Foundation Mathematics 8

1. Rational Numbers

Learning Target 1.1

1. Do Yourself.

Learning Target 1.2

1. (i) $\frac{7}{13}+\left(\frac{-6}{13}\right)=\frac{7}{13}-\frac{6}{13}=\frac{1}{13}$

(ii), (iii), (iv) Do yourself

2. (i) $\frac{-3}{-11}+\frac{5}{9}=\frac{3\times 9+5\times 11}{99}=\frac{27+55}{99}=\frac{82}{99}$

(ii), (iii), (iv) Do yourself

3. (i) $\text{LHS}=\frac{-7}{9}+\frac{(-4)}{1}=\frac{-7}{9}-\frac{4}{1}$

$=\frac{-7-9\times 4}{9}=\frac{-7-36}{9}=\frac{-43}{9}$

$\text{RHS.}=\frac{-4}{1}+\frac{(-7)}{9}=\frac{-4}{1}-\frac{7}{9}$

$=\frac{-36-7}{9}=\frac{-43}{9}$

$\text{LHS}=\text{RHS}$

(ii), (iii), (iv) Do yourself

4. (i) $\text{LHS}=\frac{-3}{4}+\left(\frac{2}{5}+\frac{-4}{7}\right)$

$=\frac{-3}{4}+\left(\frac{14-20}{35}\right)=\frac{-3}{4}-\frac{6}{35}$

$=\frac{-105-24}{140}=-\frac{129}{140}$

$\text{RHS}=\left(\frac{-3}{4}+\frac{2}{5}\right)+\frac{(-4)}{7}$

$=\left(\frac{-15+8}{20}\right)+\left(\frac{-4}{7}\right)$

$=\frac{-7}{20}-\frac{4}{7}=\frac{-49-80}{140}=-\frac{129}{140}$

$\text{LHS}=\text{RHS}$

(ii), (iii), (iv) Do yourself

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

$$=\left(\frac{4}{7}+\frac{17}{21}\right)-\left(\frac{8}{9}+\frac{13}{7}\right)$$

$$=\left(\frac{12+17}{21}\right)-\left(\frac{56+117}{63}\right)$$

$$=\frac{29\times 3-173}{63}=\frac{87-173}{63}=\frac{-86}{63}$$

(ii) Do yourself

6. (i) $0+\frac{9}{11}=\frac{9}{11}$(ii), (iii), (iv) Do yourself.

Learning Target 1.3

1. (i), (ii), (iii), (iv) Do yourself

2. (i) $\frac{13}{15}-\frac{12}{25}=\frac{13\times 5}{15\times 5}-\frac{12\times 3}{25\times 3}=\frac{65-36}{75}=\frac{29}{75}$

(i), (iii), (iv) Do yourself.

3. (i) Subtract $\frac{7}{8}$ from $\frac{5}{8}=\frac{5}{8}-\frac{7}{8}=\frac{-2}{8}=\frac{-1}{4}$

Subtract $\frac{5}{8}$ from $\frac{7}{8}=\frac{7}{8}-\frac{5}{8}=\frac{2}{8}=\frac{1}{4}$

So, Two answers are not same.

(ii), (iii) Do yourself.

4. Let the other number be x.

$$-\frac{15}{7}+x=-8\Rightarrow x=-8+\frac{15}{7}=\frac{-56+15}{7}$$

$$x=\frac{-41}{7}$$

5. Do yourself.

6. Let the required number is x.

$$x+\left(\frac{-7}{8}\right)=\frac{5}{9}$$

$$\Rightarrow \quad x-\frac{7}{8}=\frac{5}{9}$$

$$\Rightarrow \quad x=\frac{5}{9}+\frac{7}{8}$$

$$x=\frac{40+63}{72}=\frac{103}{72}$$

7. Do Yourself.

8. (i) $\left(\frac{-8}{9}-\frac{11}{4}\right)-\frac{-4}{12}=\left(\frac{-32-99}{36}\right)+\frac{4}{12}=\frac{-131}{36}+\frac{4\times3}{12\times3}$

$=\frac{-131+12}{36}=\frac{-119}{36}\quad\frac{-8}{9}-\left(\frac{11}{4}-\frac{-4}{12}\right)$

$=\frac{-8}{9}-\left(\frac{33+4}{12}\right)=\frac{-8}{9}-\frac{37}{12}$

$=\frac{-32-111}{36}=\frac{-143}{36}$

So, they are not equal.

(ii) Do yourself.

9. (i) $\frac{-2}{3}+\frac{5}{9}-\frac{-7}{6}=\frac{-2\times6+5\times2+7\times3}{18}$

$=\frac{-12+10+21}{18}=\frac{19}{18}$

(ii) $\frac{3}{8}-\frac{-2}{9}+\frac{-1}{36}=\frac{3\times9+2\times8-1\times2}{72}=\frac{27+16-2}{72}=\frac{41}{72}$

(iii), (iv) Do yourself.

10. Do Yourself.

Learning Target 1.4

1. (i) $\frac{3}{20}\times\frac{4}{5}=\frac{3}{5}\times\frac{1}{5}=\frac{3}{25}$ (ii) $\frac{-7}{30}\times\frac{5}{14}=\frac{-1}{6}\times\frac{1}{2}=\frac{-1}{12}$

(iii), (iv) Do yourself.

2. (i) $\frac{3}{11}$ by $\frac{2}{5}=\frac{3}{11}\times\frac{2}{5}=\frac{6}{55}$

(ii) $\frac{3}{7}$ by $\left(\frac{-2}{5}\right)=\frac{3}{7}\times\frac{-2}{5}=\frac{-6}{35}$

(iii) $\frac{9}{8}$ by $\frac{32}{3}=\frac{9}{8}\times\frac{32}{3}=\frac{3}{1}\times\frac{4}{1}=12$

(iv) $\frac{25}{-9}$ by $\frac{3}{-10}=\frac{25}{-9}\times\frac{3}{-10}=\frac{5}{-3}\times\frac{1}{-2}=\frac{5}{6}$

(v), (vi), (vii), (viii) Do yourself.

3. (i) $\frac{4}{15}\times\frac{9}{5}\times\frac{50}{3}=\frac{4}{3}\times\frac{3}{5}\times\frac{10}{1}=8$

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

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

$$= \frac{-6}{5} - 6 - \frac{3}{8} = \frac{-48 - 240 - 15}{40}$$

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

(iii), (iv) ,(v) Do yourself.

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

$$= \left(\frac{6}{1} \times \frac{2}{5}\right) + \left(\frac{-3}{1} \times \frac{2}{-16}\right)$$

$$= \frac{12}{5} + \frac{3}{8} = \frac{96 + 15}{40} = \frac{111}{40}$$

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

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

$$= \frac{-16}{3} - \frac{8}{5} = \frac{-80 - 24}{15} = \frac{-104}{15}$$

(iii), (iv) Do yourself.

5. Sum of $\frac{2}{9}$ and $\frac{-3}{11} = \frac{2}{9} + \left(\frac{-3}{11}\right) = \frac{22 - 27}{99} = \frac{-5}{99}$

Sum of $\frac{5}{2}$ and $\frac{7}{8} = \frac{5}{2} + \frac{7}{8} = \frac{20 + 7}{8} = \frac{27}{8}$

Multiply $= \frac{-5}{99} \times \frac{27}{8} = \frac{-5}{11} \times \frac{3}{8} = \frac{-15}{88}$

6. Do yourself.

7. Speed $= 65\frac{1}{3}$ km/h.

$$= \frac{196}{3} \text{ km/h.}$$

$$\text{Time} = 6\frac{1}{2} \text{ hours}$$

$$= \frac{13}{2} \text{ hours.}$$

$$\text{Distance} = \text{Speed} \times \text{Time} = \frac{196}{3} \times \frac{13}{2}$$

$$= \frac{98}{3} \times 13 = \frac{1274}{3} = \mathbf{424\frac{2}{3}\ km}$$

8. Cost of 1 litre milk = ₹ $16\frac{1}{2}$

Cost of $3\frac{5}{7}$ litre milk = ₹ $16\frac{1}{2} \times 3\frac{5}{7}$

$= ₹ \frac{33}{2} \times \frac{26}{7} = \frac{429}{7} = ₹ \mathbf{61\frac{2}{7}}$

Learning Target 1.5

1. Do yourself.

2. (i) $x = \frac{-1}{5}, y = \frac{2}{7}$

$\Rightarrow$ $\text{LHS} = x \times y = \frac{-1}{5} \times \frac{2}{7} = \frac{-2}{35}$

$\text{RHS} = y \times x = \frac{2}{7} \times \frac{-1}{5} = \frac{-2}{35}$

$x \times y = y \times x$

(ii), (iii), (iv) Do yourself.

3. (i) $a = \frac{1}{3}, b = \frac{-2}{3}, c = \frac{4}{3}$

$\text{LHS} = a \times (b \times c) = \frac{1}{3} \times \left(\frac{-2}{3} \times \frac{4}{3}\right)$

$= \frac{1}{3} \times \frac{-8}{9} = \frac{-8}{27}$

$\text{RHS} = (a \times b) \times c = \left(\frac{1}{3} \times \frac{-2}{3}\right) \times \frac{4}{3}$

$= \frac{-2}{9} \times \frac{4}{3} = \frac{-8}{27}$

$\because$ LHS = RHS.

$\therefore$ $a \times (b \times c) = (a \times b) \times c$

(ii) Do yourself.

4. (i) $a = \frac{5}{6}, b = \frac{-3}{4}, c = \frac{7}{8}$

$\text{LHS} = a \times (b + c) = \frac{5}{6} \times \left(\frac{-3}{4} + \frac{7}{8}\right)$

$= \frac{5}{6} \times \left(\frac{-6+7}{8}\right) = \frac{5}{6} \times \frac{1}{8} = \frac{5}{48}$

$\text{RHS} = (a \times b) + (a \times c)$

$= \left(\frac{5}{6} \times \frac{-3}{4}\right) + \left(\frac{5}{6} \times \frac{7}{8}\right)$

$$= \frac{-5}{8} + \frac{35}{48} = \frac{-30+35}{48} = \frac{5}{48}$$

$\because$ LHS = RHS

$\therefore$ $a \times (b + c) = (a \times b) + (a \times c)$

(ii), (iii), (iv) Do yourself.

5. (i) $x = \frac{1}{2}, y = \frac{3}{4}, z = \frac{-4}{5}$

$$\text{LHS} = x \times (y - z) = \frac{1}{2} \times \left(\frac{3}{4} - \frac{-4}{5}\right)$$

$$= \frac{1}{2} \times \left(\frac{15+16}{20}\right) = \frac{31}{40}$$

$$\text{RHS} = x + y - x \times z = \frac{1}{2} \times \frac{3}{4} - \frac{1}{2} \times \frac{-4}{5}$$

$$= \frac{3}{8} + \frac{2}{5} = \frac{15+16}{40} = \frac{31}{40}$$

$\because$ LHS = RHS

$\Rightarrow$ $x \times (y - z) = x \times y - x \times z$

(ii) Do yourself.

6. (i) The multiplicative inverse of $15 = \frac{1}{15}$

(ii) The multiplicative inverse of $-16 = \frac{1}{-16}$

(iii), (iv) Do yourself.

(v) Multiplicative inverse of $\frac{-6}{8} \times \frac{-3}{4} = \frac{8}{-6} \times \frac{4}{-3}$

(vi), (vii), (viii) Do yourself.

Learning Target 1.6

1. Do Yourself.

2. (i) $\frac{4}{9} \div \left(\frac{-5}{12}\right) = \frac{4}{9} \times \frac{12}{-5} = \frac{4 \times 4}{3 \times -5} = \frac{16}{-15}$

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

(iii) $\frac{-15}{7} \div (-30) = \frac{-15}{7} \times \frac{1}{-30} = \frac{1}{7} \times \frac{1}{2} = \frac{1}{14}$

(iv), (v), (vi), (vii), (viii) Do yourself.

3. Do yourself.

4. Do yourself.

5. (i) $\text{LHS} = (x \times y)^{-1} = \left(\frac{11}{23} \times \frac{-17}{5}\right)^{-1} = \left(\frac{-187}{115}\right)^{-1} = \frac{115}{-187}$

$$\text{RHS} = x^{-1} \times y^{-1} = \left(\frac{11}{23}\right)^{-1} \times \left(\frac{-17}{5}\right)^{-1}$$

$$= \frac{23}{11} \times \frac{5}{-17} = \frac{115}{-187}$$

$\because$ $\text{LHS} = \text{RHS}$

$\therefore$ $(x \times y)^{-1} = x^{-1} \times y^{-1}$

(iii) Do yourself.

6. Let the other number be x.

$$x \times \frac{-4}{15} = \frac{-8}{9} \Rightarrow x = \frac{-8}{9} \times \frac{15}{-4}$$

$$x = \frac{2}{3} \times \frac{5}{1} = \frac{10}{3} = 3\frac{1}{3}$$

7. Do yourself.

8. $\text{LHS} = (x \div y) \times z = \left(\frac{8}{15} \div \frac{2}{3}\right) \times \frac{4}{10} = \frac{8}{15} \times \frac{3}{2} \times \frac{4}{10}$

$$= \frac{8}{5} \times \frac{1}{1} \times \frac{2}{10} = \frac{8}{25}$$

$$\text{RHS} = x \div (y \times z) = \frac{8}{15} \div \left(\frac{2}{3} \times \frac{4}{10}\right)$$

$$= \frac{8}{15} \times \frac{3}{2} \times \frac{10}{4} = 2$$

$\because$ $\text{LHS} \neq \text{RHS}$

$\therefore$ $(x \div y) \times z \neq x \div (y \times z)$

9. $\text{Sum} = \frac{65}{13} + \frac{5}{7} = \frac{455 + 65}{91} = \frac{520}{91}$

$\text{Difference} = \frac{65}{13} - \frac{5}{7} = \frac{455 - 65}{91} = \frac{390}{91} = \frac{30}{7}$

$\text{Divide} = \frac{510}{91} \div \frac{30}{7} = \frac{520}{91} \times \frac{7}{30} = \frac{4}{3}$

10. Do yourself.

11. Let the number be x.

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

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

$$x = \frac{-35}{6} \times \frac{2}{-15} = \frac{7}{9}$$

12. Let the other rational number be x.

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

$\Rightarrow \quad x = \dfrac{-15}{-12} = \dfrac{5}{4}$

13. Do yourself

14. Cost of 1 metre cloth $= 65\dfrac{1}{2} \div 3\dfrac{2}{5} = \dfrac{131}{2} \div \dfrac{17}{5}$

$\Rightarrow \quad \dfrac{131}{2} \times \dfrac{5}{17} = \dfrac{655}{34} = ₹\, 19\dfrac{9}{34}$

15. Do yourself.

Learning Target 1.7

1. Do yourself

2. Do Yourself

3. Do yourself

4. LCM of 2, 8, 4 and 10 = 40

To get a Common denominatior 40, we get

$$\frac{3}{-2}, \frac{3}{8}, \frac{-7}{4}, \frac{1}{10} = \frac{-3 \times 20, 3 \times 5, -7 \times 10, 1 \times 4}{40}$$

$$= \frac{-60, 15, -70, 4}{40}$$

$\because \quad \dfrac{-70}{40} < \dfrac{-60}{40} < \dfrac{4}{40} < 15$

$\therefore \quad \dfrac{-7}{4} < \dfrac{3}{-2} < \dfrac{1}{10} < \dfrac{3}{8}$

(ii) Do yourself.

5. (i) LCM of 2, 3, 6 and 3 = 6

To get a common denominator 6, we get

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

$$= \frac{-21}{6}, \frac{4}{-6}, \frac{5}{6}, \frac{4}{6}$$

$\because \quad \dfrac{5}{6} > \dfrac{4}{6} > \dfrac{4}{-6} > \dfrac{-21}{6}$

$\therefore \quad \dfrac{5}{6} > \dfrac{2}{3} > \dfrac{2}{-3} > \dfrac{-7}{2}$

(ii) Do Yourself.

6. Do yourself.

Learning Target 1.8

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

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

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

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

Then $\frac{1}{4} + x = \frac{4}{5}$

$$x = \frac{4}{5} - \frac{1}{4} = \frac{16 - 5}{20} = \frac{11}{20}\text{L}$$

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

(a) Quantity of sugar that she used altogether

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

(b) Quantity of sugar she had left

$$= \frac{7}{9} - \frac{3}{4} = \frac{28 - 27}{36} = \frac{1}{36}\text{ cup}$$

3. (a) Their total height

$$= 1\frac{7}{10}\text{ m} + 1\frac{5}{8}\text{ m}$$

$$= \frac{17}{10}\text{m} + \frac{13}{8}\text{ m}$$

$$= \frac{68\text{m} + 65\text{m}}{40} = \frac{133}{40}\text{ m}$$

(b) Difference between their heights

$$= 1\frac{7}{10}\text{ m} - 1\frac{5}{8}\text{ m}$$

$$= \frac{17\text{m}}{10} - \frac{13}{8}\text{ m}$$

$$= \frac{68\text{ m} - 65\text{ m}}{40} = \frac{3}{40}\text{ m}$$

4. (a) Total distance he ran in two days

$$= 1\frac{2}{3}\text{ km} + 2\frac{3}{5}\text{ km}$$

$$= \frac{5}{3} + \frac{13}{5} = \frac{25 + 39}{15} = \frac{64}{15} = 4\frac{4}{15}\text{ km}$$

(b) Difference in the distances he ran on both day.

$$= 2\frac{3}{5}\text{ km} - 1\frac{2}{3}\text{ km} = \frac{13}{5}\text{ km} - \frac{5}{3}\text{ km}$$

$$= \frac{39 - 25}{15} = \frac{14}{15}\text{ km}$$

5. Number of hours spend on blind person

$$= \frac{49}{6} - \frac{24}{7} = \frac{343 - 144}{42} = \frac{199}{42}\text{ hrs.}$$

More time spend by him on the blind persons than an old persons's homes $= \frac{199}{42} - \frac{24}{7} = \frac{199 - 144}{42} = \frac{55}{42}$ hrs.

6. (a) Total time spent by Pulkit

$$= \frac{1}{4}\text{hrs} + \frac{2}{5}\text{ hrs.}$$

$$= \frac{5\text{ hrs} + 8\text{ hrs}}{20} = \frac{13}{20}\text{ hrs.}$$

(b) Time spent in cleaning the second classroom

$$= \frac{2}{5}\text{ hrs} - \frac{1}{4}\text{ hrs.}$$

$$= \frac{8\text{ hrs} - 5\text{ hrs}}{20} = \frac{3}{20}\text{ hrs.}$$

7. Do yourself.

8. Fraction of money that eldest received $= \frac{7}{13}$

Fraction of remaining money $= 1 - \frac{7}{13} = \frac{6}{13}$

Fraction of money that next received $= \frac{6}{13} \times \frac{2}{3} = \frac{4}{13}$

Fraction of money that their third brother received

$$= \frac{6}{13} - \frac{4}{13} = \frac{6 - 4}{13} = \frac{2}{13}$$

9. Cost of 1 litre of milk $= ₹\frac{4}{5}$

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

10. 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

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

11. Let two numbers are x and y.

According to question $x \times y = \frac{6}{5}$

Given, $x = \frac{1}{5}$

So, $\frac{1}{5} \times y = \frac{6}{5}$

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

$$y = 6$$

(a) Sum of two numbers $= x + y = \frac{1}{5} + \frac{6}{1} = \frac{1+30}{5} = \frac{31}{5}$

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

12. Do Yourself

13. Area of a rectangular strip of board $= 3.28\,\text{m} \times 70\,\text{mm}$

$$= 3.28 \times 100\,\text{cm} \times 70 \times \frac{1}{10}\,\text{cm}$$

$$= 328 \times 7\,\text{cm}^2$$

$$= 2296\,\text{cm}^2$$

14. Fraction of chocolate taken to $A = \frac{1}{4}$

Fraction of remaining part of chocolate $= 1 - \frac{1}{4} = \frac{3}{4}$

Fraction of chocolate taken to $B = \frac{3}{4} \times \frac{3}{8} = \frac{9}{32}$

Fraction of remaining part of chocolate $= \frac{3}{4} - \frac{9}{32} = \frac{24-9}{32} = \frac{15}{32}$

Fraction of chocolate taken of $C = \frac{15}{32} \times \frac{5}{9} = \frac{25}{96}$

Fraction of chocolate taken to $D = \frac{15}{32} - \frac{25}{96} = \frac{45-25}{96} = \frac{20}{96} = \frac{5}{24}$

15. Do yourself

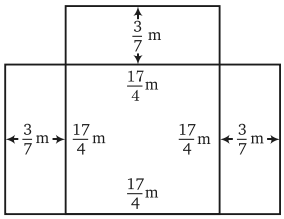
16. From the figure.

Area of the border

$$= \left(\frac{17}{4} \times \frac{3}{7}\right) + \left(\frac{17}{4} \times \frac{3}{7}\right) + \left(\frac{17}{4} \times \frac{3}{7}\right)$$

$$= \frac{51}{28} + \frac{51}{28} + \frac{51}{28}$$

$$= \frac{51 + 51 + 51}{28} = \mathbf{\frac{153}{28}\ m^2}$$



17. Length of paper box $l = \frac{25}{100}$m

$$= \frac{25}{100} \times 100\,\text{cm} = 25\,\text{cm}$$

Breadth of paper box $b = \frac{16}{100}$ m

$$= \frac{16}{100} \times 100\,\text{cm} = 16\,\text{cm}$$

Height of paper box $h = \frac{5}{100}$ m

$$= \frac{5}{100} \times 100\,\text{cm} = 5\,\text{cm}$$

Required paper used to make the box

$$= 2[l \times b + b \times h + h \times l]$$

$$= 2[25\,\text{cm} \times 16\,\text{cm} + 16\,\text{cm} \times 5\text{cm} + 5\,\text{cm} \times 25\,\text{cm}]$$

$$= 2[400\,\text{cm}^2 + 80\,\text{cm}^2 + 125\,\text{cm}^2]$$

$$= 2[605\,\text{cm}^2] = 1210\,\text{cm}^2$$

But surface area of lid will be subtract from total surface area then total paper used.

$$= 1210 - 25 \times 16 = 1210 - 400 = 810\,\text{cm}^2$$

18. Area of hall $= 8\,\text{m} \times \frac{11}{2}\,\text{m} = 44\,\text{m}^2$

Per m^2 carpeting cost $= ₹\frac{21}{4}$

Required carpeting cost of hall $= ₹\frac{21}{4} \times 44 = 21 \times 11 = ₹231$

19. Diameter of bucket $= \frac{22}{100}\,\text{m} = \frac{22}{100} \times 100\,\text{cm} = 22\,\text{cm}$

Radius of bucket $= \frac{22}{2}\,\text{cm} = 11\,\text{cm}$

Circumference of bucket $= 2\pi r = 2 \times \frac{22}{7} \times 11$

Depth $= 9.68\,\text{m} = \frac{968}{100} \times 100\,\text{cm} = 968\,\text{cm}$

Number of turns $= \frac{968}{2 \times \frac{22}{7} \times 11} = \frac{968 \times 7}{2 \times 22 \times 11} = 14$

Apply your Mind!

1. (b) **2.** (d) **3.** (c) **4.** (c)

❑

2. Exponents and Radicals

Learning Target 2.1

1. (i) $(16)^{\frac{1}{2}} = \sqrt{16}$ (ii) $(125)^{\frac{1}{3}} = \sqrt[3]{125}$

(iii) $\left(\frac{6}{17}\right)^{\frac{1}{9}} = \sqrt[9]{\frac{6}{17}}$ (iv) $\left(\frac{11}{17}\right)^{\frac{1}{11}} = \sqrt[11]{\frac{11}{17}}$

(v) $\left(\frac{61}{325}\right)^{\frac{1}{17}} = \sqrt[17]{\frac{61}{325}}$

2. (i) $\sqrt{5} = (5)^{\frac{1}{2}}$ (ii) Do yourself

(iii) $\sqrt[9]{1100} = (1100)^{\frac{1}{9}}$ (iv) $\sqrt[4]{\frac{3}{4}} = \left(\frac{3}{4}\right)^{\frac{1}{4}}$

(v) $\sqrt[8]{\frac{61}{1123}} = \left(\frac{61}{1123}\right)^{\frac{1}{8}}$

Learning Target 2.2

1. (i) $(8)^{\frac{1}{3}} = (2^3)^{\frac{1}{3}} = 2^{3 \times \frac{1}{3}} = 2$

(ii) $(27)^{\frac{2}{3}} = (3^3)^{\frac{2}{3}} = 3^{3 \times \frac{2}{3}} = 3^2 = 9$

(iii) Do yourself.

(iv) $(16)^{-\frac{3}{4}} = (2^4)^{\frac{-3}{4}} = 2^{4 \times \frac{-3}{4}} = 2^{-3} = \frac{1}{8}$

(v) Do yourself.

(vi) $(4)^{-\frac{5}{2}} = (2)^{2 \times \left(\frac{-5}{2}\right)} = 2^{-5} = \frac{1}{2^5} = \frac{1}{32}$

(vii), (viii) Do yourself.

(ix) $(243)^{\frac{2}{5}} = (3^5)^{\frac{2}{5}} = 3^{5 \times \frac{2}{5}} = 3^2 = 9$

3	243
3	81
3	27
3	9
3	3
	1

(x) $(512)^{\frac{-2}{9}} = (2^9)^{\frac{-2}{9}} = 2^{9 \times \frac{-2}{9}} = 2^{-2} = \frac{1}{2^2} = \frac{1}{4}$

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

2. (i) $(5)^{\frac{1}{4}} = \sqrt[4]{5}$ (ii) $21^{\frac{2}{3}} = \sqrt[3]{21^2}$

(iii) Do yourself. (iv) $\left(\frac{5}{17}\right)^{\frac{1}{9}} = \sqrt[9]{\frac{5}{17}}$

(v) Do yourself (vi) $(-215)^{\frac{1}{7}} = \sqrt[7]{-215}$

3. (i) $\sqrt[4]{37} = (37)^{\frac{1}{4}}$ (ii) Do yourself

(iii) $\sqrt[7]{29^2} = (29)^{\frac{2}{7}}$ (iv), (v), (vi) Do yourself.

4. (i) $(32)^{\frac{1}{5}} = 2^{5 \times \frac{1}{5}} = 2$

2	32
2	16
2	8
2	4
2	2
	1

(ii) $\frac{4}{36^{\frac{-1}{2}}} = \frac{4}{(2^2)^{\frac{-1}{2}}\,(3^2)^{\frac{-1}{2}}} = \frac{4}{(2)^{2 \times \frac{-1}{2}}\,(3)^{2 \times \frac{-1}{2}}}$

$= \frac{4}{(2)^{-1}\,(3)^{-1}} = \frac{4 \times 2 \times 3}{1} = 24$

2	36
2	18
3	9
3	3
	1

(iii) $(16)^{\frac{-3}{4}} = \frac{1}{(16)^{\frac{3}{4}}} = \frac{1}{2^{4 \times \frac{3}{4}}} = \frac{1}{2^3} = \frac{1}{8}$

5. (i) $13^{\frac{4}{3}} \div 13^{\frac{1}{3}} = 13^{\frac{4}{3}-\frac{1}{3}} = 13^{\frac{3}{3}} = 13$

(ii) Do yourself

(iii) $(110)^{\frac{1}{2}\times 4} = (110)^2 = 12100$

(iv) $(5^{10})^0 = 1$

6. (i) $7^{\frac{1}{2}} \times 7^{\frac{3}{2}} = 7^{\frac{1}{2}+\frac{3}{2}} = 7^{\frac{4}{2}} = 7^2 = 49$

(ii) Do yourself.

(iii) $2 \times 9^{\frac{3}{2}} \times 9^{-\frac{1}{2}} = 2 \times 9^{\frac{3}{2}-\frac{1}{2}} = 2 \times 9^{\frac{3-1}{2}} = 2 \times 9 = 18$

(iv) Do yourself.

7. (i) $3 \times 16^{\frac{3}{4}} = 3 \times 2^{4\times\frac{3}{4}} = 3 \times 2^3 = 3 \times 8 = 24$

(ii), (iii) Do yourself.

(iv) $\left[(8)^{\frac{2}{3}}\right]^{\frac{-3}{2}} = 8^{\frac{2}{3}\times\frac{-3}{2}} = 8^{-1} = \frac{1}{8}$

8. (i) $(0.04)^{\frac{3}{2}} = \left(\frac{4}{100}\right)^{\frac{3}{2}} = \left(\frac{2}{10}\right)^{2\times\frac{3}{2}} = \frac{8}{1000} = 0.008$

(ii) Do yourself.

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

$= \frac{32}{100000} = 0.00032$

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

$= \left(\frac{25}{10}\right)^3 = \frac{25\times25\times25}{10\times10\times10} = \frac{15625}{1000} = 15.625$

9. (i) $64^{\frac{1}{2}} \times \left(64^{\frac{1}{2}} + 1\right) = 8^{2\times\frac{1}{2}} \times \left(8^{2\times\frac{1}{2}} + 1\right)$

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

(ii) $27^{\frac{-1}{3}} \times \left(27^{\frac{1}{3}} - 27^{\frac{2}{3}}\right) = 27^{\frac{-1}{3}} \times \left(3^{3\times\frac{1}{3}} - 3^{3\times\frac{2}{3}}\right)$

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

$= 3^{-1} \times (3 - 3^2) = \frac{1}{3} \times (3 - 9) = \frac{-6}{3} = -2$

(iii) Do yourself.

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

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

$= 6^{7-5} - 6^{9-5} = 6^2 - 6^4$

$= 36 - 1296 = -1260$

10. (i) $(x^{-4})^3 = x^{-4\times 3} = x^{-12} = \frac{1}{x^{12}}$

(ii) $2x^{\frac{1}{6}} \times 2x^{\frac{-7}{6}} = 4x^{\frac{1}{6}-\frac{7}{6}} = 4x^{-1} = \frac{4}{x}$

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

(iv) $x^{\frac{5}{7}} \div x^{\frac{12}{7}} = x^{\frac{5}{7}-\frac{12}{7}} = x^{\frac{-7}{7}} = x^{-1} = \frac{1}{x}$

11. (i) $(3^2 + 4^2)^{\frac{1}{2}} = (9 + 16)^{\frac{1}{2}} = (25)^{\frac{1}{2}} = 5^{2\times\frac{1}{2}} = 5$

(ii), (iii) Do Yourself.

(iv) $(1^3 + 2^3 + 3^3)^{\frac{1}{2}} = (1 + 8 + 27)^{\frac{1}{2}} = (36)^{\frac{1}{2}} = 6^{2\times\frac{1}{2}} = 6$

Learning Target 2.3

1. (i) $6250000000 = 625 \times 10^7$

$= 6.25 \times 10^2 \times 10^7 = 6.25 \times 10^9$

(ii), (iii), (iv) Do yourself.

2. (i) $9.67 \times 10^5 = 9.67 \times 100000 = 967000$

(ii), (iii), (iv) Do yourself

3. (i) $0.0016\text{ cm} = \frac{16}{10^4} = 1.6 \times 10^{-3}\text{ cm}$

(ii) Diameter of a helium atom

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

(iii), (iv), (v), (vi) Do yourself.

4. Distance of moon from the earth

$= 384, 467, 000\text{ m}$

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

5. Do yourself.

6. Mass of the sun $= 1.989 \times 10^{30}$ kg

$= 1{,}989{,}000{,}000{,}000{,}000{,}000{,}000{,}000000{,}000$ kg

Apply your Mind!

1. (b) **2.** (c) **3.** (b) **4.** (d) **5.** (b)

❑

3. Squares and Square Roots

Learning Target 3.1

1. Do Yourself.

2. to **4.** Do Yourself.

5. (i) $65^2 = 65 \times 65 = 4225$ (ii) $75^2 = 75 \times 75 = 5625$

6. (i) $23^2 - 22^2 = (23 + 22)(23 - 22) = 45 \times 1 = 45$

(ii) $101^2 - 100^2 = (101 + 100)(101 - 100) = 201 \times 1 = 201$

(iii) Do yourself.

7. Do Yourself.

8. (iv) $4^2 + 5^2 + \mathbf{20^2} = 21^2$ (v) $5^2 + \mathbf{6^2} + 30^2 = 31^2$

(vi) $6^2 + 7^2 + 42^2 = \mathbf{43^2}$

9. to **11.** Do yourself.

Learning Target 3.2

1. (i) 25

Now, $25 - 1 = 24, 24 - 3 = 21,$

$21 - 5 = 16, 16 - 7 = 9, 9 - 9 = 0$

Since, we had to subtract 5 times.

$\therefore \quad \sqrt{25} = \mathbf{5}$

(ii) 64

Now, $64 - 1 = 63, 63 - 3$

$= 60, 60 - 5 = 55, 55 - 7 = 48$

$48 - 9 = 39, 39 - 11 = 28, 28 - 13 = 15, 15 - 15 = 0$

Since, we had to subtract 8 times

$\therefore \quad \sqrt{64} = \mathbf{8}$

(iii), (iv), (v) Do yourself.

(vi) 225

Now, $225 - 1 = 224, 224 - 3$

$= 221, 221 - 5 = 216$

$216 - 7 = 209, 209 - 9 = 200, 200 - 11$

$= 189, 189 - 13 = 176$

$176 - 15 = 161,$

$161 - 17 = 144,$

$144 - 19 = 125,$

$125 - 21 = 104,$

$104 - 23 = 81,$

$81 - 25 = 56, 56 - 27 = 29, 29 - 29 = 0$

Since, we had to subtract 15 times

$\therefore \quad \sqrt{225} = \mathbf{15}$

(vii)Do yourself.

(viii) $4900 = 49 \times 100$

Now, $49 - 1 = 48, 48 - 3 = 45,$

$45 - 5 = 40, 40 - 7 = 33$

$33 - 9 = 24, 24 - 11 = 13, 13 - 13 = 0$

Since, we had to subtract 7 times and

Now, $100 - 1 = 99, 99 - 3 = 96,$

$96 - 5 = 91, 91 - 7 = 84$

$84 - 9 = 75, 75 - 11 = 64,$

$64 - 13 = 51, 51 - 15 = 36$

$36 - 17 = 19, 19 - 19 = 0$

Since, we had to subtract 10 times.

$\sqrt{49} = 7$ and $\sqrt{100} = 10, \sqrt{4900}$

$= 7 \times 10 = \mathbf{70}$

(ix) and (x) Do yourself.

2. (i) Factorizing 16 by the division method

$$16 = 2 \times 2 \times 2 \times 2$$

$$\sqrt{16} = 2 \times 2 = 4$$

2	16
2	8
2	4
2	2
	1

(ii) Do yourself.

(iii) Factorizing 529 by the division method.

$$529 = 23 \times 23$$

$$\sqrt{529} = 23$$

23	529
23	23
1	1

(iv) Do yourself.

(v) Factorizing 1764 by the division method

$$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

$$\sqrt{1764} = 2 \times 3 \times 7 = 42$$

2	1764
2	882
3	441
3	147
7	49
7	7
	1

(vi) Do yourself.

(vii) Factorizing 7744 by the division method.

$$7744 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11$$

$$\sqrt{7744} = 2 \times 2 \times 2 \times 11 = 88$$

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

(viii), (ix) Do yourself.

(x) Factorizing 298116 by the division method.

$$298116 = 2 \times 2 \times 3 \times 3 \times 7 \times 7 \times 13 \times 13$$

$$\sqrt{298116} = 2 \times 3 \times 7 \times 13 = 546$$

2	298116
2	149058
3	74529
3	24843
7	8281
7	1183
13	169
13	13
	1

3. By prime factorization, we get

$$9408 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7$$

To be a perfect square, it should be having pairs of prime factors therefore, division by 3 is necessary.

Thus, $\frac{9408}{3} = \frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 7 \times 7}{3}$

$$3136 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 \times 7$$
$$\sqrt{3136} = 2 \times 2 \times 2 \times 7 = 56$$

2	9408
2	4704
2	2352
2	1176
2	588
2	294
3	147
7	49
7	7
	1

4. Do yourself.

5. Let there be x students in the school

$\therefore$ Number of student in the school $= x$

Fee paid by the x student $= x \times x = x^2$

The total collection of fee $= 2304$

$\therefore \quad x^2 = 2304$

$$x = \sqrt{2304}$$
$$x = \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$$
$$x = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36

2	18
3	9
3	3
	1

6. Do yourself.

Learning Target 3.3

1. (i) $\sqrt{\frac{625}{1296}} = \sqrt{\frac{5\times5\times5\times5}{6\times6\times6\times6}} = \frac{5\times5}{6\times6} = \frac{25}{36}$

(ii) $\sqrt{4\frac{29}{49}} = \sqrt{\frac{225}{49}} = \sqrt{\frac{3\times3\times5\times5}{7\times7}} = \frac{3\times5}{7} = 2\frac{1}{7}$

(iii), (iv), (v), (vi) Do yourself.

(vii) $\sqrt{5.774409} = \sqrt{\frac{5774409}{1000000}}$

$= \sqrt{\frac{3\times3\times3\times3\times3\times3\times89\times89}{10\times10\times10\times10\times10\times10}}$

$= \frac{3\times3\times3\times89}{10\times10\times10} = \frac{2403}{1000} = 2.403$

(viii), (ix), (x), (xi) Do yourself.

(xii) $\sqrt{0.09} = \sqrt{\frac{9}{100}} = \sqrt{\frac{3\times3}{10\times10}} = \frac{3}{10} = 0.3$

(xiii), (xiv) Do yourself.

(xv) $\sqrt{\frac{121}{10000}} = \sqrt{\frac{11\times11}{10\times10\times10\times10}} = \frac{11}{10\times10} = \frac{11}{100}$

(xvi), (xvii) Do yourself.

2. Area of a square field $= 101\frac{1}{400}\text{m}^2$

Then, $(\text{Side})^2 = 101\frac{1}{400}$

$(\text{Side}) = \sqrt{101\frac{1}{400}}$

$= \sqrt{\frac{40401}{400}} = \frac{201}{20} = 10\frac{1}{20}$

Learning Target 3.4

1. $\sqrt{2304} = 48$

	4 8
4	$\overline{23}\ \overline{04}$
	16
88	704
	704
	0

2. to **8.** Do yourself.

9. $\sqrt{99856} = 316$

	316
3	$\overline{9}\ \overline{98}\ \overline{56}$
	9
61	98
	61
626	3756
	3756
	0

10. to **13.** Do yourself.

14. $\sqrt{4937284} = 2222$

	2 2 2 2
2	$\overline{4}\ \overline{93}\ \overline{72}\ \overline{84}$
	4
42	93
	84
442	972
	884
444	8884
2	8884
	0

15. to **19.** Do yourself.

20. $\sqrt{3226694416} = 56804$

	5 6 8 0 4
5	$\overline{32}\,\overline{26}\,\overline{69}\,\overline{44}\,\overline{16}$
	25
106	726
	636
1128	9069
	9024
113604	454416
	454416
	0

21. The remainder in the last step is 57.
Hence, the required least number = 57

	4 8
4	23 61
	16
88	761
	704
	57

22.

	7 0
7	49 31
	49
	31
	0
	31
	71
7	49 31
	49
	31
141	141
	0

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.

23. to **25.** Do Yourself.

26. The greatest number of six digits is 999999.

	9 9 9
9	$\overline{99}$ $\overline{99}$ $\overline{99}$
	81
189	1899
	1701
1989	19899
	17901
	1998

We Subtract 1998 from 999999 to make it a perfect square.

∴ Required number = 999999 – 1998 = 998001

27. Total soldiers = 8160

Remaining soldiers = 60

Soldiers which are perfect square = 8160 – 60 = 8100

Let the x soldiers in one row and x row in a field then,

$$x^2 = 8100$$

$$x = \sqrt{8100} = \sqrt{9 \times 9 \times 10 \times 10}$$

$$= 90 \text{ soldiers.}$$

Learning Target 3.5

1. $\sqrt{\frac{361}{625}} = \sqrt{\frac{361}{625}} = \frac{\sqrt{19 \times 19}}{\sqrt{25 \times 25}} = \frac{19}{25}$

2. $\sqrt{5\frac{19}{25}} = \sqrt{\frac{144}{25}} = \sqrt{\frac{2 \times 2 \times 2 \times 2 \times 3 \times 3}{\sqrt{5 \times 5}}} = \frac{12}{5} = 2\frac{2}{5}$

3. to **7.** Do Yourself.

8. $\sqrt{332\frac{61}{169}} = \frac{\sqrt{56169}}{\sqrt{169}} = \frac{237}{13} = 18\frac{3}{13}$

	2 3 7
2	$\overline{5}\,\overline{61}\,\overline{69}$
	4
43	161
	129
467	3269
	3269
	×

9. $\sqrt{7.29} = \frac{\sqrt{729}}{\sqrt{100}} = \frac{27}{10} = 2.7$

	2 7
2	$\overline{7}\ \overline{29}$
	4
47	329
	329
	×

10. to **15.** Do Yourself.

16. $\sqrt{0.00008281} = \frac{\sqrt{8281}}{\sqrt{100000000}} = \frac{91}{10000} = 0.0091$

	9 1
9	$\overline{82}\,\overline{81}$
	81
181	181
	181
	×

17. Let the number be x

$$x \times x = 251953.8025$$
$$x^2 = 251953.8025$$

$$x = \frac{\sqrt{2519538025}}{\sqrt{10000}}$$

$$x = \frac{50195}{100} = 501.95$$

	5 0 1 9 5
5	$\overline{25}\,\overline{19}\,\overline{53}\,\overline{80}\,\overline{25}$ 25
1001	1953 1001
10029	95280 90261
100385	501925 501925
	×

18. Do yourself.

19. Area of a square playground = $(\text{side})^2$

$$256.6404 = a^2$$

$$a = \sqrt{256.6404}$$

$$a = \frac{\sqrt{2566404}}{\sqrt{10000}} = \frac{1602}{100}$$

$$= 16.02$$

	1 6 0 2
1	$\overline{2}\,\overline{56}\,\overline{64}\,\overline{04}$ 1
26	156 156
3202	6404 6404
	×

Learning Target 3.6

1. $\sqrt{1.7}$ = 1.3038 up to four places of decimal
= 1.304 Correct upto three places of decimal

	1.3 0 3 8
1	$\bar{1}\,.\,\overline{70}\;\overline{00}\;\overline{00}\;\overline{00}$ 1
23	70 69
2603	10000 7809
26068	219100 208544
	10556

2. to **3.** Do yourself.

4. $\sqrt{237.615} = \frac{\sqrt{2376150}}{\sqrt{10000}} = \frac{1541.47}{100} = 15.4147 = 15.415$

Correct upto three places of decimal.

	1 5 4 1. 4 7
1	$\bar{2}\;\overline{37}\;\overline{61}\;\overline{50}$ 1
25	137 125
304	1261 1216
3081	4550 3081
30824	146900 123296
308287	2360400 2158009
	202391

5. to **10.** Do yourself.

11. $\sqrt{\frac{7}{8}} = \sqrt{0.875} = \frac{\sqrt{8750}}{\sqrt{10000}} = \frac{93.54}{100} = 0.935$

Correct upto three places of decimal.

	9 3.54
9	$\overline{87}$ $\overline{50}$ 81
183	650 549
1865	10100 9325
18704	77500 74816
	2684

12. to**16.** Do Yourself.

17.

	3. 3 1 6 6 2
3	$\overline{11}$. $\overline{00}$ $\overline{00}$ $\overline{00}$ $\overline{00}$ 9
63	200 189
661	1100 661
6626	43900 39756
66326	414400 397956
663322	1644400 1326644
	317756

= 3.31662

Apply Your Mind!

1. (c)

2. (b) $\sqrt{2401} = \sqrt{7^x}$

$$\sqrt{7^4} = \sqrt{7^x}$$
$$(7^4)^{\frac{1}{2}} = (7^x)^{\frac{1}{2}}$$
$$7^4 = 7^x$$

Comparing of power $x = 4$

So, option (b) is right.

3. (c) **4.** (b) **5.** (c)

❑

4. Cubes and Cube Roots

Learning Target 4.1

1. (i) $7^3 = 7 \times 7 \times 7 = 343$

(ii) $12^3 = 12 \times 12 \times 12 = 1728$

(iii) $21^3 = 21 \times 21 \times 21 = 9261$

(iv) $100^3 = 100 \times 100 \times 100 = 1000000$

(v) $(302)^3 = 302 \times 302 \times 302 = 27543608$

2. $1^3 = 1 \times 1 \times 1 = 1$

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

$3^3 = 3 \times 3 \times 3 = 27$

$4^3 = 4 \times 4 \times 4 = 64$

$5^3 = 5 \times 5 \times 5 = 125$

$6^3 = 6 \times 6 \times 6 = 216$

$7^3 = 7 \times 7 \times 7 = 343$

$8^3 = 8 \times 8 \times 8 = 512$

$9^3 = 9 \times 9 \times 9 = 729$

$10^3 = 10 \times 10 \times 10 = 1000$

$11^3 = 11 \times 11 \times 11 = 1331$

$12^3 = 12 \times 12 \times 12 = 1728$

.....

$19^3 = 19 \times 19 \times 19 = 6859$

(a) Odd numbers are 1, 3, 5, 7, 9, 11, ...19 and their cubes are 1, 27, 125, 343, 729, 1331, ...6859 which are also odd numbers.

(b) Even numbers are 2, 4, 6, 8, 10, 12,..... and their cubes are 8, 64, 216, 512, 1000, 1728, ...which are also even numbers.

3. Do yourself.

4. $3^3 = 3 \times 3 \times 3 = 27$

$6^3 = 6 \times 6 \times 6 = 216$

$9^3 = 9 \times 9 \times 9 = 729$

$12^3 = 12 \times 12 \times 12 = 1728$

$15^3 = 15 \times 15 \times 15 = 3375$

27, 216, 729, 1728 and 3375 are the multiples of 27.

5. Do yourself.

6.

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	216
2	108
2	54
3	27
3	9
3	3
	1

3	243
3	81
3	27
3	9
3	3
	1

$\sqrt[3]{64} = 2 \times 2 = 4$

$\sqrt[3]{216} = 2 \times 3 = 6$

$\sqrt[3]{1728} = 2 \times 2 \times 3 = 12$ are perfect cubes.

243, 106480 are not perfect cubes.

7. Resolving 392 in to prime factors, we have

$392 = 2 \times 2 \times 2 \times 7 \times 7$

Grouping the factors in triplets of equal factors, we get

$392 = 2 \times 2 \times 2 \times 7 \times 7$

Clearly, to make it a perfect cube, must be multiplied by 7.

8. Volume of cube = $(\text{side})^3 = 13^3 = 13 \times 13 \times 13 = 2197\ \text{m}^3$

9. Do yourself.

Learning Target 4.2

1. (i) $\sqrt[3]{-125} = -\sqrt[3]{5 \times 5 \times 5} = -5$

(ii) and (iii) Do yourself.

(iv) $\sqrt[3]{-2744000}$

$= -\sqrt[3]{2 \times 2 \times 2 \times 7 \times 7 \times 7 \times 10 \times 10 \times 10}$

$= -2 \times 7 \times 10 = -140$

2	2744000
2	1372000
2	686000
7	343000
7	49000
7	7000
10	1000
10	100
10	10
	1

2. Do yourself.

Learning Target 4.3

1. $\sqrt[3]{8 \times 64} = \sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2} = 2 \times 2 \times 2 = 8$

2	64
2	32
2	16
2	8
2	4
2	2
	1

2	8
2	4
2	2
2	1

2. $\sqrt[3]{(-216) \times 1728}$

$= -\sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3}$

$= -2 \times 3 \times 2 \times 2 \times 3 = -8 \times 9 = -72$

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

3. Do yourself.

4. $\sqrt[3]{(-125) \times (-3375)} = \sqrt[3]{5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 3 \times 3 \times 3}$

$= 5 \times 5 \times 3 = 75$

5	125
5	25
5	5
	1

3	3375
3	1125
3	375
5	125
5	25
5	5
	1

5. to **7.** Do yourself.

8. $\sqrt[3]{-5832000} = -\sqrt[3]{5832000}$

$= -\sqrt[3]{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5}$

$= -2 \times 2 \times 3 \times 3 \times 5$

$= -4 \times 9 \times 5 = -180$

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

Learning Target 4.4

1. (i) $(0.3)^3 = 0.3 = \frac{3 \times 3 \times 3}{1000} = \frac{27}{1000}$ 0.027

(ii) Do yourself.

(iii) $(0.08)^3 = 0.08 \times 0.08 \times 0.08 = \frac{8 \times 8 \times 8}{100 \times 100 \times 100}$

$= \frac{512}{1000000} = 0.000512$

(iv) Do yourself.

2. (i) $\left(\frac{7}{9}\right)^3 = \frac{7 \times 7 \times 7}{9 \times 9 \times 9} = \frac{343}{729}$

(ii) $\left(\frac{-8}{11}\right)^3 = \frac{-8 \times -8 \times -8}{11 \times 11 \times 11} = \frac{-512}{1331}$

(iii) and (iv) Do yourself.

(v) $\left(2\frac{3}{5}\right)^3 = \left(\frac{13}{5}\right)^3 = \frac{13 \times 13 \times 13}{5 \times 5 \times 5} = \frac{2197}{125}$

(vi) Do yourself.

3. (i) $\sqrt[3]{\frac{27}{64}} = \sqrt[3]{\frac{3 \times 3 \times 3}{4 \times 4 \times 4}} = \frac{3}{4}$

(ii) $\sqrt[3]{\frac{125}{128}} = \sqrt[3]{\frac{5 \times 5 \times 5}{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}}$

128 is not a perfect cube.

2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

(iii), (iv) Do yourself.

4. Volume of box = $(\text{Side})^3$

$$32.768 = (\text{Side})^3$$

$$\sqrt[3]{32.768} = \text{Side}$$

$$\sqrt[3]{\frac{32768}{1000}} = \text{Side}$$

$$\text{Side} = \frac{2 \times 2 \times 2 \times 2 \times 2}{10} = \frac{32}{10} = 3.2 \text{ m}$$

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

5. (i) $\sqrt[3]{\frac{8}{125}} = \sqrt[3]{\frac{2\times2\times2}{5\times5\times5}} = \frac{2}{5}$

(ii) $\sqrt[3]{\frac{-64}{1331}} = -\sqrt[3]{\frac{4\times4\times4}{11\times11\times11}} = -\frac{4}{11}$

(iii) Do Yourself.

(iv) $\sqrt[3]{\frac{-2197}{-9261}} = \sqrt[3]{\frac{2197}{9261}} = \sqrt[3]{\frac{13\times13\times13}{21\times21\times21}} = \frac{13}{21}$

❑

5. Algebraic Expressions and Their Factorization

Learning Target 5.1

1. (i) $(x+8)(x-2) = x(x+8) - 2(x+8)$

$= x^2 + 8x - 2x - 16$

$= x^2 + 6x - 16$

(ii), (iii), (iv) Do yourself.

(v) $(y-9)(y-2) = y(y-9) - 2(y-9)$
$= y^2 - 9y - 2y + 18$
$= y^2 - 11y + 18$

(vi) $(z^2+2)(z^2-3) = (z^2+2)z^2 + (z^2+2)(-3)$
$= z^4 + 2z^2 - 3z^2 - 6$
$= z^4 - z^2 - 6$

2. (i) $102 \times 106 = (100+2) \times (100+6)$
$= (100+2) \times 100 + (100+2) \times 6$
$= 10000 + 200 + 600 + 12 =$ **10812**

(ii) $103 \times 96 = (100+3) \times (100-4)$
$= (100+3) \times 100 + (100+3) \times (-4)$
$= 10000 + 300 - 400 - 12$
$= 10300 - 412 =$ **9888**

(iii) $95 \times 97 = (100-5)(100-3)$
$= (100-5) \times 100 + (100-5) \times (-3)$
$=$ **9215**

(iv) Do yourself.

(v) $34 \times 36 = (30+4) \times (30+6)$
$= (30+4) \times 30 + (30+4) \times 6$
$= 900 + 120 + 180 + 24 = 1224$

(vi) Do yourself.

Learning Target 5.2

1. (i) $(x+2y+3z)^2$
$= (x)^2 + (2y)^2 + (3z)^2 + 2(x \times 2y + 2y \times 3z + 3z \times x)$
$= x^2 + 4y^2 + 9z^2 + 4xy + 12yz + 6zx$

(ii) $(x+y-2z)^2$
$= (x)^2 + (y)^2 + (-2z)^2 + 2\{x \times y + y \times (-2z) + (-2z) \times x\}$
$= x^2 + y^2 + 4z^2 + 2xy - 4yz - 4zx$

(iii) Do yourself.

(iv) $(p-3q-2z)^2 = (p)^2 + (-3q)^2 + (-2z)^2 + 2p \times (-3q) + (-3q) \times (-2z) + (-2z) \times p\}$
$= p^2 + 9q^2 + 4z^2 - 6pq + 12qz - 4pz$

(v), (vi) (vii) Do yourself.

(viii) $\left(3x-\frac{1}{2}p+2q\right)^2=(3x)^2+\left(-\frac{1}{2}p\right)^2+(2q)^2$

$+2\left\{3x\times\left(\frac{-1}{2}p\right)+\left(\frac{-p}{2}\right)\times(2q)+3x\times 2q\right\}$

$=9x^2+\frac{p^2}{4}+4q^2-3px-2pq+12xq$

(ix) $(5x^2+y+z)^2\,(5x^2)^2+(y)^2+(z)^2+2\{5x^2\times y$

$+y\times z+z\times 5x^2\}$

$=25x^4+y^2+z^2+10x^2y+2yz+10zx^2$

2. Do yourself.

3. (i) $(x+y+z)^2+(x+y-z)^2=(x)^2+(y)^2+(z)^2+2xy$

$+2yz+2zx+(x)^2+(y)^2+(-z)^2$

$+2xy+2y\,(-z)+2(-z)\times(x)$

$=x^2+y^2+z^2+2xy+2yz+2zx$

$+x^2+y^2+z^2+2xy-2yz-2zx$

$=2x^2+2y^2+2z^2+4xy$

(ii) $(2x+p-c)^2-(2x-p+c)^2$

$[\because (a)^2-(b)^2=(a+b)\,(a-b)]$

$=(2x+p-c+2x-p+c)\,(2x+p-c-2x+p-c)$

$=(4x)\,(2p-2c)=8px-8cx$

Learning Target 5.3

1. (i) $(3x-2y)^3=(3x)^3-(2y)^3-3\times 3x\times 2y\,(3x-2y)$

$=27x^3-8y^3-54x^2y+36xy^2$

(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), (iv), (v), (vi) Do yourself.

(vii) $\left(\frac{2}{3}x-\frac{5}{3}z\right)^3=\left(\frac{2}{3}x\right)^3-\left(\frac{5}{3}z\right)^3-3\times\frac{2}{3}x\times\frac{5}{3}z\left(\frac{2}{3}x-\frac{5}{3}z\right)$

$=\frac{8}{27}x^3-\frac{125}{27}z^3-\frac{10xz}{3}\left(\frac{2}{3}x-\frac{5}{3}z\right)$

$=\frac{8}{27}x^3-\frac{125}{27}z^3-\frac{20}{9}x^2z+\frac{50}{9}xz^2$

(viii) Do yourself.

2. (i) $3x + 2y = 14$ and $xy = 8$

$$27x^3 + 8y^3 = (3x)^3 + (2y)^3$$
$$= (3x + 2y)^3 - 3 \times 3x \times 2y\ (3x + 2y)$$
$$= (14)^3 - 18xy \times 14 = (14)^3 - 18 \times 8 \times 14$$
$$= 14\{14^2 - 18 \times 8\}$$
$$= 14\ \{196 - 144\} = 14 \times 52 = 728$$

(ii) Do yourself.

3. (i) $p^3 - q^3,\ p - q = -8$ and $pq = -12$

$$p^3 - q^3 = (p - q)^3 + 3pq\ (p - q)$$
$$= (-8)^3 + 3 \times (-12) \times (-8)$$
$$= -512 + 288 = -224$$

(ii) Do yourself.

4. (i) $64x^3 - 125z^3, 4x - 5z = 16$ and $xz = 12$

$$64x^3 - 125z^3 = (4x - 5z)^3 + 3 \times 4x \times 5z \times (4x - 5z)$$
$$= (16)^3 + 60xz \times 16 = (16)^3 + 60 \times 12 \times 16$$
$$= 16\ \{(16)^2 + 60 \times 12\} = 16\{256 + 720\}$$
$$= 16 \times 976 = 15616$$

(ii) $64x^3 - 125z^3$

$4x - 5z = \frac{3}{5}$ and $xz = 6$

$$(4x - 5z)^3 + 3 \times 4x \times 5z \times (4x - 5z)$$
$$= \left(\frac{3}{5}\right)^3 + 60 \times 6 \times \frac{3}{5} = \frac{3}{5}\left\{\left(\frac{3}{5}\right)^2 + 60 \times 6\right\}$$
$$= \frac{3}{5}\left\{\frac{9}{25} + 360\right\} = \frac{3 \times 9009}{25 \times 5} = \frac{27027}{125}$$

5. (i) $(105)^3 = (100 + 5)^3 = (100)^3 + (5)^3 + 3 \times 100 \times 5(100 + 5)$

$= 1000000 + 125 + 1500 \times 105 = 1157625$

(ii) $(99)^3 = (100 - 1)^3 = (100)^3 - (1)^3 - 3 \times 100 \times 1(100 - 1)$

$= 1000000 - 1 - 29700 = 970299$

(iii), (iv), (v) Do yourself.

(vi) $(601)^3 = (600 + 1)^3\ (600)^3 + (1)^3 + 3 \times 600 \times 1 \times (600 + 1)$

$= 216000000 + 1 + 1800 \times 601$

$= 216000000 + 1 + 1081800 = 217081801$

(vii), (viii), (ix) Do yourself.

(x) $(9.9)^3 = (10 - 0.1)^3$

$$= (10)^3 - (0.1)^3 - 3 \times 10 \times 0.1\,(10 - 0.1)$$

$$= 1000 - \frac{1}{1000} - 3 \times 9.9 = 1000 - \frac{1}{1000} - \frac{297}{10}$$

$$= \frac{1000000 - 1 - 29700}{1000} = \frac{970299}{1000} = 970.299$$

6. (i) $(2x + 3p)^3 + (2x - 3p)^3$

$$= (2x + 3p + 2x - 3p)^3 - 3\,(2x + 3p)\,(2x - 3p)\,(2x + 3p + 2x - 3p)$$

$$= (4x)^3 - 3(4x^2 - 9p^2) \times (4x)$$

$$= 64x^3 - 12x\,(4x^2 - 9p^2)$$

$$= 64x^3 - 48x^3 + 108p^2x$$

$$= 16x^3 + 108p^2x$$

(ii) $(x + 2p)^3 - (x - 2p)^3$

$$= (x + 2p - x + 2p)^3 + 3(x + 2p)\,(x - 2p)\,(x + 2p - x + 2p)$$

$$= (4p)^3 + 3(x^2 - 4p^2) \times 4p$$

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

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

$$= 4p\{16p^2 + 3x^2 - 12p^2\}$$

$$= 4p\,\{4p^2 + 3x^2\} = 16p^3 + 12px^2$$

(iii), (iv) Do yourself.

(v) $\left(\frac{x}{3} + \frac{y}{5}\right)^3 - \left(\frac{x}{3} - \frac{y}{5}\right)^3 = \left(\frac{x}{3} + \frac{y}{5} - \frac{x}{3} + \frac{y}{5}\right)^3$

$$+ 3\left(\frac{x}{3} + \frac{y}{5}\right)\left(\frac{x}{3} - \frac{y}{5}\right)\left(\frac{x}{3} + \frac{y}{5} - \frac{x}{3} + \frac{y}{5}\right)$$

$$= \left(\frac{2y}{5}\right)^3 + 3\left(\frac{x^2}{9} - \frac{y^2}{25}\right) \times \frac{2y}{5}$$

$$= \left(\frac{2y}{5}\right)\left\{\left(\frac{2y}{5}\right)^2 + 3\left(\frac{x^2}{9} - \frac{y^2}{25}\right)\right\}$$

$$= \frac{2y}{5}\left\{\frac{4y^2}{25} + \frac{x^2}{3} - \frac{3y^2}{25}\right\}$$

$$= \frac{8y^3}{125} + \frac{2x^2y}{15} - \frac{6y^3}{125} = \frac{2y^3}{125} + \frac{2x^2y}{15}$$

7. Do yourself.

Learning Target 5.4

1. (i) $(1 - x)(1 + x + x^2) = (1)^3 - (x)^3 = 1 - x^3$

(ii) $(x + 2)(x^2 - 2x + 4) = (x)^3 + (2)^3 = x^3 + 8$

(iii), (iv) Do yourself.

(v) $(0.9x + 0.7y)(0.81x^2 - 0.63xy + 0.49y^2)$

$$= (0.9x)^3 + (0.7y)^3$$

$$= 0.729x^3 + 0.343y^3$$

(vi) $\left(\frac{2x}{5} - \frac{3y}{7}\right)\left(\frac{4x^2}{25} + \frac{9y^2}{49} + \frac{6xy}{35}\right) = \left(\frac{2x}{5}\right)^3 - \left(\frac{3y}{7}\right)^3$

$$= \frac{8x^3}{125} - \frac{27y^3}{343}$$

2. Do yourself.

Learning Target 5.5

1. (i) $x^2 + 9x + 20 = x^2 + (5 + 4)x + 20$

$$= x^2 + 5x + 4x + 20$$

$$= x(x + 5) + 4(x + 5)$$

$$= (x + 4)(x + 5)$$

(ii) $x^2 - 6x + 8 = x^2 - (4 + 2)x + 8$

$$= x^2 - 4x - 2x + 8$$

$$= x(x - 4) - 2(x - 4)$$

$$= (x - 4)(x - 2)$$

(iii) Do yourself.

(iv) $p^2 + 5pq - 36q^2$

$$= p^2 + (9 - 4)pq - 36q^2$$

$$= p^2 + 9pq - 4pq - 36q^2$$

$$= p(p + 9q) - 4q(p + 9q)$$

$$= (p + 9q)(p - 4q)$$

(v) Do yourself.

(vi) $m^2 + 11mn + 18n^2 = m^2 + (9 + 2)mn + 18n^2$

$= m^2 + 9mn + 2mn + 18n^2$

$= m(m + 9n) + 2n(m + 9n)$

$= (m + 9n)\,(m + 2n)$

2. (i) $x^2 + 4y^2 + z^2 + 4xy - 2xz - 4yz$

$= (x)^2 + (2y)^2 + (-z)^2 + 2 \times x \times 2y$

$+ 2 \times 2y \times (-z) + 2 \times (-z) \times (x)$

$= (x + 2y - z)^2$

(ii) $4p^2 + 9q^2 + 4r^2 + 12pq + 12pr + 8pr$

$= (2p)^2 + (3q)^2 + (2r)^2 + 2 \times 2p \times 3q$

$+ 2 \times 3q \times 2r + 2 \times 2p \times 2r$

$= (2p + 3q + 2r)^2$

(iii), (iv) Do yourself.

3. (i) $27x^3 - 8y^3 - 54x^2y + 36xy^2$

$= (3x)^3 - (2y)^3 - 18xy\,(3x - 2y)$

$= (3x - 2y)\,(9x^2 + 4y^2$

$+ 6xy) - 18xy\,(3x - 2y)$

$= (3x - 2y)\;\;(9x^2 + 4y^2 + 6xy - 18xy)$

$= (3x - 2y)\,(9x^2 + 4y^2 - 12xy)$

$= (3x - 2y)^3$

(ii) Do yourself.

(iii) $8y^3 - 125z^3 - 60y^2z + 150yz^2$

$= (2y)^3 - (5z)^3 - 30yz\,(2y - 5z)$

$= (2y - 5z)\,(4y^2 + 25z^2$

$+ 10yz) - 30yz\,(2y - 5z)$

$= (2y - 5z)\,(4y^2 + 25z^2 + 10yz - 30zy)$

$= (2y - 5z)\,(4y^2 + 25z^2 - 20yz)$

$= (2y - 5z)^3$

(iv) Do yourself.

4. (i) $p^3 + 27 = (p)^3 + (3)^3 = (p + 3)\,(p^2 + 9 - 3p)$

(ii) Do yourself.

(iii) $1 - 27z^3 = (1)^3 - (3z)^3 = (1 - 3z)\,(1 + 9z^2 + 3z)$

(iv) Do yourself.

(v) $64x^3 - y^3 = (4x)^3 - (y)^3 = (4x - y)(16x^2 + y^2 + 4xy)$

(vi) Do yourself.

(vii) $\frac{1}{216}p^3 - 8q^3 = \left(\frac{p}{6}\right)^3 - (2q)^3 = \left(\frac{p}{6} - 2q\right)\left(\frac{p^2}{36} + 4q^2 + \frac{pq}{3}\right)$

5. (i) $10xy^4 - 10x^4y = 10xy\,(y^3 - x^3)$

$= 10xy(y - x)\,(y^2 + x^2 + xy)$

(ii) $54x^6y + 2x^3y^4 = 2x^3y\,(27x^3 + y^3)$

$= 2x^3y\,\{(3x)^3 + (y)^3\}$

$= 2x^3y(3x + y)\,(9x^2 + y^2 - 3xy)$

(iii) $(p - 2q)^3 - (8q)^3$

$= (p - 2q - 8q)\,\{(9 - 2q)^2 + (8q)^2 + (p - 2q)8q\}$

$= (p - 10q)\,\{p^2 + 4q^2 - 4pq + 64q^2 + 8pq - 16q^2\}$

$= (p - 10q)\{p^2 + 52q^2 + 4pq\}$

(iv) Do yourself.

Learning Target 5.6

1. (i) $p^3 + 8q^3 + 64r^3 - 24pqr$

$= (p)^3 + (2q)^3 + (4r)^3 - 3 \times p \times 2q \times 4r$

$= (p + 2q + 4r)\,\{p^2 + 4q^2 + 16r^2 - 2pq - 8qr - 4pr\}$

(ii) Do yourself.

(iii) $l^3 + m^3 - n^3 + 3lmn$

$= (l)^3 + (m)^3 + (-n)^3 - 3 \times l \times (m) \times (-n)$

$= (l + m - n)\,\{l^2 + m^2 + n^2 - lm + mn + nl\}$

(iv), (v) Do yourself.

(vi) $\frac{1}{27}x^3 - y^3 + 125z^3 + 5xyz$

$= \left(\frac{x}{3}\right)^3 + (-y)^3 + (5z)^3 - 3 \times \frac{x}{3} \times (-y) \times 5z$

$= \left(\frac{x}{3} - y + 5z\right)\left\{\frac{x^2}{9} + y^2 + 25z^2 + \frac{xy}{3} + 5yz - \frac{5}{3}zx\right\}$

2. (i) $(3x - 5y)^3 + (5y - 9z)^3 + (9z - 3x)^3$

Let $3x - 5y = A$, $5y - 9z = B$, $9z - 3x = C$

Then, $3x - 5y + 5y - 9z + 9z - 3x = A + B + C$

$\therefore \quad A + B + C = 0$

$\therefore \quad A^3 + B^3 + C^3 = 3ABC \Rightarrow (3x - 5y)^3 + (5y - 9z)^3 + (9z - 3x)^3$

$= 3\,(3x - 5y)\,(5y - 9z)\,(9z - 3x)$

(ii), (iii), (iv) Do yourself.

3. (i) $55^3 - 25^3 - 30^3$

$(55)^3 - (25)^3 - (30)^3$

Let $a = 55,\ b = -25,\ c = -30$

Then, $a + b + c = 0$

$\therefore \quad a^3 + b^3 + c^3 = 3abc\,(55)^3 + (-25)^3 + (-30)^3$

$= 3 \times 55 \times (-25) \times (-30)$

$= 90 \times 55 \times 25 = 123750$

(ii) Do yourself.

(iii) $(9.8)^3 - (11.3)^3 + (1.5)^3$

Let $a = 9.8,$

$b = -11.3,$

$c = 1.5$

Then, $a + b + c = 0$

$\therefore \quad a^3 + b^3 + c^3 = 3abc\,(9.8)^3 + (-11.3)^3 + (1.5)^3$

$= 3 \times 9.8 \times (-11.3) \times (1.5) = -498.33$

(iv) Do yourself.

Apply Your Mind!

1. (a) $x + y + z = 10$ and $x^2 + y^2 + z^2 = 40$

$xy + yz + zx = ?$

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

$(10)^2 = 40 + 2(xy + yz + zx)$

$100 - 40 = 2(xy + yz + zx)$

$xy + yz + zx = \dfrac{60}{2} = 30$

or $xy + yz + zx = 30$

2. (b) $x + y = 5$ and $xy = 4$

$x^3 + y^3 = ?$

$(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

$(5)^3 = x^3 + y^3 + 3 \times 4(5)$

$$125 = x^3 + y^3 + 60$$
$$125 - 60 = x^3 + y^3$$
$$\Rightarrow \quad 65 = x^3 + y^3$$
$$x^3 + y^3 = 65$$

3. (c) $(x-y)^3 + (y-z)^3 + (z-x)^3$
$$= 3(x-y)(y-z)(z-x)$$

4. (b) Let the two numbers are x and y.
Now,
According to question,
$x + y = 15$ and $x^2 - y^2 = 15$
$(x+y)(x-y) = 15$
Putting the value of $(x+y)$.
$$15(x-y) = 15$$
$$x - y = \frac{15}{15}$$
$$x - y = 1$$
Hence,
The difference of the numbers is 1.

5. (c) $a^3 + b^3 + c^3 - 3abc$ divided by $(a+b+c)$.
Then,
$$= (a^2 + b^2 + c^2 - ab - bc - ca)$$

❑

6. Division of Algebraic Expressions

Learning Target 6.1

1. (i) $6x^2yz \div 3xy = \frac{6x^2yz}{3xy} = 2xz$

(ii) $15m^2n^3 \div 5m^2n^2 = \frac{15m^2n^3}{5m^2n^2} = 3n$

(iii) Do yourself.

2. (i) $\dfrac{16m^3y^2}{4m^2y} = 4my$

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

(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) $\dfrac{9x^2-24xy+16y^2}{3x-4y} = \dfrac{(3x-4y)^2}{(3x-4y)} = 3x-4y$

(vi) $\dfrac{216z^3-343p^3}{6z-7p} = \dfrac{(6z)^3-(7p)^3}{(6z-7p)}$

$= \dfrac{(6z-7p)(36z^2+49p^2+42pz)}{(6z-7p)}$

$= 36z^2+49p^2+42pz$

Learning Target 6.2

1. (i) $(9m^5+12m^4-6m^2) \div 3m^2$

$= \dfrac{9m^5}{3m^2} + \dfrac{12m^4}{3m^2} - \dfrac{6m^2}{3m^2} = 3m^3+4m^2-2$

(ii) $(x^2+7x+12) \div (x+3) = \dfrac{x^2+7x+12}{x+3}$

$= \dfrac{x^2+4x+3x+12}{x+3} = \dfrac{x(x+4)+3(x+4)}{x+3}$

$= \dfrac{(x+3)(x+4)}{x+3} = x+4$

(iii), (iv) Do yourself.

(v) $(3m^3+4m^2+5m+18) \div (m+2)$

$m+2\,)3m^3+4m^2+5m+18(3m^2-2m+9$

$3m^3+6m^2$

$-\quad -$

$-2m^2+5m$

$-2m^2-4m$

$+\quad +$

$9m+18$

$9m+18$

$-\quad -$

$\times$

(vi) $3y^4-3y^3-4y^2-4y \div y^2-2y$

$y^2-2y\,)3y^4-3y^3-4y^2-4y(3y^2+3y+2$

$3y^4-6y^3$

$-\quad +$

$3y^3-4y^2$

$3y^3-6y^2$

$-\quad +$

$2y^2-4y$

$2y^2-4y$

$-\quad +$

$\times$

2. (i) $14x^2+13x-15 \div 7x-4$

$7x-4\,)14x^2+13x-15\,(2x+3$

$14x^2-8x$

$-\quad +$

$21x-15$

$21x-12$

$-\quad +$

-3

Quotient = $2x+3$, Remainder = -3

Now, Dividend = Divisor × Quotient + Remainder

RHS = Divisor × Quotient + Remainder

$= (7x-4)\times(2x+3)+(-3)$

$= 7x\times 2x-4\times 2x+3\times 7x-4\times 3+(-3)$

$= 14x^2-8x+21x-12-3$

$= 14x^2+13x-15$

LHS = Dividend

$= 14x^2 + 13x - 15$

Thus, LHS = RHS.

(ii), (iii) Do yourself.

(iv) $(34x - 22x^3 - 12x^4 - 10x^2 - 75) \div (3x + 7)$

$3x + 7\,)\,-12x^4 - 22x^3 - 10x^2 + 34x - 75$

$(-4x^3 + 2x^2 - 8x + 30$

$-12x^4 - 28x^3$

$+ \quad +$

$6x^3 - 10x^2$

$6x^3 + 14x^2$

$- \quad -$

$-24x^2 + 34x$

$-24x^2 - 56x$

$+ \quad +$

$90x - 75$

$90x + 210$

$- \quad -$

-285

Quotient $-4x^3 + 2x^2 - 8x + 30$, Remainder $= -285$

Now, Dividend = Divisor × Quotient + Remainder

RHS = Divisor × Quotient + Remainder

$= (3x + 7) \times (-4x^3 + 2x^2 - 8x + 30)$

$+ (-285)$

$= (-4x^3 + 2x^2 - 8x + 30) \times 3x$

$+ (-4x^3 + 2x^2 - 8x + 30) \times 7 - 285$

$= -12x^4 + 6x^3 - 24x^2 + 90x - 28x^3$

$+ 14x^2 - 56x + 210 - 285$

$= -12x^4 - 22x^3 - 10x^2 + 34x - 75$

LHS = Dividend

$= -12x^4 - 22x^3 - 10x^2 + 34x - 75$

Thus, LHS = RHS

3. (i) $(x^2 - x - 42), (x + 6)$

$x + 6\ )\ x^2 - x - 42\ (\ x - 7$

$x^2 + 6x$

$-\quad -$

$-7x - 42$

$-7x - 42$

$+\quad +$

$\times$

Yes, $(x + 6)$ is a factor of $(x^2 - x - 42)$.

(ii) $(4z^2 - 13z - 12), (4z - 3)$

$4z - 3)\ 4z^2 - 13z - 12\ (z - \frac{5}{2}$

$4z^2 - 3z$

$-\quad +$

$-10z - 12$

$-10z + \frac{15}{2}$

$+\quad -$

$-\frac{39}{2}$

No, $(4z - 3)$ is not a factor of $(4z^2 - 13z - 12)$.

(iii), (iv) Do Yourself.

(v) $(z^5 - 9z) \div (z^2 - 3)$

$z^2 - 3\ )\ z^5 - 9z\ (\ z^3 + 3z$

$z^5 - 3z^3$

$-\quad -$

$3z^3 - 9z$

$3z^3 - 9z$

$-\quad +$

$\times$

= Yes $(z^2 - 3)$ is a factor of $(z^5 - 9z)$

❑

7. Linear Equations in One Variable

Learning Target 7.1

1. (i) $\frac{2y+6}{y+4}=1$

$$2y+6=y+4$$
$$2y-y=4-6$$
$$y=-2$$

Check :

$$\text{LHS}=\frac{2(-2)+6}{(-2)+4}=\frac{-4+6}{-2+4}=\frac{2}{2}=1=\text{RHS}$$

$$\text{LHS}=\text{RHS}$$

(ii) $\frac{3x+5}{2x+7}=\frac{4}{1}$

$$3x+5=4(2x+7)$$
$$3x+5=8x+28$$
$$5-28=8x-3x$$
$$-23=5x$$
$$x=\frac{-23}{5}$$

Check :

$$=\frac{3x+5}{2x+7}=\frac{3\times\left(\frac{-23}{5}\right)+5}{2\times\left(\frac{-23}{5}\right)+7}=\frac{\frac{-69+25}{5}}{\frac{-46+35}{5}}$$

$$=\frac{-44}{-11}=\frac{4}{1}$$

$$\text{RSH}=\frac{4}{1}$$

$$\text{LHS}=\text{RHS}$$

(iii) $\frac{2x+1}{3x-2}=\frac{5}{9}$

$$\Rightarrow \quad 18x+9=15x-10$$
$$\Rightarrow \quad 18x-15x=-10-9$$

$\Rightarrow \quad 3x = -19$

$\Rightarrow \quad x = \frac{-19}{3}$

Check :

$$\text{LHS} = \frac{2x+1}{3x-2} = \frac{2 \times \left(-\frac{19}{3}\right) + 1}{3 \times \left(-\frac{19}{3}\right) - 2}$$

$$= \frac{\frac{-38+3}{3}}{-19-2} = \frac{-35}{3 \times (-21)} = \frac{-35}{-63} = \frac{5}{9}$$

$$\text{RHS} = \frac{5}{9}$$

$$\text{LHS} = \text{RHS}.$$

(iv) Do yourself.

(v) $\frac{1-9y}{19-3y} = \frac{5}{8}$

$$8 - 72y = 95 - 15y$$

$\Rightarrow \quad 8 - 95 = -15y + 72y$

$\Rightarrow \quad -87 = 57y$

$$y = \frac{-87}{57} = \frac{-29}{19}$$

Check :

$$\text{LHS} = \frac{1-9y}{19-3y} = \frac{1 - 9 \times \left(\frac{-29}{19}\right)}{19 - 3 \times \left(\frac{-29}{19}\right)}$$

$$= \frac{\frac{19+261}{19}}{\frac{361+87}{19}} = \frac{280}{448} = \frac{5}{8}$$

$$\text{RHS} = \frac{5}{8}$$

$$\text{LHS} = \text{RHS}.$$

2. (i) Do yourself.

(ii) $\frac{0.4z - 3}{1.5z + 9} = \frac{-7}{5}$

$\Rightarrow \quad 2z - 15 = -10.5z - 63$

$$12.5z = -63 + 15$$

$\Rightarrow$ $$12.5z = -48$$

$$z = \frac{-48}{12.5} = \frac{-96}{25}$$

(iii) Do yourself.

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

$\Rightarrow$ $$2x = -9x - 3$$

$$2x + 9x = -3$$

$\Rightarrow$ $$11x = -3$$

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

(v) $\frac{17(2-x) - 5(x+12)}{1-7x} = \frac{8}{1}$

$\Rightarrow \frac{34 - 17x - 5x - 60}{1 - 7x} = \frac{8}{1}$

$$\frac{-22x - 26}{1 - 7x} = \frac{8}{1}$$

$\Rightarrow$ $$8 - 56x = -22x - 26$$

$\Rightarrow$ $$8 + 26 = -22x + 56x$$

$$34 = 34x$$

$\Rightarrow$ $$x = 1$$

(vi) $\frac{y - (7 - 8y)}{9y - (3 + 4y)} = \frac{2}{3}$

$$3y - 3(7 - 8y) = 18y - 2(3 + 4y)$$

$$3y - 21 + 24y = 18y - 6 - 8y$$

$\Rightarrow$ $$27y - 21 = 10y - 6$$

$$27y - 10y = -6 + 21, 17y = 15$$

$$y = \frac{15}{17}$$

3. (i) $\frac{5y - 7}{3y} = 2$

$\Rightarrow$ $$5y - 7 = 2 \times 3y$$

$\Rightarrow$ $$5y - 6y = 7 - y = 7$$

$\Rightarrow$ $$y = -7$$

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

$\Rightarrow \quad (2x-4)\times 3 = -2\,(3x+2)$

$\Rightarrow \quad 6x - 12 = -6x - 4$

$6x + 6x = -4 + 12$

$\Rightarrow \quad 12x = 8$

$\Rightarrow \quad x = \frac{8}{12}$

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

(iii), (iv) Do yourself.

(v) $\frac{x^2-9}{x^2+5} = \frac{-5}{9}$

$\Rightarrow \quad 9(x^2 - 9) = -5(x^2 + 5)$

$\Rightarrow \quad 9x^2 - 81 = -5x^2 - 25$

$9x^2 + 5x^2 = -25 + 81$

$14x^2 = 56$

$x^2 = \frac{56}{14}$

$\Rightarrow \quad x^2 = 4 \Rightarrow x = 2$

(vi) $\frac{x+3}{7} - \frac{2x-5}{3} = \frac{4x-2}{5} - 4$

$\Rightarrow \frac{3(x+3) - 7(2x-5)}{21} = \frac{4x - 2 - 4\times 5}{5}$

$\Rightarrow \frac{3x + 9 - 14x + 35}{21} = \frac{4x - 22}{5}$

$\Rightarrow \quad \frac{-11x + 44}{21} = \frac{4x - 22}{5} \quad -55x + 220 = 84x - 462$

$\Rightarrow \quad 84x + 55x = 220 + 462$

$139x = 682$

$\Rightarrow \quad x = \frac{682}{139}$

4. (i) $4x + 5 = 13\; 4x = 13 - 5\; x = \frac{8}{4}\; x = 2$

(ii), (iii), (iv), (v) Do yourself.

(vi) $\frac{4x}{5} - \frac{2x}{15} = \frac{3}{10}$

$\Rightarrow \quad \frac{60x - 10x}{75} = \frac{3}{10}$

$$\Rightarrow \quad \frac{50x}{75} = \frac{3}{10}$$

$$\Rightarrow \quad \frac{2x}{3} = \frac{3}{10}$$

$$\Rightarrow \quad 20x = 9$$

$$\Rightarrow \quad x = \frac{9}{20}$$

Apply Your Mind!

1. (d) $\frac{2x-3}{3x+2} = \frac{-2}{3} \Rightarrow 6x - 9 = -6x - 4 \Rightarrow 12x = 5 \Rightarrow x = \frac{5}{12}$

2. (a) $7y - 9 = 5y + 7 \Rightarrow 2y = 16 \Rightarrow y = 8$

3. (c) $\frac{3y+4}{7} = \frac{2y+8}{6} \Rightarrow 18y + 24 = 14y + 56 \Rightarrow 4y = 32 \Rightarrow y = 8$

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

$$\Rightarrow \quad \frac{x}{2} - \frac{x}{3} = \frac{1}{4} + \frac{1}{5}$$

$$\Rightarrow \quad \frac{3x - 2x}{6} = \frac{5+4}{20}$$

$$\Rightarrow \quad x = \frac{9 \times 6}{20} = \frac{27}{10}$$

5. (b) $3(t-3) = 5(2t+1)$

$$\Rightarrow \quad 3t - 9 = 10t + 5$$

$$\Rightarrow \quad -14 = 7t$$

$$t = -2$$

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8. Ratios and Percentages

Learning Target 8.1

1. (i) ₹ 5 to 50 paise

₹ 5 = 5 × 100 paise = 500 paise

Thus, the required ratio

₹ 5 : 50 paise = 500 : 50 = 10 : 1

(ii), (iii), (iv) Do yourself.

2. (i) ₹ 1 = 100 paise

Then, $= \frac{30}{100} \times 100 = 30\%$

(ii), (iii) Do yourself.

3. (i) 1 hour = 60 min.

Then, $\frac{45}{60} \times 100 = \frac{3}{4} \times 100 = 3 \times 25 = 75\%$

(ii), (iii), (iv) Do yourself.

4. (i) Fraction of the students passed $= \frac{30}{36} = \frac{5}{6}$

(ii) Percentage of the students passed

$= \frac{30}{36} \times 100 = \frac{250}{3}\% = 83\frac{1}{3}\%$

5. Do yourself.

6. Do yourself.

7. (i) $15\frac{1}{2}\%$ of $640 = \frac{31}{2 \times 100} \times 640 = \frac{31 \times 16}{5} = ₹\,99.20$

(ii) 6.5% of 5000 persons $= \frac{6.5}{100} \times 5000 = 65 \times 5 = 325$ persons.

(iii), (iv), (v) Do yourself.

(vi) 60.5% of 8 hrs. $= \frac{60.5}{100} \times 8 = 4.84$ hrs.

8. Percentage of people who voted = 100% – 15% = 85%

Number of people who voted $= \frac{85}{100} \times 8500 = 7225$

9. Number of defective tyres = 28000 of $4\frac{1}{4}\%$

$= 28000 \times \frac{17}{4 \times 100} = \frac{280 \times 17}{4}$

$= 70 \times 17 = 1190$

Hence, the number of defective tyres in company is 1190.

Learning Target 8.2

1. Decrease 216 by $37\frac{1}{2}\% = 216 \times 37\frac{1}{2}\%$

$= 216 \times \frac{75}{2}\% = 216 \times \frac{75}{2 \times 100} = 81$

Decreased value = 216 − 81 = 135

2. Increase 28 by 125% $= 28 \times 125\% = 28 \times \frac{125}{100} = 35$

Increased value = 28 + 35 = 63

3. Let the number be x.

When, increased by 15% $= x \times 15\% = x \times \frac{15}{100} = \frac{3x}{20}$

According to question, $x + \frac{3x}{20} = 161$

$$\frac{20x + 3x}{20} = 161$$

$$23x = 161 \times 20$$

$$x = \frac{161 \times 20}{23}$$

$$x = 140$$

Hence, the number is 140.

4. Do yourself.

5. The cost of flat after 36% = 100% + 36%

$$= 136\% \text{ of } 1900000 = \frac{136}{100} \times 1900000$$

Then, $136 \times 19000 =$ ₹ 2584000

Hence, the cost of flat today is ₹ 2584000.

6. Amount spent by a man in a month = ₹ 880

Amount for rent = 26%

Amount of that his rent = 26% of ₹ 880

$$= 880 \times \frac{26}{100} = \frac{88 \times 26}{10} = ₹\ 228.80$$

7. After spending of 88%, 12% of his income remains

Use Proportion Method

His income : ₹ 2160 :: 100 : 12

His income $= \frac{100 \times ₹\ 2160}{12} = ₹\ 18000$

8. Do yourself.

9. New height of the tree after increased by 12.5%

$$= 4.8 \text{ m} + 4.8 \text{ m} \times 12.5\%$$

$$= 4.8 \text{ m} + 4.8 \text{ m} \times \frac{12.5}{100}$$

$$= 4.8 \text{ m} + 0.6 \text{ m} = 5.4 \text{ m}$$

Thus, the new height of tree is 5.4 m.

10. Number of the house to be sold in 2006.

$$= 4260 + 20\% \text{ of } 4260 = 4260 + 4260 \times \frac{20}{100}$$

$$= 4260 + 852 = 5112$$

Hence, the number of house in 2006 is 5112.

11. Do Yourself.

12. Let the number of passengers carried a train in 2004 be x.

Number of passengers carried by a train in 2005 $= x + x \times 8\%$

$$= x + x \times \frac{8}{100}$$

$$= x + \frac{2x}{25} = \frac{27x}{25}$$

Number of passengers carried by a train in 2006.

$$= \frac{27x}{25} + \frac{27x}{25} \times 8\% = \frac{27}{25}x + \frac{27}{25}x \times \frac{8}{100}$$

$$= \frac{27}{25}x + \frac{27}{25}x \times \frac{2}{25} = \frac{27}{25}x\left[1 + \frac{2}{25}\right]$$

$$= \frac{27}{25}x \times \frac{27}{25} = \left(\frac{27}{25}\right)^2 x$$

Increase in 2004 to 2006 $= \left(\frac{27}{25}\right)^2 x - x = \frac{729}{625}x - x$

$$= \frac{729x - 625x}{625} = \frac{104}{625}x$$

In Percentage $= \frac{104x \times 100}{625 \times x} = \frac{104 \times 100}{625} = 16.64\%$

13. Method–I

Mohan is taller than Ram = 108%

Ankur is shorter than Ram = 90%

Percentage of Mohan taller than Ankur $= \left[\frac{108\% - 90\%}{90\%} \times 100\right]\%$

$$= \left[\frac{18\%}{90\%} \times 100\right]\% = \left[\frac{1}{5} \times 100\right]\% = 20\%$$

Method–II

Let the Ram tall be x.

Then,

Mohan is taller than Ram $= x + x$ of 8%

$$= x + x \times \frac{8}{100} = x + \frac{2x}{25} = \frac{27x}{25}$$

Ankur is shorter than Ram $= x - x \times 10\%$

$$= x - x \times \frac{10}{100} = x - \frac{x}{10} = \frac{9x}{10}$$

Percentage of Mohan taller than Ankur $= \left[\frac{\frac{27}{25}x - \frac{9x}{10}}{\frac{9x}{10}} \times 100\right]\%$

$= \left[\frac{54x - 45x}{50} \times \frac{10}{9x} \times 100\right]\%$

$= \left[\frac{9x}{50} \times \frac{10}{9x} \times 100\right]\%$

$= \left[\frac{10 \times 100}{50}\right]\% = 20\%$

Apply your Mind!

1. (d) **2.** (c) **3.** (a) **4.** (d) **5.** (a)

❑

9. Profit and Loss

Learning Target 9.1

1. SP = ₹ 3240, Gain = 8%, CP = ?

$CP = \frac{100}{100 + 8} \times 3240 = ₹\,3000$

2. CP of pens = ₹ 200, CP of pencils = ₹ 50

SP of pens $= \frac{100 + 10}{100} \times 200 = \frac{110 \times 200}{100} = ₹\,220$

SP of pencils $= \frac{100 - 20}{100} \times 50 = \frac{80 \times 50}{100} = ₹\,40$

Total CP = ₹ (200 + 50) = ₹ 250

Total SP = ₹ (220 + 40) = ₹ 260, SP > CP

Profit = SP – CP = ₹ (260 – 250) = ₹ 10

$\text{Profit\%} = \frac{\text{Profit\%} \times 100}{CP} = \frac{10 \times 100}{250} = 4\%$

Profit = 4%

3. $CP = \frac{100}{100 - \text{Loss\%}} \times SP = \frac{100}{100 - 12} \times 1320$

$= ₹\,\frac{100 \times 1320}{88} = ₹\,1500$

4. CP = ₹ 1200, Profit of Sonu = 10%, SP = ?

$$SP = \frac{100 + Gain\%}{100} \times CP$$

$$= \frac{100 + 10}{100} \times 1200$$

$$= ₹ \frac{110 \times 1200}{100} = ₹ 1320$$

CP of John's cycle = ₹ 1320

Profit of Salim =12%, SP = ?

$$SP = \frac{100 + 12}{100} \times 1320 = ₹ \frac{112 \times 1320}{100} = ₹ 1478.40$$

5. Cost of 20 quires = 250, Cost of 1 quires = $\frac{250}{20}$ = ₹ 12.50

Gain% = 20%, CP = ₹ 12.50

$$SP = \frac{100 + Gain\%}{100} \times CP$$

$$SP = \frac{100 + 20}{100} \times 12.50$$

$$SP = ₹ \frac{120 \times 1250}{100 \times 100} = ₹ 15$$

6. to Do yourself.

8. SP = ₹ 360, Loss% = 10, CP = ?

$$CP = \frac{100}{100 - 10} \times 360 = \frac{100 \times 360}{90} = ₹ 400$$

In other case CP = ₹ 400

SP = ₹ 460, SP > CP

Profit = ₹ (460 – 400) = ₹ 60

$$Profit\% = \frac{Profit\% \times 100}{CP} = \frac{60 \times 100}{400} = 15\%$$

Profit = 15%

9. to **11.** Do yourself

12. SP = ₹ 360, Loss percent = 25%,

$$CP = \frac{100}{100 - 25} \times SP$$

$$\frac{100 \times 360}{75} = ₹ 480$$

Now, the CP = ₹ 480 and Gain = 25%

$$SP = \frac{100 + 25}{100} \times 480 = ₹ \frac{125 \times 480}{100} = ₹ 600$$

13. Do yourself.

14. Let the CP of 1 fan be ₹ x, CP of 4 fans = ₹ $4x$

SP of 4 fans = CP of 5 fans = ₹ $5x$, SP > CP

Profit = ₹ $(5x - 4x)$ = ₹ x

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{CP}} = \frac{x \times 100}{4x} = 25\%$$

15. Do yourself.

16. Difference in the percentage of Profit

$$= 10\% - (-5\%) = 10 + 5$$

$$= 15\%$$ Let the CP be x, then 15% of $x = 375$

$$\frac{15 \times x}{100} = 375$$

$$x = ₹\ 2500$$

17. **Case I :** SP = 67.50, Loss = 10%, CP = ?

$$\text{CP} = \frac{100}{100 - 10} \times 67.50 = \frac{100 \times 6750}{90 \times 100}$$

$$\text{CP} = ₹\ 75$$

Case : SP = 82.50 and CP = ₹ 75

$$\text{Profit} = 82.50 - 75.00 = 7.50$$

$$\text{Profit\%} = \frac{\text{Profit} \times 100}{\text{CP}} = \frac{7.50 \times 100}{75}$$

$$= \frac{750 \times 100}{75 \times 100} = 10\%$$

18. SP = ₹ 644, CP = x, gain = $\frac{x}{6}$, $\text{gain\%} = \frac{\text{gain} \times 100}{\text{CP}} = \frac{x \times 100}{6 \times x}$

$$= \frac{100}{6}\% = \frac{50}{3}\% = 16.7\%$$

19. **Case I :** $\text{CP} = 800 \times \frac{3}{4} = 600$

$$\text{Loss} = \frac{600 \times 10}{100} = 60$$

$$\text{Loss} = \text{CP} - \text{SP}$$

$$\Rightarrow \quad 60 = 600 - \text{SP}$$

$$\text{SP} = ₹\ 540$$

Case II : $\text{CP} = 800 \times \frac{1}{4} = 200$

$$\text{Profit} = \frac{200 \times 10}{100} = 20$$

$$\text{SP} = 200 + 20 = 220$$

Total SP = 540 + 220 = ₹ 760

Total CP = ₹ 800

Loss = CP − SP = ₹ (800 − 760)

$\Rightarrow$ Loss = ₹ 40

20. Do yourself.

Learning Target 9.2

1. (i) Net selling price = Market price − Discount

$$\text{Discount\%} = \frac{\text{Discount}}{\text{Marked Price}} \times 100,$$

$$20 = \frac{x \times 100}{85}$$

$\Rightarrow$ $x = 17$

NSP = 85 − 17 = ₹ 68

(ii) Do yourself.

2. (i) $\text{Marked price} = \frac{100}{100 - \text{Discount\%}} \times \text{Net SP}$

$$= \frac{100 \times 1860}{100 - 7} = ₹\ \frac{1860 \times 100}{93} = ₹\ 2000$$

(ii) Do yourself.

3. (i) Discount = Marked Price − Net SP = 40 − 34 = ₹ 6

$$\text{Discount\%} = \frac{\text{Discount} \times 100}{\text{Marked Price}} = \frac{6 \times 100}{40} = 15\%$$

(ii) Do yourself.

4. $\text{Discount\%} = \frac{\text{Discount} \times 100}{\text{Marked Price}} = \frac{75 \times 100}{750} = 10\%$

5. $\text{Discount \%} = \frac{\text{Discount} \times 100}{\text{Marked Price}}$

$\Rightarrow$ $8 = \frac{x \times 100}{8750}$

$\Rightarrow$ $x = \frac{8 \times 8750}{100} = ₹\ 700$

Net SP = Marked Price − Discount

= 8750 − 700 = ₹ 8050

6. Do yourself.

7. Net SP = 54

Discount = 10%

Marked Price = ?

$$\text{Marked Price} = \frac{100}{100 - 10} \times 54 = \frac{100 \times 54}{90} = ₹\ 60$$

8. Do yourself.

9. Let the CP be ₹ 100.

Then, Marked Price = 100 + 25 = 125

$$\text{Discount} = \frac{125 \times 20}{100} = 25$$

$$\Rightarrow \quad \text{SP} = 125 - 25 = ₹\ 100$$

$$\text{Profit} = 100 - 100 = 0$$

No Loss, No profit

10. $\text{Net selling price} = \frac{(100 - \text{Discount}\%)}{100} \times \text{Marked Price}$

$$= ₹\ \frac{100 - 12}{100} \times 5400 = ₹\ 4752$$

$$\text{Now, CP} = \frac{100}{100 + 8} \times 4752 = ₹\ \frac{100 \times 4752}{108} = ₹\ 4400$$

11. Marked Price = ₹ 800, First Discount $= \frac{800 \times 12}{100} = ₹\ 96$

Price after first discount = 800 – 96 = ₹ 704

Second discount $= \frac{704 \times 4}{100} = ₹\ 28.16$

Price after second discount = ₹ 704.00 – 28.16 = ₹ 675.84

12. Do yourself.

Learning Target 9.3

1. On ₹ 100, the tax paid was ₹ 5,

(i) On ₹ 12000 for a TV the tax paid would be

$$= ₹\ \frac{5}{100} \times 12000 = ₹\ 600$$

Bill amount for a TV = ₹ 12000 + ₹ 600 = ₹ 12600

(ii) On ₹ 1800 for a leather coat, the tax paid would be

$$= ₹\ \frac{5}{100} \times 1800 = ₹\ 90$$

Bill amount for a leather coat = ₹ 1800 + ₹ 90 = ₹ 1890

(iii) On ₹ 50 for two bars soaps, the tax paid would be

$$= ₹\ \frac{5}{100} \times 50 = ₹\ 2.50$$

Bill amount for two bars soaps = ₹ 50 + ₹ 2.50 = ₹ 52.50

(iv) On ₹ 3300 for an air cooler, the tax paid would be

$$= ₹\ \frac{5}{100} \times 3300 = ₹\ 165$$

Bill amount for an air cooler = ₹ 3300 + ₹ 165 = ₹ 3465

2. Sales tax = ₹ 2700 – ₹ 2500 = ₹ 200

The rate of sales tax = $\frac{₹\ 200}{₹\ 2500} \times 100\% = 8\%$

3. to 4. Do yourself.

Apply Your Mind!

1. (c) **2.** (d) **3.** (b) **4.** (b) **5.** (d)

❑

10. Compound Interest

Learning Target 10.1

1. Principal for the first year = ₹ 5000

Interest for first year = $\frac{₹\ 5500 \times 10 \times 1}{100}$ = ₹ 550

Amount at the end of first year = ₹ (5000 + 500)

Principal for the second year = ₹ 5500

Interest for second year = ₹ $\frac{5500 \times 10 \times 1}{100}$ = ₹ 550

Amount at the end of second year = ₹ (5500 + 550) = ₹ **6050**

CI = Amount – Principal = ₹ 6050 – ₹ 5000 = ₹ 1050

2. Principal for the first year = ₹ 3000

Interest for the first year = ₹ $\frac{3000 \times 1 \times 5}{100}$ = ₹ 150

Amount at the end of the first year = ₹ (3000 + 150) = ₹ 3150

Principal for the second year = ₹ 3150

Interest for the second year = ₹ $\frac{3150 \times 1 \times 5}{100}$ = ₹ 157.50

Amount at the end of the second year = ₹ (3150 + 157.50)
= ₹ 3307.50

CI = Amount – Principal = ₹ 3307.50 – ₹ 3000 = ₹ 307.50

3. Principal for the first year = ₹ 625

Interest for the first year = ₹ $\frac{625 \times 1 \times 4}{100}$ = ₹ 25

Amount at the end of the first year = ₹ (625 + 25) = ₹ 650

Principal for the second year = ₹ 650

Interest for the second year = $\frac{650 \times 1 \times 4}{100}$ = ₹ 26

Amount at the end of second year = ₹ (650 + 26) = ₹ 676

CI = Amount – Principal = ₹ (676 – 625) = ₹ 51

4. to **9.** Do yourself.

10. Principal for the first year = ₹ 2400

Interest for the first year = ₹ $\frac{2400 \times 1 \times 20}{100}$ = ₹ 480

Amount at the end of the first year = ₹ (2400 + 480) = ₹ 2880

Principal for the second year = ₹ 2880

Interest for second year = $\frac{2880 \times 1 \times 20}{100}$ = 576

= ₹ (2880 + 576) = ₹ 3456

Amount at the end of second year = ₹ 3456

Principal for the third year = ₹ 3456

Interest for the third year = ₹ $\frac{3456 \times 1 \times 20}{100}$ = ₹ 691.20

Amount at the end of third year = ₹ (3456 + 691.20)

= ₹ 4147.20

CI = Amount – Principal = ₹ (4147.20 – 2400) = ₹ 1747.20

Learning Target 10.2

1. P = ₹ 625, R = 4%, n = 2 years

$A = P\left(1 + \frac{R}{100}\right)^n \Rightarrow A = 625\left(1 + \frac{4}{100}\right)^2 = 625 \times \left(\frac{26}{25}\right)^2$

$A = 625 \times \frac{26 \times 26}{25 \times 25}$ = ₹ 676

2. to **5**. Do Yourself.

6. P = ₹ 1000, R = 10%, n = 3 years

$A = P\left(1 + \frac{R}{100}\right)^n \Rightarrow A = 1000\left(1 + \frac{10}{100}\right)^3$

$= 1000 \times \frac{11}{10} \times \frac{11}{10} \times \frac{11}{10}$

A = ₹ 1331

7. P = ₹ 4000, R = 2.5%, n = 2, $A = P\left(1 + \frac{R}{100}\right)^n$

$= 4000\left(1 + \frac{2.5}{100}\right)^2$ = ₹ $4000 \times \left(\frac{41}{40}\right)^2$

= ₹ $4000 \times \frac{41 \times 41}{40 \times 40}$ = ₹ 4202.50

8. Do yourself.

9. $P = ₹\,16000, R = \frac{25}{2}\%, n = 3$ years.

$$A = ₹\,16000\left(1 + \frac{25}{2 \times 100}\right)^3$$

$$= ₹\,16000\left(\frac{9}{8}\right)^3$$

$$= ₹\,16000 \times \frac{9 \times 9 \times 9}{8 \times 8 \times 8} = ₹\,22781.25$$

10. Do Yourself.

Learning Target 10.3

1. $P = ₹\,4096, R = 12\frac{1}{2}$ or $\frac{25}{2}\%$ per annum or $\frac{25}{4}$ per half yearly.

$T = 18$ months or 3 half years.

$$A = P\left(1 + \frac{R}{100}\right)^n = 4096\left(1 + \frac{25}{4 \times 100}\right)^3$$

$$= ₹\,4096\left(\frac{17}{16}\right)^3 = \frac{4096 \times 17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$= ₹\,4913$$

2. Do yourself.

3. $P = ₹\,1000, R = 2\%, n = 1$ years

When interest is compounded half yearly, then

$$P = ₹\,1000, R = \frac{2}{2}\%, 1\%,$$

$$n = 1 \times 2 = 2 \text{ half years.}$$

$$A = P\left(1 + \frac{R}{100}\right)^n = 1000\left(1 + \frac{1}{100}\right)^2$$

$$= 1000 \times \frac{101 \times 101}{100 \times 100} = ₹\,1020.10$$

4. Do yourself.

5. $P = ₹\,8000, R = 10\%, N = \frac{3}{2}$ years.

When interest is compounded half year, then,

$$P = ₹\,8000, R = \frac{10}{2} = 5\%,$$

$$n = \frac{3 \times 2}{2} = 3 \text{ half years.}$$

$$A = P\left(1 + \frac{R}{100}\right)^n = 8000\left(1 + \frac{5}{100}\right)^3$$

$$= 8000\left(\frac{21}{20}\right)^3$$

$$= ₹\,\frac{8000 \times 21 \times 21 \times 21}{20 \times 20 \times 20} = ₹\,9261$$

6. to 7. Do yourself.

8. $P = 40960, R = \frac{12.5}{2}\%, n = \frac{3 \times 2}{2}$ half $= 3$ half years.

$$A = P\left(1 + \frac{R}{100}\right)^n = 40960\left(1 + \frac{125}{20 \times 100}\right)^3$$

$$= 40960\left(\frac{17}{16}\right)^3 = ₹\,40960 \times \frac{17 \times 17 \times 17}{16 \times 16 \times 16}$$

$$= ₹\,49130$$

Amount – Principal = CI

$$\text{CI} = 49130 - 40960 = ₹\,8170$$

Learning Target 10.4

1. $P = ₹\,x$, $A = ₹\,4913, R = \frac{25}{2 \times 2}, n = \frac{3 \times 2}{2}$ years.

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad 4913 = x\left(1 + \frac{25}{4 \times 100}\right)^3$$

$$\Rightarrow \quad 4913 = x \times \left(\frac{17}{16}\right)^3 \Rightarrow \frac{4913 \times 16 \times 16 \times 16}{17 \times 17 \times 17} = x$$

$$\Rightarrow \quad x = ₹\,4096$$

Principal = ₹ 4096

2. $P = 2000$, CI $= 163.20, R = 4\%, n = ?$

$$A = P + \text{CI} = 2000 + 163.20 = 2163.20$$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad 2163.20 = 2000\left(1 + \frac{4}{100}\right)^n$$

$$\Rightarrow \quad \frac{2163.20}{2000} = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \quad \frac{676}{625} = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \quad \left(\frac{26}{25}\right)^2 = \left(\frac{26}{25}\right)^n$$

$$\Rightarrow \quad n = 2 \text{ years.}$$

3. $P = ₹\, x, R = 10\%, n = 3$ years, CI $= ₹\, 331$,

$$\text{Amount} = P + \text{CI} = ₹\,(x + 331)$$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad x + 331 = x\left(1 + \frac{10}{100}\right)^3$$

$$\Rightarrow \quad x + 331 = x \times \frac{11 \times 11 \times 11}{10 \times 10 \times 10}$$

$$\Rightarrow 1000x + 331000 = 1331x$$

$$\Rightarrow \quad 331000 = (1331 - 1000)x$$

$$331000 = 331x$$

$$\Rightarrow \quad x = ₹\, 1000$$

$$\text{Principal} = ₹\, 1000$$

4. to **7**. Do yourself.

8. $P = ₹\, 1000, A = ₹\, 2000, n = 5 \times 2$ years, $R = \frac{x}{2}\%$

$$\Rightarrow \quad A = P\left(1 + \frac{R}{100}\right)^n$$

$$\Rightarrow \quad 2000 = 1000\left(1 + \frac{x}{2 \times 100}\right)^{10}$$

$$\Rightarrow \quad \frac{2000}{1000} = \left(1 + \frac{x}{200}\right)^{10}$$

$$\Rightarrow \quad \frac{1}{2^{10}} = 1 + \frac{x}{200}$$

$$\Rightarrow \quad 1.072 - 1 = \frac{x}{200}$$

$$\Rightarrow \quad 0.072 = \frac{x}{200}$$

$$\Rightarrow \quad x = 200 \times 0.072 = 14.4\%$$

$$\text{Rate} = 14.4\%$$

9. Let the Principal = ₹ x and Rate = R

Case I

$$\text{SI} = \frac{P \times R \times T}{100}$$

$$200 = \frac{x \times R \times 2}{100} \qquad \ldots(\text{i})$$

Case II

Principal = ₹ x and Rate R

CI = ₹ 210, Amount = CI + P = ₹ $(210 + x)$

$$A = P\left(1 + \frac{R}{100}\right)^n$$

$$210 + x = x\left(1 + \frac{R}{100}\right)^2 \qquad \ldots(\text{ii})$$

From eqs (ii) and (i), $20000 = 2xR \Rightarrow x = \dfrac{10000}{R}$

$$210 + \frac{10000}{R} = \frac{10000}{R}\left(1 + \frac{R}{100}\right)^2$$

$$\frac{210R + 10000}{R} = \frac{10000}{R}\left(1 + \frac{R}{100}\right)^2$$

$$210R + 10000 = 10000\left(1 + \frac{R^2}{10000} + \frac{2R}{100}\right)$$

$$210R + 10000 = 10000 + \frac{10000R^2}{10000} + \frac{2R \times 10000}{100}$$

$$210R = R^2 + 200R$$

$$210R - 200R = R^2$$

$$10R = R^2$$

$$\Rightarrow \quad R = 10\%$$

From eqn (i),

$$200 = \frac{x \times 10 \times 2}{100}$$

$$\frac{200 \times 100}{2 \times 10} = x$$

$$x = ₹\,1000$$

Rate 10% and Principal = ₹ 1000

10. Do yourself.

Learning Target 10.5

1. Value of boat after 2 years = $₹\,16{,}000\left(1-\frac{5}{100}\right)^2$

$= ₹\,16{,}000\left(\frac{19}{20}\right)^2$

$= 16{,}000 \times \frac{19}{20} \times \frac{19}{20} = ₹\,14{,}440$

2. The present value of flat = ₹ 100000

Cost after 3 years = $P\left(1-\frac{R}{100}\right)^n$

$= 100000\left(1-\frac{10}{100}\right)^3 = 100000 \times \left(\frac{9}{10}\right)^3$

$= 100000\left(\frac{9\times 9\times 9}{10\times 10\times 10}\right) = ₹\,72900$

3. The present population of stray dogs = 1250

Population after 3 months = $P\left(1-\frac{R}{100}\right)^n = 1250\left(1-\frac{20}{100}\right)^3$

$= 1250 \times \frac{4\times 4\times 4}{5\times 5\times 5} = 640$ dogs.

4. Do yourself.

5. Present population of a city = 125000

The birth rate = 3.3% and death rate = 1.3%

Difference of rate = (3.3 – 1.3)% = 2%

Population after 3 years = $125000\left(1+\frac{2}{100}\right)^3$

$= 125000 \times \frac{51\times 51\times 51}{50\times 50\times 50} = 132651$

6. Total Amount = $40000 \times \left(1+\frac{5}{100}\right)\left(1+\frac{10}{100}\right)\left(1+\frac{15}{100}\right)$

$= 40000 \times \frac{21}{20} \times \frac{11}{100} \times \frac{23}{20} = ₹\,53130$

Total Profit = Amount – Principal = 53130 – 40000 = ₹ 13130

7. to **8.** Do yourself.

9. Production of iodised salt in India in 1985 = 288000

Production of iodised salt in India in 1988 = 1700000 n = 3 years.

$$1700000 = 288000\left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \quad \left(1+\frac{r}{100}\right)^3 = \frac{1700000}{288000}$$

$$\Rightarrow \quad 1+\frac{r}{100} = \left(\frac{1700}{288}\right)^{1/3} = 1.8072524$$

$$\Rightarrow \quad r = (1.80725 - 1) \times 100$$

$$\Rightarrow \quad r = 80.725\%$$

10. Do yourself.

11. Population of Pakistan in 1980 = 7.95×10^7

Population after 3 years = 8.65×10^7

$$8.65 \times 10^7 = 7.95 \times 10^7 \left\{1+\frac{R}{100}\right\}^3$$

$$\Rightarrow \quad \frac{8.65 \times 10^7}{7.95 \times 10^7} = \left\{1+\frac{R}{100}\right\}^3$$

$$\Rightarrow \quad \left(\frac{8.65}{7.95}\right)^{1/3} = \left(1+\frac{R}{100}\right)$$

$$\Rightarrow \quad 1.02853 = 1+\frac{R}{100}$$

$$\Rightarrow \quad 0.02853 = \frac{R}{100}$$

$$\Rightarrow \quad R = 2.853\%$$

Apply Your Mind!

1. (c) **2.** (b) **3.** (a) **4.** (c) **5.** (a)

❑

11. Direct and Inverse Variations

Learning Target 11.1

1. Do Yourself

2. Do Yourself

3. Let the commission will be x.
It is a case of direct variation.
Ration of number of money = Ration of number of commission
$1000 : 100 :: 73 : x$

$$x = \frac{100 \times 73}{1000} = ₹\ 7.30$$

4. Let the number of bottles of soft drink be x.
It is a case of direct variation.
Then,
Ratio of number of children = Ratio of number of bottles
$5 : 40 :: 8 : x$

$$\Rightarrow \quad 5 \times x = 40 \times 8$$

$$\Rightarrow \quad x = \frac{40 \times 8}{5}$$

$$\Rightarrow \quad x = 64 \text{ bottles}$$

The number of bottles 64 would be served for 40 children.

5. Let the number of stamps bought for ₹ 36 be x.
It is a case of direct variation.
Ratio of the cost of stamps in Rupees = Ratio of number of the stamp.
$18 : 36 :: 15 : x$

$$\Rightarrow \quad \frac{18}{36} = \frac{15}{x}$$

$$\Rightarrow \quad x \times 18 = 15 \times 36$$

$$\Rightarrow \quad x = \frac{15 \times 36}{18}$$

$$\Rightarrow \quad x = 30 \text{ stamps.}$$

The number of stamps that can be bought for ₹ 36 is 30.

6. Let the number of tools be x.
It is a case of direct variation.
Ratio of number of hours = Ratio of number of tools
$5 : 20 :: 120 : x$

$$\Rightarrow \quad 5 \times x = 20 \times 120$$

$$\Rightarrow \quad x = \frac{20 \times 120}{5}$$

$$\Rightarrow \quad x = 480 \text{ tools}$$

Thus, the number of tools cuts by machine 480 tools in 20 hours.

7. Let the thickness of sheet be x cm.
It is a case of direct variation.

Then,

Ratio of number of sheets = Ratio of thickness of the sheets.

$500 : 275 :: 3.5 : x$

$\Rightarrow \quad 500 \times x = 3.5 \times 275$

$\Rightarrow \quad x = \dfrac{35 \times 275}{500 \times 10}$

$\Rightarrow \quad x = \dfrac{35 \times 275}{500 \times 10} = \dfrac{35 \times 55}{1000}$

$\Rightarrow \quad x = 1.925$ cm

So, thickness of 275 sheets is 1.925 cm.

8. to **10**. Do yourself.

Learning Target 11.2

1. Do Yourself

2. Do Yourself

3. Do Yourself

4. Let the number of hours be x.

Ratio of number of pumps = Inverse ratio of number of hours

$20 : 45 :: x : 12$

$\Rightarrow \quad 20 \times 12 = x \times 45$

$\Rightarrow \quad x = \dfrac{20 \times 12}{45}$

$\Rightarrow \quad x = \dfrac{16}{3}$

$\Rightarrow \quad x = 5\dfrac{1}{3}$ hours.

Required number of hours will be $5\dfrac{1}{3}$ hours for 45 pumps to do the same work.

5. Let the required speed be x km/h.

Ratio of speed = Inverse ratio of time taken

$12 : x :: 15 : 20$

$\Rightarrow \quad 12 \times 20 = x \times 15$

$\Rightarrow \quad x = \dfrac{12 \times 20}{15}$

$\Rightarrow \quad x = 16$ km/hr.

Hence, Shalu's average speed should be 16 km/hr.

6. Let x persons are needed for the construction of the building in 24 days.

Then,
Ratio of days = Inverse ratio of persons.
40 : 24 : : x : 1800

$\Rightarrow \quad 40 \times 1800 = x \times 24$

$\Rightarrow \quad x = \dfrac{40 \times 1800}{24}$

$\Rightarrow \quad x = 3000$ persons

Needed persons are 3000 for the construction of the building in 24 days.

7. to **9.** Do yourself.

10. Let the number of days be x.
Ratio of cows = Inverse ratio of the days.
50 : 60 : : x : 15

$\Rightarrow \quad 50 \times 15 = x \times 60$

$\Rightarrow \quad x = \dfrac{50 \times 15}{60}$

$\Rightarrow \quad x = \dfrac{25}{2} = 12\dfrac{1}{2}$ days.

The required days will be $12\dfrac{1}{2}$.

Apply your Mind!

1. (d) **2.** (c) **3.** (a) **4.** (c) **5.** (b)

❑

12. Understanding Quadrilaterals

Learning Target 12.1

1. Do yourself

2. Do yourself

3. Sum of the adjacent angles of parallelogram = 180°
$80° + x = 180° \Rightarrow x = 100°$
Opposite angles of parallelogram are equal so, measure of remaining angles 80°, 100°.

4. $\angle A + \angle B + \angle C + \angle D = 360°$
$65° + 65° + \angle C + \angle D = 360°$

$$130^\circ + \angle C + \angle D = 360^\circ$$
$$\angle C + \angle D = 230^\circ$$
$$\angle C = \angle D$$
$\therefore$ Each angle $= 115^\circ$

5. Let the angles be $2x, 3x, 5x$
and $8x$, $2x + 3x + 5x + 8x = 360^\circ$, $18x^\circ = 360^\circ$

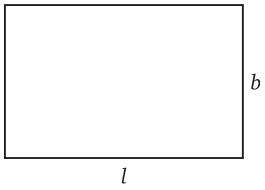
$$x = \frac{360^\circ}{18} = 20^\circ, 2 \times 20^\circ = 40^\circ$$
$$3 \times 20^\circ = 60^\circ,\ 5 \times 20^\circ = 100^\circ,$$
$$8 \times 20^\circ = 160^\circ$$

6. Perimeter of Parallelogram = Sum of four sides.
$$= 7 + 7 + 10 + 10 = 34 \text{ cm}$$

7. Let two adjacent angles be x and y.
$x - y = 30^\circ$; $x + y = 180^\circ$
On adding
$$x + y = 180^\circ$$
$$x - y = 30^\circ$$
$$2x = 210^\circ$$
$$x = 105^\circ$$
$$105^\circ + y = 180^\circ$$
$$y = 75^\circ$$
Angles $105^\circ, 75^\circ, 105^\circ, 75^\circ$

8. to **10.** Do yourself.

11. Let the length and breadth of rectangle are $3x$ and $2x$ respectively.
Then,
Perimeter of rectangle $= 2 \times (l + b)$
$$20 = 2 \times (3x + 2x)$$
$$20 = 2 \times 5x$$
$$20 = 10x$$
$$x = 2$$
Length $= 3 \times 2 = 6$ cm
Breadth $= 2 \times 2 = 4$ cm



❑

13. Areas of Rectilinear Figures

Learning Target 13.1

1. Area of rectangle = length × breadth

$$98 = 14 \times b$$

$$b = \frac{98}{14} = 7 \text{ cm}$$

Perimeter of rectangle = 2 × (length + breadth)

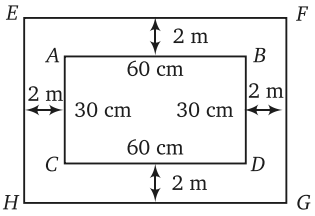
$$= 2 \times (14 + 7) = 2 \times (21) = 42 \text{ cm}$$

2. Area of rectangular lawn *ABCD*

$$= l \times b = 60 \times 30 = 1800 \text{ m}^2$$

Area of rectangular lawn with 2 m wide path

$$= l \times b = 64 \times 34 = 2176 \text{ m}^2$$



Area of path = Area of *EFGH* − Area of *ABCD*

$$= 2176 - 1800 = 376 \text{ m}^2$$

3. Area of square = $(\text{side})^2$

$$729 = (\text{side})^2$$

$$(\text{Side})^2 = (27)^2$$

$$\text{Side} = 27 \text{ m}$$

4. Area of a wall = length × breadth

$$= 5.76 \text{ m} \times 3.1 \text{ m}$$

$$= 576 \text{ cm} \times 310 \text{ cm}$$

$$= 178560 \text{ cm}^2$$

Area of a rectangular tiles = length × breadth

$$= 24 \times 10 = 240 \text{ cm}^2$$

$$\text{Number of tiles} = \frac{\text{Area of wall}}{\text{Area of tiles}} = \frac{178560}{240} = 744$$

Total cost of tiles = 744 × 1.50 = ₹ 1116

5. Altitude of the rhombus $= \dfrac{\text{Area of rhombus}}{\text{Base}} = \dfrac{10.2}{6} = 1.7$ cm

6. Perimeter of rhombus = Sum of four sides,

$$28 = 4 \times a$$

$$\Rightarrow \quad a = 7 \text{ cm}$$

Area of rhombus = Base × Altitude.

$$28 = 7 \times h$$

$$4 = h$$

$$\Rightarrow \quad h = 4 \text{ cm}$$

7. Area of trapezium $ABCD$ = Area of rectangle $AECD$ + Area of triangle CEB,

$$AB = 8 \text{ cm}, DC = 5 \text{ m}$$

$$BE = AB - DC = (8 - 5) = 3 \text{ m},$$

$$CE^2 = CB^2 - EB^2 = 5^2 - 3^2$$

$$\Rightarrow \quad CE = \sqrt{25 - 9}$$

$$\Rightarrow \quad CE = 4 \text{ m}$$

$$\text{Area of triangle} = 5 \times 4 = 20 \text{ m}^2$$

$$\text{Area of rectangle} = \frac{1}{2} \times 3 \times 4 = 6 \text{ m}^2$$

$$\text{Total area} = (20 + 6) \text{ m}^2 = 26 \text{ m}^2$$

8. Let the one side = x

Then, another side = $(x + 8)$

Area of trapezium $= \dfrac{1}{2} \times$ (Sum of parallel sides) × (Distance between them)

$$91 = \frac{1}{2} \times (x + x + 8) \times 7$$

$$91 \times 2 = (2x + 8) \times 7,$$

$$\frac{91 \times 2}{7} = 2(x + 4)$$

$$\Rightarrow \quad 13 = x + 4 \Rightarrow x = 9$$

Then another side = $(x + 8) = 9 + 8 = 17$

Sides are 9 cm and 17 cm.

9. Do yourself.

10. Area of triangle $= \sqrt{s(s - a)(s - b)(s - c)}$

$$s = \frac{10 + 10 + 12}{2} = 16$$

$$= \sqrt{16 (16 - 10) (16 - 10) (16 - 12)}$$

$$= \sqrt{16 \times 6 \times 6 \times 4} = 2 \times 4 \times 6 = 48\ \text{cm}^2$$

$$48 = \frac{1}{2} \times 12 \times h$$

$$\Rightarrow \quad 8 = h$$

$$\text{Altitude} = 8\ \text{cm}$$

$$\text{Area of trapezium} = \frac{1}{2} \times (\text{Sum of Parallel Sides}) \times (\text{Distance between Parallel sides})$$

$$= \frac{1}{2}(10 + 22) \times 8 = \frac{1}{2} \times 32 \times 8 = 128\ \text{cm}^2$$

11. to **12.** Do yourself

Learning Target 13.2

1. $$\text{Area of equilateral triangle} = \frac{\sqrt{3}}{4}(\text{side})^2 = \frac{\sqrt{3}}{4} \times (12)^2$$

$$= \frac{\sqrt{3}}{4} \times 12 \times 12 = 36\sqrt{3}\ \text{cm}^2$$

$$= 62.35\ \text{cm}^2 \ \text{(approx)}$$

2. $a = 12,\ b = 10,\ c = 10$

$$s = \frac{12 + 10 + 10}{2} = \frac{32}{2} = 16$$

$$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{16\ (16 - 12)\ (16 - 10)\ (16 - 10)}$$

$$= \sqrt{16 \times 4 \times 6 \times 6}$$

$$= 4 \times 2 \times 6$$

$$= 48\ \text{cm}^2$$

3. $$\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{a + b + c}{2}$$

$$s = \frac{10 + 24 + 26}{2} = \frac{60}{2} = 30$$

$$= \sqrt{30\ (30 - 10)\ (30 - 24)\ (30 - 26)}$$

$$= \sqrt{30 \times 20 \times 6 \times 4}$$

$$= \sqrt{2 \times 3 \times 5 \times 2 \times 2 \times 5 \times 2 \times 3 \times 2 \times 2}$$

$$= 2 \times 2 \times 2 \times 3 \times 5$$

$$= 120\ \text{cm}^2$$

4. **to 6.** Do yourself

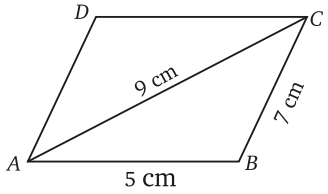
7. $AB = 5\,\text{cm}, BC = 7\,\text{cm}, AC = 9\,\text{cm}$

Area of parallelogram

$$ABCD = \text{Area of } \Delta ACD + \text{Area of } \Delta ABC$$

Area of ΔABC, $AB = 5\,\text{cm}$, $BC = 7\,\text{cm}$,

$CA = 9\,\text{cm}$.



$$s = \frac{5+7+9}{2} = \frac{21}{2}\,\text{cm}$$

$$= \sqrt{\frac{21}{2} \times \left(\frac{21}{2} - 5\right)\left(\frac{21}{2} - 7\right)\left(\frac{21}{2} - 9\right)}$$

$$= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{7}{2} \times \frac{3}{2}} = \frac{21\sqrt{11}}{4} = \frac{21}{4} \times 3.317$$

$$= \frac{69.657}{4} = 17.414$$

Area of ΔABC + Area of $\Delta ADC = 17.414 \times 2 = 34.82\,\text{cm}^2$

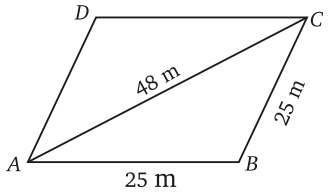
8. Do yourself.

9. Area of rhombus = Area of ΔABC + Area of ΔACD

Area of ΔABC, $AB = 25\,\text{m}$,

$BC = 25\,\text{m}$, $AC = 48\,\text{m}$

$$s = \frac{25+25+48}{2} = \frac{98}{2} = 49$$



$$= \sqrt{s(s-a)\,(s-b)\,(s-c)}$$

$$= \sqrt{49\,(49-25)\,(49-25)\,(49-48)}$$

$$= \sqrt{49 \times 24 \times 24 \times 1}$$

$$= 7 \times 24 = 168$$

Area of rhombus $= 2 \times 168 = 336\,\text{m}^2$

10. Altitude = AD

$$s = \frac{25 + 56 + 39}{2} = \frac{120}{2} = 60$$

$$\text{Area of triangle} = \sqrt{60\,(60 - 25)\,(60 - 56)\,(60 - 39)}$$

$$= \sqrt{60 \times 35 \times 4 \times 21}$$

$$= \sqrt{2 \times 2 \times 3 \times 5 \times 5 \times 7 \times 2 \times 2 \times 7 \times 3}$$

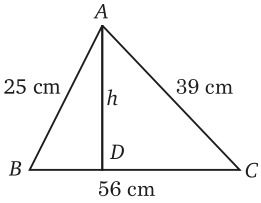
$$= 2 \times 5 \times 2 \times 7 \times 3 = 10 \times 42 = 420$$

$$\text{Area of triangle} = \frac{1}{2} \times \text{Base} \times \text{Altitude}$$

$$420 = \frac{1}{2} \times 56 \times h$$

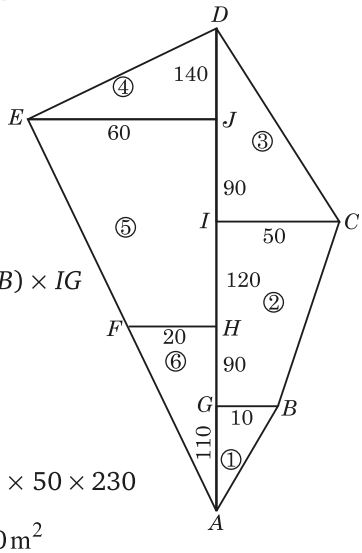
$$\frac{420 \times 2}{56} = h$$

$$\Rightarrow \quad h = 15\,\text{cm}$$



Learning Target 13.3

1. Area of field = Area (ΔAGB) + Area (trap $GBCI$) + Area (ΔCID) + Area (ΔDEJ) + Area (trap $JEFH$) + Area (ΔFAH).



(1) Area $\Delta AGB = \frac{1}{2} \times AG \times GB$

$$= \frac{1}{2} \times 110 \times 10 = 550\,\text{m}^2$$

(2) Area trap $GBCI = \frac{1}{2} \times (IC + GB) \times IG$

$$= \frac{1}{2} \times (50 + 10) \times 210$$

$$= \frac{1}{2} \times 60 \times 210 = 6300\,\text{m}^2$$

(3) Area $\Delta CIO = \frac{1}{2} \times IC \times ID = \frac{1}{2} \times 50 \times 230$

$$= 25 \times 230 = 5750\,\text{m}^2$$

(4) Area $\Delta DEJ = \frac{1}{2} \times JE \times DJ = \frac{1}{2} \times 60 \times 140 = 4200\,\text{m}^2$

(5) Area trap $JEFH = \frac{1}{2} \times (EJ + FH) \times JH$

$$= \frac{1}{2} \times (60 + 20) \times 210 = \frac{1}{2} \times 80 \times 210 = 8400\ \text{m}^2$$

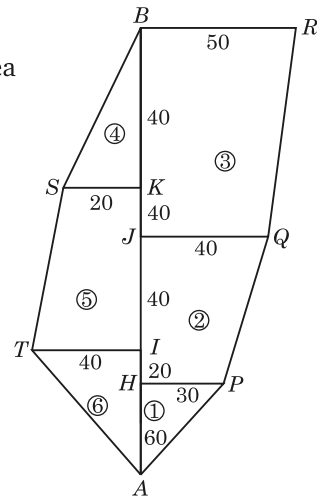
(6) Area $\Delta FAH = \frac{1}{2} \times FH \times AH = \frac{1}{2} \times 20 \times 200 = 2000 \text{ m}^2$

Total area = $(550 + 6300 + 5750 + 4200 + 8400 + 2000) \text{ m}^2$

$= \mathbf{27200} \text{ m}^2$

2. to **4.** Do yourself.

5. Area of field = Area (ΔAPH) + Area (trap $HPQJ$) + Area (trap $JQRB$) + Area (ΔBSK) + Area (trap $SKIT$) + Area (ΔTIA).



(i) Area, $\Delta APH = \frac{1}{2} \times AH \times HP$

$= \frac{1}{2} \times 60 \times 30 = 900 \text{ m}^2$

(2) Area trap $HPQJ$

$= \frac{1}{2} \times (HP + JQ) \times HJ$

$= \frac{1}{2} \times (30 + 40) \times 60$

$= \frac{1}{2} \times 70 \times 60 = 2100 \text{ m}^2$

(3) Area (trap $JQRB$) $= \frac{1}{2} \times (BR + JQ) \times BJ$

$= \frac{1}{2} \times (50 + 40) \times 80 = \frac{1}{2} \times 90 \times 80 = 3600 \text{ m}^2$

(4) Area $\Delta BSK = \frac{1}{2} \times BK \times SK = \frac{1}{2} \times 40 \times 20 = 400 \text{ m}^2$

(5) Area (trap $SKIT$) $= \frac{1}{2} \times (SK + TI) \times IK$

$= \frac{1}{2} \times (20 + 40) \times 80 = \frac{1}{2} \times 60 \times 80 = 2400 \text{ m}^2$

(6) Area (trap ΔTIA) $= \frac{1}{2} \times TI \times AI = \frac{1}{2} \times 40 \times 80 = 1600 \text{ m}^2$

Total area = $(900 + 2100 + 3600 + 400 + 2400 + 1600) \text{ m}^2$

$= 11000 \text{ m}^2$

Apply your Mind!

1. (c) Do Yourself.

2. (b) $(2 \times 10) + (3 \times 8) - (2 \times 3) = 20 + 24 - 6 = 38$

3. (d) Area of triangle with base x = Area of a square of side x

$\Rightarrow \quad \frac{1}{2} \times x \times h = x^2$

$\Rightarrow \quad \frac{1}{2} h = x$

$\Rightarrow \quad h = 2x$

Hence, the altitude of the triangle is $2x$.

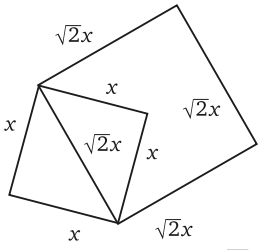
4. (b) 1 : 2 from the figure.

i.e., $= \frac{x^2}{(\sqrt{2}x)^2} = \left[\frac{x^2}{2x^2}\right] = \frac{1}{2}$

Ratio = 1 : 2

5. (b) Other leg $= \sqrt{(5)^2 - (2)^2}$

$= \sqrt{25 - 4} = \sqrt{21}$



❑

14. Circumference and Area of a Circle

Learning Target 14.1

1. (i) Circumference $= 2\pi r$

$7.7 = 2 \times \frac{22}{7} \times r \Rightarrow \frac{77}{10} = 2 \times \frac{22}{7} \times r, \Rightarrow r = \frac{77 \times 7}{2 \times 10 \times 22}$

$\Rightarrow r = 1.225\,\text{m} \Rightarrow d = 2r = 2 \times 1.225 = 2.45\,\text{m}$

(ii), (iii) Do yourself.

2. (i) Circumference of circle $= 2\pi r$

$= 2 \times \frac{22}{7} \times 7 = 44\,\text{cm} \qquad \left[\because r = \frac{14}{2} = 7\,\text{cm}\right]$

(ii), (iii) Do yourself.

3. (i) Circumference of circle $= 2\pi r = 2 \times \frac{22}{7} \times 3.5 = 22\,\text{cm}$

(ii), (iii) Do yourself.

4. (i) Circumference of circle $= 2\pi r$

$6.28 = 2 \times 3.14 \times r \Rightarrow \frac{6.28}{2 \times 3.14} = r \Rightarrow r = 1\,\text{cm}$

Diameter $= 2r = 2 \times 1 = 2\,\text{cm}$

(ii), (iii) Do yourself.

5. (i) Circumference of circle = $2\pi r$

$$26.4 = 2 \times \frac{22}{7} \times r$$

$$26.4 \times 7 = 2 \times 22 \times r$$

$$r = \frac{26.4 \times 7}{2 \times 22} = \mathbf{4.2\ cm}$$

(ii), (iii) Do yourself.

6. Let the radii of the circles be $3x$ and $2x$, then.

Ratio of circumference $= \frac{2\pi \times 3x}{2\pi \times 2x} = \frac{3}{2} = 3 : 2$

7. Perimeter of equilateral triangle = Circumference of circle.

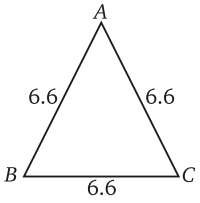
$$3 \times 6.6 = 2 \times \frac{22}{7} \times r$$

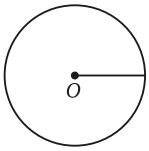
$$\Rightarrow \frac{3 \times 66 \times 7}{10 \times 2 \times 22} = r$$

$\Rightarrow r = 3.15$ cm

Diameter $= 2r = 2 \times 3.15$

$= 6.3$ cm





8. Radius of wheel = 35 cm,

One complete round = $2\pi r$

24 Complete round = $24 \times 2\pi r$

$= 24 \times 2 \times \frac{22}{7} \times 35 = 10 \times 22 \times 24 = 5280$ cm

9. Do yourself.

10. Circumference of pond = $2\pi r$

$$66 \times 400 = 2 \times \frac{22}{7} \times x$$

$$\Rightarrow \quad x = \frac{66 \times 400 \times 7}{2 \times 22} = r$$

$$\Rightarrow \quad r = 4200 \text{ cm}$$

Diameter $= 2r = 2 \times 4200 = 8400$ cm

Learning Target 14.2

1. (i) Circumference of circle = $2\pi r$

$\Rightarrow 31.4 = 2 \times 3.14 \times r, \frac{31.4}{2 \times 3.14} = r \Rightarrow r = 5$ m

Area of circle = $\pi r^2 = 3.14 \times 5 \times 5 = 78.50\,\text{m}^2$

(ii) and (iii) Do yourself.

2. (i) Area of circle $= \pi r^2 = \frac{22}{7} \times 3.5 \times 3.5 = 38.5\,\text{cm}^2$

(ii) and (iii) Do yourself.

3. (i) Diameter $= 2 \times$ Radius

$4.2 = 2 \times \text{Radius} \Rightarrow r = 2.1\,\text{cm}$

Area of circle $= \pi r^2 = \frac{22}{7} \times 2.1 \times 2.1$

$$= \frac{22}{7} \times \frac{21 \times 21}{100} = 13.86\,\text{cm}^2$$

(ii) and (iii) Do yourself.

4. Area of circle $= \pi r^2 = 3.14 \times \frac{5}{2} \times \frac{5}{2} = 19.625\,\text{cm}^2$

5. Area of circle $= \pi r^2 \Rightarrow 154 = \frac{22}{7} \times r^2 \Rightarrow r^2 = \frac{154 \times 7}{22} \Rightarrow r = 7$

Circumference $= 2\pi r = 2 \times \frac{22}{7} \times 7 = 44\,\text{m}$

6. (i) Area of circle $= \pi r^2\ \pi = \pi r^2, r^2 = 1 \Rightarrow r = 1\,\text{cm}$

(ii) and (iii) Do yourself.

7. Perimeter of square $= 4 \times a \Rightarrow 44 = 4 \times a \Rightarrow a = 11\,\text{cm}$

Circumference of circle $= 2\pi r \Rightarrow 44 = 2 \times \frac{22}{7} \times r \Rightarrow r = 7\,\text{cm}$

Area of square $= \text{side}^2 = 11^2 = 121\,\text{cm}^2$

Area of circle $= \pi r^2 = \frac{22}{7} \times 7 \times 7 = 154\,\text{cm}^2$

Greater area that the circle has $= 154 - 121 = 33\,\text{cm}^2$

8. Area of a face washer $= \pi R_1^2 - \pi R_2^2 = \pi(4^2 - 2^2) = \pi \times 12$

$$= \frac{22}{7} \times 12 = 37.71\,\text{cm}^2$$

9. Area of rectangular sheet $= 36 \times 24 = 864\,\text{cm}^2$

Area of each buttons $= \pi r^2 = \pi \times \frac{3}{2} \times \frac{3}{2}$

Area of 64 button $= \frac{9\pi \times 64}{4} = 16 \times 9\pi = 144\pi = 452.16\,\text{cm}^2$

Remaining Area $= 864 - 452.16 = 411.84\,\text{cm}^2$

10., 11. Do yourself.

Learning Target 14.3

1. (i) Area of segment $A \times B$ = Area of sector OAB − Area of ΔOAB

Area of sector $OA \times B = \frac{90^\circ}{360^\circ} \times \frac{22}{7} \times 14 \times 14 = 154\,\text{cm}^2$

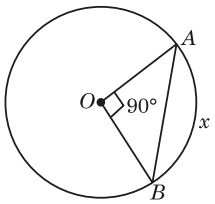
Area of right triangle $= \frac{1}{2} \times 14 \times 14 = 98\,\text{cm}^2$

Area of segment $A \times B = 154 - 98 = 56\,\text{cm}^2$

(ii), (iii) Do yourself.

2. Area of disc $= \pi r^2 = \pi \times 2^2 = 4\pi$

Area of sector $= \pi r^2 \times \frac{x}{360^\circ} = \pi \times 4 \times \frac{45^\circ}{360^\circ} = \frac{\pi}{2}$



Remaining part of the disc $= 4\pi - \frac{\pi}{2} = \frac{7\pi}{2} = \frac{7 \times 22}{7 \times 2} = 11\,\text{cm}^2$

3. (i) Length of Arc $= \frac{2\pi rx}{360^\circ} = \frac{2 \times 22 \times 2.8}{7} \times \frac{90^\circ}{360^\circ}$

$= \frac{2 \times 22 \times 28 \times 1}{4 \times 7 \times 10} = 4.4\,\text{cm}$

(ii), (iii) Do yourself.

4. (i) Area of sector $= \frac{\pi r^2 \times x}{360^\circ} = \frac{22}{7} \times 3.5 \times 3.5 \times \frac{60^\circ}{360^\circ}$

$= \frac{22 \times 35 \times 35}{7 \times 100 \times 6}\,\text{cm}^2 = 6\frac{5}{12}\,\text{cm}^2$

(ii) and (iii) Do yourself.

5. Do yourself.

6. Length of Arc $= \frac{2\pi rx}{360^\circ} \Rightarrow 22 = \frac{2\pi r \times 18^\circ}{360^\circ} \Rightarrow 2\pi r = 440\,\text{m}$

Circumference of circle $= 440\,\text{m}$

7. Area of sector $= \frac{\pi r^2 \times 36^\circ}{360^\circ}$

$\Rightarrow \qquad 3.85 = \frac{\pi \times r^2 \times 1}{10}$

$$\Rightarrow \quad r^2 = \frac{3.85 \times 10}{\pi}$$

$$\Rightarrow \quad r = \frac{7}{2}$$

$$\text{Length of Arc} = \frac{2\pi r \times x}{360^\circ} = 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{36^\circ}{360^\circ} = 2.2 \text{ cm}$$

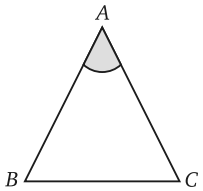
8. Do yourself.

9. In a equilateral triangle every angle be 60°.

$$\text{Area of sector} = \pi r^2 \times \frac{x}{360^\circ}$$

$$= 3.14 \times 10 \times 10 \times \frac{60^\circ}{360^\circ}$$

$$= \frac{314}{6} = 52.34 \text{ m}^2$$



10. Do yourself.

Apply Your Mind!

1. (b) $2\pi r_1 = 176$ $\qquad 2\pi r_2 = 132$

$$r_1 = \frac{176}{2\pi} \qquad r_2 = \frac{132}{2\pi}$$

$$r_1 = \frac{176 \times 7}{2 \times 22} \qquad r_2 = \frac{132 \times 7}{2 \times 22}$$

$$r_1 = 28 \text{ m} \qquad r_2 = 21 \text{ m}$$

Difference between their radii $= (r_1 - r_2) = 28 \text{ m} - 21 \text{ m} = 7 \text{ m}$

2. (a) If the radius of a circle is increased two times.

Then the circumference of the circle will increase

$r_1 = r$ then,

$$\frac{2\pi r_1}{2\pi r_2} = \frac{2\pi r}{2\pi \times 2r} = \frac{2\pi r}{2(2\pi r)} \; r_2 = 2r$$

So, two times the original value.

3. (a) $\pi r^2 = 2464$

$$r^2 = \frac{2464}{\pi} = \frac{2464 \times 7}{22}$$

$$\Rightarrow \quad r^2 = 112 \times 7$$

$$r^2 = 784$$

$$\sqrt{r^2} = \sqrt{784} \Rightarrow r = \sqrt{28^2} = 28 \text{ m}$$

Hence, the length of the rope is 28 m.

4. (c) $2\pi r \times 1000 = 88 \times 1000\,\text{m}$

$$r = \frac{88 \times 1000}{2\pi \times 1000}\,\text{m},$$

$$r = \frac{88 \times 1000 \times 7}{2 \times 22 \times 1000}\,\text{m}$$

$$r = 14\,\text{m}$$

The diameter of the wheel $= 2r = 2 \times 14\,\text{m} = 28\,\text{m}$

❑

15. Volumes and Surface Areas of Solids

Learning Target 15.1

1. Do yourself.

2. (i) In given figure

$$l = 6\,\text{cm}$$
$$b = 8\,\text{cm}$$
$$h = 10\,\text{cm}$$

The volume of cuboid from given figure

$$= l \times b \times h$$
$$= 6\,\text{cm} \times 8\,\text{cm} \times 10\,\text{cm}$$
$$= 480\,\text{cm}^3$$

Surface area of cuboid from given figure.

$$= 2[lb + bh + hl]$$
$$= 2[6\,\text{cm} \times 8\,\text{cm} + 8\,\text{cm} \times 10\,\text{cm} + 10\,\text{cm} \times 6\,\text{cm}]$$
$$= 2[48\,\text{cm}^2 + 80\,\text{cm}^2 + 60\,\text{cm}^2]$$
$$= 2\,[188\,\text{cm}^2]$$
$$= 376\,\text{cm}^2$$

(ii), (iii), (iv), (v) and (vi) Do yourself.

3. (i) Capacity $= lbh = 5.5\,\text{m} \times 3.5\,\text{m} \times 3.6\,\text{m} = 69.3\,\text{m}^3$

(ii), (iii) and (iv) Do yourself.

4. The volume of rectangular tank whose sides are

Length (l) = 65 cm

Width (b) = 40 cm

Height (h) = 54 cm

Then,

Volume of rectangular tank = $l \times b \times h$

$= 65\text{ cm} \times 40\text{ cm} \times 54\text{ cm} = 140400\text{ cm}^3$

The number of glasses of sugarcane = $140400 \div 200 = 702$

5. Capacity of water in water tank = 4.8 litre

$= 4.8 \times 1000\text{ cm}^3 = 4800\text{ cm}^3$

Volume of water tank = lbh

$4800 = 20\text{ cm} \times 15\text{ cm} \times h$

$\Rightarrow \quad \frac{4800}{20 \times 15} = h$

$\Rightarrow \quad h = \frac{4800}{20 \times 15}$

$\Rightarrow \quad h = 16\text{ cm}$

Total surface area of the cuboid = $2[lb + bh + hl]$

$= 2[20\text{ cm} \times 15\text{ cm} + 15\text{ cm} \times 16\text{ cm} + 16\text{ cm} \times 20\text{ cm}]$

$= 2[300\text{ cm}^2 + 240\text{ cm}^2 + 320\text{ cm}^2]$

$= 2[860\text{ cm}^2] = 1720\text{ cm}^3$

6. Given,

The volume of solid cube = 64 cm^3

$(\text{side})^3 = (4\text{ cm})^3$

$\text{side} = 4\text{ cm}$

Then,

Total surface area of the solid = $6 \times (\text{Side})^2$

$= 6 \times (4\text{ cm})^2 = 96\text{ cm}^2$

7. Do yourself.

8. Capacity of the tank = $4 \times 2 \times 4.8 = 38.4\text{ m}^3$

$= 38.4 \times 1000\text{ L} = 38400\text{ L}$

Initially,

Water in tank $= \frac{38400}{2} = 19200\,\text{L}$

When 4000L water add to it, then $= 19200 + 4000 = 23{,}200\,\text{L}$

Depth of the water $= \frac{23200}{4 \times 2 \times 1000} = 2.9\,\text{m}$

Learning Target 15.2

1. (i) Do yourself.

(ii) Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times 2.8 \times 2.8 \times 15$

$= \frac{22}{7} \times \frac{28 \times 28 \times 15}{100} = 369.6\,\text{m}^2$

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) Do yourself.

3. Volume of cylinder $= \pi r^2 h = 154 \times 15 = 2310\,\text{cm}^3$

4. Circumference of the base of the cylinder, $132 = 2\pi r$

$\Rightarrow r = \frac{132 \times 7}{2 \times 22} \Rightarrow r = 21\,\text{cm}$

Volume of cylinder $= \pi r^2 h = \frac{22}{7} \times 21 \times 21 \times 25 = 34650\,\text{cm}^3$

5. Volume of first pack = Area of base × Height $= 5 \times 5 \times 12 = 300\,\text{cm}^3$

Volume of second pack = Area of base × Height

$= \pi r^2 h = \frac{22}{7} \times 3.5 \times 3.5 \times 10$

$= \frac{22}{7} \times \frac{35 \times 35}{100} \times 10 = 385\,\text{cm}^3$

Difference $= 385 - 300 = 85\,\text{cm}^3$

6. Do yourself.

7. Volume of roof $= \frac{18 \times 16.5 \times 10}{100} = 29.7\,\text{cm}^3$

Volume of roof = Volume of cylindrical tank

$\Rightarrow \quad 29.7 = \pi \times 4 \times 4 \times h$

$\Rightarrow \quad 29.7 = 3.14 \times 4 \times 4 \times h$

$\Rightarrow \quad h = \frac{29.7}{3.14 \times 4 \times 4}$

$\Rightarrow \quad h = 0.596\,\text{m}$

$= 59.6\,\text{cm}$

8. to **9.** Do yourself.

10. Volume of cylinder = Volume of wire $\pi r_1^2 h_1 = \pi r_2^2 h_2$

$$\Rightarrow \quad \pi \times \frac{1}{2} \times \frac{1}{2} \times 5 = \pi \times \frac{1}{20} \times \frac{1}{20} \times h$$

$$\Rightarrow \quad \frac{5}{4} = \frac{h}{20 \times 20}$$

$$\Rightarrow \quad 4h = 20 \times 20 \times 5$$

$$\Rightarrow \quad h = \frac{20 \times 20 \times 5}{4}$$

$$\Rightarrow \quad h = 500\,\text{cm} = 5\,\text{m}$$

Learning Target 15.3

1. Total surface area of cylinder $= 2\pi r(r + h)$

$$= 2 \times \frac{22}{7} \times 5 \times (5 + 15)$$

$$= 2 \times \frac{22}{7} \times 5 \times 20 = 628.57\ \text{cm}^2$$

Lateral surface area of cylinder $= 2\pi rh = 176 \times 100$

$$= 17600\,\text{cm}^2 = 1.76\,\text{m}^2$$

2. **to 4.** Do yourself.

5. $r = \frac{3.5}{2} h = 10\,\text{m}$

Curved surface area $= 2\pi rh$

$$= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10$$

$$= 2 \times \frac{22}{7} \times \frac{35}{2} = 110\,\text{m}^2$$

The coat of plastering $= 110 \times 4 = ₹\,440$

6. Total surface area of cylinder $= 2\pi r\ (r + h)$

$$= 2 \times \frac{22}{7} \times 21 \times (100 + 21)$$

$$= 2 \times \frac{22}{7} \times 21 \times 121$$

$$= 132 \times 121 = 15972\ \text{cm}^2$$

7. **to 9.** Do yourself.

Learning Target 15.4

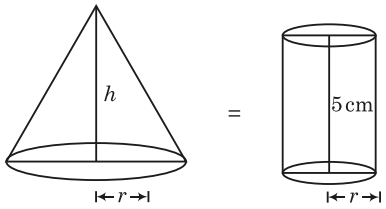
1. Volume of cone $= \frac{\pi r^2 h}{3} = \frac{22}{7} \times \frac{6 \times 6 \times 8}{3} = 301.71\ \text{cm}^3$

2. Volume of cone $= \frac{\pi r^2 h}{3} = \frac{314 \times 15}{3} = 314 \times 5 = 1570 \text{ cm}^3$

3. $\frac{\pi r_1^2 h_1}{3} = \pi r_2^2 h_2$

$\frac{\pi \times r^2 \times h}{3} = \pi r^2 \times 5$

$\frac{h}{3} = 5 \Rightarrow h = \mathbf{15\ cm}$



4. Volume of cone $= \frac{\pi r^2 h}{3}$

$$48\pi = \pi \times \frac{4 \times 4 \times h}{3}$$

$$\Rightarrow \quad h = \frac{48 \times 3}{4 \times 4}$$

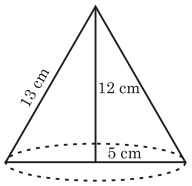
$$\Rightarrow \quad h = 9 \text{ cm}$$

5. Do yourself.

6. $\frac{\pi r^2 h}{3} = \frac{22 \times 2 \times 2 \times 5}{7 \times 3} \text{ cm}^3 = 20.95 \text{ cm}^3$

7. Volume $= \frac{\pi r^2 h}{3} = \frac{22 \times 5 \times 5 \times 12}{7 \times 3}$

$= 314 \text{ cm}^3$ (approx)



8. Do yourself.

Learning Target 15.5

1. $r = \frac{14}{2} = 7 \text{ cm}, l = 9 \text{ cm}$

Curved surface area $= \pi rl = \frac{22}{7} \times 7 \times 9 = 198 \text{ cm}^2$

2. $r = 5, l = 10 \text{ cm}$

Lateral surface area $= \pi rl = \frac{22 \times 5 \times 10}{7} = 157.14 \text{ cm}^2$

3. Do yourself.

4. (i) Lateral surface area $= \pi rl = \frac{22}{7} \times 5 \times 15 = 235.71 \text{ cm}^2$

(ii) Area of base $= \pi r^2 = \frac{22}{7} \times 5 \times 5 = 78.57 \text{ cm}^2$

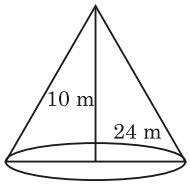
(iii) Total surface area of the cone = $\pi r(r + l)$

$$= \frac{22}{7} \times 5 \times (5 + 15)$$

$$= \frac{22}{7} \times 20 \times 5 = 314.28 \text{ cm}^2$$

5. to **6.** Do yourself.

7. $r = 24$ m, $h = 10$ m, $l = ?$



$$l^2 = r^2 + h^2$$

$$l^2 = 24^2 + 10^2$$

$$l^2 = 576 + 100$$

$$\Rightarrow \quad l^2 = 676$$

$$\Rightarrow \quad l = 26 \text{ m}$$

Area of lateral surface = $\pi rl = \frac{22}{7} \times 24 \times 26$

Total cost of canvas = ₹ $\frac{22}{7} \times 24 \times 26 \times 15$ = ₹ 29417.14

8. Volume of cone = $\frac{\pi r^2 h}{3}$

$$\Rightarrow \quad 1232 = \frac{22}{7} \times \frac{14 \times 14}{3} \times h$$

$$\Rightarrow \quad \frac{1232 \times 7 \times 3}{22 \times 14 \times 14} = h$$

$$\Rightarrow \quad h = \frac{25872}{4312}$$

$$\Rightarrow \quad h = 6 \text{ cm}$$

$$\Rightarrow \quad l^2 = h^2 + r^2$$

$$\Rightarrow \quad l^2 = 6^2 + 14^2$$

$$\Rightarrow \quad l^2 = 36 + 196$$

$$\Rightarrow \quad l = \sqrt{232}$$

Curved Surface area of cone

$$= \pi rl = \frac{22}{7} \times 14 \times \sqrt{232}$$

$$= \frac{22 \times 14 \times 2\sqrt{58}}{7}$$

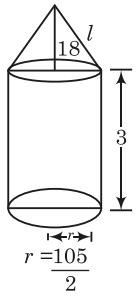
$$= 88\sqrt{58} \text{ cm}^2$$

9. $l^2 = h^2 + r^2$

$$\Rightarrow \quad l^2 = (18)^2 + \left(\frac{105}{2}\right)^2$$

$$\Rightarrow \quad l^2 = 3080.25$$

$$\Rightarrow \quad l = 55.5 \text{ m}$$



Total canvas used $= 2\pi rh + \pi rl$

$$l = \frac{22}{7} \times \frac{105}{2} \{2 \times 3 + 55.5\}$$

$$\Rightarrow \frac{22}{7} \times \frac{105}{2} \times 61.5 = 10147.5 \text{ m}^2$$

10. Do yourself.

Learning Target 15.6

1. (i) $\text{Radius} = \frac{\text{Diameter}}{2} = \frac{14}{2} = 7 \text{ cm}$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$$

$$= \frac{30184}{21} = 1437.33 \text{ cm}^3$$

(ii), (iii) Do yourself.

2. (i) $\text{Volume of sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 2 \times 2 \times 2 = 33.52 \text{ cm}^3$

(ii), (iii) Do yourself.

3. $\text{Volume of hemisphere} = \frac{2}{3}\pi R^3$

$$= \frac{2}{3} \times \frac{22}{7} \times \frac{11.2}{2} \times \frac{11.2}{2} \times \frac{11.2}{2}$$

$$= \frac{2}{3} \times \frac{22}{7} \times \frac{112 \times 112 \times 112}{1000 \times 8}$$

$$= \frac{61816832}{168000} = 367.96 \text{ cm}^3$$

4. When $r = r$, then, volume of sphere $= \frac{4}{3}\pi r^3$,

When $r = 2r$, then

Volume of sphere $= \frac{4}{3}\pi(2r)^3$,

Volume of increased $\Rightarrow \frac{4}{3}\pi r^3 : \frac{4}{3}\pi 8r^3 = 8$ times.

5. Volume of hemisphere $= \frac{2}{3}\pi r^3$

$$= \frac{2}{3} \times \frac{22}{7} \times \frac{28 \times 28 \times 28}{10 \times 10 \times 10}$$

$$= \frac{965888}{21000} = 45.995\ \text{m}^3$$

$$= 45.995 \times 1000\ \text{L}$$

$$= 45995\ \text{L}$$

6. Do Yourself.

7. Diameter of stone = 42 cm

Radius of stone $= \frac{42}{2} = 21$ cm

Volume of stone $= \frac{4}{3}\pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 = 38808\text{cm}^3$

Weight of the stone $= 38808 \times 2 = 77616\,g = 77.616$ kg

8. Do yourself.

Learning Target 15.7

1. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{15 \times 15}{2 \times 2}$

$$= 707.14\ \text{cm}^2$$

(ii), (iii) Do yourself.

2. (i) Surface area of the sphere $= 4\pi r^2 = 4 \times \frac{22}{7} \times 12 \times 12$

$$= 1810.29\ \text{cm}^2$$

or Take $\pi = 3.14$; $4 \times 3.14 \times 12 \times 12 = 1808.64\ \text{cm}^2$

(ii), (iii) Do yourself.

3. **Case I:** Surface area of sphere

$$= 4\pi r^2 = 4 \times \frac{22}{7} \times 7 \times 7 = 616\ \text{cm}^2$$

Case II : Surface area of sphere

$$= 4\pi r^2 = 4 \times \frac{22}{7} \times 14 \times 14 = 2464\ \text{cm}^2$$

Ratio = 616 : 2464 = 1 : 4

4. Surface area of hemisphere

$$= 2\pi r^2 = 2 \times \frac{22}{7} \times \frac{10.5}{2} \times \frac{10.5}{2}$$

$$= \frac{2 \times 22 \times 105 \times 105}{7 \times 2 \times 2 \times 100} = \frac{2 \times 22 \times 105 \times 105}{2800}$$

$$= \frac{485100}{2800} = 173.25 \text{ cm}^2$$

$$\text{Cost of painting} = ₹ \frac{173.25 \times 4}{100} = ₹ \frac{693}{100} = ₹ 6.93$$

5. to **7.** Do yourself.

8. Surface area of sphere $= 4\pi r^2$

$$\Rightarrow \quad 154 = 4 \times \frac{22}{7} \times r^2$$

$$\Rightarrow \quad r = 3.5 \text{ cm}$$

$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 3.5$$

$$= \frac{4 \times 22 \times 35 \times 35 \times 5}{3 \times 1000} \text{ cm}^3$$

$$= 179.67 \text{ cm}^3$$

Apply Your Mind!

1. (b)

2. (b) $\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = \frac{3\pi r^2 h}{\pi r^2 h} = \frac{3}{1}$

Hence, the ratio of volume of cylinder and cone is 3 : 1.

3. (b) Volume of cube $= 125 \text{ cm}^3 \Rightarrow a^3 = (5)^3 \Rightarrow a = 5 \text{ cm}$

Where a is a side of cube

Then lateral surface area of a cube $= 4a^2$

$$= 4 \times (5)^2 = 4 \times 25 = 100 \text{ cm}^2$$

4. (c) Number of small cubes $= \frac{100 \times 100 \times 100}{10 \times 10 \times 10} = 1000$

5. (d) $\frac{h_1}{h_2} = \frac{1}{2}$ then $\pi r_1^2 h_1 = \pi r_2^2 h_2 \left(\frac{r_1}{r_2}\right) = \sqrt{\frac{2}{1}} = \frac{\sqrt{2}}{1}$

$$\left(\frac{r_1}{r_2}\right)^2 = \left(\frac{h_2}{h_1}\right)$$

$$\frac{r_1}{r_2} = \frac{\sqrt{2}}{1}$$

$$r_1 : r_2 = \sqrt{2} : 1$$

❑

16. Data Handling

Learning Target 16.1

1. (i) Total number of workers
$= 4 \times 1 + 2 \times 6 + 3 \times 5 + 4 \times 3 + 5 \times 2$
$= 4 + 12 + 15 + 12 + 10 = 53 = 53$

(ii) Do yourself.

2. to 10. Do yourself.

11. (i) $x° + 5x° + 240° = 360°$
$6x = 120°$
$x = 20°$

(ii) (a) Number of boys $= \frac{45°}{20°} \times 240° = 540$

(b) Number of girls $= \frac{45}{20°} \times 5 \times 20° = 225$

Learning Target 16.2

1. (i) Let A denote the event 'getting an even number and a multiple of 3'. Clearly, event A occurs if we obtain 6 as out come.
Therefore, favourable number of elementary events = 1
Hence, $P(A) = \frac{1}{6}$

(ii), (iii) and (iv) Do yourself.

2. Do yourself.

3. If two unbiased coins are tossed simultaneously we obtain anyone of the following as an out come
HH, HT, TH, TT
Total number of elementary events = 4
(i) One head obtain
HT, TH
Favourable number of elementary events = 2
Hence, the required probability $= \frac{2}{4} = \frac{1}{2}$

(ii), (iii) Do yourself.

4. Do yourself.

5. (i) The required probability $= \frac{26}{52} = \frac{1}{2}$

(ii) The required probability $= \frac{2}{52} = \frac{1}{26}$

(iii), (iv) Do yourself.

6. Total number of elementary events = 36
Favourable events = (1, 1), (1, 2), (1, 4), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (1, 6), (6, 1), (6, 5).
Favourable number of elementary events = 15
The required probability $= \frac{15}{36} = \frac{5}{12}$
(ii), (iii), (iv) Do yourself.

Apply Your Mind!

1. (a) **2.** (b) **3.** d) **4.** (c) **5.** (c)

❑

17. Introduction to Graphs

Do yourself.

Model Test Paper–I

1. (i) $\frac{7}{13}$ and $\frac{-6}{13} = \frac{7}{13} + \left(\frac{-6}{13}\right) = \frac{7-6}{13} = \frac{1}{13}$

(ii) $\frac{6}{7}$ and $\frac{4}{7} = \frac{6}{7} + \frac{4}{7} = \frac{10}{7}$

(iii), (iv) Do yourself.

2. (i) $\frac{-3}{-11} + \frac{5}{9} = \frac{3}{11} + \frac{5}{9} = \frac{27+55}{99} = \frac{82}{99}$

(ii) $\frac{-7}{9} + \frac{3}{4} = \frac{-28+27}{36} = \frac{-1}{36}$

(iii), (iv) Do yourself.

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

$= \frac{-12+10+21}{18} = \frac{19}{18}$

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

$= \frac{27+16-2}{72} = \frac{41}{72}$

(iii), (iv) Do yourself.

4. Do yourself.

5. Quantity of paint that Ravi had $= \frac{3}{4}$ L

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

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

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

Then $\quad \frac{1}{4} + x = \frac{4}{5}$

$$x = \frac{4}{5} - \frac{1}{4} = \frac{16 - 5}{20} = \frac{11}{20}\text{L}$$

6. Length of paper box $l = \frac{25}{100}$m

$$= \frac{25}{100} \times 100\,\text{cm} = 25\,\text{cm}$$

Breadth of paper box $b = \frac{16}{100}$ m

$$= \frac{16}{100} \times 100\,\text{cm} = 16\,\text{cm}$$

Height of paper box $h = \frac{5}{100}$ m

$$= \frac{5}{100} \times 100\,\text{cm} = 5\,\text{cm}$$

Required paper used to make the box

$$= 2[l \times b + b \times h + h \times l]$$
$$= 2[25\,\text{cm} \times 16\,\text{cm} + 16\,\text{cm} \times 5\text{cm} + 5\,\text{cm} \times 25\,\text{cm}]$$
$$= 2[400\,\text{cm}^2 + 80\,\text{cm}^2 + 125\,\text{cm}^2]$$
$$= 2[605\,\text{cm}^2] = 1210\,\text{cm}^2$$

But surface area of lid will be subtract from total surface area then total paper used.

$$= 1210 - 25 \times 16 = 1210 - 400 = 810\,\text{cm}^2$$

7. (i) $\sqrt[4]{37} = (37)^{1/4}$ (ii) $\sqrt[5]{27} = (27)^{1/5}$

(iii) $\sqrt[7]{(29)^2} = (29)^{2/7}$ (iv), (v), (vi) Do Yourself.

8. Let the number of rows in auditorium = x

Number of student in x rows = x^2

Total number of students are sitting in an auditorium = 5929

$$x^2 = 5929$$

$$\Rightarrow \quad x = \sqrt{5929}$$

$$\Rightarrow \quad x = \sqrt{7 \times 7 \times 11 \times 11} = 7 \times 11 = 77$$

	135
1	$\overline{18}\,\overline{26}5$
	1
23	82
	69
265	1365
	1325
	40

The remainder in the last step is 40.

Hence, the required least number = 40

and required perfect square = 18265 − 40 = 18225

Also, $\sqrt{18225} = 135$

10. (i) $\sqrt[3]{-125} = -\sqrt[3]{125} = -\sqrt{5 \times 5 \times 5} = -5$

(ii) $\sqrt[3]{-5832} = -\sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= -2 \times 3 \times 3 = -18$

(iii), (iv) Do Yourself.

11. (i) $27x^3 + 8y^3 = (3x + 2y)^3 - 18xy\,(3x + 2y)$

$[\because a^3 + b^3 = (a + b)^3 - 3ab(a + b)]$

$= (14)^3 - 18 \times 8 \times 14 = 2744 - 2016 = 728$

(ii) Do yourself.

12. Student's percentage who like to visit Badkal lake, Faridabad

$$= \frac{24}{120} \times 100 = 20\%$$

Students's percentage who like to visit cheetal, Khatauli

$$= \frac{36}{120} \times 100 = 30\%$$

Student's percentage who like to visit shahasradhara, Dehradun

$$= \frac{54}{120} \times 100 = 45\%$$

Student's percentage who like to visit Appu Ghar, New Delhi.

$$= 100\% - (20 + 30 + 45)\% = 5\%$$

13. Let the number of passengers carried a train in 2004 be x.

Number of passengers carried by a train in 2005 $= x + x \times 8\%$

$$= x + x \times \frac{8}{100}$$

$$= x + \frac{2x}{25} = \frac{27x}{25}$$

Number of passengers carried by a train in 2006.

$$= \frac{27x}{25} + \frac{27x}{25} \times 8\%$$

$$= \frac{27}{25}x + \frac{27}{25}x \times \frac{8}{100}$$

$$= \frac{27}{25}x + \frac{27}{25}x \times \frac{2}{25}$$

$$= \frac{27}{25}x\left[1 + \frac{2}{25}\right]$$

$$= \frac{27}{25}x \times \frac{27}{25} = \left(\frac{27}{25}\right)^2 x$$

Increase in 2004 to 2006 $= \left(\frac{27}{25}\right)^2 x - x$

$$= \frac{729}{625}x - x$$

$$= \frac{729x - 625x}{625} = \frac{104}{625}x$$

$$\text{In Percentage} = \frac{104x \times 100}{625 \times x} = \frac{104 \times 100}{625} = 16.64\%$$

❑

Model Test Paper–II

1. On ₹ 100, the tax paid was ₹ 5,

(i) On ₹ 12000 for a TV the tax paid would be

$$= ₹ \frac{5}{100} \times 12000 = ₹ 600$$

Bill amount for a TV = ₹ 12000 + ₹ 600 = ₹ 12600

(ii) On ₹ 1800 for a leather coat, the tax paid would be

$$= ₹ \frac{5}{100} \times 1800 = ₹ 90$$

Bill amount for a leather coat = ₹ 1800 + ₹ 90 = ₹ 1890

(iii) On ₹ 50 for two bars soaps, the tax paid would be

$$= ₹ \frac{5}{100} \times 50 = ₹ 2.50$$

Bill amount for two bars soaps = ₹ 50 + ₹ 2.50 = ₹ 52.50

(iv) On ₹ 3300 for an air cooler, the tax paid would be

$$= ₹ \frac{5}{100} \times 3300 = ₹ 165$$

Bill amount for an air cooler = ₹ 3300 + ₹ 165 = ₹ 3465

2. Principal for the first year = ₹ 2000

$$\text{Interest for the first year} = \frac{2000 \times 1 \times 4}{100} = ₹ 80$$

Amount at the end of the first year = ₹ 2000 + 80 = ₹ 2080

Principal for the second year = ₹ 2080

$$\text{Interest for second year} = \frac{2080 \times 1 \times 4}{100} = ₹ 83.2$$

Amount at the end of the second year = 2080 + 83.2 = ₹ 2163.2

Principal for the third year = ₹ 2163.2

$$\text{Interest for third year} = \frac{2163.2 \times 1 \times 4}{100} = ₹ 86.528$$

Amount at end of the third year = 2163.2 + 86.528 = 2249.728

CI = Amount – Principal = 2249.728 – 2000 = 249.728 = ₹ 249.73

3. Principal = ₹ 256, $R = 12\frac{1}{2}\%$ Per annum = = $\frac{25}{4}$ per half-year.

n = 1 year = 2 half year

$$A = P\left(1 + \frac{R}{100}\right)^n = 256\left(1 + \frac{25}{4 \times 100}\right)^2$$

$$= 256 \times \frac{17}{16} \times \frac{17}{16} = ₹ 289$$

4. (i) Inverse variation (ii) Inverse variation
(iii) Direct variation

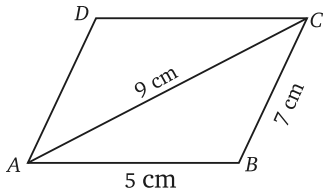
5. $AB = 5\,\text{cm}, BC = 7\,\text{cm}, AC = 9\,\text{cm}$

Area of parallelogram

$ABCD$ = Area of ΔACD + Area of ΔABC

Area of ΔABC, $AB = 5\,\text{cm}$, $BC = 7\,\text{cm}$,

$CA = 9\,\text{cm}$.



$$s = \frac{5+7+9}{2} = \frac{21}{2}\,\text{cm}$$

$$= \sqrt{\frac{21}{2} \times \left(\frac{21}{2} - 5\right)\left(\frac{21}{2} - 7\right)\left(\frac{21}{2} - 9\right)}$$

$$= \sqrt{\frac{21}{2} \times \frac{11}{2} \times \frac{7}{2} \times \frac{3}{2}}$$

$$= \frac{21\sqrt{11}}{4} = \frac{21}{4} \times 3.317$$

$$= \frac{69.657}{4} = 17.414$$

Area of ΔABC + Area of $\Delta ADC = 17.414 \times 2 = 34.82\,\text{cm}^2$

6. (i) Circumference $= 2\pi r \Rightarrow 7.7 = 2 \times \frac{22}{7} \times r$

$$\Rightarrow \quad r = \frac{77 \times 7}{2 \times 22 \times 10}$$

$$\Rightarrow \quad r = \frac{49}{40} = 1.225\,\text{m}$$

$$\Rightarrow \quad d = 2 \times r = 2 \times 1.225 = 2.45\,\text{m}$$

(ii), (iii) Do yourself.

7. Diameter of first circular plate = 10 cm

Diameter of second circular plate = 24 cm

Radius of first circular plate $= \frac{10}{2} = 5\,\text{cm}$

Radius of second circular plate $= \frac{24}{2} = 12\,\text{cm}$

Area of a plate which has equal area a given plates

$$\pi R^2 = \pi(5)^2 + \pi(12)^2$$

$$\pi R^2 = \pi[25 + 144]$$

$$\Rightarrow \quad R = \sqrt{169}$$

$$\Rightarrow \quad R = 13 \text{ cm}$$

Diameter $= 2 \times 13 = 26$ cm

8. Area of the remaining part of park

$$= (50)^2 - 4 \times \frac{90^\circ}{360^\circ} \times \frac{22}{7} \times 7 \times 7$$

$$= 2500 - 154 = 2346 \text{ m}^2$$

9. (i) Capacity of rectangular tank

$$= lbh = 5.5 \text{ m} \times 3.5 \text{ m} \times 3.6 \text{ m}$$

$$= 69.3 \text{ m}^3 = 69.3 \times 1000\, L$$

$$= 69300\, L$$

(ii), (iii), (iv) Do yourself.

10. Here, Radius $= \frac{20}{2} = 10$ cm and Height $= 14$ cm

Surface area of a cylindrical vessel

$$= 2\pi rh + \pi r^2$$

$$= 2 \times \frac{22}{7} \times 16 \times 14 + \frac{22}{7} \times 10 \times 10$$

$$= 880 + 314 = 1194 \text{ cm}^2$$

Cost of tin plating it on the inside $= \frac{1194}{100} \times \frac{₹\ 50}{100} = ₹\ 5.97$

11. Area of a right circular cone $= \pi rl = \frac{22}{7} \times 5 \times 10$

$$= 157.14 \text{ cm}^2 \text{ (approx)}$$

12. (i) Product 1 (ii) April

(iii) 35 Lakhs (iv) 45 lakhs

(v) $35 + 30 + 35 + 35 = 135$ lakhs

(vi) $20 + 25 + 30 + 45 = 120$ lakhs

13. Do yourself

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