1 Integers

Exercise 1.1

1. (a) $(-2)\times(-2)\times(-2)\times(-2)\times(-2)\times(-2)$
$=[(-2)\times(-2)]\times[(-2)\times(-2)]\times[(-2)\times(-2)]$
$=4\times4\times4=$ **64**

(b) $(-2)\times(-2)\times(-2)$
$=[-2]\times[(-2)\times(-2)]$
$=(-2)\times4=$ **-8**

(c) $(-6)\times2+6\times(-2)$
$=(-12)+(-12)$
$=12-12=$ **-24**

(d) $0\times(-8)\times(-4)\times3\times(-4)$
$=0\times[(-8)\times(-4)\times3\times(-4)]$
$=$ **0**

2. (a) $673\times272-673\times72$
$=673\times[272-72]$
$=673\times200$
$=$ **134600**

(b) $(-546)\times(-22)+(-546)\times(-78)$
$=(-546)\times[(-22)+(-78)]$
$=(-546)\times[-22-78]$
$=(-546)\times(-100)$
$=$ **54600**

(c) $7250\times(-31)+(-7250)\times69$
$=7250\times[(-31)+(-1)\times69]$
$=7250\times[-31-69]$
$=7250\times(-100)$
$=$ **-725000**

(d) $199\times26743-(-26743)$
$=199\times26743+26743$
$=26743\times[199+1]$
$=26743\times200$
$=$ **5348600**

(e) $(-4)\times20-(-4)\times15-(-4)\times62+(-4)\times97$
$=(-4)\times[20-15-62+97]$
$=(-4)\times[97+20-(15+62)]$
$=(-4)\times[117-77]$
$=(-4)\times40$
$=$ **-160**

3. (a) $(-2)\times(-3)\times(-4)\times(-5)$
Here, the number of negative integers is even (4).
Thus, the sign of the product of numbers is positive.

(b) $(-6)\times(-5)\times(-8)\times(-9)\times0$
$=[(-6)\times(-5)\times(-8)\times(-9)]\times0=0$
$\because$ The product of these number is 0.
Thus, the product of these numbers have no sign.

(c) $(-1)\times(-2)\times(-1)\times9$
Here, the number of negative integers is odd (3).
Thus, the sign of the product of numbers is negative.

(d) $12 \times 7 \times (-6) \times 7$

Here, the number of negative integers is odd (1).

Thus, the sigh of the product of numbers is negative.

(e) $(10) \times (-9) \times (-8) \times 4$

Here, the number of negative integers is even (2).

Thus, the sign of the product of numbers is positive.

4. (a) Sign of [31 (odd) negative integers × 2 positive integers]

$= (-) \times (+) = (-)$ ve.

So, the sign of the product of given integers is negative.

(b) Sign of [18 (even) negative integers × 3 positive integers]

$= (+) \times (+) = (+)$ ve.

So, the sign of the product of given integers is positive.

(c) Sign of [28 positive integers × 14 (even) negative integers]

$= (+) \times (+) = (+)$ ve.

So, the sign of the product of given integers is positive.

(d) $a \times b \times c \times (-d) \times (-e) \times (-f)$

Here, the number of negative integers is 3 (odd).

Thus, the sign of the product of given integers is negative.

(e) $(-a) \times (-b) \times c \times (-d) \times (-e) \times f \times g \times (-h)$

Here, the number of negative integers is 5 (odd).

Thus, the sign of the product of given integers is negative.

5. (a) $-19 \times [4 + (-2)] = -19 \times 4 + (-19) \times x$

$-19 \times [4 - 2] = -19 \times [4 + x]$

$4 - 2 = 4 + x$

$\therefore \quad x = -2$

So, the value of x is (-2).

(b) $8 \times [(-7) + (-5)] = x \times (-7) + x \times (-5)$

$8 \times [(-7) + (-5)] = x \times [(-7) + (-5)]$

$\therefore \quad 8 = x$

So, the value of x is 8.

(c) $-18 \times [(-7) + 3] = (-18) \times x + (-18) \times 3$

$-18 \times [(-7) + 3] = -18 \times [x + 3]$

$-7 + 3 = x + 3$

$\therefore \quad x = 3$

So, the value of x is 3.

(d) $x \times [6 \times (-8)] = 15 \times 6 + (-8) \times 15$

$x \times [6 + (-8)] = 15 \times [6 + (-8)]$

$\therefore \quad x = 15$

So, the value of x is 15.

Exercise 1.2

1. (a) $144 \div (-36)$

$= \frac{144}{(-36)} = -\frac{144}{36} \Rightarrow -4$

(b) $(-144) \div 36$

$= \frac{-144}{36} = -\frac{144}{36} = -4$

(c) $(-144) \div (-36)$

$= \frac{-144}{-36} = \frac{144}{36} = 4$

(d) $0 \div (-8)$

$= \frac{0}{(-8)} = 0.$

2. (a) $(-42) \div (-14) = \frac{-42}{-14} = \frac{42}{14} = 3$

Check :

Divisor × Quotient $= -14 \times 3 = -42 =$ Dividend.

(b) $(-1) \div (-1) = \frac{-1}{-1} = \frac{1}{1} = 1$

Check :

Divisor × Quotient $= (-1) \times 1 = -1 =$ Dividend.

(c) $0 \div (-5) = \frac{0}{(-5)} = 0$

Check :

Divisor × Quotient $= (-5) \times 0 = 0 =$ Dividend.

3. (a) True, (b) False, (c) True

Exercise 1.3

1. (a) $18 \times (-6 + 4) \div 9$

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

$= 2 \times (-2) = -4$

(b) $-5 - (-48) \div (12) + (-2) \times 6$

$= -5 + 48 \div 12 - 2 \times 6$

$= -5 + 4 - 12$

$= -17 + 4 = -13$

(c) $64 \div 16 \times (-3) + 2$

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

$= -12 + 2$

$= -10$

(d) $-3 + \{(-4) \div 4 + 1\} + 3$

$= -3 + \{-1 + 1\} + 3$

$= -3 + 0 + 3$

$= -3 + 3 = 0$

(e) $6 \div \overline{3 - 2}$

$= 6 \div 1 = 6$

(f) $[-15 + \{4 \div \overline{(-1) - (3)}\} \times 6]$

$= [-15 + \{4 \div -1 - 3 \times 6]$

$= [-15 + \{4 \div (-4)\} \times 6]$

$= [-15 + \{-1\} \times 6]$

$= [-15 + (-6)]$

$= [-15 - 6] = -21$

2. (a) $-49 \div 7$ or $-49 \div -7$

Now, $-49 \div 7 = \frac{-49}{7} = -7$

And, $-49 \div 7 = \frac{-49}{-7} = \frac{49}{7} = 7$

$\because \quad -7 < 7$

$\therefore \quad (-49 \div 7) < (-49 \div -7)$

Hence, $(-49 \div -7)$ is greater than $(-49 \div 7)$.

(b) $7 + 6 \times (-4)$ or $-8 + (-2) \times (-8)(-1)$

Now, $7 + 6 \times (-4) = 7 + (-24) = 7 - 24 = -17$

And, $-8 + (-2) \times (-8) \times (-1) = -8 + 16 \times (-1) = -8 - 16 = -24$

$\because \quad -17 > -24$

$\therefore \quad [7 + 6 \times (-4)] > [-8 + (-2) \times (-8)(-1)]$

Hence, $[7 + 6 \times (-4)]$ is greater than $[-8 + (-2) \times (-8)(-1)]$

(c) $(-4) \times (-22) \times 4 \times (-3)$ or $(-2) \times (-1) \times (-1) \times 2$

Now, $(-4) \times (-22) \times 4 \times (-3) = [(-4) \times (-22)] \times [4 \times (-3)]$

$= 88 \times (-122) = -1056$

And, $(-2) \times (-1) \times (-1) \times 2 = [(-2) \times (-1)] \times [(-1) \times 2]$

$= 2 \times (-1) = -2$

$\because \quad -1056 < -2$

$\therefore \quad [(-4) \times (-22) \times 4 \times (-3)] < [(-2) \times (-1) \times (-1) \times 2]$

Hence, $[(-2) \times (-1) \times (-1) \times 2]$ is greater than $[(-4) \times (-22) \times 4 \times (-3)]$.

Multiple Choice Questions

1. (b), 2. (c), 3. (b), 4. (b), 5. (a)

Brain Teaser

1. (a) $17 + 3 \times 26 \square (17 + 3) \times 26$

$17 + 78 \square 20 \times 26$

$\because \quad 95 \square 520$

$\therefore \quad 17 + 3 \times 26 \square (17 + 3) \times 26$

(b) $6 - 3 \times 11 \square (6 - 3) \times 11$

$6 - 33 \square 3 \times 11$

$\therefore 6 - 3 \times 11 \square (6 - 3) \times 11$

(c) $(-6) \times (-5) - 2 \square (-6) \times (-5 - 2)$

$+ 30 - 2 \square (-6) \times (-7)$

$\because \quad 28 \square + 42$

$\therefore \quad (-6) \times (-5) - 2 \square (-6) \times (-5 - 2)$

(d) $7 \times (-3) \square (-3) \times 7$

$-21 = -21$

$\therefore \; 7 \times (-3) = (-3) \times 7$

(e) $11 \times 2 + 3 \square 13 \times 2 + 1$

$22 + 3 \square 26 + 1$

$\because \; 25 < 27$

$\therefore \; 11 \times 2 + 3 < 13 \times 2 + 1$

(f) $21 \times [-3 + (-5)] \square 21 \times (-3) + 21 \times (-5)$

$21 \times (-3 - 5) \square -63 + (-105)$

$21\times(-8)\square -63-105$

$\because\quad -168=-168$

$\therefore\quad 21\times[-3+(-5)]=21\times(-3)+21\times(-5)$

2. Calculate the sum : $5+(-5)+5+(-5)+\ldots\ldots\ldots$

(a) If the number of terms is 10.

Thus, the sum of $[5+(-5)+5+(-5)+\ldots\ldots\ldots]$

of 10 terms $=[5+(-5)+5+(-5)+\ldots\ldots\ldots]$

$=[(5-5)+(5-5)+\ldots\ldots\ldots]$

$=[0+0+0+0+0]=0$

(b) If the number of terms is 11.

Thus, the sum of $[5+(-5)+5+(-5)+\ldots\ldots\ldots]$

$=[5+(-5)+5+(-5)+\ldots\ldots\ldots]$

$=[(5-5)+(5-5)+\ldots\ldots\ldots+5]$

$=[0+0+0+0+0+5]$

$=0+5=5$

HOTS

Given, In a test :

Marks awarded for every correct answer = 5 marks

Marks awarded for every incorrect answer $=(-2)$ marks

And, marks awarded for not attempted questions = 0 marks

(a) Mohan gets correct answers = 4

And, he gets incorrect answers = 6

Thus, Mohan's score $=5\times4+(-2)\times6$

$=20+(-12)$

$=20-12=8$ marks.

(b) Reshma gets correct answers = 5

And, she gets incorrect answers = 5

Thus, Reshma's score $=5\times5+(-2)\times5$

$=25+(-10)$

$=25-10=15$ marks.

(c) Heena gets correct answers = 2

And, she gets incorrect answers = 5

Thus, Heena's score $=2\times5+(-2)\times5$

$=10+(-10)$

$=10-10=0$ marks

2 Fractions

Exercise 2.1

1. (a) $\frac{5}{11}$

$\because \quad \frac{5}{11}=\frac{5\times 2}{11\times 2}=\frac{5\times 3}{11\times 3}=\frac{5\times 4}{11\times 4}=\frac{5\times 5}{11\times 5}$

$\therefore \quad \frac{5}{11}=\frac{10}{22}=\frac{15}{33}=\frac{20}{44}=\frac{25}{55}$

Hence, $\frac{10}{22},\frac{15}{33},\frac{20}{44}$ and $\frac{25}{55}$ are four equivalent fractions to $\frac{5}{11}$.

(b) $7\frac{3}{21}$

$\because \quad \frac{150}{21}=\frac{150\times 2}{21\times 2}=\frac{150\times 3}{21\times 5}=\frac{150\times 4}{21\times 4}=\frac{150\times 5}{21\times 5}$

$\therefore \quad 7\frac{3}{21}=\frac{300}{42}=\frac{450}{63}=\frac{600}{84}=\frac{750}{105}$

Hence, $\frac{300}{42},\frac{450}{63},\frac{600}{84}$ and $\frac{750}{105}$ are four equivalent fraction to $7\frac{3}{21}$.

(c) $1\frac{202}{303}=\frac{505}{303}$

$\because \quad \frac{505}{303}=\frac{505\times 2}{303\times 2}=\frac{505\times 3}{303\times 3}=\frac{505\times 4}{303\times 4}=\frac{505\times 5}{303\times 5}$

$\therefore \quad 1\frac{202}{303}=\frac{1010}{606}=\frac{1515}{909}=\frac{2020}{1212}=\frac{2525}{1515}$

Hence, $\frac{1010}{606},\frac{1515}{909},\frac{2020}{1212}$ and $\frac{2525}{1515}$ are four equivalent fraction to $1\frac{202}{303}$.

2. (a) $\frac{5}{9}-\frac{7}{12}+\frac{1}{2}$

$\because$ LCM of 9, 12 and 2 is 36.

$\therefore \quad \frac{5}{9}-\frac{7}{12}+\frac{1}{2}=\frac{5\times 4-7\times 3+1\times 18}{36}=\frac{20-21+18}{36}=\frac{17}{36}.$

(b) $8-4\frac{1}{2}-2\frac{1}{4}=8-\frac{9}{2}-\frac{9}{4}$

$\because$ LCM of 2 and 4 is 4.

$\therefore \quad 8-\frac{9}{2}-\frac{9}{4}=\frac{8\times 4-9\times 2-9\times 1}{4}=\frac{32-18-9}{4}=\frac{32-27}{4}=\frac{5}{4}\Rightarrow 1\frac{1}{4}.$

(c) $8\frac{5}{6}-3\frac{3}{8}+1\frac{7}{12}=\frac{53}{6}-\frac{27}{8}+\frac{19}{12}$

$\because$ LCM of 6, 8 and 12 is 24.

$\therefore \quad \frac{53}{6}-\frac{27}{8}+\frac{19}{12}=\frac{53\times 4-27\times 3+19\times 2}{24}=\frac{212-81+38}{24}=\frac{250-81}{24}$

$=\frac{169}{24}=7\frac{1}{24}.$

3. Thus, $7\frac{4}{5}+x=8\frac{2}{5}$

$\frac{39}{5}+x=\frac{42}{5}$

$x=\frac{42}{5}-\frac{39}{5}=\frac{42-39}{5}=\frac{3}{5}$

Hence, $\frac{3}{5}$ added to $7\frac{4}{5}$ to get $8\frac{2}{5}$.

4. Suman studies daily $5\frac{2}{3}$ hours

She devotes her time for science and mathematics = $2\frac{4}{5}$ hours

$\therefore$ Time devoted by Suman for other subjects $=5\frac{2}{3}$ hr $-2\frac{4}{5}$ hr.

$=\left(5\frac{2}{3}-2\frac{4}{5}\right)$ hours

$=\left(\frac{17}{3}-\frac{14}{5}\right)$ hours

$=\left(\frac{17\times 5-14\times 3}{15}\right)$ hours

$=\frac{851-42}{15}$ hours

$=\frac{43}{15}$ hours $=2\frac{13}{15}$ hours.

Hence, Suman devotes $2\frac{13}{15}$ hours to her time for other subjects.

5. Atul travels by bus to reach his school = $22\frac{1}{3}$ km.

And, the distance of a museus from his school = $6\frac{1}{4}$ km.

$\therefore$ Distance of the museus form Atul's house $=22\frac{1}{3}$ km $-6\frac{1}{4}$ km

$=\left(\frac{67}{3}-\frac{25}{4}\right)$ km

$$= \left(\frac{67 \times 4 - 25 \times 3}{12} \right) \text{km}$$

$$= \left(\frac{268 - 75}{12} \right) \text{km} = \frac{193}{12} \text{ km}$$

$$= \frac{193}{12} \text{ km} = 16\frac{1}{12} \text{ km}$$

Hence, the muses is $16\frac{1}{2}$ km for from Atul's house.

Exercise 2.2

1. (a) $y \times \frac{3}{22} = 1$

$y = \frac{1 \times 21}{3}$

$y = \frac{21}{3} \Rightarrow 7$

Hence, the value of y is 7.

(b) $18 \times y = 1$

$y = \frac{1}{18}$

Hence, the value of y is $\frac{1}{18}$.

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

$\therefore \; y = \frac{1 \times 13}{2}$

$y = \frac{13}{2} = 6\frac{1}{2}$

Hence, the value of y is $6\frac{1}{2}$.

(d) $5\frac{2}{3} \times y = 1$

$\frac{17}{3} \times y = 1$

$y = \frac{1 \times 3}{17} = \frac{3}{17}$

Hence, the value of y is $\frac{3}{17}$.

(e) $\frac{9}{25} \times 2\frac{7}{9} = y$

$\frac{9}{25} \times \frac{25}{9} = y$

$1 \times 1 = y$

$\therefore \quad y = 1$

Hence, the value of y is 1.

(f) $5\frac{1}{3} \times y = 1$

$\frac{16}{3} \times y = 1$

$y = \frac{1 \times 3}{16} = \frac{3}{16}$

Hence, the value of y is $\frac{3}{16}$.

2. (a) The reciprocal of 95 is $\frac{1}{95}$.

(b) The reciprocal of $\frac{5}{12}$ is $\frac{12}{5}$ or $2\frac{2}{5}$.

(c) The reciprocal of $\frac{1}{44}$ is 44.

(d) The reciprocal of $\frac{18}{23}$ is $\frac{23}{18}$ or $1\frac{5}{18}$.

(e) The reciprocal of $5\frac{4}{7}=\frac{39}{7}$ is $\frac{7}{39}$.

(f) The reciprocal of $3\frac{9}{11}=\frac{42}{11}$ is $\frac{11}{42}$.

3. (a) $\frac{3}{4}$ of 24 $l=\frac{3}{4}\times 24\,l=(3\times 6)\,l=18\,l$

(b) $\frac{4}{5}$ of ₹ 2 $=\frac{4}{5}\times$ ₹ 2 $=$ ₹ $\frac{8}{5}=$ ₹ 1.60

(c) $2\frac{1}{3}$ of 18 m $=\frac{7}{3}\times 18$ m $=(7\times 6)$ m = 42 m

(d) $\frac{1}{2}$ of $9\frac{1}{2}=\frac{1}{2}\times\frac{19}{2}=\frac{19}{4}=4\frac{3}{4}$ or 4.75

4. (a) $2\frac{2}{3}\times 3\frac{3}{4}=\frac{8}{3}\times\frac{15}{4}=2\times 5\Rightarrow 10$

(b) $1\frac{1}{2}\times 1\frac{1}{3}\times 1\frac{1}{4}=\frac{3}{2}\times\frac{4}{3}\times\frac{5}{4}=\frac{5}{2}\Rightarrow 2\frac{1}{2}$

(c) $3\frac{1}{2}\times 2\frac{2}{5}\times 1\frac{1}{7}=\frac{7}{2}\times\frac{12}{5}\times\frac{8}{7}=\frac{6\times 8}{5}=\frac{48}{5}\Rightarrow 9\frac{3}{5}$

(d) $22\frac{2}{3}\times 3\frac{1}{7}=\frac{68}{3}\times\frac{22}{7}=\frac{1496}{21}\Rightarrow 71\frac{5}{21}$

Exercise 2.3

1. (a) $\frac{6}{11}\div 15=\frac{6}{11}\times\frac{1}{15}=\frac{2\times 1}{11\times 5}=\frac{2}{55}$.

(b) $6\frac{4}{5}\div\frac{7}{35}=\frac{34}{5}\times\frac{35}{7}=\frac{34}{5}\times 5=34$.

(c) $\frac{16}{7}\div\frac{28}{42}=\frac{16}{7}\times\frac{42}{28}=\frac{16}{7}\times\frac{3}{2}=\frac{8\times 3}{7}=\frac{24}{7}=3\frac{3}{7}$

2. (a) $\left(5\frac{1}{4}\times\frac{16}{7}\right)\div\frac{2}{3}=\left(\frac{21}{4}\times\frac{16}{7}\right)\times\frac{3}{2}=(3\times 4)\times\frac{3}{2}=12\times\frac{3}{2}=(6\times 3)\Rightarrow 18$

(b) $\left(18\frac{2}{9}\div 9\frac{1}{9}\right)\div 1\frac{1}{3}=\left(\frac{164}{9}\div\frac{82}{9}\right)\div\frac{4}{3}=\left(\frac{164}{9}\times\frac{9}{82}\right)\times\frac{3}{4}$

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

(c) $\left(2\frac{1}{7}\times 2\frac{4}{5}\right)\div\frac{1}{10}=\left(\frac{15}{7}\times\frac{14}{5}\right)\times 10=(3\times 2)\times 10=60$

Exercise 2.4

1. The perimeter of a square $=9\frac{1}{11}$ m

$\therefore$ Each side of the square $=\frac{1}{4}\times$ perimeter $=\frac{1}{4}\times 9\frac{1}{11}$ m

$=\frac{1}{4}\times\frac{100}{11}$ m $=\frac{25}{11}$ m $=2\frac{3}{11}$ m

Thus, the area of the square = $(\text{side})^2 = \left(\frac{25}{11}\text{m}\right)^2 = \frac{625}{121}\text{m}^2 = 5\frac{20}{121}\text{m}^2$.

2. The product of two numbers $= \frac{4}{9}$

And, one of the number $= \frac{7}{17}$

Thus, the other number = product ÷ one number

$$= \frac{4}{9} \div \frac{7}{17} = \frac{4}{9} \times \frac{17}{7} = \frac{68}{63} = 1\frac{5}{63}$$

3. The cost of $8\frac{1}{4}$ kg of tomatoes = ₹ $194\frac{1}{4}$

$\therefore$ Cost of 1 kg of tomatoes $= ₹\ 194\ \frac{1}{4} \div 8\frac{1}{4} = ₹\ \frac{777}{4} \div \frac{33}{4}$

$$= ₹\ \frac{777}{4} \times \frac{4}{33} = ₹\ \frac{777}{33}$$

$$= ₹\ \frac{259}{11} = ₹\ 23\frac{6}{11}$$

Thus, the cost of $3\frac{3}{4}$ kg of tomatoes $= ₹\ 23\frac{6}{11} \times 3\frac{3}{4} = ₹\ \frac{259}{11} \times \frac{15}{4}$

$$= ₹\ \frac{3885}{44} = ₹\ 88\ \frac{13}{44}$$

4. Total number of students in a class = 50

$\therefore$ The number of girls in the class $= \frac{3}{5}$ of $50 = \frac{3}{5} \times 50$

$$= 3 \times 10 \Rightarrow 30$$

Thus, the number of boys in the class $= 50 - 30 = 20$.

5. The number of pieces of the iron rod of equal length = 8

And, the length of each piece of iron rod $= 6\frac{3}{4}$ m

$\therefore$ Total length of the iron rod $= 8 \times 6\frac{3}{4}\text{ m} = 8 \times \frac{27}{4}\text{ m}$

$$= 8 \times \frac{27}{4}\text{ m} = (2 \times 27)\text{ m} \Rightarrow 54\text{ m}.$$

Hence, the original length of the iron rod is 54 m.

6. The product of two numbers $= 15\frac{5}{6}$

And, one of the number $= 6\frac{1}{3}$

Thus, the other number = Product ÷ one number

$$= 15\frac{5}{6} \div 6\frac{1}{3} = \frac{95}{6} \div \frac{19}{3}$$

$$= \frac{95}{6} \times \frac{3}{19} = \frac{5}{2} = 2\frac{1}{2}$$

7. Let, the total number of students in the school be x.

Thus, the number of boys $= \frac{4}{7}$ of $x = \frac{4}{7}x$.

And, the number of girls $= x - \frac{4}{7}x$

$$= \frac{7x-4x}{7} = \frac{3x}{7}$$

$\because$ Number of girls in the school $= 210$

$\therefore \quad \frac{3x}{7} = 210$

$$x = \frac{210 \times 7}{3} = 70 \times 7 \Rightarrow 490$$

$\therefore$ Total number of students in the school = 490

Hence, the number of boys in the school $= 490 - 210 = 280$

Brain Teaser

1. A number which is in form of $\frac{p}{q}$, where p and q are whole numbers and $q \neq 0$, is called fraction.

2. $\frac{1}{2}, \frac{2}{3}, \frac{4}{5}, \frac{5}{8}$ and $\frac{7}{8}$ are the examples of unlike fractions.

3. Multiplicative inverse of $\frac{1}{999}$ is 999.

Multiple Choice Questions

1. (a), 2. (b), 3. (d), 4. (c), 5. (a);

HOTS

1. Let, the required fraction be $\frac{p}{q}$.

Thus, $\frac{p}{q+1} = \frac{1}{2}$

$$2p = q + 1$$

$$2p - q = 1 \qquad \ldots(1)$$

And, $\frac{p+1}{q} = 1$

$$p + q = q$$

$$p - q = -1 \qquad \ldots(2)$$

Equation (1) equation (2)

$$\begin{array}{r} 2p - q = 1 \\ p - q = -1 \\ \hline p = 2 \end{array}$$

Thus, $q = p + q = 2 + 1 \Rightarrow 3$

Hence, the required fractions is $\frac{2}{3}$.

2. Given, fractions : $\frac{9}{49}, \frac{3}{49}, \frac{7}{49}, \frac{5}{49}, \frac{10}{49}, \frac{6}{49}$

$\because$ All denominators are equal.

$\therefore$ Largest fraction $= \frac{10}{49}$

And, smallest fraction $= \frac{3}{49}$

Thus, the product of the largest and the smallest fractions $= \frac{10}{49} \times \frac{3}{49} = \frac{30}{2401}$

NEP

Do it yourself.

3 Decimals

Exercise 3.1a

1. (a) 3.8, 15.09, 0.385, 387.5

$\because$ 3.8 = 3.800
15.09 = 15.090
0.385 = 0.385
And 387.5 = 387.500
$\therefore$ 3.800, 15.090, 0.385, 387.500 are like decimals.

(b) 376.5, 8.235, 20.6, 38.5

$\because$ 376.5 = 376.500
8.235 = 8.235
20.6 = 20.600
38.5 = 38.500
$\therefore$ 376.500, 8.235, 20.600, 38.500 are like decimals.

2. (a) 63.500, 265.250, 50.626

$\because$ 63.500 = 63.5
265.250 = 265.25
And, 50.626 = 50.626
$\therefore$ 63.5, 265.25, 50.626 are unlike decimals.

(b) 72.250, 165.300, 275.350

$\because$ 72.250 = 72.25
165.300 = 165.3
And, 275.350 = 275.35
$\therefore$ 72.25, 165.3, 275.35 are unlike fractions.

3. (a) 12. 25, 15.62 and 35.55

$$\begin{array}{r} 12.25 \\ 15.62 \\ +35.55 \\ \hline 63.42 \end{array}$$

Hence,
12.25 + 15.62 + 35.55
= **63.42**

(b) 326.123, 210.6 and 632.27

$$\begin{array}{r} 326.123 \\ 210.600 \\ +\ 632.270 \\ \hline 1168.993 \end{array}$$

Hence,
326.123 + 210.6 + 632.27
= **1168.993**

(c) 720. 62, 523.690 and 120.007

720.620
523.690

(d) 607.12, 790.657 and 1930.425

607.120
790.657

+120.007
1364.317

Hence, 720.62 + 523.690 + 120.007 = **1364.317**

+ 1930.425
3328.202

Hence, 607.12 + 790.657 + 1930.425 = **3328.202**

4. (a) 300–126.75

300.00
– 126.75
173.25

Hence, 300 – 126.75 = **173.25**

(b) 623.123 – 172.256

623.123
– 172.256
450.867

Hence, 623.123–172.256 = **450.867**

(c) 1987.5– 928.62

1987.50
–928.62
1058.88

Hence, 1987.5 – 928.62 = **1058.88**

(d) 3485.26 – 2123.135

3485.260
–2123.135
1362.125

Hence, 3485.26–2123.135 = **1362.125**

Exercise 3.2

1. (a) 2.75 × 10 = **27.5** (Shift decimal to one place to the right)

(b) 2.01 × 10 = **20.1** (Shift decimal to one place to the right)

(c) 3.5 × 10 = **35.0** (Shift decimal to one place to the right)

(d) 1.33 × 10 = **13.3** (Shift decimal to one place to the right)

(e) 0.13 × 100 = **13.0** (Shift decimal to two places to the right)

(f) 8.9 × 100 = **890.0** (Shift decimal to two places to the right)

(g) 16.17 × 100 = **1617** (Shift decimal to two places to the right)

(h) 2.31 × 1000 = **2310.0** (Shift decimal to third places to the right)

2. (a) 1.3 ×7

Here, Sum of decimal places in given decimal = 1

1 3
× 7
9 1

Hence, 1.3 × 7 = **9.1**

(b) 2.57 × 18

Here, Sum of decimal places in given decimal = 2

2 5 7
× 1 8
2 0 5 6
2 5 7×
4 6 2 6

Hence, 2.57 × 18 = **46.26**

(c) 1.5 × 9

Here, Sum of decimal places in given decimal = 1

1 5
× 9
135

Hence, 1.5× 9 = **13.5**

(d) 0.225 ×13

Here, Sum of decimal places in given decimal = 3

2 2 5
× 1 3
6 7 5
2 2 5×
2 9 2 5

Hence, 0.225 × 13 = **2.925**

(e) 49.25×25

Here, Sum of decimal places in given decimal = 2

$$\begin{array}{r} 4\,9\,2\,\ 5 \\ \times\ 2\,\ 5 \\ \hline 2\,4\,6\,2\,5 \\ 9\,8\,5\,0\times \\ \hline 1\,2\,3\,1\,2\,5 \end{array}$$

Hence, $49.25 \times 25 =$ **1231.25**

(f) 19.84×27

Here, Sum of decimal places in given decimal = 2

$$\begin{array}{r} 1\,9\,8\,4 \\ \times\ 2\,7 \\ \hline 1\,3\,8\,8\,8 \\ 3\,9\,6\,8\times \\ \hline 5\,3\,5\,6\,8 \end{array}$$

Hence, $19.84 \times 27 =$ **535.68**

(g) 16.34×79

Here, Sum of decimal places in given decimals = 2

$$\begin{array}{r} 1\,6\,3\,4 \\ \times\ 7\,9 \\ \hline 1\,4\,7\,0\,6 \\ 1\,1\,4\,3\,8\times \\ \hline 1\,2\,9\,0\,8\,6 \end{array}$$

Hence, $16.34 \times 79 =$ **1290.86**

(h) 0.427×235

Here, Sum of decimal places in given decimals = 3

$$\begin{array}{r} 4\,2\,7 \\ \times\ 2\,3\,5 \\ \hline 2\,1\,3\,5 \\ 1\,2\,8\,1\times \\ 8\,5\,4\times\times \\ \hline 1\,0\,0\,3\,4\,5 \end{array}$$

Hence, $0.427 \times 235 =$ **100.345**

3. (a) 3.6×0.5

Here, Sum of decimal places in given decimals = 1 + 1 = 2

$$\begin{array}{r} 3\,6 \\ \times\ 5 \\ \hline 1\,8\,0 \end{array}$$

Hence, $3.6 \times 0.5 = 1.80$

(b) 1.2×1.2

Here, Sum of decimal places in given decimals = 1 + 1 = 2

$$\begin{array}{r} 1\,2 \\ \times\ 1\,2 \\ \hline 2\,4 \\ 1\,2\,\times \\ \hline 1\,4\,\ 4 \end{array}$$

Hence, $1.2 \times 1.2 = 1.44$

(c) 0.13×0.6

Here, Sum of decimal places in given decimals = 2 + 1 = 3

$$\begin{array}{r} 1\,3 \\ \times\ 6 \\ \hline 7\,8 \end{array}$$

Hence, $0.13 \times 0.6 =$ **0.078**

(d) 2.01×1.1

Here, Sum of decimal places in given decimals = 2 + 1 = 3

$$\begin{array}{r} 2\,0\,1 \\ \times\ 1\,1 \\ \hline 2\,0\,1 \\ 2\,0\,1\times \\ \hline 2\,2\,1\,1 \end{array}$$

Hence, $2.01 \times 1.1 =$ **2.211**

(e) 4.21×7.25

Here, Sum of decimal places in given decimals = 2 + 2 = 4

(f) 12.23×6.3

Here, Sum of decimal places in given decimals = 2 + 1 = 3

7 2 5
× 4 2 1
7 2 5
1 4 5 0 ×
2 9 0 0 × ×
3 0 5 2 2 5

Hence, 4.21 × 7.25 = **30.5225**

(g) 12.24 × 6.5

Here, Sum of decimal places in given decimals = 2 + 1 = 3

1 2 2 4
× 6 5
6 1 2 0
7 3 4 4 ×
7 9 5 6 0

Hence, 12.24 × 6.5 = **79.560**

(i) 13.25 × 1.5

Here, Sum of decimal places in given decimals = 2 + 1 = 3

1 3 2 5
× 1 5
6 6 2 5
1 3 2 5 ×
1 9 8 7 5

Hence, 13.25 × 1.5 = **19.875**

(k) 0.235 × 4.8

Here, Sum of decimal places in given decimals = 3 + 1 = 4

2 3 5
× 4 8
1 8 8 0
9 4 0 ×
1 1 2 8 0

Hence, 0.235 × 4.8 = **1.1280**

1 2 2 3
× 6 3
3 6 6 9
7 3 3 8 ×
7 7 0 4 9

Hence, 12.23 × 6.3 = **77.049**

(h) 13.63 × 1.1

Here, Sum of decimal places in given decimals = 2 + 1 = 3

1 3 6 3
× 1 1
1 3 6 3
1 3 6 3 ×
1 4 9 9 3

Hence, 13.63 × 1.1 = **14.993**

(j) 19.84 × 27.9

Here, Sum of decimal places in given decimals = 2 + 1 = 3

1 9 8 4
× 2 7 9
1 7 8 5 6
1 3 8 8 8 ×
3 9 6 8 × ×
5 5 3 5 3 6

Hence, 19.84 × 27.9 = **553.536**

(l) 1.475 × 2.112

Here, Sum of decimal places in given decimals = 3 + 3 = 6

1 4 7 5
× 2 1 1 2
2 9 5 0
1 4 7 5 ×
1 4 7 5 × ×
2 9 5 0 × × ×
3 1 1 5 2 0 0

Hence, 1.475 × 2.112 = **3.115200**

4. (a) The price of 1m of cloth =₹ 62.85

∴ The price of 23m of cloth =₹ 62.85× 23 =₹1445.55

$$\begin{array}{r} 6\ 2\ 8\ 5 \\ \times\ 2\ 3 \\ \hline 1\ 8\ 8\ 5\ 5 \\ 1\ 2\ 5\ 7\ 0\times \\ \hline 1\ 4\ 4\ 5\ 5\ 5 \end{array}$$

(b) Shubham's monthly salary =` 5500

The part of salary saved by Shubham = 0.2

Thus, Shubham's monthly savings =` 5500× 0.2

$$\begin{array}{r} 1\ 1\ 0\ 0 \\ \times\ 1\ 2 \\ \hline 2\ 2\ 0\ 0 \\ 1\ 1\ 0\ 0\times \\ \hline 1\ 3\ 2\ 0\ 0 \end{array}$$

∵ Shubham saves in 1 month =₹1100

∴ Shubham saves in 12 months =₹1100× 12 =₹1 3200

Hence, he will save `₹13200 in one year.

(c) ∵ 1m = 39.37 inches

∴ 16m = 39.37 × 16 inches = 629.92 inches

$$\begin{array}{r} 3\ 9\ 3\ 7 \\ \times\ 1\ 6 \\ \hline 2\ 3\ 6\ 2\ 2 \\ 3\ 9\ 3\ 7\times \\ \hline 6\ 2\ 9\ 9\ 2 \end{array}$$

(d) Cost of 1 orange = ₹ 6.45

Cost of 1 dozen (i.e.,12) oranges = ₹ 6.45 × 12 = ₹ 77.4

$$\begin{array}{r} 6\ 4\ 5 \\ \times\ 1\ 2 \\ \hline 1\ 2\ 9\ 0 \\ 6\ 4\ 5\times \\ \hline 7\ 7\ 4\ 0 \end{array}$$

Exercise-3.3

1. (a) $9.69 \div 10$

$= \frac{9.69}{10} = \frac{969}{10\times 100}$

$= \frac{969}{1000} = \mathbf{0.969}$

(b) $13.05 \div 10$

$= \frac{13.05}{10} = \frac{1305}{10\times 100}$

$= \frac{1305}{1000} = \mathbf{1.305}$

(c) $34.19 \div 10$

$= \frac{34.19}{10} = \frac{3419}{10\times 100} = \frac{3419}{1000}$

$= \mathbf{3.419}$

(d) $0.01 \div 100$

$= \frac{0.01}{100} = \frac{1}{100\times 100} = \frac{1}{10000}$

$= \mathbf{0.0001}$

(e) $56.192 \div 10$

$= \frac{56.192}{10} = \frac{56192}{10 \times 1000}$

$= \frac{56192}{10000} = \mathbf{5.6192}$

(f) $0.73 \div 100$

$= \frac{0.73}{100} = \frac{73}{100 \times 100} = \frac{73}{10000}$

$= \mathbf{0.0073}$

2. (a) $4.9 \div 0.7$

$= \frac{4.9}{0.7} = \frac{49}{7} = \mathbf{7}$

(b) $80 \div 1.6$

$= \frac{80}{1.6} = \frac{80 \times 10}{16} = \mathbf{50}$

(c) $5.45 \div 0.25$

$= \frac{5.45}{0.25} = \frac{545}{25} = \mathbf{21.8}$

(d) $9.69 \div 1.9$

$= \frac{9.69}{1.9} = \frac{969 \times 10}{19 \times 100} = \frac{51}{10} = \mathbf{5.1}$

(e) $56.192 \div 3.2$

$= \frac{56.192}{3.2} = \frac{56192 \times 10}{32 \times 1000}$

$= \frac{1756}{100} = \mathbf{17.56}$

(f) $289.6 \div 6.4$

$= \frac{289.6}{6.4} = \frac{2896 \times 10}{64 \times 10}$

$= \frac{2896}{64} = \mathbf{45.25}$

(g) $0.0102 \div 1.7$

$= \frac{0.0102}{1.7} = \frac{102 \times 10}{17 \times 10000}$

$= \frac{6}{1000} = \mathbf{0.006}$

(h) $0.759 \div 0.3$

$= \frac{0.759}{0.3} = \frac{759 \times 10}{3 \times 1000}$

$= \frac{253}{100} = \mathbf{2.53}$

(i) $25.395 \div 1.5$

$= \frac{25.395}{1.5} = \frac{25395 \times 10}{15 \times 1000}$

$= \frac{1693}{100}$

$= \mathbf{16.93}$

3. (a) The product of two decimal numbers = 131.58
And, one of the decimal number = 2.15

$$\begin{array}{r} 61.2 \\ 215\overline{)\,131.58} \\ -\,1290 \\ \hline 258 \\ -\,215 \\ \hline 430 \\ -\,430 \\ \hline \times \end{array}$$

Thus, the other decimal number
$= 131.58 \div 2.15$

$= \frac{131.58}{2.15} = \frac{13158}{215} = 61.2$

Hence, the other decimal number is 61.2.

(b) The total sum of money distributed among 44 workers = ₹ 4483.60
Thus, money distributes to each worker = ₹ 4483.60 ÷ 44

$= ₹ \frac{4483.60}{44} = ₹\ 101.9$

$$
\begin{array}{r}
101.9 \\
44 \overline{)\,4483.60} \\
-\,44 \\
\hline
083 \\
-\,44 \\
\hline
396 \\
-\,396 \\
\hline
\times
\end{array}
$$

Hence, worker gets ₹ 101.90.

(c) Total height of the pile of books = 54.4 cm

And, the thickness of each book = 3.2 cm

Thus, the number of books in the pile of books

$$= 54.4 \div 3.2$$

$$= \frac{54.4}{3.2} = \frac{544}{32} = 17$$

$$
\begin{array}{r}
17 \\
32 \overline{)\,544} \\
-\,32 \\
\hline
224 \\
-\,224 \\
\hline
\times
\end{array}
$$

Hence, there are 17 books in the pile in all.

Exercise-3.4

1. (a) $0.79\text{m} = 0.79 \times 100\ \text{cm} = \underline{\mathbf{79}}\ \text{cm}$

(b) $50\ \text{km} = 50 \times 1000 \times 100\ \text{cm} = \underline{\mathbf{5000000}}\ \text{cm}$

(c) $5\ \text{m}\ 60\ \text{cm} = 5 \times 100\ \text{cm} + 60\ \text{cm} = \underline{\mathbf{560}}\ \text{cm}$

(d) $165\ \text{mm} = \frac{165}{1000}\text{m} = \underline{\mathbf{0.165}}\ \text{m}$

(e) $4.7\ \text{kg} = 4.7 \times 1000\ \text{g} = \underline{\mathbf{4700}}\ \text{g}$

(f) $470\ \text{g} = \frac{470}{1000}\ \text{kg} = \underline{\mathbf{0.47}}\ \text{kg}$

(g) $8.73\text{kg} = 8.73 \times 1000\ \text{g} = \underline{\mathbf{8730}}\ \text{g}$

(h) $73\text{m} = 73 \times 100\ \text{cm} = \underline{\mathbf{7300}}\ \text{cm}$

2. Distance covered by vehicle in 14 litres of petrol $= 176.96$ km

$\therefore$ Distance covered by vehicle in 1 litre of petrol $= 176.96 \div 14$ km

$= 12.64$ km

So, the vehicle covers the average distance of 12.64 km per litre.

3. One cone can be filled of ice-cream = 35 ml

$\therefore$ Number of cone required 10.5 litres of ice-cream $= \frac{10.5\ \text{litre}}{35\ \text{ml}}$

$$= \frac{10.5 \times 1000\ \text{ml}}{35\ \text{ml}} = \frac{10{,}500}{35}$$

$$= 300$$

So, 300 ice-cream cones can be filled from 10.5 litres of ice-cream.

4. The cost of a dozen show pieces = ₹ 230

$\therefore$ The cost of one show piece $= ₹\ 230 \div 12 = ₹\ \frac{230}{12} = ₹19.1666$

Multiple Choice Questions

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

HOTS

1. Sum of 24.75 and 20.25 $= 24.75 + 20.25 = 45$

ifference of 24.75 and 20.25 $= 24.75 - 20.25 = 4.5$

$\therefore$ Product of their sum and difference $= 45 \times 4.5 = 202.5$

2. $18.75 \div 2.5 = \frac{18.75}{2.5} = \frac{1875 \times 10}{25 \times 100} = \frac{75}{10} = 7.5$

$18.750 \div 2.50 = \frac{18.750}{2.50} = \frac{18750 \times 100}{250 \times 1000} = \frac{75}{10} = 7.5$

Thus, both are same.

---

4 Data Handling

Exercise 4.1

1. (a) 4, 7, 3, 8, 2, 5, 9, 4, 3

$\therefore$ Mean $= \frac{\text{Sum of the data}}{\text{No. of the data}}$

$= \frac{4+7+3+8+2+5+9+4+3}{9} = \frac{45}{9} = 5$

And, Range = Maximum data $-$ Minimum data $= 9 - 2 = 7$

(b) 85, 76, 90, 84, 39, 48, 86, 95, 81 and 75

$\therefore$ Mean $= \frac{\text{Sum of the data}}{\text{No. of the data}}$

$= \frac{85+76+90+84+39+48+86+95+81+75}{10}$

$= \frac{759}{10} = 75.9$

And, Range = Maximum data $-$ Minimum data

$= 95 - 39 = 56$

2. (a) First five prime numbers are 2, 3, 5, 7 and 11.

$\therefore$ Mean $= \frac{\text{Sum of all numbers}}{\text{No. of such numbers}}$

$= \frac{2+3+5+7+11}{5} = \frac{28}{5} = 5.6$

(b) First ten composite numbers are 4, 6, 8, 9, 10, 12, 14, 15, 16 and 18.

$\therefore$ Mean $= \frac{\text{Sum of all such numbers}}{\text{No. of such numbers}}$

$$= \frac{4+6+8+9+10+12+14+15+16+18}{10}$$

$$= \frac{112}{10} = 11.2$$

(c) First five multiples of 6 are 6, 12, 18, 24 and 30.

$$\therefore \text{ Mean} = \frac{\text{Sum of multiples of 6}}{\text{No. of multiples of 6}}$$

$$= \frac{6+12+18+24+30}{5} = \frac{90}{5} = 18$$

(d) Factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24.

$$\therefore \text{ Mean} = \frac{\text{Sum of all the factors of 24}}{\text{No. of factors of 24}}$$

$$= \frac{1+2+3+4+6+8+12+24}{8} = \frac{60}{8} = 7.5$$

3. The height of 5 persons are 150 cm, 160 cm, 140 cm, 175 cm and 155 cm.

$$\therefore \text{ Mean height} = \frac{\text{Sum of the heights of all persons}}{\text{No. of persons}}$$

$$= \frac{150\text{cm} + 160\text{cm} + 140\text{cm} + 175\text{cm} + 155\text{cm}}{5} = \frac{780}{5} = 156 \text{ cm.}$$

Now, the number of persons whose height is below the mean height is 3.

4. The marks obtained by students are 85, 76, 90, 85, 39, 48, 56, 95, 81 and 75.

(a) Highest marks obtained by students = 95

Lowest marks obtained by students = 39

(b) $\text{Mean marks} = \frac{\text{Sum of all the marks}}{\text{No. of students}}$

$$= \frac{85+76+90+85+39+48+56+95+81+75}{10}$$

$$= \frac{730}{10} = 73 \text{ marks.}$$

(c) No. of students securing marks more than the mean marks = 7

5. The height of 10 girls are as follows :

135 cm, 150 cm, 139 cm 128 cm, 151 cm, 132 cm, 146 cm, 149 cm, 143 cm and 141 cm.

(a) The height of the tallest girl = 151 cm

(b) The height of the shortest girl = 128 cm

(c) Range of the data = 151 cm − 128 cm = 23 cm

(d) $\text{Mean height of the girls} = \frac{\text{Sum of the heights of the girls}}{\text{No. of girls}}$

$$= \frac{135+150+139+128+151+132+146+149+143+141}{10}$$

$$= \frac{1414}{10} = 141.4$$

(e) No. of girls having height more than the mean height is 5.

6. Enrolment of a school during six years are 1555, 1670, 1750, 2013, 2540 and 2820.

$$\therefore \quad \text{Mean enrollment} = \frac{\text{Sum of enrolled students}}{\text{No. of year}}$$

$$= \frac{1555 + 1670 + 1750 + 2013 + 2540 + 2820}{6}$$

$$= \frac{12348}{6} = 2058$$

7. The weight of new porn babies (in 1 kg) are :
3.4, 3.6, 3.0, 4.0, 2.5, 3.6, 3.8, 2.8, 3.2 and 2.6

$\therefore$ Mean weight of new born babies

$$= \frac{\text{Sum of the weight of all the new born babies}}{\text{No. of new born babies}}$$

$$= \frac{(3.4 + 3.6 + 3.0 + 4.0 + 2.5 + 3.6 + 3.8 + 2.8 + 3.2 + 2.6)}{10} \text{ kg}$$

$$= \frac{32.5\,\text{kg}}{10} = 3.25 \text{ kg}$$

8. $\because$ Mean $= \dfrac{\text{Sum of four numbers}}{4}$

$$\therefore \quad 32 = \frac{\text{Sum of four numbers}}{4}$$

$32 \times 4 = \text{Sum of four numbers}$

$\Rightarrow 128 = \text{Sum of four numbers}$

Let the fifth number be x.

Then, mean of five numbers $= \dfrac{\text{Sum of four numbers} + x}{5}$

$$31 = \frac{128 + x}{5}$$

$$31 \times 5 = 128 + x$$

$$155 = 128 + x$$

$$155 - 128 = x$$

$$27 = x \Rightarrow x = 27$$

Hence, the fifth observation is 27.

9. Average of Team A $= \dfrac{\text{Sum of all the games played by team A}}{\text{Total No. of games}}$

$$= \frac{67 + 87 + 90 + 95}{4} = \frac{339}{4} = 84.75$$

Average of Team B $= \dfrac{\text{Sum of all the games played by team B}}{\text{Total no. of games}}$

$$= \frac{82 + 92 + 70 + 65}{4} = \frac{309}{4} = 77.25$$

And, Average of Team C $= \dfrac{\text{Sum of all games played by team C}}{\text{Total no. of games}}$

$$= \frac{32 + 150 + 65 + 85}{4} = \frac{332}{4} = 83$$

(a) The average of team *B* is least.

(b) Do it yourself.

10.

x_i	f_i	$f_i \times x_i$
5	3	$5 \times 3 = 15$
15	P	$15 \times P = 15P$
25	3	$25 \times 3 = 75$
35	6	$35 \times 6 = 210$
45	2	$45 \times 2 = 90$
	$\Sigma f_i = 14 + P$	$\Sigma f_i x_i = 390 + 15P$

$\because$ $\text{Mean} = \dfrac{\Sigma f_i \times x_i}{\Sigma f_i}$

$\therefore$ $25 = \dfrac{390 + 15P}{14 + P}$

$$25(14 + P) = 390 + 15P$$
$$350 + 25P = 390 + 15P$$
$$25P - 15P = 390 - 350$$
$$10P = 40$$
$$P = \frac{40}{10} = 4$$

Hence, the value of *P* is 4.

11.

Variable (x)	Frequency (f)	$f \times x$
10	5	50
30	9	270
50	12	600
70	8	560
90	6	540
	$\Sigma f = 40$	$\Sigma fx = 2020$

$\therefore$ $\text{Mean} = \dfrac{\Sigma fx}{\Sigma f} = \dfrac{2020}{40} = 50.5$

Exercise 4.2

1. The score of mathematics taste of 15 students are :
19, 25, 23, 20, 19, 15, 20, 18, 7, 9, 8, 15, 20, 25 and 20.
Here 20 has maximum frequency.
So, the mode of the given data is 20.
To find the median we first arrange the marks in ascending order.
7, 8, 9, 15, 15, 18, 19, 19, 20, 20, 20, 20, 23, 25, 25.
Here, $n = 15$ (odd)

$$\therefore \quad \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation}$$

$$= \left(\frac{15+1}{2}\right)^{th} \text{ observation} = \left(\frac{16}{2}\right)^{th} \text{ observation}$$

$$= 8^{th} \text{ observation} = 19$$

Hence, 19 is the median of the scores.
The mode and the median of the data are not same.

2.

Size	4	5	6	7	8	9	10
Demand	5	10	12	10	12	3	2

Here, size no. 6 and 8 have maximum frequency (12).
So, the mode of the given data are 6 and 8.
Yes, it has two modes.

3. The runs scored in 11 cricket matches are as follows :
60, 15, 120, 50, 100, 80, 90, 89, 15, 70, 15
Arranging in ascending order
15, 15, 15, 50, 60, 70, 80, 89, 90, 100, 120

$$\therefore \quad \text{Mean} = \frac{\text{Sum of the runs scored}}{\text{Total number of matches}}$$

$$= \frac{15+15+15+50+60+70+80+89+90+100+120}{11}$$

$$= \frac{704}{11} = 64 \text{ runs}$$

Here, $n = 11$ which is odd.

$$\therefore \quad \text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation}$$

$$= \left(\frac{11+1}{2}\right)^{th} \text{ observation}$$

$$= \left(\frac{12}{2}\right)^{th} \text{ observation} = 6^{th} \text{ observation}$$

$$= 70$$

$\therefore$ Median = 70 runs

Since, 15 occurs maximum number of times

$\therefore$ Mode = 15 runs.

Hence, the mean, median and mode of the data are 64, 70 and 15 respectively.

4. The heights (in cm) of students are as follows :

155, 161, 145, 149, 150, 145, 152, 145, 140

$$\therefore \text{ Mean} = \frac{\text{Sum of the heights}}{\text{No. of students}}$$

$$= \frac{155 + 161 + 145 + 149 + 150 + 145 + 152 + 145 + 140}{9}$$

$$= \frac{1342}{9} = 149.11 \text{ cm}$$

So, mean = 149.11 cm.

Arranging the given height in ascending order as follows :

140, 145, 145, 145, 149, 150, 152, 155, 161.

here, $n = 9$ which is odd.

$$\therefore \text{ median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation}$$

$$= \left(\frac{9+1}{2}\right)^{th} \text{ observation} = 5^{th} \text{ observation} = 149$$

So, Median = 149 cm.

Mode : Since 145 cm occurs maximum number of times

So, mode = 145 cm.

5. The maximum temp. in (°C) for the first week of a month in Delhi are 37, 35, 36, 39, 36, 33 and 36.

$$\therefore \text{ Mean} = \frac{\text{Sum of all the temp.}}{\text{No. of days for the first week}}$$

$$= \frac{37 + 35 + 36 + 39 + 36 + 33 + 36}{7} = \frac{252}{7} = 36$$

So, Mean = 36° C.

Here $n = 7$ which is odd.

Arranging the data in ascending order

33, 35, 36, 36, 36, 37, 39

$$\therefore \text{ Median} = \left(\frac{n+1}{2}\right)^{th} \text{ observation}$$

$$= \left(\frac{7+1}{2}\right)^{th} \text{ observation} = 4^{th} \text{ observation} = 36$$

So, Median = 36°C.

Here 36 occurs maximum number of times.

So, mode = 36°C.

6. Preparing the cumulative frequency table, we have :

Variable (x)	Frequency (f)	Cumulative frequency
10	3	3
12	4	7
14	6	13
16	5	18
18	2	20
20	9	29
22	6	35
	Total = 35	

Here, $n = 35$ which is odd

So, Median $= \left(\frac{n+1}{2}\right)^{th}$ observation

$= \left(\frac{35+1}{2}\right)^{th}$ term $= 18^{th}$ term

$= 16$ (since 16 comes under cumulative frequency 18)

Hence, median $= 16$.

7. Preparing the cumulative frequency table, we have :

Weight (in kg) (x)	No. of persons (f)	Cumulative frequency
15	4	4
20	5	9
25	9	18
30	7	25
36	8	33
42	4	37
	Total = 37	

Here, $n = 37$ which is odd.

So, Median $= \left(\frac{n+1}{2}\right)^{th}$ term

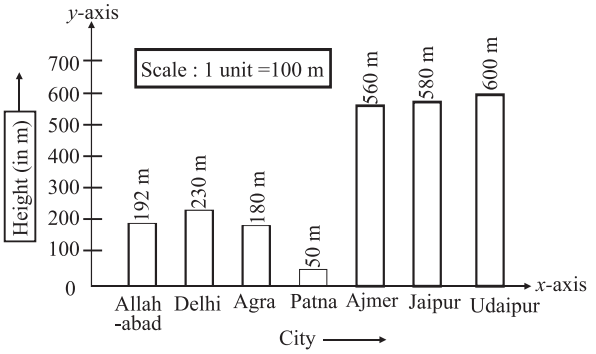
$= \left(\frac{37+1}{2}\right)^{th}$ term

$= \left(\frac{38}{2}\right)^{th}$ term $= 19^{th}$ term $= \mathbf{30}$

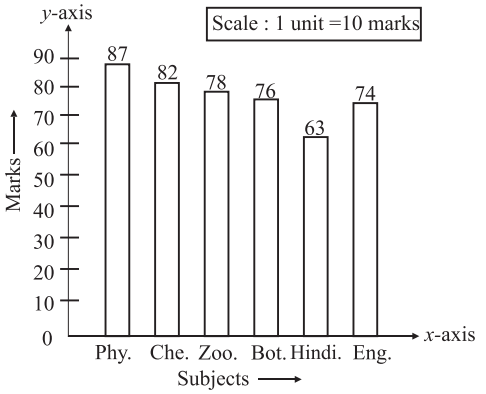
(since 30 comes in between cumulative frequency 18 and 25.)

Exercise 4.3

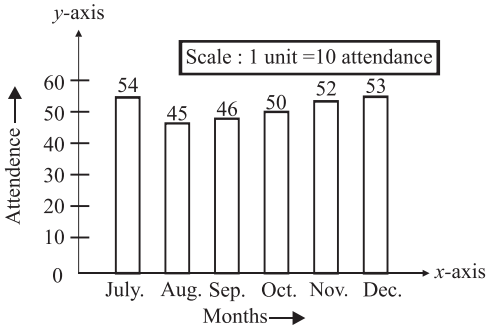
1. We will draw two perpendicular axis and take cities along x-axis and height along y-axis. Taking 1 unit = 10 students.



2.



3. We will draw two perpendicular axis and take months along x-axis and attendance along y-axis. Taking 1 unit = 10 students.

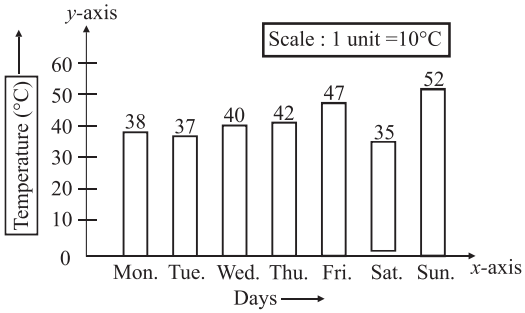


(a) In July, the average attendance was maximum.
(b) In Aug., the average attendance was minimum.
(c) In Aug. and Sep., the average attendance was less than 50.

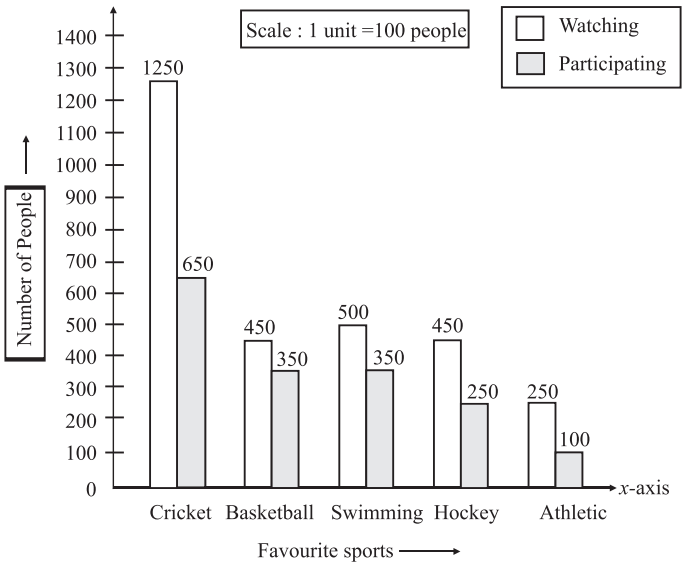
(d) In July, Nov. and Dec. the average attendance was more than 50.

(e) Required difference = Max. attendance − Min. attendance
$= 54 - 45 = 9.$

4. We will draw two perpendiculars axis and take days along x-axis and temperature along y-axis. Taking 1 unit = 10°C.



5.



(a) The given bar graph show a survey of a colony in their favourite sports watching and participating.

(b) Cricket (c) Athletic (d) Watching

(e) Basketball [$\because$ Watching – Participating $= 450 - 350 = 100$]

Multiple Choice Questions

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

Brain Teaser

1. Median of data if n is even $= \frac{1}{2}\left[\left(\frac{n}{2}\right)\text{th value} + \left(\frac{n}{2}+1\right)\text{th value}\right]$

2. Range = **Maximum value – Minimum value**
3. Data condensed in classes or group is called **collection of data**.
4. The number of times an observation occurs is called its frequency.

5 Probability

Exercise 5

1. If a coin is tossed 100 times and head is obtained 59 times.

$\therefore$ obtained tail $= 100 - 59 = 41$ times.

(a) Probability of getting a head :

$$\text{P (a head)} = \frac{\text{No of favourable out comes to head}}{\text{Total No. of possible outcomes}} = \frac{59}{100} = 0.59$$

(b) Probability of getting a tail :

$$\text{P (a tail)} = \frac{\text{No of favourable out comes to tail}}{\text{Total No. of possible outcomes}} = \frac{41}{100} = 0.41$$

2. (a) *a* '2'

Throwing a dice, the possible outcomes or sample space will be

$S = \{1, 2, 3, 4, 5, 6\}$

$\therefore$ P (getting 2) $= \dfrac{\text{No. of Favourable event}}{\text{Total no. of event}} = \dfrac{2}{6} = \dfrac{1}{3}.$

(b) an even number

Sample space $S = \{1, 2, 3, 4, 5, 6\}$

No. of favourable event $= \{2, 4, 6\}$

$\therefore$ P (an even number) $= \dfrac{\text{No. of Favourable event}}{\text{Total no. of event}} = \dfrac{3}{6} = \dfrac{1}{2}.$

(c) a prime number

Sample space $S = \{1, 2, 3, 4, 5, 6\}$

No. of favourable event i.e., prime numbers $= \{2, 3, 5\}$

$\therefore$ P (prime number) $= \dfrac{\text{No. of Favourable event}}{\text{Total no. of event}} = \dfrac{3}{6} = \dfrac{1}{2}.$

(d) a multiple of 3

Sample space $S = \{1, 2, 3, 4, 5, 6\}$

No. of favourable event i.e., multiple of $3 = \{3, 6\}$

$\therefore$ P (multiple of 3) $= \dfrac{\text{No. of Favourable event}}{\text{Total no. of event}} = \dfrac{2}{6} = \dfrac{1}{3}.$

(e) a factor of 6

Sample space $S = \{1, 2, 3, 4, 5, 6\}$

No. of favourable event i.e. factor is of $6 = \{1, 2, 3, 6\}$

$\therefore$ P (Factor of 6) $= \dfrac{\text{No. of Favourable event}}{\text{Total no. of event}} = \dfrac{4}{6} = \dfrac{2}{3}$

3. Total number of letter in word MATHEMATICS = 11.

(a) getting M (2 times)

$$\text{Probability of getting M} = \frac{\text{No. of Favourable outcomes}}{\text{Total no. of outcome}} = \frac{2}{11}.$$

(b) getting T (2 times)

$$\text{Probability of getting T} = \frac{\text{No. of Favourable outcomes}}{\text{Total no. of outcome}} = \frac{2}{11}$$

(c) getting S (1 times)

$$\text{Probability of getting S} = \frac{\text{No. of Favourable outcomes}}{\text{Total no. of outcome}} = \frac{1}{11}.$$

(d) getting a vowel (A, E, A, I)

$$\text{Probability of getting a vowel} = \frac{\text{No. of Favourable outcomes}}{\text{Total no. of outcome}} = \frac{4}{11}.$$

4. When two dice are rolled simultaneously, the possible outcomes are :

(1, 1) (2, 1) (3, 1) (4, 1) (5, 1) (6, 1)
(1, 2), (2, 2) (3, 2) (4, 2) (5, 2) (6, 2)
(1, 3) (2, 3) (3, 3) (4, 3) (5, 3) (6, 3)
(1, 4) (2, 4) (3, 4) (4, 4) (5, 4) (6, 4)
(1, 5) (2, 5) (3, 5) (4, 5) (5, 5) (6, 5)
(1, 6) (2, 6) (3, 6) (4, 6) (5, 6) (6, 6)

Total number of outcomes when two dice are rolled simultaneously = 36 (i.e., 6×6)

(a) a total of 12

Let A be the event of getting a total of 12.

The outcomes favourable to event A are (6, 6).

$\therefore$ Favourable outcomes = 1

$$\text{Hence } P(A) = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{1}{36}.$$

(b) a total of 3

Let B be the event of getting a total of 3.

The outcomes favourable to event B are (1, 2) and (2, 1).

$\therefore$ Favourable outcomes = 2

$$\text{Hence, } P(B) = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{2}{36} = \frac{1}{18}.$$

(c) a total of 8

Let C be the event of getting a total of 8.

The outcomes favourable to event C are (2, 6), (3, 5), (4, 4), (6, 2), (5, 3).

$\therefore$ Favourable outcomes = 5

$$\text{Hence, } P(C) = \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{5}{36}.$$

5. When a dice is rolled once, the possible outcomes are 1, 2, 3, 4, 5 and 6.

$\therefore$ Total outcomes = 6

(a) P (a composite number)

Composite numbers are 4, 6

$\therefore$ favourable outcomes $= 2$

Hence, P (a composite number) $= \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}} = \dfrac{2}{6} = \dfrac{1}{3}$.

(b) P (a number less than 4)

Number less than 4 are 1, 2, 3

So, favourable outcomes $= 3$

Hence, P (a number less than 4) $= \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}} = \dfrac{3}{6} = \dfrac{1}{2}$.

(c) P (a number divisible by 3)

Number divisible by 3 are 3, 6

So, favourable outcomes $= 2$

Hence, P (a number divisible by 3) $= \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}} = \dfrac{2}{6} = \dfrac{1}{3}$.

(d) P (a number between 2 and 6)

Numbers between 2 and 6 are 3, 4, 5

$\therefore$ favourable outcomes $= 3$

Hence, P (a number between 2 and 6) $= \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}} = \dfrac{3}{6} = \dfrac{1}{2}$.

Multiple Choice Questions

1. (b) **2.** (a) **3.** (b) **4.** (c) **5.** (d) **6.** (b) **7.** (d)

Brain Teaser

Fill in the blanks :

1. A dice is rolled once. The probability of P (a number less than 5) $= \mathbf{\dfrac{4}{6}}$ or $\mathbf{\dfrac{2}{3}}$.

2. A dice is rolled once. The probability of getting a number divisible by 3 is $\mathbf{\dfrac{2}{6}}$ or $\mathbf{\dfrac{1}{3}}$.

3. A jar contains 20 red and 22 white marbles. The probability of getting red marble is $\mathbf{\dfrac{20}{42}}$ **or** $\mathbf{\dfrac{10}{21}}$.

4. A number is drawn at random from 21 to 32. The probability of P (an odd number) $= \mathbf{\dfrac{6}{12}}$ or $\mathbf{\dfrac{1}{2}}$.

5. A letter is chosen from the word 'MATHEMATICS' at random. The probability of getting an 'M' is $\mathbf{\dfrac{2}{11}}$.

True or False :

1. T **2.** T **3.** F **4.** T **5.** T **6.** T **7.** T **8.** T.

HOTS

1. A box contains the number is it :
2, 3, 4, 7, 8, 9, 10, 15, 16, 20.
∴ Sample space {S} = {2, 3, 4, 7, 8, 9, 10, 15, 16, 20}
And, total possible outcomes = 10
the outcomes favourable to event are (3, 16), (4, 15) and (10, 9)
∴ favourable outcomes of two cards = 3
So, probability (a sum of 19) $= \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{3}{10}$.

2. Number of cards in a deck of cards :
Number of blue cards = 3
Number of red cards = 2.
Number of violet cards = 6.
And, the number of orange cards $= 4$
∴ Total possible outcomes = 15
Thus, the probability of P (a red card) $= \frac{\text{Favourable outcomes}}{\text{Total outcomes}} = \frac{2}{15}$.
Now, the number of remaining cards $= 15 - 1 = 14$
Thus, the probability of P (a blue card) there after $= \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$
$= \frac{3}{14}$.

6 Simple Equations

Exercise 6.1

1. Write equations for the following statements.

(a) 7 m = 84 (b) $\frac{y}{2} = 33$ (c) $5b - 3 = 12$

(d) $5x + 3 = 18$ (e) $d - 11 = 40$ or $11 - d = 40$

(f) $\frac{c}{6} = 2 + 8$ (g) $\frac{1}{4}p + 4 = 40$ (h) $\frac{t}{7} + 13 = 20$

2. Write the following equations in statement forms :
(a) x added to 8 gives 21.
(b) p subtracted from 5 is – 3.
(c) $-p$ divided by 7 gives 7.
(d) k divided by 9 gives 9.
(e) Three-fourth of y is 15.
(f) 6 times of x added to 11 gives 35.

(g) 3 subtracted from the quotient of b and 7 is 8.

(h) 5 subtracted from y gives – 12.

3. (a) Let, the two consecutive numbers are x and $(x+b)$.

Thus, $x+(x+1)=67$

$2x+1=67.$

(b) Let, the age of Pawan's sister Nisha $=x$ years

Thus, the age of Pawan $=x+6$ years

$\because$ Sum of their ages $=24$ years

$\therefore \quad x+x+6=24$

$2x+6=24.$

(c) Let, the required number be x.

Thus, $x+\frac{x}{2}=117.$

(d) Let, the breadth of a rectangle be x m.

Thus, the length of rectangle $=(2x-6)$ m.

$\because$ Perimeter of the rectangle = 240 m

$\therefore \quad 2(l+b)=240$

$2[(2x-6)+x]=240$

$4x-12+2x=240$

$6x-12=240$

Exercise 6.2

Solve the following linear equations by trial and error method and systematic method :

1. $x-5=0$

x	LHS $=x-5$	RHS = 0
1	$1-5=-4$	0
2	$2-5=-3$	0
3	$3-5=-2$	0
4	$4-5=-1$	0
5	$5-5=0$	0

$\therefore \quad (x=5)$ is the solution of given equation.

2. $x+4=0$

x	LHS $=x+4$	RHS = 0
1	$1+4=5$	0
2	$2+4=6$	0
0	$0+4=4$	0
– 1	$-1+4=-3$	0
– 4	$-4+4=0$	0

$\therefore \quad (x=-4)$ is the solution of the given equation.

3. $b - 7 = 9$

x	LHS = $b - 7$	RHS = 9
1	$1 - 7 = -6$	9
7	$7 - 7 = 0$	9
14	$14 - 7 = 7$	9
15	$15 - 7 = 8$	9
16	$16 - 7 = 9$	9

$\therefore \quad (p = 12)$ is the solution of the given equation.

4. $y + 8 = 20$

y	LHS = $y + 8$	RHS = 20
1	$1 + 8 = 9$	20
2	$2 + 8 = 10$	20
8	$8 + 8 = 16$	20
10	$10 + 8 = 18$	20
12	$12 + 8 = 20$	20

$\therefore \quad (y = 12)$ is the solution of the given equation.

5. $p + 6 = -6$

p	LHS = $p + 6$	RHS = -6
1	$1 + 6 = 7$	-6
2	$2 + 6 = 8$	-6
-6	$-6 + 6 = 0$	-6
-12	$-12 + 6 = -6$	-6

$\therefore \quad (x = -12)$ is the solution of the given equation.

6. $q + 9 = 9$

q	LHS = $q + 9$	RHS = 9
1	$1 + 9 = 10$	9
2	$2 + 9 = 11$	9
9	$9 + 9 = 18$	9
0	$0 + 9 = 9$	9

$\therefore \quad (q = 0)$ is the solution of the given equation.

7. $5d = 45$

d	LHS = $5d$	RHS = 45
1	$5 \times 1 = 5$	45

3	$5 \times 3 = 15$	45
5	$5 \times 5 = 25$	45
9	$5 \times 9 = 45$	45

$\therefore \quad (d = 9)$ is the solution of the given equation.

8. $30t = -60$

t	LHS $= 30t$	RHS $= -60$
1	$30 \times 1 = 30$	-60
2	$30 \times 2 = 60$	-60
-1	$30 \times (-1) = -30$	-60
-2	$30 \times (-2) = -60$	-60

$\therefore \quad (t = -2)$ is the solution of the given equation.

9. $\frac{-r}{8} = 6$

$-r$	LHS $= \frac{-r}{8}$	RHS $= 6$
-8	$\frac{-8}{-8} = 1$	6
-16	$\frac{-16}{8} = 2$	6
-32	$\frac{-32}{-8} = 4$	6
-48	$\frac{-48}{-8} = 6$	6

$\therefore \quad (r = -48)$ is the solution of the given equation.

10. $\frac{-a}{11} = \frac{18}{55}$

a	LHS $= \frac{-a}{11}$	RHS $= \frac{18}{15} = \frac{6}{5}$
-11	$\frac{-(-11)}{11} = 1$	$\frac{18}{15} = \frac{6}{5}$
-33	$\frac{-(-33)}{11} = 3$	$\frac{18}{15} = \frac{6}{5}$
$\frac{-55}{3}$	$\frac{-\left(\frac{-55}{3}\right)}{11} = 15$	$\frac{18}{15} = \frac{6}{5}$

$\frac{-66}{5}$	$\frac{-\left(\frac{-66}{5}\right)}{11}=\frac{6}{5}$	$\frac{18}{15}=\frac{6}{5}$

$\therefore \quad \left(a=\frac{-66}{5}\right)$ is the solution of the given equation.

11. $\frac{y}{16}=\frac{7}{48}$

y	LHS $=\frac{y}{16}$	RHS $=\frac{7}{48}$
16	$\frac{16}{16}=1$	$\frac{7}{48}$
28	$\frac{28}{16}=\frac{7}{4}$	$\frac{7}{48}$
$\frac{7}{12}$	$\frac{\left(\frac{7}{12}\right)}{16}=\frac{7}{192}$	$\frac{7}{48}$
$\frac{7}{3}$	$\left(\frac{7/5}{16}\right)=\frac{7}{48}$	$\frac{7}{48}$

$\therefore \quad \left(y=\frac{7}{3}\right)$ is the solution of the given equation.

12. $3n-2=22$

n	LHS $= 3n-2$	RHS $= 22$
2	$3\times2-2=4$	22
4	$3\times4-2=10$	22
6	$3\times6-2=16$	22
8	$3\times8-2=22$	22

$\therefore \quad (n=8)$ is the solution of the given equation.

13. $4x+9=45$

x	LHS $= 4x+9$	RHS $= 45$
1	$4\times1+9=13$	45
3	$4\times3+9=21$	45
5	$4\times5+9=29$	45
9	$4\times9+9=45$	45

$\therefore \quad (x=9)$ is the solution of the given equation.

14. $14l = 56$

l	LHS = $14l$	RHS = 56
1	$14 \times 1 = 14$	56
2	$14 \times 2 = 28$	56
4	$14 \times 4 = 56$	56

$\therefore$ $(l = 4)$ is the solution of the given equation.

15. $15p + 15 = 90$

p	LHS = $15p + 15$	RHS = 90
1	$15 \times 1 + 15 = 30$	90
2	$15 \times 2 + 15 = 45$	90
3	$15 \times 3 + 15 = 60$	90
5	$15 \times 5 + 15 = 90$	90

$\therefore$ $(p = 5)$ is the solution of the given equation.

16. $-5x - 3 = 107$

x	LHS = $-5x - 3$	RHS = 107
1	$-5 \times 1 - 3 = -8$	107
– 5	$-5 \times (-5) - 3 = 22$	107
– 11	$-5 \times (-11) - 3 = 52$	107
– 22	$-5 \times (-22) - 3 = 107$	107

$\therefore$ $(x = -22)$ is the solution of the given equation.

17. $4y + 3y = 84$

y	LHS = $4y + 3y$	RHS = 84
1	$4 \times 1 + 3 \times 1 = 7$	84
4	$4 \times 4 + 3 \times 4 = 28$	84
8	$4 \times 8 + 3 \times 8 = 56$	84
12	$4 \times 12 + 3 \times 12 = 84$	84

$\therefore$ $(y = 12)$ is the solution of the given equation.

18. $5 + 9x - 7 = 9x - 2 - x$

x	LHS = $5 + 9x - 7$	RHS = $9x - 2 - x$
1	$5 + 9 \times 1 - 7 = 7$	$9 \times 1 - 2 - 1 = 6$
2	$5 + 9 \times 2 - 7 = 16$	$9 \times 2 - 2 - 2 = 14$
– 1	$5 + 9 \times (-1) - 7 = -11$	$9 \times (-1) - 2 - (-1) = -10$
0	$5 + 9 \times 0 - 7 = -2$	$9 \times 0 - 2 - 0 = -2$

$\therefore$ $(x = 0)$ is the solution of the given equation.

19. $x + \frac{1}{2} = 19$

x	LHS $= x + \frac{1}{2}$	RHS $= 19$
1	$1 + \frac{1}{2} = \frac{3}{2}$	19
2	$2 + \frac{1}{2} = \frac{5}{2}$	19
19	$19 + \frac{1}{2} = \frac{39}{2}$	19
$\frac{19}{2}$	$\frac{19}{2} + \frac{1}{2} = 10$	19
$\frac{37}{2}$	$\frac{37}{2} + \frac{1}{2} = \frac{38}{2} = 19$	19

$\therefore$ $\left(x = \frac{37}{2}\right)$ is the solution of the given equation.

20. $2s - \frac{1}{2} = -\frac{1}{3}$

S	LHS $= 2S - \frac{1}{2}$	RHS $= -\frac{1}{3}$
1	$2 \times 1 - \frac{1}{2} = \frac{3}{2}$	$\frac{-1}{3}$
$\frac{1}{2}$	$2 \times \frac{1}{2} - \frac{1}{2} = \frac{1}{2}$	$\frac{-1}{3}$
$\frac{1}{6}$	$2 \times \frac{1}{6} - \frac{1}{2} = \frac{1}{6}$	$\frac{-1}{3}$
$\frac{1}{6}$	$2 \times \frac{1}{6} - \frac{1}{2} = \frac{-1}{6}$	$\frac{-1}{3}$
$\frac{1}{12}$	$2 \times \frac{1}{12} - \frac{1}{2} = \frac{-1}{3}$	$\frac{-1}{3}$

$\therefore$ $\left(S = \frac{1}{12}\right)$ is the solution of the given equation.

Exercise 6.3

1. $-2(y + 3) = 7$

$y + 3 = \frac{7}{(-2)}$

2. $2m + \frac{5}{2} = \frac{37}{2}$

$2m = \frac{37}{2} - \frac{5}{2}$

$y = \frac{-7}{2} - 3$

$y = \frac{-7}{2} - 3$

$y = \frac{-7-6}{2} = \frac{-13}{2}$

Check :

$\text{LHS} = -2(y+3)$

$= -2\left(\frac{-13}{2} + 3\right)$

$= -2\left(\frac{-13+6}{2}\right)$

$= -2 \times \frac{-7}{2}$

$= 7 = \text{RHS}.$

Hence, $\left(y = \frac{-13}{2}\right)$ is the solution of given equation.

3. $34 - 5(n-1) = 4$

$34 - 5n + 5 = 4$

$39 - 5n = 4$

$39 - 4 = 5n$

$35 = 5n$

$n = \frac{35}{5} = 7$

Check :

$\text{LHS} = 34 - 5(n-1)$

$= 34 - 5(7-1)$

$= 34 - 5 \times 6$

$= 34 - 30$

$= 4 = \text{RHS}.$

Hence, $(n = 7)$ is the solution of the given equation.

5. $0 = 18 + 9(m-2)$

$0 = 18 + 9m - 18$

$0 = 9m$

$\therefore \quad m = \frac{0}{9} = 0$

Check :

$2m = \frac{37-5}{2}$

$2m = \frac{32}{2} = 16$

$m = \frac{16}{2} = 8$

Check :

$\text{LHS} = 2m + \frac{5}{2}$

$= 2 \times 8 + \frac{5}{2}$

$= 16 + \frac{5}{2}$

$= \frac{32+5}{2}$

$= \frac{37}{2} = \text{RHS}$

Hence, $(m = 8)$ is the solution of the given equation.

4. $-3(4-x) = 2x + 5$

$-12 + 3x = 2x + 5$

$3x - 2x = 5 + 12$

$x = 17$

Check :

$\text{LHS} = -3(4-x)$

$= -3(4-17)$

$= (-3) \times (-13) = 39$

$\text{RHS} \quad = 2x + 5$

$= 2 \times 17 + 5$

$= 34 + 5 = 39$

$\therefore$ LHS = RHS

Hence, $(x = 17)$ is the solution of the given equation.

6. $4(5x-4) + 3(2x-1) = 7$

$20x - 16 + 6x - 3 = 7$

$26x - 19 = 7$

$26x = 7 + 19$

$26x = 26$

RHS $= 18 + 9(m-2)$

$= 18 + 9(0-2)$

$= 18 + 9\times(-2)$

$= 18 - 18 = 0 = \text{LHS}.$

Hence, $(m = 0)$ is the solution of the given equation.

7. $4x - \frac{1}{3} = \frac{1}{5} + 3x$

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

$x = \frac{3+5}{15} = \frac{8}{15}$

Check :

LHS $= 4x - \frac{1}{3}$

$= 4\times\frac{8}{15} - \frac{1}{3}$

$= \frac{32}{15} - \frac{1}{3}$

$= \frac{32-5}{15} = \frac{27}{15} = \frac{9}{5}$

And, RHS $= \frac{1}{5} + 3x$

$= \frac{1}{5} + 3\times\frac{8}{15}$

$= \frac{1}{5} + \frac{8}{5}$

$= \frac{1+8}{5} = \frac{9}{5}$

$\therefore$ LHS = RHS

Hence, $\left(x = \frac{9}{5}\right)$ is the solution of the given equation.

9. $\frac{2x}{3} - \frac{x}{2} = 30$

$\frac{4x-3x}{6} = 30$

$x = \frac{26}{26} = 1$

Check :

LHS $= 4(5x-4) + 3(2x-1)$

$= 4(5\times1-4) + 3(2\times1-1)$

$= 4(5-4) + 3(2-1)$

$= 4\times1 + 3\times1$

$= 4 + 3$

$= 7 = \text{RHS}.$

Hence,$(x = 1)$ is the solution of the given equation.

8. $\frac{y}{5} - \frac{y}{6} = \frac{1}{30}$

$\frac{6y-5y}{30} = \frac{1}{30}$

$y = \frac{1\times30}{30}$

$y = 1$

Check :

LHS $= \frac{y}{5} - \frac{y}{6}$

$= \frac{1}{5} - \frac{1}{6} = \frac{6-5}{30}$

$= \frac{1}{30} = \text{RHS}$

Hence, $(y = 1)$ is the equation

of the given equation.

$x = 30 \times 6$

$x = 180$

Check :

$$\text{LHS} = \frac{2x}{3} - \frac{x}{2}$$

$$= \frac{2 \times 180}{3} - \frac{180}{2}$$

$$= 120 - 90$$

$$= 30 = \text{RHS.}$$

Hence, $(x = 180)$ is the solution of the given equation.

Exercise 6.4

1. Let, the two consecutive odd numbers are x and $(x + 2)$.

$\because$ Their sum is 136.

$\therefore \quad x + (x + 2) = 136$

$$x + x + 2 = 136$$

$$2x = 136 - 2$$

$$x = \frac{134}{2} = 67$$

And, $x + 2 = 67 + 2 \Rightarrow 69$.

Hence, the required two consecutive odd numbers are 67 and 69.

2. Let, the required number be x.

Thus, $2x + 7 = 59$

$$2x = 59 - 7$$

$$x = \frac{52}{2} \Rightarrow 26$$

Hence, the required number is 26.

3. Let, the required number be x.

Thus, $x + \frac{3}{4}x = 91$

$$\frac{4x + 3x}{4} = 91$$

$$7x = 91 \times 4$$

$$x = \frac{91 \times 4}{7}$$

$x = 13 \times 4 \Rightarrow 52$

Hence, the required number is 52.

4. Let, the two consecutive even numbers be x and $(x + 2)$.

$\because$ Their sum is 502

$\therefore \quad x + (x + 2) = 502$

$$x + x + 2 = 502$$

$$2x = 502 - 2$$

$x = \frac{500}{2} = 250$

And, $(x+2) = 250+2 \Rightarrow 252$

Hence, the required two consecutive even numbers are 250 and 252.

5. Let, the required number be x.

Thus, $\frac{2}{3}x = \frac{1}{3}x + 3$

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

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

$x = 3 \times 3 \Rightarrow 9$

Hence, the required number is 9.

6. Let, the required number be x.

Thus, $5x - 3 = 42$

$5x = 42 + 3$

$x = \frac{45}{5} \Rightarrow 9$

Hence, the required number is 9.

7. The total number of students in class = 40

Let, the number of boys in class $= x$

Thus, the number of girls $= \frac{3}{5}x$

$\therefore \quad x + \frac{3}{5}x = 40$

$\frac{5x+3x}{5} = 40$

$8x = 40 \times 5$

$x = \frac{40 \times 5}{8}$

$x = 5 \times 5 \Rightarrow 25$

So, the number of girls in the class $= \frac{3}{5} \times 25 = 3 \times 5 \Rightarrow 15.$

8. The ratio of angles of a triangle = 1 : 2 : 3

Let, the angles of the triangle are x, $2x$ and $3x$.

$\because$ The sum of all the angles of a triangle $= 180°$

$\therefore \quad x + 2x + 3x = 180°$

$6x = 180°$

$x = \frac{180°}{6} \Rightarrow 30°$

Thus, $2x = 2 \times 30° \Rightarrow 60°$

And, $3x = 3 \times 30° \Rightarrow 90°$

Hence, the angles of the triangle are 30°, 60° and 90°.

9. Let, the age of Varun be x.

Thus, the age of Varun's mother $= 5x$

$\because$ The sum of their ages = 48 years

$\therefore \quad x + 5x = 48$

$$6x = 48$$

$$x = \frac{48}{6} \Rightarrow 8$$

Hence, the age of Varun is 8 years.

And, the age of Varun's mother is $(5 \times 8) = 40$ years.

10. Let, three consecutive integers are $(x-1), x$ and $(x+1)$.

$\because$ Sum of three consecutive integers $= 24$

$\therefore \quad (x-1) + x + (x+1) = 24$

$$x - 1 + x + x + 1 = 24$$

$$3x = 24$$

$$x = \frac{24}{3} = 8$$

Thus, $(x-1) = 8 - 1 \Rightarrow 7$

And, $(x1) = 8 + 1 \Rightarrow 9$

Hence, the three consecutive integers are 7, 8 and 9.

11. Let, the age of Nisha $= x$

Thus, the age of Nisha's mother $= 3x$

$\because$ The sum of their ages together = 72 years.

$\therefore \quad x + 3x = 72$

$$4x = 72$$

$$x = \frac{72}{4} = 18$$

Thus, $3x = 3 \times 18 \Rightarrow 54$

Hence, the present age of Nisha and her mother are 18 years and 54 years respectively.

12. Let, the number of runs scored by Sidhu be x.

Thus, the number of runs scored by Raina $= 2x$.

$\because$ The number of runs scored by them together = five short of a double century

$\therefore \quad x + 2x = 2 \times 100 - 5$

$$3x = 200 - 5$$

$$3x = 195$$

$$x = \frac{195}{3} \Rightarrow 65$$

And, $2x = 2 \times 65 \Rightarrow 130$

Hence, Sidhu scored 65 runs and raina scored 130 runs.

13. Let, each of the base angle of an isosceles triangle be x.

Thus, the vertex angle of triangle $= 3x$

$\because$ Sum of the angles of the triangle $= 180°$

$\therefore \quad x + x + 3x = 180°$

$5x = 180°$

$x = \frac{180°}{5} \Rightarrow 36°$

And, $3x = 3 \times 36° \Rightarrow 108°$

Hence, all the angles of the isosceles triangle are 36°, 36° and 108°.

14. Let, the breadth of the rectangle be x.

Thus, the length of the rectangle $= 4x - 3$ m

$\because$ perimeter of the rectangle $= 94$ m.

$\therefore \quad 2[l + b] = 94$ m

$2\,[4x - 3m + x] = 94$ m

$5x - 3m = \frac{94}{2}$ m

$5x = 47$ m + 3 m

$x = \frac{50\,\text{m}}{5} \Rightarrow 10\,\text{m}$

So, the breadth of the rectangle $(x) = 10$ m.

And, the length of the rectangle $= 4x - 3m = 4 \times 10m - 3m$

$= (40 - 3)$ m $\Rightarrow$ 37 m.

Hence, the length and the breadth of the rectangle are 10 m and 37 m.

15. Let, the present age of Rekha's brother be x.

Thus, the present age of Rekha $= (x - 5)$ years after 4 years.

$\because$ The ratio of their ages after 4 years = 2 : 3

$\therefore \quad (x - 5) + 4 : (x + 4) = 2 : 3$

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

$3 \times (x - 1) = 2 \times (x + 4)$

$3x - 3 = 2x + 8$

$3x - 2x = 8 + 3$

$x = 11$ years

And, $(x - 5) = (11 - 5)$ years $\Rightarrow$ 6 years.

Hence, the present age of Rekha and her brother are 6 years and 11 years respectively.

16. Let, the number of 2-rupees coins be x.

Thus, the number of 1-rupee coins $= 3x$

$\because$ The total value of these coins = ₹ 50

$\therefore \quad$ ₹ $2 \times x +$ ₹ $1 \times 3x =$ ₹ 50

₹ $[2x + 3x] =$ ₹ 50

$5x = 50$

$x = \frac{50}{5} \Rightarrow 10$

And, $3x = 3 \times 10 \Rightarrow 30$

Hence, the number of 1-rupee coins and 2-rupees coins are 30 and 10 respectively.

17. Let, the present age of Gulshan be x.
Thus, the age of Gulshan after 15 years $= 4x$
$\therefore \quad 4x = x + 15$ years
$4x - x = 15$ years
$3x = 15$ years
$x = \frac{15}{3}$ years $\Rightarrow$ 5 years
Hence, the present age of Gulshan is 5 years.

18. Let, the number of ₹ 100-notes be x.
And, the number of ₹ 500-notes be y.
$\because$ Total number of notes in the purse = 30
$\therefore \quad x + y = 30$ …(1)
$\because$ Total money containing in the purse = ₹ 5000
$\therefore$ ₹ $100 \times x +$ ₹ $500 \times y =$ ₹ 5000
₹ $100 \times [x + 5y] =$ ₹ 5000
$x + 5y = \frac{₹\ 5000}{₹\ 100}$
$\therefore \quad x + 5y = 50$ …(2)
Now, equation (2) equation (1)
$(x + 5y) - (x + y) = 50 - 30$
$x + 5y - x - y = 20$
$4y = 20$
$y = \frac{20}{4} \Rightarrow 5$
Put, the value of y in equation …(1)
$x + 5 = 30$
$x = 30 - 5 \Rightarrow 25$
Hence, the number of ₹ 100-notes and ₹ 500-notes are 25 and 5 respectively.

Multiple Choice Question

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

HOTS

1. Given $x = 3$ is a solution of equation $3x * 2 = 7$.
$\because \quad 3x * 2 = 7$
$\therefore \quad 3 \times 3 * 2 = 7$
$9 * 2 = 7$ …(1)
$\because \quad 9 - 2 = 7$
So, the sign of subtraction (–) will come in place of $*$.

2. A car move from Delhi to Kolkata with speed = 50 km/h
And, another car move Kolkata to Delhi with speed = 100 km/hr
Let, they meet each other after x hours.
$\therefore$ Distance covered by first car in x hours = 50 x km
And, distance covered by second car in x hours $= 100x$ km
$\because \quad 50x$ km $< 100x$ km
Hence, the second car will cover longer distance when they meet each other.

7 Lines and Angles

Exercise 7.1

1. (a) The complement angle of 28° is (90° – 28°) = 62°.
(b) The complement angle of 75° is (90° – 75°) = 15°.
(c) The complement angle of 35° is (90° – 35°) = 55°.
(d) The complement angle of 51° is (90° – 51°) = 39°.

2. (a) The supplement angle of 69° is (180° – 69°) = 111°.
(b) The supplement angle of 100° is (18° – 100°) = 80°.
(c) The supplement angle of 135° is (180° – 135°) = 45°.
(d) The supplement angle of 90° is (180° – 90°) = 90°.

3. (a) 45°, 135°

$\because$ Sum $= 45° + 135° = 180°$

Since, sum of given angles is 180°. So, these are supplementary angles.

(b) 60°, 30°

$\because$ Sum $= 60° + 30° = 90°$

Since, sum of given angles is 90°. So, these are complementary angles.

(c) 90°, 90°

$\because$ Sum $= 90° + 90° = 180°$

Since, sum of given angles is 180°. So, these are supplementary angles.

(d) 23°, 67°

$\because$ Sum $= 23° + 67° = 90°$.

Since, sum of given angles is 90°. So, these are complementary angles.

(e) 36°, 54°

$\because$ Sum $= 36° + 54° = 90°$

Since, sum of given angles is 90°. So, these are complementary angles.

(f) 63°, 117°

$\because$ Sum $= 63° + 117° = 180°$

Since, sum of given angles is 180°. So, these are supplementary angles.

(g) 105°, 75°

$\because$ Sum $= 105° + 75° = 180°$.

Since, sum of given angles is 180°. So, these are supplementary angles.

(h) 120°, 60°

$\because$ Sum $= 120° + 60° = 180°$

Since, sum of given angles is 180°. So, these are supplementary angles.

4. Let x is the angle greater than 45°.

$\therefore$ its complementary angle $= 90° - (45° + x)$

$= 90° - 45° - x$

$= 45° - x$

$\Rightarrow$ It will be less than 45°.

5. Since two lines l_1 and l_2 intersect vertically at a point O. So opposite angles are equal.

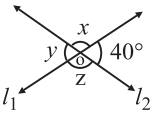
$\therefore \quad \angle x = \angle z$

and $\quad \angle y = 40°$

But, $\quad \angle x + 40° = 180°$ [by linear pair]

$\Rightarrow \quad \angle x = 180° - 40° = 140°$

Also, $\angle z = \angle x = 140°$.

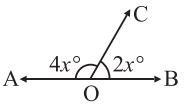


6. Two adjacent supplementary angles from a linear pair.

$\therefore \quad \angle AOC + \angle BOC = 180°$

$$4x + 2x = 180° \Rightarrow 6x = 180° \Rightarrow x = \frac{180°}{6} = 30°$$

So, the value of x is 30°.



7. Let one angle be $= x$

Then its complement angle be $= (90 - x)$

According to condition,

$x = 8(90° - x)$

$x = 720° - 8x$

$$x + 8x = 720° \Rightarrow 9x = 720° \Rightarrow x = \frac{720°}{9} = 80°$$

$\therefore$ First angle $= x = 80°$

and second angle (its complement) $= (90° - 80°) = 10°$.

8. In the given figure,

$\angle COD + \angle DOE = 180°$ [by linear pair]

$\angle y + 40° = 180°$

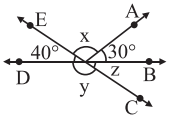
$\angle y = 180° - 40° = 140°$

$\angle DOC + \angle BOC = 180°$ [by linear pair]

$\angle y + \angle z = 180°$

$140° + \angle z = 180°$

$\angle z = 180° - 140° = 40°$



Since, we know that the sum of all the angles on a straight line is 180°.

So, $\angle EOA + \angle AOB + \angle BOC = 180°$

$x + 30° + z = 180°$

$x + 30° + 40° = 180°$

$x = 180° - 70° = 110°$

Hence, $x = 110°$, $y = 140°$, $z = 40°$.

9. (a) No, because they have no common arm.

(b) Yes, because they have a common arm.

(c) No, because they have no common vertex.

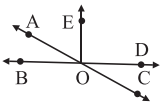
(d) No.

10. (a) Obtuse vertically opposite angles :

$(\angle AOB$ and $\angle COD)$, $(\angle AOD$ and $\angle BOC)$

(b) Adjacent complementary angles : $\angle BOA$ and $\angle AOE$

(c) Equal supplementary angles : $\angle BOE$ and $\angle EOD$



(d) Unequal supplementary angles: ($\angle AOB$ and $\angle BOC$), ($\angle BOC, \angle DOC$)

(e) Adjacent angles that do not form a linear pair : ($\angle AOE$ and $\angle EOD$)

Exercise 7.2

1. (a) $125° + a = 180°$ [by linear pair]

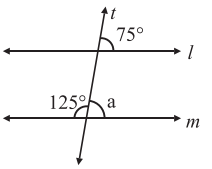
$a = 180° - 125°$

$a = 55°$

Since corresponding angles are not equal

i.e., $a \neq 75°$

So, given pair of lines are not parallel.



(b) $\angle b + 80° = 180°$ [by linear pairs]

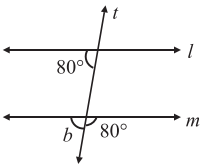
$\angle b = 180° - 80°$

$\angle b = 100°$

Since, corresponding angles are not equal

i.e., $\angle b \neq 80°$

So, given pair of lines are not parallel.



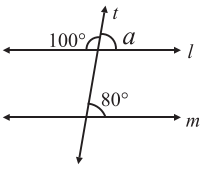
(c) $100 + a = 180$ [by linear pair]

$\angle a = 180° - 100° = 80°$

$\angle a = 80°$

Since, corresponding angles are equal i.e., $a = 80°$

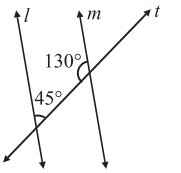
So, given pair of lines are parallel.



(d) Since, t is a transversal and we know that sum of interior angles on the same side of transversal is 180°.

i.e., $45° + 130° = 175° \neq 180°$

So, given pair of lines are not parallel.

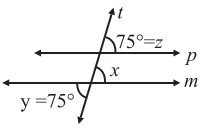


(e) $\angle x = \angle y$ (vertically opp. angles)

$\angle x = 75°$ (given)

Since, $\angle x = \angle z = 75°$

So, lines p and m are parallel.



(f) Here, $\angle a + 60° = 180°$ (by linear pair)

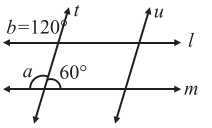
$\angle a = 180° - 60° = 120°$

Again, $\angle a = \angle b = 120°$ [given $\angle b = 120°$]

Since, corresponding angles are equal

i.e., $\angle a = \angle b$

So, given pair of lines are parallel.



2. (a) All pairs of alternate interior angles :

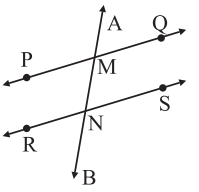
$\angle QMN$ and $\angle MNR$;

$\angle PMN$ and $\angle MNS$.

(b) All pairs of corresponding angles :

($\angle AMP$ and $\angle MNR$); ($\angle AMQ$ and $\angle MNS$);

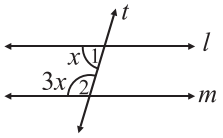
($\angle PMN$ and $\angle RNB$); ($\angle QMN$ and $\angle SNB$);



(c) All enterior angles :
$\angle AMP, \angle AMQ, \angle RNB$ and $\angle SNB$.

(d) All pairs of alternative exterior angles :
($\angle AMP$ and $\angle SNB$) ; ($\angle AMQ$ and $\angle RNB$) ;

3. Given : $l \,||\, m$ and t is a transversal.



$\therefore \quad \angle 1 + \angle 2 = 180°$

(by consecutive interior angles are supplementary)

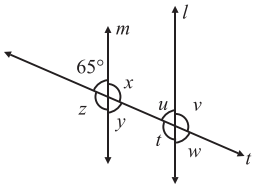
So, $x + 3x = 180°$

$$4x = 180° \Rightarrow x = \frac{180°}{4} = 45°$$

$\therefore \quad \angle 1 = x = 45°$

And, $\angle 2 = 3x = 3 \times 45° = 135°$.

4. Given : $l \,||\, m$, and t is a transversal.



$\therefore \quad \angle y = 65°$ (vertically opposite angles)

$\angle x + 65° = 180°$ (by linear pair)

$\therefore \quad \angle x = 180° - 65° = 115°$

$\angle z = \angle x$ (vertically opposite angles)

$\therefore \quad \angle z = 115°$

Again, $\angle u + \angle x = 180°$ (consecutive interior angles are supplementary)

$\therefore \quad \angle u = 180° - \angle x = 180° - 115° = 65°$

$\angle t + \angle y = 180°$ (consecutive interior angles are supplementary)

$\angle t + 65° = 180°$

$\angle t = 180° - 65° = 115°$

$\angle w = \angle u$ (vertically opposite angles)

$\therefore \quad \angle w = 65°$

$\angle v = \angle t$ (vertically opposite angles)

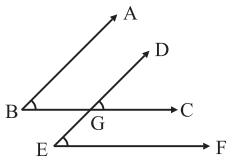
$\therefore \quad \angle v = 115°$

Hence, $\angle y = \angle u = \angle w = 65°$

And, $\angle x = \angle z = \angle v = \angle t = 115°$

5. Given : $AB \,||\, DE$ and $BC \,||\, EF$.

also, $\angle GEF = 58°$,



(a) $\angle ABC = \angle DGC$ (corresponding angles) …(1)

$GC \,||\, EF$, ED is a transversal

So, $\angle DGC = \angle GEF$ ($\because$ corresponding angles are equal)

$\therefore \quad \angle DGC = 58°$ …(2)

by equation (1) and equation (2).

So, $\angle ABC = 58°$.

(b) $\angle DGC = 58°$ [by equation (2)]

(c) $\angle EGC + \angle DGC = 180°$ {By linear pair}

$\angle EGC + 58° = 180°$ {By equation (2)}

$\angle EGC = 180° - 58°$

So, $\angle EGC = 122°$

6. Given : $m \,||\, n$ and p, q are transversal.

$\angle 1 = 123°$

And, $\angle 4 = 85°$

$\angle 2 = \angle 1$ ($\because$ Alternate angles are equal)

$\therefore \quad \angle 2 = 123°$

$\angle 2 + \angle 3 = 180°$ (linear pair angles)

$123° + \angle 3 = 180°$

$\therefore \quad \angle 3 = 180° - 123° = 57°$

Now, $\angle k = \angle 4$ (corresponding angles)

$\therefore \quad \angle k = 85°$

$\angle k + \angle 7 = 180°$ (linear pair angles)

$85° + \angle 7 = 180°$

$\therefore \quad \angle 7 = 180 - 85° = 95°$

$\angle 5 = \angle 7$ (vertically opposite angles)

$\therefore \quad \angle 5 = 95°.$

7. (a) angle alternate to angle $h = \angle b$

(b) angle alternate to angle $f = \angle d$

(c) angle corresponding to angle $d = \angle h$

(d) angle linear to angle $a = \angle b$ or $\angle d$

(e) angle adjacent to angle $g = \angle f$ or $\angle h$

(f) angle consecutive to angle $e = \angle b$

8. Given : $l \,||\, m$

$\angle c = 85°$ (vertically opposite angles)

$\therefore \quad \angle c = 85°$

$\angle e + \angle c = 180°$ (sum of interior angles on the same side of transversal is 180°)

$\therefore \quad \angle e + 85° = 180°$

$\angle e = 180° - 85° = 95°$

$\therefore \quad \angle e = 95°$

$\angle f = \angle e$ (vertically opposite angles)

$\therefore \quad \angle f = 95°$

$\angle a = 120°$ (vertically opposite angles)

$\therefore \quad \angle a = 120°$

$\angle d = \angle a$ (corresponding angles)

$\therefore \quad \angle d = 120°$

$\angle b + \angle d = 180°$ (linear pair angles)

$\angle b + 120° = 180°$

$\angle b = 180° - 120° = 60°$

$\therefore \quad \angle b = 60°.$

9. Given : $l \,||\, m$ and t is a transversal, $\angle 4 : \angle 3 = 2 : 3$

Let, $\angle 4 = 2k$

And, $\angle 3 = 3k$

Now, we know that

$\angle 4 + \angle 3 = 180°$ (linear pair angles)

$\therefore \quad 2k + 3k = 180°$

$\therefore \quad 2k + 3k = 180°$

$\therefore \quad 5k = 180°$

$\therefore \quad k = \frac{180°}{5} = 36°$

$\therefore \quad \angle 4 = 2k = 2 \times 36° = 72°$

And, $\angle 3 = 3k = 3 \times 36° = 108°$

Now, $\angle 2 = \angle 4$ (vertically opposite angles)

$\therefore \quad \angle 2 = 72°$

Similarly, $\angle 1 = \angle 3$ (vertically opposite angles)

$\therefore \quad \angle 1 = 108°$

Now, $\angle 8 = \angle 4$ (corresponding angles)

$\therefore \quad \angle 8 = 72°$

Similarly, $\angle 7 = \angle 3$ (corresponding angles)

$\therefore \quad \angle 7 = 108°$

Finally, $\angle 6 = \angle 2$ (corresponding angles)

$\therefore \quad \angle 6 = 72°$

and $\angle 5 = \angle 1$ (corresponding angles)

$\therefore \quad \angle 5 = 108°$

Multiple Choice Questions

1. (a) **2.** (d) **3.** (a) **4.** (b) **5.** (c) **6.** (b)

HOTS

1. Let m and n are two lines and t is a transversal line.

$\because$ Corresponding angles are equal.

$\therefore \quad \angle 1 = \angle 5, \angle 2 = \angle 6, \angle 4 = \angle 8$ and $\angle 3 = \angle 7$

Thus, lines m and n are parallel.

Hence, the pairs of aternate angles are equal.

2. (a) Given, $\angle ABC = 45°$.

And, $\angle CDE = 60°$

$\therefore \quad \angle BCD = \angle ABC + \angle CDE$

$= 45° + 60° = 105°$

Thus, $x = 360° - \angle BCD = 360° - 105°$

So, $x = 255°$

(b) Given, $\angle ABC = 58°, \angle CDE = 290°$

And, $\angle DEF = 20°$

$\therefore \quad \angle CDE = 360° - 290° = 70°$

Thus, $\angle BCD = \angle ABC + (\angle CDE - \angle DEF)$

$y = 58° + (70° - 20°)$

$= 58° + 50°$

So, $y = 108°$

8 Triangles and its Properties

Exercise 8.1

1. (a) $AB = 4$ cm, $BC = 5$ cm, $CA = 3$ cm

Since all the sides are unequal, so it is a scalene triangle.

(b) $\angle A = 90°$, $BC = 4$ cm, $CA = 5$ cm

Since one angle is 90°, so it is a right angled triangle.

(c) $\angle A = 120°$, $AB = 4$ cm, $BC = 7$ cm

Since one angle is greather then 90°, so it is an obtuse angled triangle.

(d) $\angle A = 60°$, $\angle B = 30°$, $\angle C = 90°$

Since one angle is 90°, so it is a right angled triangle.

(e) $\angle A = 120°$, $\angle B = 20°$, $\angle C = 40°$

Since one angle is greater than 90°, i.e, obtuse angle, so it is an obtuse angled triangle.

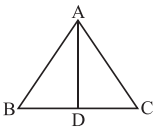
(f) $PQ = 6.5$ cm, $QR = 6.5$ cm, $RP = 6.5$ cm

Since all the sides are equal, so it is an equilateral triangle.

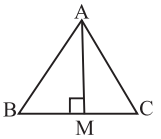
(g) $XY = 7$ cm, $YZ = 7$ cm, $ZX = 4$ cm.

Since two sides are equal, so it is an isosceles triangle.

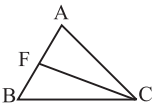
2. (a) ΔABC with median AD



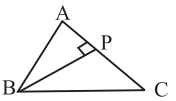
(b) ΔABC with altitude AM.



(c) ΔABC with median CF.



(d) ΔABC with altitude BP.



3. Fill in the blanks :

(a) A triangle has **six** elements.

(b) Vertex opposite to side BC of a triangle ABC is **A**.

(c) Side opposite to angle A of a ΔABC is **BC**.

(d) In ΔABC if D is mid point of side BA then its median is **CD**.

Exercise 8.2

1. (a) 63°, 38°, 79°

$\because$ Sum of all the three angles $= 63° + 38° + 79° = 180°$

So, these can be measures of the angles of a triangle.

(b) 30°, 55°, 65°

$\because$ Sum $= 30° + 55° + 65° = 150°$

Since, sum of all the angles are not equal to 180°.

So, these can't be measures of the angles of a triangle.

(c) 40°, 90°, 50°

$\because$ Sum $= 40° + 90° + 50° = 180°$

So, these can be measures of the angles of a triangle.

(d) 130°, 40°, 50°

$\because$ Sum $= 130° + 40° + 50°$

$= 220°$

Since, sum of all the angles are not equal to 180°.

So, these can't be measures of the angles of a triangle.

2. (a) In the given triangle PQR,

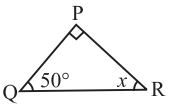
$\angle P + \angle Q + \angle R = 180°$ (Angle sum property)

$\Rightarrow \quad 90° + 50° + x = 180°$

$\Rightarrow \quad 140° + x = 180°$

$\Rightarrow \quad x = 180° - 140° = 40°$

So, the value at x is 40°.



(b) In the given triangle RST,

$\angle R + \angle S + \angle T = 180°$ (Angle sum property)

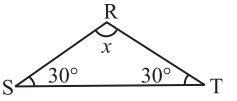
$\Rightarrow \quad x + 30° + 30° = 180°$

$\Rightarrow \quad x + 60° = 180°$

$\Rightarrow \quad x = 180° - 60° = 120°$

$\Rightarrow \quad x = 120°$

So, the value of x is 120°.



(c) In the given triangle ABC,

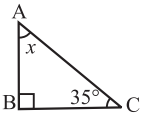
$\angle A + \angle B + \angle C = 180°$ (Angle sum property)

$x + 90° + 35° = 180°$

$x + 125° = 180°$

$x = 180° - 125° = 55°$

So, the value of x is 55°.



(d) In the given triangle PQS,

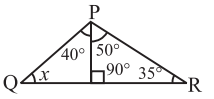
$\angle Q + \angle P + \angle S = 180°$ (Angle sum property)

$x + (40° + 55°) + 35° = 180°$

$x + 130° = 180°$

$x = 180° - 130° = 50°$

So, the value of x is 50°.



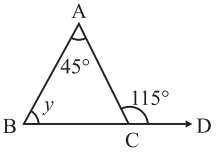
3. (a) $\angle A + \angle B = \angle PRS$

$45° + y = 115°$ (by exterior angle property)

$\Rightarrow \quad y = 115° - 45°$

$\Rightarrow \quad y = 70°$

So, the value of y is 70°.



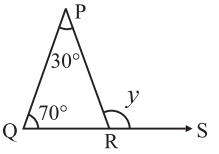
(b) $\angle P + \angle Q = \angle PRS$

$30° + 70° = y$ (by exterior angle property)

$\Rightarrow \quad 100° = y$

$\Rightarrow \quad y = 100°$

So, the value of y is 100°.



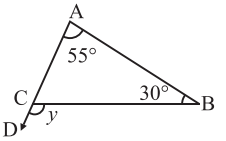
(c) $\angle A + \angle B = \angle BCD$

$55° + 35° = y$ (by exterior angle property)

$\Rightarrow \quad 90° = y$

$\Rightarrow \quad y = 90°$

So, the value of y is 90°.



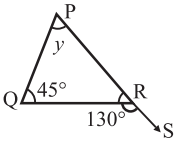
(d) $\angle P + \angle Q = \angle QRS$ (by exterior angle property)

$\Rightarrow \quad y + 45° = 130°$

$\Rightarrow \quad y = 130° - 45° = 85°$

$\Rightarrow \quad y = 85°$

So, the value of y is 85°.



(e) $\angle P + \angle Q + \angle R = 180°$ (Angle sum property)

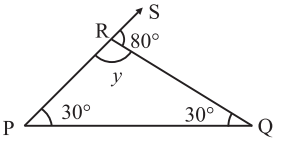
$\Rightarrow \quad 50° + 30° + y = 180°$

$\Rightarrow \quad 80° + y = 180°$

$\Rightarrow \quad y = 180° - 80° = 100°$

$\Rightarrow \quad y = 100°$

So, the value of y is 100°.



4. Given, $\angle ABC : \angle BAC = 2 : 3$

Let, $\angle ABC = 2x$ and $\angle BAC = 3x$

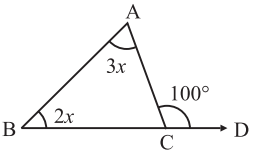
$\angle ABC + \angle BAC = \angle ACD$

(by exterior angle property)

$2x + 3x = 100°$

$5x = 100°$

$x = \dfrac{100°}{5} = 20°$



$\therefore \quad \angle ABC = 2x = 2 \times 20° = 40°$

$\angle BAC = 3x = 3 \times 20° = 60°$

Now, $\angle ABC + \angle BAC + \angle ACB = 180°$ (Angle sum property)

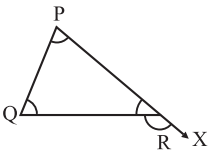
$40° + 60° + \angle ACB = 180°$

$100° + \angle ACB = 180°$

$\angle ACB = 180° - 100° = 80°$

Hence, all the angles of the triangle arc 40°, 60° and 80°.

5. Given : $\angle QRX$ = exterior angle



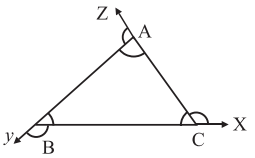
(a) Interior adjacent angle of $\angle QRX$ is $\angle QRP$

(b) Interior opposite angles of $\angle QRX$ are $\angle QPR$ and $\angle PQR$

6. (a) $\angle ACX = \angle ABC + \angle BAC$ (By exterior angle property)

(b) $\angle CBY = \angle BAC + \angle ACB$ (")

(c) $\angle BAZ = \angle ABC + \angle ACB$ (")



Exercise 8.3

1. (a) $AB + BC > AC$ **True**

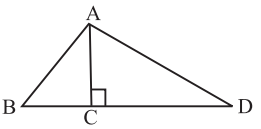
(b) $AC + AD > CD$ **True**

(c) $AB + AD > BD$ **True**

(d) $AC + CD > AD$ **True**

(e) $BC + CA < AB$ **False**

(f) $AD + AB < BD$ **False**



2. (a) 7 cm, 13 cm, 16 cm

$(7 + 13)$ cm $= 20$ cm > 16 cm; $(13 + 16)$ cm $= 29$ cm > 7cm

And, $(7 + 16)$ cm $= 23$ cm > 13cm

Since, sum of any two sides is greater than the third side.

So, 7 cm, 13 cm and 16 cm could be the possible sides of a triangle.

(b) 8 cm, 10 cm, 8 cm

$(8 + 10)$ cm $= 18$ cm > 8 cm; $(10 + 8)$ cm $= 18$ cm > 8 cm;

And, $(8 + 8)$ cm $= 16$ cm > 10 cm

Since, sum of any two sides is greater than the third side.

So, 8 cm, 10 cm and 8 cm could be the possible sides of a triangle.

(c) 4 cm, 4 cm, 7 cm

$(4 + 4)$ cm $= 8$ cm > 7 cm; $(4 + 7)$ cm $= 11$ cm > 4 cm;

$(4 + 7)$ cm $= 11$ cm > 4 cm

Since, sum of any two sides is greater than the third side.

So, 4 cm, 4 cm and 7 cm could be the possible sides of a triangle.

(d) 12 cm, 8 cm, 25 cm

$(12 + 8)$ cm $= 20$ cm < 25 cm;

Since, sum of any two sides is not greater than the third side.
So, 12 cm, 8 cm and 25 cm could not be the possible sides of a triangle.

(e) 15 cm, 6 cm, 5 cm
$(6+5)$ cm $= 11$ cm < 15 cm;
Since, sum of any two sides is not greater than the third side.
So, 15 cm, 6 cm and 5 cm could not be the possible sides of a triangle.

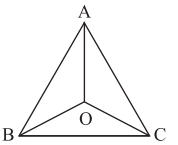
(f) 3 cm, 4 cm, 8 cm
$(3+4)$ cm $= 7$ cm < 8 cm;
Since, sum of any two sides is not greater than the third side.
So, 3 cm, 4 cm and 8 cm could not be the possible sides of a triangle.

3. (a) $AO + BO > AB \rightarrow$ Yes
(by triangle inequality property)

(b) $OB + OC > BC \rightarrow$ Yes
(by triangle inequality property)

(c) $AO + OC > AC \rightarrow$ Yes.
(by triangle inequality property)

(d) $AB + BC > AC \rightarrow$ Yes
(by triangle inequality property)

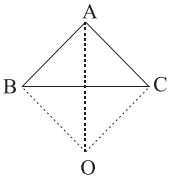


4. Given, two sides of a triangle are 5 cm and 8 cm.
Now, sum of two sides = 5 cm + 8 cm = 13 cm.
And, difference of two sides = 8 cm – 5 cm = 3 cm.
Hence, the third side of the triangle is greater than 3 cm and less than 13 cm.

5. (a) $OA + OB > AB$ …(1)
(by triangle inequality property)

(b) $OB + OC > BC$ …(2)
(by triangle inequality property)

(c) $OA + OC > AC$ …(3)
(by triangle inequality property)



Adding equations (1), (2) and (3) we get

$$(OA + OB) + (OB + OC) + (OA + OC) > AB + BC + AC$$
$$2(OA + OB + OC) > AB + BC + AC$$

So, $\left[OA + OB + OC > \frac{1}{2}(AB + BC + AC)\right]$

6. No.

Exercise 8.4

1. (a) 2 cm, 2 cm, 5 cm
$2^2 + 2^2 = 8,\ 5^2 = 25$
$\because \quad 8 \neq 25$
$\therefore \quad 2^2 + 2^2 \neq 5^2$
Hence, these sides can't form a right triangle.

(b) 11 cm, 60 cm, 61 cm

$11^2 + 60^2 = 121 + 3600$

$= 3721$

$61^2 = 3721$

$\therefore\ 11^2 + 60^2 = 61^2$

Hence, 11 cm, 60 cm and 61 cm can form a right angled triangle.

(c) 2.5 cm, 6.5 cm, 6 cm

$2.5^2 + 6^2 = 6.25 + 36$

$= 42.25$

$(6.5)^2 = 42.25$

$\therefore\ 2.5^2 + 6^2 = (6.5)^2$

Hence, 2.5 cm, 6.5 cm and 6 cm can form a right angled triangle.

(d) 2.1 cm, 2.8 cm, 3.5 cm

$2.1^2 + 2.8^2 = 4.41 + 7.84$

$= 12.25$

$3.5^2 = 12.25$

$\therefore\ 2.1^2 + 2.8^2 = 3.5^2$

Hence, 2.1 cm, 2.8 cm and 3.5 cm can form a right angled triangle.

2. (a) In ΔABC, given

$a = 6$ cm, $b = 8$ cm and $\angle C = 90°$

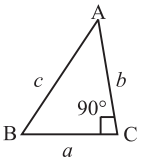
Using pythagoras property, we have

$c^2 = a^2 + b^2$

$= 6^2 + 8^2 = 36 + 64 = 100$

$\therefore\quad c = \sqrt{100} = 10$ cm

So, the hypotenuse is 10 cm.



(b) $a = 8$ cm, $b = 15$ cm and $\angle C = 90°$

Using pythagoras property, we have

$c^2 = a^2 + b^2$

$= 8^2 + 15^2 = 64 + 225 = 289$

$\therefore\quad c = \sqrt{289} = 17$ cm

So, the hypotenuse is 17 cm.

(c) $a = 2.5$ cm, $b = 6$ cm and $\angle C = 90°$

Using pythagoras property, we have

$c^2 = a^2 + b^2$

$= (2.5)^2 + (6)^2$

$= 6.25 + 36$

$= 42.25$

$\therefore\quad c = \sqrt{42.25} = 6.5$ cm

So, the hypotenuse is 6.5 cm.

3. (a) 12, 35, 37

Three positive integers a, b and c are said to form a pythagorean triplet.

If $\quad c^2 = a^2 + b^2$

$37^2 = 12^2 + 35^2$

$1369 = 144 + 1225$

$1369 = 1369$

Hence, numbers 12, 35 and 37 represent pythagorean triplet.

(b) 7, 24, 25

Three positive integers a, b and c are said to form a pythagorean triplet.

If $c^2 = a^2 + b^2$

$25^2 = 7^2 + 24^2$

$625 = 49 + 576$

$625 = 625$

Hence, numbers 7, 24 and 25 represent pythagorean triplet.

(c) 6, 8, 10

Let $a = 6$, $b = 8$ and $c = 10$

$a^2 + b^2 = c^2$ (To be pythagorean triplet)

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

$36 + 64 = 100$

$100 = 100$

Hence, numbers 6, 8 and 10 represent pythagorean triplet.

(d) 2, 1.5, 2.5

Let $a = 2$, $b = 1.5$ and $c = 2.5$

$a^2 + b^2 = c^2$ (To be pythagorean triplet)

$2^2 + 1.5^2 = 2.5^2$

$4 + 2.25 = 6.25$

$6.25 = 6.25$

Hence, numbers 2, 1.5 and 2.5 represent pythagorean triplet.

(e) 3, 4, 5

Let $a = 3$, $b = 4$, $c = 5$

$a^2 + b^2 = c^2$ (To be pythagorean triplet)

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

$9 + 16 = 25$

$25 = 25$

Hence, numbers 3, 4 and 5 represent pythagorean triplet.

(f) 6, 2.5, 6.5

Let $a = 6$, $b = 2.5$ and $c = 6.5$

$a^2 + b^2 = c^2$ (To be pythagorean triplet)

$6^2 + 2.5^2 = 6.5^2$

$36 + 6.25 = 42.25$

$42.25 = 42.25$

Hence, numbers 6, 2.5 and 6.5 represent pythagorean triplet.

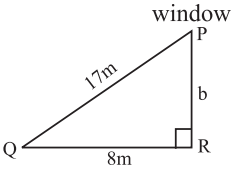
4. Let, PR be the height of the window.

Then $PR = b$, $PQ = 17$ m, $QR = 8$ m

Using pythagoras property, we have

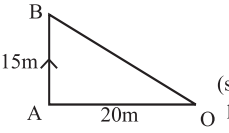
$PQ^2 = QR^2 + PR^2$

$$17^2 = 8^2 + b^2$$
$$289 = 64 + b^2$$
$$\Rightarrow \quad 289 - 64 = b^2$$
$$\Rightarrow \quad 225 = b^2$$
$$\Rightarrow \quad b = \sqrt{225}$$
$$= 15$$

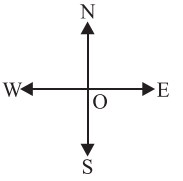


Thus, the height of window is 15 m.

5. $OB^2 = AB^2 + OA^2$
$$= 15^2 + 20^2$$
$$= 225 + 400$$
$$= 625$$
$$OB = \sqrt{625} = 25$$

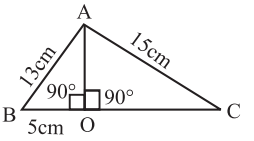


(starting point)



So, the Man is 25 m away from the starting point.

6. In ΔABO, we know by pythagoras property
$$AB^2 = OB^2 + OA^2$$
$$13^2 = 5^2 + OA^2$$
$$169 = 25 + OA^2$$
$$169 - 25 = OA^2$$
$$144 = OA^2$$
$$\sqrt{144} = OA$$
$$OA = 12 \text{ cm}$$



Now, in ΔAOC, we know by pythagoras property
$$AC^2 = OA^2 + OC^2$$
$$15^2 = 12^2 + OC^2$$
$$225 = 144 + OC^2$$
$$225 - 144 = OC^2$$
$$81 = OC^2$$
$$\sqrt{81} = OC$$
$$OC = 9 \text{ cm}$$

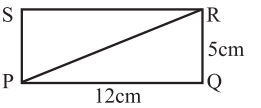
So, The length of $BC = BO + OC$
$$= 5 \text{ cm} + 9 \text{ cm}$$
$$= 14 \text{ cm.}$$

7. In rectangle $PQRS$, $PQ = RS = 12$ cm

And, $QR = SP = S$ cm

In ΔPQR,

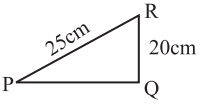
Using pythagoras property, we have
$$PR^2 = PQ^2 + QR^2$$
$$= 12^2 + 5^2 = 144 + 25$$
$$PR^2 = 169$$
$$PR = \sqrt{169} = 13$$



So, The length of diagonal of rectangle is 13 cm.

8. In ΔPQR, using pythagoras property, we have

$$PR^2 = PQ^2 + QR^2$$
$$25^2 = PQ^2 + 20^2$$
$$625 = PQ^2 + 400$$
$$625 - 400 = PQ^2$$
$$225 = PQ^2$$
$$PQ = \sqrt{225}\text{ m}$$
$$PQ = 15\text{ cm}$$

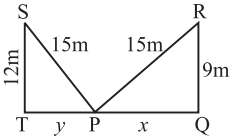


Hence, the distance of the foot of ladder from the building is 15 m.

9. Let the width of the street $= (x + y)$ m

In ΔPQR, using pythagoras property, we have

$$PR^2 = PQ^2 + RQ^2$$
$$15^2 = x^2 + 9^2$$
$$225 = x^2 + 81$$
$$225 - 81 = x^2$$
$$144 = x^2$$
$$x = \sqrt{144}$$
$$x = 12\text{ m}$$



Again, In ΔSPT, using pythagoras property, we have

$$SP^2 = ST^2 + TP^2$$
$$15^2 = 12^2 + y^2$$
$$225 = 144 + y^2$$
$$225 - 144 = y^2$$
$$81 = y^2$$
$$y = \sqrt{81}$$
$$y = 9\text{ m}$$

Hence, the width of the street $= (x + y)$
$$= (12 + 9)$$
$$= 21\text{ m.}$$

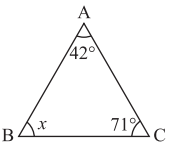
Multiple Choice Questions

1. (a) **2.** (c) **3.** (d) **4.** (c) **5.** (c) **6.** (b)

Brain Teaser

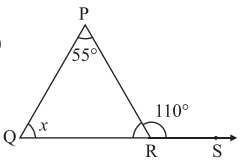
(a) In ΔABC,

$\angle A + \angle B + \angle C = 180°$
(Angle sum property)
$42° + x + 71° = 180°$
$x + 113° = 180°$
$x = 180° - 113°$
So, $x = 67°$



(b) In ΔPQR,

$\angle P + \angle Q = \angle PRS$ (by exterior angle property)
$55° + x = 110°$
$x = 110° - 55°$
So, $x = 55°$



9 Congruent Triangles

Exercise 9

1. Given, $\Delta ABC \cong \Delta PQR$

(a) $\therefore \angle B = \angle \underline{\boldsymbol{Q}}$ (b) $\overline{CA} = \overline{\boldsymbol{RP}}$ (c) $\angle C = \angle \underline{\boldsymbol{R}}$

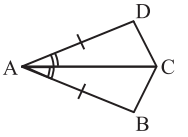
(d) $\overline{BC} = \overline{\boldsymbol{QR}}$ (e) $\angle R = \angle \underline{\boldsymbol{C}}$

2. (a) In ΔADC and ΔABC : $AD = AB$ (given)

$AC = AC$ (common)

$\angle DAC = \angle BAC$ (common)

$\therefore \Delta DAC \cong \Delta BAC$ (by SAS congruence condition)



(b) In, ΔAOC and ΔBOD :

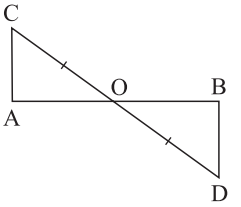
$OC = OD$ (Given)

$\angle AOC = \angle BOD$ (Opposite angles)

$\angle CAO = \angle OBD$ (Each right angle)

$\therefore \Delta AOC \cong \Delta BOD$

(By ASA congruence condition)



3. Given : AX is bisector of $\angle CAB$ and $\angle CDB$.

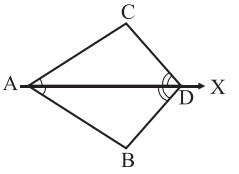
$\therefore \angle CAD = \angle BAD$

$\angle CDA = \angle BDA$

And, $AD = AD$ (common)

So, $\Delta ABD \cong \Delta ACD$

(by ASA congruence condition).



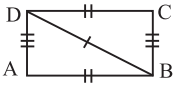
4. Given : $ABCD$ is a rectangle and BD is a diagonal

$\therefore AB = DC$ (side)

$AD = BC$ (side)

And, $BD = BD$ (common)

So, $\Delta ABD \cong \Delta CBD$ (by SSS congruence).



5. In ΔPLO and ΔPMO

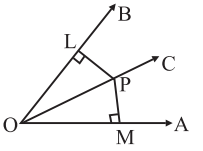
$\overline{PL} = \overline{PM}$ (given)

$\overline{OP} = \overline{OP}$ (common)

$\angle OMP = \angle OLP = 90°$

($\because \overline{PL} \perp \overline{OB}$ and $\overline{PM} \perp \overline{OA}$)

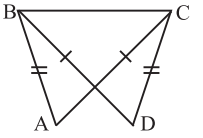
So, $\Delta PLO \cong \Delta PMO$ (by R.H.S. or SAS congruence condition).



6. In ΔABC and ΔDBC

$\overline{AB} = \overline{DC}$ (given)

$\overline{AC} = \overline{DB}$ (given)

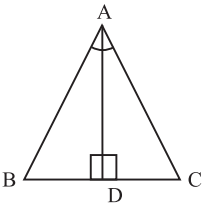


$\overline{BC} = \overline{BC}$ (common)

$\therefore \quad \Delta ABC \cong \Delta DCB$ (by SSS congruence condition)

So, (b) is true.

7. Given : $\overline{AD}$ bisects $\angle A$ and $\overline{AD} \perp \overline{BC}$.



Since $\overline{AD}$ bisects $\angle A$, therefore we have

$\angle BAD = \angle CAD$ (given)

$\overline{AD} = \overline{AD}$ (common)

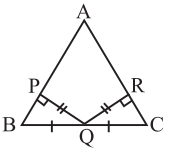
$\angle ADB = \angle ADC = 90°$ ($\because AD \perp BC$)

So, $\Delta ADB \cong \Delta ADC$ (by ASA congruence condition).

(a) Yes, $\Delta ADB \cong \Delta ADC$

(b) The condition of congruency is *ASA*.

8. InΔPQB and ΔRQC



$PQ = QR$ (given)

$BQ = QC$ (given)

$\angle BPQ = \angle CRQ$ (each 90°)

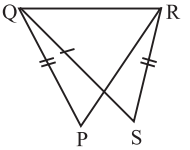
$\therefore \Delta BPQ \cong \Delta CRQ$ (by RHS congruence condition)

$\angle B = \angle C$ (C.P.C.T.)

$\therefore \quad \Delta ABC$ is a isosceles triangle

Thus, $[AB = AC]$

9. In ΔPQR and ΔSRQ



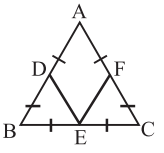
$PQ = SR$ (given)

$PR = SQ$ (given)

$QR = QR$ (common)

$\therefore \Delta PQR \cong \Delta SRQ$ (by SSS congruence condition).

10. Since D, E and F are the midpoints of sides AB, BC and CA respectively.



$\therefore \quad AD = DB = \dfrac{AB}{2}$ …(i)

$BE = EC = \dfrac{BC}{2}$ … (ii)

$AF = FC = \dfrac{AC}{2}$ … (iii)

$\because \quad AB = AC$ (given)

$\therefore \quad 2DB = 2FC$

$\Rightarrow \quad DB = FC$ (side)

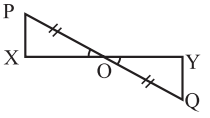
Again, $AB = AC$

$\therefore \quad \angle ACB = \angle ABC$ or $\angle FCE = \angle DBE$

$BE = EC$ ($\because E$ is the midpoint of BC)

So, $\Delta DBE \cong \Delta FCE$ (by SAS congruence condition).

11. PQ and XY intersect at O such that $PO = OQ$ (given)



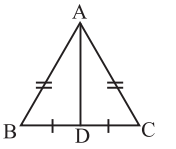
and $\angle P = \angle Q$ (given)

$\angle POX = \angle QOY$

(vertically opposite angle)

$\therefore \quad \Delta POX \cong \Delta QOY$ (by ASA congruence condition).

12. In ΔABD and ΔACD, we have



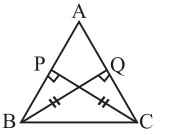
$BD = DC$ (given)

$BA = CA$ (given)

$AD = AD$ (common)

$\therefore \quad \Delta BDA \cong \Delta CDA$ (by SSS congruence condition).

13. In ΔBCQ and ΔCBP, we have



$BQ = CP$ (given)

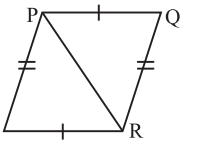
$BC = BC$ (common)

$\angle BQC = \angle CPB$ (each 90°)

$\therefore \quad \Delta BCQ \cong \Delta CBP$

(by SAS or RHS congruence condition).

14. In ΔPQR and ΔRSP, we have



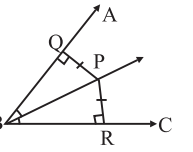
$PQ = SR$ (given)

$PS = QR$ (given)

$PR = PR$ (common)

$\therefore \quad \Delta PQR \cong \Delta RSP$ (by SSS congruence condition).

15. Since $PQ \perp BA$ and $PR \perp BC$ such that $PQ = PR$



$PQ = PR$ (given)

$BP = BP$ (common)

$\angle BRP = \angle BQP$ (each 90°)

$\therefore \quad \Delta BRP \cong \Delta BQP$ (by SAS or RHS congruence)

$\Rightarrow \angle PBR = \angle PBQ$ (C.P.C.T.)

So, BP bisects $\angle ABC$.

Multiple Choice Questions

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

Brain Teaser

$\Delta PQR \cong \Delta LMN$ (given)

$\therefore \quad QR = MN$

and $\angle QPR = \angle MLN$

$a + 5 = 50°$

$a = 50° - 5° = 45°$

$a = 45°$

Similarly, $QP = ML$

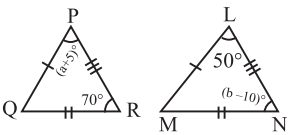
And $\angle PRQ = \angle LNM$

$70° = b - 10$

$70° + 10° = b$

$80° = b$

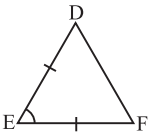
$b = 80°$



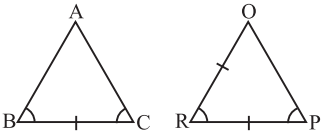
Hence, the value of a and b are 45° and 80° respectively.

HOTS

1. The angle $\angle DEF$ or $\angle FED$ is included between the sides $\overline{DE}$ and $\overline{EF}$ of ΔDEF.



2. Given, $\Delta ABC \cong \Delta QRP$ (by ASA congruence rule)
And, $BC = RP$
$\therefore$ The additional information need to establish the congruence of ΔABC and ΔQRP is :
$(\angle ABC = \angle QRP)$ and $(\angle ACB = \angle QPR)$.



10 Ratio, Proportion and Percentage

Exercise 10.1

1. (a) 2m to 5 m $= 2\text{ m} : 5\text{m} = \frac{2m}{5m} = \frac{2}{5} =$ **2 : 5**

(b) 7 kg to 140g $= 7\text{ kg} : 140\text{g}$
$= 7 \times 1000\text{g} : 140\text{g} = 7000\text{g} : 140\text{g}$
$= \frac{7000g}{140g} = \frac{50}{1} =$ **50 : 1**

(c) $1.5l$ to $2.7l = \frac{1.5l}{2.7l} = \frac{15}{27} = \frac{5}{9} =$ **5 : 9**

(d) 50 p to ₹ 3 $= 50\text{p} : ₹\,3$
$= 50\,p : 3 \times 100\,p$
$= 50\text{p} : 300\text{p}$ [$\because$ ₹ 1 = 100 p]
$= \frac{50p}{300p} = \frac{1}{6} =$ **1 : 6**

(e) 60 minutes to 35 seconds $= 60$ minutes : 35 seconds
$= \frac{60 \times 60\text{seconds}}{35\text{seconds}} = \frac{720}{7} =$ **720 : 7**

(f) 1 crore to 1 million = 1 crore : 1 million = 100 lakh : 10 lakh
$= \frac{100\,\text{lakh}}{10\,\text{lakh}} = \frac{10}{1} =$ **10 : 1**

(g) 16 hrs to 2 days $= 16\text{ hrs} : 2\text{ days}$
$= 16\,\text{hrs} : 2 \times 24\text{ hrs}$
$= 16\text{ hrs} : 48\text{ hrs}$
$= \frac{16\,\text{hrs}}{48\text{ hrs}} = \frac{1}{3} =$ **1 : 3**

(h) 160cm to 1 metre

$= 160\text{ cm} : 1\text{ m}$

$= 160\text{ cm} : 100\text{cm} = \dfrac{160\text{cm}}{100\text{cm}} = \dfrac{8}{5} = \mathbf{8 : 5}$

(i) 6 km to 150 m $= 6\text{ km} : 150\text{m}$

$= 6 \times 1000\text{ m} : 150\text{ m} = 6000\text{ m} : 150\text{ m}$

$= \dfrac{6000\text{ m}}{150\text{ m}} = \dfrac{40}{1} = \mathbf{40 : 1}$

2. Let x kg of fuel would be used for two hours flight.

Then, 600 kg : x kg :: 45 minutes : 2 hours

$\Rightarrow$ $600\,kg : x\text{ kg} = 45\text{ minutes} : 2\text{ hours}$

$$\frac{600kg}{xkg} = \frac{45\text{ minutes}}{2 \times 60\text{ minutes}} \Rightarrow \frac{600}{x} = \frac{3}{8}$$

$$x = \frac{600 \times 8}{3} = 1600$$

So, 1600 kg of fuel would be used for a two hours flight.

3. Total number of students in class VII $= 40$

Number of students in class VIIA, got grade 'A' $= 9$

Number of students in class VIIB got grade 'A' $= 6$

Clearly, number of students in class VII A is more than number of students in class VII B who got 'A' grade.

So, section 'A' of class VII has better record.

4. Given, ratio $= 5:3$

Sum of ratios $= 5 + 3 = 8$

Total sum of money $= ₹\,1200$

$\therefore$ First son will get $= \dfrac{5}{8} \times 1200 = ₹\,750$

And, other son will get $= \dfrac{3}{8} \times 1200 = ₹\,450$

So, Mr Siddigui gives ₹ 650 and ₹ 450 to his two sons.

5. Let, the distance between the two cities A and C is x km.

$\therefore$ $700 : x :: 5 : 11$

$700 : x = 5 : 11$

$$\frac{700}{x} = \frac{5}{11} \Rightarrow x = \frac{700 \times 11}{5} = 1540$$

So, the required distance between cities A and C is 1540 km.

6. Let x raffle tickets were sold.

Then, 50 tickets : x tickets : : ₹ 500 : ₹ 1500

$$\frac{50\text{ tickets}}{x\text{ tickets}} = \frac{₹\,500}{₹\,1500}$$

$$\frac{50}{x} = \frac{1}{3}$$

$$x = 50 \times 3 = 150$$

So, 150 tickets were sold by him,

7. Given : a, b, c are in proportion

Then a : b : : b : c

a : b = b : c

$$\frac{a}{b}=\frac{b}{c}$$

$$\frac{a}{15}=\frac{15}{40} \quad \{\because b=15 \text{ and } c=40\}$$

$$a=\frac{15\times 15}{40}=\frac{45}{8}$$

So, the value of a is $\frac{45}{8}$.

8. Let 'x' kg of sweets is required for 700 people.

Then, 50 kg : x kg :: 200 people : 700 people.

$$\frac{50}{x}=\frac{200}{700}$$

$$\frac{50}{x}=\frac{2}{7}$$

$$x=\frac{50\times 7}{2}=175$$

Here 175 kg of sweets is required for 700 people.

9. (a) 2 : 5 or 3 : 7

$$2:5 = \frac{2}{5}=0.4$$

$$3:7 = \frac{3}{7}=0.428$$

$\because$ 0.4 < 0.428

So, 3 : 7 > 2 : 5

(b) 4 : 5 or 5 : 6

$$4:5=\frac{4}{5}=0.8 \text{ and } 5:6=\frac{5}{6}=0.833$$

$\because$ 0.8 < 0.833

So, 5:6 > 4 : 5

(c) 6:11 or 9:14

$$6:11=\frac{6}{11}=0.54$$

$$9:14=\frac{9}{14}=0.64$$

$\because$ 0.54 < 0.64

So, 9 :14 > 6 : 11

(d) 1 : 4 or 6 : 30

$$1:4=\frac{1}{4}=0.25 \text{ and } 6:30=\frac{6}{30}=0.2$$

$\because$ $0.25 > 0.2$

So, $1 : 4 > 6 : 30$

10. (a) $4 : x :: 20 : 35$

$\frac{4}{x} = \frac{20}{35}$

$x = \frac{4 \times 35}{20} = 7$

So, $x = 7$

(b) $2.5 : 7.5 :: x : 10.5$

$\frac{2.5}{7.5} = \frac{x}{10.5}$

$x = \frac{2.5 \times 10.5}{7.5} = 3.5$

So, $x = 3.5$

(c) $x : 19 :: 142 : 71$

$\frac{x}{19} = \frac{142}{71}$

$x = \frac{19 \times 142}{71} = 38$

So, $x = 38$

(d) $21 : 35 :: 33 : x$

$\frac{21}{35} = \frac{33}{x}$

$x = \frac{33 \times 35}{21} = 55$

So, $x = 55$

(e) $196 : x :: x : 1$

$\frac{196}{x} = \frac{x}{1}$

$x^2 = 196$

$x = \sqrt{196} = 14$

So, $x = 14$

Exercise 10.2

1. 5 men can eat bananas in a day $= 30$

$\therefore$ 1 men can eat bananas in a day $= \frac{30}{5}$

Thus, 12 men can eat bananas in a day $= \frac{30 \times 12}{5} = 72$

Hence, 12 men can eat 72 bananas in a day.

2. 30 apples weight $= 6$ kg

$\therefore$ 1 apple weighs $= \frac{6}{30}$ kg

Thus, 1080 such apples weight $= \frac{6 \times 1080}{30}$

$= 216$ kg

Hence, 1080 such apples will be containing weigh 216 kg.

3. 10 workers are paid for one day $= ₹1680$

$\therefore$ 1 worker is paid for one day $= ₹\frac{1680}{10}$

Thus, 28 workers are paid for one day $= ₹\frac{1680}{10} \times 28 = ₹\ 4704$

Hence, ₹ 4704 will be paid to 28 workers for one day.

4. 10 men dig a well in $= 9$ days

$\therefore$ 1 men dig a well in $= (9 \times 10)$ days

So, 15 men dig a well in $= \frac{9 \times 10}{15}$ days $= 6$ days

Hence, 15 men can dig the same well in 6 days.

5. The cost of 15 envelopes $= ₹\,37.50$

$\therefore$ The cost of 1 envelope $= ₹\,\frac{37.50}{15}$

Thus, The cost of 20 envelopes $= \frac{₹\,37.50 \times 20}{15} = ₹\,50$

$\therefore$ In ₹ 50, the number of envelops bought $= 20$

In ₹ 1 the number of envelops bought $= \frac{20}{50}$

In ₹ 300 the number of envelops bought $= \frac{20}{50} \times 300 = 120$

Hence, 120 envelopes bought in ₹ 300 and cost of 20 envelopes is ₹ 50.

6. Total wages of 30 labourers $= ₹\,3450$

$\therefore$ Total wages of 1 labourer $= ₹\,\frac{3450}{30}$

Thus, Total wages of $(30 + 10 = 40)$ labourers $= ₹\,\frac{3450}{30} \times 40$

$= ₹\,4600$

Hence, total wages of 40 labourers would be ₹ 4600.

7. Time $= 7$ hr
Speed $= 48$ km/hr
Distance covered $= ?$
We know that
$d = S \times T$
$= 48 \times 7$
$= 336$ km

Now, speed is decreased by 20 km/hr.

$\therefore$ $S = (48 - 20)$ km/hr
$= 28$ km/hr
$d = 336$ km
$T = ?$
$T = \frac{d}{s} = \frac{336}{28} = 12$ hr

Hence, the car will take 12 hours to cover the same distance.

8. Working 8 hours daily, a man takes time to complete task $= 12$ days
$\therefore$Working 1 hour daily, the man will take time to complete task $= 12 \times 8$ days
Thus, Working 6 hours daily, the men will take time to complete task $= \frac{12 \times 8}{6} = 16$ days

Hence, the same work will be completed in 16 days if he works 6 hours daily.

9. In 1 hr 30 min (i,e., 90 min) the train covers distance $= 90$ km
In 1 min the train cover distance $= \frac{90}{90}$ km

In 4 hr 30 min (i.e., 270 min) the train cover distance $= \frac{90}{90} \times 270\text{km} = 270\text{km}$

So, the train will traved 270 km in 4 hr 30 minutes.

10. Aman takes 5 hours to paint a wall.

So, Aman's 1 hour's work $= \frac{1}{5}$ part

Vivek takes 6 hours to paint the same wall.

So, Vivek's 1 hour's work $= \frac{1}{6}$ part

Both 1 hour's work $= \left(\frac{1}{5} + \frac{1}{6}\right)$ part

$= \frac{6+5}{30} = \frac{11}{30}$ part

$\frac{11}{30}$ part of the work is done in 1 hours.

So, 1 part of the work is done in $\frac{1}{\left(\frac{11}{30}\right)}$ hour $= 1 \times \frac{30}{11}$ hour

$= \frac{30}{11} = 2\frac{8}{11}\text{hr}$

Hence, they will paint the wall in $2\frac{8}{11}$ hours together.

Exercise 10.3

1. (a) $32\% = \frac{32}{100} = \frac{8}{25} =$ **8 : 25**

(b) $6\frac{1}{4}\% = \frac{25}{4}\% = \frac{25}{4 \times 100} = \frac{1}{16} =$ **1 : 16**

(c) $0.35\% = \frac{35}{100}\% = \frac{35}{100 \times 100} = \frac{7}{2000} =$ **7 : 2000**

(d) $200\% = \frac{200}{100} = \frac{2}{1} =$ **2 : 1**

(e) $15\frac{2}{3}\% = \frac{47}{3}\% = \frac{47}{3 \times 100} = \frac{47}{300} =$ **47 : 300**

2. (a) $25\% = \frac{25}{100} = 0.25$

(b) $0.3\% = \frac{0.3}{100} = \frac{3}{1000} = 0.003$

(c) $\frac{5}{4}\% = \frac{5}{4 \times 100} = \frac{1}{80}$

$= 0.0125$

(d) $2\frac{1}{3}\% = \frac{7}{3}\% = \frac{7}{3 \times 100}$

$= \frac{7}{300} = 0.0233$

(e) $145\% = \frac{145}{100} = 1.45$

3. (a) $30\% = \frac{30}{100} = \frac{3}{10}$

(b) $12\frac{1}{2}\% = \frac{25}{2\times 100} = \frac{1}{8}$

(c) $1.45\% = \frac{1.45}{100} = \frac{145}{100\times 100}$

$= \frac{29}{2000}$

(d) $0.5\% = \frac{0.5}{100} = \frac{5}{100\times 10}$

$= \frac{1}{200}$

(e) $0.24\% = \frac{0.24}{100} = \frac{24}{100\times 100}$

$= \frac{3}{1250}$

4. (a) 25% of ₹100

$= \frac{25}{100} \times ₹100$

$= ₹25$

$= ₹\ \frac{81}{10} = ₹8.1$

(b) $4\frac{1}{2}\%$ of ₹ 180

$= \frac{9}{2}\%$ of ₹180

$= \frac{9}{2\times 100} \times$ ₹ 180

(c) 2.25% of 1000m

$= \frac{2.25}{100}$ of 1000m

$= \frac{225\times 1000m}{100\times 100} = 22.5m$

$= \frac{46\times 6}{100} = 2.76$

(d) $15\frac{1}{3}\%$ of 18

$= \frac{46}{3}\%$ of 18

$= \frac{46}{3\times 100} \times 18$

(e) 0.5% of 250 km

$= \frac{0.5}{100} \times 250$ km

$= \frac{5\times 250}{100\times 10} = \frac{5}{4}$ km

= 1.25 km

5. (a) $\frac{51}{100} = \left(\frac{51}{100}\times 100\right)\% = 51\%$

(b) $2\frac{3}{5} = \left(\frac{13}{5}\times 100\right)\% = 260\%$

(c) $\frac{75}{40} = \left(\frac{75}{40}\times 100\right)\% = 187.5\%$ or $187\frac{1}{2}\%$

(d) $6\frac{1}{4} = \left(\frac{25}{4}\times 100\right)\% = 625\%$

(e) $\frac{1}{7} = \left(\frac{1}{7}\times 100\right)\% = 14\frac{2}{7}\%$

6. (a) $0.04 = \frac{4}{100} = \left(\frac{4}{100}\times 100\right)\% = 4\%$

(b) $2.35 = \frac{235}{100} = \left(\frac{235}{100} \times 100\right)\% = 235\%$

(c) $7.50 = \frac{750}{100} = \left(\frac{750}{100} \times 100\right)\% = 750\%$

(d) $0.23 = \frac{23}{100} = \left(\frac{23}{100} \times 100\right)\% = 23\%$

(e) $0.0008 = \frac{8}{10000} = \left(\frac{8}{10000} \times 100\right)\% = \frac{8}{100}\% = 0.08\%$

(f) $7.25 = \frac{725}{100} = \left(\frac{725}{100} \times 100\right)\% = 725\%$

(g) $0.07 = \frac{7}{100} = \left(\frac{7}{100} \times 100\right)\% = 7\%$

(h) $1.204 = \frac{1204}{1000} = \left(\frac{1204}{1000} \times 100\right)\% = \frac{1204}{10}\% = 120.4\%$

(i) $15.2 = \frac{152}{10} = \left(\frac{152}{10} \times 100\right)\% = 1520\%$

7. (a) $1:5 = \frac{1}{5} = \left(\frac{1}{5} \times 100\right)\% = 20\%$

(b) $2:3 = \frac{2}{3} = \left(\frac{2}{3} \times 100\right)\% = \frac{200}{3}\% = 66\frac{2}{3}\%$

(c) $25:75 = \frac{25}{75} = \left(\frac{25}{75} \times 100\right)\% = \frac{100}{3}\% = 33\frac{1}{3}\%$

(d) $20:25 = \frac{20}{25} = \left(\frac{20}{25} \times 100\right)\% = 80\%$

(e) $11:125 = \frac{11}{125} = \left(\frac{11}{125} \times 100\right)\% = \frac{44}{5}\% = 8\frac{4}{5}\%$ or 8.8%

(f) $7:5 = \frac{7}{5} = \left(\frac{7}{5} \times 100\right)\% = 140\%$

(g) $13:20 = \frac{13}{20} = \left(\frac{13}{20} \times 100\right)\% = 65\%$

(h) $9:10 = \frac{9}{10} = \left(\frac{9}{10} \times 100\right)\% = 90\%$

(i) $10:36 = \frac{10}{36} = \left(\frac{10}{36} \times 100\right)\% = \frac{250}{9}\% = 27\frac{7}{9}\%$

8. Income of Sita = ₹ 1500

Money spent by Sita = ₹ 575

∴ Money saved by Sita = ₹ 1500 – ₹ 575 = ₹ 925

So, Required percent of her saving $= \left(\frac{\text{Saving}}{\text{Income}} \times 100\right)\%$

$= \left(\frac{₹\ 925}{₹\ 1500} \times 100\right)\% = \frac{185}{3}\% = 61\frac{2}{3}\%$

9. Given, $y\%$ of $250 = 21$

$\therefore \quad \frac{y}{100} \times 250 = 21$

$y = \frac{21 \times 100}{250} = \frac{42}{5} = 8\frac{2}{5}$ or 8.4

So, the value of y $8\frac{2}{5}$ or 8.4.

10. Let the number be x.

Then, $3\frac{1}{4}\%$ of $x = 13$

$\frac{13}{4}\%$ of $x = 13$

$\frac{13}{4 \times 100} \times x = 13$

$x = \frac{13 \times 400}{13} = 400$

Thus, the required number is 400.

11. Let the number be x.

Then, 0.05% of $x = 200$

$\Rightarrow \quad \frac{5}{100}\%$ of $x = 200$

$\Rightarrow \quad \frac{5}{100 \times 100} \times x = 200$

$\Rightarrow \quad x = \frac{200 \times 100 \times 100}{5} = 4{,}00{,}000$

Thus, the required number is 4,00,000.

12. Let the number be x.

Then, 10% of $x = 5$

$\frac{10}{100} \times x = 5$

$x = \frac{5 \times 100}{10} = 50$

Thus, the required number is 50.

13. Total number of marks = 80

Marks obtained by Nishant = 40

$\therefore$ Percent of marks $= \left(\frac{40}{80} \times 100\right)\% = 50\%$

Hence, Nishant got 50% marks.

14. Total number of oranges $= 120$

Number of oranges distributed among students $= 25$

$\therefore$ Remaining organges in the basket $= 120 - 25 = 95$

So, Percentage of oranges left in the basket $= \left(\frac{95}{120} \times 100\right)\% = \frac{475}{6} = 79\frac{1}{6}\%$

15. (a) ₹ 100 of ₹ 500?

$\therefore$ Required percent $= \frac{₹\ 100}{₹\ 500} \times 100\% = 20\%$

Hence, 20% of ₹ 500 is ₹100.

(b) 160 metres of 5 km?

$\therefore$ Required percent $= \frac{160\,\text{m}}{5\,\text{km}} \times 100\%$

$= \frac{160\,\text{m} \times 100\%}{5000\,\text{m}} = \frac{16\%}{5} = 3\frac{1}{5}\%$ or 3.2%

Hence, $3\frac{1}{5}\%$ of 5 km is 160 m.

(c) 75 paise of ₹ 8?

$\therefore$ Required percent $= \frac{75\,\text{paise}}{₹\ 8} \times 100\%$

$= \frac{75\ \text{paise}}{800\,\text{paise}} \times 100\% = \frac{75}{8}\% = 9\frac{3}{8}\%$ or 9.375 %

Hence, $9\frac{3}{8}\%$ of ₹ 8 is 75 paise.

(d) 0.5 of 5?

$\therefore$ Required percent $= \frac{0.5}{5} \times 100\% = \frac{50}{5}\% = 10\%$

Hence, 10% of 5 is 0.5.

(e) 450 grams of 2.75 kg?

$\therefore$ Required percent $= \frac{450\text{g}}{2.75\,\text{kg}} \times 100\%$

$= \frac{450\text{g}}{2750\text{g}} \times 100\%$

$= \frac{9}{55} \times 100\% = \frac{180}{11}\% = 16\frac{4}{11}\%$

Hence, $16\frac{4}{11}\%$ of 2.75 kg is 450 grams.

(f) 12 minutes of 3 hours?

$\therefore$ Required percent $= \frac{12\,\text{min}}{3\,\text{hr}} \times 100\%$

$= \frac{12\ \text{min}}{3 \times 60\ \text{min}} \times 100\%$

$$= \frac{20}{3}\% = 6\frac{2}{3}\%$$

Hence, $6\frac{2}{3}\%$ of 3 hours is 12 minutes.

(g) 80 apples of 120 apples?

$\therefore$ Required percent $= \frac{80\text{apples}}{120\text{apples}} \times 100\% = \frac{2}{3} \times 100\% = 66\frac{2}{3}\%$

Hence, $66\frac{2}{3}\%$ of 120 apples is 80 apples.

(h) 20 of 200?

$\therefore$ Required percent $= \frac{20}{200} \times 100\% = 10\%$

Hence, 10% of 200 is 20.

(i) 3 kg of 15 kg?

$\therefore$ Required percent $= \frac{3\,\text{kg}}{15\,\text{kg}} \times 100\% = \frac{100}{5}\% = 20\%$

Hence, 20% of 15 kg is 3 kg.

16. Percent of Passed candidates = 90%

And, number of Failed candidates = 80

$\therefore$ Percent of failed candidates $= (100-90)\% = 10\%$

Let x candidates had appeared in the examination.

Then, 10% of $x = 80$

$$\frac{10}{100} \times x = 80$$

$$x = \frac{80 \times 100}{10} = 800$$

Hence, 800 candidates had appeared in the examination,

17. Percent of marks of Mohit $= \left(\frac{630}{900} \times 100\right)\% = 70\%$

And Percent of marks of Vidhi $= \left(\frac{650}{1000} \times 100\right)\% = 65\%$

Since, 70% > 65%

Hence, Mohit's performance is better than Vidhi.

18. Man travelled by bus = 50 km

And, man travelled by train = 200 km

$\therefore$ Total Journey travelled by the man $= 50km + 200km = 250km$

So, Per cent of journey travelled by bus $= \left(\frac{50\,\text{km}}{250\,\text{km}} \times 100\right)\%$

$= 20\%$

And, Percent of Journey travelled by train $= \left(\frac{200\,\text{km}}{250\,\text{km}} \times 100\right) = 80\%$

19. Percent of Minimum passing marks = 36%
Jayant gets marks = 180
And, he failed = by 36 marks
$\therefore$ Minimum passing marks = 180 + 36 = 216
Let Total (i.e., maximum) marks = x
Then, 36% of $x = 216$

$$\frac{36}{100} \text{ of } x = 216$$

$$\frac{36}{100} \times x = 216$$

$$x = \frac{216 \times 100}{36} = 600$$

Hence, the maximum marks of examination is 600.

20. Price increased of suit = by 12%
And, Present price = ₹896
Let the original price be ₹ x.
Then, $x + 12\%$ of $x =$ ₹ 896

$$x + \frac{12x}{100} = ₹\ 896$$

$$\frac{112x}{100} = ₹\ 896$$

$$x = \frac{₹\ 896 \times 100}{112} = ₹\ 800$$

Hence, the original price of the suit is ` 800.

21. Percent of girls in the school = 35%
Number of boys in the school = 910
Percent of boys in the school = (100 − 35)% = 65%
Let total number of students are x.
Then, 65% of $x = 910$

$$\frac{65}{100} \times x = 910$$

$$x = \frac{910 \times 100}{65} = 1400$$

So, Total enrolments (i.e., students) in the school are 1400.
And, Number of girls in the school = 1400 − 910 = 490.

Exercise 10.4

1. Complete the following table :

Sol :

	CP	SP	Profit	Loss	Profit or Loss %
(a)	₹ 700	₹ 650	—	**₹ 50**	$7\frac{1}{7}$**%**

(b)	₹ 500	**₹ 525**	₹ 25	—	**5%**
(c)	₹ 480	**₹ 440**	—	`40	$\mathbf{8\frac{1}{3}\%}$
(d)	**₹ 700**	₹ 770	₹ 70	—	**10%**
(e)	₹ 900	**₹ 840**	—	`60	$\mathbf{6\frac{2}{3}\%}$

2. (a) S.P = ₹400, Profit = ₹35

$\therefore$ C.P = S.P − P

= ₹ 400 − ₹ 35

= ₹ 365

(b) S.P = ₹ 1250, Profit = ₹ 250

$\therefore$ C.P = S.P − P

= ₹ 1250 − ₹ 250

= ₹ 1000

(c) S.P = ₹ 1250, Loss = ₹150

$\therefore$ C.P = S.P + L

= ₹1250 + ₹150

= ₹1400

(d) S.P = ₹1800, Loss = ₹325

$\therefore$ C.P = S.P + L

= ₹1800 + ₹325

= ₹ 2125

3. (a) C.P = ₹250, Profit = ₹22

$\therefore$ S.P = C.P + P

= ₹250 + ₹22

= ₹272

(b) C.P = ₹720, Profit = ₹105

$\therefore$ S.P = C.P + P

= ₹720 + ₹105

= ₹825

(c) C.P = ₹790, Loss = ₹20

$\therefore$ S.P = C.P − L

= ₹790 − ₹20

= ₹770

(d) C.P = ₹1550, Loss = ₹220

$\therefore$ S.P = C.P − L

= ₹1550 − ₹220

= ₹ 1330

4. C.P of 15 dozen pens = ₹ 60 × 15 = ₹ 900

S.P of 15 dozen (i.,e 180) pens = ₹ 6.50 × 12 × 15 = ₹ 1170

Since, $S.P > C.P$, so, there is a profit

$\therefore$ Profit = $S.P - C.P$ = ₹1170 − ₹900 = ₹270

Hence, his gain is ₹270.

5. C.P of 16 notebooks = S.P of 12 notebooks

Let the C.P of 1 notebook be x.

Then, C.P of 12 notebooks = $12x$

S.P of 12 notebooks = C. P of 16 notebooks = $16x$

$\therefore$ Profit = S.P of 12 notebook − C.P of 12 notebooks

$= 16x - 12x = 4x$

So, Profit % = $\frac{4x}{16x} \times 100\% = 25\%$

Hence, the gain percent is 25%.

6. Let, S.P. of 1 banana = x

$\therefore$ S.P. of 4 bananas = $4x$

And, S.P. of 36 bananas = $36x$

$\because$ C.P. = S.P. + Loss

$\therefore$ C.P. of 36 bananas = S.P. of 36 bananas + S.P. of 4 bananas

$= 36x + 4x$

$= 40x$

So, loss % $= \frac{\text{Loss}}{\text{C.P.}} \times 100\%$

$= \frac{4x}{40x} \times 100\% = \frac{100}{10}\% \Rightarrow 10\%$

7. S.P. of a table = ₹1320, gain = 10%, C.P = ?

Gain = 10% of C.P

C.P is not given to us. So, let C.P = x

gain = 10% of $x = \frac{10}{100} \times x = \frac{x}{10}$

C.P = S.P – Profit

$x = ₹1320 - \frac{x}{10} \quad \Rightarrow \quad \left(x + \frac{x}{10}\right) = ₹\ 1320$

$\frac{11x}{10} = ₹1320 \quad \Rightarrow \quad x = \frac{1320}{11} \times 10$

$x = ₹1200$

Hence, C.P of the table is ₹1200.

8. Cost price of radio for Kabir = ₹ 300

Profit = 25%

$\therefore$ S.P. of radio = C.P. + Profit

= ₹ 300 + 25% of ₹ 300

= ₹ 300 + $\frac{25}{100} \times$ ₹ 300

= ₹ 300 + ₹ 75

= ₹ 375

Now, S.P. for Kabir = C.P. for Sunny = ₹ 375

Loss = 10%

$\therefore$ S.P. for Sunny = C.P. – Loss

= ₹ 375 – 10% of ₹ 375

= ₹ 375 – $\frac{10}{100} \times$ ₹ 375

= ₹ 375 – ₹ 37.5

= ₹ 337.5

Now, S.P. for Sunny = C.P. for Kuldeep = ₹ 337.5

Hence, kuldeep buy the radio at ₹ 337.50.

9. C.P of 100 articles =₹4000

Overall profit = 20% of ₹4000 = $\frac{20}{100} \times$ ₹ 4000 $\Rightarrow$ ₹ 800

$\therefore$ S.P. of 100 articles = C.P + profit

=₹4000 +₹800 =₹4800

Now, C.P of 20 article $= ₹\frac{4000}{100} \times 20 = ₹800$

Profit $= 5\%$ of $₹800 = \frac{5}{100} \times ₹800 = ₹40$

$\therefore$ S.P of 20 articles = C.P + Profit $= ₹800 + ₹40 = ₹840$

C.P of 80 article $= ₹\frac{4000}{100} \times 80 = ₹3200$

Let he should sell the remaining articles at y % profit.

$\therefore$ Profit $= y\%$ of $₹3200 = \frac{y}{100} \times 3200 = 32y$

$\therefore$ S.P = C.P+ Profit $= ₹3200 + 32y$

Total S.P = C.P + Profit $= 840 + 3200 + 32y = ₹4040 + 32y$

$₹4800 = ₹(4040 + 32y)$

$₹32y = ₹(4800 - 4040) = ₹760$

$y = \frac{760}{32} = \frac{95}{4}\% = 23\frac{3}{4}\%$ or 23.75%

Thus, he sell the remaining articles at 23.75% gain.

10. S.P. of each article = ₹ 375

Let, C.P of first article is x and second is y.

Profit % of one article = 25%

Then, S.P = C.P. + Profit

$₹\ 375 = x + 25\%$ of x

$₹\ 375 = x + \frac{x \times 25}{100}$

$₹\ 375 = x + \frac{x}{4}$

$\frac{5x}{4} = ₹\ 375$

$x = ₹\ \frac{375 \times 4}{5}$

$x = ₹\ 300$

And, Loss % of other article = 25%

Then, S.P. $= C.P. - Loss$

$₹\ 375 = y - 25\%$ of y

$= y - \frac{25 \times y}{100} = y - \frac{y}{4}$

$\frac{3y}{4} = ₹\ 375$

$y = ₹\ \frac{375 \times 4}{3}$

$y = ₹\ 500$

$\therefore$ C.P. of whole transaction $= x + y$
$= ₹\ 300 + ₹\ 500$
$= ₹\ 800$
And S.P. of whole ransaction $= ₹\ 375 + ₹\ 375$
$= ₹\ 750$
Since, C.P. > S.P., so there is a loss.
$\therefore$ Loss = C.P. $-$ S.P. $= ₹\ 800 - ₹\ 750 = ₹\ 50$
So, Loss % $= \frac{\text{Loss}}{\text{C.P.}} \times 100\% = \frac{₹\ 50}{₹\ 800} \times 100\% = \frac{25}{4}\% = 6\frac{1}{4}\%$

11. C.P of the old computer = ₹ 20,000
Amount spent on its upgradation = ₹ 2250
$\therefore$ Total investment (new C.P) $= ₹ (20000 + 2250) = ₹ 22250$
S.P of the old computer $= ₹ 25810$
Clearly, S.P > C.P, so there is a profit.
$\therefore$ Profit $= \text{S.P} - \text{C.P} = ₹ 25810 - ₹ 22250 = ₹ 3560$
Thus, gain percent $= \frac{\text{gain}}{\text{C.P.}} \times 100\%$
$= \frac{3560}{22250} \times 100\%$
Hence, her gain is 16% in whole transaction.

12. C.P of a flat $= ₹ 17,75,000$
Amount spent on its interior decoration $= ₹ 1,25,000$
$\therefore$ Total investment (new C. P) $= ₹ (17,75,000 + 1,25,000) = ₹ 19,00,000$
Profit % on it = 20% of total investment
$\therefore$ Profit $= \frac{20}{100} \times 1900000 = ₹ 380000$
So, the S.P of the flat = New C.P + Profit
$= ₹ 1900000 + ₹ 380000 = ₹ 22,80,000$

Exercise 10.5

1. Calculate the interest and amount in the following cases :

	Principle	Rate p.a.	Time	Interest	Amount
(a)	₹ 810	5%	3 years	**₹ 121.5**	**₹ 931.5**
(b)	₹ 500	$5\frac{1}{2}\%$	**6 years**	**₹ 165**	₹ 665
(c)	₹ 10,000	**15%**	2 years	₹ 3000	**₹ 13,000**
(d)	₹ 3,000	$\mathbf{8\frac{1}{2}\%}$	6 years	**₹ 1530**	₹ 4530

2. $P = ₹ 7300$, $R = 10\%$ p.a, $T = 2$ years
$\therefore$ S.I $= \frac{P \times R \times T}{100} = ₹ \frac{7300 \times 10 \times 2}{100} = ₹ 1460.$
Hence, the simple interest is ₹ 1460.

3. R = ?, $P = ₹800$, $A = ₹1000$, $T = 2$ years

$I = A - P = ₹1000 - ₹800 = ₹200$

Now, $I = \frac{P \times R \times T}{100}$

$200 = \frac{800 \times R \times 2}{100}$

$\therefore \quad R = \frac{200}{8 \times 2} = \frac{25}{2} = 12\frac{1}{2}\%$ p.a.

Hence, the required rate is $12\frac{1}{2}\%$ p.a.

4. $T = ?$, $R = 10\%$ p.a.

Let P $= ₹x$, then $A = ₹1.5x$,

$I = A - P = 1.5x - x = 0.5x$

$\therefore \quad T = \frac{I \times 100}{P \times R} = \frac{0.5x \times 100}{x \times 10} = 5$ years

Hence, the required time is 5 years.

5. $R = 12\%$ p.a, $T = 3$ years, $I = ₹180$

Let she borrowed ₹ y.

Now, $I = \frac{P \times R \times T}{100}$

$180 = \frac{y \times 12 \times 3}{100}$

$y = \frac{180 \times 100}{12 \times 3} = 500$

Hence, she borrowed ₹ 500.

6. Rate = 10% p.a., Time = 5 years, Interest = ₹ 150

$\because \quad$ S.I. $= \frac{P \times R \times T}{100}$

$\therefore \quad P = \frac{I \times 100}{R \times T} = \frac{₹150 \times 100}{10 \times 5} =$ ₹ 300

Hence, ₹ 300 produce ₹ 150 in 5 years.

7. Given : $A_1 = ₹2200$ $\qquad$ $A_2 = ₹2800$

$T_1 = 1$ year $\qquad$ $T_2 = 4$ years

Let, $R_1 = r\%$ $\qquad$ $R_2 = r\%$

$P_1 = P$ $\qquad$ $P_2 = P$

$I_1 = \frac{P_1 \times R_1 \times T_1}{100}$ $\qquad$ $I_2 = \frac{P_2 \times R_2 \times T_2}{100}$

$I_1 = \frac{P \times r \times 1}{100}$ $\qquad$ $I_2 = \frac{P \times r \times 4}{100}$

$I_1 = \frac{Pr}{100}$ ...(1) $\qquad$ $I_2 = \frac{4Pr}{100}$ ...(3)

and $I_1 = A_1 - P_1$ and $I_2 = A_2 - P_2$

$\frac{Pr}{100} = 2200 - P$ $I_2 = 2800 - P$

$\frac{Pr}{100} + P = 2200$ ...(2) $\frac{4Pr}{100} + P = 2800$ ...(4)

Subtracting equation (2) from equation (4), we get

$$\frac{4Pr}{100} + P - \left(\frac{Pr}{100} + P\right) = 2800 - 2200$$

$$\frac{4Pr}{100} + P - \frac{Pr}{100} - P = 600$$

$$\frac{4Pr}{100} - \frac{Pr}{100} = 600 \Rightarrow \left(\frac{4Pr - Pr}{100}\right) = 600$$

$$\frac{3Pr}{100} = 600$$

$$Pr = \frac{600 \times 100}{3} = 20000$$

Put this value in equation (1), we get,

$$I_1 = \frac{20000}{100} = ₹\ 200$$

From $I_1 = A_1 - P_1$

$\Rightarrow$ $200 = 2200 - P$ $[\because P_1 = P]$

$P = 2200 - 200 = 2000$

$\therefore$ $P = ₹\ 2000$

Put this value in equation (5), we get

$2000 \times r = 20000$

$r = \frac{20000}{2000} = 10$

$\therefore$ $r = 10\%$

Hence, the sum of money is ₹ 2000 and rate of interest is 10% p.a.

8. $P = ₹\ 800$, $R = 12.5\%$ p.a, $I = ₹\ 125$, $T = ?$

$\because$ $I = \frac{P \times R \times T}{100}$

$\therefore$ $125 = \frac{800 \times 12.5 \times T}{100}$

$$T = \frac{125}{8 \times 12.5} = \frac{125 \times 10}{8 \times 125} = \frac{10}{8} = \frac{5}{4}$$

$T = 1\frac{1}{4}$ year or 1 year 3 months.

9. Let the principal (P) be x

$\therefore$ Amount (A) $= 3x$ Rate (R) = ?

Time (T) = 16 years

$I = A - P = 3x - x = 2x$

Now, $R = \dfrac{I \times 100}{P \times T} = \dfrac{2x \times 100}{x \times 16} = \dfrac{200}{16}$

$\therefore \quad R = 12.5\%$

Hence, the rate of interest is 12.5% p.a.

10. Let the sum be ₹ x.

$T_1 = 2$ years $\quad T_2 = 3$ years $\quad R_1 = 8\% \quad R_2 = 12\%$

Given, $\text{S.I}_1 = \text{S.I}_2 - ₹\ 120$

$\therefore \quad \dfrac{\text{P} \times \text{R}_1 \times \text{T}_1}{100} = \dfrac{\text{P} \times \text{R}_2 \times \text{T}_2}{100} - ₹120$

$\dfrac{P \times 8 \times 2}{100} = \dfrac{P \times 12 \times 3}{100} - ₹120$

$\dfrac{36P}{100} - \dfrac{16P}{100} = ₹120$

$\dfrac{36P - 16P}{100} = ₹120$

$20P = ₹\ 120 \times 100$

$P = \dfrac{120 \times 100}{20} = ₹\ 600$

Hence, the required sum is ₹ 600.

Multiple Choice Questions

1. (c) **2.** (c) **3.** (c) **4.** (d) **5.** (a) **6.** (d) **7.** (b) **8.** (b)

Brain Teaser

1. In a transaction if there is a loss of 20%, then $SP = CP - 20\%$ of **C.P**.

2. Amount = **Principal** + **Interest**.

3. 300 marks out of 400 is **75%**.

4. Fractional representation of 16.25% is $\dfrac{\mathbf{65}}{\mathbf{4}}$.

5. If an item is sold for ` 990 at a profit of 10%, then its C.P = **` 900**.

6. If x% of 1250 = 250, then x = **20**.

7. 80% of 80 is **64**.

HOTS

1. Amit scored marks in four subjects = 72,61,54 and 6.3

Let, the scored x marks in 5th subject.

The maximum marks of each subject = 80 marks

$\therefore$ Total maximum marks $= 5 \times 80$ marks

$= 400$ marks.

Now, his score = 80% marks overall

$= 80\%$ of 400 marks

$= \dfrac{80}{100} \times 400 = 320$ marks

$\therefore \quad 72 + 61 + 54 + 63 + x = 320$

$250 + x = 320$

$x = 320 - 250$

$x = 70$ marks

Hence, Amit got 70 marks in 5th subject.

2. Given, $P_1 = ₹\,8400, R_1 = 9\% P.a., T_1 = 146$ days;

$P_2 = \frac{1}{2} \times ₹\,8400 = ₹\,4200, R_2 = 15\% P.a., T_2 = 292$ days;

Now, S.I.for Nishant $= \frac{P_1 \times R_1 \times T_1}{100}$

$= \frac{₹\,8400 \times 9 \times \frac{146}{365}}{100}$

$= ₹\,84 \times 9 \times \frac{2}{5} = ₹\,\frac{1512}{5} = ₹\,302.40$

And, S.I. for Dheeraj $= \frac{P_2 \times R_2 \times T_2}{100}$

$= \frac{₹\,4200 \times 15 \times \frac{292}{365}}{100}$

$= ₹\,42 \times 15 \times \frac{4}{5}$

$= ₹\,(42 \times 12) = ₹\,504$

So, the difference of interest received by them $= ₹\,504 - ₹\,302.40 = ₹\,201.60$

3. Saplings planted by Rohan = 20

Saplings planted by Surbhi = 24

And, Saplings planted by Preeti = 32

(i) The ratio of saplings planted by Rohan to Preeti is

$(20:32) = \frac{20}{32} = \frac{5}{8} = \mathbf{5:8}$

(ii) The ratio of saplings planted by Surbhi to Rohan is $(24:20) = \frac{24}{20} = \frac{6}{5} = \mathbf{6:5}$

(ii) $\because 5:8 = \frac{5}{8} = 0.625$

And, $6:5 = \frac{6}{5} = 1.2$

$\because \quad 0.625 < 1.2$

So, the ratio of saplings Planted by Rohan to Preeti is less than the ratio of Surbhi to Rohan.

NEP

Do it yourself.

11 Rational Numbers

Exercise 11.1

1. (a) $\frac{15}{17}=\frac{15}{17}$ (Standard form)

(b) $\frac{-14}{-49}=\frac{14}{49}=\frac{2}{7}$ (Standard form)

(c) $\frac{-16}{56}=\frac{-4}{14}=-\frac{2}{7}$ (Standard form)

(d) $\frac{72}{-108}=\frac{-72}{108}=\frac{-8}{12}=\frac{-2}{3}$ (Standard form)

2. (a) $\frac{7}{10}$ (b) $\frac{3}{8}$ (c) $\frac{-3}{-5}$

$\therefore \left|\frac{7}{10}\right|=\frac{7}{10}$ $\therefore \left|\frac{3}{8}\right|=\frac{3}{8}$ $\therefore \left|\frac{-3}{-5}\right|=\frac{3}{5}$

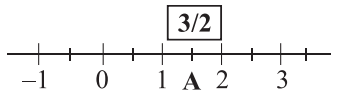
(d) $\frac{-6}{13}$ (e) $\frac{7}{-9}$

$\therefore \left|\frac{-6}{13}\right|=\frac{6}{13}$ $\therefore \left|\frac{7}{-9}\right|=\frac{7}{9}$

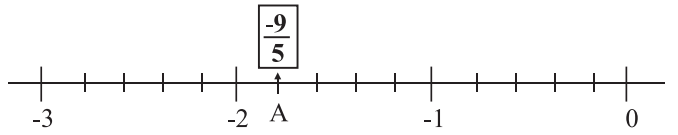
3. Negative rational number are (b) $\frac{-9}{17}$, (d) $\frac{7}{-13}$ and (f) $\frac{3}{-61}$

Positive rational number are (a) $\frac{-5}{-3}$, (c) $\frac{-6}{-15}$ and (e) $\frac{2}{3}$

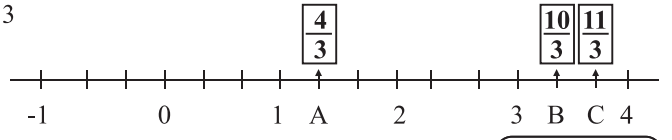
4. (a) $\frac{3}{2}=$



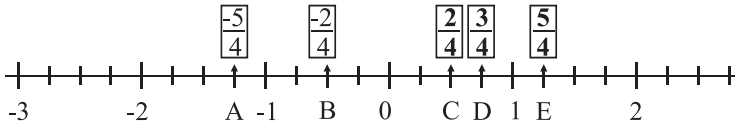
(b) $\frac{-9}{5}$



(c) $\frac{4}{3}, \frac{10}{3}, \frac{11}{3}$



(d) $\frac{-5}{4}, \frac{-2}{4}, \frac{2}{4}, \frac{3}{4}, \frac{5}{4}$



5. (a) $\frac{1}{7}=\frac{1\times 2}{7\times 2}=\frac{2}{14}$; $\frac{1}{7}=\frac{1\times 3}{7\times 3}=\frac{3}{21}$;
$\frac{1}{7}=\frac{1\times 4}{7\times 4}=\frac{4}{28}$; $\frac{1}{7}=\frac{1\times 5}{7\times 5}=\frac{5}{35}$

So, the four equivalent rational numbers of $\frac{1}{7}$ are $\frac{2}{14},\frac{3}{21},\frac{4}{28},\frac{5}{35}$.

(b) $\frac{-5}{8}=\frac{-5\times 2}{8\times 2}=\frac{-10}{16}$; $\frac{-5}{8}=\frac{-5\times 3}{8\times 3}=\frac{-15}{24}$
$\frac{-5}{8}=\frac{-5\times 4}{8\times 4}=\frac{-20}{32}$; $\frac{-5}{8}=\frac{-5\times 5}{8\times 5}=\frac{-25}{40}$

So, the four equivalent rational numbers of $\frac{-5}{8}$ are $\frac{-10}{16},\frac{-15}{24},\frac{-20}{32},\frac{-25}{40}$.

(c) $\frac{4}{9}=\frac{4\times 2}{9\times 2}=\frac{8}{18}$; $\frac{4}{9}=\frac{4\times 3}{9\times 3}=\frac{12}{27}$;
$\frac{4}{9}=\frac{4\times 4}{9\times 4}=\frac{16}{36}$; $\frac{4}{9}=\frac{4\times 5}{9\times 5}=\frac{20}{45}$

So, the four equivalent rational numbers of $\frac{4}{9}$ are $\frac{8}{18},\frac{12}{27},\frac{16}{36},\frac{20}{45}$.

(d) $\frac{6}{13}=\frac{6\times 2}{13\times 2}=\frac{12}{26}$; $\frac{6}{13}=\frac{6\times 3}{13\times 3}=\frac{18}{39}$;
$\frac{6}{13}=\frac{6\times 4}{13\times 4}=\frac{24}{52}$; $\frac{6}{13}=\frac{6\times 5}{13\times 5}=\frac{30}{65}$

So, the four equivalent rational numbers of $\frac{6}{13}$ are $\frac{12}{26},\frac{18}{39},\frac{24}{52},\frac{30}{65}$.

6. (a) $\frac{-2}{3}=\frac{6}{x}$

$-2\times x=6\times 3$

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

Hence, the value of x is – 9.

(b) $\frac{6}{-7}=\frac{42}{x}$

$6\times x=42\times(-7)$

$x=\frac{42\times(-7)}{6}=7\times(-7)=-49$

Hence, the value of x is – 49.

(c) $\frac{9}{-5}=\frac{x}{25}$

$x\times(-5)=9\times 25$

$x=\frac{9\times 25}{-5}=9\times(-5)=-45$

Hence, the value of x is – 45.

(d) $\frac{12}{48}=\frac{x}{-12}$

$x\times 48=12\times(-12)$

$x=\frac{12\times(-12)}{48}=\frac{-32}{4}=-3$

Hence, the value of x is – 3.

(e) $\frac{-64}{36}=\frac{16}{x}$

$-64\times x=16\times 36$

$x=\frac{16\times 36}{-64}=\frac{36}{-4}=-9$

Hence, the value of x is -9.

(f) $\frac{25}{42}=\frac{x}{21}$

$x\times 42=25\times 21$

$x=\frac{25\times 21}{42}=\frac{25}{2}$

$x=12\frac{1}{2}$ or 12.5

Hence, the value of x is $12\frac{1}{2}$ or 12.5.

7. (a) $\frac{-4}{3},\frac{5}{-6}$

L.C.M of 3, $6=6$

$\frac{-4}{3}=\frac{-4\times 2}{3\times 2}=\frac{-8}{6}$

$\frac{5}{-6}=\frac{5\times(-1)}{-6\times(-1)}=\frac{-5}{6}$

Since, $-8<-5$

$\therefore \quad \frac{-8}{6}<\frac{-5}{6}$

So, $\frac{-4}{3}<\frac{5}{-6}$

(b) $\frac{-4}{7},\frac{2}{-3}$

L.C.M of 7, $3=21$

$\frac{-4}{7}=\frac{-4\times 3}{7\times 3}=\frac{-12}{21}$

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

Since, $-14<-12$

$\therefore \quad \frac{-14}{21}<\frac{-12}{21}$

So, $\frac{2}{-3}<-\frac{4}{7}$

(c) $\frac{7}{12},\frac{3}{14}$

L.C.M of 12, $14=84$

$\frac{7}{12}=\frac{7\times 7}{12\times 7}=\frac{49}{84}$

$\frac{3}{14}=\frac{3\times 6}{14\times 6}=\frac{18}{84}$

Since, $18<49$

$\because \quad \frac{18}{84}<\frac{49}{84}$

So, $\frac{3}{14}<\frac{7}{12}$

(d) $\frac{-9}{13},\frac{7}{-12}$

L.C.M of 12, $13=156$

$\frac{-9}{13}=\frac{-9\times 12}{13\times 12}=\frac{-108}{156}$

$\frac{7}{-12}=\frac{7\times(-13)}{-12\times(-13)}=\frac{-91}{156}$

Since, $-108<-91$

$\because \quad \frac{-108}{156}<\frac{-91}{156}$

So, $\frac{-9}{13}<\frac{7}{-12}$

8. (a) $\frac{1}{2},\frac{-2}{4},\frac{-5}{-6}$

L.C.M of 2, 4, $6=12$

$\frac{1}{2}=\frac{1\times 6}{2\times 6}=\frac{6}{12}$

$\frac{-2}{4}=\frac{-2\times 3}{4\times 3}=\frac{-6}{12}$

$\frac{-5}{-6}=\frac{5\times 2}{6\times 2}=\frac{10}{12}$

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

L.C.M of 3, 6, $7=42$

$\frac{2}{-3}=\frac{2\times -14}{-3\times -14}=\frac{-28}{42}$

$\frac{-5}{6}=\frac{-5\times 7}{6\times 7}=\frac{-35}{42}$

$\frac{-6}{7}=\frac{-6\times 6}{7\times 6}=\frac{-36}{42}$

Since, $-6 < 6 < 10$

or $\frac{-6}{12} < \frac{6}{12} < \frac{10}{12}$

$\therefore \quad \frac{-2}{4} < \frac{1}{2} < \frac{-5}{6}$

So, $\frac{-2}{4}$ is the smallest rational number.

Since, $-36 < -35 < -28$

or, $\frac{-36}{42} < \frac{-35}{42} < \frac{-28}{42}$

$\therefore \quad \frac{-6}{7} < \frac{-5}{6} < \frac{2}{-3}$

So, $\frac{-6}{7}$ is the smallest rational number.

(c) $\frac{4}{8}, \frac{-5}{6}, \frac{11}{-24}$

L.C.M of 8, 6, 24 = 24

$\frac{4}{8} = \frac{4\times 3}{8\times 3} = \frac{12}{24}$

$\frac{-5}{6} = \frac{-5\times 4}{6\times 4} = \frac{-20}{24}$

$\frac{11}{-24} = \frac{11\times(-1)}{-24\times(-1)} = \frac{-11}{24}$

Since, $-20 < -11 < 12$

or $\frac{-20}{24} < \frac{-11}{24} < \frac{12}{24}$

$\therefore \quad \frac{-5}{6} < \frac{11}{-24} < \frac{4}{8}$

So, $\frac{-5}{6}$ is the smallest rational number.

9. (a) $\frac{3}{10}, \frac{6}{15}, \frac{-11}{5}, \frac{1}{6}$

L.C.M of 5, 6, 10, 15 = 30

$\frac{3}{10} = \frac{3\times 3}{10\times 3} = \frac{9}{30}$

$\frac{6}{15} = \frac{6\times 2}{15\times 2} = \frac{12}{30}$

$\frac{-11}{5} = \frac{-11\times 6}{5\times 6} = \frac{-66}{30}$

$\frac{1}{6} = \frac{1\times 5}{6\times 5} = \frac{5}{30}$

Since, $-66 < 5 < 9 < 12$

or $\frac{-66}{30} < \frac{5}{30} < \frac{9}{30} < \frac{12}{30}$

$\therefore \quad \frac{-11}{5} < \frac{1}{6} < \frac{3}{10} < \frac{6}{15}$ are in ascending order.

(b) $\frac{-9}{10}, \frac{-5}{20}, \frac{7}{12}, \frac{2}{5}$

L.C.M of 5, 10, 12, 20 = 60

$\frac{-9}{10} = \frac{-9\times 6}{10\times 6} = \frac{-54}{60}$

$\frac{-5}{20} = \frac{-5\times 3}{20\times 3} = \frac{-15}{60}$

$\frac{7}{12} = \frac{7\times 5}{12\times 5} = \frac{35}{60}$

$\frac{2}{5} = \frac{2\times 12}{5\times 12} = \frac{24}{60}$

Since, $-54 < -15 < 24 < 35$

or, $\frac{-54}{60} < \frac{-15}{60} < \frac{24}{60} < \frac{35}{60}$

$\therefore \frac{-9}{10} < \frac{-5}{20} < \frac{2}{5} < \frac{7}{12}$ are in ascending order.

10. (a) $\frac{5}{8}, \frac{7}{6}, \frac{-3}{8}, \frac{11}{12}$

L.C.M of 6, 8, 12, $= 24$

$\frac{5}{8} = \frac{5\times 3}{8\times 3} = \frac{15}{24}$

$\frac{7}{6} = \frac{7\times 4}{6\times 4} = \frac{28}{24}$

$\frac{-3}{8} = \frac{-3\times 3}{8\times 3} = \frac{-9}{24}$

$\frac{11}{12} = \frac{11\times 2}{12\times 2} = \frac{22}{24}$

Since, $28 > 22 > 15 > -9$

or $\frac{28}{24} > \frac{22}{24} > \frac{15}{24} > \frac{-9}{24}$

$\therefore \frac{7}{6} > \frac{11}{12} > \frac{5}{8} > \frac{-3}{8}$ are in descending order.

(b) $\frac{7}{9}, \frac{5}{6}, \frac{11}{12}, \frac{-1}{3}, \frac{-5}{6}$

L.C.M of 3, 6, 9, 12 $= 36$

$\frac{7}{9} = \frac{7\times 4}{9\times 4} = \frac{28}{36}$

$\frac{5}{6} = \frac{5\times 6}{6\times 6} = \frac{30}{36}$

$\frac{11}{12} = \frac{11\times 3}{12\times 3} = \frac{33}{36}$

$\frac{-1}{3} = \frac{-1\times 12}{3\times 12} = \frac{-12}{36}$

$\frac{-5}{6} = \frac{-5\times 6}{6\times 6} = \frac{-30}{36}$

Since, $33 > 30 > 28 > -12 > -30$.

or, $\frac{33}{36} > \frac{30}{36} > \frac{28}{36} > \frac{-12}{36} > \frac{-30}{36}$

$\therefore \frac{11}{12} > \frac{5}{6} > \frac{7}{9} > \frac{-1}{3} > \frac{-5}{6}$ are in descending order.

Exercise 11.2

1. (a) $\frac{3}{2}$ and $\frac{5}{2}$

$\therefore \frac{3}{2} + \frac{5}{2} = \frac{3+5}{2} = \frac{8}{2} = 4$

(b) $\frac{-7}{9}$ and $\frac{-3}{4}$

$\therefore \frac{-7}{9} + \frac{-3}{4} = \frac{(-7)\times 4 + (-3)\times 9}{36}$

$= \frac{-28-27}{36} = \frac{-55}{36}$

(c) $\frac{7}{6}$ and $\frac{-1}{5}$

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

$= \frac{7\times 5 - 1\times 6}{30}$

$= \frac{35-6}{30} = \frac{29}{30}$

(d) $\frac{-5}{11}$ and $\frac{3}{2}$

$\frac{-5}{11} + \frac{3}{2} = \frac{-5\times 2 + 3\times 11}{22}$

$= \frac{-10+33}{22} = \frac{23}{22}$

(e) $\frac{7}{-5}$ and $\frac{11}{5}$

$\therefore \frac{7}{-5} + \frac{11}{5} = \frac{-7}{5} + \frac{11}{5}$

$= \frac{-7+11}{5}$

$= \frac{4}{5}$

(f) $\frac{3}{-4}$ and $\frac{18}{20}$

$\therefore \frac{3}{-4} + \frac{18}{20} = \frac{-3}{4} + \frac{18}{20}$

$= \frac{-3\times 5 + 18\times 1}{20}$

$= \frac{-15+18}{20} = \frac{3}{20}$

2. (a) $\frac{-3}{4}+\frac{4}{5}=\frac{-3\times 5+4\times 4}{20}=\frac{-15+16}{20}=\frac{1}{20}$

(b) $\frac{-2}{15}+\frac{3}{4}=\frac{-2\times 4+3\times 15}{60}=\frac{-8+45}{60}=\frac{37}{60}$

(c) $\frac{-5}{6}+\frac{7}{15}=\frac{-5\times 5+7\times 2}{30}=\frac{-25+14}{30}=\frac{-11}{30}$

(d) $\frac{1}{3}+\frac{-5}{6}+\frac{1}{18}=\frac{6+(-5)\times 3+1}{18}=\frac{6-15+1}{18}=\frac{-8}{18}=\frac{-4}{9}$

(e) $\frac{-9}{21}+\frac{5}{-7}+\frac{2}{3}=\frac{-9\times 1+5\times(-3)+2\times 7}{21}=\frac{-9-15+14}{21}=\frac{-10}{21}$

(f) $3\frac{1}{7}+\frac{-5}{14}+\frac{-5}{21}=\frac{22}{7}+\frac{(-5)}{14}+\frac{(-5)}{21}$

$=\frac{22\times 6+(-5)\times 3+(-5)\times 2}{42}=\frac{132-15-10}{42}=\frac{107}{42}$

3. (a) $\frac{-19}{9}-2=\frac{-19-18}{9}=\frac{-37}{9}$

(b) $2-\left(\frac{-18}{11}\right)=\frac{2}{1}+\frac{18}{11}=\frac{2\times 11+18\times 1}{11}=\frac{22+18}{11}=\frac{40}{11}$

(c) $\frac{2}{3}-\frac{3}{4}=\frac{2\times 4-3\times 3}{12}=\frac{8-9}{12}=\frac{-1}{12}$

(d) $\frac{11}{5}-\frac{7}{5}=\frac{11-7}{5}=\frac{4}{5}$

(e) $\frac{9}{10}-\left(\frac{-5}{8}\right)=\frac{9}{10}+\frac{5}{8}=\frac{9\times 8+5\times 10}{80}=\frac{72+50}{80}=\frac{122}{80}=\frac{61}{40}$

(f) $\frac{5}{63}-\left(\frac{-6}{21}\right)=\frac{5}{63}+\frac{6}{21}=\frac{5\times 1+6\times 3}{63}=\frac{5+18}{63}=\frac{23}{63}$

4. (a) $\frac{3}{10}\times\frac{-19}{2}\times\frac{10}{19}=\frac{-3}{2}$ (b) $\frac{9}{2}\times\frac{-7}{5}=\frac{-63}{10}$

(c) $\frac{6}{-5}\times\frac{9}{11}=\frac{-54}{55}$ (d) $\frac{3}{-5}\times\frac{-5}{3}\times\frac{1}{7}=\frac{1}{7}$

(e) $\frac{3}{7}\times\frac{-2}{5}\times\frac{5}{11}=\frac{-6}{77}$ (f) $\frac{16}{-5}\times\frac{3}{8}\times\frac{10}{3}=\frac{2\times 10}{-5}=-4$

5. (a) $(-4)\div\frac{2}{3}=-4\times\frac{3}{2}=-6$ (b) $\frac{2}{3}\div\frac{5}{11}=\frac{2}{3}\times\frac{11}{5}=\frac{22}{15}$

(c) $\frac{-4}{5}\div 12=\frac{-4}{5}\div\frac{12}{1}=\frac{-4}{5}\times\frac{1}{12}=\frac{-1}{15}$

(d) $\frac{12}{-13}\div\frac{1}{26}=\frac{12}{-13}\times\frac{26}{1}=\frac{24}{-1}=-24$

(e) $\frac{3}{13}\div\frac{-4}{65}=\frac{3}{13}\times\frac{65}{-4}=\frac{15}{-4}=\frac{-15}{4}$

(f) $\frac{21}{-36} \div \frac{30}{44} = \frac{21}{-36} \times \frac{44}{30} = \frac{7 \times 11}{-9 \times 10} = \frac{77}{-90} = \frac{-77}{90}$

6. (a) $\frac{2}{3} \times \frac{5}{7} \div \frac{4}{9} = \frac{2}{3} \times \frac{5}{7} \times \frac{9}{4} = \frac{15}{14}$

(b) $\frac{5}{4} - \frac{7}{6} + \frac{-2}{3} = \frac{5 \times 3 - 7 \times 2 + (-2) \times 4}{12} = \frac{15 - 14 - 8}{12} = \frac{-7}{12}$

(c) $\frac{2}{3}\left(\frac{-1}{3} + \frac{5}{6}\right) = \frac{2}{3} \times \left[\frac{-2+5}{6}\right] = \frac{2}{3} \times \left[\frac{3}{6}\right] = \frac{6}{18} = \frac{1}{3}$

(d) $2\frac{1}{5} \times \left(\frac{6}{7} + 1\frac{1}{7}\right) = \frac{11}{5}\left(\frac{6}{7} + \frac{8}{7}\right) = \frac{11}{5}\left(\frac{6+8}{7}\right) = \frac{11}{5} \times \frac{14}{7} = \frac{22}{5}$

(e) $\left(\frac{2}{13} \div \frac{1}{7}\right) \times \frac{26}{14} = \frac{2}{13} \times \frac{7}{1} \times \frac{26}{14} = 2$

(f) $\frac{4}{5} + \frac{-13}{15} + \frac{-11}{45} = \frac{4 \times 9 + (-13) \times 3 + (-11) \times 1}{45} = \frac{36 - 39 - 11}{45} = \frac{-14}{45}$

(g) $\left(\frac{8}{5} \times \frac{-3}{2}\right) + \left(\frac{3}{10} \times \frac{11}{8}\right) = \frac{-24}{10} + \frac{33}{80}$

$= \frac{-24 \times 8 + 33 \times 1}{80} = \frac{-192 + 33}{30} = \frac{-159}{80}$

(h) $2\frac{3}{4} - \frac{5}{8} + \frac{-5}{12} + 1\frac{1}{6} = \frac{11}{4} - \frac{5}{8} + \frac{-5}{12} + \frac{7}{6}$

$= \frac{11 \times 6 - 5 \times 3 + (-5) \times 2 + 7 \times 4}{24}$

$= \frac{66 - 15 - 10 + 28}{24} = \frac{69}{24} = \frac{23}{8}$

Exercise 11.3

1. (a) $\frac{1}{12}$

Prime factors of denominator (12) are $2 \times 2 \times 3$.

$\because$ 3 is a factor of 12.

So, $\frac{1}{12}$ is a non-terminating decimal.

(b) $-\frac{5}{10}$

Prime factors of denominator (10) are 2×5.

So, $\frac{-5}{10}$ is a terminating decimal.

(c) $\frac{18}{30} = \frac{3}{5}$

Prime factors of denominator (5) is 5.

So, $\frac{18}{30}$ or $\frac{3}{5}$ is a terminating decimal.

(d) $\frac{-33}{20}$

Prime factors of denominator (20) are $2\times 2\times 5$.

So, $\frac{-33}{20}$ is a terminating decimal.

(e) $\frac{26}{25}$

Prime factor of denominator (25) are 5×5.

So, $\frac{26}{25}$ is a terminating decimal.

(f) $\frac{-13}{27}$

Prime factor of denominator (27) are $3\times 3\times 3$.

$\because$ 3 is a factor of 27.

So, $\frac{13}{27}$ is a non-terminating decimal.

(g) $\frac{19}{25}$

Prime factors of denominator (45) are $3\times 3\times 5$.

$\because$ 3 is a factor of 45.

So, $\frac{19}{45}$ is a non-terminating decimal.

(h) $\frac{71}{75}$

Prime factors of denominator (75) are $3\times 5\times 5$.

$\because$ 3 is a factor of 45.

So, $\frac{71}{75}$ is a non-terminating decimal.

2. (a) $\frac{2}{11}$

$\therefore \frac{2}{11} = 0.1818\ldots = 0.\overline{18}$

$$
\begin{array}{r}
0.1818 \\
11\overline{)\,2.000} \\
-\,11 \\
\hline
90 \\
-\,88 \\
\hline
20 \\
-\,11 \\
\hline
90 \\
-\,88 \\
\hline
2
\end{array}
$$

(b) $\frac{11}{8}$

$\therefore \frac{11}{8} = 1.375$

$$
\begin{array}{r}
1.375 \\
8\overline{)\,11.00} \\
-\,8 \\
\hline
30 \\
-\,24 \\
\hline
60 \\
-\,56 \\
\hline
40 \\
-\,40 \\
\hline
\times
\end{array}
$$

(c) $\frac{16}{32}$

$\therefore \quad \frac{16}{32} = \frac{1}{2} = 0.5$

(d) $\frac{26}{25}$

$\therefore \quad \frac{26}{25} = \frac{26 \times 4}{25 \times 4}$

$= \frac{104}{100} = 1.04$

(e) $\frac{49}{15}$

$\therefore \quad \frac{49}{15} = 3.2666\ldots$

$= 2.2\overline{6}$

$$\begin{array}{r} 3.266 \\ 15\overline{)\ 49.0} \\ -45 \\ \hline 40 \\ -10 \\ \hline 100 \\ -90 \\ \hline 100 \\ -90 \\ \hline 10 \end{array}$$

(f) $\frac{85}{12}$

$\therefore \quad \frac{85}{12} = 7.0833\ldots$

$= 7.08\overline{3}$

$$\begin{array}{r} 7.0833 \\ 12\overline{)\ 85} \\ -84 \\ \hline 100 \\ -96 \\ \hline 40 \\ -36 \\ \hline 40 \\ -30 \\ \hline 4 \end{array}$$

(g) $\frac{26}{500}$

$\therefore \quad \frac{26}{500} = \frac{26 \times 2}{500 \times 2}$

$= \frac{52}{1000} = 0.052$

(h) $\frac{303}{125}$

$\therefore \quad \frac{303}{125} = \frac{303 \times 8}{125 \times 8} = \frac{2424}{1000} = 2.424$

3. (a) $3.125 = \frac{3125}{1000} = \frac{25}{8}$

(b) $5.005 = \frac{5005}{1000} = \frac{1001}{200}$

(c) $2.\overline{3}$

Let $x = 2.\overline{3} = 2.333\ldots$ ... (1)

Multiply it by 10 on both sides

$10x = 23.333\ldots$ ... (2)

Subtract (1) from (2), we get

$$10x - x = 23.\overline{3} - 2.\overline{3}$$

$$9x = 21$$

$$x = \frac{21}{9} = \frac{7}{3}$$

Hence, $2.\overline{3} = \frac{7}{3}$

(d) $1.4\bar{7}$

Let $x = 1.4\bar{7} = 1.47777\ldots\ldots$ ...(1)

multiply it by 10 on both sides

$10x = 14.\bar{7} = 14.7777\ldots\ldots$ ...(2)

Again, multiply it by 10 on both sides

$100x = 147.\bar{7} = 147.777\ldots\ldots$

Subtract (2) from (3), we get

$$100x - 10x = 147.\bar{7} - 14.\bar{7}$$
$$90x = 133$$
$$x = \frac{133}{90}$$

Hence, $1.4\bar{7} = \frac{133}{90}$

(e) $0.1\bar{3}$

Let $x = 0.1\bar{3} = 0.13333\ldots\ldots$ ...(1)

$10x = 1.\bar{3} = 1.333\ldots\ldots$ ...(2)

$100x = 13.\bar{3} = 13.333\ldots\ldots$ ...(3)

Subtract (2) from (3) we get,

$$100x - 10x = 13.\bar{3} - 1.\bar{3}$$
$$90x = 12$$
$$x = \frac{12}{90} = \frac{2}{15}$$

Hence, $0.1\bar{3} = \frac{2}{15}$

(f) $3.\overline{185}$

Let $x = 3.\overline{185} = 3.185185\ldots\ldots$ ...(1)

$1000x = 3185.\overline{185} = 3185.185185\ldots\ldots$ ...(2)

Subtract (1) from (2) we get,

$$1000x - x = 3185.\overline{185} - 3.\overline{185}$$
$$999x = 3182$$
$$x = \frac{3182}{999}$$

Hence, $3.\overline{185} = \frac{3185}{999}$

(g) $0.8\bar{3}$

Let $x = 0.8\bar{3} = 0.8333\ldots$ ...(1)

$10x = 8.\bar{3} = 8.333\ldots$ ...(2)

$100x = 83.\bar{3} = 83.333\ldots$ ...(3)

Now, subtracting (2) from (3), we get

$$100 - 10x = 83.\bar{3} - 8.\bar{3}$$
$$90x = 75$$

$$x = \frac{75}{90} = \frac{5}{6}$$

Hence, $= 0.8\bar{3} = \frac{5}{6}$

(h) $12.68 = \frac{1268}{100} = \frac{317}{25}$

4. Only (a) & (b) can be expressed as rational numbers.

5. (a) $3.\bar{5} + 4.\bar{7}$

Let $x = 3.\bar{5}$ ...(1)

$10x = 35.\bar{5}$ ...(2)

Subtracting (1) from (2), we get

$10x - x = 35.\bar{5} - 3.\bar{5}$

$9x = 32$

$x = \frac{32}{9}$

Again, let $y = 4.\bar{7}$ ...(3)

$10y = 47.\bar{7}$ ...(4)

Subtracting (3) from (4), we get

$10y - y = 47.\bar{7} - 4.\bar{7}$

$9y = 43$

Hence, $3.\bar{5} + 4.\bar{7} = \frac{32}{9} + \frac{43}{9} = \frac{32+43}{9}$

$= \frac{75}{9} = \frac{25}{3}$

(b) $0.\bar{2} + 0.\bar{3} + 0.\bar{4}$

Let $a = 0.\bar{2}$ ...(1)

$10a = 2.\bar{2}$ ...(2)

Subtracting, (1) from (2) , we get

$10a - a = 2.\bar{2} - 0.\bar{2}$

$9a = 2$

$a = \frac{2}{9}$

Similarly, let $b = 0.\bar{3}$

$\Rightarrow$ $b = \frac{3}{9}$

and $c = 0.\bar{4}$

$\Rightarrow$ $c = \frac{4}{9}$

Hence, $0.\bar{2} + 0.\bar{3} + 0.\bar{4} = a + b + c$

$= \frac{2}{9} + \frac{3}{9} + \frac{4}{9}$

$$= \frac{2+3+4}{9} = \frac{9}{9}$$

$$= 1$$

Exercise 11.4

1. The cost of $5\frac{2}{5}$ kg of sugar $= ₹\ 101\frac{1}{4}$

$\therefore$ The cost of 1 kg of sugar $= ₹\ 101\frac{1}{4} \div 5\frac{2}{5}$

$$= ₹\ \frac{405}{4} \div \frac{27}{5}$$

$$= ₹\ \frac{405}{4} \times \frac{5}{27}$$

$$\Rightarrow \quad ₹\ \frac{75}{4} = ₹\ 18\frac{3}{4}.$$

2. Weight of one packet of chocolates $= \frac{9}{4}$kg

Weight of other packet of chcolate $= \frac{10}{7}$ kg

$\therefore$ Total weight of chocolates $= \frac{9}{4}$ kg + $\frac{10}{7}$ kg

$$= \left(\frac{9\times 7+10\times 4}{28}\right) \text{kg} = \left(\frac{63+40}{28}\right) \text{kg}$$

$$= \frac{103}{28} \text{ kg} = 3\frac{19}{28} \text{ kg}.$$

3. Let 'a' should be added

Then, $\frac{-5}{8} + a = \frac{5}{9}$

$$a = \frac{5}{9} + \frac{5}{8} = \frac{5\times 8+5\times 9}{72} = \frac{40+45}{72} = \frac{85}{72}$$

$$a = 1\frac{13}{72}$$

Hence, the required number is $1\frac{13}{72}$.

4. Required cloth to stitch 35 shirts $= \frac{49}{2}$ m

$\therefore$ Required cloth to stitch each shirt $= \left(\frac{49}{2} \div 35\right)$ m

$$= \left(\frac{49}{2} \times \frac{1}{35}\right) m = \frac{7}{10} m.$$

5. Sum $= \frac{12}{5} + \frac{13}{7} = \frac{12\times 7 + 13\times 5}{35} = \frac{84+65}{35} = \frac{149}{35}$

And, Product $= \frac{-4}{7} \times \frac{-1}{2} = \frac{2}{7}$

$\therefore$ Required division $= \frac{149}{35} \div \frac{2}{7}$

$= \frac{149}{35} \times \frac{7}{2} = \frac{149}{10}$ or $14\frac{9}{10}$

6. Meenu spent pocket money $= \frac{3}{4}$ part

Money spent on a books $= \frac{1}{2}$ part

Money spend on movie ticket $= \frac{1}{6}$ part

$\therefore$ Money spend on dress $= \frac{3}{4} - \left(\frac{1}{2} + \frac{1}{6}\right)$

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

$= \frac{3}{4} - \frac{4}{6}$

$= \frac{3\times 3 - 4\times 2}{12}$

$= \frac{9-8}{12} = \frac{1}{12}$

Hence, Meenu spent $\frac{1}{12}$ of her pocket money on the dress.

7. Amount paid by Waseem $= \frac{1}{3}$ part

Amount paid by Ankit $= \frac{1}{4}$ part

$\therefore$ Rest part paid by Rajan $= 1 - \left(\frac{1}{3} + \frac{1}{4}\right)$

$= 1 - \left(\frac{4+3}{12}\right)$

$= 1 - \frac{7}{12} = \frac{12-7}{12} = \frac{5}{12}$

Hence, Rajan paid $\frac{5}{12}$ of the bill.

Multiple Choice Questions

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

Brain Teaser

	Column A		Column B
(a)	$\frac{-3}{5} \times \frac{5}{3}$	(i)	$\frac{-4}{9}$
(b)	$\frac{-5}{-9} - 1$	(ii)	$2\frac{1}{2}$
(c)	$\frac{-11}{19} + 0$	(iii)	-1
(d)	$\frac{-4}{3} \div \frac{8}{-1}$	(iv)	$\frac{-11}{19}$
(e)	$\frac{7}{5} \div \frac{14}{25}$	(v)	₹ 60
(f)	$\frac{3}{5}$ of ₹ 100	(vi)	$\frac{1}{6}$

NEP

Do it yourself.

12 Constructions

Exercise 12

1. (a) 3 cm

Solution : We follow the steps of construction given below.

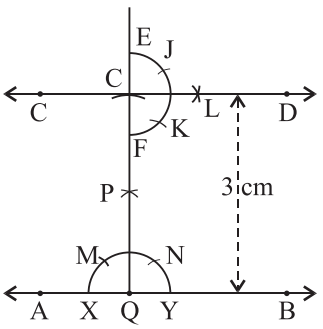
Step of Construction :

Step 1. Draw a line segment AB using a ruler.

Step 2. Mark a point Q on AB and with Q as centre, draw an arc intersecting AB at X and Y.

Step 3. Again taking X as centre and with the same radius, draw arc intersecting previous arc XY at M.

Step 4. Taking M as centre and with the same radius, draw another arc intersecting previous arc XY at N.



Step 5. With M and N as centres and with the same radius, draw two arcs, such that they intersect each other at point P.

Step 6. Joint Q and P such that, $\angle PQA = \angle PQB = 90°$.

Step 7. Now mark a point C on perpendicular QP such that $CQ = 3$ cm.

Step 8. Again construct a right angle at C by following the steps 1 to 6.

{Corresponding angles}

Since, $\angle ECD = \angle CQB = 90°$

So, CD is parallel to AB.

(b) Do same as Q. No. 1. (a)

(c) Do same as Q. No. 1 (a)

2. Steps of construction :

Step 1. Draw a line segment $XY = 7$ cm. Take a point A lying outside XY.

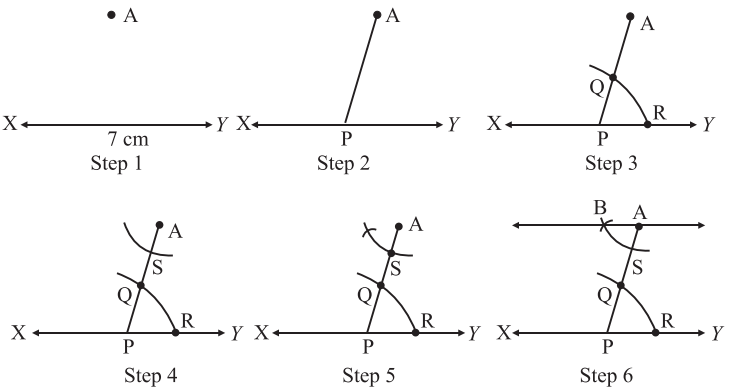
Step 2. Take any point P on line segment XY. Join P and A.

Step 3. With P as centre and any radius, draw an arc intersecting AP and PY at Q and R respectively.

Step 4. With A as centre and same radius, draw another arc intersecting AP at a point S.

Step 5. With S as centre and radius QR (distance between Q and R), draw an arc intersecting previous arc at point B.

Step 6. Join A and B and extend this line segment in both the directions. $\overleftrightarrow{AB}$ is the required line passing through A and parallel to $\overleftrightarrow{XY}$.



Step 7. Now AP is the required distance between the parallel lines.

3. Steps of construction :

Step 1. Draw a line segment $MN = 4$ cm.

Step 2. Taking M as centre and with any radius, draw and arc AB intersecting MN at point A.

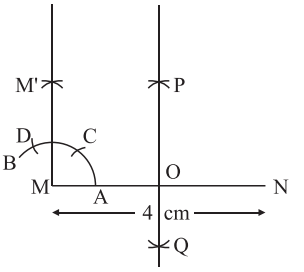
Step 3. With A as centre and same radius, draw an arc intersecting previous arc AB at point C.

Step 4. Again taking C as centre with same radius draw another arc intersecting previous arc AB at point D.

Step 5. With C and D as centre and same radius, draw two arcs, such that they intersects each other at point M'.

Step 6. Join M and M'. So, MM' is perpendicular to MN.

$\therefore \angle M'MN = 90°$.



Step 7. With M and N as centres and radius more than half of MN, draw two arcs above MN, such that they intersects each other at point P. And two arcs below MN, such that they intersect each other at point Q.

Step 8. Join P and Q so, PQ is the perpendicular bisector of MN. Which intersect MN at point O.

$\therefore \quad \angle MOP = \angle PON = 90°$

Since, $\angle M'MO = 90° = \angle PON$ {Corresponding angles}

So, MM' is parallel to PQ.

4. Steps of Construction

Step 1. Draw a rough sketch.

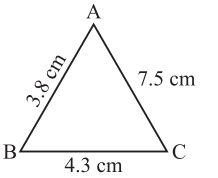
Step 2. Draw a line segment $BC = 4.3$ cm.

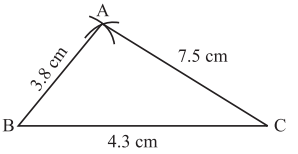
Step 3. With B as centre and radius 3.8 cm, draw an arc.

Step 4. With C as centre and radius 7.5 cm, draw another arc, cutting the previous arc at point A.

Step 5. Join AB and AC.

Then, ΔABC is the required triangle.





5. Do same as Q.No. 4.

6. Steps of Construction

Step 1. Draw a rough sketch.

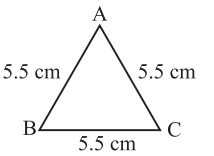
Step 2. Draw a line segment $BC = 5.5$ cm.

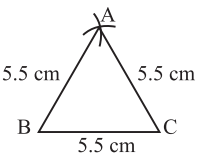
Step 3. Which B as centre and radius 5.5 cm, draw an arc.

Step 4. With C as centre and radius 5.5 cm, draw another arc, cutting the previous arc at point A.

Step 5. Join AB and AC.

Then, ΔABC is the required equilateral triangle.





7. Steps of Construction

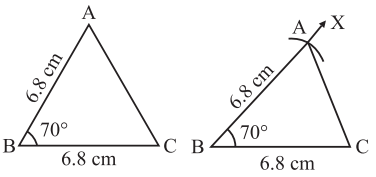
Step 1. Draw a rough sketch.

Step 2. Draw a line segment $BC = 6.8$ cm.

Step 3. At point B, draw $\angle CBX = 70°$

Step 4. With B as centre and radius 6.8 cm, draw an arc cutting BX at A.

Step 5. Join AC.



Then, ΔABC is the required triangle.

8. Do same as Q. No. 7.

9. Do same as Q. No. 7.

10. Steps of Construction

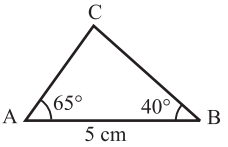
Step 1. Draw a rough sketch.

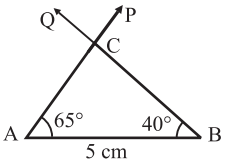
Step 2. Draw a line segment $AB = 5$ cm.

Step 3. At point A, draw $\angle PAB = 65°$.

Step 4. At point B, draw $\angle QBA = 40°$.

Step 5. Let AP and BQ intersect each other at point C.





Then, ΔABC is the required triangle.

11. The sum of all three angles of a triangle = 180°

$\therefore \quad \angle A + \angle B + \angle C = 180°$

$\angle A + 75° + 30° = 180°$

$\angle A + 75° + 30° = 180°$

$\angle A + 105° = 180°$

$\angle A = 180° - 105°$

$\angle A = 75°$

Steps of construction :

Do same as Q. No. 10.

12. Do same as Q. No. 11.

13. Steps of Construction

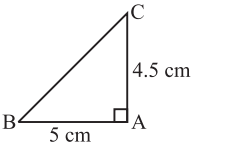
Step 1. Draw a rough sketch.

Step 2. Draw a line segment $BA = 5$ cm.

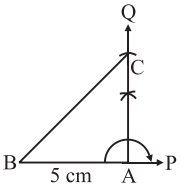
Step 3. At point A, draw $\angle BAQ = 90°$.

Step 4. With A as centre and radius 4.9 cm, draw an arc, cutting AQ at C.

Step 5. Join CB.

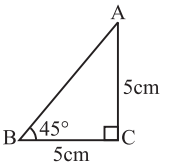


(Rough Sketch)



Then, ΔABC is the required triangle.

14. Steps of Construction



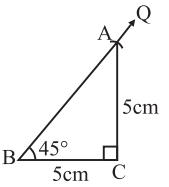
Step 1. Draw a rough sketch.

Step 2. Draw a line segment $BC = 5$ cm.

Step 3. At point B, draw $\angle CBQ = 45°$.

Step 4. With C as centre and radius 5 cm, draw an arc, cutting BQ at A.

Step 5. Join AC.



Thus, ΔABC is the required triangle.

Since, $BC = AC$ (given)

$\therefore \quad \angle BAC = \angle ABC$

$\Rightarrow \quad \angle BAC = 45°$ [$\because$ given $\angle ABC = 45°$]

Now, In ΔABC, we know that

$\angle A + \angle B + \angle C = 180°$ (Angle sum property)

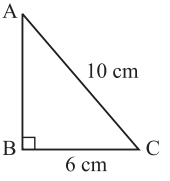
$45° + 45° + \angle C = 180°$

$\angle C = 180° - 90°$

$\angle C = 90°$

So, ΔABC is a right angled triangle.

15. Steps of Construction



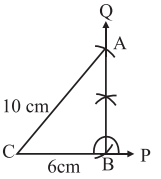
Step 1. Draw a rough sketch.

Step 2. Draw a line segment $CB = 6$ cm.

Step 3. At point B, draw $\angle CBQ = 90°$.

Step 4. With C as centre and radius 10 cm, draw an arc, cutting BQ at A.

Step 5. Join AC.



Then, ΔABC is the required triangle.

In ΔABC :

By pythagoras theorem :

$$AC^2 = AB^2 + BC^2$$
$$(10\text{ cm})^2 = AB^2 + (6\text{ cm})^2$$
$$100\text{ cm}^2 = AB^2 + 36\text{ cm}^2$$
$$100\text{ cm}^2 - 36\text{ cm}^2 = AB^2$$
$$64\text{ cm}^2 = AB^2$$
$$\therefore \quad AB = \sqrt{64}\text{ cm} \Rightarrow 8\text{ cm}$$

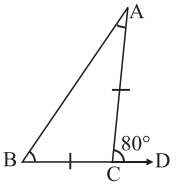
Hence, the length of AB is 8 cm.

16. Do as Q. No. 14.

17. Do as Q. No. 15.

Brain Teaser

1. $\angle ACD = 80°$ (given)



And, $AC = BC$ (given)

$\therefore \quad \angle B = \angle A$ …(1)

(opposite angles of equal sides are equal)

And, $\angle A + \angle B = 80°$ …(2)

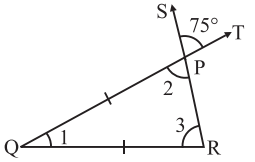
(by Exterior angle property)

From (1) & (2), we get

$$\angle A + \angle A = 80°$$
$$2\angle A = 80°$$
$$\angle A = \frac{80°}{2} = 40°$$

And, $\angle B = \angle A = 40°$.

2. Given : $\angle SPT = 75°$



And , $PQ = QR$

$\therefore \quad \angle PRQ = \angle RPQ$

$\Rightarrow \quad \angle 3 = \angle 2$ …(1)

(opposite angles of equal sides are equal)

$\angle SPT = \angle 2$ …(2) (vertically opposite angles)

$75° = \angle 2$

$\Rightarrow \quad \angle 2 = 75°$

Hence, $\angle 3 = 75°$ [by (1)]

Now, In ΔPQR, we have

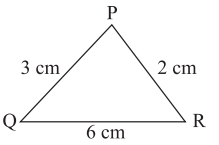
$$\angle 1 + \angle 2 + \angle 3 = 180°$$
$$\angle PQR + 75° + 75° = 180°$$
$$\angle PQR + 150° = 180°$$
$$\angle PQR = 180° - 150°$$

So, $\angle PQR = 30°$

HOTS

1. No, it is not right.

2. Given : In ΔDEF :



$EF = 7.2$ cm, $\angle = 110°$ and $\angle F = 80°$

Now, $\angle E + \angle F = 110° + 80° = 190° > 180°$

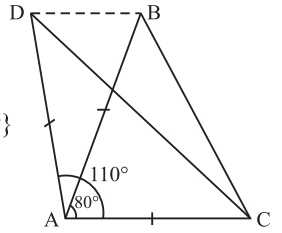
$\because$ Sum of two angles of ΔDEF is greater than 180°.

$\therefore$ The construction of this triangle DEF is not possible.

3. Given, ΔABC and ΔADC are two isosceles triangle.

$AB = AC = AD$ (given)

$\angle BAC = 80°$ and $\angle DAC = 110°$



In ΔABC :

$\because \quad AB = AC$

$\therefore \quad \angle ABC = \angle ACB = x$ (माना)

$\because \quad \angle A + \angle B + \angle C = 180°$ {Angle sum Property}

$\therefore \quad 80° + x + x = 180°$

$2x = 180° - 80°$

$x = \dfrac{100°}{2} = 50°$

$\therefore \quad \angle ABC = \angle ACB = 50°$

In ΔDAC :

$\because \quad AD = AC$

$\therefore \quad \angle ACD = \angle ADC = y$ (माना)

$\because \quad \angle A + \angle D + \angle C = 180°$ {Angle sum property}

$(\angle DAC - \angle BAC) + z + z = 180°$

$(110° - 80°) + 2z = 180°$

$30° + 2z = 180°$

$2z = 180° - 30°$

$z = \dfrac{150°}{2} = 75°$

$\therefore \quad \angle ABD = \angle ADB = 75°$

Now, **In ΔBDC :**

$\angle BDC = \angle BDA - \angle ADC$

$= 75° - 35° \Rightarrow 40°;$

$\angle DBC = \angle DBA + \angle ABC$

$= 75° + 50° \Rightarrow 125°;$

And, $\angle BCD = \angle BCA - \angle DCA$

$= 50° - 35° \Rightarrow 15°$

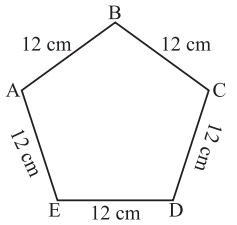
Hence, all the angles of ΔBDC arc $\angle B = 125°$, $\angle C = 15°$ and $\angle D = 40°$.

4. The angle between the hour hand and minute hand at the time 03 : 30 is $\left(90° - \dfrac{1}{2} \times 30°\right) \Rightarrow 75°$.

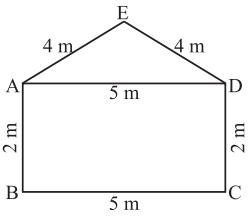
13 Area and Perimeter

Exercise 13.1

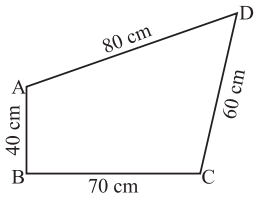
1. (a) Perimeter = $AB + BC + CD + DE + EA$
$= (12 + 12 + 12 + 12 + 12)$ cm
$= 60$ cm.



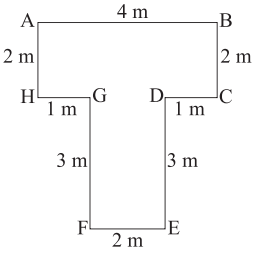
(b) Perimeter = $AB + BC + CD + DE + AE$
$= (2 + 5 + 2 + 4 + 4)$ m
$= 17$ m.



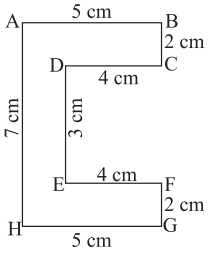
(c) Perimeter = $AB + BC + CD + DA$
$= (40 + 70 + 60 + 80)$ cm
$= 250$ cm.



(d) Perimeter = $AB + BC + CD + DE + EF + FG + GH + AH$
$= (4 + 2 + 1 + 3 + 2 + 3 + 1 + 2)$ m
$= 18$ m.



(e) Perimeter = $AB + BC + CD + DE + EF + FG + GH + AH$
$= (5 + 2 + 4 + 3 + 4 + 2 + 5 + 7)$ m
$= 32$ cm.



2. Given, breadth of rectangular park = 480 m

And, the length of required wire = 3 km 72 m

$\because$ perimeter of rectangle $= 2(l + b)$

$\therefore$ $3 \text{ km } 72 \text{ m} = 2(l + 480\text{m})$

$3 \times 1000 \text{ m} + 72 \text{ m} = 2l + 960 \text{ m}$

$3072 \text{ m} = 2l + 960 \text{ m}$

$3072 \text{ m} - 960 \text{ m} = 2l$

$2112 \text{ m} = 2l$

$$l = \frac{2112}{2} \text{ m} = 1056 \text{ m}$$

Hence, the length of the rectangular park is 1056 m.

3. Given : Perimeter of square $= 120$ m

Let length of rectangle $= 3x$

And, breadth of rectangle $= 2x$

$\because$ Perimeter of square $= 2 \times$ Perimeter of rectangle

$120 \text{ m} = 2 \times [2 \times (l + b)]$

$120 \text{ m} = 4 (3x + 2x)$

$120 \text{ m} = 4 \times 5x$

$120 \text{ m} = 20x$

$$x = \frac{120}{20} \text{ m} = 6 \text{ m}$$

Herce, the Breadth of the rectangle $= 2x = 2 \times 6 \text{ m} = 12$ m.

4. Perimeter of triangle $= AB + BC + AC$

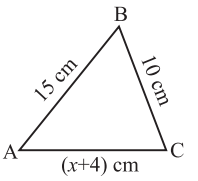
$50 \text{ cm} = 15 \text{ cm} + 10 \text{ cm} + (x + 4) \text{ cm}$

$50 \text{ cm} = 25 \text{ cm} + x + 4 \text{ cm}$

$50 \text{ cm} = 29 \text{ cm} + x$

$\therefore$ $x = 50 \text{ cm} - 29 \text{ cm}$

$x = 21 \text{ cm}$



Hence, the value of x is 21 cm.

5. (a) $\because$ Diameter of circle $= 14$ cm

$\therefore$ Circumference $= \pi d$

$$= \frac{22}{7} \times 14 \text{ cm}$$

$$= 44 \text{ cm}$$

(b) $\because$ Diameter of circle $= 28$ cm

$\therefore$ Circumference $= \pi d$

$$= \frac{22}{7} \times 28$$

$$= 88 \text{ cm}$$

(c) $\because$ Diameter of circle $= 10$ cm

$\therefore$ Circumference $= \pi d$

$$= \frac{22}{7} \times 10$$

$$= \frac{220}{7} \text{ cm}$$

$$= 31\frac{3}{7} \text{ cm}$$

(d) $\because$ Diameter of circle $= 7$ cm

$\therefore$ Circumference $= \pi d$

$$= \frac{22}{7} \times 7$$

$$= 22 \text{ cm}$$

6. (a) ∵ Circumference of circle = 44 m

$\therefore \quad 2\pi r = 44 \text{ m}$

$$2 \times \frac{22}{7} \times r = 44 \text{ m}$$

$$r = \frac{44 \times 7}{44} \text{ m} \Rightarrow 7 \text{ m}$$

Hence, the radius of the circle is 7 m.

(b) ∵ circumference of circle = 22 cm

$\therefore \quad 2\pi r = 22 \text{ cm}$

$$2 \times \frac{22}{7} \times r = 22 \text{ cm}$$

$$r = \frac{22 \times 7}{2 \times 22} \text{ cm}$$

$$r = \frac{7}{2} \text{ cm} = 3.5 \text{ cm}$$

Hence, the radius of the circle is 3.5 cm.

(c) ∵ Circumference of circle = 66 m

$\therefore \quad 2\pi r = 66 \text{ m}$

$$2 \times \frac{22}{7} \times r = 66 \text{ m}$$

$$r = \frac{66 \times 7}{2 \times 22} \text{ m}$$

$$r = \frac{21}{2} \text{ m} = 10.5 \text{ m}$$

Hence, the radius of the circle is 10.5 m.

(d) Circumference of circle = 30.8 cm

$\therefore \quad 2\pi r = 30.8 \text{ m}$

$$2 \times \frac{22}{7} \times r = 30.8 \text{ m}$$

$$r = \frac{30.8 \times 7}{2 \times 22} \text{ cm}$$

$$= 0.7 \times 7 = 4.9 \text{ cm}$$

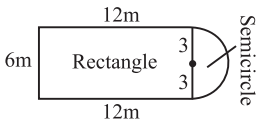
Hence, the radius of the circle is 4.9 cm.

7. (a) Perimeter of the given figure $= (2l + b) + (\pi r)$

$$= (2 \times 12 \text{ m} + 6 \text{ m}) + \left(\frac{22}{7} \times 3 \text{ m}\right)$$

$$= 30 \text{ m} + \frac{66}{7} \text{ m}$$

$$= \frac{276}{7} \text{ m} = 39\frac{3}{7} \text{ m}.$$

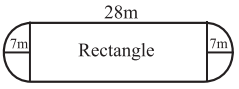


(b) Perimeter of the given figure

= Perimeter of rectangle + Perimeter of 2 semi-circle.

$= (\pi r + \pi r) + (2l + 2b - 2b) = 2\pi r + 2l$

$= 2 \times \frac{22}{7} \times 7\text{ m} + 2\text{ m} \times 28\text{ m} = 44\text{ m} + 56\text{ m} = 100\text{ m}.$

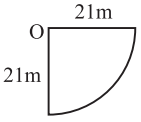


(c) Perimeter of the given figure $= \left(\frac{2\pi r}{4}\right) + r + r$

$= \frac{\pi r}{2} + 2r$

$= \frac{22}{7} \times \frac{21}{2}\text{ m} + 2 \times 21\text{ m}$

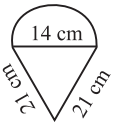
$= 33\text{ m} + 42\text{ m} = 75\text{ m}.$



(d) Perimeter $= \pi r + 2l$

$= \frac{22}{7} \times 7\text{ m} + 2 \times 21\text{ m} \quad \left[\because r = \frac{d}{2} = \frac{14}{2} = 7\right]$

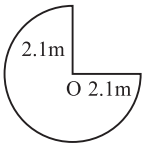
$= 22\text{ m} + 42\text{ m} = 64\text{ cm}.$



(e) Perimeter $= \frac{3}{4}(2\pi r) + 2r$

$= \frac{3}{4}\left(2 \times \frac{22}{7} \times 2.1\text{ m}\right) + 2 \times 2.1\text{ m}$

$= 3 \times 11 \times 0.3\text{ m} + 4.2\text{ m} = (9.9 + 4.2)\text{ m} = 14.1\text{ m}.$



8. Given : $C_1 : C_2 = 5 : 3$, $r_1 : r_2 = ?$

We know that $C = 2\pi r$

$\therefore \quad C_1 : C_2 = 2\pi r_1 : 2\pi r_2$

$\Rightarrow \quad 5 : 3 = 2\pi r_1 : 2\pi r_2$

$\Rightarrow \quad \frac{5}{3} = \frac{2\pi r_1}{2\pi r_2} \Rightarrow \frac{r_1}{r_2} = \frac{5}{3} \Rightarrow r_1 : r_2 = 5 : 3$

Hence, the ratio of their radii is 5 : 3.

9. Length of wire = permeter of rectangle $= 2(l + b)$

$= 2(40 + 26)\text{ cm}$

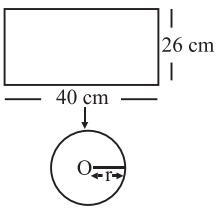
$= 2 \times 66\text{ cm} = 132\text{ cm}$

$\because$ Circumference of circle = Length of wire

$2\pi r = 132\text{ cm}$

$2 \times \frac{22}{7} \times r = 132\text{ m}$

$r = \frac{132 \times 7}{2 \times 22} = 21\text{ cm}$



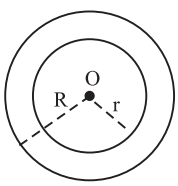
Let the radius of outer and inner circles are R and r respectively.

10. Circumference of outer circle $= 132\text{ cm}$

$\therefore \quad 2\pi R = 132\text{ cm}$

$2 \times \frac{22}{7} \times R = 132\text{ cm}$

$R = \frac{132 \times 7}{2 \times 22} = 21\text{ cm}$



And, Circumference of inner circle $= 88$ cm

$$\therefore \quad 2\pi r = 88$$

$$2 \times \frac{22}{7} \times r = 88$$

$$r = \frac{88 \times 7}{2 \times 22} = 14 \text{ cm}$$

So, the required difference between the radii

$$= (R - r)$$

$$= (21 - 14) \text{ cm} = 7 \text{ cm.}$$

Exercise 13.2

1. Given : the sides of triangle :

(a) $a = 12$ cm, $b = 10$ cm, $c = 14$ cm.

$$\{\because S = \frac{1}{2}(a + b + c) = \frac{1}{2}(12 + 10 + 14) = \frac{1}{2} \times 36 = 18\}$$

$$\therefore \text{ Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)} \text{ cm}^2$$

$$= \sqrt{18\,(18-12)\,(18-10)\,(18-14)} \text{ cm}^2$$

$$= \sqrt{18 \times 6 \times 8 \times 4} \text{ cm}^2$$

$$= \sqrt{6 \times 3 \times 6 \times 2 \times 4 \times 4} \text{ cm}^2$$

$$= 6 \times 4\sqrt{3 \times 2} \text{ cm}^2$$

$$= 24\sqrt{6} \text{ cm}^2 \text{ or } 58.78 \text{ cm}^2.$$

(b) $a = 56$ cm, $b = 52$ cm, $c = 60$ cm.

$$\{\because S = \frac{1}{2}(a + b + c) = \frac{1}{2}(56 + 52 + 60) = \frac{1}{2} \times 168 = 84$$

$$\therefore \text{ Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)} \text{ cm}^2$$

$$= \sqrt{84\,(84-56)\,(84-52)\,(84-60)} \text{ cm}^2$$

$$= \sqrt{84 \times 28 \times 32 \times 24} \text{ cm}^2$$

$$= \sqrt{4 \times 7 \times 3 \times 7 \times 4 \times 16 \times 2 \times 3 \times 2 \times 4} \text{ cm}^2$$

$$= 64 \times \sqrt{7 \times 3 \times 7 \times 3} \text{ cm}^2$$

$$= 64 \times 21 \text{ cm}^2$$

$$= 1344 \text{ cm}^2.$$

(c) $a = 17$ cm, $b = 21$ cm, $c = 10$ cm.

$$\{\because S = \frac{1}{2}(a + b + c) = \frac{1}{2}(17 + 21 + 10) = \frac{1}{2} \times 48 = 24$$

$$\therefore \text{ Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)} \text{ cm}^2$$

$$= \sqrt{24\,(24-17)\,(24-21)\,(24-10)} \text{ cm}^2$$

$$= \sqrt{24 \times 7 \times 3 \times 14} \text{ cm}^2$$

$$= \sqrt{2 \times 4 \times 3 \times 7 \times 3 \times 2 \times 7} \text{ cm}^2$$

$$= 2 \times 2 \times 3 \times 7 \text{ cm}^2$$

$$= 84 \text{ cm}^2.$$

2. Given, the side of an equilateral triangle :

(a) 8 cm

$\therefore$ Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 8 \times 8\,\text{cm}^2$

$= 16\sqrt{3}\ \text{cm}^2$

or $27.712\ \text{cm}^2$.

(b) 12 cm

$\therefore$ Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 12 \times 12\,\text{cm}^2$

$= 36\sqrt{3}\ \text{cm}^2$

or, $62.352\ \text{cm}^2$.

(c) 10.2 cm

$\therefore$ Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times (\text{side})^2$

$= \frac{\sqrt{3}}{4} \times 10.2 \times 10.2\ \text{cm}^2$

$= 26.01 \times \sqrt{3}\ \text{cm}^2 = 45.05\ \text{cm}^2$

3. Area of a squares field $= (\text{side})^2$

$= (20.9\,\text{m})^2 = 436.81\,\text{m}^2$

$\because$ Cost of 1 m^2 area levelling = ₹ 9

$\therefore$ Cost of 436.81 m^2 area levelling = ₹ (436.81×9)

= ₹ 3931.29

4. Let original length of the side of the square be x unit.

Then Area of the square = $(\text{side})^2$

$= (x)^2 = x^2\ \text{unit}^2$

Now, side becomes $= \frac{2}{5}(x) = \frac{2x}{5}$

Now, Area of the square = $(\text{New side})^2$

$= \left(\frac{2}{5}x\right)^2 = \frac{4}{25}x^2\ \text{unit}^2$

So, the new area of square is $\frac{4}{25}$ times of its original area.

5. Area of triangle $\Delta = 50\,\text{cm}^2$, Altitude = 8 cm

lengtth of **base** = ?

$\because$ Area of triangle $\Delta = \frac{1}{2} \times$ **base** $\times$ altitude (height)

$\therefore \quad 50 = \frac{1}{2} \times b \times 8$

$b = \frac{50 \times 2}{8} = 12.5\ \text{cm}$

Hence, the length of the **base** of triangle is 12.5 cm.

6. Given ; $b:h=4:5$, Area of $\Delta = 90$ sq m.

Let, **base** $(b)=4x$, and height $(h)=5x$

Now, by formula, we have

$\because$ Area of $\Delta = \frac{1}{2} \times$ **base** $\times$ height

$\therefore \quad 90 = \frac{1}{2} \times 4x \times 5x$

$90 = 10x^2$

$9 = x^2$

$x = \sqrt{9} = 3\text{m}$

Hence, the **base** of triangle $= 4x = 4 \times 3 \text{ m} = 12 \text{ m}$

and the height of triangle $= 5x = 5 \times 3 \text{ m} = 15\text{m}$

7. Let, length and breadth of a rectangle be l and b respectively.

Area of a rectangle = Length × Breadth= $l \times b$ … (1)

When length and breadth are increased, then

$L = l + 30,\ B = b + 30$

$\therefore$ Area of new rectangle = Length × Breadth

$= (l + 30)(b + 40)$

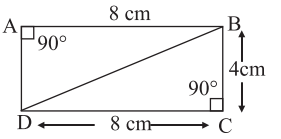
$= lb + 40l + 30b + 1200$ … (2)

Hence, the amount of Area increased $= (lb + 40l + 30b + 1200) - lb$

$= 40l + 30b + 1200.$

8. Area of $\Delta ABD = \frac{1}{2} \times$ **base** $\times$ height

$= \frac{1}{2} \times 8 \times 4 = 16 \text{ cm}^2.$



And, area of $\Delta CDB = \frac{1}{2} \times$ **base** $\times$ height

$= \frac{1}{2} \times 8 \times 4 = 16 \text{ cm}^2.$

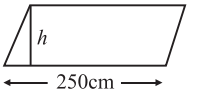
9. Area of parallelogram $= 2.25 \text{ m}^2$

$\because$ Area of parallelogram = **base** $\times$ altitude

$\therefore \quad 2.25 \text{ m}^2 = 250\text{cm} \times h$

$h = \frac{2.25}{2.5} = \frac{2.25}{2.50} = \frac{225}{250}$ [$\because$ 1 m = 100 cm]

$= \frac{9}{10} \text{m} = 0.9 \text{ m or } 90 \text{ cm.}$



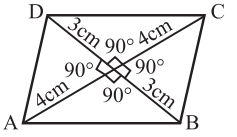
10. Given : $d_1 = 8$ cm,

And, $d_2 = 6$ cm

$\therefore$ Area of rhombus

$= 4 \times$ (Area of one right angled trianlge)

$= 4 \times \left(\frac{1}{2} \times 4 \times 3 \right) \text{cm}^2 = 24 \text{ cm}^2$



Second Method : by the following formula :

Area of rhombus $= \frac{1}{2} \times d_1 \times d_2$

$= \frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2.$

11. Area of the surface of floor $= l \times b$

$= 4 \text{ m} \times 2.5 \text{ m} = 10 \text{ m}^2$

Area of 1 tile $= l \times b$

$= 10 \text{ cm} \times 10 \text{ cm} = \frac{1}{10} \text{ m} \times \frac{1}{10} \text{ m}$

$= \frac{1}{100} \text{ m}^2$

So, the number of required tiles $= \frac{\text{Area of the surface}}{\text{Area of a tile}} = \frac{10 m^2}{\left(\frac{1}{100}\right) m^2}$

$= 10 \times 100 = 1000.$

12. Area of rectangular field = Area of the square

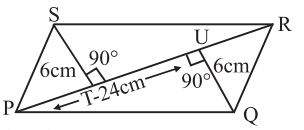
$\therefore \quad l \times b = (\text{side})^2$

$9.0 \text{ m} \times b = (5.4 \text{ m})^2$

$b = \frac{5.4 \times 5.4}{9} \text{ m} = 3.24 \text{ m}$

Hence, the breadth of the rectangular filed is 3.24 m.

13. Given : $PR = 24$ cm, $QU = ST = 6$ cm



Area of parallelogram $PQRS$

= Area of ΔPRS + Area of ΔPRQ

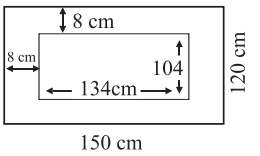
$= \frac{1}{2} \times b \times h + \frac{1}{2} \times b \times h = 2\left(\frac{1}{2} \times b \times h\right) = b \times h$

$= 24 \times 6 = 144 \text{ cm}^2.$

Exercise 13.3

1. Length of outer painting $= 150$ cm

Breadth of outer painting $= 120$ cm



$\therefore$ Area of painting with margin

$= l \times b = 150 \times 120 = 18000 \text{ cm}^2$

Length of painting without margin $= 150 - 8 - 8 = 134$ cm

Breadth of painting without margin $= 120 - 8 - 8 = 104$ cm

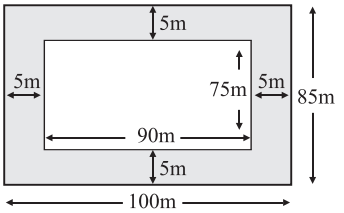
$\therefore$ Area of actual painting $= l \times b = 134 \times 104 = 13936 \text{ cm}^2$

2. Length of garden $= 90$ m

Breadth of garden $= 75$ m

$\therefore$ Area of the garden

$= 90 \times 75 = 6750 \text{ m}^2$



Length of with path garden $= 90 + 5 + 5 = 100$ m

Breadth of garden with path $= 75 + 5 + 5 = 85$ m

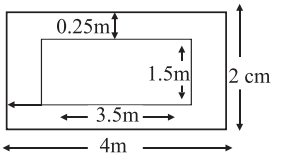
$\therefore$ Area of the garden with path $= 100 \times 85 = 8500\ \text{m}^2$

So, Area of the path = Area of the garden with path $-$ Area of the garden without path

$= 8500 - 6750 = 1750$ sq.m.

3. Length of table $= (4 - 0.25 - 0.25)$ m

$= 3.5$ m



Breadth of table

$= (2 - 0.25 - 0.25) = 1.5$ m

So, Area of Table top $= l \times b = 3.5 \times 1.5 = 5.25\ \text{m}^2$

$\because$ The cost of polishing 1 m^2 area $= ₹\ 25$

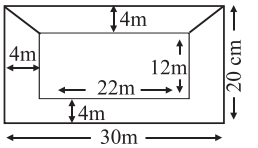
$\therefore$ The cost of polishing 5.25 m^2 area $= ₹\ (25 \times 5.25) = ₹\ 131.25$.

4. Length of the carpet $= 30$ m

Breadth of the carpet $= 20$ m

$\therefore$ Area of the carpet $= l \times b$

$= 30\ \text{m} \times 20\ \text{m} = 600\ \text{m}^2$



After cutting off 4 m wide strip from all around

Length of the remaining carpet $= (30 - 4 - 4)\ \text{m} = 22$ m

Breadth of the remaining carpet $= (20 - 4 - 4)\ \text{m} = 12$ m

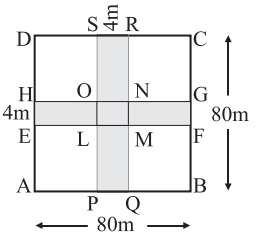
So, the area of the remaining carpet $= l \times b = 22 \times 12 = 264\ \text{m}^2$

And, the area of strip cut-out $= 600 - 264 = 336\ \text{m}^2$.

5. Area of the path along the length i.e.,

the area of rectangle $EFGH = l \times b$

$= 80 \times 4 = 320\ \text{m}^2$



Area of the path along the breadth i.e.,

the area of rectangle $PQRS = l \times b$

$= 80 \times 4 = 320\ ^2\text{m}$

Area of the central square i.e.,

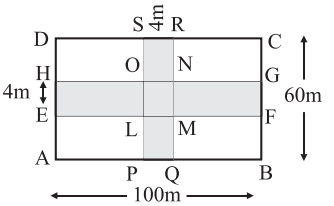
Area of the square $LMNO = (\text{Side})^2 = 4 \times 4 = 16\ \text{m}^2$

$\therefore$ Area of the paths $= (320\ \text{m}^2 + 320\ \text{m}^2) - 16\ \text{m}^2$

$= 640\ \text{m}^2 - 16\ \text{m}^2 = 624\ \text{m}^2$

Hence, the area of the path is 624 m^2.

6. (a) Area of rectangle $EFGH = 100\text{ m} \times 4\text{m} = 400\text{ m}^2$



Area of rectangle $PQRS = 60 \times 4 = 240\text{ m}^2$

Area of the central square $LMNO = 4 \times 4 = 16\text{ m}^2$

$\therefore$ Area of the paths $= (400\text{ m}^2 + 240\text{ m}^2) - 16\text{ m}^2$

$= (640 - 16)\text{ m}^2 = 624\text{ m}^2.$

(b) Area of rectangle $AFKP = l \times b$

$= 60 \times 50 = 3000\text{ m}^2$

Area of 1 square (i.e., square $ABCD$) = $(\text{side})^2 = 8 \times 8 = 64\text{ m}^2$

Area of 4 squares $= 4 \times 64 = 256\text{ m}^2$

Now, the Area of the shaded region $= 3000\text{ m}^2 - 256\text{ m}^2$

$= 2744\text{ m}^2.$

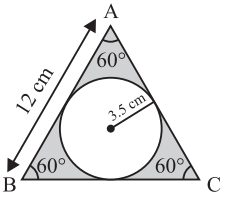
7. The area of equilateral triangle :

$\Rightarrow \quad \frac{\sqrt{3}}{4} \times (\text{side})^2$

$\Rightarrow \quad \frac{\sqrt{3}}{4} \times 12\text{ cm} \times 12\text{ cm}$

$\Rightarrow \quad 36\sqrt{3}\text{ cm}^2$

$\Rightarrow \quad 36 \times 1.732\text{ cm}^2 = 62.352\text{ cm}^2$



Area of the circle $= \pi r^2$

$= \frac{22}{7} \times 3.5\text{ cm} \times 3.5\text{ cm}$

$= 22 \times 1.75\text{ cm}^2$

$= 38.5\text{ cm}^2$

So, the area of the shaded portion $= 62.352\text{ cm}^2 - 38.5\text{ cm}^2$

$= 23.852\text{ cm}^2.$

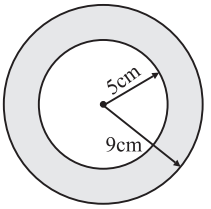
8. Area of the shaded region

$= \pi(R^2 - r^2)$

$= \pi(9^2 - 5^2)$

$= \frac{22}{7} \times (9 + 5)(9 - 5)$

$= \frac{22}{7} \times 14 \times 4 = 176\text{ cm}^2.$



9. Here, $r = \frac{D}{2} = \frac{80}{2} = 40\text{ m}$

$R = (r + 4) = 40\text{ m} + 4\text{ m} = 44\text{ m}$

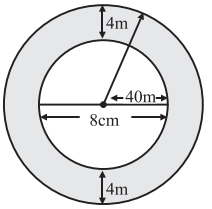
Area of circular road $= \pi(R^2 - r^2)$

$= \pi(44^2 - 40^2)$

$= \frac{22}{7}(44+40)(44-40)$

$= \frac{22}{7} \times 84 \times 4 = 22 \times 12 \times 4$

$= 1056\,\text{m}^2$



$\because$ Cost of constructing the road 1 $\text{m}^2 = ₹10$

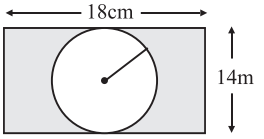
$\therefore$ Cost of constructing the road 1056 $\text{m}^2 = ₹1056 \times 10 = ₹10560$.

10. $l = 18$ cm, $b = 14$ cm

Area of the rectangle $= l \times b$

$= 18 \times 14 = 252\,\text{cm}^2$

radius of circle(r) $= \frac{\text{diameter}}{2} = \frac{14}{2} = 7$ cm



Area of the circle $= \pi r^2$

$= \frac{22}{7} \times (7)^2 = \frac{22}{7} \times 7 \times 7 = 154\,\text{cm}^2$

$\therefore$ Area of the shaded portion $= 252\,\text{cm}^2 - 154\,\text{cm}^2$

$= 98\,\text{cm}^2$.

Multiple Choice Questions

1. (d) 2. (c) 3. (c) 4. (a) 5. (c)

Brain Teaser

Fill in the blanks :

1. Area of right triangle $= \frac{1}{2} \times$ **base** $\times$ **height**

2. 1 $\text{m}^2 =$ **100 dm^2**

3. Diagonal of a square $= \sqrt{2} \times$ side

4. The product of diagonal and sum of offset in it and $\frac{1}{2}$ is equal to the area of a **quadrilateral**.

5. Hero's formula $= \sqrt{S(s-a)(s-b)(s-c)}$ sq. unit.

NEP

Do it yourself.

14 Algebraic Expressions

Exercise-14.1

1. Monomials : (a) and (e) Binomials : (b), (c) and (f)
Trinomials : (d), (g) and (h)

2. (a) Constant term of $-6x^2+7x-3$ is -3.

(b) Constant term of $16a^3-2a-\frac{17}{5}$ is $\frac{-17}{5}$.

(c) Constant term of $\frac{1}{3}p^2-2q+2$ is 2.

3. (a) Numerical coefficient of $-101x^2y^3z=-101$.

(b) Numerical coefficient of $-3\times 7\times 15\times x\times y\times y\times z\times z$
$=-3\times 7\times 15=-315$.

(c) Numerical coefficient of $-P^2q^3r=-1$

(d) Numerical coefficient of $-17x^3+12x^3=1$ or $(-5x^3)=-5$.

4. (a) The coefficient of x in $-15xy^2=-15y^2$.

(b) The coefficient of p^2 in $\frac{16}{3}p^2q^3r=\frac{16}{3}q^3r$.

(c) The coefficient of a in $-17ab^2c=-17b^2c$.

(d) The coefficient of r^3 in $p^3qr^3=p^3q$.

5. (a) Like terms : $x^2, -15x^2$

(b) Like terms : $(-3x^2y, -5yx^2)$, $(2y^2x^2, -2x^2y^2)$

(c) Like terms : $\left(-6x, \frac{-3x}{2}\right)$

(d) Like terms : $(a^2b^2c, \quad a^2cb^2, \quad -5a^2b^2c)$.

Exercise 14.2

1. Add :

(a) $5a^2, -8a^2, 4a^2$

$\therefore$ The required sum $=5a^2+(-8a^2)+4a^2$
$=9a^2-8a^2=a^2$.

(b) $-3a^2b^2, \frac{2}{3}a^2b^2, \frac{-1}{6}a^2b^2, \frac{1}{9}a^2b^2$

$\therefore$ The required sum $=-3a^2b^2+\frac{2}{3}a^2b^2+\left(-\frac{1}{6}a^2b^2\right)+\frac{1}{9}a^2b^2$

$=a^2b^2\left(-3+\frac{2}{3}-\frac{1}{6}+\frac{1}{9}\right)$

$=a^2b^2\left(\frac{-54+12-3+2}{18}\right)$

$=a^2b^2\left(\frac{-43}{18}\right)=\frac{-43}{18}a^2b^2$.

(c) $3x^2-8y^2+4z^2,\ 2y^2-5x^2+4z^2,\ 6y^2-9x^2+4z^2$

$\therefore$ The required sum $=(3x^2-8y^2+4z^2)+(2y^2-5x^2+4z^2)$
$+(6y^2-9x^2+4z^2)$
$=(3x^2-5x^2-9x^2)+(-8y^2+2y^2+6y^2)$
$+(4z^2+4z^2+4z^2)$
$=-11x^2+0y^2+12z^2=-11x^2+12z^2$.

(d) $\frac{3}{2}a^2b-\frac{1}{2}ab,\ 3a^2b+2ab,\ -\frac{1}{2}a^2b+\frac{3}{2}ab$

The required sum $=\left(\frac{3}{2}a^2b-\frac{1}{2}ab\right)+(3a^2b+2ab)+\left(\frac{-1}{2}a^2b+\frac{3}{2}ab\right)$

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

$=\left(\frac{3a^2b+6a^2b-a^2b}{2}\right)+\left(\frac{-ab+4ab+3ab}{2}\right)$

$=\left(\frac{8a^2b}{2}\right)+\left(\frac{6ab}{2}\right)$

$=4a^2b+3ab$ or $ab(4a+3)$.

(e) $5x^2+\frac{4}{3}x+2,\ -7x^2-\frac{1}{4}x+\frac{3}{5},\ 6x^2-\frac{5}{12}x-\frac{7}{3}$

$\therefore$ The required sum

$=\left(5x^2+\frac{4}{3}x+2\right)+\left(-7x^2-\frac{1}{4}x+\frac{3}{5}\right)+\left(6x^2-\frac{5}{12}x-\frac{7}{3}\right)$

$=(5x^2-7x^2+6x^2)+\left(\frac{4}{3}x-\frac{1}{4}x-\frac{5}{12}x\right)+\left(2+\frac{3}{5}-\frac{7}{3}\right)$

$=(5-7+6)x^2+\left(\frac{16-3-5}{12}\right)x+\left(\frac{30+9-35}{15}\right)$

$=4x^2+\frac{8}{12}x+\frac{4}{15}=4x^2+\frac{2}{3}x+\frac{4}{15}$.

(f) $7a^2+5b^2-4c^2,\ -8a^2-5b^2-7c^2,\ 3a^2$

The required sum

$=(7a^2+5b^2-4c^2)+(-8a^2-5b^2-7c^2)+(3a^2)$

$=7a^2+5b^2-4c^2-8a^2-5b^2-7c^2+3a^2$

$=(7a^2-8a^2+3a^2)+(5b^2-5b^2)+(-4c^2-7c^2)$

$=2a^2+0+(-11c^2)=2a^2-11c^2$.

2. Subtract :

(a) $-8a^2$ from $5a^2=5a^2-(-8a^2)$

$=5a^2+8a^2=13a^2$.

(b) $\frac{1}{5}a^2b^2$ from $-3a^2b^2=-3a^2b^2-\frac{1}{5}a^2b^2$

$=\left(-3-\frac{1}{5}\right)a^2b^2=\frac{-16}{5}a^2b^2$.

(c) $a^2-2a+\frac{1}{2}$ from $-a^2+2a-\frac{1}{2}$

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

$$= -a^2 + 2a - \frac{1}{2} - a^2 + 2a - \frac{1}{2}$$

$$= -2a^2 + 4a - \frac{2}{2} = -2a^2 + 4a - 1.$$

(d) 0 from $7a^2 + 8b^2 - 9c^2 = 7a^2 + 8b^2 - 9c^2 - 0$

$= 7a^2 + 8b^2 - 9c^2$

(e) $2a^2 + 3b^2 - 4c^2$ from $2c^2 - 3a^2 + 4b^2$

$= 2c^2 - 3a^2 + 4b^2 - (2a^2 + 3b^2 - 4c^2)$

$= 2c^2 - 3a^2 + 4b^2 - 2a^2 - 3b^2 + 4c^2$

$= (-3a^2 - 2a^2) + (4b^2 - 3b^2) + (2c^2 + 4c^2)$

$= -5a^2 + b^2 + 6c^2.$

(f) $7a^2 + 8b^2 - 9c^2$ from $0 = 0 - (7a^2 + 8b^2 - 9c^2)$

$= -7a^2 - 8b^2 + 9c^2.$

(g) $9 + 3a + 5b - c$ from $1 = 1 - (9 + 3a + 5b - c)$

$= 1 - 9 - 3a - 5b + c$

$= -8 - 3a - 5b + c$.

(h) 1 from $9 + 2a + 5b - c = (9 + 2a + 5b - c) - (1)$

$= 9 + 2a + 5b - c - 1$

$= 8 + 2a + 5b - c.$

3. (a) $6p + 2q + 9p - 5q = 6p + 9p + 2q - 5q$

$= 15p - 3q$

(b) $56a^2 + 60a - 3 - (40a^2 + 17a - 17)$

$= 56a^2 + 60a - 3 - 40a^2 - 17a + 17$

$= (56a^2 - 40a^2) + (60a - 17a) + (17 - 3)$

$= 16a^2 + 43a + 14.$

(c) $9x^2y - 2xy + 5 - (3 - 15xy + 20x^2y)$

$= 9x^2y - 2xy + 5 - 3 + 15xy - 20x^2y$

$= (9x^2y - 20x^2y) + (15xy - 2xy) + (5 - 3)$

$= -11x^2y + 13xy + 2.$

(d) $6a + 2b - 4c + 6a + 2b - 4c - (6a + 2b - 4c)$

$= 6a + 2b - 4c + 6a + 2b - 4c - 6a - 2b + 4c$

$= (6a + 6a - 6a) + (2b + 2b - 2b) + (-4c - 4c + 4c)$

$= 6a + 2b - 4c$

$= 2(3a + b - 2c)$

(e) $4a - 10b - (-8a + 4b) = 4a - 10b + 8a - 4b$

$= (4a + 8a) + (-10b - 4b)$

$= 12a + (-14b) = 2(6a - 7b).$

(f) $6c^2 + 4cd + 5d^2 - 5c^2 - 2cd + 2d^2$

$= (6c^2 - 5c^2) + (4cd - 2cd) + (2d^2 + 5d^2)$

$= c^2 + 2cd + 7d^2.$

4. $\because (8 - 5a^2 + 7b) - (2a^2 - 3b + 7)$

$= 8 - 5a^2 + 7b - 2a^2 + 3b - 7$

$= (8 - 7) + (-5a^2 - 2a^2) + (7b + 3b)$

$= 1 + (-7a^2) + (10b)$

$= -7a^2 + 10b + 1$

Hence, $2a^2 - 3b + 7$ is $(-7a^2 + 10b + 1)$ smaller than $8 - 5a^2 + 7b$.

5. Earning of Somya per month $= (12a + 7b)$ rupees

Expenditure of Somya per month $= (2a - 3b)$ rupees

$\therefore$ Saving of Somya per month $= (12a + 7b) - (2a - 3b)$

$= 12a + 7b - 2a + 3b$

$= (12a - 2a) + (7b + 3b)$

$= 10a + 10b$ rupees.

6. $\because$ $16a^2 - 3b^2 + 7ab - (12a^2 - 9ab) = 16a^2 - 3b^2 + 7ab - 12a^2 + 9ab$

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

Hence, $16a^2 - 3b^2 + 7ab$ is $(4a^2 - 3b^2 + 16ab)$ larger than $12a^2 - 9ab$.

7. Money spent by Ritika for a shirt $= (9a - b)$ rupees

Money spent by Ritika for a mobile $= (6a + 2b)$ rupees

Money spent by Ritika for chocolates $= (2a - 3b)$ rupees

$\therefore$ Total money spent by Ritika on these items $= 9a - b + 6a + 2b + 2a - 3b$

$= (17a - 2b)$ rupees

She had money with her = ₹ 2000

So, the money left with her = ₹ $2000 - (17a - 2b) =$ ₹ $[2000 - 17a + 2b]$

8. Let y should be subtracted

$\therefore$ $(p^3 - 2p^2 + 7p - 6) - y = 3p^2 - 2p + 3$

$(p^3 - 2p^2 + 7p - 6) - (3p^2 - 2p + 3) = y$

$p^3 - 2p^2 + 7p - 6 - 3p^2 + 2p - 3 = y$

$p^3 - 5p^2 + 9p - 9 = y$

$\therefore$ $y = p^3 - 5p^2 + 9p - 9$

Hence, we should subtract $p^3 - 5p^2 + 9p - 9$.

9. $x^3 - 3x^2 + 7x - 5 + 2x^3 - 9x^2 + 3 - x$

$= 3x^3 - 12x^2 + 6x - 2$ …(1)

Putting $x = -3$ in R.H.S. of equation (1), we get

$3x^3 - 12x^2 + 6x - 2 = 3(-3)^3 - 12(-3)^2 + 6(-3) - 2$

$= 3 \times (-27) - 12 \times (9) - 18 - 2$

$= -81 - 108 - 18 - 2 = -209.$

10. (a) $-p + [6p - \{q - (3p - 2q)\}]$

$= -p + [6p - \{q - 3p + 2q\}]$

$= -p + [6p - \{3q - 3p]$

$= -p + [6p - 3q + 3p]$

$= -p + [9p - 3q]$

$= -p + 9p - 3q$

$= 8p - 3q.$

(b) $7a - [2b - \{3a - (4a - 2b) + 8a - (2a + 5b + 3c)\}]$

$= 7a - [2b - \{3a - 4a + 2b + 8a - 2a - 5b - 3c\}]$

$= 7a - [2b - \{5a - 3b - 3c\}]$

$$= 7a - [2b - 5a + 3b + 3c]$$
$$= 7a - [-5a + 5b + 3c]$$
$$= 7a + 5a - 5b - 3c$$
$$= 12a - 5b - 3c$$

(c) $yz - [zx - xy - \{yz - (zx + yz) - (2xy - zx)\}]$
$= yz - [zx - xy - \{yz - zx - yz - 2xy + zx\}]$
$= yz - [zx - xy - \{-2xy\}]$
$= yz - [zx - xy + 2xy]$
$= yz - [zx + xy]$
$= yz - zx - xy.$

Multiple Choice Questions

1. (b) **2.** (a) **3.** (a) **4.** (b) **5.** (a) **6.** (b) **7.** (b) **8.** (c)

Brain Teaser

1. Let, y should be subtracted

Then, $4a^2 - 7b - 8 - y = -7a^2 + 6$
$4a^2 - 7b - 8 + 7a^2 - 6 = y$
$11a^2 - 7b - 14 = y$
$\therefore \quad y = 11a^2 - 7b - 14$

Hence, $11a^2 - 7b - 14$ should be subtracted.

2. If $\frac{a}{3} + \frac{a}{3} + \frac{a}{3} = 15$

$\Rightarrow \quad 3 \times \left(\frac{a}{3}\right) = 15$

$a = 15$

Hence, the value of a is 15.

3. $a + \frac{3}{8} = \frac{10}{16}$

$a = \frac{10}{16} - \frac{3}{8} = \frac{10 - 6}{16} = \frac{4}{16} = \frac{1}{4}$

4. $9x - 13 = 11x + 27$
$9x - 11x = 27 + 13$
$-2x = 40$
$x = \frac{40}{-2} = -20$

Hence, $(x = -20)$ is the solution of given equation.

5. Let, the required number be x.

Thus, $2x + 4 = 10$
$2x = 10 - 4$
$x = \frac{6}{2} \Rightarrow 3$

Hence, the required number is 3.

6. Let, the required number be x.

Thus, $3x - 3 = 12$

$$3x = 12 + 3$$
$$x = \frac{15}{3} \Rightarrow 5$$

Hence, the required number is 5.

HOTS

1. Pankaj scored in English $= x$ marks.

$\because$ He scored 25 marks more than the marks scored in English.

So, the marks scored by Pankaj in Mathematics

$= 25$ marks more than x marks

$= (x + 25)$ marks.

2. Let A is added to given number.

$\therefore \quad (2x^3 - y^2 + 3y - 3) + A = x^3 + y^2 + 2y + 1$

$$A = x^3 + y^2 + 2y + 1 - (2x^3 - y^2 + 3y - 3)$$
$$= x^3 + y^2 + 2y + 1 - 2x^3 + y^2 - 3y + 3$$
$$= (x^3 - 2x^3) + (y^2 + y^2) + (2y - 3y) + (z + 3)$$
$$= -x^3 + 2y^2 - y + 4$$

Hence, $(-x^3 + 2y^2 - y + 4)$ is added to $2x^3 - y^2 + 3y - 3$ so that the sum is $x^3 + y^2 + 2y + 1$.

15 Exponents (Power)

Exercise 15.1

1. Write the **base** and **exponent** in each of the following :

(a) $(8)^{14}$

Base $= 8$

Exponent $= 14$

(b) $\left(-\frac{1}{6}\right)^5$

Base $= \frac{-1}{6}$

Exponent $= 5$

(c) $(35.4)^6$

Base $= 35.4$

Exponent $= 6$

(d) $\left(-\frac{3}{7}\right)^5$

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

Exponent $= 5$

(e) $(-1)^{15}$

Base $= -1$

Exponent $= 15$

(f) $(7)^7$

Base $= 7$

Exponent $= 7$

(g) $(0.01)^5$

Base $= 0.01$

Exponent $= 5$

(h) $\left(\frac{2}{3}\right)^7$

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

Exponent $= 7$

2. (a) $2\times 2\times 2\times b\times c\times c\times b = 2^3\times b^2\times c^2$

(b) $(-3)\times(-3)\times(-3)\times p\times p\times q = (-3)^3\times p^2\times q$

(c) $(-x)\times(-x)\times(-x)\times y\times y\times z = (-x)^3\times y^2\times z$

(d) $a\times a\times a\times b\times b\times c\times c\times d = a^3b^2c^2d$

3. (a) 10000

2	10000
2	5000
2	2500
2	1250
5	625
5	125
5	25
5	5
	1

So, $10000 = 2\times 2\times 2\times 2\times 5\times 5\times 5\times 5$
$= 2^4\times 5^4$
or $(2\times 5)^4$

(b) 2187

3	2187
3	729
3	243
3	81
3	27
3	9
3	3
	1

So, $2187 = 3\times 3\times 3\times 3\times 3\times 3\times 3$
$= 3^7$

(c) $\frac{81}{169}$

3	81
3	27
3	9
3	3
	1

$\therefore\ 81 = 3\times 3\times 3\times 3 = 3^4$

13	169
13	13
	1

$\therefore\ 169 = 13\times 13 = 13^2$

So, $\frac{81}{169} = \frac{3\times 3\times 3\times 3}{13\times 13}$

$= \frac{(3)^4}{(13)^2}$ or $\left(\frac{9}{13}\right)^2$

(d) 2401

So, $2401 = 7 \times 7 \times 7 \times 7 = 7^4$

7	2401
7	343
7	49
7	7
	1

(e) $\frac{243}{1024}$

3	243
3	81
3	27
3	9
3	3
	]1

$\therefore \quad 243 = 3 \times 3 \times 3 \times 3 \times 3 = 3^5$

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$\therefore \quad 1024 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^{10}$

So, $\frac{243}{1024} = \frac{3^5}{2^{10}}$ or $\left(\frac{3}{4}\right)^5$

(f) 5929

So, $5929 = 7 \times 7 \times 11 \times 11 = 7^2 \times 11^2$

or $(7 \times 11)^2$

7	5929
7	847
11	121
11	11
	1

4. (a) $3 \times 10^2 = 3 \times 10 \times 10 = 3 \times 100 = 300$

(b) $6 \times 2^4 = 6 \times 2 \times 2 \times 2 \times 2 = 6 \times 16 = 96$

(c) $3 \times 4^2 = 3 \times 4 \times 4 = 3 \times 16 = 48$

(d) $5^3 \times 2^3 = (5 \times 5 \times 5) \times (2 \times 2 \times 2) = 125 \times 8 = 1000$

(e) $(-1)^5 \times 7^3 = (-1) \times (-1) \times (-1) \times (-1) \times (-1) \times 7 \times 7 \times 7 = (-1) \times 343 = -343$

(f) $3^2 \times 10^3 = 3 \times 3 \times 10 \times 10 \times 10 = 9 \times 1000 = 9000$

(g) $2^5 \times 5 = 2 \times 2 \times 2 \times 2 \times 2 \times 5 = 32 \times 5 = 160$

(h) $3^4 \times 5 = 3 \times 3 \times 3 \times 3 \times 5 = 81 \times 5 = 405$

5. (a) 1200

2	1200
2	600
2	300
2	150
3	75
5	25
5	5
	1

$\therefore \quad 1200 = 2\times 2\times 2\times 2\times 3\times 5\times 5 = 2^4 \times 3^1 \times 5^2$

(b) 2250

2	2250
3	1125
3	375
5	125
5	25
5	5
	1

$\therefore \quad 2250 = 2\times 3\times 3\times 5\times 5\times 5 = 2^1 \times 3^2 \times 5^3$

(c) 1080

2	1080
2	540
2	270
3	135
3	45
3	15
5	5
	1

$\therefore \quad 1080 = 2\times 2\times 2\times 3\times 3\times 3\times 5 = 2^3 \times 3^3 \times 5^1$

(d) 720

2	720
2	360
2	180
2	90
3	45
3	15
5	5
	1

$\therefore 720 = 2\times 2\times 2\times 2\times 3\times 3\times 5 = 2^4 \times 3^2 \times 5$

(e) 1600

2	1600
2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

$\therefore \quad 1600 = 2\times 2\times 2\times 2\times 2\times 2\times 5\times 5 = 2^6 \times 5^2$

(f) 3200

2	3200
2	1600
2	800
2	400
2	200
2	100
2	50
5	25
5	5
	1

$\therefore \quad 3200 = 2\times 2\times 2\times 2\times 2\times 2\times 2\times 5\times 5 = 2^7 \times 5^2$

(g) 864

2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
	1

$\therefore \quad 864 = 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3 = 2^5 \times 3^3$

(h) 5324

2	5324
2	2662
11	1331
11	121
11	11
	1

$\therefore \quad 5324 = 2\times 2\times 11\times 11\times 11 = 2^2 \times 11^3$

(i) 4500

2	4500
2	2250
3	1125
3	375
5	125
5	25
5	5
	1

$\therefore \quad 4500 = 2\times 2\times 3\times 3\times 5\times 5\times 5 = 2^2 \times 3^2 \times 5^3$

6. (a) 5^4 or 4^5

$\because \quad 5^4 = 5\times 5\times 5\times 5 = 625$

And, $4^5 = 4\times 4\times 4\times 4\times 4 = 1024$

Clearly, $4^5 > 5^4$.

(b) 2^6 or 6^2

$\because \quad 2^6 = 2\times 2\times 2\times 2\times 2\times 2 = 64$

And, $6^2 = 6\times 6 = 36$

Clearly, $2^6 > 6^2$.

(c) 3^5 or 5^3

$\because \quad 3^5 = 3\times 3\times 3\times 3\times 3 = 243$

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

Clearly, $3^5 > 5^3$.

(d) 7^2 or 2^7

$\because \quad 7^2 = 7\times 7 = 49$

And, $2^7 = 2\times 2\times 2\times 2\times 2\times 2\times 2$

$= 128$

Clearly, $2^7 > 7^2$.

(e) 3^2 or 2^3

$\because \quad 3^2 = 3\times 3 = 9$

And, $2^3 = 2\times 2\times 2$

$= 8$

Clearly, $3^2 > 2^3$.

(f) 2^{20} or 20^2

$\because \quad 2^{20} = 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2$

$\times 2\times 2\times 2\times 2\times 2 = 1048576$

$20^2 = 20\times 20 = 400$

Clearly, $2^{20} > 20^2$.

7. (a) $(-3)^2 \times (-5)^2 = (-3)\times(-3)\times(-5)\times(-5) = 9\times 25 = 225$

(b) $(-1)^5 \times (-3)^4 = (-1)\times(-1)\times(-1)\times(-1)\times(-1)\times(-3)\times(-3)$
$\times(-3)\times(-3) = (-1)\times 81 = -81$

(c) $(-2)^3 \times (-3)^3 = (-2)\times(-2)\times(-2)\times(-3)\times(-3)\times(-3)$
$= (-8)\times(-27) = 216$

(d) $(-5)^2 \times 2^4 = (-5)\times(-5)\times 2\times 2\times 2\times 2 = 25\times 16 = 400$

(e) $(-7)^2 \times (-2)^5 = (-7)\times(-7)\times(-2)\times(-2)\times(-2)\times(-2)\times(-2)$
$= 49\times(-32) = -1568$

(f) $(-2)^4 \times (-3)^3 = (-2)\times(-2)\times(-2)\times(-2)\times(-3)\times(-3)\times(-3)$
$= 16\times(-27) = -432$

8. (a) 1.8×10^{15} and 1.5×10^{20}

$1.8\times 10^{15} = 1.8\times 10\times 10^{14} = 18\times 10^{14}$

and $1.5\times 10^{20} = 1.5\times 10\times 10^{19} = 15\times 10^{19}$

$\because$ Number of digits in 15×10^{19} is more than number of digits in 18×10^{14}.

Hence, $1.5\times 10^{20} > 1.8\times 10^{15}$.

(b) 2.7×10^{11} and 3.0×10^{15}

$2.7\times 10^{11} = 2.7\times 10\times 10^{10} = 27\times 10^{10}$

$3.0\times 10^{15} = 3.0\times 10\times 10^{14} = 30\times 10^{14}$

$\because$ Number of digits in 30×10^{14} is more than number of digits in 27×10^{10}.

Hence, $3.0\times 10^{15} > 2.7\times 10^{11}$.

(c) 2.8×10^{20} and 3.5×10^{18}

$2.8\times 10^{20} = 2.8\times 10\times 10^{19} = 28\times 10^{19}$

$3.5\times 10^{18} = 3.5\times 10\times 10^{17} = 35\times 10^{17}$

$\because$ Number of digits in 28×10^{19} is more than number of digits in 35×10^{17}.

Hence, $2.8\times 10^{20} > 3.5\times 10^{18}$.

(d) 1.008×10^{15} and 2.009×10^{20}

$1.008\times 10^{15} = 1.008\times 1000\times 10^{12} = 1008\times 10^{12}$

$2.009\times 10^{20} = 2.009\times 1000\times 10^{17} = 2009\times 10^{17}$

$\because$ Number of digits in 2009×10^{17} is more than number of digits in 1008×10^{12}.

Hence, $2.009\times 10^{20} > 1.008\times 10^{15}$.

Exercise-15.2

1. Find the value of the following :

(a) $(3^5)^7 = 3^{5\times 7} = 3^{35}$

(b) $3^0 \times 3^5 \times 3^{-5} = 3^{0+5+(-5)} = 3^{5-5} = 3^0 = 1$

(c) $\dfrac{(5^5)^8}{(5^8)^5} = \dfrac{5^{5\times 8}}{5^{8\times 5}} = \dfrac{5^{40}}{5^{40}} = 5^{40-40} = 5^0 = 1$

(d) $(3^4)^5 = 3^{4\times 5} = 3^{20}$

(e) $\dfrac{3^5 \times 7^9}{7^9 \times 3^5} = 3^{5-5} \times 7^{9-9} = 3^0 \times 7^0 = 1\times 1 = 1$

(f) $\frac{2^8}{2^5} = 2^{8-5} = 2^3$ or 8

(g) $(2658)^0 = 1$ $\{\because a^0 = 1\}$

(h) $\frac{(7561)^{30}}{(7561)^{29}} = (7561)^{30-29} = (7561)^1 = 7561$

2. (a) $3^2 \times 3^4 \times 3^7 = 3^{2+4+7} = 3^{13}$ $(\because a^m \times a^n = a^{m+n})$

(b) $6^{15} \div 6^{10} = 6^{15-10} = 6^5$ $(\because a^m \div a^n = a^{m-n})$

(c) $a^7 \times a^5 = a^{7+5} = a^{12}$ $(\therefore a^m \times a^n = a^{m+n})$

(d) $7^x \times 7^2 = 7^{x+2}$

(e) $(27)^2 \div 3^3 = (3^3)^2 \div 3^3 = 3^6 \div 3^3 = 3^{6-3} = 3^3$ $(\because (a^m)^n = a^{mn})$

(f) $(3^4)^2 \div 3^5 = 3^8 \div 3^5 = 3^{8-5} = 3^3$

(g) $(2^{20} \div 2^{12}) \times 2^3 = (2^{20-12}) \times 2^3$

$= 2^8 \times 2^3 = 2^{8+3} = 2^{11}$ $(\because a^m \times a^n = a^{m+n})$

(h) $8^t \div 8^3 = 8^{t-3}$ $(\therefore a^m \div a^n = a^{m-n})$

(i) $(3^4)^2 \div (3^2) = 3^8 \div 3^2 = 3^{8-2} = 3^6$ $(\because a^m \div a^n = a^{m-n})$

(j) $(5^3 \div 5^2) \times 5^3 = 5^{(3-2)} \times 5^3 = 5^1 \times 5^3 = 5^{1+3} = 5^4$ $(\because a^m \times a^n = a^{m+n})$

(k) $(2^7)^2 \div 2^7 = 2^{14} \div 2^7 = 2^{14-7} = 2^7$ $(\because (a^m)^n = a^{mn})$

(l) $(15^3)^3 \div (15^2) = 15^9 \div 15^2 = 15^{9-2} = 15^7$

3. (a) $\frac{2^3 \times 3^4 \times 8}{3 \times 64} = \frac{2^3 \times 3^4 \times 2^3}{3^1 \times 2^6} = 2^{3+3-6} \times 3^{4-1} = 2^0 \times 3^3 = 3^3$

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

(c) $(125)^4 \div (25)^3 = (5^3)^4 \div (5^2)^3$

$= 5^{12} \div 5^6$ $[\because a^m \div a^n = a^{m-n}]$

$= 5^{12-6} = 5^6$

(d) $\frac{3 \times 7^4 \times 11^2}{21 \times 11} = \frac{3 \times 7^4 \times 11^{2-1}}{3 \times 7} = 7^{4-1} \times 11^1 = 7^3 \times 11^1$

(e) $\frac{3^7 \times 3^2}{(3^4)^2} = \frac{3^{7+2}}{3^8} = \frac{3^9}{3^8} = 3^{9-8} = 3^1$

(f) $(2^0 + 3^0) \times (5^0) = (1+1) \times 1$ $[\because a^0 = 1]$

$= 2 \times 1 = 2$

(g) $\frac{2^8 \times a^5 \times b^3}{4^2 \times a^2 \times b} = \frac{2^8 \times a^{5-2} \times b^{3-1}}{(2^2)^2}$ $\left[\frac{a^m}{a^n} = a^{m-n}\right]$

$= \frac{2^8}{2^4} \times a^3 \times b^2 = 2^{8-4} \times a^3 \times b^2 = 2^4 \times a^3 \times b^2$

(h) $\left(\frac{a^7}{b^2}\right) \times \left(\frac{b^5}{a^2}\right) = a^{7-2} \times b^{5-2} = a^5 \times b^3$

(i) $(2^3 \div 2)^4 = (2^{3-1})^4 = (2^2)^4 = 2^{2\times4} = 2^8$ $[\because a^m \div a^n = a^{m-n}]$

(j) $(2^0 \times 3^0 + 3^0 \times 4^0) \times 3^0 = (1 \times 1 + 1 \times 1) \times 1 = (1+1) \times 1 = 2 \times 1 = 2^1$

$[\because a^0 = 1]$

(k) $\frac{75\times 77}{5^3\times 21}=\frac{5\times 5\times 3\times 7\times 11}{5\times 5\times 5\times 7\times 3}=5^{2-3}\times 3^{1-1}\times 7^{1-1}\times 11^1$

$=5^{-1}\times 11^1=\left(\frac{11}{5}\right)^1$

(l) $\frac{108\times 25^2}{2^6\times 5^2}=\frac{4\times 27\times (5^2)^2}{2^6\times 5^2}=\frac{2^2\times 3^3\times (5^2)^2}{2^6\times 5^2}=\frac{3^3\times 5^4}{2^{6-2}\times 5^2}$

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

4. (a) 216×192

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

2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$\because\ 216=2\times 2\times 2\times 3\times 3\times 3=2^3\times 3^3$

$=2^9\times 3^4$

And, $192=2\times 2\times 2\times 2\times 2\times 2\times 3=2^6\times 3^1$

So, $216\times 192=(2^3\times 3^3)\times(2^6\times 3^1)$

$=2^3\times 3^3\times 2^6\times 3^1=2^{3+6}\times 3^{3+1}$

$=2^9\times 3^4$

(b) 1024×9

3	9
3	3
	1

2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$\because\ 1024=2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2\times 2$

$= 2^{10}$

And, $9 = 3 \times 3 = 3^2$

So, $1024 \times 9 = 2^{10} \times 3^2$.

(c) 1536

2	1536
2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$\because \quad = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$= 2^9 \times 3^1$

So, $1536 = 2^9 \times 3$.

5. (a) $\dfrac{(3^5) \times 7^3}{(27)^3 \times 7} = \dfrac{3^5 \times 7^{3-1}}{(3^3)^3}$ $\qquad [\because a^m \div a^n = a^{m-n}]$

$= \dfrac{3^5 \times 7^2}{3^9} = 3^{5-9} \times 7^2$

$= 3^{-4} \times 7^2 = \dfrac{7^2}{3^4} = \dfrac{49}{81}$

(b) $\dfrac{25 \times 125 \times t^7}{10^5 \times t^2} = \dfrac{5^2 \times 5^3 \times t^{7-2}}{(2 \times 5)^5} = \dfrac{5^{2+3} \times t^5}{2^5 \times 5^5}$

$= \dfrac{5^{5-5} \times t^5}{2^5}$

$= \dfrac{1 \times t^5}{2^5}$

$= \dfrac{t^5}{2^5}$

$= \left(\dfrac{t}{2}\right)^5$.

(c) $\dfrac{3^5 \times 10^5 \times 75}{5^3 \times (6)^3} = \dfrac{3^5 \times (2 \times 5)^5 \times 75}{5^3 \times (2 \times 3)^3}$

$$= \frac{3^5 \times 2^5 \times 5^5 \times (5 \times 5 \times 3)}{5^3 \times 2^3 \times 3^3}$$
$$= 3^{5-3} \times 2^{5-3} \times 5^{5-3} \times (5^2 \times 3^1)$$
$$= 3^{2+1} \times 2^2 \times 5^{2+2}$$
$$= 3^3 \times 2^2 \times 5^4$$
$$= 27 \times 4 \times 625$$
$$= 67500.$$

(d) $$\frac{3^5 \times 75 \times a^3 \times b^2}{3^6 \times 5^2 \times b^2 \times a^3} = \frac{3^5 \times (5 \times 5 \times 3) \times a^3 \times b^2}{3^6 \times 5^2 \times b^2 \times a^3}$$
$$= \frac{3^{5+1} \times 5^2 \times a^{3-3} \times b^{2-2}}{3^6 \times 5^2}$$
$$= 3^{6-6} \times 5^{2-2} \times a^0 \times b^0$$
$$= 3^0 \times 5^0 \times 1 \times 1 \qquad \{\because a^0 = 1\}$$
$$= 1 \times 1 \times 1 \times 1 = 1$$

Exercise-15.3

1. (a) Radius of the sun = 70000000 m
$= 7 \times 100000000$ m $= 7.0 \times 10^8$ m.

(b) Diameter of the Earth = 1,27,56,000 m = 12,756 × 1000 m
= 1.2756 × 1000 × 1000 m
= 1.2756×10^7 m.

(c) Speed of light in vacuum = 300000 km/sec
= 3 × 100000 km/sec
= 3.0×10^5 km/sec.

(d) The distance of the earth from the moon = 384000000 m
= 384 × 1000000 m
= 3.84 × 100 × 1000000 m
= 3.84×10^8 m.

(e) Number of stars in our Galaxy is approx = 1000000000000
= 1×10^{12}
= 1.0×10^{12} stars.

(f) The age of the universe = 12000000000 years
= 12 × 1000,000,000 years
= 1.2 × 10 × 100000000 years
= 1.2×10^{10} years.

(g) The Earth has sea water = 1353000000 cubic km
= 1353 × 1000000 km^3
= 5.353 × 1000 × 1000000 km^3
= 5.353×10^9 cubic km.

(h) Population of India in 2011
= 1,21,00,00,000
= 121 × 1,00,00,000

$= 1.21 \times 100 \times 1,00,00,000$

$= 1.21 \times 10^9$.

(i) The number of molecules in 1.8 gm of water

$= 60,230,000,000,000,000,000,000$

$= 6023 \times 10,00,000,000,000,000,000$

$= 6.023 \times 1000 \times 10,00,000,000,000,000,000$

$= 6.023 \times 10^{22}$ molecules.

2. (a) 18 billion $= 18,000,000,000 = 18 \times 10^9$

$$= \frac{18}{10} \times 10 \times 10^9$$

$$= 1.8 \times 10^{10}$$

(b) 305 million $= 305,000,000$

$$= 305 \times 10^6$$

$$= \frac{305}{100} \times 10^2 \times 10^6$$

$$= 3.05 \times 10^8$$

(c) $73925.6 = \frac{739256}{10} = \frac{739256 \times 10^4}{10 \times 10^4}$

$$= \frac{739256 \times 10^4}{100000}$$

$$= 7.39256 \times 10^4$$

(d) $1005678900 = 10056789 \times 10^2 = \frac{10056789 \times 10^2 \times 10^7}{10^7}$

$$= 1.0056789 \times 10^9$$

(e) $725682.900 = \frac{725682900}{1000}$

$$= \frac{7256829 \times 10^5}{10 \times 10^5}$$

$$= 7.256829 \times 10^5$$

(f) $923.45 = \frac{92345}{100} = \frac{92345 \times 100}{100 \times 100} = 9.2345 \times 10^2$

(g) $30000000000 = 3 \times 10^{10} = 3.0 \times 10^{10}$

(h) $49672000000 = 49672 \times 10^6 = \frac{49672}{10^4} \times 10^6 \times 10^4$

$$= 4.9672 \times 10^{10}$$

(i) $23.40628 = \frac{2340628 \times 10}{100000 \times 10} = \frac{2340628 \times 10^1}{1000000} = 2.340628 \times 10^1$

(j) $9823500000 = 98235 \times 10^5 = \frac{98235}{10^4} \times 10^5 \times 10^4 = 9.8235 \times 10^9$

(k) $30089625000 = 30089625 \times 10^3 = \frac{30089625 \times 10^3 \times 10^7}{10^7}$

$$= 3.0089625 \times 10^{10}$$

(l) $92157890000 = 9215789 \times 10^4 = \frac{9215789}{10^6} \times 10^4 \times 10^6$

$= 9.215789 \times 10^{10}$

Multiple Choice Questions

1. (a) 2. (a) 3. (c)

NEP

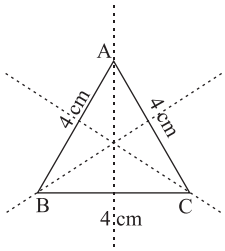
Do it yourself.

16 Symmetry

Exercise 16.1

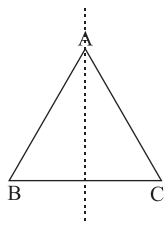
1. Draw the lines of symmetry of the following figures and also mark their point (s) of symmetry, if any :

(a)



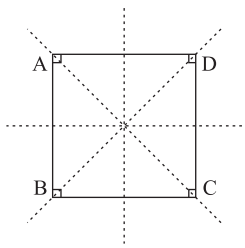
3-lines of symmetry

(b)



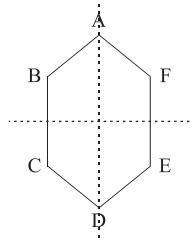
1-line of symmetry

(c)



4-lines of symmetry

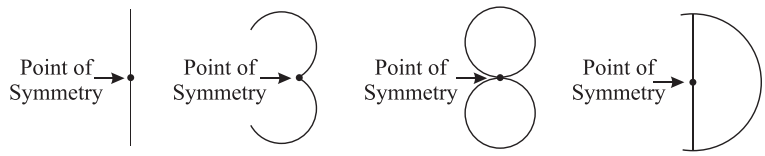
(d)



2-lines of symmetry

2. Draw the lines of symmetry and the point of symmetry of the given figures :

(a) (b) (c) (d)

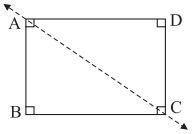


3. Draw the mirror image of each of the following :

(a) (b) (c) (d)

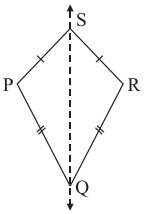
4. In each of the following figures, the line of symmetry has been drawn with a dotted line. Identify the corresponding sides and the corresponding angles about the line of symmetry.

(a)



Corresponding sides : (AB and CD), (BC and AD);
Corresponding angles : ($\angle ABC$ and $\angle ADC$), ($\angle BAC$ and $\angle DCA$), ($\angle BCA$ and $\angle DAC$);

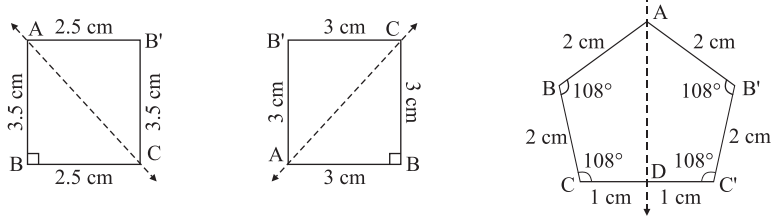
(b)



Corresponding sides : (PS and RS), (PQ and RQ)
Corresponding angles : ($\angle SPQ$ and $\angle SRQ$), ($\angle PSQ$ and $\angle RSQ$), ($\angle PQS$ and $\angle RQS$);

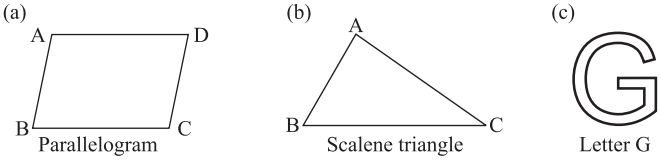
5. Complete the following figures about the given lines of symmetry which have been shown by dotted lines :

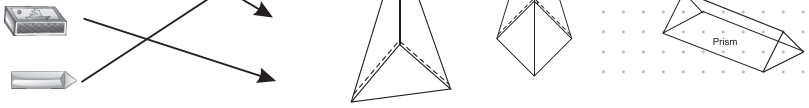
(a) (b) (c)



6. Draw three shapes with no line of symmetry.

(a) (b) (c)

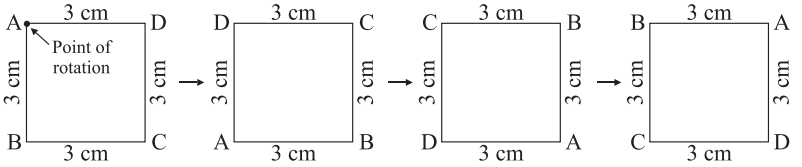




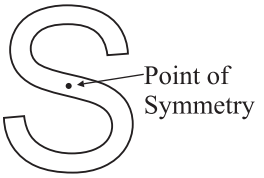
7. State the number of lines of symmetry for the following figures.
(a) The number of lines of symmetry in a circle is infinite.
(b) The number of lines of symmetry in a rhombus is 2.
(c) The number of lines of symmetry in a rectangle is 2.
(d) The number of lines of symmetry in a parallelogram is 0 (zero).

Exercise 16.2

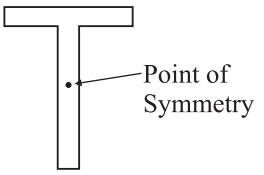
1. (a) False, (b) True, (c) True, (d) False, (e) True, (f) False, (g) False.
2. The order of rotational symmetry of a regular pentagon is 5.
3.



So, the order of rotational symmetry of a square is 4.
4. Only figures a, c and e have rotational symmetry.
5. Letters : H, I and X have both line of symmetry and rotational symmetry.
6. Letters : A, B and C have line symmetry but have no rotational symmetry.
7.



Order of rotational symmetry = 2



Order of rotational symmetry = 2

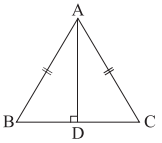
8. A Parallelogram has no line of symmetry but has rotational symmetry of order 2.

Multiple Choice Questions

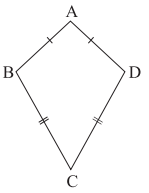
1. (c) **2.** (c) **3.** (a) **4.** (a) **5.** (b)

Brain Teaser

1. In ΔABC : $AB = AC$ and $AD \perp BC$
$\therefore$ ΔABC is symmetrical about : (a) AD



2. In a kite $ABCD$:
$AB = AD$ and $BC = DC$
$\therefore$ The kite is symmetrical about :
(a) the diagonal AC.



NEP

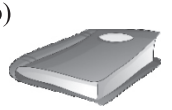
Do it yourself.

17 Representing 3D in 2D

Exercise 17

1.

(a)  Cube

(b)  Cuboid

(c)  Cylinder

(d)  Sphere

(e)  Triangular Prism

(f)  Cone

(g)  Square Pyramid

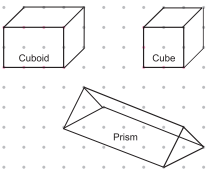
(h)  Cylinder

2. Match the figures (Column A) with their respective names (Column B) :

'A'		'B'
(a)		(i) Cone
(b)		(ii) Prism
(c)		(iii) Sphere
(d)		(iv) Cuboid

3.

Solids	Figure	Value of $V + F - E$
(a) Cube		$8 + 6 - 12 = 2$
(b) Cuboid		$8 + 6 - 12 = 2$
(c) Triangular prism		$6 + 5 - 9 = 2$
(d) Triangular pyramid		$4 + 4 - 6 = 2$
(e) Square pyramid		$5 + 5 - 8 = 2$

4. (c) **5.** 

6. (c)

7. (a) No. of cubes in row $1 = 3 \times 1 = 3$ No. of cubes in row $2 = 3 \times 1 = 3$
No. of cubes in row $3 = 3 \times 2 = 6$ No. of cubes in row $4 = 3 \times 2 = 6$
No. of cubes in row $5 = 3 \times 3 = 9$ No. of cubes in row $6 = 3 \times 3 = 9$
$\therefore$ Total no. of cubes in fig (a) $= 3 + 3 + 6 + 6 + 9 + 9 = 36$
(b) No. of cubes in row $1 = 1 \times 1 = 1$ No. of cubes in row $2 = 2 \times 2 = 4$
No. of cubes in row $3 = 3 \times 3 = 9$ No. of cubes in row $4 = 4 \times 4 = 16$
$\therefore$ Total no. of cubes in fig. (b) $= 1 + 4 + 9 + 16 = 30$

8. There should be $36 + 36 = 72$ packs on 2 full shelves.

9. Triangular prism.

Multiple Choice Questions

1. (b) 2. (a) 3. (b) 4. (b) 5. (d)