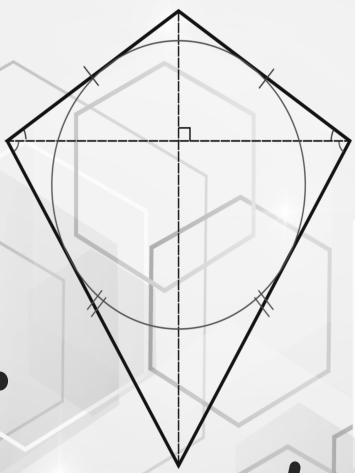
Timax®

# MATHS MAGIC

## Teacher Manual

$A^2+B^2=C^2$

$\pi=3.1416$



NEP 2020
ENHANCED EDITION

8

# MATHS TEACHER MANUAL
## Class - VIII
## Exercise 1.1

**1.** (a) $\frac{-5}{7}$ is a rational number because 5 and 7 are integers and $7 \neq 0$.

(b) $\frac{14}{-20}$ is a rational number because 14 and –20 are integers and $-20 \neq 0$.

(c) $\frac{19}{119}$ is a rational number because 19 and 119 are integers and $119 \neq 0$.

(d) $\frac{-13}{0}$ is not a rational number as denominator is 0.

(e) $\frac{-14}{1}$ is a rational number as –14 and 1 are integers and $1 \neq 0$.

**2.** (a) $\frac{7}{9}$ is in the standard form as 7 and 9 are co-prime numbers and 9 is positive.

(b) $\frac{18}{29}$ is in the standard form and 29 is positive.

(c) $\frac{13}{-17}$ is not in the standard form as –17 is negative.

$\frac{13}{-17} \times \frac{-1}{-1} = \frac{-13}{17}$ is in the standard form.

(d) $\frac{20}{27}$ is int he standard form and 27 is positive.

(e) $\frac{11}{21}$ is in the standard form as 21 is positive.

(f) $\frac{119}{65}$ is in the standard form and 65 is positive.

(g) $\frac{17}{-85}$ is not in the standard form, because HCF of 17 and –85 is 17.

$\frac{17}{-85} \div \frac{17}{17} = \frac{1}{-5} \times \frac{-1}{-1} = \frac{-1}{5}$

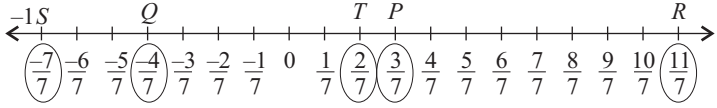
$-\frac{1}{5}$ is the standard form of $\frac{17}{-85}$

(h) $\frac{16}{-4}$ is not in the standard form as HCF of 16 and –4 is 4.

So, $\frac{16}{-4} \div \frac{4}{4} = \frac{4}{-1} \times \frac{-1}{-1} = \frac{-4}{1} = -4$

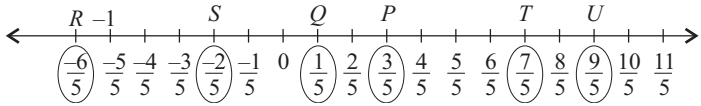
$-4$ is the standard form of $\frac{16}{-4}$

**3.** (a) $\frac{3}{7}, \frac{-4}{7}, \frac{11}{7}, \frac{-7}{7}$ and $\frac{2}{7}$




$P = \frac{3}{7}, Q = \frac{-4}{7}, R = \frac{11}{7}, S = \frac{-7}{7}, T = \frac{2}{7}$

(b) $\frac{3}{5}, \frac{1}{5}, \frac{-6}{5}, \frac{-2}{5}, \frac{7}{5}, \frac{9}{5}$




$P = \frac{3}{7}, Q = \frac{1}{5}, R = \frac{-5}{5}, S = \frac{-2}{5}, T = \frac{7}{5}, U = \frac{9}{5}$

**4.** (a) $\frac{11}{12} = \frac{\boxed{x}}{72}$; $\frac{11}{12} \times \frac{x}{72}$; $11 \times 72 = 12 \times x$; $x = \frac{11 \times 72}{12}$, $x = 66$

$\frac{11}{12} = \frac{22}{\boxed{y}}$; $\frac{11}{12} \times \frac{22}{y}$; $11 \times y = 22 \times 12$; $y = \frac{22 \times 12}{11} = 24$, $y = 24$

(b) $\frac{3}{13} = \frac{12}{\boxed{x}}$; $\frac{3}{13} \times \frac{12}{x}$; $3 \times x = 12 \times 13$; $x = \frac{12 \times 13}{3}$, $x = 52$

$\frac{3}{13} = \frac{\boxed{y}}{26}$; $\frac{3}{13} \times \frac{y}{26}$; $3 \times 26 = y \times 13$; $y = \frac{3 \times 26}{13} = 6$

(c) $\frac{-12}{\boxed{x}} \frac{4}{-7}$; $\frac{-12}{x} \times \frac{4}{-7}$; $-12 \times -7 = 4 \times x$; $4x = -12 \times -7$

$x = \frac{-12 \times -7}{4} = 21$; $\frac{4}{-7} = \frac{y}{-35}$; $\frac{4}{-7} \times \frac{y}{-35}$ $y \times -7 = 4 \times -35$

$y = \frac{4 \times -35}{-7}$; $y = \frac{4 \times 35}{7} \Rightarrow y = +20$

(d) $\frac{\square}{-9} = \frac{10}{3} = \frac{-300}{\square}$; $\frac{x}{-9} \times \frac{10}{3}$; $3 \times x = 10 \times -9$; $x = \frac{10 \times -9}{3}$, $x = -30$

$\frac{10}{3} = \frac{-300}{y}$; $\frac{10}{3} \times \frac{-300}{y}$; $10 \times y = -300 \times 3$; $y = \frac{-300 \times 3}{10}$, $y = -90$

**5.** (a) $\frac{-4}{9}, \frac{-5}{12}$

| | |
|---|---|
| 2 | 9, 12 |
| 2 | 9, 6 |
| 3 | 9, 3 |
| 3 | 3, 1 |
| | 1, 1 |

LCM of 9 and 12;

LCM = $2\times2\times3\times3 = 36$

$\frac{-4}{9}\times\frac{4}{4} = \frac{-16}{36}$; $\frac{-5}{12}\times\frac{3}{3} = \frac{-15}{36}$; $\frac{-16}{36} < \frac{-15}{36}$; $\therefore \frac{-4}{9} < \frac{-5}{12}$

So, $\frac{-5}{12}$ is greater than $\frac{-4}{9}$

(b) $\frac{-20}{18}, \frac{-1}{9}$

| | |
|---|---|
| 2 | 18, 9 |
| 3 | 9, 9 |
| 3 | 3, 3 |
| | 1, 1 |

LCM of 18 and 9

LCM of 18 and $9 = 2\times3\times3 = 18$

$\frac{-20}{18}\times\frac{1}{1} = \frac{-20}{18}$, $\frac{-1}{9}\times\frac{2}{2} = \frac{-2}{18}$

$\frac{-20}{18} < \frac{-2}{18}$; $\frac{-20}{18} < \frac{-1}{9}$

So, $\frac{-1}{9}$ is greater than $\frac{-20}{18}$

(c) $\frac{2}{7}, \frac{7}{7}$

$\frac{7}{7} > \frac{2}{7}$ So, $\frac{7}{7}$ is greater as the denominator is same.

(d) $\frac{21}{12}, \frac{-13}{21}$

| | |
|---|---|
| 2 | 12, 21 |
| 2 | 6, 21 |
| 3 | 3, 21 |
| 7 | 1, 7 |
| | 1, 1 |

LCM of 12 and 21

LCM of 12 and 21= $2\times2\times3\times7 = 84$

$\frac{21}{12}\times\frac{7}{7} = \frac{147}{84}$; $\frac{-13}{21}\times\frac{4}{4} = \frac{-52}{84}$

$\frac{147}{84} > \frac{-52}{84}$; $\frac{21}{12} > \frac{-13}{21}$ So, $\frac{21}{12}$ is greater than $\frac{-13}{21}$

**6.** (a) $\frac{-7}{8}, \frac{13}{8}$; $-\frac{7}{8}$ is smaller than $\frac{13}{8}$

(b) $\frac{10}{12}, \frac{9}{20}$

| | |
|---|---|
| 2 | 12, 20 |
| 2 | 6, 10 |
| 3 | 3, 5 |
| 5 | 1, 5 |
| | 1, 1 |

LCM of 12 and 20

LCM of 12 and $20 = 2\times2\times3\times5 = 60$

$\frac{10}{12}\times\frac{5}{5}=-\frac{50}{60};\ \frac{9}{20}\times\frac{3}{3}=\frac{27}{60};\ \frac{50}{60}\ \square\ \frac{27}{60}$ So, $\frac{10}{12}\ \square\ \frac{9}{20}$

So, $\frac{9}{20}$ is smaller than $\frac{10}{12}$

(c) $\frac{-2}{9}$ and $\frac{6}{-18}$

| | |
|---|---|
| 2 | 9, 18 |
| 3 | 9, 9 |
| 3 | 3, 3 |
| | 1, 1 |

LCM of 9 and $-18$ LCM of 9 and $-18 = 2\times3\times3=-18$

$\frac{-2}{9}\times\frac{2}{2}=\frac{-4}{18};\ \frac{6}{-18}\times\frac{1}{1}=\frac{6}{-18}\times\frac{-1}{-1}=\frac{-6}{18}$

$\frac{-4}{18}\ \square\ \frac{-6}{18};\ \frac{-2}{9}\ \square\ \frac{-6}{-18}$ So, $\frac{6}{-18}$ is smaller than $\frac{-2}{9}$

(d) $\frac{9}{7}, \frac{9}{9}$; LCM of 7 and 9

| | |
|---|---|
| 3 | 7, 9 |
| 3 | 7, 3 |
| 7 | 7, 1 |
| | 1, 1 |

LCM of 7 and $9 = 3\times3\times7=63$

$\frac{9}{7}\times\frac{9}{9}=\frac{81}{63};\ \frac{9}{9}\times\frac{7}{7}=\frac{63}{63};\ \frac{81}{63}>\frac{63}{63}$, So, $\frac{9}{7}>\frac{9}{9}$

So, $\frac{9}{9}$ is smaller than $\frac{9}{7}$

**7.** (a) $\frac{-11}{12}, \frac{13}{24}, \frac{9}{21}, \frac{-7}{-12}$

| | |
|---|---|
| 2 | 12, 24, 21 |
| 2 | 6, 12, 21 |
| 2 | 3, 6, 21 |
| 3 | 3, 3, 21 |
| 7 | 1, 1, 7 |
| | 1, 1, 1 |

LCM of 12, 24, 21

LCM of $12, 24, 21 = 2\times2\times2\times3\times7=168$

$-\frac{11}{12}\times\frac{14}{14}=\frac{-154}{168}$

$\frac{13}{24}\times\frac{7}{7}=\frac{91}{168};\ \frac{9}{21}\times\frac{8}{8}=\frac{72}{168};\ \frac{-7}{-12}\times\frac{14}{14}=\frac{98}{168}$

$\frac{-154}{168}<\frac{72}{168}<\frac{91}{168}<\frac{98}{168};\ \frac{-11}{12}<\frac{9}{21}<\frac{13}{24}<\frac{-7}{-12}$

(b) $\frac{17}{20}, \frac{-13}{18}, \frac{-11}{9}, \frac{-3}{-16}$

| | |
|---|---|
| 2 | 20, 18, 9, 16 |
| 2 | 10, 9, 9, 8 |
| 2 | 5, 9, 9, 4 |
| 2 | 5, 9, 9, 2 |
| 3 | 5, 9, 9, 1 |
| 3 | 5, 3, 3, 1 |
| 5 | 5, 1, 1, 1 |
| | 1, 1, 1, 1 |

LCM of 20, 18, 9, $-16$

LCM of 20, 18, 9, $-16 = 2\times2\times2\times2\times3\times3\times5=720$

$\frac{17}{20}\times\frac{36}{36}=\frac{612}{720};\ \frac{-13}{18}\times\frac{40}{40}=\frac{-520}{720}$

$\frac{-11}{9}\times\frac{80}{80}=\frac{-880}{720};\ \frac{-3}{-16}\times\frac{45}{45}=\frac{135}{720};\ \frac{-880}{720}<\frac{-520}{720}<\frac{135}{720}<\frac{612}{720}$

$$\frac{-880}{720} < \frac{-520}{720} < \frac{135}{720} < \frac{612}{720}; \frac{-11}{9} < \frac{-13}{18} < \frac{-3}{-16} < \frac{17}{20}$$

**8.** (a) $\frac{-1}{21}, \frac{2}{45}, \frac{-7}{15}, \frac{8}{21}$

| | |
|---|---|
| 3 | 21, 45, 15 |
| 3 | 7, 15, 5 |
| 5 | 7, 5, 5 |
| 7 | 7, 1, 1 |
| | 1, 1, 1 |

LCM of 21, 45, 15

LCM of 21, 45, 15 = $3 \times 3 \times 5 \times 7 = 315$

$\frac{-1}{21} \times \frac{15}{15} = \frac{-15}{315}; \frac{8}{21} \times \frac{15}{15} = \frac{120}{315}; \frac{2}{45} \times \frac{7}{7} = \frac{14}{315}$

$\frac{-7}{15} \times \frac{21}{21} = \frac{-147}{315}; \frac{120}{315} > \frac{14}{315} > \frac{-15}{315} > \frac{-147}{315}; \frac{8}{21} > \frac{2}{45} > \frac{-1}{21} > \frac{-7}{15}$

(b) $\frac{15}{16}, \frac{-17}{-8}, \frac{1}{40}, \frac{12}{24}$

| | |
|---|---|
| 2 | 16, 8, 40, 24 |
| 2 | 8, 4, 20, 12 |
| 2 | 4, 2, 10, 6 |
| 2 | 2, 1, 5, 3 |
| 3 | 1, 1, 5, 3 |
| 5 | 1, 1, 5, 1 |
| | 1, 1, 1, 1 |

LCM of 16, 8, 40, 24

$= 2 \times 2 \times 2 \times 2 \times 3 \times 5 = 240$

$\frac{15}{16} \times \frac{15}{15} = \frac{225}{240}; \frac{-17}{-8} \times \frac{30}{30} = \frac{510}{240}$

$\frac{1}{40} \times \frac{6}{6} = \frac{6}{240}; \frac{12}{24} \times \frac{10}{10} = \frac{120}{240}; \frac{510}{240} > \frac{225}{240} > \frac{120}{240} > \frac{6}{240}$

$\frac{-17}{-8} > \frac{15}{16} > \frac{12}{24} > \frac{1}{40}$

## Exercise 1.2

**1.** (a) $\frac{-13}{12} + \frac{14}{12}; \frac{-13+14}{12} = \frac{1}{12}$

(b) $\frac{14}{10} + \frac{16}{10} = \frac{14+16}{10} = \frac{30}{10} = 3$

(c) $\frac{20}{3} + \frac{(-17)}{3} = \frac{20+(-17)}{3} = \frac{20-17}{3} = \frac{3}{3}$

(d) $\frac{17}{19} + \frac{13}{19} = \frac{17+13}{19} = \frac{30}{19}$

(e) $\frac{-9}{10} + \left(\frac{-11}{10}\right) = \frac{-9+(-11)}{10} = \frac{-9-11}{10} = \frac{-20}{10} = -2$

(f) $\frac{7}{45} + \frac{-7}{45} = \frac{7+(-7)}{45} = \frac{7-7}{45} = \frac{0}{45} = 0$

(g) $\frac{22}{30} + \frac{(-15)}{30} = \frac{22+(-15)}{30} = \frac{22-15}{30} = \frac{7}{30}$

(h) $\frac{11}{9} + \frac{(-2)}{9} = \frac{11+(-2)}{9} = \frac{11-2}{9} = \frac{9}{9} = 1$

**2.** (a) $\frac{4}{7}+\frac{3}{9}=\square+\frac{4}{7}$

$\frac{3}{9}$ will come in the box and commutative property is used.

(b) $\square+\left[\frac{4}{11}+\left(\frac{-3}{9}\right)\right]=\left(\frac{-7}{9}+\frac{4}{11}\right)+\square$

$\frac{-7}{9}$ will come in the first box and $\frac{-3}{9}$ will come in the second box and associative property is used.

(c) $\square+\frac{-3}{4}=0$

$\frac{3}{4}$ will come in the box and $\frac{3}{4}$ is the additive inverse.

(d) 0 will come in the box as it is the additive identity.

(e) 0 will come in the box as here it is additive inverse.

**3.** (a) $x=\frac{-5}{7}, y=\frac{1}{2}, z=\frac{-2}{3}$

$x+(y+z)=(x+y)+z$

Using associativity of rational numbers

$$\text{LHS}=\frac{-5}{7}+\left[\frac{1}{2}+\left(\frac{-2}{3}\right)\right]=\frac{-5}{7}+\left(\frac{3+(-4)}{6}\right)=\frac{-5}{7}+\left[\frac{-1}{6}\right]$$

$$=\frac{-5}{7}+\frac{(-1)}{6}=\frac{-30+(-7)}{42}=\frac{-30-7}{42}=\frac{-37}{42}$$

$$\text{RHS}=\left[\frac{-5}{7}+\frac{1}{2}\right]+\left(\frac{-2}{3}\right)$$

$$=\left[\frac{-10+7}{14}\right]+\left(\frac{-2}{3}\right)=\frac{-3}{14}+\left(\frac{-2}{3}\right)=\frac{-9+(-28)}{42}=\frac{-9-28}{42}=\frac{-37}{42}$$

LHS = RHS ***Hence, verified***

(b) $x=\frac{-7}{9}, y=\frac{-1}{3}, z=\frac{7}{3}$

Using associativity of rational numbers.

$$\text{LHS}=x+(y+z)$$

$$=\frac{-7}{9}+\left(\frac{-1}{3}+\frac{7}{3}\right)=\frac{-7}{9}+\left(\frac{-1+7}{3}\right)=\frac{-7}{9}+\frac{6}{3}=\frac{-7+18}{9}=\frac{11}{9}$$

$$\text{RHS}=(x+y)+z$$

$$= \left[\frac{-7}{9} + \left(\frac{-1}{3}\right)\right] + \frac{7}{3} = \left[\frac{-7}{9} - \frac{1}{3}\right] + \frac{7}{3} = \left[\frac{-7-3}{9}\right] + \frac{7}{3}$$

$$= \frac{-10}{9} + \frac{7}{3} = \frac{-10+21}{9} = \frac{11}{9}$$

$\therefore$ LHS = RHS ***Hence, verified***

**4.** (a) Commutative property is used.

(b) Additive identity is used.

(c) Commutative property is used.

(d) Associative property is used.

**5.** (a) $\frac{-7}{9}$ (b) $\frac{-12}{7}$

(c) $\frac{13}{6}$ (d) $\frac{-3}{4}$

(e) $\frac{-8}{11}$

## Exercise 1.3

**1.** (a) $\frac{9}{11}$ and $\frac{11}{11}$; $\frac{11}{11} - \frac{9}{11} = \frac{11-9}{11} = \frac{2}{11}$

(b) $\frac{-3}{7}$ and $\frac{3}{7}$; $\frac{3}{7} - \frac{(-3)}{7} = \frac{3}{7} + \frac{3}{7} = \frac{6}{7}$

(c) 7 and $\frac{-14}{11}$; $\frac{-14}{11} - 7 = \frac{-14-77}{11} = \frac{-91}{11}$

(d) $\frac{-10}{15}$ and $-5$; $-5 - \left(\frac{-10}{15}\right) = -5 + \frac{10}{15} = \frac{-75+10}{15} = \frac{-65}{15} = \frac{-13}{3}$

(e) $\frac{9}{10}$ and $\frac{13}{10} = \frac{13}{10} - \frac{9}{10} = \frac{13-9}{10} = \frac{4}{10} = \frac{2}{5}$

(f) $\frac{-5}{9}$ and $\frac{-4}{9}$; $\frac{-4}{9} - \left(\frac{-5}{9}\right) = \frac{-4+5}{9} = \frac{1}{9}$

**2.** (a) $\frac{13}{9} - \left(\frac{-7}{9}\right) + \frac{8}{6}$

$$= \frac{13-(-7)}{9} + \frac{8}{6} = \frac{13+7}{9} + \frac{8}{6} = \frac{20}{9} + \frac{8}{6} = \frac{40+24}{18} = \frac{64}{18} = \frac{32}{9}$$

(b) $\frac{-1}{6} + \left(\frac{-3}{18}\right) - \left(\frac{-7}{24}\right); = \left[\frac{-1}{6} + \left(\frac{-3}{18}\right)\right] - \left(\frac{-7}{24}\right); = \left[\frac{-1}{6}\frac{-3}{18}\right] - \left(\frac{-7}{24}\right)$

$$= \left[\frac{-3-3}{18}\right] + \frac{7}{24}; = \frac{6}{18} + \frac{7}{24} = \frac{-24+21}{72} = \frac{-3}{72} = -\frac{1}{24}$$

(c) $\frac{11}{12}-\frac{13}{24}-\left(\frac{-15}{18}\right)=\frac{22-13}{24}-\left(\frac{-15}{18}\right)=\frac{9}{24}+\frac{15}{18}=\frac{27+60}{72}=\frac{87}{72}$

(d) $\frac{-18}{16}+\left(\frac{-11}{20}\right)-\left(\frac{-13}{12}\right)$

$=\left[\frac{-18}{16}+\left(\frac{-11}{20}\right)\right]+\frac{13}{12}=\left[\frac{-90+(-44)}{80}\right]+\frac{13}{12}$

LCM of 16 and 20 $= 2\times2\times2\times2\times5=80$

$=\frac{-90-44}{80}+\frac{13}{12}=\frac{-134}{80}+\frac{13}{12}=\frac{-402+260}{240}$

LCM of 80 and 12 $= 2\times2\times2\times2\times3\times5=240$

$=\frac{-142}{240}=\frac{-71}{120}$

| | |
|---|---|
| 2 | 16, 20 |
| 2 | 8, 10 |
| 2 | 4, 5 |
| 2 | 2, 5 |
| 5 | 1, 5 |
| | 1, 1 |

| | |
|---|---|
| 2 | 80, 12 |
| 2 | 40, 6 |
| 2 | 20, 3 |
| 2 | 10, 3 |
| 3 | 5, 3 |
| 5 | 5, 1 |
| | 1, 1 |

(e) $\frac{-7}{60}-\left(\frac{-3}{20}\right)-\frac{7}{10}$

$=\left[\frac{-7}{60}-\left(\frac{-3}{20}\right)\right]-\frac{7}{10}=\left[\frac{-7-(-9)}{60}\right]-\frac{7}{10}$

LCM of 60, 20, $= 2\times2\times3\times5=60$

$=\left[\frac{-7+9}{60}\right]-\frac{7}{10}=\left[\frac{+2}{60}\right]-\frac{7}{10}=\frac{1}{30}-\frac{7}{10}=\frac{1-21}{30}=\frac{-20}{30}=\frac{-2}{3}$

| | |
|---|---|
| 2 | 60, 20 |
| 2 | 30, 10 |
| 3 | 15, 5 |
| 5 | 5, 5 |
| | 1, 1 |

(f) $\frac{7}{36}+\left(\frac{-9}{6}\right)+\left(\frac{-7}{27}\right)$

$=\left[\frac{7+(-54)}{36}\right]+\left(-\frac{7}{27}\right)=\left[\frac{7-54}{36}\right]+\left(\frac{-7}{27}\right)=\frac{47}{36}+\left(\frac{-7}{27}\right)$

LCM of 36 and 27 $= 2\times2\times3\times3\times3=108$

$=\frac{141+(-28)}{108}=\frac{-169}{108}$

| | |
|---|---|
| 2 | 36, 27 |
| 2 | 18, 27 |
| 3 | 9, 27 |
| 3 | 3, 9 |
| 3 | 1, 3 |
| | 1, 1 |

**3.** (a) True (b) False (c) False (d) False (e) False

## Exercise 1.4

**1.** (a) $\frac{17}{19}$ by $\frac{-95}{85}$; $\frac{17}{19}\times\frac{-95}{85}=-1$

(b) $\frac{-7}{9}$ by $\frac{3}{14}$; $=\frac{7}{9}\times\frac{3}{14}=\frac{-1}{6}$

(c) $\frac{13}{-3}$ by $\frac{13}{-26}$; $=\frac{13}{-3}\times\frac{12}{-26}=\frac{1\times2}{-1\times-1}=2$

(d) $\frac{1}{2}$ by $\frac{1}{4}=\frac{1}{2}\times\frac{1}{4}=\frac{1}{8}$

(e) $\frac{16}{25}$ by $\frac{-30}{12} = \frac{16}{25} \times \frac{-30}{12} = \frac{8 \times -3}{5 \times 3} = \frac{-8}{5}$

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

**2.** (a) $\frac{-7}{9} \div \frac{1}{18} = \frac{-7}{9} \times \frac{18}{1} = -14$ (b) $\frac{-13}{16} \div -\frac{26}{48} = \frac{-13}{16} \times \frac{48}{-26} = \frac{-3}{-2} = \frac{3}{2}$

(c) $0 \div \frac{-19}{7} = 0 \times \frac{7}{-19} = 0$ (d) $\frac{-35}{18} \div \frac{10}{-15} = \frac{-35}{18} \times \frac{-15}{10} = \frac{35}{12}$

(e) $\frac{-19}{20} \div \frac{-19}{20} = \frac{19}{20} \times \frac{20}{19} = \frac{-1}{-1} = 1$ (f) $\frac{17}{16} \div \frac{32}{34} = \frac{17}{16} \times \frac{34}{32} = \frac{289}{256}$

**3.** (a) $\frac{-7}{8} \times \left(\frac{-3}{7} \times \frac{9}{12}\right) = \left(\frac{-7}{8} \times \frac{-3}{7}\right) \times \frac{9}{12}$

LHS $= \frac{-7}{8} \times \left(\frac{-3}{7} \times \frac{9}{12}\right) = \frac{-7}{8} \times \left(\frac{-9}{28}\right) = \frac{-7}{8} \times \frac{-9}{28} = \frac{9}{32}$

RHS $= \left(\frac{-7}{8} \times \frac{-3}{7}\right) \times \frac{9}{12} = \frac{3}{8} \times \frac{9}{12} = \frac{9}{32}$

LHS = RHS $\quad \therefore \quad \frac{-7}{8} \times \left(\frac{-3}{7} \times \frac{9}{12}\right) = \left(\frac{-7}{8} \times \frac{-3}{7}\right) \times \frac{9}{12}$

LHS = RHS, ***Hence verified.***

(b) $\frac{-4}{9} \times \frac{-3}{16} = \frac{-3}{16} \times \frac{-4}{9}$

LHS $= \frac{-4}{9} \times \frac{-3}{16} = \frac{1}{12}$ RHS $= \frac{-3}{16} \times \frac{-4}{9} = \frac{1}{12}$

$\therefore$ LHS = RHS, Hence verified $\quad \therefore -\frac{4}{9} \times \frac{-3}{16} = \frac{-3}{16} \times \frac{-4}{9}$ Hence verified

(c) $\frac{5}{9} \times \left(\frac{7}{2} + \frac{3}{2}\right) = \left(\frac{5}{9} \times \frac{7}{2}\right) + \left(\frac{5}{9} \times \frac{3}{2}\right)$

LHS $= \frac{5}{9} \times \left(\frac{7}{2} + \frac{3}{2}\right) = \frac{5}{9} \times \left(\frac{7+3}{2}\right) = \frac{5}{9} \times \left(\frac{10}{2}\right) = \frac{5}{9} \times 5$

LHS $= \frac{25}{9}$

RHS $= \left(\frac{5}{9} \times \frac{7}{2}\right) + \left(\frac{5}{9} \times \frac{3}{2}\right) = \frac{35}{18} + \frac{15}{18} = \frac{35+15}{18} = \frac{50}{18} = \frac{25}{9}$

$\therefore$ LHS = RHS $\quad \therefore \quad \frac{5}{9} \times \left(\frac{7}{2} + \frac{3}{2}\right) = \left(\frac{5}{9} \times \frac{7}{2}\right) + \left(\frac{5}{9} \times \frac{3}{2}\right)$

***Hence, Verified***

(d) $\frac{-7}{9}\times\left(\frac{13}{6}+\frac{-2}{3}\right)=\frac{-7}{9}\times\frac{13}{6}+\frac{-7}{9}\times\frac{-2}{3}$

LHS $=\frac{-7}{9}\times\left(\frac{13}{6}+\frac{-2}{3}\right)$

$=\frac{-7}{9}\times\left(\frac{13+(-4)}{6}\right)=\frac{-7}{9}\times\left(\frac{13-4}{6}\right)=\frac{-7}{9}\times\frac{9}{6}=\frac{-7}{6}$

RHS $=\frac{-7}{9}\times\frac{13}{6}+\left(\frac{-7}{9}\times\frac{-2}{3}\right)=\frac{-91}{54}+\frac{14}{27}=\frac{-91+28}{54}=\frac{-63}{54}=\frac{-7}{6}$

$\therefore$ LHS = RHS ***Hence Verified***

(e) $\frac{-4}{9}\div\frac{-3}{16}\neq\frac{-3}{16}\div\frac{-4}{9}$

LHS $=\frac{-4}{9}\div\frac{-3}{16}=\frac{-4}{9}\times\frac{16}{-3}=\frac{64}{27}$

RHS $=\frac{-3}{16}\div\frac{-4}{9}=\frac{-3}{16}\times\frac{9}{-4}=\frac{27}{64}$

$\therefore$ LHS $\neq$ RHS, ***Hence verified***

(f) $\frac{-7}{8}\div\left(\frac{-3}{7}\div\frac{9}{12}\right)\neq\left(\frac{-7}{8}\div\frac{-3}{7}\right)\div\frac{9}{12}$

LHS $=\frac{-7}{8}\div\left(\frac{-3}{7}\div\frac{9}{12}\right)$

$=\frac{-7}{8}\div\left(\frac{-3}{7}\times\frac{12}{9}\right)=\frac{-7}{8}\div\left(\frac{-4}{7}\right)=\frac{-7}{8}\times\frac{7}{-4}=\frac{49}{32}$

RHS $=\left(\frac{-7}{8}\div\frac{-3}{7}\right)\div\frac{9}{12}=\left(\frac{-7}{8}\times\frac{7}{-3}\right)\div\frac{9}{12}=\frac{49}{24}\times\frac{12}{9}=\frac{49}{18}$

$\therefore$ LHS $\neq$ RHS, ***Hence verified.***

(g) $\frac{-7}{10}\times\left(\frac{-2}{7}-\frac{(-3)}{14}\right)=\frac{-7}{10}\times\frac{-2}{7}-\frac{-7}{10}\times\frac{-3}{14}$

LHS $=\frac{-7}{10}\times\left(\frac{-2}{7}-\frac{(-3)}{14}\right)=\frac{-7}{10}\times\left(\frac{-4-(-3)}{14}\right)=\frac{-7}{10}\times\left(\frac{-4+3}{14}\right)$

$=\frac{-7}{10}\times\frac{-1}{14}=\frac{1}{20}$

RHS $=\frac{7}{10}\times\frac{-2}{7}-\frac{-7}{10}\times\frac{-3}{14}=\frac{1}{5}-\frac{3}{20}=\frac{4-3}{20}=\frac{1}{20}$

$\therefore$ LHS = RHS, ***Hence verified***

## Exercise 2.1

**1.** (a) $7^{-4} = \frac{1}{7^4} = \frac{1}{7\times7\times7\times7} = \frac{1}{2401}$

(b) $\left(\frac{2}{5}\right)^4 = \frac{2\times2\times2\times2}{5\times5\times5\times5} = \frac{16}{625}$

(c) $\left(\frac{9}{7}\right)^{-2} = \left(\frac{7}{9}\right)^2 = \frac{7\times7}{9\times9} = \frac{49}{81}$

(d) $\left(\frac{2}{2}\right)^3 = \frac{2\times2\times2}{2\times2\times2} = \frac{8}{8} = 1$

(e) $\left(\frac{9}{13}\right)^{-2} = \left(\frac{13}{9}\right)^2 = \frac{13\times13}{9\times9} = \frac{169}{81}$

(f) $\left(\frac{3}{5}\right)^3 = \frac{3\times3\times3}{5\times5\times5} = \frac{27}{125}$

(g) $\left(\frac{16}{17}\right)^{-3} = \left(\frac{17}{16}\right)^3 = \frac{17\times17\times17}{16\times16\times16} = \frac{4913}{4096}$

(h) $\left(\frac{6}{11}\right)^3 = \frac{6\times6\times6}{11\times11\times11} = \frac{216}{1331}$

**2.** (a) $\frac{-8}{243} = \frac{-2\times-2\times-2}{7\times7\times7} = \left(\frac{-2}{7}\right)^3$

(b) $\frac{9}{4} = \frac{3\times3}{2\times2} = \left(\frac{3}{2}\right)^2$

(c) $\frac{49}{4} = \frac{7\times7}{2\times2} = \left(\frac{7}{2}\right)^2$

(d) $\frac{125}{216} = \frac{5\times5\times5}{4\times4\times4} = \left(\frac{5}{6}\right)^3$

(e) $\frac{-125}{64} = \frac{-5\times-5\times-5}{4\times4\times4} = \left(\frac{-5}{4}\right)^3$

(f) $\frac{16}{81} = \frac{2\times2\times2\times2}{3\times3\times3\times3} = \left(\frac{2}{3}\right)^4$

(g) $\frac{32}{243} = \frac{2\times2\times2\times2\times2}{3\times3\times3\times3\times3} = \left(\frac{2}{3}\right)^5$

(h) $\frac{25}{9} = \frac{5\times5}{3\times3} = \left(\frac{5}{3}\right)^2$

**3.** (a) $\left(\frac{6}{15}\right)^{-2}$ Multiplicative inverse is $\left(\frac{15}{6}\right)^2$

(b) $\left(\frac{10}{9}\right)^{13}$ Multiplicative inverse is $\left(\frac{9}{10}\right)^{-13}$

(c) $\left(\frac{19}{5}\right)^{-3}$ Multiplicative inverse is $\left(\frac{5}{19}\right)^3$

(d) $\left(\frac{7}{9}\right)^5$ Multiplicative inverse is $\left(\frac{9}{7}\right)^{-5}$

**4.** (a) $\left(\frac{-2}{3}\right)^4 \times \left(\frac{9}{8}\right)^2 = \frac{-2\times-2\times-2\times-2}{3\times3\times3\times3} \times \frac{9\times9}{8\times8} = \frac{16}{81} \times \frac{81}{64} = \frac{1}{4}$

(b) $(3^{-2} \div 2^{-3}) \times 5^{-3} = \left(\frac{1}{3^2} \div \frac{1}{2^3}\right) \times \frac{1}{5^3} = \left(\frac{1}{9} \div \frac{1}{8}\right) \times \frac{1}{125}$

$$= \left(\frac{1}{9}\times\frac{8}{1}\right)\times\frac{1}{125} = \left(\frac{8}{9}\right)\times\frac{1}{125} = \frac{8}{9}\times\frac{1}{125} = \frac{8}{1125}$$

(c) $\left(\frac{-1}{5}\right)^3 \times (-1)^{17} \times \left(\frac{2}{5}\right)^3 = \frac{-1\times-1\times-1}{5\times5\times5} \times -1 \times \frac{2\times2\times2}{5\times5\times5}$

$$= \frac{-1}{125}\times-1\times\frac{8}{125} = \frac{8}{125\times125} = \frac{8}{15625}$$

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

$$= \left(\frac{1}{8}\right) \div \left(\frac{4\times4}{1\times1}\right) + \left(\frac{-2\times-2\times-2}{1\times1\times1}\right) = \frac{1}{8} \div \frac{16}{1} + (-8) = \frac{1}{8}\times\frac{1}{16} + (-8)$$

$$= \frac{1}{128} - \frac{8}{1} = \frac{1-1024}{128} = -\frac{1023}{128}$$

(e) $\left(\frac{4}{-5}\right)^{-2} \times \frac{16}{25} = \left(\frac{4}{-5}\right)^{-2} \times \frac{16}{25} = \left(\frac{-5}{4}\right)^2 \times \frac{16}{25} = \frac{-5\times-5}{4\times4} \times \frac{16}{25} = \frac{25}{16}\times\frac{16}{25} = 1$

(f) $(3^0+4^{-1})\times 2^2 = \left(1+\frac{1}{4}\right)\times 4 = \left(\frac{4+1}{4}\right)\times 4 = \frac{5}{4}\times\frac{4}{1} = 5$

**5.** $a^2 + b(b+2)^2$ If $a = 3, b = -2$

$= 3^2 + (-2)(-2+2)^2 = 9 - 2(0)^2 = 9 - 2\times 0 = 9 - 0 = 9$

**6.** $(a+b)^2 \div (a-b)^2$ if $a = 3, b = -2$

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

$= 1 \div 25 = 1\times\frac{1}{25} = \frac{1}{25}$

**7.** $a(a+b)^3$ If $a = \frac{-1}{2}, b = \frac{3}{2}$

$$= \frac{-1}{2}\left(\frac{-1}{2}+\frac{3}{2}\right)^3 = \frac{-1}{2}\left(\frac{-1+3}{2}\right)^3 = \frac{-1}{2}\left(\frac{2}{2}\right)^3 = \frac{-1}{2}\left(\frac{2\times2\times2}{2\times2\times2}\right) = \frac{-1}{2}(1) = \frac{-1}{2}$$

## Exercise 2.2

**1.** (a) $(-2)^6$ So, $b = -2, e = 6$ (b) $4^{-6}$ So, $b = 4, e = -6$

(c) $\left(\frac{1}{\sqrt{3}}\right)^0$ So, $b = \frac{1}{\sqrt{3}}, e = 0$ (d) $(0)^4$ so, $b = 0, e = 4$

(e) $\left(\frac{2}{6}\right)^{-6}$ So, $b = \frac{2}{6}, e = -6$ (f) $\left(\frac{\sqrt{4}}{3}\right)^{-8}$ So, $b = \frac{\sqrt{4}}{3}, e = -8$

(g) $(\sqrt{3})^0$ So, $b = \sqrt{3}, e = 0$ (h) $\left(\frac{-8}{9}\right)^{-7}$ So, $b = \left(\frac{-8}{9}\right), e = -7$

**2.** (a) $2\times2\times2\times2=2^4$ (b) $\frac{16}{81}=\frac{4\times4}{9\times9}=\left(\frac{4}{9}\right)^2$

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

(e) $\sqrt{3}\times\sqrt{3}\times\sqrt{3}=(\sqrt{3})^3$ (f) $5^2\times5^2\times5^2=(5^2)^3=5^6$

**3.** (a) $2^{18}\div2^{13}=\frac{2^{18}}{2^{13}}=2^{18-13}=2^5$

(b) $4^{-6}\times4^8\times4^{-1}=4^{-6+8+(-1)}=4^{+2-1}=4^1=4=2\times2=2^2$

(c) $=\left(\frac{1}{\sqrt{2}}\right)^4\times\left(\frac{1}{\sqrt{2}}\right)^{-1}\times\left(\frac{1}{\sqrt{2}}\right)^{-3}=\left(\frac{1}{\sqrt{2}}\right)^{4+(-1)+(-3)}=\left(\frac{1}{\sqrt{2}}\right)^{4-1-3}=\left(\frac{1}{\sqrt{2}}\right)^0$

(d) $(2^8)^{-4}=2^{8\times-4}=2^{-32}$

(e) $(\sqrt{6})^{-5}\times(\sqrt{6})^{-1}\times(\sqrt{6})^{-7}=(\sqrt{6})^{-5+(-1)+(-7)}=(\sqrt{6})^{-5-1-7}=(\sqrt{6})^{-13}$

**4.** (a) $x^5\times x^{-3}\times x^6$ As, $a^m\times a^n=(a^{m+n})$

$=x^{5+(-3)+6}=x^{5-3+6}=x^{2+6}=x^8$

(b) $\frac{100^{-6}}{100^{-5}}=100^{-6-(-5)}$ Using the law of $\frac{a^m}{a^n}=a^{m-n}$

$=100^{-6-(-5)}=100^{-6+5}=100^{-1}=\frac{1}{100}$

(c) $\frac{3^{-5}\times a^{-6}\times b^{-4}}{3^{-6}\times a^{-5}\times b^{-3}}$ As, $\frac{a^m}{a^n}=a^{m-n}$

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

$=3^1\times a^{-1}\times b^{-1}=3a^{-1}b^{-1}$

**5.** (a) $2\times2\times2\ldots10$ times

$=(2^{10})=2\times2\times2\times2\times2\times2\times2\times2\times2\times2=1024$

(b) $\frac{\sqrt{4}}{3}\times\frac{\sqrt{4}}{3}\times\frac{\sqrt{4}}{3}\times\frac{\sqrt{4}}{3}=\left(\frac{\sqrt{4}}{3}\right)^4$

(c) $\left(\frac{-3}{7}\right)^3\times\left(\frac{-3}{7}\right)^{10}\times\left(\frac{-3}{7}\right)^5=\left(\frac{-3}{7}\right)^{3+10+5}=\left(\frac{-3}{7}\right)^{18}$

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

(e) $\frac{25\times a^{-4}}{5^3\times10\times a^{-8}}=\frac{5^2\times a^{-4}}{5^3\times2^1\times5^1\times a^8}=\frac{5^{2-3+1}\times a^{-4-(-8)}}{2^1}$ $\left\{\begin{array}{l}\frac{a^m}{a^n}=a^{m-n}\\ a^m\times a^n=a^{m+n}\end{array}\right\}$

$$= \frac{5^{+2-3-1} \times a^{-4+8}}{2} = \frac{5^{-2} \times a^4}{2} = \frac{a^4}{5^2 \times 2} = \frac{a^4}{25 \times 2} = \frac{a^4}{50}$$

(f) $\dfrac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}} = \dfrac{3^{-5} \times (2 \times 5)^{-5} \times 5^3}{5^{-7} \times 6^{-5}}$ $\left\{\begin{array}{l} a^m \times a^n = a^{m+n} \\ \dfrac{a^m}{a^n} = a^{m-n} \end{array}\right\}$

$$= \frac{3^{-5} \times (2 \times 5)^{-5} \times 5^3}{5^{-7} \times (2 \times 3)^{-5}} = \frac{3^{-5} \times 2^{-5} \times 5^{-5} \times 5^3}{5^{-7} \times 2^{-5} \times 3^{-5}} = \frac{5^{-5} \times 5^3}{5^{-7}}$$

$$= 5^{-5+3-(-7)} = 5^{-5+3+7} = 5^{-5+10} = 5^5 = 5 \times 5 \times 5 \times 5 \times 5 = 3125$$

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

$$= \frac{1}{2^5} = \frac{1}{2 \times 2 \times 2 \times 2 \times 2} = \frac{1}{32}$$

The reciprocal is 32.

(b) $\left(\frac{3}{5}\right)^3 \div \left(\frac{6}{7}\right)^3 = \frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} \times \frac{7}{6} \times \frac{7}{6} \times \frac{7}{6} = \frac{7 \times 7 \times 7}{125 \times 8} = \frac{343}{1000}$

Reciprocal $= \frac{1000}{343}$

**7.** (a) $(2^{-1} \times 7^{-1}) \times \left(\frac{-3}{7}\right)^{-1} = \left(\frac{1}{2} \times \frac{1}{7}\right) \times \left(\frac{7}{-3}\right)^1 = \frac{1}{14} \times \frac{7}{3} = \frac{-1}{6}$

(b) $(7^{-1} + 14^{-1}) \div 14^{-1} = \left(\frac{1}{7} + \frac{1}{14}\right) \div \frac{1}{14} = \left(\frac{2+1}{14}\right) \times \frac{14}{1} = \frac{3}{14} \times \frac{14}{1} = 3$

(c) $(2^7 \div 2^2) \div 2^5$ $\qquad (a^m \div a^n = a^{m-n})$

$= (2^{7-2}) \div 2^5 = 2^5 \div 2^5$ $\qquad (a^\circ = 1)$

$= 2^{5-5} = 2^\circ = 1$

## Exercise 2.3

**1.** (a) $8848 \text{ m} = 8.848 \times 10^3 \text{ m}$

(b) $149600000000 \text{ m} = 1.496 \times 10^{11} \text{ m}$

(c) $0.000007 \text{ mm} = 7.0 \times 10^{-6} \text{ mm}$

(d) $503600 \text{ kg} = 5.036 \times 10^5 \text{ kg}$

(e) $0.0000713 = 7.13 \times 10^{-5}$

(f) $228000000 = 2.28 \times 10^8 \text{ km}$

(g) $100000 = 1.0 \times 10^5$ light years

(h) $153000000000 = 1.53 \times 10^{11}$

(i) $0.000003 \text{mm} = 3.0 \times 10^{-6} \text{ mm}$

(j) $384467000 \text{ m} = 3.84467 \times 10^8 \text{ m}$

**2.** (a) $9.0 \times 10^{-4} = \dfrac{9.0}{100000} = 0.0009$

(b) $5.7 \times 10^{-7} = \dfrac{5.7}{100000000} = 0.00000057$

(c) $7.54 \times 10^{-4} = \dfrac{7.54}{1000000} = 0.000754$

(d) $23.794 \times 10^{5} = 2379400$ (e) $1.0002 \times 10^{8} = 100020000$

(f) $73.173000 \times 10^{-9} = \dfrac{73.173000}{1000000000000000} = \dfrac{73173}{1000000000000}$

$= 0.000000073173$

## Exercise 3.1

**1.** (a) 445

$445 = 5 \times 89$

So, this is not a perfect square.

| | |
|---|---|
| 5 | 445 |
| 89 | 89 |
| | 1 |

(b) 1849

$1849 = 43 \times 43$

$\sqrt{1849} = 43$

So, 1849 is a perfect square.

| | |
|---|---|
| 43 | 1849 |
| 43 | 43 |
| | 1 |

(c) 841

$841 = 29 \times 29$

$\sqrt{841} = 29$

So, 841 is a perfect square.

| | |
|---|---|
| 29 | 841 |
| 29 | 29 |
| | 1 |

(d) 5329

$5329 = 73 \times 73$

$\sqrt{5329} = 73$

So, 5329 is a perfect square.

| | |
|---|---|
| 73 | 5329 |
| 73 | 73 |
| | 1 |

(e) 61009

$61009 = 13 \times 13 \times 19 \times 19$

$\sqrt{61009} = 13 \times 19$

$\sqrt{61009} = 289$

So, 61009 is a perfect square.

| | |
|---|---|
| 13 | 61009 |
| 13 | 4693 |
| 19 | 361 |
| 19 | 19 |
| | 1 |

**2.** (a) 431

Since, 431 ends with an odd number 1 so, it is the square of an add number.

(b) 529

Since 529 ends with an odd number 9 so, it is the square of an odd number.

(c) 49

Since 49 ends with the odd number 9 so, it is the square of an odd number.

(d) 1681

Since 1681 ends with an odd number 1 so, it is the square of an odd number.

**3.** (a) 3, 4, 5; $3^2 = 9$; $4^2 = 16$; $5^2 = 25$ As, $9 + 16 = 25$

$\therefore$ $3^2 + 4^2 = 5^2$

Thus, 3, 4, 5 is a Pythagoras triplet.

(b) 6, 8, 10; $6^2 = 36$; $8^2 = 84$; $10^2 = 100$

As, $36 + 84 = 100$

$\therefore$ $6^2 + 8^2 = 10^2$

Thus, 6, 8, 10 is a Pythagoras triplet.

(c) 8, 9, 10; $8^2 = 64$; $9^2 = 81$; $10^2 = 100$ As, $64 + 81 \neq 100$

$\therefore$ $8^2 + 9^2 \neq 10^2$

Thus, 8, 9, 10 is not a pythagoras triplet.

(d) 20, 21, 29

$20^2 = 400$

$21^2 = 441$

$29^2 = 841$

As, $400 + 441 = 841$

$\therefore$ $20^2 + 21^2 = 29^2$

thus, 20, 21, 29 is a pythagoras tripet

**4.** (a) $49 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

(b) $100 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$

(c) $121 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$

**5.** (a) $1 + 3 + 5 + 7 = 4^2 = 16$

(b) $1 + 3 + 5 + 7 + 9 + 11 = 6^2 = 36$

(c) $1 + 3 + 5 + 7 + 9 + 11 + 13 = 7^2 = 49$

**6.** (a) 17 and 18

There will 2 n numbers in between the square of 17 and 18

Where $n = 17$

$2n = 2 \times 17 = 34$

So, $34n$ numbers will lie between the squares of 17 and 18.

(b) 19 and 20

$2n$ numbers will lie between the square of 19 and 20

So, $n = 19$

and $2n = 2 \times 19 = 38$

So, 38 numbers will lie in between the squares of 19 and 20.

(c) 27 and 28

Here $n = 27$, So $2 \times 27 = 54$

54 numbers will lie between the square roots of 27 and 28.

(d) 30 and 31

Here, $n = 30$,

So $2n = 2 \times 30 = 60$

64 numbers will lie between the square roots of 30 and 31

(e) 44 and 45

Here $n$, $= 44$, So, $2n = 2 \times 44 = 88$

So, 88 numbers will lie between the square roots of 44 and 45

(f) 99 and 100

Here $n = 99$, So, $2n = 2 \times 99 = 198$

So, 198 numbers will lie between the square roots of 99 and 100

**7.** $11^2 = 121$; $101^2 = 10201$; $1001^2 = 1002001$; $100001^2 = 10000200001$

**8.** (a) $12^2 + 13^2 + 156^2 = 157^2$ (b) $10^2 + 11^2 + 110^2 = 111^2$

(c) $8^2 + 7^2 + 72^2 = 73^2$

**9.** (a) 35; $a = 3, b = 5$

| Column I | Column II | Column III |
|---|---|---|
| $a^2$ | $2ab$ | $b^2$ |
| $(3)^2$ | $2 \times 3 \times 5$ | $(5)^2$ |
| 9 | 30 | ②5 |
| | +② | |
| | 32 | |
| +3 | | |
| 12 | 2 | 5 |

Thus, the square of 35 is 1225.

(b) 45

$a = 4, b = 5$

| Column I | Column II | Column III |
|---|---|---|
| $a^2$ | $2ab$ | $b^2$ |
| $(4)^2$ | $2 \times 4 \times 5$ | $(5)^2$ |
| 16 | 40 | ②5 |
| | +② | |
| | 42 | |
| +4 | | |
| 20 | 2 | 5 |

So, the square of 45 = 2025

(c) 75, $a = 7, b = 5$

| Column I | Column II | Column III |
|---|---|---|
| $a^2$ | $2ab$ | $b^2$ |
| $(7)^2$ | $2 \times 7 \times 5$ | $(5)^2$ |
| 49 | 70 | ②5 |
| | +② | |
| | 72 | |
| +7 | | |
| 56 | 2 | 5 |
| | | 5 |

So, the square of 75 = 5625

(d) 90, $a = 9, b = 0$

| Column I | Column II | Column III |
|---|---|---|
| $a^2$ | $2ab$ | $b^2$ |
| $(9)^2$ | $2 \times 9 \times 0$ | $(0)^2$ |
| 81 | 0 | ⓪0 |
| | +⓪0 | |
| +0 | | |
| 81 | 0 | 0 |

So, the square of 90 = 8100

**10.** (a) 89

| | 8 | 9 |
|---|---|---|
| 8 | 6 / 4 | 7 / 2 |
| 9 | 7 / 2 | 8 / 1 |

| 89 | 7921 |
|---|---|
| 89 | 89 |
| | 1 |

Square of 89 = 7921

Verify through Prime factorization

LCM of 7921 = 89 × 89 = 7921

∴ 89 is the perfect square

(b) 109

| | 1 | 0 | 9 |
|---|---|---|---|
| 1 | 0 / 1 | 0 / 0 | 0 / 9 |
| 0 | 0 / 0 | 0 / 0 | 0 / 0 |
| 9 | 0 / 9 | 0 / 0 | 8 / 1 |

Square of 109 = 11881

Verify by using Prime factorization method.

LCM of 11881 = 109 × 109

| 109 | 11881 |
|---|---|
| 109 | 109 |
| | 1 |

∴ 109 is a perfect square.

(c) 293

| | 2 | 9 | 3 |
|---|---|---|---|
| 2 | 0 / 4 | 1 / 8 | 0 / 6 |
| 9 | 1 / 8 | 8 / 1 | 2 / 7 |
| 3 | 0 / 6 | 2 / 7 | 0 / 9 |

Square of 293 = 85849

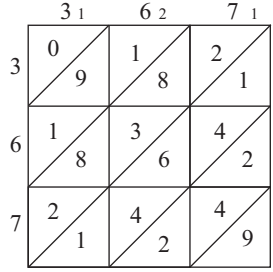
verify by using prime factorization method.

| 293 | 85849 |
|---|---|
| 293 | 293 |
| | 1 |

LCM of 85849 = 293 × 293

∴ 293 is a perfect square.

(d) 367




Square of 367 = 134689

Verify by using the prime factorization method.

LCM of 134689 = 367 × 367

| 367 | 134689 |
|---|---|
| 367 | 367 |
| | 1 |

∴ 367 is the perfect square.

## Exercise 3.2

**1.** (a) 8, 15 and 20

LCM of 8, 15 and 20

LCM = $2\times2\times2\times3\times5 = 120$

Since 2, 3 and 5 are not in pair. So, we will multiply 120 by 2, 3 and 5

$120\times2\times3\times5 = 3600$

So, 3600 is the smallest number divisible by 8, 15 and 20

| 2 | 8, 15, 20 |
|---|---|
| 2 | 4, 15, 10 |
| 2 | 2, 15, 5 |
| 3 | 1, 15, 5 |
| 5 | 1, 5, 5 |
| | 1, 1, 1 |

**2.** (a) $729 = 3\times3\times3\times3\times3\times3$

$\sqrt{729} = 3\times3\times3$

$\sqrt{729} = 3^3$

$\sqrt{729} = 27$

| 3 | 729 |
|---|---|
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(b) 1764

$1764 = 2\times2\times3\times3\times7\times7$

$\sqrt{1764} = 2\times3\times7$

$\sqrt{1764} = 42$

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

(c) 4096

$4096 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$

$4096 = 2\times2\times2\times2\times2\times2$

$\sqrt{4096} = 2^6$

$\sqrt{4096} = 64$

| 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 |

(d) 7744

$7744 = 2\times2\times2\times2\times2\times2\times11\times11$

$\sqrt{7744} = 2\times2\times2\times11$

$\sqrt{7744} = 88$

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

(e) 8100

$8100 = 2\times2\times3\times3\times3\times3\times5\times5$

$\sqrt{8100} = 2\times3\times3\times5$

$\sqrt{8100} = 90$

| | |
|---|---|
| 2 | 8100 |
| 2 | 4050 |
| 3 | 2025 |
| 3 | 675 |
| 3 | 225 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

**3.** Prime factorization of 768

(i) 768

$768 = 2\times2\times2\times2\times2\times2\times2\times2\times3$

Since, 3 is left unpaired, so the given number 768 should be multiplied with 3 to make it a perfect square.

$= 768\times3 = 2304 = 2304$

| | |
|---|---|
| 2 | 768 |
| 2 | 384 |
| 2 | 192 |
| 2 | 96 |
| 2 | 48 |
| 2 | 24 |
| 2 | 12 |
| 2 | 6 |
| 3 | 3 |
| | 1 |

Prime factorization of 2304

$2304 = 2\times2\times2\times2\times2\times2\times2\times2\times3\times3$

$\sqrt{2304} = 2\times2\times2\times2\times3$

$\sqrt{2304} = 48$

So, the square root of 2304 = 48.

| | |
|---|---|
| 2 | 2304 |
| 2 | 1152 |
| 2 | 576 |
| 2 | 288 |
| 2 | 144 |
| 2 | 72 |
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(i) 1008

Prime factorization of 1008

$1008 = 2\times2\times2\times2\times3\times3\times7$

Since, 7 is not in pair, so we will multiply 1008 by 7.

So, 7 is the smallest number by which 1008 must be multiplied.

$1008\times7 = 7056$

| | |
|---|---|
| 2 | 1008 |
| 2 | 504 |
| 2 | 252 |
| 2 | 126 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

Prime factorization of 7056

$7056 = 2\times2\times2\times2\times3\times3\times7\times7$

$\sqrt{7056} = 2\times2\times3\times7$

$\sqrt{7056} = 84$

| | |
|---|---|
| 2 | 7056 |
| 2 | 3528 |
| 2 | 1764 |
| 2 | 882 |
| 3 | 441 |
| 3 | 147 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

**4.** (i) 396

$396 = 2\times2\times3\times3\times11$

Since, 11 is not pair, So, we will divide 396 by 11.

$396 \div 11$

So, we have to find the square root of 36.

$36 = 2\times2\times3\times3$

$\sqrt{36} = 2\times3$

$\sqrt{36} = 6$

So, 6 is the square root of 36.

| | |
|---|---|
| 2 | 36 |
| 2 | 18 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$$\begin{array}{r|l} 11 & 396 \\ & 33 \\ \hline & 66 \\ & -66 \\ \hline & 00 \end{array}$$

| | |
|---|---|
| 2 | 396 |
| 2 | 198 |
| 3 | 99 |
| 3 | 33 |
| 11 | 11 |
| | 1 |

(ii) 1620

$1620 = 2\times2\times3\times3\times3\times3\times5$

Since 5, is not in pair so we will divide 1620 by 5

Prime factorization of 324 is

$324 = 2\times2\times3\times3\times3\times3$

$\sqrt{324} = 2\times3\times3$

$\sqrt{324} = 18$

So, 18 is the square root of 324.

$$\begin{array}{r|l} 5 & 1620 \\ & 15 \\ \hline & 12 \\ & 10 \\ \hline & 20 \\ & -20 \\ \hline & 00 \end{array}$$

| | |
|---|---|
| 2 | 1620 |
| 2 | 810 |
| 3 | 405 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

| | |
|---|---|
| 2 | 324 |
| 2 | 162 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

**5.** (i) 100

Square root of 100

$100 - 1 = 99$ ; $99 - 3 = 96$

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

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

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

$36 - 17 = 19$; $19 - 19 = 0$

Since, there are 10 steps of repeated subtraction.

So, $\sqrt{100} = 10$

(ii) 144 square root of 144

$144 - 1 = 143$ $143 - 3 = 140$

$140 - 5 = 135$ $135 - 7 = 128$

$128 - 9 = 119$ $119 - 11 = 108$

$108 - 13 = 95$ $95 - 15 = 80$

$80 - 17 = 63$ $63 - 19 = 44$

$44 - 21 = 23$ $23 - 23 = 0$

Since, there are 12 steps of repeated subtraction.

So, $\sqrt{144} = 12$

**6.** (a) 53361; $\sqrt{53361} = 231$

```
   231
2 | 5 33 61
  | –4
43| 133
  | –129
461| 461
   | –461
   | 0
```

(b) 43264; $\sqrt{43264} = 208$

```
   208
2 | 4 32 64
  | –4
40| 032
  | –00
408| 3264
   | –3264
   | 0
```

(c) 4489; $\sqrt{4489} = 67$

```
   67
6 | 44 89
  | –36
127| 889
   | –889
   | 0
```

(d) 4036081; $\sqrt{4036081} = 2009$

```
   2009
2 | 40 36 08 1
  | –4
40| 003
  | –0
400| 360
   | – 0
4009| 36081
   | –36081
   | 0
```

(e) 54007801; $\sqrt{54007801} = 7349$

```
   7349
7 | 54 00 78 01
  | –49
143| 500
   | –429
1464| 7178
   | – 5856
14689| 132201
   | –132201
   | 00
```

**7.** (a) $\frac{16}{49}$ On doing the prime factorisation of 16 and 49 we get.

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

$\sqrt{16} = 2 \times 2$; $\sqrt{16} = 4$; $49 = 7 \times 7$

$\sqrt{49} = 7$

$\sqrt{\frac{16}{49}} = \frac{4}{7}$

| 7 | 49 |
|---|---|
| 7 | 7 |
| | 1 |

| 2 | 16 |
|---|---|
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(b) $\frac{81}{169}$ on doing the prime factorisation of 81 and 169 we get

$81 = 3\times3\times3\times3$

$\sqrt{81} = 3\times3$

$\sqrt{81} = 9$

$169 = 13\times13$

$\sqrt{169} = 13$

So, $\sqrt{\frac{81}{169}} = \frac{9}{13}$

| 3 | 81 |
|---|---|
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| 13 | 169 |
|---|---|
| 13 | 13 |
| | 1 |

(c) $5\frac{1}{16} = \frac{81}{16}$ On doing the prime factorisation of 81 and 16 we get

$81 = 3\times3\times3\times3$

$\sqrt{81} = 3\times3$

$\sqrt{81} = 9$

$16 = 2\times2\times2\times2$

$\sqrt{16} = 2\times2$

$\sqrt{16} = 4$ So $\frac{\sqrt{81}}{16} = \frac{9}{4}$

| 3 | 81 |
|---|---|
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

| 2 | 16 |
|---|---|
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

(d) $1\frac{87}{169} = \frac{256}{169}$ On doing the prime factorisation of 256 and 169, we get

$256 = 2\times2\times2\times2\times2\times2\times2\times2$

$\sqrt{256} = 2\times2\times2\times2$

$\sqrt{256} = 16$

$169 = 13\times13$

$\sqrt{169} = 13$

So, $\sqrt{\frac{256}{169}} = \frac{16}{13}$

| 2 | 256 |
|---|---|
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

| 13 | 169 |
|---|---|
| 13 | 13 |
| | 1 |

**8.** (a) 7.29; $\sqrt{7.29} = 2.7$

| | 27 |
|---|---|
| 2 | 7.29 |
| | –4 |
| 47 | 329 |
| | –329 |
| | 00 |

(b) 31.36; $\sqrt{31.36} = 5.6$

| | 56 |
|---|---|
| 5 | 31.36 |
| | –25 |
| 106 | 636 |
| | –636 |
| | 00 |

(c) 146.8944; $\sqrt{146.8944} = 12.12$ (d) 964.288809

```
      12.12
   1 | 146.8944
     | -1
  22 |  046
     |- 44
 241 |   289
     |-  241
2422 |   4844
     |  -4844
     |------
     |    00
```

```
      31053
   3 | 964.288809
     | -9
  61 |  064
     |- 61
 620 |   328
     |-  000
6205 |  32888
     | -31025
62103|  186309
     | -186309
     |--------
     |     00
```

$\sqrt{964.288809} = 31.053$

**9.** Area of square = 2601 $m^2$

Let the side of square = $x$

$\sqrt{2610} = 51$

So, the side of square = 51 m.

```
     51
  5 | 2601
    | -25
101 |  101
    | -101
    |-----
    |   00
```

**10.** Since $(80)^2 < 6412 < (81)^2$

So, $6400 < 6412 < 6561$

$6561 - 6412 = 149$

149 must be added to 6412 to get a perfect square

```
     80
  8 | 6412
    | -64
160 |  012
    | -0000
    |------
    |   12
```

```
     81
  8 | 6561
    | -64
161 |  161
    | -161
    |-----
    |   00
```

$\sqrt{6561} = 81$

So, 81 is the square root of 6561.

**11.** 53 must be subtracted from 1989 to get a perfect square.

$1989 - 53 = 1936$

$\sqrt{1936} = 44$

So, 44 is the square root of 1936.

```
     44
  4 | 1989
    | -16
 84 |  389
    | -336
    |-----
    |   53
```

```
     44
  4 | 1936
    | -16
 84 |  336
    | -336
    |-----
    |   00
```

**12.** (a) 19

$$\begin{array}{r|l} & 4.3 \\ \hline 4 & \overline{19}.\overline{00}\overline{00}\overline{00} \\ & -16 \\ \hline 83 & 300 \\ & -\ 249 \\ \hline 865 & 5100 \\ & -\ 4325 \\ \hline 8707 & 67500 \\ & -\ 60949 \\ \hline & 6551 \end{array}$$

$\sqrt{19.000000} = 4.357 = 4.36$ (approx)

(b) 53; $\sqrt{\overline{53}.\overline{00}\overline{00}\overline{00}} = 7.28$

$$\begin{array}{r|l} & 7.28 \\ \hline 7 & 53.0000 \\ & -49 \\ \hline 142 & 4.00 \\ & -\ 284 \\ \hline 1448 & 11600 \\ & -\ 11584 \\ \hline & 16 \end{array}$$

(c) 68

$$\begin{array}{r|l} & 8.246 \\ \hline 8 & \overline{68}.\overline{00}\overline{00}\overline{00} \\ & -64 \\ \hline 162 & 400 \\ & -\ 324 \\ \hline 1644 & 7600 \\ & -\ 6576 \\ \hline 16486 & 102400 \\ & -\ 98916 \\ \hline & 3484 \end{array}$$

$\sqrt{68.000000} = 8.246$

(d) 88

$\sqrt{88.0000} = 9.38$

$$\begin{array}{r|l} & 9.38 \\ \hline 9 & \overline{88}.\overline{00}\overline{00} \\ & -81 \\ \hline 183 & 700 \\ & -\ 549 \\ \hline 1868 & 15100 \\ & -\ 14944 \\ \hline & 156 \end{array}$$

## Exercise 4.1

**1.** (a) 34896

Since it ends with 6, so the unit digit for the cube of 34896 will be 6.

as $6 \times 6 \times 6 = 21\underline{6}$

(b) 6825

Since it ends with 5, so the unit digit for the cube of 6825 will be 5.

as $5 \times 5 \times 5 = 12\underline{5}$

(c) 40091

Since, it ends with 1, so the unit digit for the cube of 40091.

Will be 1 as $1 \times 1 \times 1 = \underline{1}$

(d) 999999

Sincce, it ends with 9, so the unit digit for the cube of 999999 is 9 as $9 \times 9 \times 9 = 72\underline{9}$

(e) 4393

Since, it ends with 3 so the unit digit for the cube of 4393 is 7, as

$3 \times 3 \times 3 = 27$

(f) 254

Since, it ends with 4 so the units digit for the cube of 254 is 4,as $4 \times 4 \times 4 = 6\underline{4}$

(g) 64828

Since it ends with 8, so the unit digit for the cube of 64828 is 2, as $8 \times 8 \times 8 = 51\underline{2}$

(h) 52000

Since, it ends with 0, so the unit digit for the cube of 52000 is 0, as $0 \times 0 \times 0 = 0$

**2.** (a) 675

$675 = 3 \times 3 \times 3 \times 5 \times 5$

Since 5 is not in the triplet, so it is not a perfect cube.

| | |
|---|---|
| 3 | 675 |
| 3 | 225 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(b) 1728

$1728 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3$

$1728 = 2 \times 2 \times 3$

$\sqrt[3]{1728} = 12$

So, 1728 is a perfect square.

| | |
|---|---|
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(c) 157464

$157464 = 2\times2\times2\times3\times3\times3\times3\times3\times3\times3\times3\times3$

$157464 = 2\times3\times3\times3$

$\sqrt[3]{157464} = 54$

Yes, 157464 is a perfect cube.

| 2 | 157464 |
|---|---|
| 2 | 78732 |
| 2 | 39366 |
| 3 | 19683 |
| 3 | 6561 |
| 3 | 2187 |
| 3 | 729 |
| 3 | 243 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(d) 999

$999 = 3\times3\times3\times37$

Hence, 37 does not form a triplet, so 999 is not a perfect cube.

| 3 | 999 |
|---|---|
| 3 | 333 |
| 3 | 111 |
| 37 | 37 |
| | 1 |

(e) 4096

$4096 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$

$\sqrt[3]{4096} = 2\times2\times2\times2$

$\sqrt[3]{4096} = 16$

So, 4096 is a perfect cube.

| 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 |

(f) 6859

$6859 = 19\times19\times19$

$\sqrt[3]{6859} = 19$

Yes, 6859 is a perfect cube.

| 19 | 6859 |
|---|---|
| 19 | 361 |
| 19 | 19 |
| | 1 |

(g) 526

$526 = 2\times263$

No, 526 is not a perfect cube.

| 2 | 526 |
|---|---|
| 263 | 263 |
| | 1 |

(h) 2197

$2197 = 13\times13\times13$

$\sqrt[3]{2197} = 13$

Yes, 2197 is a perfect cube.

| 13 | 2197 |
|---|---|
| 13 | 169 |
| 13 | 13 |
| | 1 |

**3.** (a) 2700

$2700 = 2\times2\times3\times3\times3\times5\times5$

2 and 5 do not form a triplet,

So, we will multiply 2700 by 10

$\therefore$ 10 is the smallest number.

| 2 | 2700 |
|---|---|
| 2 | 1350 |
| 3 | 675 |
| 3 | 225 |
| 3 | 75 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(b) 1064800

$1064800 = 2\times2\times2\times2\times2\times5\times5\times11\times11\times11$

Since, 2 and 5 do not form a triplet so the smallest number is $2\times5=10$ by which 10648000 must be multiplied.

| | |
|---|---|
| 2 | 1064800 |
| 2 | 532400 |
| 2 | 266200 |
| 2 | 133100 |
| 2 | 66550 |
| 5 | 33275 |
| 5 | 6655 |
| 11 | 1331 |
| 11 | 121 |
| 11 | 11 |
| | 1 |

(c) 392

$392 = 2\times2\times2\times7\times7$

Since 7 is not in a triplet, so the smallest number is 7 by which 392 must be multiplied.

| | |
|---|---|
| 2 | 392 |
| 2 | 196 |
| 2 | 98 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

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

p and $r$ do not form a triplet, so we will multiply $p^2q^3r$ by $pr^2$.

(e) 2560

$2560 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times5$

5 is not in triplet, so the smallest number is 25 by which 2560 must be multiplied.

| | |
|---|---|
| 2 | 2560 |
| 2 | 1280 |
| 2 | 640 |
| 2 | 320 |
| 2 | 160 |
| 2 | 80 |
| 2 | 40 |
| 2 | 20 |
| 2 | 10 |
| 5 | 5 |
| | 1 |

(f) 219700

| | |
|---|---|
| 2 | 219700 |
| 2 | 109850 |
| 5 | 54925 |
| 5 | 10985 |
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$219700 = 2\times2\times5\times5\times13\times13\times13$

Since 2 and 5 do not form a triplet so, $2\times5=10$

10 is the smallest number by which 219700 must be multipled.

(g) 5184

$5184 = 2\times2\times2\times2\times2\times2\times3\times3\times3\times3$

Since 3 does not form a triplet

so, $3\times3=9$. 9 is the smallest number by which 5184 must be multipled.

| | |
|---|---|
| 2 | 5184 |
| 2 | 2592 |
| 2 | 1296 |
| 2 | 648 |
| 2 | 324 |
| 2 | 162 |
| 3 | 81 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(h) $27a^3b = 3\times3\times3\times a\times a\times a\times b$

$b$ does not form a triplet, so we will multiply $27a^3b$ by $b^2$

**4.** (a) 256

| | |
|---|---|
| 2 | 256 |
| 2 | 128 |
| 2 | 64 |
| 2 | 32 |
| 2 | 16 |
| 2 | 8 |
| 2 | 4 |
| 2 | 2 |
| | 1 |

$256 = 2\times2\times2\times2\times2\times2\times2\times2$

$2\times2 = 4$

256 should be divided by 4,

so that the quotient should be a perfect cube.

(b) 8640

| | |
|---|---|
| 2 | 8640 |
| 2 | 4320 |
| 2 | 2160 |
| 2 | 1080 |
| 2 | 540 |
| 2 | 270 |
| 3 | 135 |
| 3 | 45 |
| 3 | 15 |
| 5 | 5 |
| | 1 |

$8640 = 2\times2\times2\times2\times2\times2\times3\times3\times3\times5$

5 does not form a triplet, so 8640 must be divided by 5, that the quotient becomes a perfect cube.

(c) 686

| | |
|---|---|
| 2 | 686 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

$686 = 2\times7\times7\times7$

2 does not form triplet so 686 must be divided by 2, so that the quotient becomes a perfect cube.

(d) $9\times3 = 27 = 3\times3\times3 = 3$ form a triplet

(e) $a^3b^2 = a\times a\times a\times b\times b$

$b$ does not form a triplet, So $a^3b^2$ must be divided with $b^2$ to make the quotient a perfect cube.

(f) 8788

| | |
|---|---|
| 2 | 8788 |
| 2 | 4394 |
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

$8788 = 2\times2\times13\times13\times13$

2 does not form a triplet so 8788 must be divided with 4, So that the quotient becomes a perfecct cube.

(g) $64ab = 2\times2\times2\times2\times2\times2\times a\times b$

ab do not form a triplet, So 64ab must be divided with ab, so that the quotient becomes a perfect cube.

(h) 1701

$1701 = 3\times3\times3\times3\times3\times7$

Since 7 do not form a triplet,

So 1701 must be divided with $7\times3\times3 = 63$

So that the quotient becomes a perfect cube.

| | |
|---|---|
| 3 | 1701 |
| 3 | 567 |
| 3 | 189 |
| 3 | 63 |
| 3 | 21 |
| 7 | 7 |
| | 1 |

**5.** Length of the edge of the cube = 15 cm

Volume of the cube = $(\text{edge})^3 = 15\times15\times15 = 3375\,\text{cm}^3$

**6.** (a) 5, Cube $= 5\times5\times5 = 125$

(b) 1.1, cube $= 1\cdot1\times1\cdot1\times1\cdot1 = 1\cdot331$

(c) 0, cube $= 0\times0\times0 = 0$

(d) 100, cube $= 100\times100\times100 = 1000000$

(e) 6, cube $= 6\times6\times6 = 216$

(f) 101, cube $= 101\times101\times101 = 1030301$

(g) 20, cube $= 20\times20\times20 = 8000$

(h) 3.1, cube $= 3\cdot1\times3\cdot1\times3\cdot1 = 29\cdot791$

**7.** $1^3 + 2^3 + 3^3 + 4^3 = (1 + 2 + 3 + 4)^2$

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 = (1 + 2 + 3 + 4 + 5 + 6)^2$

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3 + 8^3 + 9^3 = (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9)^2$

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 + 6^3 + 7^3 + 8^3 + 9^3 + 10^3$

$= (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10)^2$

## Exercise 4.2

**1.** (a) 32768

$32768 = 2\times2\times2\times2\times2\times2\times2$

$\times2\times2\times2\times2\times2\times2\times2$

$\sqrt[3]{32768} = 2\times2\times2\times2\times2$

$\sqrt[3]{32768} = 32$

32 is the cube root of 32768

| | |
|---|---|
| 2 | 32768 |
| 2 | 16384 |
| 2 | 8192 |
| 2 | 4096 |
| 2 | 2048 |
| 2 | 1024 |
| 2 | 512 |
| 2 | 256 |

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

(b) 2197

$2197 = 13\times13\times13$

$\sqrt[3]{2197} = 13$

13 is the cube root of 2197

| | |
|---|---|
| 13 | 2197 |
| 13 | 169 |
| 13 | 13 |
| | 1 |

(c) 64000

$64000 = 2\times2\times2\times2\times2\times2\times2\times2\times5\times5\times5$

$\sqrt[3]{64000} = 2\times2\times2\times5$

$\sqrt[3]{64000} = 40$

40 is the cube root of 64000.

| | |
|---|---|
| 2 | 64000 |
| 2 | 32000 |
| 2 | 16000 |
| 2 | 8000 |
| 2 | 4000 |
| 2 | 2000 |
| 2 | 1000 |
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(d) 1000

$1000 = 2\times2\times2\times5\times5\times5$

$\sqrt[3]{1000} = 2\times5$

$\sqrt[3]{1000} = 10$

10, is the cube root of 1000.

| | |
|---|---|
| 2 | 1000 |
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(e) 512

$512 = 2\times2\times2\times2\times2\times2\times2\times2\times2$

$\sqrt[3]{512} = 2\times2\times2$

$\sqrt[3]{512} = 8$

8 is the cube root of 512

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

(f) 1728

$1728 = 2\times2\times2\times2\times2\times2\times3\times3\times3$

$\sqrt[3]{1728} = 2\times2\times3$

$\sqrt[3]{1728} = 12$

12, is the cube root of 1728.

| | |
|---|---|
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

(g) 9261

$9261 = 3\times3\times3\times7\times7\times7$

$\sqrt[3]{9261} = 3\times7$

$\sqrt[3]{9261} = 21$

21, is the cube root of 9261.

| | |
|---|---|
| 3 | 9261 |
| 3 | 3087 |
| 3 | 1029 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(h) 42875

$42875 = 5\times5\times5\times7\times7\times7$

$\sqrt[3]{42875} = 5\times7$

$\sqrt[3]{42875} = 35$

35, is the cube root of 42875.

| | |
|---|---|
| 5 | 42875 |
| 5 | 8575 |
| 5 | 1715 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

(i) $8000 = 2\times2\times2\times2\times2\times2\times5\times5\times5$

$\sqrt[3]{8000} = 2\times2\times5$

$\sqrt[3]{8000} = 20$

20 is the cube root of 8000.

| | |
|---|---|
| 2 | 8000 |
| 2 | 4000 |
| 2 | 2000 |
| 2 | 1000 |
| 2 | 500 |
| 2 | 250 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

(k) 13824

| | |
|---|---|
| 2 | 13824 |
| 2 | 6912 |
| 2 | 3456 |
| 2 | 1728 |
| 2 | 864 |
| 2 | 432 |
| 2 | 216 |
| 2 | 108 |
| 2 | 54 |
| 3 | 27 |
| 3 | 9 |
| 3 | 3 |
| | 1 |

$13824 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times3\times3\times3$

$\sqrt[3]{13824} = 2\times2\times2\times3$

$\sqrt[3]{13824} = 24$

24, is the cube root of 13824.

(l) 27000

$27000 = 2\times2\times2\times3\times3\times3\times5\times5\times5$

$\sqrt[3]{27000} = 2\times3\times5$

$\sqrt[3]{27000} = 30$

30, is the cube root of 27000.

| | |
|---|---|
| 2 | 27000 |
| 2 | 13500 |
| 2 | 6750 |
| 3 | 3375 |
| 3 | 1125 |
| 3 | 375 |
| 5 | 125 |
| 5 | 25 |
| 5 | 5 |
| | 1 |

**2.** (a) There are 2 digits in the cube root of $\overline{91125}$

(b) There are 3 digits in the cube root of $\overline{210}\,\overline{644}\,\overline{875}$

(c) There are 3 digits in the cube root of $\overline{247}\,\overline{673}\,\overline{152}$

(d) There are 2 digits in the cube root of $\overline{1331}$

(e) There is only 1 digit in the cube root of $\overline{343}$.

(f) There are 3 digits in the cube root of $\overline{57066625}$.

**3.** (a) 175616

The first group is 616, Since the unit digit of the first group is 6 and the unit digit of the cube root is 6.

The second group is 175

175 lies between 125 and 216.

$5^3 < 115 < 63$

$\therefore$ The tens digit is the cube root of 5, thus

$\sqrt[3]{175616} = 56$

(b) 110592

The unit digit of 592 is 2, So the unit digit of required cube root is 8.

Now $4^3 < 110 < 5^3$; $64 < 110 < 125$

The smallest number is 4, So $\sqrt[3]{110592} = 48$.

(c) 3723875

The unit digit of 875 is 5, so the unit digit of required cube root = 5

Now, $3375 < 3723 < 4096$; $15^3 < 3723 < 16^3$

The smallest number is 4 so $\sqrt[3]{3723875} = 155$

(d) 250047

The first group is 047 and the unit digit of the cube of 7 is 3.

The second group is 250

$6^3 < 250 < 7^3$; $216 < 250 < 343$

So, the smallest number is 6.

$\sqrt[3]{250047} = 63$

(e) 74088

The first group is 088 and the unit digit for the cube of 8 is 2

The second group is 74

$4^3 < 74 < 5^3$; $64 < 74 < 125$ So, the smallest no is 4.

$\sqrt[3]{74088} = 42$

(f) 636056

The first group is 056 and the unit digit of the cube of 6 is 6.

The second group is 636.

$8^3 < 636 < 9^3$; $512 < 636 < 729$

So, the smallest number is 86

$\therefore$ $\sqrt[3]{636056} = 86$

(g) 1953125

The first group is 125 and the unit digit of the cube of 5 is 5.

The second group is 1953

$12^3 < 1953 < 13^3$; $1728 < 1953 < 2744$

So, the smallest number is 12; $\sqrt[3]{1953125} = 125$

(h) 59319

The first group is 319 and the unit digit of the cube of 9 is 9.

The second group is 59.

$3^3 < 59 < 4^3$; $27 < 59 < 64$ So, the smallest number is 3.

$\sqrt[3]{59319} = 39$

(i) 2197

The first group is 197 and the unit digit of the cube of 7 is 3.`

So, the second group is 2.

$1^3 < 2 < 2^3$; $1 < 2 < 8$

So, the smallest number is 13 $\sqrt[3]{2197} = 13$

**4.** Volume of the cube = 2744 $m^3$

Side = $\sqrt[3]{\text{Volume of cube}} = \sqrt[3]{2744}$

$2744 = 2\times2\times2\times7\times7\times7$; $\sqrt[3]{2744} = 2\times7$

$\sqrt[3]{2744} = 14$

Side = $\sqrt[3]{2744}$ $\therefore$ Side = 14

| | |
|---|---|
| 2 | 2744 |
| 2 | 1372 |
| 2 | 686 |
| 7 | 343 |
| 7 | 49 |
| 7 | 7 |
| | 1 |

**5.** (a) $64a^3b^6$; $\sqrt[3]{64a^3b^6} = 4ab^2$ (b) $8p^9 = \sqrt[3]{8p^9} = 2p^3$

(c) $x^3y^32^3 = \sqrt[3]{x^3y^3z^3} = xyz$

## Exercise 4.3

**1.** (a) 18; $\sqrt[3]{18} = 2.621$

(b) $270 = 27\times10 = \sqrt[3]{27\times10} = 6.463$.

(c) $\frac{27}{729} = \sqrt[3]{\frac{27}{729}} = \frac{\sqrt[3]{27}}{\sqrt[3]{729}} = \frac{3}{9} = \frac{1}{3} = .33$ (approx)

(d) $\frac{54}{343} = \sqrt[3]{\frac{54}{343}} = \frac{\sqrt[3]{54}}{\sqrt[3]{343}} = \frac{\sqrt[3]{54}}{7} = \frac{3.78}{7} = 0.54$

(e) 73.8; $\sqrt[3]{73.8} = 4.1946$

(f) 34.2; $\sqrt[3]{34.2} = 3.2459$

**2.** (a) $\sqrt[3]{7532} = 19.6021$ (b) $\sqrt[3]{700} = \sqrt[3]{7\times100} = 58.879$

(c) $\sqrt[3]{\frac{64}{135}} = \frac{\sqrt[3]{64}}{\sqrt[3]{135}} = 0.7797$ (d) $\sqrt[3]{883} = 9.4091$

(e) $\sqrt[3]{70} = 4.1212$

(f) $\sqrt[3]{\frac{32}{216}} = \frac{\sqrt[3]{32}}{6} = \frac{3.1748}{6} = 0.5291$

(g) $\sqrt[3]{792} = 9.2521$ (h) $\sqrt[3]{\frac{85}{343}} = \frac{\sqrt[3]{85}}{\sqrt[3]{343}} = \frac{\sqrt[3]{85}}{7} = 0.6281$

**3.** (a) $\sqrt[3]{23\times343} = \sqrt[3]{23}\times\sqrt[3]{343} = \sqrt[3]{23\times7} = 2.843\times7 = 19.9070$

(b) $\sqrt[3]{3094\times100} = \sqrt[3]{3094.00} = 67.6353$

(c) $\sqrt[3]{3700\times729} = \sqrt[3]{3700}\times\sqrt[3]{729}$

$= \sqrt[3]{3700}\times9 = 15.4607\times9 = 139.201$

(d) $\sqrt[3]{50\times540} = \sqrt[3]{27000} = 30$ (e) $\sqrt[3]{24\times576} = \sqrt[3]{13824} = 24$

(f) $\sqrt[3]{148\times200} = \sqrt[3]{29600} = 30.9336$

**4.** Volume of cubical box = 61 $cm^3$

Length of each side = $\sqrt[3]{61}$

Length of each side = 3.94 cm

**5.** Volume of cube = 252 $cm^2$

Length of each side = $\sqrt[3]{252} = 6.32$ cm

## Exercise 5.1

**1.** (a) $6.0005\times10^8 = 600050000$ (b) $9.3\times10^5 = 930000$

(c) $1.03\times10^8 = 103000000$ (d) $4.2\times10^{-13} = 0.00000000000042$

(e) $3.6\times10^{-11} = 0.000000000036$

(f) $2.07\times10^{17} = 207000000000000$

**2.** The distance travelled by ray of light in one year is 94605000000000

$= 9.465\times10^3$ meter

**3.** (a) $2400 = 2.4\times10^3$ (b) $390000 = 3.9\times10^5$

(c) $0.7 = 7\times10^1$ (d) $0.0074 = 7.4\times10^{-3}$

(e) $0.00000030 = 3\times10^{-7}$

## Exercise 5.2

**1.** Let the digit at ones place be $x$

and at the tens place be $y$

So, according to question

$10y + x - (10x + y) = 63;\ 10y + x - 10x - y = 63$

$10y - y + x - 10x = 63;\ 9y - 9x = 63$

$9(y - x) = 63;\ y - x = \frac{63}{9};\ y - x = 7$

So, the difference is 7.

**2.** Let the number at unit place be $y$

and at ten's place be $x$

So, according to question.

$y - x = 1$ ...(1)

$10x + y = \frac{5}{6}(10y + x)$; $6(10x + y) = 5(10y + x)$

$60x + 6y = 50y + 5x$; $60x - 5x + 6y - 50y = 0$; $55x - 44y = 0$

$11(5x - 4y) = 0$; $5x - 4y = \frac{0}{11}$; $5x - 4y = 0$

$5x = 4y$ ...(2)

$y - x = 1$;

$y = 1 + x$ ... (3)

$5x = 4y$; $5x = 4(1 + x)$; $5x = 4 + 4x$; $5x - 4x = 4$; $x = 4$

So, $y = 1 + x$; $y = 1 + 4 = 5$ As, $x = 4$ and $y = 5$

$\therefore$ The number is 54

**3.** Let the digit at ten's place be $x$

and at unit place be y So, According to question

$10x + y = x + y + 18$, above $y = 2x$

$10x + 2x = x + 2x + 18$; $12x = 3x + 18$; $12x - 3x = 18$

$9x = 18$; $x = \frac{18}{9} = 2$ Also, $y = 2x$

$y = 2 \times 2$; $y = 4$ and $x = 2$

So the number is $10x + y = 10 \times 2 + 4 = 20 + 4 = 24$

**4.** Let the digit at ten's place be $x$ and at one's place be $y$

So, $y = 3$ (given)

According to the question

$\frac{1}{7}(10x + y) = x + 3$; $\frac{1}{7}(10x + 3) = x + 3$

$10x + 3 = 7(x + 3)$; $10x + 3 = 7x + 21$

$10x - 7x = 21 - 3$; $3x = 18$; $x = \frac{18}{3}$, $x = 6$

So, the number is $10x + y$ as $y = 3$

$= 10 \times 6 + y$; $= 60 + y$; $= 60 + 3 = 63$

**5.** Let the common ratio be $x$

one's digit = $1x$ Ten's digit = $20x$

Number obtained = $20x + x = 21x$

$21x - 19x = 2x$

Digits after interchanging

One's digit = $2x$ Ten's digit = $10x$

Number obtained = $10x + 2x = 12x$

$21x - 12x = 36$; $9x = 36$; $x = 4$

$\therefore$ Difference = $21x - 19x = 2x = 2 \times 4 = 8$

**Exercise 5.3**

**1.**

| | | | | |
|---|---|---|---|---|
| | | 41 | | |
| | | 53 | | |
| 13 | 23 | 17 | 61 | 47 |
| | | 31 | | |
| | | 19 | | |

**2.** Factors of 1904 are 1, 2, 4, 7, 8, 14, 16, 17, 28, 34, 56, 68, 112, 119, 136, 238, 272, 476, 952, 1904.

The product of units digit is 24 and that of their tens digit is 15, So only two numbers satisfy our need.

i.e., $5 \times 3 = 15$ $6 \times 4 = 24$

So, 56 and 34 are the numbers.

**3.** $\{(3 * 3) * 3\} \sim 3$; $\{(3 \times 3 + 2) * 3\} \sim 3$; $\{11 \times 3\} \sim 3$; $\{11 \times 3 + 2\} \sim 3$

$= [33 + 2] \sim 3 = 35 \sim 3 = 35 + 3 - 1 = 38 - 1 = 37$

**4.** The result is a 7-digit number, it has identical digits,

$239 \times 4649 = 1111111$

**Exercise 5.4**

**1.** (a) 451; $4 + 5 + 1 = 10$

The sum is 10 so it is not divisible by 3.

(b) 753; $7 + 5 + 3 = 15$

The sum is 15, so 753 is divisibe by 3

(c) 8519; $8 + 5 + 1 + 9 = 23$

The sum is 23, so 8519 is not divisible by 3.

(d) 105532; $1 + 0 + 5 + 5 + 3 + 2 = 16$

The sum is 16, so 105532 is not divisible by 3

**2.** (a) 321

it ends with 1, so it is not divisible by 5

(b) 4015

it ends with 5, so it is divisible by 5

(c) 9210

it ends with 0, so it is divisible by 5

(d) 20563

it ends with 3, so it is not divisible by 5

**3.** (a) $356 = 3 + 5 + 6 = 14$

The sum is 14, so it is not divisible by 9.

(b) $693 = 6 + 9 + 3 = 18$

The sum is 18, so it is divisible by 9.

(c) $2045 = 2 + 0 + 4 + 5 = 11$

The sum is 11, so it is not divisible by 9.

(d) $6058 = 6 + 0 + 5 + 8 = 19$

The sum is 19, so it is not divisible by 9.

**4.** (a) 162,

It ends with 2, so it is not divisible by 10.

(b) 190,

It ends with 0, so it is divisible by 10.

(c) 205, It ends with 5, so it is not divisible by 10.

(d) 320, it ends with 0, so it is divisible by 10.

## Exercise 6.1

**1.** (a) 3 (b) 5 (c) 4 (d) 7

(e) 1 (f) 4 (g) 3 (h) 4

**2.** The like terms are

(1) $4x^2y$, $3yx^2$, $7x^2y$ (2) $3xyz$, $4xyz$, $3yxz$

(3) $-7ab$, $4ab$ (4) $4xy$, $-2xy$, $3yx$, $3xy$

(5) $8y^2x$ (6) $abc$, $3abc$

**3.** (a) The three like terms are $-3xy$, $4xy$, $-5xy$

(b) 2l The 3 like terms are 4l, 5l, 6l

(c) $7\ m^2n$

The treee like terms are $5m^2n$, $4m^2n$, $3m^2n$

(d) The three like terms are $7abc$, $9abc$, $-109abc$

**4.** (a) $4x^4 + 7x^2 - 3x - 4$ (b) $9x^7 + 3x^3 - 4x + 3$

(c) $8x^5 + 3x^3 - 7x^2 + 7x + 9$ (d) $-4x^7 + 7x^5 - 2x^4 + 3x^3 + 7$

(e) $10x^{10} + 3x^3 - 7x^2 + 8$ (f) $15x^3 - 3$

**5.** (a) It is not a polynomial (b) It is not a polynomial

(c) It is not a polynomial (d) It is a polynomial

(e) It is not a polynomial. (f) It is a polynomial

(g) It is a polynomial (h) It is not a polynomial

**6.** (a) Monomial – Not any (b) Binomial = $33x^3 + 7$

(c) Trinomial = $9x^3 + 3x^2 + 7$ (d) Polynomial = $7x^3 + 4x^2 - 3x - 1$

(e) Nonpolynomial = $4x^{-4} + 3x^2 + 7x - 4$

$2x^7 + 3a^5 - 4x^{-3} + 1$

$2x^4 + 7x^3 + 2x^{1/2} - 1$, $23x^{10} + 7x^4 - 3x^5 2x^{-9} + 3$,

$23x^{1/3} + 9x^2 + 3x$

**7.** (a) $7x^4 - 3x^3 - 4$, $5x^2 + 3x^2 - 1$

(b) $3x^3y + 7x^2y - 3xy$, $7xy - 8x^2y + x^3y$

(c) $3x^2 + 5$, $-4x^3 - 6$, $5x + 4$

## Exercise 6.2

**1.** (a) $x^3 - 6x^2y + 3xy + y^2 + 3x^3 + 5x^2y + 3xy - y^2 + (-4xy) + 2y^2$

$= x^3 + 3x^3 - 6x^2y + 5x^2y + 3xy + 3xy - 4xy + 2y^2$

$= 4x^3 - x^2y + 2xy + 2y^2$

(b) $4 - x - x^2 + x^3 + x^2 - 5x + 5 + 5x^2 - 7x + 6 + 6x - 7$

$= x^3 + x^2 - x^2 + 5x^2 - 5x - 7x + 6x - x + 4 - 6 + 5 - 7$

$= x^3 + 5x^2 - 7x + 8$

(c) $3a + 4b - 7 + 3a + 3 + 4b - 7 + 3$

$= 3a + 3a + 4b + 4b - 7 - 7 + 3 + 3 = 6a + 8b - 8$

(d) $13x^2 - 7xy + 9y^2 + 10x^2 - 10y^2 + (-7xy) + 3y^2$

$= 13x^2 + 10x^2 + 9y^2 - 10y^2 + 3y^2 - 7xy - 7xy$

$= 23x^2 + 2y^2 - 14xy$

(e) $x + 4x^2 + y + 9x^3 + 3x^4 - 10x^3 + 3 - 7x^2$

$= x + y + 3 + 4x^2 - 7x^3 + 9x^3 - 10x^3 + 3x^4$

$= 3x^4 - x^3 - 3x^2 + x + y + 3$

(f) $7xy + 5yz - 3zx + 5y + 9zx - 4yz + 5x - 2xy$

$= 7xy - 2xy + 5yz - 4yz - 3zx + 9zx + 5x + 5y$

$= 5xy + yz + 6zx + 5x + 5y$

(g) $a + 2b + 3c - 4d + 4d + 3c - a + 3c - 7d - 2b = 9c - 7d$

**2.** (a) $3a^2 - 4 + 6a;\ 4a^2 - 7a - 3$

$4a^2 - 7a - 3 - (3a^2 - 4 + 6a)$

$= 4a^2 - 7a - 3 - 3a^2 + 4 - 6a = 4a^2 - 3a^2 - 7a - 6a + 4 - 3$

$= a^2 - 13a + 1$

(b) $a + 2b + 3c - 7d - (4d - 7c - 3a)$

$= a + 2b + 3c - 7d - 4d + 7c + 3a = a + 3a + 2b + 3c + 7c - 7d - 4d$

$= 4a + 2b + 10c - 11d$

(c) $-7yx^2 - (9x^2y) = -7yx^2 + 9x^2y = 2x^2y$

(d) $3x^2 - 8y^2 - 2x^2y + 7xy^2 - (-5x^2 + 7y^2 + 5x^2y - 8xy^2)$

$= 3x^2 - 8y^2 - 2x^2y + 7xy^2 + 5x^2 - 7y^2 - 5x^2y + 8xy^2$

$= 3x^2 + 5x^2 - 8y^2 - 7y^2 - 2x^2y - 5x^2y + 7xy^2 + 8xy^2$

$= 3x^2 + 5x^2 - 8y^2 - 7y^2 - 2x^2y - 5x^2y + 7xy^2 + 8xy^2$

$= 8x^2 - 15y^2 - 7x^2y + 15xy^2$

(e) $3ab - 2a^2 + b^2 - 16 - (1 - ab + a^2 + b^2)$

$= 3ab - 2a^2 + b^2 - 16 - 1 + ab - a^2 - b^2$

$= 3ab + ab - 2a^2 - a^2 + b^2 - b^2 - 16 - 1 = 4ab - 3a^2 - 17$

(f) $-7pq - 14q + 13p - (13p + 14q - 7pq)$

$= -7pq - 14q - 14q + 13p + 7pq = -28q$

**3.** $12a - 9ab + 5b - 3 - (4a - 7ab + 3b + 12)$

$= 12a - 9ab + 5b - 3 - 4a + 7ab - 3b - 12$

$= 12a - 4a - 9ab + 7ab + 5b - 3b - 3 - 12 = 8a - 2ab + 2b - 15$

**4.** $-10yz - 7xy + 9x - (7x - 7xy + 9yz)$

$= -10yz - 7xy + 9x - 7x + 7xy - 9yz$

$= -10yz - 9yz - 7xy + 7xy + 9x - 7x = -19yz + 2x$

**5.** $9p^2 + 3q^2 + 3q + 9 - (7 + 7q - 9p^2) = 9p^2 + 3q^2 + 3q + 9 - 7 - 7q + 9p^2$

$= 9p^2 + 9p^2 + 3q^2 + 3q - 7q + 9 - 7 = 18p^2 + 3q^2 + 4q + 2$

**6.** $5xy - 3yz - 7zx - 11xyz - (5xy) + 4yz - 9zx + 3$

$= 5xy - 3yz - 7zx - 11xyz - 5xy - 4yz + 9zx - 3$

$= 5xy - 5xy - 3yz - 4yz - 7zx + 9zx - 11xyz - 3$

$= -7yz + 2zx - 11xyz - 3$

**7.** Perimeter of $\Delta$ = sum of all the sides

$= (4x + 3y + 7)m + (8x + 3)m + (3y + 7)m$

$= 4x + 3y + 7 + 8x + 3 + 3y + 7 = 12x + 6y + 17$

**8.** Perimeter of square = $4 \times$ side

$= 4 \times (3xy + 7x) = 4 \times (3xy + 7x) = 12xy + 28x = (12xy + 28x)$ m

**9.** Perimeter of rectangle = $2(l + b)$

$= 2[(3x + 2y) + 5y] = 2[3x + 7y] = 2 \times 3x + 2 \times 7y = (6x + 14y)$ cm

**10.** $10x^2 + 3y + x - 14yx^2 - (7x + 3y + 9x^2 + 10x^2y)$

$= 10x^2 + 3y + x - 14yx^2 - 7x - 3y - 9x^2 - 10x^2y$

$= 10x^2 - 9x^2 + 3y - 3y + x - 7x - 10x^2y - 14yx^2 = x^2 - 24x^2y - 6x$

**11.** $4x^2 - 10x - (4x^2 + 3x - 2)$

$= 4x^2 - 10x - 4x^2 - 3x - 2 = 4x^2 - 4x^2 - 10x - 3x - 2 = -13x + 2$

**12.** $6x^3 + 6x^2 + 5x + 9 - (5x^3 - 10x^2 + 3)$

$= 6x^3 + 6x^2 + 5x + 9 - 5x^3 + 10x^3 - 3 + 10x^2$

$= 6x^3 - 5x^3 + 6x^2 + 10x^2 + 5x + 9 - 3 = x^3 + 16x^2 + 5x + 6$

**13.** $5a^3 + 3a^2 - 7ab - 5 - (-7a^3 - 2a^2 + 3ab - 7)$

$= 5a^3 + 3a^2 - 7ab - 5 + 7a^3 + 2a^2 - 3ab + 7$

$= 5a^3 + 7a^3 + 3a^2 + 2a^2 - 7ab - 3ab - 5 + 7 = 12a^3 + 5a^2 - 10ab + 2$

**14.** $4ab + 3a^2 - 7a + 2 - (4a^2 - 5 + 9a - 3ab)$

$= 4ab + 3a^2 - 7a + 2 - 4a^2 + 5 - 9a + 3ab$

$= 4ab + 3ab + 3a^2 - 4a^2 - 7a + 2 + 5 - 9a = 7ab - a^2 - 16a + 7$

**15.** Cost of pencil = ₹$(4x + 7)$

Costof pen = ₹$(5x^2 + 7x - 3)$

Total cost = $(5x^2 + 7x - 3 + 4x + 7)$ = ₹ $(5x^2 + 11x + 4)$

Money given to the shopkeeper = ₹ $(2x^3 + 3x - 5)$

Money he will get back = $2x^3 + 3x - 5 - (5x^2 + 11x + 4)$

$= 2x^3 + 3x - 5 - 5x^2 - 11x - 4$ = ₹$(2x^3 - 5x^2 - 8x - 4)$

**16.** $3x^3 - (2x^4 - 3x + 6y) = 3x^3 - 2x^4 + 3x - 6y = -2x^4 + 3x^3 + 3x - 6y$

## Exercise 6.3

**1.** (a) $4ab \times 3a^2b = 12a^3b^2$

(b) $9x^2 \times 4x \times 3x^3 = 108x^6$

(c) $4p^2q^2r \times -9pqr^3 \times 3r = -108p^3q^3r^4$

(d) $3x^2y \times 2xy^2 = 6x^3y^3$

(e) $4abc \times -5a^2b^2c^2 = -20a^3b^3c^3$

(f) $-x \times -y \times -z = -xyz$

**2.** (a) $7xy^{10} \times \frac{4}{21} xy \times \frac{-1}{4} = \frac{-1}{3} x^2y^{11}$

(b) $13a^2b \times \frac{2}{39} abc^2 = \frac{2}{3} a^3b^2c^2$ (c) $\frac{3}{7} x^2y \times \frac{12}{21} x^2y^3 = \frac{12}{49} x^4y^4$

(d) $a^2b \times ab^3c \times \frac{1}{4} ab = \frac{1}{4} a^4b^5c$

(e) $\frac{2}{3} xy^2p \times \frac{-9}{4} xp^2 \times \frac{-18}{7} p = \frac{27}{7} x^2y^2p^4$

(f) $\frac{1}{3} x^2y \times \frac{1}{8} xy^2 \times -16x = -\frac{2}{3} x^4y^3$

(g) $13x^2y^3 \times -12xy^3 \times 39 = 6084x^3y^6$

(h) $a^3b^2 \times 7a^2b^3 \times -4 = -28a^5b^5$

**3.** (a) $7(x^2 - 2) = 7x^2 - 14$

(b) $12x(3x^2 + 9y^2) = 36x^3 + 108xy^2$

(c) $5a(a^3b - a^2b) = 5a^4b - 5a^3b$

(d) $\frac{19}{2} xy(18x^2 + 10) = \frac{19}{2} xy \times 18x^2 + \frac{19}{2} xy \times 10 = 171x^3y + 95xy$

(e) $3ab(a^2b - ab^2) = 3a^3b^2 - 3a^2b^3$

(f) $3x^2y(7x + 3xy) = 21x^3y + 9x^3y^2$

**4.** (a) $(x^3 + 5x)$ by $(x + 9x^2)$

$= (x^3 + 5x) \times (x + 9x^2) = x^4 + 9x^5 + 5x^2 + 45x^3$

$= 9x^5 + x^4 + 45x^3 + 5x^2$

(b) $(y^2 - 3) \times (y^2 + 4) = y^4 - 3y^2 - 12 + 4y^2 = y^4 - y^2 - 12$

(c) $(7x^2y + 3y) \times (9x - 7y) = 63x^3y - 49x^2y^2 + 27xy - 21y^2$

(d) $(7p + 3q^2) \times (-9q + 4q) = 7p \times -9p + 7p \times 4q + 3q^2 \times -9p + 3q^2 \times 4q$

$-63p^2 + 28pq - 27pq^2 + 12q^3$

(e) $(-4pq + 3q) \times (-3p - 2q)$

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

$= 12p^2q + 8pq^2 - 9pq - 6q^2$

(f) $(a - b) \times (a^3 - b^3)$

$= a \times a^3 + a \times -b^3 + (-b)a^3 + (-b) \times (-b)^3 = a^4 - ab^3 - a^3b + b^4$

**5.** (a) $(7x + 3y)(9x + 7y - 3z)$

$= 7x \times 9x \times 7x + 7y + 7x \times (-3z) + 3y \times 9x + 3y \times 7y + 3y \times -3z$

$= 63x^2 + 76xy - 21xz - 9yz + 21y^2$

(b) $(2x^2 - 7y + 3)(-4x + 5)$

$= 2x^2 \times (-4x) + 2x^2 \times 5 + (-7y) \times (-4x) - 7y(5) + 3(-4x) + 3 \times 5$

$= -8x^3 + 10x^2 + 28xy - 35y - 12x + 15$

(c) $(x^2 + y^2 + z^2)(2x + 3y + 4z)$

$= x^2 \times 2x + x^2 \times 3y + x^2 \times 4z + y^2 \times 2x + y^2 \times 3y + y^2 \times 4z + z^2 \times 2x$

$+ z^2 \times 3y + z^2 \times 4z$

$= 2x^3 + 3x^2y + 4x^2z + 2xy^2 + 3y^3 + 4y^2z + 2xz^2 + 3yz^2 + 4z^3$

(d) $(2 - 5x)(3 + x + x^2 + x^3)$

$= 2 \times 3 + 2 \times x + 2 \times x^2 + 2 \times x^3 + (-5x) \times 3 + (-5x) \times x + (-5x) \times x^2$

$+ (-5x) \times x^3 = 6 + 2x + 2x^2 + 2x^3 - 15x - 5x^2 - 5x^3 - 5x^4$

$= 5x^4 - 3x^3 - 3x^2 - 13x + 6 = 4x^3 + 3x^2 - 4xy^6 - 3y$

(e) $(x^2 - y^2)(4xy^4 + 3y)$

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

(f) $(5 - 2d - 2d^3)(3 - 4d + d^2)$

$= 5 \times 3 + 5(-4d) + 5d^2 - 2d(3) - 2d(4d) - 2d(d^2)$

$-2d^3(3) - 2d^3 \times (-4d) - 2d^3 \times d^2$

$= 15 - 20d + 5d^2 - 6d + 8d^2 - 2d^3 - 6d^3 + 8d^4 - 2d^5$

$-2d^5 + 8d^4 - 8d^3 + 13d^2 - 26d + 15$

**6.** Cost of one pencil $= ₹2x^2$

Cost of $7xy$ pencils $= 7xy \times 2x^2 = ₹14x^3y$

**7.** No. of copies in one box $= 4xy + 3y^2$

No. of boxes $= 6x + 3y$

Total copies $= (6x + 3y)(4xy + 3y^2)$

$= 6x \times 4xy + 6x \times 3y^2 + 3y \times 4xy + 3y \times 3y^2$

$= 24x^2y + 12xy^2 + 18xy^2 + 9y^3$

**8.** No. of students $= 2x^2 - 7y^2$

No. of classes $= 4x - 2y$

No. of students in $4x - 2y$ classes $= (4x - 2y) \times (2x^2 - 7y^2)$

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

$= 8x^3 - 28xy^2 - 4x^2y + 14y^3$

**9.** Area of rectangle $= l \times b$

$= (2x + 3y)(3x^2 + y) = 2x \times 3x^2 + 2xy + 3y + 3x^2 + 3y \times y$

$= (6x^3 + 2xy + 9x^2y + 3y^2)\, m^2$

**10.** Volume of a box $= l \times b \times h$

$= 3x \times 2x^2 \times 7y = 42x^3y\ m^3$

## Exercise 6.4

**1.** (a) $\frac{ab}{ab} = b^4$ (b) $\frac{-a^4}{4a^2b} = \frac{-a^2}{4b}$

(c) $\frac{50x^2y^2z^2a^3}{-10x^2z^2a} = -5y^2a^2$ (d) $\frac{-12^3a^3b^3}{-4b} = 3a^3b^2$

(e) $\frac{-10x^3y^2}{5xy^2} = -2x^2$ (f) $\frac{8x^{10}y^5}{4x^2y} = 2x^8y^4$

**2.** (a) $\frac{-6a^2 - 12b^2}{3} = \frac{-6a^2}{3}\ \frac{-12b^2}{3} = -2a^2 - 4b^2$

(b) $\frac{-15a^7 - 12a^3}{-3a} = \frac{-15a^7}{-3a} + \frac{-12a^3}{-3a} = 5a^6 + 4a^2$

(c) $\frac{-20x^3 + 12y^3}{4} = \frac{-20x^3}{4} + \frac{12y^3}{4} = -5x^3 + 3y^3$

(d) $\frac{100p^5 + 16p^3}{4p} = \frac{100p^5}{4p} + \frac{16p^3}{4p} = 25p^4 + 4p^2$

(e) $\frac{-18p^6q^3r^4 - 27p^5r^3}{-9p^3r^3} = \frac{18p^6q^3r^4}{-9p^3r^3} + \left(\frac{-27p^5r^3}{-9p^3r^3}\right) = 2p^3q^3r + 3p^2$

(f) $\frac{20x^2 - 10x^3}{-10x} = \frac{20x^2}{-10x} + \left(\frac{-10x^3}{-10x}\right) = 2x + x^2$

(g) $\frac{14a^2b + 21ab}{-7ab} = \frac{14a^2b}{-7ab} + \frac{21ab}{-7ab} = -2a - 3$

(h) $\frac{7a^2 - 14b^2}{7} = \frac{7a^2}{7} - \frac{14b^2}{7} = a^2 - 2b^2$

(i) $(16x^2 - 2xy) \div (-3xy) = 16x^2 - 2xy \times \frac{1}{-3xy} = \frac{16x^2}{-3xy} + \left(\frac{-2xy}{-3xy}\right)$

$= \frac{-16x}{3y} + \frac{2}{3}$

(j) $\frac{10x^{12}y + 8x^5z}{2x^3} = \frac{10x^{12}y}{2x^3} + \frac{8x^5z}{2x^3} = 5x^9y + 4x^2z$

**3.** Weight of one copy $= 2yx^5 - 30x^3 \div 6$

$= \frac{2yx^5}{6} - \frac{30x^3}{6} = \left(\frac{1}{3}yx^3 - 5x\right)$ kg

**4.** Area of rectangular field $= (14x^3 - 35x)\ m^2$

Length $= 7x$ m

Breadth $= \dfrac{14x^3 - 35x}{7x} = \dfrac{14x^3}{7x} - \dfrac{35x}{7x} = (2x^2 - 5)$ m

**5.** Time = 5 hours

Speed of the train = ?

Distance covered $= 5x^3 + 10x^2 + 15$

Speed $= \dfrac{\text{distance}}{\text{Time}}$

$= \dfrac{5x^3 + 10x^2 + 15}{5} = \dfrac{5x^3}{5} + \dfrac{10x^2}{5} + \dfrac{15}{5} = (x^3 + 2x^2 + 3)$ km/hr

**6.** No. of Children $= 8xy$

No. of Sweets $= 40x^2y^3 + 64x^2y$

distributed

No. of sweets given to one child $= \dfrac{40x^2y^3}{8xy} + \dfrac{64x^2y}{8xy} = 5xy^2 + 8x$

**7.** No. of children = 3

Total no. of books $= 27pq + 30p^2q$

No. of books that one child got $= \dfrac{27pq}{3} + \dfrac{30p^2q}{3} = 9pq + 10p^2q$

## Exercise 6.5

**1.** (a) $3a^3 + 6x^4y + 18xy$ by $3xy$

$= \dfrac{3a^3}{3xy} + \dfrac{6x^4y}{3xy} + \dfrac{18xy}{3xy} = \dfrac{a^3}{xy} + 2x^3 + 6$

(b) $2x^4 + 8x^3 + 7x^2 + 4x + 3$ by $x + 3$

$$
\begin{array}{r}
2x^3 + 2x^2 + x + 1 \\
x+3 \;\overline{)\; 2x^4 + 8x^3 + 7x^2 + 4x + 3} \\
\underset{(-)}{} \; 2x^4 \underset{(-)}{+} 6x^3 \\
\hline
2x^3 + 7x^2 + 4x + 3 \\
\underset{(-)}{} \; 2x^3 \underset{(-)}{+} 6x^2 \\
\hline
x^2 + 4x + 3 \\
\underset{(-)}{} \; x^2 \underset{(-)}{+} 3x \\
\hline
x + 3 \\
\underset{(-)}{} \; x \underset{(-)}{+} 3 \\
\hline
0
\end{array}
$$

Quotient $= 2x^3 + 2x^2 + x + 1$

(c) $x+2\overline{)x^2+4x+4}\,(x+2$

$$\begin{array}{r} x^2+2x \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline 2x+4 \\ 2x+4 \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline 0 \end{array}$$

Quotient $= x+2$

(d) $a-6\overline{)a^2+6a-72}\,(a+12$

$$\begin{array}{r} a^2-6a \\ \underset{(-)}{} \quad \underset{(+)}{} \\ \hline 12a-72 \\ 12a-72 \\ \underset{(-)}{} \quad \underset{(+)}{} \\ \hline 0 \end{array}$$

$Q = a+12$

(e) $2x+3\overline{)4x^2+12x+9}\,(2x+3$

$$\begin{array}{r} 4x^2+6x \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline 6x+9 \\ 6x+9 \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline 0 \end{array}$$

$Q = 2x+3$

(f) $4x^3+6x^2-x$ by $\frac{-1}{2}x$

$$\frac{4x^3}{\frac{-1}{2}x}+\frac{6x^2}{\frac{-1}{2}x}-\frac{x}{\frac{-1}{2}x}=\frac{-4\times 2x^3}{x}-\frac{6\times 2x^2}{x}+\frac{2x}{x}=-8x^2-12x^2+2$$

(g) $m^2-12m+13\overline{)m^3-14m^2+37m-26}\,(m-2$

$$\begin{array}{r} m^2-12m^2+13\,\mathrm{m} \\ \underset{(-)}{} \quad \underset{(+)}{} \quad \underset{(-)}{} \\ \hline -2m^2+24m-26 \\ -2m^2+24m-26 \\ \underset{(+)}{} \quad \underset{(-)}{} \quad \underset{(+)}{} \\ \hline 0 \end{array}$$

$Q = m-2$

(h) $a^3+1\overline{)a^5+a^4+a^3+a^2+a+1}\,(a^2+a+1$

$$\begin{array}{r} a^5 \qquad +a^2 \\ \underset{(-)}{} \quad \underset{(+)}{} \\ \hline a^4+a^3+a+1 \\ +a^4 \qquad +a \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline a^3+1 \\ a^3+1 \\ \underset{(-)}{} \quad \underset{(-)}{} \\ \hline 0 \end{array}$$

$Q = a^2+a+1$

**2.** (a) $\frac{14p^2 - 53p + 45}{7p - 9}$

$$7p - 9 \overline{)14p^2 - 53p + 45} \; 2p - 5$$

$$\begin{array}{r} {}_{(-)}14p^2 \; {}_{(+)}-18p \\ \hline -35p + 45 \\ {}_{(+)}-35p \; {}_{(-)}+45 \\ \hline 0 \end{array}$$

$Q = 2p - 5$

(b) $\frac{2p^3 - p^2q - 2pq^2 - q^3}{p^2 - q^2}$

$$p^2 - q^2 \overline{)2p^3 - p^2q - 2pq^2 - q^3} \; 2p - q$$

$$\begin{array}{r} {}_{(-)}2p^3 \quad {}_{(+)}-2pq^2 \\ \hline -p^2q - q^3 \\ {}_{(+)}-p^2q \; {}_{(+)}-q^3 \\ \hline 0 \end{array}$$

$Q = 2p - q$

(c) $\frac{x^3 - 8}{x - 2}$

$$x - 2 \overline{)x^3 + 0x^2 + 0x - 8} \; x^2 + 2x + 4$$

$$\begin{array}{r} {}_{(-)}x^3 \; {}_{(+)}-2x^2 \\ \hline 2x^2 + 0x - 8 \\ {}_{(-)}2x^2 \; {}_{(+)}-4x \\ \hline 4x - 8 \\ {}_{(-)}4x \; {}_{(+)}-8 \\ \hline 0 \end{array}$$

$Q = x^2 + 2x + 4$

(d) $\frac{8x^2 + 14x - 15}{4x - 3}$

$$4x - 3 \overline{)8x^2 + 14x - 15} \; 2x + 5$$

$$\begin{array}{r} {}_{(-)}8x^2 \; {}_{(+)}-6x \\ \hline 20x - 15 \\ {}_{(-)}20x \; {}_{(+)}-15 \\ \hline 0 \end{array}$$

$Q = 2x + 5$

(e) $\dfrac{-10a^3b^2 + 20a^2b^2 - 15ab}{-5ab}$

$= \dfrac{10a^3b^2}{-5ab} + \dfrac{20a^2b^2}{-5ab} + \left(\dfrac{-15ab}{-5ab}\right) = 2a^2b - 4a^2b^2 + 3$

**3.** (a) $13x + 20 \overline{)26x^3 + 14x^2 - 27x - 65} (\ 2x^2 - 2x + 1$

$26x^3 + 40x^2$ (–) (–)

$-26x^2 - 27x - 65$

$-26x^2 - 40x$ (+) (+)

$13x - 65$

$13x + 20$ (–) (–)

$-85$

$Q = 2x^2 - 2x + 1$

$R = -85$

(b) $acx^2 + bcx + adx + bd$ by $ax + b$

$ax + b \overline{)acx^2 + bcx + adx + bd} (\ cx + d$

$acx^2 + bcx$ (–) (–)

$adx + bd$

$adx + bd$ (–) (–)

$0$

$Q = cx + d$

$R = 0$

(c) $4y^4 - 10y^3 - 10y^2 + 31y - 15$ by $2y - 5$

$2y - 5 \overline{)4y^4 - 10y^3 - 10y^2 + 31y - 15} (\ 2y^3 - 5y + 3$

$4y^4 - 10y^3$ (–) (+)

$-10y^2 + 31y - 15$

$-10y^2 + 25y$ (+) (–)

$6y - 15$

$6y - 15$ (–) (+)

$0$

$Q = 2y^3 - 5y + 3$

$R = 0$

**4.** (a) yes, it is the factor of $x^3 + y^3$

(b) No, $2x^2 - x + 3$ is the factor of $6x^5 - x^4 + 4x^3 - x + 5$

(c) No, $3y - 2$ is not the factor of $15y^4 - 16y^3 + 9y^2$

**5.** Not possible → Unreadable question

**6.** $4x^2 - 5 \overline{)4x^4 + 7x^2 + 20} \; x^2 + 3$

$$\begin{array}{r} 4x^4 - 5x^2 \\ \hline 12x^2 + 20 \\ 12x^2 - 15 \\ \hline 35 \end{array}$$

$\therefore$ 35 should be added to $4x^4 + 7x^2 + 20$ to make it divisible by $4x^2 - 5$

**7.** Area of rectangle = $(a+b)^2$ cm = $a^2 + 2ab + b^2$

Length of rectangle = $a + b$

Breadth = $\dfrac{\text{Area}}{\text{length}} = \dfrac{a^2 + 2ab + b^2}{a + b}$

$a + b \overline{)a^2 + 2ab + b^2} \; a + b$

$$\begin{array}{r} a^2 + ab \\ \hline ab + b^2 \\ ab + b^2 \\ \hline 0 \end{array}$$

Breadth = $a + b$

**8.** $a + b + c \overline{)a^2 + b^2 - c^2 + 2ab} \; a + b - c$

$$\begin{array}{r} a^2 \quad + ab + ac \\ \hline b^2 - c^2 + ab + ac \\ b^2 \quad + bc + ab \\ \hline -c^2 + ab + ac - bc - ab \\ -c^2 \quad - ac - bc \\ \hline ab + 2ac - ab \end{array}$$

Yes, $(a + b + c)$ is a factor.

**9.** Cost of one book = $\dfrac{x^3 + y^3}{x + y}$

$= \dfrac{(x+y)^3 - 3x^2y - 3xy^2}{x+y} = \dfrac{(x+y)^3 - 3xy(x+y)}{x+y} = x + y\,\dfrac{[(x+y)^2 - 3xy]}{x+y}$

$= x^2 + y^2 + 2xy - 3xy$

Cost of one book $= ₹(x^2 + y^2 - xy)$

**10.** No. of sweets $= 3y^3 - 28y + 16$

No. of children $= 3y - 4$

$$
\begin{array}{l}
3y-4 \;\overline{)\; 3y^3 - 28y + 16 \;(\; y^2 + 4y - 4} \\
\underset{(-)}{3y^3} \quad \underset{(+)}{-4y^2} \\
\hline
4y^2 - 28y + 16 \\
\underset{(-)}{12y^2} \quad \underset{(+)}{-16y} \\
\hline
-8y^2 - 12y + 16y \\
\underset{(+)}{-12y + 16} \\
\hline
-8y^2
\end{array}
$$

## Exercise 6.6

**1.** (a) $(5x + 7)$

$(a+b)^2 = a^2 + b^2 + 2ab$; $a = 5x$, $b = 7$

$= (5x)^2 + 2 \times 5x \times 7 + (7)^2 = 25x^2 + 70x + 49$

(b) $(3x^3 + 7)^2$

$(a+b)^2 = a^2 + b^2 + 2ab$

$a = 3x^3 \quad b = 7 = (3x^3)^2 + 2 \times 3x^3 \times 7 + 7^2 = 9x^6 + 42x^3 + 49$

(c) $(4x^2 + 3y^3)^2$; $(a+b)^2 = a^2 + b^2 + 2ab$

$a = 4x^2$, $b = 3y^3$

$= (4x^2)^2 + 2 \times 3y^3 \times 4x^2 + (3y^3)^2 = 16x^4 + 24x^2y^3 + 9y^6$

(d) $\left(9x \dfrac{-2}{3} y^2\right)^2$

$(a-b)^2 = a^2 - 2ab + b^2$; $a = 9x$, $b = \dfrac{2}{3} y^2$

$(9x)^2 - 2 \times 9x \times \dfrac{2}{3} y^2 + \left(\dfrac{-2}{3} y^2\right)^2 = 81x^2 - 12xy^2 + \dfrac{4}{9} y^4$

(e) $\left(\dfrac{4}{7} - 21x\right)^2$; $(a-b)^2 = a^2 - 2ab + b^2$

$a = \dfrac{4}{7}, \quad b = -21x$

$= \left(\dfrac{4}{7}\right)^2 - 2 \times \dfrac{4}{7} \times 21x + (-21x)^2 = \dfrac{16}{49} - 24x + 441x^2$

(f) $(p^4 + 3)^2$

$a = p^4\ b = 3; (a+b)^2 = a^2 + b^2 + 2ab$

$= (p^4)^2 + 2p^4 \times 3 + (3)^2 = p^8 + 6p^4 + 9$

(g) $(2p - 3q)^2$

$a - 2p,\ b = +3q;\ \ (a-b)^2 = a^2 - 2ab + b^2$

$= (2p)^2 - 2 \times 2p \times 3q + (3q)^2 = 4p^2 - 12pq + 9q^2$

(h) $\left(\frac{3}{4}x^2 - 5p\right)^2$; $(a-b)^2 = a^2 - 2ab + b^2$; $a = \frac{3}{4}x^2\ b = 5p$

$= \left(\frac{3}{4}x^2\right)^2 - 2 \times \frac{3}{4}x^2 \times 5p + (-5p)^2 = \frac{9}{16}x^4 - \frac{15}{2}x^2p + 25p^2$

**2.** (a) $(x + 3)(x - 6)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= x^2 + (3 - 6)x + 3x(-6) = x^2 - 3x - 18$

(b) $(p^3 - 7)(p^3 + 10)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= (p^3)^2 + (-7 + 10)p^3 + (-7)(10) = p^6 + 3p^3 - 70$

(c) $(x^2 - 7)(x^2 - 3)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= (x^2)^2 + (-7 - 3)x^2 + (-7)(-3) = x^4 - 10x^2 + 21$

(d) $(9x + 7)(9x - 7)$

Using $(a + b)(a - b) = a^2 - b^2$

$= (9x)^2 - (7)^2 = 81x^2 - 49$

(e) $(4x^2 - 1)(4x^2 + 2)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$(4x^2)^2 + (-7 + 2)x^2 + (-7)(2) = 16x^4 - 20x^2 - 14$

(f) $(2x + 3)(2x - 6)$

Using $(x + a)(x + b) = x^2 + (a + b)x + ab$

$= (2x)^2 + [3 + (-6)]2x + 3 \times (-6) = 4x^2 - 6x - 18$

(g) $(7x^2 + 3)(7x^2 - 3)$; $(a-b)(a+b) = a^2 - b^2$

$= (7x^2)^2 - (3)^2 = 49x^4 - 9$

(h) $(3x + 4y)(3x + 7y)$

$(x + a)(x + b) = x^2 + (a + b)x + ab$

$= (3x)^2 + (4y + 7y)3x + 4y \times 7y = 9x^2 + 33xy + 28y^2$

(i) $(12x^2 - 13y^2)(12x^2 + 13y^2)$; $a^2 - b^2 = (a+b)(a-b)$

$= (12x^2)^2 - (13y^2)^2 = 144x^4 - 169y^4$

(j) $\left(x + \frac{1}{x}\right)\left(x \frac{-1}{x}\right)$; $(a+b)(a-b) = a^2 - b^2$

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

**3.** (a) $36^2 = (35+1)^2 = 35^2 + 1^2 + 2 \times 35 \times 1 = 1225 + 1 + 70 = 1296$

(b) $(10.7)^2 = (10.6 + 0.1)^2 = (10.6)^2 + (1)^2 + 2 \times 10.6 \times (.1)$

$= 112.36 + 0.01 + 2.12 = 114.49$

(c) $997^2 = (996+1)^2 = (996)^2 + 2 \times 996 \times 1$

$= 992016 + 1 + 1192 = 994009$

(d) $97 \times 98 = (100-3)(100-2)\{(x+a)(x+b) = x^2 + (a+b)x + ab\}$

$= (100)^2 + (-3-2)100 + [(-3 \times (-2))]$

$= 1000 - 500 + 6 = 9506$

(e) $297 \times 303$; $(300-3) \times (300+3)$

Using $(a+b)(a-b) = a^2 - b^2$

$(300)^2 - (3)^2 = 90000 - 9 = 89991$

(f) $9.7 \times 9.8$; $(9 + 0.7)(9 + 0.8)$

Using $(x+a)(x+b) = x^2 + (a+b)x + ab$

$= (9)^2 + (0.7 + 0.8)9 + 0.7 \times 0.8 = 81 + 13.5 + 0.56 = 95.06$

(g) $(1.0)^2 - (0.98)^2$; $a^2 - b^2 = (a+b)(a-b) = (1.0 + 0.98)(1.0 - 0.98)$

$= 1.98 \times 0.02 = 0.0396$

(h) $(153)^2 - (147)^2$

Using $a^2 - b^2 = (a+b)(a-b)$

$= (153-147)(153+147) = 6 \times 300 = 1800$

(i) $(39)^2 = (38+1)^2$

Using $(a+b)^2 = a^2 + b^2 + 2ab$

$= 38^2 + 1^2 + 2 \times 38 \times 1 = 144 + 1 + 76 = 1521$

**4.** (a) $(7m + 8n)^2 + (7m - 8n)^2$

$= (7m)^2 + (8n)^2 + 2 \times 7m \times 8n + (7m)^2 + (8n)^2 - 2 \times 7m \times 8n$

$= 49m^2 + 64n^2 + 112mn + 49m^2 + 64n^2 - 112mn = 98m^2 + 112n^2$

(b) $(a^2 - ab)^2 + 2a^3b^2 = (a^2)^2 + (ab)^2 - 2(a^2)(ab) + 2a^3b^2$

$= a^4 + a^2b^2 - 2a^3b + 2a^3b^2$

(c) $(x+1)(x-1)(x^2+1) = (x^2-1)(x^2+1) = x^4-1$

(d) $\left(a+\frac{1}{a}\right)\left(a\frac{-1}{a}\right)\left(a^2+\frac{1}{a^2}\right); \left(a^2-\frac{1}{a^2}\right)\left(a^2+\frac{1}{a^2}\right) = a^4-\frac{1}{a^4}$

(e) $1.35\times1.35-0.65\times0.65$

$= (1.35)^2-(0.65)^2 = (1.35+0.65)-(1.35-0.65) = 2\times0.7 = 1.4$

(f) $\frac{144\times144-133\times133}{277}$

$= \frac{(144+133)(144-133)}{277} = \frac{277\times11}{277} = 11$

(g) $\frac{23.71\times23.71-16.29\times16.29}{0.742}; \frac{(23.71)^2-(16.29)}{0.742}$

$= \frac{(23.71+16.29)(23.71-16.29)}{0.742} \quad = \frac{40\times7.42}{0.742} = 400$

(h) $(2x+6)^2(2x-6)^2$

$= (2x)^2+(6)^2+2\times2x\times6-[(2x)^2+(6)^2-2\times2x\times6]$

$= 4x^2+36+24x-[4x^2+36-24x]$

$= 4x^2+36+24x-4x^2-36+24x = 24x+24x = 48x$

**5.** (a) $20x = 60^2-40^2$; $20x = 3600-1600$; $20x = 2000$

$x = \frac{2000}{20} = 100$

(b) $36x^2 = 120^2-48^2 = 14400-2304$; $36x^2 = 12096$

$x^2 = \frac{12096}{36} = 336$; $x^2 = 36$; $x = 18.33$

**6.** If $x-\frac{1}{x} = 3$

Squaring both sides $\left(x-\frac{1}{x}\right)^2 = 9$

$x^2+\left(\frac{1}{x}\right)^2-2\times x\times\frac{1}{x} = 9$; $x^2+\frac{1}{x^2}-2 = 9$; $x^2+\frac{1}{x^2} = 11$

**7.** $x+\frac{1}{x} = 7$

Squaring both sides

$\left(x+\frac{1}{x}\right)^2 = (7)^2$; $x^2+\frac{1}{x^2}+2\times x\times\frac{1}{x} = 49$

$x^2+\frac{1}{x^2}+2 = 49$; $x^2+\frac{1}{x^2} = 47$

**8.** $x - y = 10$

Squaring both Sides

$(x-y)^2 = (10)^2$; $x^2 + y^2 - 2xy = 100$

Put $xy = (-2)$

$x^2 + y^2 - (2)(-2) = 100$; $x^2 + y^2 + 4 = 100$; $x^2 + y^2 = 100 - 4$

$x^2 + y^2 = 96$

**9.** $x + y = 8$

Squaring both the sides

$(x+y)^2 = 8^2$; $x^2 + y^2 + 2xy = 64$

Put $xy = 3$

$x^2 + y^2 + 2\times 3 = 64$; $x^2 + y^2 + 6 = 64$; $x^2 + y^2 = 64 - 6$

$x^2 + y^2 = 58$

**10.** (a) $25a^2 + 30a + 9$; $(a+b)^2 = a^2 + b^2 + 2ab$

Put $a = -2$

$= (5a)^2 + 2\times 5a \times 3 + (3)^2 = (5a+3)^2 = (5\times(-2)+3)^2$

$= (-10+3)^2 = (-7)^2 = 49$

(b) $36a^2 - 24a + 4^2$; $(a-b)^2 = a^2 + b^2 - 2ab$

$= (6a)^2 - 2\times 6a \times 2 + (2)^2 = (6a-2)^2$ Put $a = -2$

$= (6\times(-2) - 2)^2 = (-12-2)^2 = (-14)^2 = 196$

(c) $(2a+3)(2a-3)$; $a^2 - b^2 = (a+b)(a+b) = [(2a)^2 - (3)^2] = [4a^2 - 9]$

Put $a = -2$

$= [4\times(-2)^2 - 9] = [4\times 4 - 9] = 16 - 9 = 7$

(d) $(7a^2 - 4)(7a^2 + 4)$; $a^2 - b^2 - (a+b)(a-b)$

$= (7a^2)^2 - (4)^2 = 49a^4 - 16$

Put $a = (-2)$

$= 49(-2)^4 - 16 = 49\times 16 - 16 = 784 - 16 = 768$

**11.** (a) $\left(\frac{2}{7}ab - c\right)\left(\frac{2}{7}ab + c\right)$; $a^2 - b^2 = (a+b)(a-b)$

$\left(\frac{2}{7}ab\right)^2 - (c)^2 = \frac{4}{49}a^2b^2 - c^2$

(b) $\left(\frac{1}{2}xy - a^2\right)\left(\frac{1}{2}xy + a^2\right)$

Using $a^2 - b^2 = (a+b)(a-b) = \left(\frac{1}{2}xy\right)^2 - (a^2)^2 = \frac{1}{4}x^2y^2 - a^4$

## Exercise 7.1

**1.** (a) $\frac{0.25+y}{3} = y + \frac{1}{2}; \frac{0.25+y}{3} = \frac{2y+1}{2}$

$2(0.25+y) = 3(2y+1); 5.0 + 2y = 6y + 3$

$5 - 3 = 6y - 2y; 2 = 4y; \frac{2}{4} = y; y = 0.625$

(b) $1.2y + \frac{18}{25} = 5y - \frac{39}{35}$

$\frac{18}{25} + \frac{39}{35} = 5y - 1.2y; \frac{126+195}{175} = 3.8y; \frac{321}{175} = 3.8y$

$\frac{321 \times 38}{175 \times 10} = y; \frac{12198}{1750} = y; y = 6.97$

(c) $0.12y + \left(\frac{0.5+y}{2}\right) = \frac{y}{3} + 1.5$

$\Rightarrow \quad \frac{2(0.12y)+0.5+y}{2} = \frac{y+4.5}{3}$

$\Rightarrow \quad \frac{0.24y+0.5+y}{2} = \frac{y+4.5}{3}$

$\Rightarrow \quad 3(0.24y + 0.5 + y) = 2(y + 4.5)$

$\Rightarrow \quad 0.72y + 1.5 + 3y = 2y + 9$

$\Rightarrow \quad 3.72y - 2y = 9 - 1.5$

$\Rightarrow \quad 1.72y = 7.5$

$\Rightarrow \quad y = \frac{7.5}{1.72} = 4.3$

(d) $0.3y + 0.5 = 0.4y - 0.2$

$0.3y - 0.4y = -0.2 - 0.5; -0.1y = -0.7; y = 7$

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

$\frac{15-(2z-4)}{3} = z + \frac{3}{2}$

$2(15 - 2z + 4) = 3(2z + 3); 30 - 4z + 8 = 6z + 9$

$38 - 9 = 6z + 4z; 29 = 10z; z = \frac{29}{10}$

(f) $5x - \frac{1}{3}(x+1) = 6\left(x + \frac{1}{30}\right)$

$5x - \frac{1}{3}x - \frac{1}{3} = 6x + \frac{6}{30}; \frac{15x - x - 1}{3} = \frac{30x+1}{5}$

$5(14x-1)=3(30x+1);\ 70x-5=90x+3$

$70x-90x=3+5;\ -20x=8;\ x=\frac{-8}{20}=\frac{-2}{5}$

(g) $\frac{3(y-5)}{4}-4y=3\frac{-(y-3)}{2}$

$\frac{3y-15-16y}{4}=\frac{6-y+3}{2};\ \frac{-13y-15}{4}=\frac{9-y}{2}$

$2(-13y-15)=4(9-y);\ -26y-30=36-4y$

$-26y+4y=36+30;\ -22y=66;\ y=\frac{-66}{22}=-3$

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

$\frac{8x}{3}-\frac{2}{3}-\frac{6x-1-x}{3}=\frac{x+4}{3};\ \frac{8x-2-6x+1+x}{3}=\frac{x+4}{3}$

$3(3x-1)=3(x+4);\ 9x-3=3x+12;\ 9x-3x=12+3$

$6x=15;\ x=\frac{15}{6}=2\frac{1}{2}$

**2.** (a) $\frac{7y}{5}=y-4$

$7y=5y-20;\ 7y-5y=-20;\ 2y=-20;\ y=\frac{-20}{2}=-10$

Verification

$\frac{7(-10)}{5}=-10-4;\ \frac{-70}{5}=-14;\ -14=-14$

LHS = RHS, ***Hence Verified***

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

$\frac{9x+2}{3}=2x+1;\ 9x+2=6x+3;\ 9x-6x=3-2;\ 3x=1;\ x=\frac{1}{3}$

Verification

$3\left(\frac{1}{3}\right)+\frac{2}{3}=2\left(\frac{1}{3}\right)+1=1+\frac{2}{3}=\frac{2}{3}+1;\ \frac{3+2}{3}=\frac{2+3}{3};\ \frac{5}{3}=\frac{5}{3}$

LHS = RHS, **Hence Verified**

(c) $15-(3x-1)=x-4$

$15-3x+1=x-4;\ 16-3x=x-4;\ 16+4=x+3x$

$20=4x;\ \frac{20}{4}=x;\ x=5$

Verification

$15-[(3\times 5)-1]=5-4;\ 15-15+1=1;\ 1=1$

LHS = RHS, ***Hence Verified***

(d) $3(x-1)=8;\ 3x-3=8;\ 3x=8+3;\ 3x=11;\ x=\frac{11}{3}$

Verification

$3\left(\frac{11}{3}-1\right)=8;\ 3\left(\frac{11-3}{3}\right)=8;\ 3\times\frac{8}{3}=8$

LHS = RHS, ***Hence Verified***

**3.** (a) $\frac{2-9y}{17-4y}=\frac{4}{5}$

$5(2-9y)=4(17-4y);\ 10-45y=68-16y$

$10-68=-16y+45y;\ -58=29y$

$\frac{-58}{29}=y;\ y=-2$

(b) $\frac{6y-5}{2y}=\frac{7}{9};\ 9(6y-5)=7\times 2y;\ 54y-45=14y$

$54y-14y=45;\ 40y=45;\ y=\frac{45}{40}=\frac{9}{8}$

(c) $\frac{4x+7}{9-3x}=\frac{1}{4};\ 4(4x+7)=9-3x$

$16x+28=9-3x;\ 16x+3x=9-28;\ 19x=-19$

$x=\frac{-19}{19}=-1$

(d) $=\frac{3x}{5x+2}=-2;\ 3x=-2(5x+2);\ 3x=-10x-4;\ 13x=-4$

$x=\frac{-4}{13}$

## Exercise 7.2

**1.** Let the first even number = $2x$ Second even number = $2x+2$

Third even number = $2x+4$

According to Questions

$2x+2x+2+2x+4=36$

$6x+6=36;\ 6x=36-6;\ 6x=30;\ x=\frac{30}{6}=5$

$\therefore$ First number $= 2x = 2\times 5 = 10$

Second number $= 2x + 2 = 2\times 5 + 2 = 12$

Third number $= 2x + 4 = 2\times 5 + 4 = 14$

**2.** Let the length of the rectangle $= x$

Breadth of the rectangle $= \frac{2}{3}x$

Perimeter of rectangle $= 180$ m

According to question

$2(L + B) = 180;\ 2\left(x + \frac{2}{3}x\right) = 180$

$2\left(\frac{3x + 2x}{3}\right) = 180;\ 2\times\frac{5x}{3} = 180;\ 10x = 3\times 180;\ x = \frac{3\times 180}{10} = 54$

$\therefore$ Length of the rectangle is 54 m

Breadth of the rectangle $= \frac{2}{3}\times 54 = 36$

**3.** Let the first number be $x$

Second number be $200 - x$

According to question

$\frac{1}{3}x = \frac{1}{2}(200 - x);\ \frac{2x}{3} = 200 - x;\ 2x = 600 - 3x;\ 2x + 3x = 600$

$5x = 600;\ x = \frac{600}{5} = 120$

$\therefore$ First part ₹120 Second part =₹180

**4.** Let my age 4 years ago is $x$

Father's age 4 years ago is $4x$

According to question

$x + 4 + 4x + 4 = 53;\ 5x + 8 = 53;\ 5x = 53 - 8;\ 5x = 45;\ x = 9$

$\therefore$ Mine Present age is $9 + 4 = 13$ years

Father's age is $4x + 4 = 4\times 9 + 4 = 36 + 4 = 40$ years

**5.** Let Ashu's age is $x$ Ashu's Mothers age is $4x$

According to question

$4x + 5 = 3(x + 5);\ 4x + 5 = 3x + 15;\ 4x - 3x = 15 - 5;\ x = 10$

$\therefore$ Ashu's age is 10 years

Mother's age is 40 years

**6.** Let the age of Ritesha is $x$ years

Akshay's age is $(x + 9)$ years

According to question

$10 + x + 9 = 2(x - 10)$; $x + 19 = 2x - 20$; $2x - x = 19 + 20$; $x = 39$

$\therefore$ Ritesha's present age is 39 years

Akshay's age is $39 + 8 = 47$ years

**7.** Let the digit at units place is $x$

Let the digit at tens place is $9 - x$

Original number $= 10(9 - x) + x$

Sum of 2-digit number $= 90 - 10x + x = 90 - 9x$

Interchanging digits

New number $= 10 \times x + (9 - x) = 10x + 9 - x = 9x + 9$

According to the question

$9x + 9 = 27 + 90 - 9x$; $9x + 9 = 117 - 9x$; $9x + 9x = 117 - 9$

$18x = 108$; $x = 6$

Unit's Place digit is 6 Tens place digit is $9 - 6 = 3$

$\therefore$ Number is 36

**8.** Let Monu's Mothers age is $x$ years

Monu's age is $\frac{1}{5}x$; $\frac{1}{3}(x + 5) = \frac{1}{5}x + 5$; $\frac{1}{3}x + \frac{5}{3} = \frac{x + 25}{5}$

$5(x + 5) = 3(x + 25)$; $5x + 25 = 3x + 75$; $5x - 3x = 75 - 25$

$2x = 50$; $x = 25$

$\therefore$ Mother's age is 25 yeas

Monu's age is $\frac{1}{5} \times 25 = 5$ years

**9.** Let the number be $x$

According to question

$5x + 10 = 40$; $5x = 40 - 10$; $5x = 30$; $x = 6$

**10.** Let the number to be subtracted is $x$

According to question

$4 \times \frac{3}{5} - x = \frac{1}{5}$; $\frac{12}{5} - \frac{1}{5} = x$; $\frac{11}{5} = x$

**11.** Let the number be $x$

According to question

$3x - 60 = 90$; $3x = 90 + 60$; $3x = 150$; $x = 50$

**12.** Let the number of 5 – rupees coins = $x$

Number of 2-rupees coins = $3x$

$5x + 6x = 77;\ 11x = 77;\ x = \frac{77}{11} = 7$

Number of 5 rupees coins = 7

Number of 2-rupees coins = $3 \times 7 = 21$

**13.** Let Monu's age 5 years ago was $x$ years

$x + 15 = 5(x - 5);\ x + 15 = 5x - 25;\ 5x - x = 15 + 25;\ 4x = 40$

$x = \frac{40}{4} = 10$

$\therefore$ Monu's present age is 10 years.

**14.** Let the number be $x$

According to questions

$8\left(x - \frac{5}{2}\right) = 3x;\ 8x - \frac{5}{2} \times 8 = 3x;\ 8x - 20 = 3x;\ 8x - 3x = 20$

$5x = 20;\ x = 4$

**15.** Let the age of granddaughter is $x$ years.

Grandfather's age is $x + 60$

$x + 60 = 11x;\ 11x - x = 60;\ 10x = 60;\ x = \frac{60}{10} = 6$

$\therefore$ granddaughter's age = 6 years

Grand father's age = 60 + 6 = 66 years

**16.** Let the digit at unit's place = $x$

Ten's place digit = $x + 3$

original number = $10(x + 3) + x = 10x + 30 + x = 11x + 30$

Interchanging digit

New number = $10x + x + 3 = 11x + 3$

According to question

$11x + 30 + 11x + 3 = 143;\ 22x + 33 = 143;\ 22x = 143 - 33$

$22x = 110;\ x = \frac{110}{22} = 5$

Unit's place digit is 5

Ten's place digit is 5 + 3 = 8

Original number = 85

## Exercise 8.1

**1.** (a) $25.5\% = \frac{255}{10\times100} = \frac{51}{200}$; 51 : 200; 0.255

(b) $17\frac{3}{5}\% = \frac{88}{5}\times\frac{1}{100} = \frac{22}{125}$; 22:15; 0.176

(c) $0.007\% = \frac{7}{1000\times100} = \frac{7}{100000}$; 7 : 100000; 0.00007

(d) $390\% = \frac{390}{100} = \frac{39}{10}$; 39 : 10 = 3.9

(e) $13\% = \frac{13}{100}$; 13:100; 0.13

(f) $\frac{21}{80}\% = \frac{21}{80}\times\frac{1}{100} = \frac{21}{8000}$; 21 : 8000; 0.002625

(g) $0.375\%\frac{375}{1000}\times\frac{1}{100} = \frac{3}{800}$; 3: 800; 0.00375

(h) $2.05\% = \frac{205}{100\times100} = \frac{41}{2000}$; 41 : 2000; 0.0205

**2.** (a) $0.8 = 0.8\times100 = 80\%$ (b) $0.75 = 0.75\times100 = 75\%$

(c) $0.03 = 0.03\times100 = 3\%$ (d) $0.005 = 0.005\times100 = 0.5\%$

(e) $7.12 = 7.12\times100 = 712\%$ (f) $11.80 = 11.80\times100 = 1180\%$

(g) $132.125 = 132.125\times100 = 13212.5\%$

(h) $1.003 = 1.003\times100 = 100.3\%$

**3.** (a) $5.6\% = \frac{56}{10\times100} = \frac{28}{500} = 0.056$

(b) $0.03\% = \frac{3}{100\times100} = \frac{3}{10000} = 0.0003$

(c) $0.3\% = \frac{3}{10\times100} = \frac{3}{1000}$

(d) $32\% = \frac{32}{100} = \frac{8}{25}$

## Exercise 8.2

**1.** (a) 20% of ₹100; $\frac{20}{100}\times1000 = ₹200$

(b) 70% of 1440 l $= \frac{70}{100}\times1440 = 1008$ l

(c) 135% of 80 cm $= \frac{135}{100}\times80 = 1.08$ cm

(d) 15% of 400 days; $\frac{15}{100} \times 400 = 60$ days

(e) 32% of ₹ 850; $\frac{32}{100} \times 850 =$ ₹272

(f) 75% of 20 km $= \frac{75}{100} \times 20 = 15$ km

**2.** (a) 200% of $x = 550$; $\frac{200}{100} \times x = 550$

$x = \frac{550 \times 100}{200} = 275$

(b) $\frac{3}{2}$% of $x = 99$; $\frac{3}{2} \times \frac{1}{100} \times x = 99$

$x = \frac{99 \times 2 \times 100}{3} = 6600$

(c) $x$% of 500= 25; $\frac{x}{100} \times 500 = 25$; $x = \frac{25}{5} = 5\%$

$x = 18 \times 4 = 72\%$

(d) $x$% of 25 is 18; $\frac{x}{100} \times 25 = 18$; $x = 18 \times 4 = 72\%$

(e) 0.5% of $x = 3$; $\frac{5}{10} \times \frac{1}{100} \times x = 3$

$x = \frac{3 \times 10 \times 100}{5} = 600$

(f) 2.9% of $x = 58$; $\frac{29}{10 \times 100} \times x = 58$

$x = \frac{58 \times 10 \times 100}{291} = 2000$

**3.** Saving per month =₹500, Let the total salary =₹$x$

Expenditure is $x - 500$

According to question

80% of $x = x - 500$; $\frac{80}{100} \times x = x - 500$; $80x = 100(x - 500)$

$80x = 100x - 50000$; $100x - 80x = 50000$; $20x = 50000$

$x = \frac{50000}{20} = 2500$

$\therefore$ Total monthly salary is ₹ 2500

**4.** Let the strength of the school in first year = $x$

$x + 30\%$ of $x = x + \frac{30}{100} x = \frac{130x}{100}$

School strength in second year $= x - \frac{10}{100}x$

$= \frac{130x}{100} = 10\%$ of $\frac{130x}{100}$

According to question

$1404 = \frac{130x}{100} - \frac{10}{100} \times \frac{130x}{100}$; $1404 = \frac{130x}{100}\left[1 - \frac{10}{100}\right]$

$1404 = \frac{130x}{100}\left[\frac{100-10}{100}\right]$; $1404 = \frac{130x}{100} \times \frac{90}{100}$

$\frac{1404 \times 100 \times 100}{130 \times 90} = x$; $x = 1200$

$\therefore$ Original strength of the school is 1200.

**5.** Let the maximum marks = $x$

Passing marks = 210

According to Question

$\frac{30}{100} \times x = 210$; $x = -\frac{210 \times 100}{30} = 700$

$\therefore$ Maximum marks be 700 marks

**6.** Let the number be $x$

$x + \frac{10}{100}x + x - \frac{10}{100}x = 100$; $2x = 100$; $x = 50$

**7.** Let the number be $x$

$x + \frac{10}{100}x = \frac{110x}{100}$; $x = \frac{110x}{100} - \frac{10}{100} \times \frac{110x}{100}$

$x = \frac{110x}{100}\left[1 - \frac{10}{100}\right]$; $x = \frac{110x}{100} \times \frac{90}{100}$

**8.** Mohan's income = ₹10,000

Savings $= \frac{15}{100} \times 10{,}000 =$ ₹1500

Increased income $= 10{,}000 + \frac{20}{100} \times 10{,}000 = 10{,}000 + 2000 =$ ₹12000

Increased savings $= \frac{30}{100} \times 12000 =$ ₹3600

$\therefore$ Money saved more = ₹3600 − ₹1500 = ₹2100

**9.** Total calories = 3900

Proteins $= \frac{20}{100} \times 3900 =$ ₹780

Carbohydrates $= \frac{65}{100} \times 3900 = ₹2535$

Fats $= \frac{10}{100} \times 3900 = 390$; Other things $= \frac{5}{100} \times 3900 = 195$

**10.** Let the income of Sunil $= x$

Anil's income is $= x - \frac{10}{100} x = \frac{90x}{100}$

Percentage of Sunil's income $= \frac{100}{9}\%$

**11.** Let the third Person gets $= x$

Second person gets $= \frac{60}{100} \times x = \frac{60x}{100}$

First person $= \frac{40}{100} \times \frac{6x}{10} = \frac{24x}{100}$

According to question

$x + \frac{60x}{10} + \frac{24x}{100} = 5152; \frac{100x + 6x + 24x}{100} = 5152$

$184x = 5152 \times 100; x = \frac{5152 \times 100}{184} = ₹2800$

Third person gets ₹ 2800

Second person gets $= \frac{60}{100} \times 2800 = ₹1680$

First person gets $= \frac{40}{100} \times 1680 = ₹672$

**12.** First year value of the car $= 22500 - \frac{20}{100} \times 22500$

$= 22500 - 4500 = ₹18000$

Second year value of the car

$= 18000 - \frac{20}{100} \times 18000 = 18000 - 3600 = ₹14400$

**13.** Present value of machine $= ₹38,700$

Let the value of machine one year ago $= x$

According to question

$x \frac{-10}{100} x = 38700; \frac{90x}{100} = 38700; x = \frac{38700 \times 100}{90}; x = ₹43000$

$\therefore$ Value of the machine

One year ago was ₹ 43,000

**14.** Let the price of a commodity = $x$

Increased price = $x + \frac{10}{100} \times x = \frac{110x}{100}$

Percentage by which a lady reduce her

Consumption so that expenditure

Does not increase = $\frac{100}{11}\%$

**15.** Let the original number of passengers = $x$

Number of passengers got down at station $X = \frac{40}{100} \times x$

Number of passengers got down at station $Y = \frac{75}{100}\left(x - \frac{40}{100}x\right)$

Number of passengers got down at $z = 12$

According to question

$\frac{40}{100} \times x + \frac{75}{100}\left(\frac{60}{100}x\right) + 12 = x;\ \frac{40}{100}x + \frac{4500}{10000}x + 12 = x$

$x - \frac{40}{100}x - \frac{45x}{100} = 12;\ \frac{100x - 40x - 45x}{100} = 12$

$\frac{15x}{100} = 12;\ x = \frac{12 \times 1000}{15} = 80$

$\therefore$ Original number of passengers is 80.

## Exercise 8.3

**1.** Cost of defective T.v. ₹10000

SP of TV = $10{,}000 - \frac{30}{100} \times 10000 = 10000 - 3000 = 7000$

Further reduce price = $7000 - \frac{10}{100} \times 7000 = 7000 - 700 = ₹6300$

**2.** Cost price of car = 175000; Repairs on car = ₹15000

Total cost price of car = ₹1,90,000

Selling price of car = ₹2,50,000

Profit = ₹2,50,000 – 1,90,000 = 60,000

Profit % = $\frac{\text{Profit}}{\text{CP}} \times 100 = \frac{60000}{190000} \times 100 = \frac{600}{19} = 31.58\%$

**3.** Let the cost price = ₹$x$

Selling price = ₹1100; Profit = $\frac{1}{10} \times x = \frac{x}{10}$

According to question

$CP = SP - P$

$x = 1100 - \frac{x}{10}$; $x + \frac{x}{10} = 1100$; $\frac{10x + x}{10} = 1100$; $\frac{11x}{10} = 1100$

$x = \frac{1100 \times 10}{11} = ₹1000$

$\therefore$ $CP = ₹1000$; Profit $= \frac{1}{10} \times 1000$

Profit % $= \frac{\text{Profit}}{\text{CP}} \times 100$; Profit % $= \frac{100}{1000} \times 100 = 10\%$

**4.** CP of 80 articles = 2400

Profit % = 20%

SP $= \text{CP}\left(\frac{100 + \text{Profit}\%}{100}\right)$; SP $= 2400\left(\frac{100 + 20}{100}\right)$

$= 2400 \times \frac{120}{100} = ₹2880$

$\therefore$ SP of 80 articles $= ₹2880$

SP of 1 article $= ₹2880 \div 80 = ₹36$

**5.** SP of chair $= ₹448$

Profit = 12%

CP $= \frac{SP \times 100}{100 + p\%} = \frac{448 \times 100}{100 + 12} = \frac{44800}{112} = ₹400$

**6.** Profit of selling 120 mangoes = CP of 20 mangoes

Let the CP of one mango $= ₹x$

CP of 20 mangoes $= ₹20x$

Profit $= ₹20x$

CP of 120 mangoes $= ₹120x$

Profit % $= \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{20x}{120x} \times 100 = \frac{2000}{120} = 16.67\%$

**7.** SP of 10 copies = CP of 15 copies

Let the CP of 1 copy $₹x$ CP of 15 copies $= ₹15x$

CP of 10 copies $= ₹10x$ $\therefore$ SP of 10 copies $= ₹15x$

Profit $= Sp - CP = 15x - 10x = 5x$

Profit % $= \frac{\text{Profit}}{\text{CP}} \times 100 = \frac{5x}{10x} \times 100 = \frac{100}{2} = 50\%$

**8.** Gain% = 12%

New Gain % = 14%

Let the CP of toy = ₹$x$

$SP = \frac{CP(100 + P\%)}{100}$

$SP = x\left(\frac{100+12}{100}\right)$; $SP = \frac{112x}{100}$

Increased $SP = \frac{112x + 33}{100}$; $CP = \frac{SP + 100}{100 + p\%}$; $x = \frac{\frac{112x}{100} + 33 + 100}{100 + 14}$

$114x = \frac{112x}{100} + 33 + 100$; $114x = \frac{112x + 3300 + 10000}{100}$

$11400x = 112x + 13300$; $11400x - 112x = 13300$

$11288x = 13300$

**9.** CP of 11 toffees = ₹10; Sp of 11 toffees = ₹11

CP of 9 toffees = ₹10; SP of 9 toffees = ₹9

SP of 20 toffees = ₹20; Loss % $= \frac{\text{Loss}}{\text{CP}} \times 100$

**10.** Cost of repairing = ₹75000; Let the CP of house = $x$

Profit = 30%; Total Cost price = $x + 75000$

SP = 5,00,000; $CP = \frac{SP \times 100}{100 + p\%}$

$x + 75000 = \frac{500000 \times 100}{100 + 30}$

$130(x + 75000) = 50000000$; $130x + 9750000 = 50000000$

$130x = 50000000 - 9750000$; $130x = 40250000$; $x = \frac{40250000}{130}$

$x$ = ₹309615.38

**11.** Gain = 5%

## Exercise 8.4

**1.** Let the marked price = ₹$x$; Discount = 5%

CP of an article = ₹380

SP of an article $= ₹380 + \frac{20}{100} \times 380 = 380 + 76 =$ ₹456

Marked price $= \frac{100 \times SP}{100 - D\%}$; $x = \frac{100 \times 456}{100 - 5}$; $95x = 45600$

$x = \frac{45600}{95} = ₹480$

**2.** Let the CP be ₹ $x$; Marked price = ₹480

Discount = 25% ; SP = $x + \frac{15}{100}x$

$Sp = \frac{MP(100 - D\%)}{100}$; SP = $\frac{480(100 - 25)}{100}$

SP = $\frac{48000 - 12000}{100}$; SP = ₹360

SP = $360 + \frac{15}{100} \times 360$; SP = 360 + 54

SP = ₹414

**3.** Marked Price of washing machine = ₹8500

Discount = 20% and 10%

Selling price of washing machine after 20% discount

$= 8500 - 8500 \times \frac{20}{100} = 8500 - 1700 = ₹6800$

Selling price of washing machine after

10% discount = $6800 - \frac{10}{100} \times 6800 = ₹6800 - 680 = ₹6120$

**4.** Discount = 10% ; Profit = 20%

Let the CP = ₹$x$; Marked price = 800

$SP = \frac{MP(100 - D\%)}{100}$; SP = $\frac{800(100 - 10)}{100} = 800 - 80 = ₹720$

CP = $\frac{SP \times 100}{100 + p\%}$; CP = $\frac{720 \times 100}{100 + 20} = \frac{72000}{120} = ₹600$

∴ Cost Price = ₹600

**5.** SP of chair = ₹500

Successive discounts = 10% and 5%

Ist Disc @ 5% Marked price = $\frac{100 \times SP}{100 - D\%}$

$= \frac{100 \times 500}{100 - 5} = \frac{50000}{95} = ₹526.315$

2nd Disc @ 10% Marked price = $\frac{100 \times SP}{100 - D\%}$

$$= \frac{100 \times 526.315}{100 - 10} = \frac{52631.57}{90}$$

Marked price = ₹584.795

**6.** Let the Listed price be ₹ $x$

Discount = 10% ; Profit = 20%

**7.** Discount = 40% ; Profit % = 40%

Profit = ₹300; $\frac{\text{Profit}}{\text{CP}} \times 100 = 40\%$

$\frac{300}{CP} \times 100 = 40$; $\frac{300 \times 100}{40} = \text{CP}$

CP = ₹750; SP = CP + Profit

SP = ₹750 + 300 = ₹1050

Marked price = $\frac{100 \times SP}{100 - D\%} = \frac{100 \times 1050}{100 - 40} = \frac{105000}{60}$ = ₹1750

**11.** SP of table = ₹1200; Let the marked price = $x$

1st discount = 10% ; Discount 10% on $x = \frac{10}{100} \times x = \frac{x}{10}$

Remaining Amount = $x - \frac{x}{10} = \frac{10x - x}{10} = \frac{9x}{10}$

2nd Discount = 5%

Discount = 5% on $\frac{9x}{10}$; SP = $\frac{9x}{10} - \frac{9x}{200}$; $1200 = \frac{180x - 9x}{200}$

$1200 = \frac{171x}{200}$; $\frac{1200 \times 200}{171} = x$; $x$ = ₹1403.508

## Exercise 9.1

**1.** Principal for first year= ₹2000

Rate = 10% p.a.; Time = 2 years

Interest for the first year = $\frac{P \times R \times T}{100} = \frac{2000 \times 10 \times 1}{100}$ = ₹200

= Principal for second year

= ₹ 2000 + ₹ 200 = ₹2200

Interest for the second year

$= \frac{2200 \times 10 \times 1}{100}$ = ₹220

Compound Interest at the end of the second year

= ₹200 + 220 = ₹420

**2.** Principal for the first year = 1000

Time = 2 years; Rate = 4% p.a.

Interest for the first year = $\frac{P \times R \times T}{100} = \frac{1000 \times 4 \times 2}{100} = ₹40$

Principal for the second year = 1000 + 40 = ₹1040

Interest for second year = $\frac{1040 \times 4 \times 1}{100} = ₹41.6$

Compound Interest at the end of second year

= ₹40 + 41.6 = ₹81.60

**3.** Principal for the first year = ₹2000

Rate = 4% p.a.; Time = 3 years

Interest for first year = $\frac{2000 \times 4 \times 1}{100} = ₹80$

Principal for second year = ₹2000 + ₹80 = ₹2080

Interest for second year = $\frac{2080 \times 4 \times 1}{100} = ₹83.2$

Principal for third year = ₹2080 + 83.2 = 2163.2

Interest for third year = $\frac{2163.2 \times 4 \times 1}{100}$ = ₹86.528

Compound Interest at the end of third year

= ₹80 + ₹ 83.2 + ₹ 86.52 = ₹ 249.72

**4.** Principal for first year= ₹2000

Rate = 5% P.a. Time = 2 years

Interest for first year = $\frac{2000 \times 5 \times 1}{100} = ₹100$

Principal for second year = ₹2000 + ₹100 = ₹2100

Interest for second year = $\frac{2100 \times 5 \times 1}{100} = 105$

Principal for second year = ₹2100 + ₹105 = ₹2205

∴ Amount for second year = 2205

**5.** Principal for first year = ₹2000

Rate = 5% p.a.; Time = 3 years

Interest for first year = $\frac{2000 \times 5 \times 1}{100} = ₹100$

Principal for second year = ₹2000 + ₹100 = ₹2100

Interest for second year $= \frac{2100 \times 5 \times 1}{100} = ₹105$

Principal for third year $= ₹2100 + 105 = ₹2205$

Interest for third year $= \frac{2205 \times 5 \times 1}{100} = ₹110.25$

Compound Interest at the end of third year

$= ₹100 + ₹105 + ₹110.25 = ₹315.25$

**Exercise 9.2**

**1.** Principal $= ₹64000$; Rate = 25%

Time = 3 years; Amount $= P\left(1 + \frac{R}{100}\right)^3$

$= 64000\left(1 + \frac{25}{100}\right)^3 = 64000\left(\frac{125}{100}\right)^3 = 64000 \times \frac{125}{100} \times \frac{125}{100} \times \frac{125}{100}$

$= ₹125000$; C.I. = A-P $= ₹125000 - 64000' = ₹\,61000$

**2.** Principal $= ₹2400$; Rate = 20% p.a.

Time = 3 years; Amount $= P\left(1 + \frac{R}{100}\right)^n$

$= 2400\left(1 + \frac{20}{100}\right)^3 = 2400\left(\frac{120}{100}\right)^3 = 2400 \times \frac{120}{100} \times \frac{120}{100} \times \frac{120}{100}$

$= ₹4147.2$

C.I. $= A - P = ₹4147.2 - ₹2400 = ₹1747.2$

**3.** Principal $= ₹\,12000$; Time = 2 years

Time for half yearly = 4 half years

Rate= 20% p.a.; Rate half yearly $= \frac{20}{2} = 10\%$

Amount $= P\left(1 + \frac{R}{100}\right)^n = 12000\left(1 + \frac{10}{100}\right)^4 = 12000\left(\frac{110}{100}\right)^4$

$= 12000 \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} \times \frac{110}{100} = \frac{175692}{10} = 17569.2$

C.I. $= A - P = ₹17569.2 - 12000 = ₹5569.2$

**4.** (a) Principal $= ₹4000$; Rate = 5%

Time = 2 years

Amount $= P\left(1 + \frac{R}{100}\right)^n = 4000\left(1 + \frac{5}{100}\right)^2 = 4000\left(\frac{105}{100}\right)^2$

$$= 4000 \times \frac{105}{100} \times \frac{105}{100} = 4410$$

C.I. $= A - P =$ ₹4410 − 4000 = ₹410

(b) Principal = ₹5000; Rate = 8%

Time = 3 years; $A = P\left(1 + \frac{R}{100}\right)^n$

$$= 5000\left(1 + \frac{8}{100}\right)^3 = 5000\left(\frac{108}{100}\right)^3 = 5000 \times \frac{108}{100} \times \frac{108}{100} \times \frac{108}{100}$$

$$= \frac{157464}{25} = ₹6298.56$$

**5.** Principal = ₹7200; Time = 2 years

Rate = 5% p.a.; Amount $= P\left(1 + \frac{R}{100}\right)^n$

$$= 7200\left(1 + \frac{5}{100}\right)^2 = 7200\left(\frac{105}{100}\right)^2 = 7200 \times \frac{105}{100} \times \frac{105}{100}$$

$$= 18 \times 21 \times 21 = 7938$$

C.I. = A − P = ₹7938 − ₹7200 = ₹738

**6.** Principal = ₹ 25000; Time = 3 years

Rate = 15% p.a.; Amount $= P\left(1 + \frac{R}{100}\right)^n$

$$= 25000\left(1 + \frac{15}{100}\right)^3 = 25000\left(\frac{115}{100}\right)^3 = 25000 \times \frac{115}{100} \times \frac{115}{100} \times \frac{115}{100}$$

$$= \frac{304175}{8} = ₹38021.875$$

C.I. $= A - P =$ ₹38021.875 − 25000 = ₹ 13021.875

**7.** Principal = ₹12500

Rate = 8% P.A.

Time = 6 months; Quarterly Rate $= \frac{8}{4} = 2\%$

Time $= \frac{1}{2} \times 4 = 2$ Quarters; Amount $= P\left(1 + \frac{R}{100}\right)^n$

$$= 12500\left(1 + \frac{2}{100}\right)^2 = 12500\left(\frac{102}{100}\right)^2 = 12500 \times \frac{102}{100} \times \frac{102}{100}$$

$$= \frac{52020}{4} = ₹13005$$

C.I. = A − P = ₹13005 − ₹12500 = ₹505

## Exercise 9.3

**1.** Principal = ₹4000 Time = $\frac{3}{2}$ years

Time half yearly = $\frac{3}{2}\times 2 = 3$ half yearly

Rate = 10% p.a. Rate half yearly = $\frac{10}{2} = 5\%$

Amount = $P\left(1+\frac{R}{100}\right)^n$

$= 4000\left(1+\frac{5}{100}\right)^3 = 4000\left(\frac{105}{100}\right)^3 = 4000\left(\frac{105}{100}\times\frac{105}{100}\times\frac{105}{100}\right)$

$= \frac{9261}{2}$ = ₹4630.5

C.I. = A – P = ₹4630.5 – 4000 = ₹630.50

**2.** Principal = ₹2560 Rate = $\frac{25}{2}$ % p.a.

Half yearly interest rate = $\frac{25}{2}\times\frac{1}{2} = \frac{25}{4}$

Time = 2 half years Amount = $P\left(1+\frac{R}{100}\right)^n$

$= 2560\left(1+\frac{25}{4\times 100}\right)^2 = 2560\left(\frac{400+25}{400}\right)^2 = 2560\left(\frac{425}{400}\right)^2$

$= 2560\times\frac{425}{400}\times\frac{425}{400}\times\frac{425}{400} = ₹\frac{122825}{40}$ = ₹3070.625

C.I = A – P = ₹3070.625 – 2560 = ₹510.62

**3.** Principal = ₹500 Rate = 10% p.a.

Half yearly rate of interest = $\frac{10}{2} = 5\%$

Time = 2 half years

Amount = $P\left(1+\frac{R}{100}\right)^n = 500\left(1+\frac{5}{100}\right)^2 = 500\times\frac{105}{100}\times\frac{105}{100}$

$= \frac{2205}{4}$ = ₹551.25

C.I. = A – P = ₹ 551.25 – 500 = ₹51.25

**4.** Principal = ₹10000 Rate = 8% p.a.

Half yearly rate of interest $= \frac{8}{2}\% = 4\%$

Time = 2 half years

Amount $= P\left(1+\frac{R}{100}\right)^n = 10000\left(1+\frac{4}{100}\right)^2 = 10000\left(\frac{104}{100}\right)^2$

$= 10000 \times \frac{104}{100} \times \frac{104}{100} = ₹10816$

C.I. = A– P = ₹10816 – 10000

= ₹816

## Exercise 9.4

**1.** Let the principal be = ₹100 Rate= 5%

Time = 2 years

Amount $= P\left(1+\frac{R}{100}\right)^n = 100\left(1+\frac{5}{100}\right)^2 = 100\left(\frac{105}{100}\right)^2 = 100 \times \frac{105}{100} \times \frac{105}{100}$

= ₹1102.5

C.I. = A – P = ₹1102.5 – 100 = 10.25

If C.I. is ₹ 10.25 then principal = ₹100

If C.I. is ₹ 1, then principal $= ₹\frac{100}{10.25}$

If C.I. is ₹ 164 then Principal $= ₹\frac{100}{10.25} \times 164 = ₹1600$

**2.** Let the principal be ₹ 100 Rate = 10% p.a.

Time $= \frac{3}{2}$ years Half yearly rate $= \frac{10}{2}\% = 5\%$

Time $= \frac{3}{2} \times 2 = 3$ Half years

Amount $= P\left(1+\frac{R}{100}\right)^n = 100\left(1+\frac{5}{100}\right)^3 = 100\left(\frac{105}{100}\right)^3 = 100\left(\frac{105}{100}\right)^3$

$= 100 \times \frac{105}{100} \times \frac{105}{100} \times \frac{105}{100} = ₹\frac{9261}{80} = ₹115.76$

C.I. = A–P

= ₹115.76 – ₹100 = ₹15.76

If C.I. is ₹ 15.76 then Principal = ₹100

If C.I. is ₹ 1 then Principal $= ₹\frac{100}{15.76}$

If C.I. is ₹ 630.50 then principal $= ₹ \frac{100}{15.76} \times 630.50 = ₹ 4000$

**3.** Principal = ₹4000 Amount = ₹4410

Rate = 5%

$\text{Amount} = P\left(1 + \frac{R}{100}\right)^n$; $4410 = 4000\left(1 + \frac{5}{100}\right)^n$

$4410 = 4000\left(\frac{105}{100}\right)^n$; $\frac{4410}{4000} = \left(\frac{105}{100}\right)^n$; $\left(\frac{21 \times 21}{20 \times 20}\right)^2 = \left(\frac{21}{20}\right)^n$

$\therefore \quad n = 2$ years

**4.** Principal for 1st year ₹ 32000

Loss = 5%

$\text{Loss} = \frac{\text{Loss}}{\text{Principal}} \times 100$; $\frac{5 \times 32000}{100} = \text{Loss}$

Loss = ₹1600

Principal for 2nd year = ₹32000 – 1600 = ₹ 30400

Profit = 10%

$\text{Profit} = \frac{10}{100} \times 30400 = ₹3040$

Principal for 3rd year = ₹30400 + 3040 = ₹33440

$\text{profit} = \frac{25}{2}\%$

$\text{Profit} = \frac{25}{2 \times 100} \times 33440 = ₹4180$

Net profit for entire period of 3 years = ₹4180 + 3040 – 1600 = ₹5620

**5.** Rate = 5% p.a.

Present population = 16000

First year increased population is $= 16000 + \frac{5}{100} \times 16000$

$= 16000 + 800 = 16800$

Second year increase population is $= 16800 + \frac{5}{100} \times 16800$

$= 16800 + 840 = 17640$

**6.** Cost of Refrigerator = ₹7812.50

Depreciation rate = 12% p.a.

Time = 3 years

First year depreciated cost will be $= ₹7812.50 - \frac{12}{100} \times 7812.50$

$= ₹7812.50 = ₹937.5 = ₹6875$

Second year depreciated cost will be $= 6875 - \frac{12}{100} \times 6875$

$= 6875 - 825 = ₹6050$

Third year depreciated cost will be $= ₹6050 - \frac{12}{100} \times 6050$

$= ₹(6050 - 726) = 5324$

**7.** No. of workers = 6400

Time = 4 years

No. of workers at the end of first year $= 6400 - \frac{25}{100} \times 6400$

$= 6400 - 1600 = 4800$

No. of workers at the end of third year $= 4800 + \frac{25}{100} \times 4800$

$= 4800 + 1200 = 6000$ workers

**8.** Do it yourself

**9.** Principal = ₹ 25 crore  Rate = 12.5% p.a.

Time = 20 years

Amount $= P\left(1 + \frac{R}{100}\right)^n = 250000000 \times \left(1 + \frac{12.5}{100}\right)^{20}$

$= 250000000\left(\frac{112.5}{100}\right)^{20}$

$= 250000000 \times 10.5451 = ₹2635000000$

C.I. = A – P = ₹ 2635000000 – ₹ 250000000 = 2385000000

**10.** Principal = ₹5.21 Crore

Time = 10 years  Rate = 4% p.a.

Amount $= P\left(1 + \frac{R}{100}\right)^n = 5.21 \text{ crore} \left(1 + \frac{4}{100}\right)^{100}$

$= 5.21 \text{ crore} \left(\frac{104}{100}\right)^{100} = 5.21 \text{ crore} \times 1.18024 = ₹ 6.1490504 \text{ Crore}$

C.I. = A.P.

= ₹6.1490504 Crore – ₹5.21 Crore

## Exercise 10 .1

**1.** (a) $\frac{5}{25}=\frac{1}{5}, \frac{7}{35}=\frac{1}{5}, \frac{11}{55}=\frac{1}{5}, \frac{18}{90}=\frac{1}{5}, \frac{48}{240}=\frac{1}{5}$

Since all the ratios are same so they vary directly.

(b) Each of these cannot be reduced with a common ratio so they do not vary directly.

(c) This does not vary directly

**2.**

| **No. of men** | 13 | $x$ |
|---|---|---|
| **Length of the Bench** | 117 | 225 |

Let the no. of men be $x$

$\frac{13}{117}=\frac{x}{225}; 13\times225=117\times x; \frac{13\times225}{117}=x; x=25$ men

**3.**

| **No. of days** | 13 | $x$ |
|---|---|---|
| **Money paid** | 806 | 1798 |

Let the no. of days be $x$

$\frac{13}{806}=\frac{x}{1798}; 13\times1798=806\times x; x=\frac{13\times1798}{806}=29$ men

**4.**

| **Length of the pole** | 72 | $x$ |
|---|---|---|
| **Length of the shadow** | 80 | 10 |

Let the length of the pole be $x$

$\frac{72}{80}=\frac{x}{10}; 72\times10=x\times80; \frac{72\times10}{80}=x; x=9$ m

**5.**

| **No. of patients** | 60 | $x$ |
|---|---|---|
| **Litres of Milk** | 1350 | 1710 |

Let the no. of patients be $x$

$\frac{60}{1350}=\frac{x}{1710}; 60\times1710=x\times1350; \frac{60\times1710}{1350}=x; x=76$ patients

## Exercise 10.2

**1.** No. of cycles = 25

Cost of one cycle = ₹500 + ₹125 = ₹625

Cost of 25 cycle = 25 × 500 = ₹12500

No. of cycles = $\frac{12500}{625}=20$ cycles

**2.** Cost of each machine =₹200

Cost of 75 machines = $75 \times 200$ =₹15000

Reduced cost of each machine = $200 - 50$ =₹150

Thus, the no. of machines are = $\frac{15000}{150} = 100$ machines

**3.** Speed of the first car = 54 km/hr

Time taken by the first car = 10 hrs

Distance covered = $54 \times 10 = 540$ km

Speed of the second car = 60 km/hr

Time taken by the second car = $x$ hrs

Disance covered = 540 km

(for instance both cars cover the same distance)

Time = $\frac{\text{Distance}}{\text{Speed}} = \frac{540}{60} = 9$ hours

**4.**

| **Time** | 8 | $5\frac{1}{3} = \frac{16}{3}$ |
|---|---|---|
| **No. of Pumps** | 4 | $x$ |

Since they vary inversely

$8 \times 4 = \frac{16}{3} \times x$; $x = \frac{8 \times 4 \times 3}{16} = 6$ pumps

**5.**

| **No. of men** | 125 | 150 |
|---|---|---|
| **No. of days** | 180 | $x$ |

$125 \times 180 = 150 \times x$; $\frac{125 \times 180}{150} = x$; $x = 150$ days

**6.**

| No. of labourers | 30 | $x$ |
|---|---|---|
| No. of days | 18 | 30 |

As, 30 labourers complete work in $18 \times 7 = 126$ hours

Let $x$ labourers needed to complete work in $6 \times 30 = 180$ hours

So, $30 \times 126 = x \times 180$; $\frac{30 \times 126}{180} = x$, $x = 21$ labourers

## Exercise 10.3

**1.** $X^{15}$ one day work = $\frac{1}{10}$

$Y^{15}$ one day work = $\frac{1}{6}$

Work done by both together in 1 day= $\frac{1}{10}+\frac{1}{6}=\frac{6+10}{60}=\frac{16}{60}$

Work done by both in 2 days = $2\times\frac{16}{60}=\frac{16}{30}$

No. of days in which x will complete the remain work = $\frac{16}{30}\times 10=\frac{16}{3}$

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

**2.** Money earned by 12 boys in 7 days =₹420

Money earned by 12 boys in 1 day = $\frac{420}{7}$ =₹60

Money earned by 1 boy in 1 day = $\frac{60}{12}$ =₹5

Now money earned by 20 boys in 6 days =₹5×₹6×₹20 =₹600

**3.**

| **No. of baskets** | 25 | 220 |
|---|---|---|
| **Days** | 70 | $x$ |

Let the number of days be $x$

$\frac{25}{70}=\frac{220}{x}$; $25\times x=220\times 70$; $x=\frac{220\times 70}{25}=61$ days

**4.**

| **Distance** | 4500 | $x$ |
|---|---|---|
| **Time** | 5 hrs | 12 |

Let the distance travelled be $x$

$\frac{4500}{5}=\frac{x}{12}$; $4500\times 12=5\times x$; $\frac{4500\times 12}{5}=x$; $x=10800$ km

**5.**

| **Men** | 56 | $x$ |
|---|---|---|
| **Days** | 40 | 14 |

Let the no. of men be $x$

It varies inversely

$56\times 40=x\times 14$; $\frac{56\times 40}{14}=x$; $x=960$ men

**6.** Aman's one day work = $\frac{1}{5}$; Salman's one day work = $\frac{1}{7}$

Work done together by Aman and Salman = $\frac{1}{5}+\frac{1}{7}=\frac{5+7}{35}=\frac{12}{35}$

Time taken to done work together = $\frac{35}{12}$ days = $2\frac{4}{12}$ days

**7.**

| **No. of baskets** | 35 | $x$ |
|---|---|---|
| **Days** | 49 | 70 |

Let the no. of baskets be $x$

They vary directly

$\frac{35}{49} = \frac{x}{70}$; $35 \times 70 = x \times 49$; $\frac{35 \times 70}{49} = x$; $x = 50$ baskets

**8.**

| **No. of men** | 12 | 4 |
|---|---|---|
| **Days** | 25 | $x$ |

They vary inversely

let the no. of days = $x$

$12 \times 25 = 4 \times x$; $\frac{12 \times 25}{4} = x$; $x = 75$ days

**9.** Work done together by A and $B = \frac{1}{15}$

B's 15 days work = $\frac{3}{5}$

B can do whole work in $15 \times \frac{5}{3} = 25$ days

So, B's one day work = $\frac{1}{25}$

Now A's one day work = $(A + B)$'s 15 day work –B's 15 day work

$= \frac{1}{15} - \frac{1}{25} = \frac{25-15}{375} = \frac{10}{375}$

Time Taken by A to finish the work is $\frac{375}{10} = 37\frac{1}{2}$ days

## Exercise 11.1

**1.** (a) Vertex – The point where the two line segments meet is called the vertex of he quadrilateral.

(b) Diagonal– The line segment which joins the opposite vertex of quadrilateral or polygon is called diagonal.

(c) Adjacent sides– The two sides having one side common, are called adjacent sides.

(d) Adjacent angles– the two angles having one side common, are called adjacent angles.

(e) Opposite sides– The two sides having no side common is called opposite sides.

(f) Opposite angles– The two angles having no common vertex, is called opposite angles.

**2.** (a) $PR$, $SQ$ (b) $PQ$, $QR$ ; $QR$, $RS$

(c) $\angle PQR$, $\angle QRS$, $\angle QRS$, $RSP$ (d) $PQ$, $SR$, $PS$, $RQ$

(e) $\angle SPQ$, $\angle SRQ$, $\angle PSR$, $\angle PQR$ (f) 4 pairs

(g) 2 pairs (h) 4 pairs

(i) 2 pairs

**3.** Let the common ratio be $x$

Four angle of the quadrilateral are $4x$, $5x$, $6x$, $9x$

$4x + 5x + 6x + 9x = 360$ (Sum of the angles of quadrilateral are 360°)

$24x = 360°$; $x = \dfrac{360}{24} = 15°$ $\therefore$ First angle is $4x = 4 \times 15° = 60°$

$5x = 5 \times 15° = 75°$; $6x = 6 \times 15° = 90°$; $9x = 9 \times 15° = 135°$

**4.** Let first, second and third angle be $x°$ each

$x + x + x + 60° = 360°$ (Sum of the angles of quadrilateral are 360°)

$3x + 60° = 360°$; $3x = 360° - 60°$; $3x = 300°$; $x = \dfrac{300°}{3} = 100°$

**5.** Three angle of quadrilateral are 90° each

Let the fourth angle be $x°$

$90° + 90° + 90° + x° = 360°$; $270° + x = 360°$; $x = 360° - 270°$; $x = 90°$

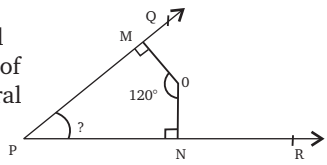
**6.** In quadrilateral PMON

$\angle P + \angle N + \angle O + \angle M = 360°$ (Sum of all the angles of quadrilateral are 360°)

$\angle P + 90° + 120° + 90° = 360°$

$\angle P = 360° - 90° - 120° - 90°$

$\angle P = 60°$



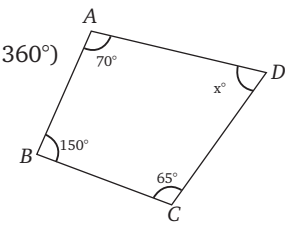

**7.** (a) $\angle A + \angle B + \angle C + \angle D = 360°$

(Sum of all the angle of quadrilateral are 360°)

$70° + 150° + 65° + x = 360°$

$285 + x = 360°$

$x = 360° - 285° = 75°$




(b) $30° + x° + 85° + 90° = 360°$

(Sum of all angle of quadrilateral are 360°)

$205° + x = 360°$; $x = 360° - 205°$; $x = 155°$

(c) $x°+120°+120°+60° = 360°$

(Sum of all angles of quadrilateral are 360°)

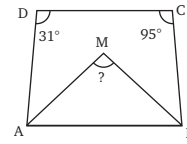
$x°+300° = 360°$; $x = 360°–300° = 60°$

(d) $120°+90°+60°+x° = 360°$

(Sum of all angles of quadrilateral are 360°)

$270°+x° = 360°$; $x = 360°–270° = 90°$

**8.** In quadrilateral ABCD




$\angle A + \angle B + \angle C + \angle D = 360°$

(Sum of all the angles of quadrilateral are 360°)

$\angle A + \angle B = 360°–95°–31°$; $\angle A + \angle B = 234°$

In $\Delta AMB$

$\angle MAB + \angle AMB + ABM = 180°$ (Sum of all angles of triangle are 180°)

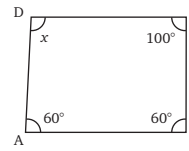
$\frac{1}{2}\angle DAB + \angle AMB + \frac{1}{2}\angle CBA = 180°$

(AM and BM are angle bisectors of $\angle A$ and $\angle B$)

$\frac{1}{2}(\angle DAB + \angle CBA) + \angle AMB = 180°$; $\frac{1}{2} \times 234 + \angle AMB = 180°$

$\angle AMB = 180°–117° = 63°$

**9.** $\angle A = 60°$; $\angle B = 60°$; $\angle C = 100°$; $\angle D = x°$

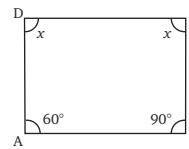



$\angle A + \angle B + \angle C + \angle D = 360°$

(Sum of all angles of quadrilateral are 360°)

$60°+60°+100°+x = 360°$; $x = 360°–220° = 140°$

**10.** $\angle A + \angle B + \angle C + \angle D = 360°$ (Sum of all angles of quadrilateral are 360°)




$60°+90°+x + x = 360°$

$150°+2x = 360°$; $2x = 360°–150°$; $2x = 210°$; $x = \frac{210}{2}$

$x = 105°$ $\therefore$ $\angle C = 105°$, $\angle D = 105°$

## Exercise 11.2

**1.** (a) $QR$ (b) $SR$

(c) $OR$ (d) 180°

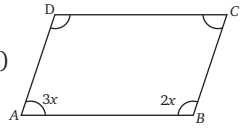
(e) $\angle R$ (f) $\angle Q$

**2.** In ||gm ABCD

$\angle A = 3x$

$\angle A = \angle C = 3x$(Opposite angles of || gm are equal)

$\angle B = 2x$




$\angle B = \angle C = 2x$ (Opposite angles of ||gm are equal)

$\angle A + \angle B + \angle C + \angle D = 360°$

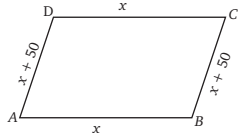
(Sum of all angles of ||gm are 360°)

$3x + 2x + 3x + 2x = 360°$; $10x = 360°$; $x = \dfrac{360°}{10} = 36°$

$\angle A = 3x = 3 \times 36° = 108°$; $\angle B = 2x = 2 \times 36° = 72°$

$\angle C = 108°$; $\angle D = 72°$

**3.** Perimeter of ||gm = 300 m




Let the adjacent sides = $x$ m

One of its side = $x + 50$

$AB + BC + CD + DA = 300$

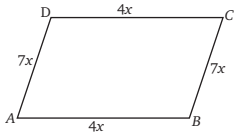
$x + x + 50 + x + x + 50 = 300$ (opposite sides of ||gm are equal)

$4x + 100 = 300$; $4x = 200$

$x = \dfrac{200}{4} = 50$ m ; $AB = 50$ m; $BC = x + 50 = 50 + 50 = 100$ m

$CD = 50$ m; $AD = 100$ m

**4.** Let the common ratio be $x$



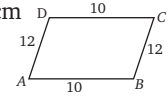

Perimeter = 44 cm

$AB + BC + CD + Da = 44$

$4x + 7x + 4x + 7x = 44$ (opposite sides of ||gm are equal)

$22x = 44$; $x = \dfrac{44}{22} = 2$ m

$\therefore$ $AB = 4x = 4 \times 2 = 8$ cm; $BC = 7x = 7 \times 2 = 14$ cm; $CD = 8$ cm




$DA = 14$ cm

**5.** $AB = 10$ cm; $BC = 12$ cm; $AB = CD = 10$ cm

$BC = DA = 12$ cm (Opposite sides of ||gm are equal)

$AB + BC + CD + DA$ = Perimeter

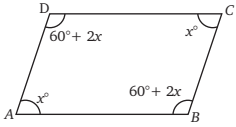
$10 + 12 + 10 + 12 = 44$ cm; Perimeter = 44 cm

**6.** Let the adjacent angle be $x°$

$\angle A = \angle C = x°$

$\angle B = \angle D = 60° + 2x$ (opposite angle of ||gm are equal)

$\angle A + \angle B + \angle C + \angle D = 360°$




$x + 60 + 2x + x + 60 + 2x = 360°$

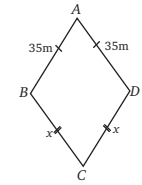
$6x + 120° = 360°$

$6x = 360° - 120°$

$6x = 240°$; $x = \frac{240°}{6} = 40°$; $\angle A = 40°$; $\angle B = 60° + 2 \times 40° = 140°$

$\angle C = 40°$; $\angle D = 140°$

**7.** $AB = 35$ m




$AB = AD = 35$ m (Adjacent sides of kite are equal)

$BC = CD = x$ m

Perimeter = 200 m

Perimeter = $AB + BC + CD + DA$

Perimeter = $35 + 35 + x + x$

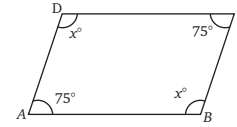
$200 = 70 + 2x$; $200 - 70 = 2x$; $130 = 2x$; $\frac{130}{2} = x$; $x = 65$ m

**8.** $\angle A = \angle C = 75°$ (Opposite angle of ||gm are equal)

$\angle B = \angle D = x°$ (Opposite angle of ||gm are equal)

$\angle A + \angle B + \angle C + \angle D = 360°$ (sum of all angles of quadrilateral are 360°)

$75° + x + 75° + x = 360°$




$150° + 2x = 360°$; $2x = 360° - 150°$; $2x = 210°$

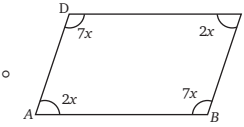
$x = \frac{210}{2}$; $x = 105°$ $\quad \therefore \angle B = \angle D = 105°$

**9.** $\angle A = \angle C = 2x$ (Opposite angle of ||gm are equal)

$\angle B = \angle D = 7x$ (Opposite angle of ||gm are equal)

$\angle A + \angle B + \angle C + \angle D = 360°$ (Sum of all angles of quadrilateral are 360°)

$2x + 7x + 2x + 7x = 360°$

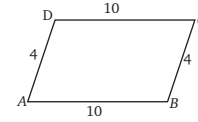



$18x = 360°$; $x = \frac{360°}{18} = 20°$

$\angle A = 2x = 2 \times 20° = 40°$; $\angle B = 7x = 7 \times 20° = 140°$

$\angle C = 40°$; $\angle D = 140°$

**10.** Let the breadth = $\frac{2}{5} \times 10 = 4$ cm

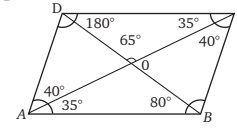



Length = 10 cm

Perimeter = $AB + BC + CD + DA$

$10 + 4 + 10 + 4 = 28$ cm

**11.** (a) $\angle ABO = \angle ODC = 80°$ (Alternate angles are equal)




$\angle A = 40° + 35° = 75°$

(Opposite angles of ||gm are equal)

$\angle C = 75°$

(b) In $\Delta DOC$

$\angle DOC = 65°$

$\angle OCD = \angle OAB = 35°$ (alternate interior angles are equal)

$\angle ODC + \angle DOC + \angle OCD = 180°$ (Sum of all angles of $\Delta$ are 180°)

$\angle ODC + 65°+35° = 180°$; $\angle ODC = 180°-100°$; $\angle ODC = 80°$

(c) $\angle ACB = \angle CAD = 40°$ (Alternate angles are equal)

(d) $\angle DAB + \angle ABC = 180°$ (Co-interior angle are supplementary)

$75°+\angle ABC = 180°$; $\angle ABC = 180°-75°$; $\angle ABC = 105°$

$\angle ABC = \angle ABO + \angle CBO$; $105° = 80°+\angle CBO$; $105°-80° = \angle CBO$

$\angle CBO = 25° = \angle CBD$

**12.** (a) In $\Delta SRQ$

$\angle RSQ + \angle SRQ + \angle QRS = 180°$ (Sum of all angles of $\Delta$ are 180°)

$30°+Z + 90° = 180°$; $Z + 120° = 180°$; $Z = 180°-120° = 60°$

$\angle SRQ = \angle SPQ = 60°$ (Opposite angle of ||gm are equal)

$\therefore$ $y = 60°$

$\angle SQR + \angle SQR = 180°$ (Linear Pair)

$x + 90° = 180°$; $x = 180°-90° = 90°$

(b) $\angle ABC = \angle ADC = 100°$(Opposite angle of ||gm are equal)

$\therefore$ $x = 100°$

$\angle DAB + \angle ABC = 180°$ (Co-interior angles are supplementary)

$30°+Z + 100° = 180°$; $130°+Z = 180°$; $Z = 180°-130° = 50°$

$\angle CAB = \angle ACD = 50°$ (Alternate interior angles are equal)

$\therefore$ $y = 50°$

(c) $\angle HEL = \angle HPL = 120°$ (Opposite angles of ||gm are equal)

$\therefore$ $y = 120°$; $y + z = 180°$ (Linear pair)

$120°+Z = 180°$; $Z = 180°-120° = 60°$

$x + 120° = 180°$ (Co interior angles are supplementary)

$x = 180°-120° = 60°$

(d) In $\Delta PLO$

$\angle PLO + \angle LPO + \angle LOP = 180°$ (Sum of all angles of $\Delta$ are 180°)

$x + y + 30° = 180°$; $90°+y + 30° = 180°$; $120°+y = 180°$

$y = 180°-120° = 60°$

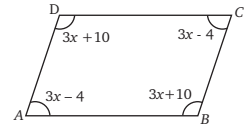
$y = z = 60°$ (Alternate interior angles are equal)

**13.** $\angle A = \angle C = 3x - 4$

$\angle B = \angle D = 3x + 10$ {Opposite angles of ||gm are equal}

$\angle A + \angle B + \angle C + \angle D = 360°$ (Sum of angles of quadrilateral are 360°)

$(3x - 4)° + (3x + 10)° + (3x - 4)° + (3x + 10)° = 360°$




$12x + 12° = 360°; 12x = 360° - 12°$

$12x = 348°; x = \frac{348°}{12} = 29°$

$\angle A = 3x - 4 = 3 \times 29° - 4° = 83°$

$\angle B = 3x + 10 = 3 \times 29 + 10 = 97°; \angle C = 83°; \angle D = 97°$

**14.** GU = SN (Opposite sides of ||gm are equal)

$3y - 1 = 23; 3y = 24; y = \frac{24}{3} = 8$ cm

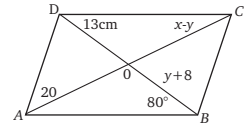
GU= $3 \times 8 - 1 = 24 - 1 = 23$ cm

GS = NU (Opposite sides of ||gm are equal)

$4x = 16; x = \frac{16}{4} = 4$ cm

(b) $DO = OB$ (diagonals of ||gm bisect each other)

and $AO = OC; DO = OB; 13 = y + 8; 13 - 8 = y$



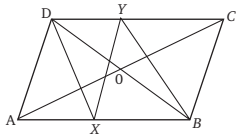

$y = 5$ cm

$OB = 5 + 8 = 13$ cm

$AO = OC; 20 = x - y; 20 = x - 5; 20 + 5 = x$

$25 = x; x = 25$ cm; $OC = 25 - 13 = 12$ cm

**15.**




(a) $OB = OD$ (Diagonals of ||gm bisect each other)

(b) $\angle OBY = \angle ODX$ (Alternate angles are equal)

(c) $\angle BOY = \angle DOX$ (Vertically opposite angles are equal)

(d) $\Delta BOY \cong \Delta DOQ$

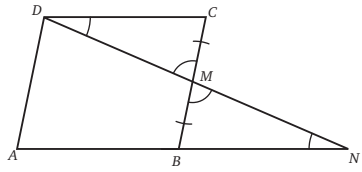
$\angle O = \angle O$ (Vertically Opp. L's)

$\angle B = \angle D$ (Alternate angles are equal)

$OB = OD$ (Diagonals bisect each other)

$\therefore$ By ASA $\Delta BOY \cong \Delta DOQ$

**16.**




$BC = AD$ (opposite sides of ||gm are equal)

$AD = 2BM$ (M is the mid point of BC)

$AB = CD$ (Opposite sides of ||gm are equal ) ...(1)

In $\Delta DMC$ and $\Delta NMB$

$\angle m = \angle m$(vertically opposite angle)

$BM = CM$ (M is the mid point of BC)

$\angle CDN = \angle BNM$ (Alternate interior angles are equal)

$\Delta DMC \cong \Delta NMB$ (By ASA)

$\therefore \quad CD = BN$ (C.P.C.T)

From Eq 1 $AB = BN$

This proves that $B$ is the mid point of AN

$\therefore \quad AN = AB + BN;\ AN = 2AB$

***Hence proved***

## Exercise 11.3

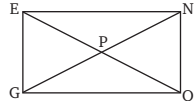
**1.** (a) False (b) False

(c) False (d) True

(e) True (f) False

(g) True

**2.** $GP = 3x + 1;\ EP = 4x - 1$




(diagonals of Rectangle are equal)

$GN = OE;\ GP + PN = EP + OP$

$3x + 1 + 3x + 1 = 4x - 1 + 4x - 1$ (Diagonals of Rectangle bisect each other)

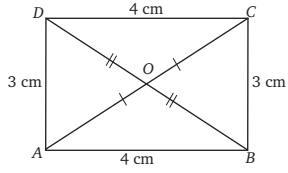
$6x + 2 = 8x - 2;\ 8x - 6x = 2 + 2;\ 2x = 4;\ x = 2$

$GP = 3x + 1 = 3 \times 2 + 1 = 7;\ EP = 4x - 1 = 4 \times 2 - 1 = 7$

**3.** (a) Parallelogram (b) Square and Rhombus

(c) Rectangle and Square

**4.** In $\Delta DAB$

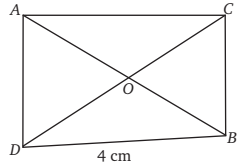



$BD^2 = AB^2 + AD^2$ (By pythagoras theorem)

$BD^2 = 4^2 + 3^2$

$BD^2 = 25$; $BD = 5$ cm; $BD = AC = 5$ cm (Diagonals of Rectangle are equal)

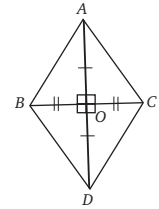
**5.** It is a || gm because diagonals of || gm bisect each other.




**6.** $AD = 6$ cm; $BC = 8$ cm

$OA = \frac{1}{2} \times 6 = 3$ cm; $OB = \frac{1}{2} \times 8 = 4$ cm

{Diagonals of Rhombus bisect each other}



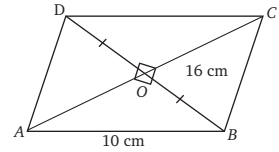

In $\Delta AOB$

$AB^2 = OA^2 + OB^2$ (By pythagoras theorem)

$AB^2 = 3^2 + 4^2$; $AB^2 = 9 + 16$; $AB^2 = 25$; $AB = 5$ cm

$AB = AC = CD = DB = 5$ cm (All sides of Rhombus are equal)

**7.** In $\Delta AOB$




$AB^2 = OB^2 + OA^2$;

$10^2 = 8^2 + OA^2$ (By Pythagoras theorem)

$100 = 64 + OA^2$;

$100 - 64 = OA^2$ (O is the mid-point of BD)

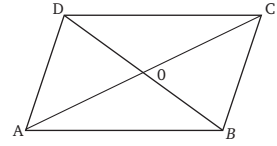
$36 = OA^2$; $OA = 6$ cm

As diagonals of the rhombus bisect each other

$OA = OC = 6$ cm

$\therefore$ $AC = OA + OC = 6 + 6 = 12$ cm

**8.** (a) To prove




$\Delta BOC \cong \Delta DOC$

In $\Delta BOC$ and $\Delta DOC$

$BC = CD$ (All sides of Rhombus are equal)

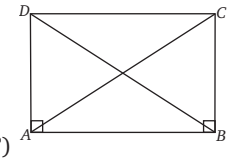
$OC = OC$ (common); $OD = OB$ (O is the mid point of BD)

$\Delta BOC \cong \Delta DOC$ (By SSS)

(b) To prove $\angle BCO = \angle DCO$

$\angle BCO = \angle DCO$ (By CPCT)

**9.** To prove: Diagonals of rectangle are equal




In $\Delta ABC$ and $\Delta BAD$

$AD = BC$ (Opposite sides of rectangle are equal)

$\angle DAB = \angle CBA = 90°$ (Each angle of rectangle is 90°)

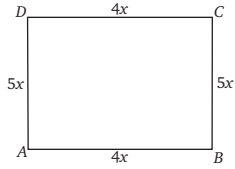
$AB = BA$

$\therefore$ $\Delta ABC \cong \Delta BAD$ (BY SAS)

$\therefore$ $AC = BD$ ***Hence proved***

**10.** $AB = CD = 4x$(Opposite sides of rectangle are equal)

$BC = AD = 5x$




Perimeter of rectangle = 180 cm

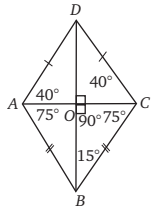
$2(l + b) = 180$; $2(4x + 5x) = 180$

$2 \times 9x = 180$; $18x = 180$; $x = \dfrac{180}{18} = 10$

$AB = 4x = 4 \times 10 = 40$ cm; $BC = 5x = 5 \times 10 = 50$ cm

**11.** No, the quadrilateral can be a rectangle or square. '

**12.** In $\Delta BOC$




$\angle BOC + \angle BCO + \angle OBC = 180°$

(sum of all angles of $\Delta$ are 180°)

$= 90° + \angle BCO + 15° = 180°$

$\angle BCO = 180° - 90° - 15° = 75°$

$\angle OCD = \angle OAD = 40°$ (Angles opposite to equal sides re equal)

$\angle BCO = \angle BAO = 75°$ (Angles opposite to equal sides are equal)

(a) To find $\angle ABC$

In $\Delta ABC$

$\angle BAC + \angle BCA + \angle ABC = 180°$ (Sum of all angles of $\Delta$ are 180°)

$75° + 75° + \angle ABC = 180°$; $\angle ABC = 180° - 150° = 30°$

(b) To find $\angle ADC$

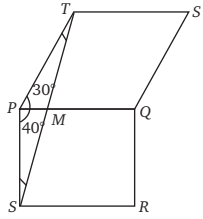
In $\Delta ADC$

$\angle ADC + \angle DAC + DCA = 180°$ (sum of all angles of $\Delta$ are 180°)

$\angle ADC + 40° + 40° = 180°$; $\angle ADC = 180° - 80° = 100°$

(c) $\angle BAD = \angle BAC + \angle DAC = 75° + 40° = 115°$

**13.** $\angle TPS = 120°$




$\angle TPM + \angle SPM = 120°$

$\angle TPM + 90° = 120°$

$\angle TPM = 120 - 90 = 30°$

$PT = PQ$ (All sides of Rhombus are equal)

$PQ = PS$ (all sides of square are equal)

$\angle PST = \angle PTS$ (angles opposite to equal sides are equal)

Let $\angle PST$ be $x$

In $\Delta PTS$

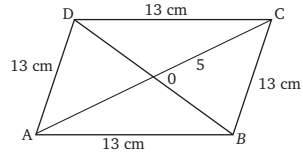
$\angle P + \angle T + \angle S = 180°$ (sum of all angles of $\Delta$ are 180°)

$120° + x + x = 180°$; $2x = 180° - 120°$; $2x = 60°$; $x = 30°$

$\therefore \quad \angle PTS = \angle PST = 30°$

**14.** In $\Delta COD$

$CD^2 = OD^2 + OC^2$ (By Pythagoras theorem As Diagonals of Rhombus bisect each other)




$13^2 = OD^2 + 5^2$

$169 = OD^2 + 25$

$144 = OD^2$

$OD = 12\,\text{cm}$

$OD = OB$ (Diagonals of Rhombus bisect each other)

$\therefore \quad OB = 12$ $\qquad\qquad$ $\therefore \quad BD = OB + OD$

$= 12 + 12 = 24\,\text{cm}$

**15.** In || gm RISK

$\angle RKS = \angle RIS$ (opposite angles of ||gm are equal)

$\angle RIS = 120°$

$\angle KRI + \angle RIS = 180°$ (Co-interior angles are supplementary)

$\angle KRI + 120° = 180°$; $\angle KRI = 60°$

$\angle KRI = \angle KSI$ (Opposite angles of 11gm are equal)

$\angle KSI = 60°$

In ||gm CLUE

$\angle CLU = \angle UEC = 70°$ (opposite angles of ||gm are equal)

In $\Delta EOS$; $\angle OES + \angle EOS + \angle OSE = 180°$

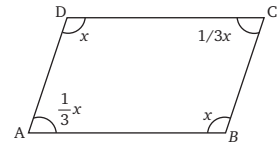
(sum of all angles of $\Delta$ are 180°)

$70° + \angle EOS + 60° = 180°$; $\angle EOS = 180° - 130°$

$\therefore \quad x° = 50°$

**16.** Let the adjacent angle be $x$

$\angle A = \angle C = \frac{1}{3}x$ (opposite angles of || gm are equal)




$\angle B = \angle D = x$

$\angle A + \angle B + \angle C + \angle D = 360°$

$\frac{1}{3}x + x + \frac{1}{3}x + x = 360°$

$\frac{x + 3x + x + 3x}{3} = 360°; \frac{8x}{3} = 360°$

**17.** $\angle A + \angle C = 200°$

$\angle A + \angle B + \angle C + \angle D = 180°$ (Sum of all angles of quadrilateral as 360°)

$(\angle A + \angle C) + (\angle B + \angle D) = 360°$

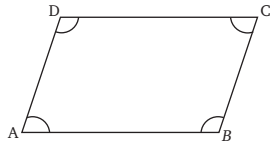
$200° + 2\angle B = 360°$ (Opposite angle of ||gm are equal)

$2\angle B = 360° - 200°$

$2\angle B = 160°$

$\angle B = 80°$

$\angle D = 80°$




$\angle A + \angle B = 180°$ (Co interior angles are supplementary)

$\angle A + 80° = 180°; \angle A = 180° - 80° = 100°$

**18.** In $\Delta MBC$

$\angle MBC + \angle MCB + \angle BMC = 180°$ (Sum of all angles of $\Delta$ are 180°)

$x + 40° + 90° = 180°; \; x = 180° - 130° = 50°$

$\angle B = \angle D = 50°$ (opposite angles of ||gm are equal)

in $\Delta NDC$;

$\angle NDC + \angle DNC + \angle DCN = 180°$ (sum of all angles of $\Delta$ are 180°)

$50° + 90° + \angle DCN = 180°; 140° + \angle DCN = 180°; \angle DCN = 40°$

$\angle DCB = \angle DCN + y + \angle MCB; \angle DCB = 40° + y + 40°; \angle DCB = 80° + y$

$\angle ADC + \angle DCB = 180°$ (co interior angles are supplementary)

$50° + 80° + y = 180°; 130° + y = 180°; y = 180° - 130° = 50°$

**19.** In ||gm QTUS

$QT = SU$ (Opposite sides of || gm are equal)

$QS = UT$; In || gm RTSU

$TR = SU$ (opposite sides of ||gm are equal)

$ST = UR; \therefore$ QT=SU=TR

Yes $QT = TR$; In ||gm PQRS

**20.** $\angle SPQ = 60°$

$\angle SPQ = \angle SRQ = 60°$ (opposite angles of || gm are equal)

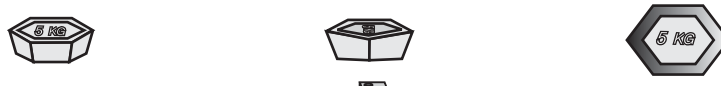
In || gm $MN \times R$

$\angle MRX = \angle MNX = 60°$ (opposite angles of || gm are equal)

$\therefore \quad \angle MNX = 60°$

## Exercise 12.1

**1.** (b)




(c)


(d)

**2.**

| | Top vew | Front view | Side view |
|---|---|---|---|
| (a) | (i) | (iii) | (ii) |
| (b) | (iii) | (ii) | (i) |
| (c) | (ii) | (iii) | (i) |
| (d) | (ii) | (iii) | (i) |
| (e) | (i) | (iii) | (ii) |

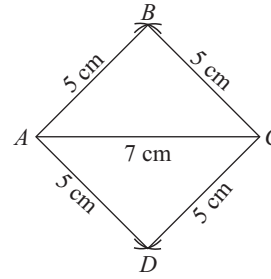
**3.**

| | Top vew | Front view | Side view |
|---|---|---|---|
| (a) | (iii) | (i) | (ii) |
| (b) | (iii) | (i) | (ii) |
| (c) | (iii) | (i) | (ii) |
| (d) | (iii) | (i) | (ii) |

## Exercise 13.1

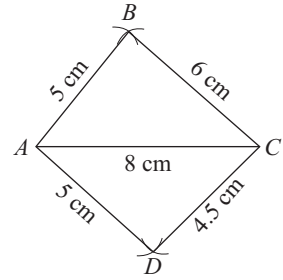
**1.** Steps of Construction

1. Draw a line $AC = 7$ cm
2. Then with $A$ as centre cut an arc of 5 cm and with C as centre cut an arc of 5 cm do that it meets the previous arc at B.
3. Then again with A as centre cut an arc of 5 cm and with C as centre cut an arc of 5 cm which meets the previous arc at D.
4. Join all the arcs and sides ABCD is the required quadrilateral.



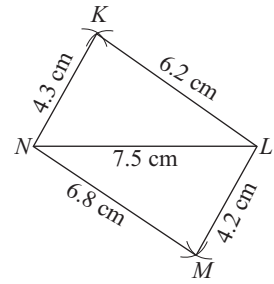
**2.** Steps of Construction

1. Draw a line $AC = 8$ cm
2. Then with $A$ as centre cut an arc of 5 cm and with C as centre cut an arc of 6 cm such that it meets the previous arc at B.
3. Then with A as centre again cut an arc of 5 cm and with C as centre cut an arc of 4.5 cm. Such that it meets the previous arc at D. Join all the arcs and sides.
4. ABCD is the required quadrilateral.



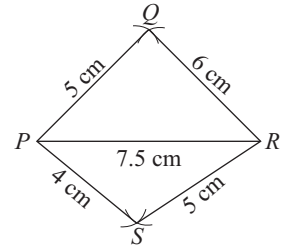

**3.** Steps of Construction

1. Draw a line of 7.6 cm = NL
2. Then with N as centre cut an arc of 4.3 cm and from L cut an arc of 6.2 cm such that it meets the previous arc at K.
3. Then with N as centre cut an arc of 6.8 cm with L as centre cut an arc of 4.2 cm. Such that it meets the previous arc at M.
4. Join all the arcs and sides, KLMN is the required quadrilateral.




**4.** Steps of construction

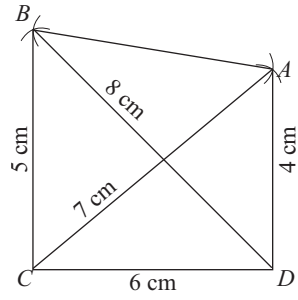
1. Draw a line $PR = 7.5$ cm
2. With $P$ as centre cut an arc of 6 cm such that it meets the previous arc at $Q$.
3. With $P$ as centre again cut an arc of 4 cm and with $R$ as centre cut an arc of 5 cm such that it meets the previous arc at 5.
4. Join all the arcs and sides. $PQRS$ is the required quadrilateral.




**5.** Not Possible

**6.** Steps of Construction

1. Draw a line $CD = 6$ cm, then with C as centre cut an arc of 7 cm and with D as centre cut an arc of 4 cm. Such that it meets the previous arc at A.
2. With $C$ as centre cut an arc of 5 cm and with $D$ as centre cut an arc of 8 cm. Such that it meets the previous arc at $B$.

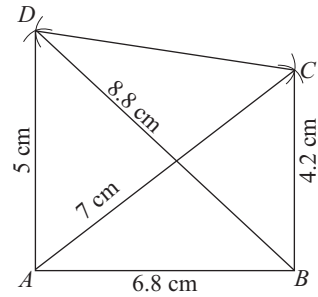


3. Join all the arcs and sides *ABCD* is the required quadrilateral.

**7.** No, it is not possible to construct a quadrilateral as the sum of its 3 angles is 360° and $LD \neq 0$ So, this quadrilateral can not be constructed.

**8.** Step of Construction

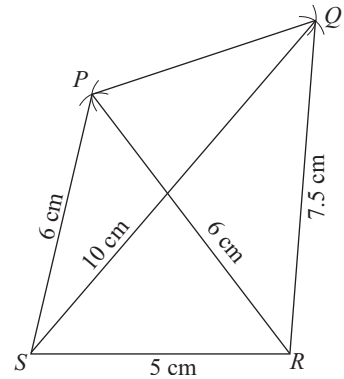
1. Draw a line $AB = 6.8$ cm
2. Then with *A* as centre, cut an arc of 7.5 cm and with *B* as centre cut an arc of 4.2 cm such that it meets the previous arc at *C*
3. Then with *A* as centre cut another arc of 5.4 cm and with *B* as centre cut an arc of 8.8 cm, such that it meets the previous arc at D.




4. Join all the sides and arcs. *ABCD* is the required quadrilateral.

**9.** Step of construction

1. Draw a line $SR = 5$ cm
2. From *S* as centre cut an arc of 10 cm and with *R* as centre cut an arc of 7.5 cm such that it meets the previous arc also.
3. With *S* as centre cut an arc of 6 cm and with *R* as centre again cut an arc of 6 cm such that it meets the previous arc at *P*.
4. Join all the arcs and sides *PQRS* is the required quadrilateral.



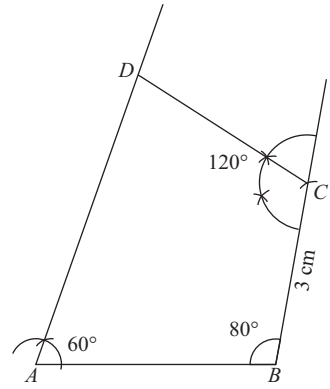

**10.** No, it is not possible because length of its one diagonal is shorter.

**11.** No, it is not possible because its sides $BC = 4$ cm and $CD = 5$ cm do not intersect

**12.** Step of construction

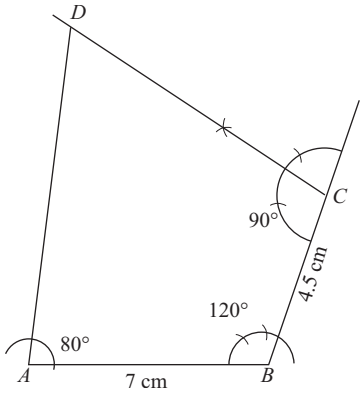
1. Draw a line $AB = 5$ cm
2. With A as centre draw an angle of 60° and with *B* as centre draw an angle of 80°. From *B* cut an arc of 3 cm at C. Now draw an angle of 120° from *C*. Join all the sides.

*ABCD* is the required quadrilateral.



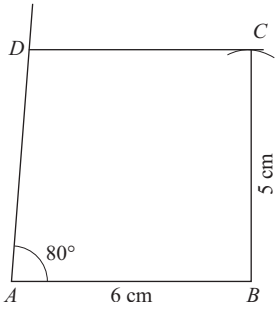
**13.** Steps of Construction

1. Draw a line $AB = 7$ cm
2. With $A$ as centre draw an angle of 80° and with $B$ as centre draw an angle of 120°.
3. With $B$ cut an arc of 4.5 cm at $C$ and from $C$ make an angle of 90°
4. Join all the sides. $ABCD$ is the required quadrilateral.



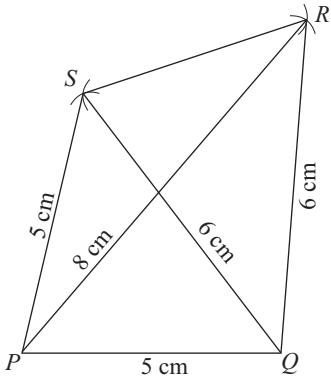

**14.** Steps of Construction

1. Draw a line $AB = 6$ cm
2. From $A$ draw an angle of 80°
3. From $B$ cut an arc of 5 cm at $C$
4. Join all the arcs and sides. $ABCD$ is the required quadrilateral.




**15.** Step of Construction

1. Draw a line $PQ = 5$ cm
2. With $P$ as a centre draw on arc of 8 cm and then $Q$ as a centre draw an arc of 6 cm such that it meets the previous arc at $R$
3. With $Q$ as a centre draw an arc of 6 cm and then $P$ as a centre draw an arc of 5 cm such that it meets the previous arc at 5.
4. Join all sides and arcs. $PQRS$ is the required quadrilateral.




## Exercise 14.1

**1.** (a) Area of rectangle $= l \times b = 5 \times 4.5; = 22.5\,\text{cm}^2$

(b) Area of rectangle $= l \times b = 7 \times 6.3\,\text{cm} = 44.1\,\text{cm}^2$

(c) Area of Rectangle $= l \times b$

$= 8 \times 4.6\,\text{m} = 36.8\,\text{m}^2$

**2.** (a) Area of square = side × side = $6.2 \times 6.2 = 38.44\ cm^2$

(b) Area of square = Side × Side = $4.8 \times 4.8 = 23.04\ cm^2$

(c) Areaof square = Side × Side = $6.5 \times 6.5 = 42.25\ cm^2$

**3.** Area of rectanglular garden = $l \times b$

Length = $0.3 \times 100 = 30$ cm; Breadth = 2 cm

Area = $30 \times 2 = 60\ cm^2$ or $0.006\ m^2$

**4.** Area of rectangular field = 8355 sq.m.

Sides of rectangle = 50 m; Other side = $\frac{835}{50} = 16.7$ m

**5.** Area of square = Side × Side = $25 \times 25 = 625\ cm^2$

**6.** Area of square = 3600 sq.m.

Side of square = $\sqrt{3600} = 60$ m

$$\begin{array}{r|l} & 60 \\ \hline 6 & 3600 \\ & -36 \\ \hline & 00 \end{array}$$

**7.** Area of Rhombus = $\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 7 \times 20 = 140\ cm^2$

**8.** Area of the outer figure= $l \times b = 40 \times 25 = 1000\ cm^2$

Area of the inner figure = $(25 - 8) \times (40 - 8) = 17 \times 32$; $544\ cm^2$

Area of shaded figure = $1000 - 544 = 456\ cm^2$

(b) Area of outer figure = $l \times b = 30 \times 17 = 510\ m^2$

Area of first Triangle = $\frac{1}{2} \times b \times h = \frac{1}{2} \times 17 \times \frac{0.02}{100} = \frac{17}{100} = 0.17\ m^2$

Area of second $\Delta = \frac{1}{2} \times b \times h = \frac{1}{2} \times 17 \times \frac{0.02}{100} = \frac{17}{100} = 0.17\ m^2$

Total area of the 2 $\Delta$'$s$ = 0.17 + 0.17 = $0.34\ m^2$

Area of shaded portion = Area of outer figure – Area of 2 $\Delta$'$s$

= $510 - 0.34 = 509.66\ m^2$

**9.** Area of an equilateral $\Delta = \frac{\sqrt{3}}{4} a^2$

Side of an equilateral $\Delta = 24$

Area = $\frac{\sqrt{3}}{4} \times 49 \times 24 \times 24 = 144\sqrt{3}\ cm^2$

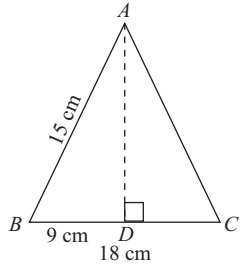
**10.** Area of an equilateral triangle = $49\sqrt{3}\ m^2$

$\frac{\sqrt{3}}{4} a^2 = 49\sqrt{3}$; $a^2 = \frac{49\sqrt{3} \times 4}{\sqrt{3}}$; $a^2 = 196$; $a = \sqrt{196} = a = 14$ m

**11.** Let AD be the Perpendicular bisector so that

$BD = DC$

$BD = \frac{1}{2}$ of $BC = \frac{1}{2} \times 18 = 9$ cm




In $\Delta ABD$

$AB^2 = AD^2 + BD^2$; $15^2 = AD^2 + 9^2$; $225 = AD^2 + 81$

$AD^2 = 144$; $AD = 12$ cm

Area of $\Delta ABC = \frac{1}{2} \times b \times h = \frac{1}{2} \times 18 \times 12 = 108$ m$^2$

**12.** Area of parallelogram = 2000 m$^2$

One of its sides = 200 m

Height of the parallelogram = $\frac{\text{Area}}{\text{Side}} = \frac{2000}{200}$

Height = 10 m

## Exercise 14.2

**1.** Area of trapezium $ABCD = \frac{1}{2} \times$ (sum of || sides) $\times h$

$= \frac{1}{2}(AB + CD) \times h = \frac{1}{2} \times (10 + 16) \times 13 = \frac{1}{2} \times 26 \times 13 = 13 \times 13 = 169$ cm$^2$

**2.** Area of trapezium $= \frac{1}{2} \times$ (sum of 11 sides) $\times h$

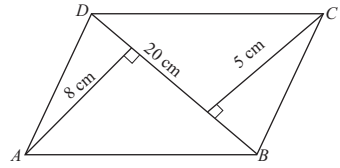
$= \frac{1}{2} \times (14 + 12) \times 20 = 26 \times 10 = 260$ cm$^2$

**3.** Area of quadrilateral = Area of $\Delta ABD$ + area of $\Delta DBC$

$= \frac{1}{2} \times b_1 \times h_1 + \frac{1}{2} \times b_2 \times h_2$

$= \frac{1}{2} \times 20 \times 8 + \frac{1}{2} \times 20 \times 5$

$= 80 + 50 = 130$ cm$^2$



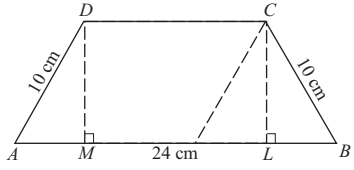

**4.** Let one of the parallel sides of trapezium be $x$, so the other becomes $3x$

Area = 84 cm$^2$, Height = 14 cm

$84 = \frac{1}{2} \times (x + 3x) \times 14$; $\frac{84 \times 2}{14} = x + 3x$; $12 = 4x$; $x = \frac{12}{4} = 3$

So, one of the parallel sides is 3 cm and the other is 9 cm

**5.** Do it yourself.



**6.** Area of trapezium $= \frac{1}{2} \times$ (sum of parallel sides) $\times h$

$= \frac{1}{2} \times (1 + 1.2) \times 0.8 = \frac{1}{2} \times 2.2 \times 0.8 = 2.2 \times 0.4 = 0.88 \text{ m}^2$

**7.** Area of trapezium = 390 $\text{cm}^2$; Let the sides be $x$

$\frac{1}{2} \times (5x + 8x) \times 6 = 390;\ 13x \times 3 = 390;\ 39x = 390$

$x = \frac{390}{39} = 10 \text{ cm}$

So, one of its parallel sides is $10 \times 5 = 50$ cm

and the other side is $8 \times 10 = 80$ cm

**Exercise 15.1**

**1.** (a) Face = *ABCD*, *BCFG*, *GFEH*, *ADEH*, *ABGH*, *CDEF*

Edges = *AB*, *DC*, *EF*, *HG*, *AD*, *BC*, *GF*, *HE*, *AH*, *BG*, *CF*, *DE*

vertices = *A*, *B*, *C*, *D*, *E*, *F*, *G*, *H*

(b) Faces = *PQRS*, *SRUT*, *TSPW*, *QPWD*, *QRUV*, *TWVU*

Edges = *PQ*, *SR*, *TU*, *WV*, *SP*, *TW*, *QR*, *VU*, *PW*, *VQ*, *UR*, *TS*

Vertices = *P*, *Q*, *R*, *S*, *T*, *U*, *W*

**2.** (a) Area of cube $= 6a^2 = 6 \times 4 \times 4 = 96 \text{ cm}^2$

(b) Area of cube $= 6a^2 = 6 \times 7 \times 7 = 294 \text{ cm}^2$

**3.** (a) Area of cuboid $= 2(lb + bh + hl) = 2(9 \times 5 + 5 \times 2 + 9 \times 2)$

$= 2(45 + 10 + 18) = 2 \times 73 = 146 \text{ cm}^2$

(b) Area of cuboid $= 2(lb + bh + hl)$

$= 2(4 \times 75 + 75 \times 20 + 20 \times 4) = 2(300 + 1500 + 80) = 3760 \text{ cm}^2$

**4.** Area of the open box $= 2(lb + bh + hl) - lb$

$= 2(50 \times 20 + 20 \times 10 + 50 \times 10) - 50 \times 20$

$= 2(1000 + 200 + 500) - 1000 = 2(1700) - 1000$

$= 3400 - 1000 = 2400 \text{ cm}^2$ or $0.24 \text{ m}^2$

Cost of painting $1\text{m}^2$ = ₹50

Cost of painting $0.24\text{m}^2 = 0.24 \times 50$ = ₹12

**5.** Surface area of the cuboid

$= 2(lb + bh + hl) = 2(15 \times 5 + 15 \times 5 + \times 5) = 2(15 + 75 + 25)$

$= 2 \times 175 = 350 \text{ cm}^2$

**6.** Area of 4 walls $= 2 \times h(l + b) = 2 \times 8(12 + 10)$

$= 16 \times 22 = 352 \text{ m}^2$

Cost of white washing = ₹75 per $m^2$

Cost of white washing for 352 $m^2$ = 352 × 75 = ₹26400

Area of the floor = $l \times b$ = 12 × 10 = 120 $m^2$

Cost of cementing per $m^2$ = ₹100

Cost of cementing per 120$m^2$ = 100 × 120 = ₹12000

**7.** Area of cuboid = 2662 $m^2$; Let the dimensions be $x$

So, that Length = 3$x$, Breadth = 2$x$; Height = 1$x$

$2662 = 2(3x \times 2x + 2x \times x + 3x \times x)$; $2662 = 2(6x^2 + 2x^2 + 3x^2)$

$2662 = 2 \times 11x^2$; $2662 = 22x^2$; $\frac{2662}{22} = x^2$; $x^2 = 121$; $x = 11$ m

$\therefore$ Length = $3x = 3 \times 11 = 33$ m; Breadth = $2x = 2 \times 11 = 22$ m

Height = 11 m

**8.** The area of the sheet = $4 \times 8 = 32\ m^2$

Cost of iron sheet per m = ₹5

Cost of iron sheet per 32 $m^2$ = 5 × 36 = ₹160

## Exercise 15.2

**1.** (a) Volume of cube = 14 × 14 × 14 = 274 $cm^3$

(b) Volume of cube = 20 × 20 × 20 = 8000 $cm^3$

**2.** (a) Length = 4 cm, Breadth = 3 cm; Heigth = 7 cm

Volume of cuboid = $4 \times 3 \times 7 = 84\ cm^3$

(b) Volume of cuboid = $l \times b \times h$

1 cm = $\frac{1}{10}$ dm; Height = $\frac{9}{10} = 0.9$ dm

$= 6 \times 3 \times 0.9 = 16.2\ dm^3$

**3.** (a) 7l (b) 3000 ml

(c) 10000 $dm^3$ (d) 1$m^3$

**4.** Volume of cuboid = $l \times b \times h$

$= 60 \times 40 \times 30 = 72000\ m^3$

= Volume of cube = $10 \times 10 \times 10 = 1000\ m^3$

No. of boxes that can fit = $\frac{\text{Volume of Cuboid}}{\text{Volume of Cube}} = \frac{72000}{1000} = 72$ boxes

**5.** Area of 4 walls = $2 \times h \times (l + b)$

$= 2 \times 4 \times (12 + 8) = 2 \times 4 \times 20 = 160\ m^2$

Cost of white washing per $m^2$ = ₹15

Cost of white washing 160 $m^2$ = 15 × 160 = ₹ 2400

**6.** Volume of water tank = 576$l$ or 576000 $cm^3$

Length = $x$; Breadth = 90 cm

Height = 40 cm; Length = $\frac{576000}{90 \times 40} = 160$ cm

**7.** Volume of the first box = $l \times b \times h$

$= 10 \times \frac{5}{100} \times \frac{2}{100} = \frac{10}{1000} = \frac{1}{100} = 0.01\ m^3$

Volume of the second box = $l \times b \times h = 13 \times 1 \times 0.5 = 6.5\ cm^3$

$\therefore$ Volume of the first box is greater.

**8.** (a) if the edge of the cube is doubled its surface area will increase by 4 times.

(b) If the edge of the cube is doubled its volume will increase by 8 times.

**9.** Height = $\frac{\text{Volume of the box}}{\text{Base area}} = \frac{14400\ cm^3}{120\ cm^2}$; Height = 120 cm

**10.** Volume of the cube = $(\text{Side})^3 = 15 \times 15 \times 15 = 3375\ cm^3$

Volume of the cube = Volume of the cuboid = $3375\ cm^3$

Volume of cuboid = $3375\ cm^3$; $l \times b \times h = 3375$; $25 \times 9 \times h = 3375$

$h = \frac{3375}{25 \times 9} = 15$ cm

**11.** Volume of the cuboid = 60 cm; $h$ = 20 cm, $b$ = 20 cm

Volume of the cuboid = $60 \times 20 \times 20 = 2400\ cm^3$

**12.** (a) 32 $cm^3$ (b) 24 $cm^3$

(c) 36 $cm^3$ (d) 30 $cm^3$

## Exercise 15.3

**1.** (a) Curved surface Area of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{4.9}{2} \times \frac{10}{10} = 15.4\ cm^2$

Total surfafe Area of cylinder = $2\pi r(r + h)$

$= 2 \times \frac{22}{7} \times \frac{4.9}{10 \times 2}\left(10 + \frac{4.9}{2 \times 10}\right) = \frac{77}{5}\left(\frac{200 + 49}{20}\right)$

$= \frac{77}{5} \times \frac{249}{20} = 191.73\ cm^2$

(b) Curved surface are of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times 35 \times 14 = 44 \times 5 \times 14 = 3080\ cm^2$

Total surface area of cylinder = $2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times (14 + 35) = 44 \times 5 \times 49 = 10780 \text{ cm}^2$

(c) Curved surface area of the cylinder = $2\pi rh$

$= \frac{22}{7} \times 10.5 \times 16 = 44 \times 1.5 \times 16 = 1056 \text{ cm}^2$

Total surface are of the cylinder = $2\pi r(h + r)$

$= 2 \times \frac{22}{7} \times 10.5(16 + 10.5) = 1749 \text{ cm}^2$

**2.** (a) Internal curved surface area = $2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{10}{2} \times 4.20 = 13200 \text{ cm}^2$

(b) External curved surface area = $2\pi Rh$

$= 2 \times \frac{22}{7} \times \frac{12}{2} \times 420 = 15840 \text{ cm}^2$

Total curved surface area of Pipe = $2\pi rh + 2\pi Rh$

$= 2\pi h(R + r) = 2 \times \frac{22}{7} \times 420(6 + 5) = 2 \times \frac{22}{7} \times 420 \times 11$

$= 29040 \text{ cm}^2$

Area of one end = $\pi R^2 - \pi r^2 = \pi(R^2 - r^2) = \pi(R - r)(R + r)$

$= \pi(6 - 5)(6 + 5) = \pi \times 1 \times 11 = 11 \times \frac{22}{7} = \frac{242}{7}$

Area of 2 ends = $2 \times \frac{242}{7} = \frac{484}{7}$

$\therefore$ Total Surface are of pipe = $29040 + \frac{484}{7}$

$= \frac{203280 + 484}{7} = \frac{203764}{7} = 29109.14 \text{ cm}^2$

**3.** Total surface area = 968 $\text{cm}^2$

Let the height of cylinder be $x$

$2\pi r(h + r) = 968;\ 2 \times \frac{22}{7} \times 3.5(x + 3.5) = 968;\ x + 3.5 = \frac{968 \times 7 \times 10}{2 \times 22 \times 3.5}$

$x + 3.5 = 44;\ x = 44 - 3.5 = 40.5 \text{ cm}$

$\therefore$ Height = 40.5 cm

**4.** Diameter = 14 m

Radius = 7 m

Height = 15 m

Area of the cylindrical tank = $2\pi r(h+r)-\pi r^2$

$= 2\times\frac{22}{7}\times 7(15+7)-\frac{22}{7}\times 7\times 7 = 44\times 22-22\times 7 = 968-154 = 814\ m^2$

Cost of painting inside per $m^2$ = ₹30

Cost of painting for 814 $m^2$ = $814\times 30$ = ₹24420

**5.** Area of the metal sheet required to make a cylinder = $2\pi r(h+r)$

$= 2\times\frac{22}{7}\times\frac{2.8}{10}\times(5+2.8) = \frac{88}{5}\times\frac{7.8}{10} = \frac{6864}{50} = 137.28\ m^2$

**6.** Area of the road roller = $2\pi rh$

$= 2\times\frac{22}{7}\times 3\times\frac{49}{2} = 22\times 3\times 7 = 462\ m^2$

= Area covered in 200 revolutions = $462\times 200 = 92400\ m^2$

**7.** Area of the metal sheet = $2\pi r(r+h)-\pi r^2$

$= 2\times\frac{22}{7}\times\frac{28}{2}(14+42)-\frac{22}{7}\times 14\times 14 = 88\times 56 = 616$

$= 4928-616 = 4312\ cm^2$

**8.** Lenght = 88 cm, Breadth = 25 cm

Curved surface areaof the cylinder = $2\pi rh$

$2\pi R = 88;\ 2\times\frac{22}{7}\times R = 88$ $\qquad R = \frac{88\times 7}{2\times 22} = 14$ cm

Curved surface Area of he cylinder = $2\times\frac{22}{7}\times 14\times 25 = 2200\ cm^2$

**9.** Let the height be $x$ and radius be $2x$ curved surface Area = 616 $m^2$

$2\pi rh = 616$

$2\times\frac{22}{7}\times 2x\times x = 616;\ \frac{44\times 2x^2}{7} = 616;\ 2x^2 = \frac{616\times 7}{44}$

$x^2 = \frac{14\times 7}{2};\ x^2 = 7\times 7;\ x = 7$cm

Radius = $2\times 7 = 14$ cm $\qquad$ Diameter= $14\times 2 = 28$ m.

**10.** Internal radius = 10 cm; Thickness of metal = 1.5 cm

Length = 21 cm

External radius = 10 + 1.5 = 11.5 cm

Curved surface area = $2\pi rh = 2\times\frac{22}{7}\times 11.5\times 2+3 = 1518\ cm^2$

Cost of painting per $cm^2$=₹16

Cost of painting 1518 $cm^2$ = $16\times 1518$ =₹24288

**11.** Lateral surface area= 1408 $cm^2$

Breadth of the sheet = Height of the hollow cylinder = 32 cm

$1408 = 2\pi rh$; $1408 = 2\times\frac{22}{7}\times r\times 32$; $r = \frac{1408\times 7}{2\times 22\times 32}$; $r = 7$ cm

Length = $2\pi r = 2\times\frac{22}{7}\times 7 = 44$ cm

Perimeter = $2\times(l + b) = 2\times(44 + 32) = 152$ cm

**12.** Total surface area = 1760 $m^2$

Sum of base radius and height = 40 cm

$2\pi r(h + r) = 1760$; $2\times\frac{22}{7}\times r\times 40 = 1760$; $r = \frac{1760\times 7}{2\times 22\times 40} = 7$ cm

Height = $40 - 7 = 33$ cm

Curved surface Area = $2\pi rh = 2\times\frac{22}{7}\times 7\times 33 = 1452\ cm^2$

## Exercise 15.4

**1.** (a) Volume of the cylinder = $\pi r^2h = \frac{22}{7}\times 21\times 21\times 2.1 = 2910.6\ m^3$

(b) Volume of the cylinder = $\pi r^2h = \frac{22}{7}\times\frac{3.5}{2\times 10}\times\frac{3.5}{2\times 10}\times 11$

$= 105.875\ cm^3$

(c) Volume of the cylinder = $\pi r^2h = 19\times 10 = 190\ m^3$

(d) Volume of the cylinder = $\pi r^2h$

Circumference of base = $2\pi r$; $2\pi r = 44$

$2\times\frac{22}{7}\times r = 44$; $r = \frac{44\times 7}{2\times 22} = 7$ cm

Volume = $\pi r^2h = \frac{22}{7}\times 7\times 7\times 15 = 2310\ m^3$

**2.** Curved Surface Area of cylinder = 8800 $dm^2$

circumference of base = 220 dm

$220 = 2\pi r$ ; $220 = 2\times\frac{22}{7}\times r$; $\frac{220\times 7}{2\times 22} = r$; $r = 35$ dm

$$\text{Height} = \frac{\text{Curved Surface Area of the Cylinder}}{\text{Curved Surface Circumference Area of the base}}$$

$$= \frac{8800}{220} = 40 \text{ dm}$$

Volume of the cylinder = $\pi r^2h$

$= \frac{22}{7} \times 35 \times 35 \times 40 = 154000 \text{ dm}^3 = 154 \text{ m}^3$

**3.** Let the common ratio be $x$

Radius = $4x$; Height = $5x$

Volume of cylinder = 2160 $\text{m}^3$; $2160 = \frac{22}{7} \times 4x \times 4x \times 5x$

$2160 = \frac{1760}{7} x^3$; $\frac{2160 \times 7}{1760} = x^3$; $\frac{1512}{176} x^3$; $x = \sqrt[3]{8.59}$

Diameter = $4 \times 2\sqrt[3]{8.59}$; Height = $5\sqrt[3]{8.59}$

**4.** Volume of he cylinder = $\pi r^2 h = \frac{22}{7} \times 35 \times 35 \times 0.1 = 385 \text{ m}^2$

**5.** Volume of vessel = $l \times b \times h = 33 \times 8 \times 7 = 1848 \text{ m}^3$

Volume of rectangular vessel = Volume of the cylinder

$1848 = \pi r^2 h$; $1848 = \frac{22}{7} \times 10 \times 10 \times h$; $\frac{1848 \times 7}{22 \times 10 \times 10} = h$

$h = 5.88$ cm

**6.** Diameter = 21 cm; Radius = $\frac{21}{2}$ cm

Speed = 2 km/hr; Speed = $\frac{\text{Distance}}{\text{Time}} = \frac{2\text{km}}{1\text{hr}}$

2 km = 200000 cm

In 60 min height of cylinder = 200000 cm

In 1 min height of cylinder = $\frac{200000}{60}$ cm

Volume of cylinder = $\pi r^2 h = \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{20000}{6.2} = 1155000 \text{ cm}^3$

$= 1.555 \text{ m}^3$

**7.** Volume of the cylinder = $\pi r^2 h$

$= \frac{22}{7} \times 2 \times 2 \times 15 = \frac{1320}{7} \text{ cm}^3$

Volume of the wire = Volume of the cylinder

$\pi r^2 h = \frac{1320}{7}$; $\frac{22}{7} \times 0.2 \times 0.2 \times h = \frac{1320}{7}$; $h = \frac{1320 \times 7}{7 \times 0.2 \times 0.2 \times 22}$

$h = 1500$ cm = 15 m.

**8.** Volume of the cylinder = $\pi r^2 h$

$h = 4$ cm

$2\pi r = 22;\ 2\times\frac{22}{7}\times r = 22;\ r = \frac{22\times 7}{2\times 22} = \frac{7}{2} = 3.5\text{ cm}$

$\text{Volume} = \frac{22}{7}\times 3.5\times 3.5\times 4 = 154\text{ cm}^3$

$\left\{\begin{array}{l} 1\text{ m} = 100\text{ cm} \\ 2\text{ m} = 200\text{ cm} \\ \text{and} \\ 1\text{m}^3 = \frac{1}{1000000}\text{ cm}^3 \end{array}\right.$

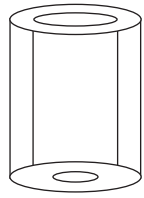
**9.** Volume of the roller $= \pi r^2 h = \frac{22}{7}\times\frac{84}{2}\times\frac{84}{2}\times 200 = 1.1088\text{ m}^3$

**10.** Length = 15 cm, Breadth = 3 cm  Radius = $r$

$2\times\frac{22}{7}\times r = 15\text{ cm};\ r = \frac{15\times 7}{2\times 22} = 2.38$

Volume of the cylinder $= \pi r^2 h = \frac{22}{7}\times 2.38\times 2.38\times 3 = 53.40\text{ cm}^3$ (approx)

**11.** Length of the cylinder = 35 m



Outer radius $= \frac{17}{2}$ m

Inner radius $= \frac{10}{2}$ m

Volume of metal $= \pi R^2 h$

$R^2 = R_1^2 - R_2^2$

$R^2 = \left(\frac{17}{2}\right)^2 - \left(\frac{10}{2}\right)^2 = \left(\frac{17}{2}\right)^2 - \left(\frac{10}{2}\right)^2 = \left(\frac{17}{2}-\frac{10}{2}\right)\left(\frac{17}{2}+\frac{10}{2}\right) = \frac{7}{2}\times\frac{17}{2}$

$R^2 = \frac{119}{2};\ \text{Volume} = \frac{22}{7}\times\frac{119}{2}\times 35 = 6545\text{ m}^3$

Weight of 1 $\text{m}^3 = 11$ g

Weight of 6545 $\text{m}^3 = 11\times 6545 = 71995$ g

**12.** Volume of the first cylinder = Volume of the second cylinder

$\pi(2r)^2\times h_1 = \pi(3r)^2\times h_2;\ \frac{h_1}{h_2} = \frac{9r^2}{4r^2};\ h_1 : h_2 = 9:4$

So, the ratio = 9 : 4

## Exercise 16.1

**1.**

| Marks | Tally Maks | Frequency |
|---|---|---|
| 7 | \|\|\| | 3 |
| 10 | \|\|\|\| | 4 |
| 11 | 𝍸 \| | 6 |
| 15 | 𝍸 \| | 6 |
| 20 | \| | 1 |
| | **Total** | **20** |

(a) 7 (b) 1

(c) 1 (d) 13

**2.**

| Runs | Tally Maks | Frequency |
|---|---|---|
| 45 | \|\|\| | 3 |
| 70 | \|\| | 2 |
| 73 | 𝍸 | 5 |
| 75 | \|\| | 2 |
| 99 | \|\|\| | 3 |
| | **Total** | **15** |

(a) 155 (b) 140

(c) 155 – 40 = 15

(d)

| Height | Tally Maks | Frequency |
|---|---|---|
| 140 | \| | 1 |
| 142 | \|\|\|\| | 4 |
| 146 | 𝍸 \|\|\| | 8 |
| 149 | \|\| | 2 |
| 150 | 𝍸 \| | 6 |
| 155 | \|\|\|\| | 4 |
| | **Total** | **25** |

## Exercise 16.2

**1.** (a) Each element of the collections of date is called datum

(b) The number of scores occuring in a set is called frequency

(c) The data can be counted such as test marks etc is called discrete data.

(d) The data that is obtained from measurement in which threre is always some degree of approximation, such as weight, height etc is called continous data.

(e) Each class interval is bounded by 2 figures is called calss limit.

(f) The difference b/w the highest and the lowest values of the data or observation is called as range.

**2.**

| Height | Tally Maks | Frequency |
|---|---|---|
| 125-130 | \|\|\|\| | 4 |
| 130-135 | \|\|\| | 3 |
| 135-140 | 𝍸 \|\| | 7 |
| 140-145 | 𝍸 \| | 6 |
| 145-150 | \|\|\| | 3 |

| | | |
|---|---|---|
| 150-155 | \|\| | 2 |
| 155-160 | 𝍸 | 5 |
| 160-165 | \| | 1 |
| 165-170 | \| | 1 |
| 170-175 | \|\|\| | 3 |
| | **Total** | **35** |

(a) 173 cm (b) 125 cm

(c) 46 cm (d) 12 (e) 20

**3.**

| Class Intervals | Tally Marks | Frequency |
|---|---|---|
| 6-10 | \|\| | 2 |
| 11-15 | 𝍸 \|\|\| | 8 |
| 16-20 | 𝍸 \|\| | 7 |
| 21-25 | 𝍸 𝍸 \| | 11 |
| 26-30 | \|\|\|\| | 4 |
| 31-35 | 𝍸 \|\| | 7 |
| 36-40 | 𝍸 \| | 6 |
| **Total** | | **45** |

**4.**

| Weight of Mangos | Tally Marks | Frequency |
|---|---|---|
| 50-70 | 𝍸 \|\|\|\| | 9 |
| 70-90 | 𝍸 \|\| | 7 |
| 90-110 | \| | 1 |
| 110-130 | \|\|\| | 3 |
| 130-150 | 𝍸 \|\| | 7 |
| 150-170 | \|\|\| | 3 |
| 170-190 | 𝍸 \|\| | 7 |
| 190-210 | 𝍸 \|\| | 7 |
| 210-230 | 𝍸 \| | 6 |
| **Total** | | **50** |

**5.** Do it yourself

## Exercise 17.1

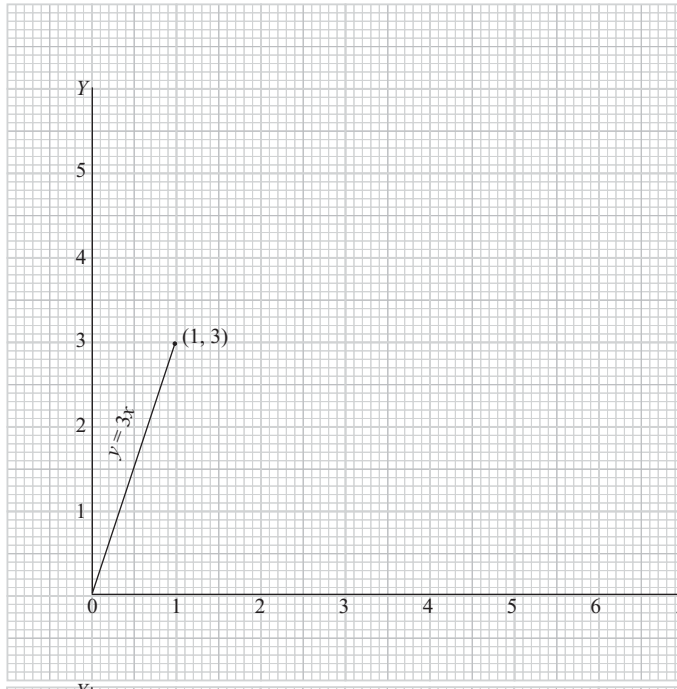
**1.** (a) $y = 3x$

| | | |
|---|---|---|
| $x$ | 0 | 1 |
| $y$ | 0 | 3 |

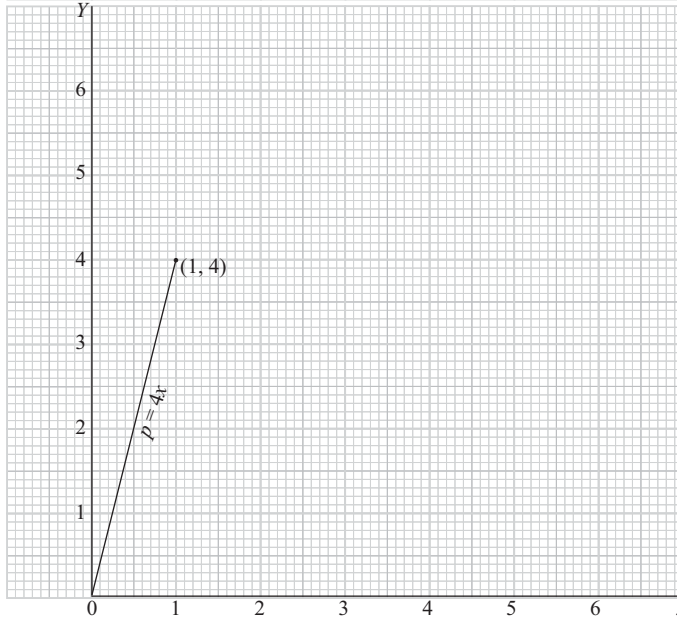
**2.** (a) $P = 4x$

| | | |
|---|---|---|
| $x$ | 0 | 1 |
| $y$ | 0 | 4 |

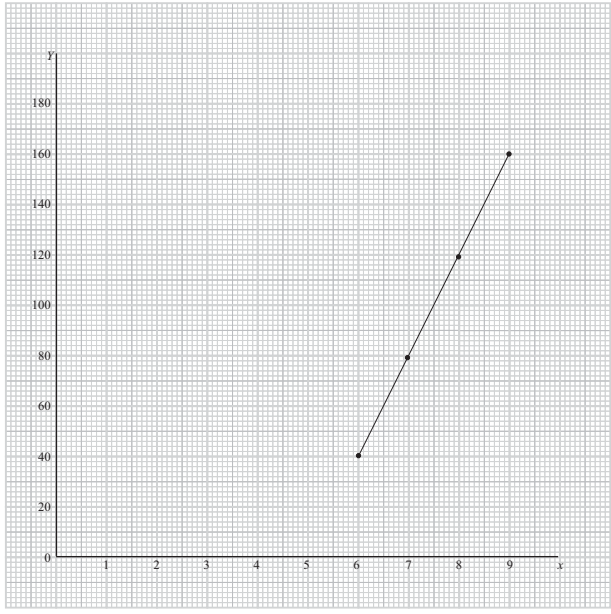
(b) (i)



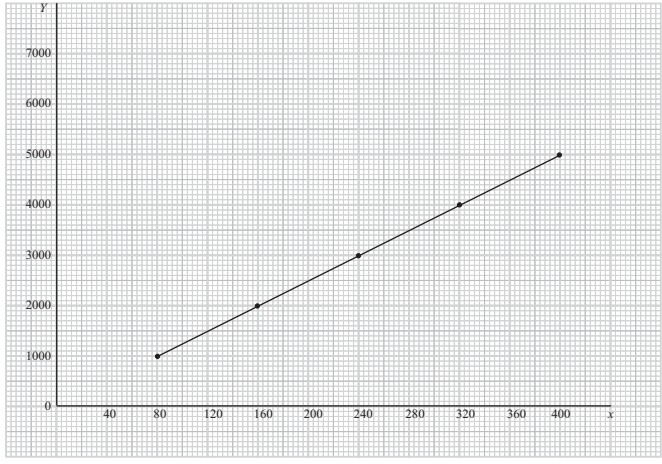

(ii)



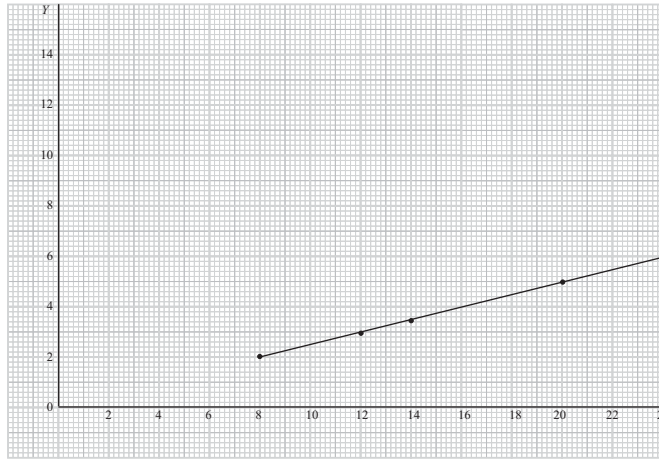
(iii)


y
180
160
140
120
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
x

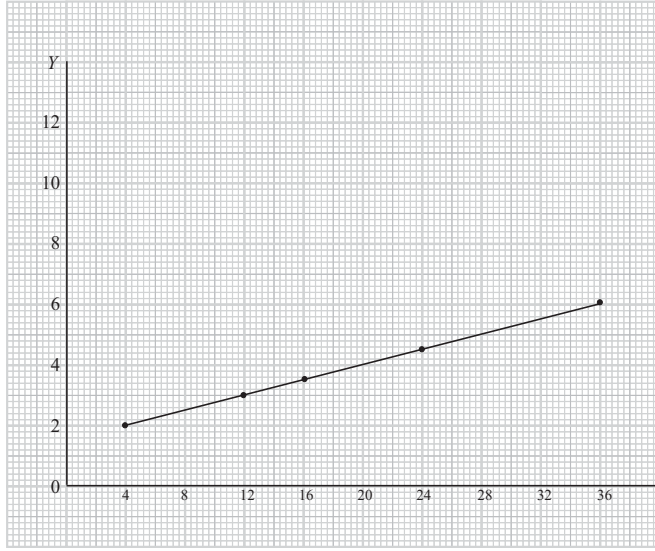
(i)


y
7000
6000
5000
4000
3000
2000
1000
0
40
80
120
160
200
240
280
320
360
400
x

(ii)


Y
14
12
10
8
6
4
2
0
2
4
6
8
10
12
14
16
18
20
22
24

(iii)


Y
12
10
8
6
4
2
0
4
8
12
16
20
24
28
32
36
x

**2.** (a) $P = 4x$

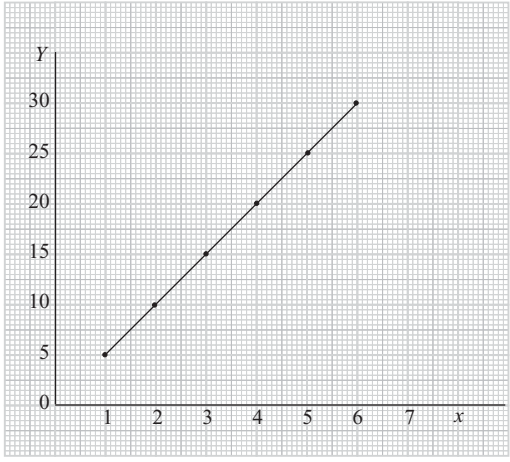
| $x$ | 0 | 1 |
|---|---|---|
| $y$ | 0 | 4 |

**3.** (a) (i) 20 km (ii) 7 : 30 am

(b) (i) yes (i) ₹200 (iii) 3500

**4.** (a) Yes (b) No

**5.**




**6.** (a) IV (b) II

(c) III (d) I

## Exercise 18.1

**1.** Probability $= \frac{20}{60} = \frac{1}{3}$

**2.** (a) $\frac{3}{10}$ (b) $\frac{1}{10}$ (c) $\frac{2}{10} = \frac{1}{5}$ (d) $\frac{2}{5}$

**3.** (a) $\frac{3}{6} = \frac{1}{2}$ (b) $\frac{3}{6} = \frac{1}{2}$ (c) $\frac{3}{6} = \frac{1}{2}$

**4.** (a) $\frac{33}{100}$ (b) $\frac{20}{100} = \frac{1}{5}$ (c) $\frac{9}{100}$

**5.** (a) $\frac{2}{46} = \frac{1}{23}$ (b) $\frac{2}{46} = \frac{1}{23}$ (c) $\frac{2}{46} = \frac{1}{23}$

**6.** (a) $\frac{3}{14}$ (b) $\frac{4}{14} = \frac{2}{7}$ (c) $\frac{7}{14} = \frac{1}{2}$

# MATHS MAGIC

**Interactive Resources**

- Download the free app 'Green Book House' from google play.
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