{Angle of Banana} = \frac{30}{100} \times 360 = 108°$$

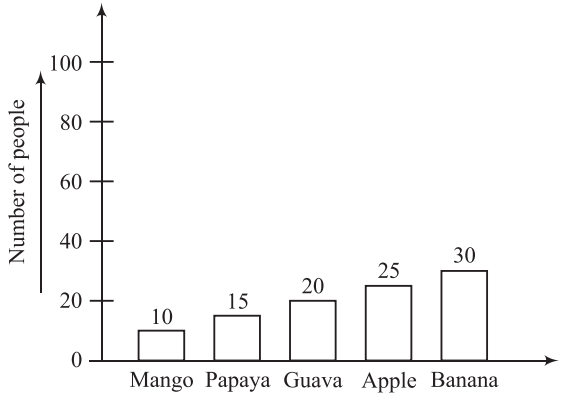
$$\text{Angle of Apple} = \frac{25}{100} \times 360 = 90°$$

$$\text{Angle of Mango} = \frac{10}{100} \times 360 = 36°$$

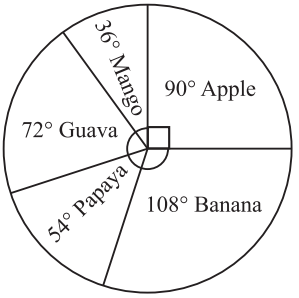
$$\text{Angle of Papaya} = \frac{15}{100} \times 360 = 54°$$

$$\text{Angle of Guava} = \frac{20}{100} \times 360 = 72°$$

(i) Bar graph is as shown,

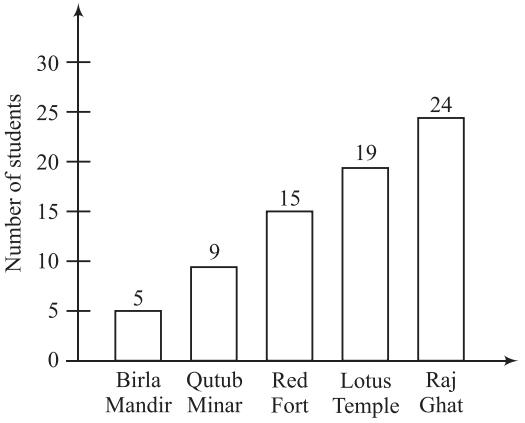


(b) Pie-chart as shown- Fruits →



(ii), (iii) Do it yourself.

6. Bar graph between place of interest and students.



7. (i) Probability of a red card $= \frac{26}{52} = \frac{1}{2}$

(ii) Probability of neither a king nor a queen $= \frac{44}{52} = \frac{11}{13}$

(iii) Probability of a red face card $= \frac{6}{52} = \frac{3}{26}$

(iv) Probability of a card of spade $= \frac{16}{52} = \frac{4}{13}$

8. Do it yourself.

9. Do it yourself.

10. Do it yourself.

11. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

(i) Probability of odd no. $= \frac{9}{17}$

(ii) Probability of even no. $= \frac{8}{17}$

(iii) Probability of prime no. $= \frac{7}{17}$

(iv) Probability of divisible by 3 $= \frac{5}{17}$

12. No. of prize = 5

No. of black tickets = 995

Probability of winning prize $= \frac{5}{995 + 5} = \frac{5}{1000} = \frac{1}{200}$

13. 53 Sundays in a leap year

Probability of getting 53 Sundays in a leap year

$$(P) = \frac{2}{7}$$

20. Introduction to Graphs

Exercise 20A

1. Do it yourself.

2. (i) (2, 3)

In the point (2, 3) abscissa and ordinate both are positive.
So, it lies in the I quadrant.

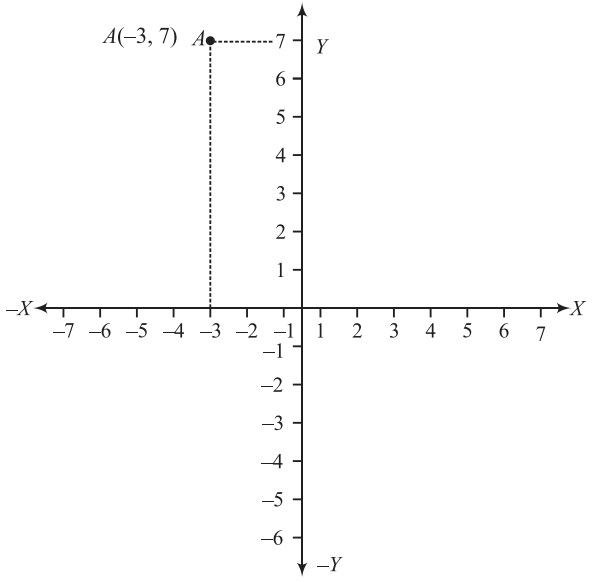
(ii) In point (–5, –4) abscissa and ordinate both are negative.
So, it lies in III quadrant.

(iii) In point (–10, –6) abscissa and ordinate both are negative.
So, it lies in III quadrant.

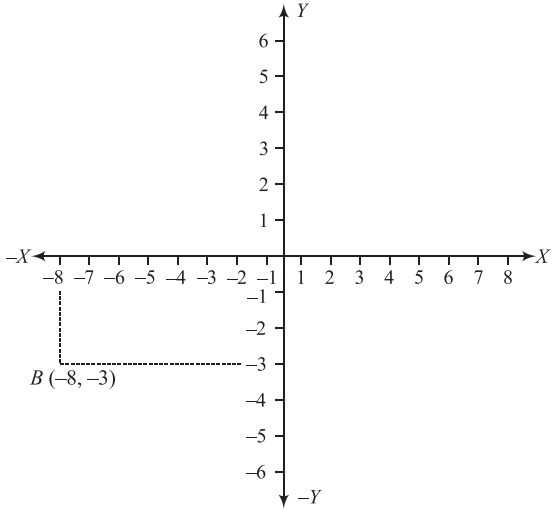
(iv) In point (4, – 5) abscissa is positive and ordinate is negative.
So, it lies in IV quadrant.

3. (i) (–3, 0) Point lie in *X*-axis.
(ii) (0, 7) Point lie on *Y*-axis.
(iii) (0, – 5)
Point lie one *Y*-axis.
(iv) (6,0)
Point lie on *X*-axis.

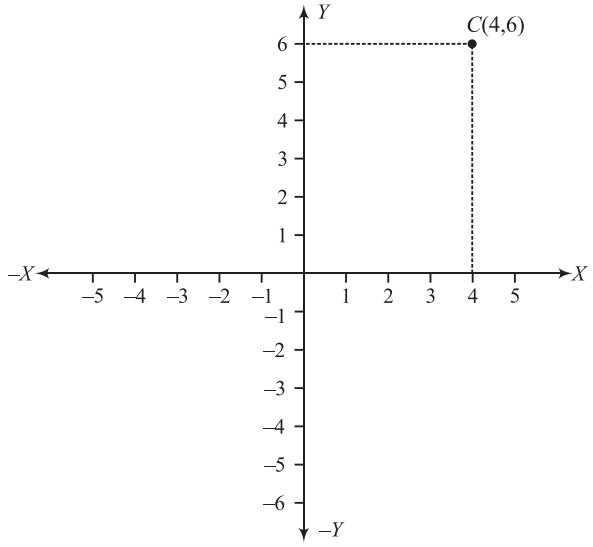
4. (i) *A* (–3, 7)



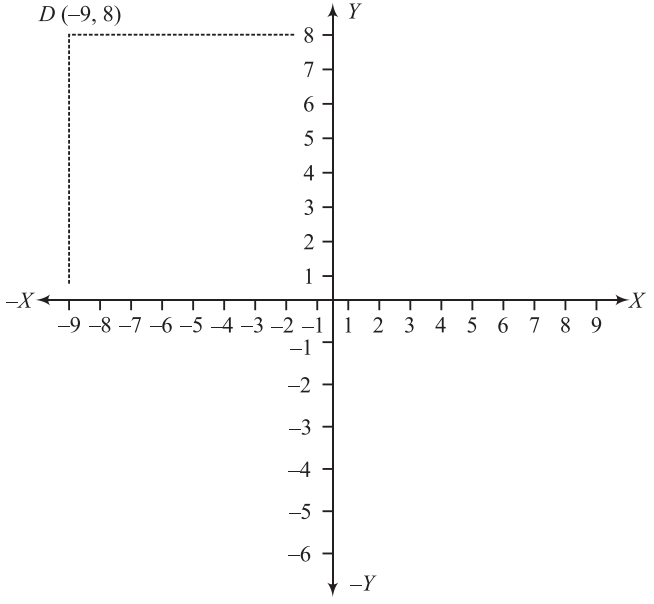
(ii) *B* (–8, – 3)



(iii) C (4, 6)



(iv) D (–9, 8)



5. Do it yourself.

Exercise 20B

1. (i) We know that
Relation of Celsius and Fahrenheit,
Given :

$$C = 25°$$
$$F = ?$$
$$\frac{C}{5} = \frac{F-32}{9}$$
$$\frac{25}{5} = \frac{F-32}{9}$$
$$5 \times 9 = F - 32$$
$$F = 45 + 32 = 77°$$

(ii) We know that

$$\frac{C}{5} = \frac{F-32}{9}$$
$$\frac{C}{5} = \frac{95-32}{9}$$
$$\frac{C}{5} = \frac{63}{9}$$
$$\frac{C}{5} = 7$$
$$C = 5 \times 7$$
$$C = 35°$$

2. 4 kg Apple of price $= ₹\ 240$

1 kg Apple of price $= ₹\ \frac{240}{4} = ₹\ 60$

22 kg Apple of price $= 60 \times 22 = ₹\ 1320$

3. $P = ₹\ 1{,}000, T = 1\text{ year } R = ?$

$$\text{S.I.} = ₹\ 60$$
$$\text{S.I.} = \frac{PRT}{100}$$
$$60 = \frac{1000 \times R \times 1}{100}$$
$$R = 6\%$$

(i) $$\text{S.I.} = \frac{1800 \times 6 \times 1}{100}$$
$$\text{S.I.} = ₹\ 108$$

Thus, simple interest of 1800 is ₹ 108.

(ii) $$156 = \frac{P \times 6 \times 1}{100}$$

$$P = \frac{15600}{6}$$

$$P = ₹\ 2600$$

4. (i) In one second distance covered = 10 m

6 second distance covered = 60 m

(ii) Time of 90 m covered distance = $\frac{90}{10} = 9$ sec.

5. 5 Litres diesel of cost = ₹ 350

1 Litre diesel of cost = $\frac{350}{5} = ₹\ 70$

In ₹ 1960 diesel or quantity = $\frac{1960}{70} = 28$ Litre

6. (i) In one hour distance covered = 50 km

In $\frac{1}{2}$ hour distance covered = $50 \times \frac{1}{2} = 25$ km

(ii) Time of 175 km = $\frac{175}{50} = 3.5$ hours

Time of 175 km = 8 m + $\frac{1}{2}$ hour = 8 : 30 am

7. Do it yourself.

Multiple Choice Questions

Do it yourself.

Revision Exercise

1. (i) In the point (–7, – 8) abscissa and ordinate both are negative.
So, it lies in the III quadrant.

(ii) In the point (5, 8) abscissa and ordinate both are positive.
So, it lies in the I quadrant.

(iii) In the point (–4, 5) abscissa is negative and ordinate is positive.
So, it lies in the II quadrant.

(iv) In the point (6, –3) abscissa is positive and ordinate is negative.
So, it lies in IV quadrant.

2. (i) (0, –2) Point lie in *Y*-axis.

(ii) (3, 0) Point lie in *X*-axis.

(iii) (0, 6) Point lie in Y-axis.

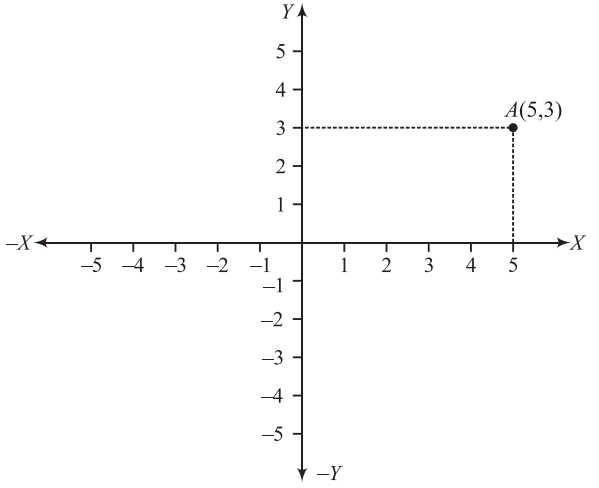
(iv) (–5, 0) Point lie in X-axis.

3. Do it yourself.

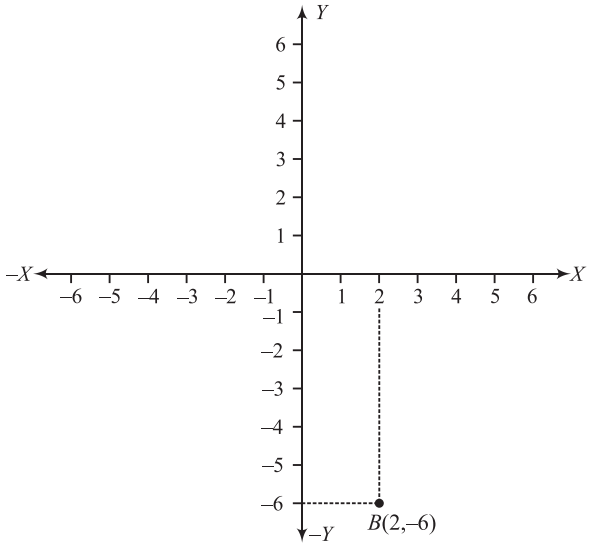
4. Do it yourself.

5. Do it yourself.

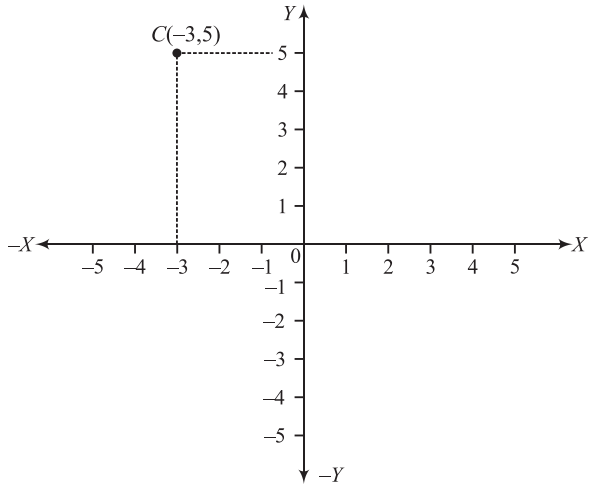
6. (i) $A\,(5, 3)$



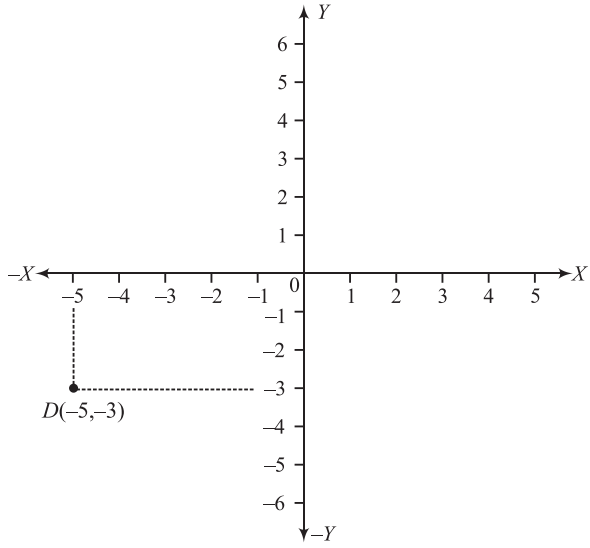
(ii) $B\,(2, -6)$



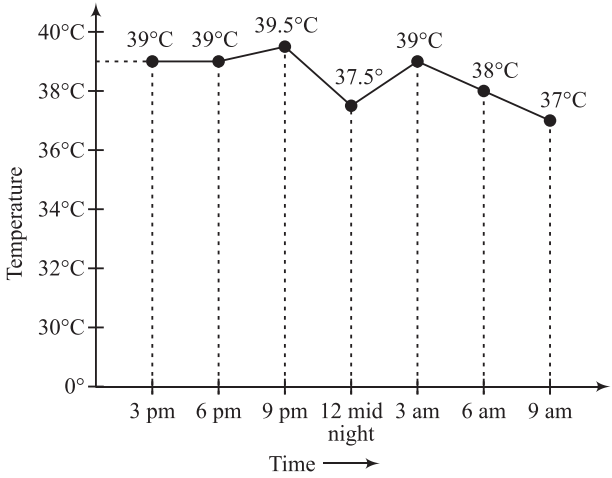
(iii) $C\ (-3,\ 5)$



(iv) $D\ (-5,\ -3)$



7. (i) Line graph between Time and Temperature.



(ii) Patients temperature are 5 pm and at 1 am = 39° C, 38°C

8. Do it yourself.

9. Do it yourself.