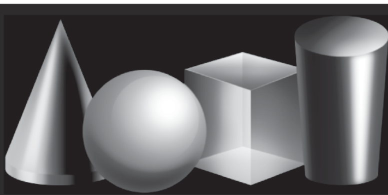
KIMAYA
Nurturing childhood with Divine Power



Mathematics Drill

Help Kit 6 to 8

Written by :
Ramesh Paul
M.Sc. (Maths), B.Ed.
&
Nikita Chauhan
M.Sc. (Maths), B.Ed.

Written by :
Ramesh Paul
M.Sc. (Maths), B.Ed.
&

E-LEARNING
INSTRUCTOR'S HANDBOOK
SOLVABLE QUESTIONNAIRE
LESSON PLANS
EXAM MAKER

1 Knowing Our Numbers

Exercise 1.1

1.

	Name of Periods	Crores	Lakhs		Thousands		Ones		
	Places	Crores	Ten Lakhs	Lakhs	Ten Thousands	Thousands	Hundreds	Tens	Ones
a.	71,507				7	1	5	0	7
b.	2,31,756			2	3	1	7	5	6
c.	10,45,723		1	0	4	5	7	2	3
d.	9,60,78,782	9	6	0	7	8	7	8	2

2.

	Name of Periods	Millions		Thousands			Ones		
	Places →	Ten Millions	Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
a.	23,175				2	3	1	7	5
b.	492,001			4	9	2	0	0	1
c.	7,823,120		7	8	2	3	1	2	0
d.	94,310,278	9	4	3	1	0	2	7	8

3. In the number 2,56,43,193 :
The place value of first 3 is 3.
The place value of 9 is 90.
The place value of 1 is 100.
The place value of second 3 is 3,000.
The place value of 4 is 40,000.
The place value of 6 is 6,00,000.
The place value of 5 is 50,00,000.

4.

	Numbers	Indian system of numeration	International system of numeration
a.	71932	71,932	71,932

b.	1979302	19,79,302	1,979,302
c.	876120345	87,61,20,345	876,120,345

5. (a) $3\times 1000+7\times 100+2\times 10$
$= 3000 + 700 + 20 \Rightarrow$ **3720**

(b) $9\times 10000000+6\times 100000+3\times 1000+5\times 10+5$
$=90000000+600000+3000+50+5\Rightarrow$ **90603055**

(c) $11\times 10000+7\times 1000+5\times 10+9$
$=1100000+700+50+9\Rightarrow$ **1100759**

6. (a) $540803015=500000000+40000000+0+800000+0+3000+0+10+5$
$=5\times 1000000000+4\times 10000000+8\times 100000+3\times 1000+1\times 10+5$

(b) $31234560 =30000000+1000000+200000+30000+4000+500 +60+0$
$=3\times 10000000+1\times 1000000+2\times 100000+3\times 10000+4\times 1000+ 5\times 100+6\times 10$

(c) $789507 =700000+80000+9000+500+0+7$
$=7\times 100000+8\times 10000+9\times 1000+5\times 100+7$

(d) $5700005 =5000000+700000+0+0+0+0+5$
$=5\times 1000000+7\times 100000+5$

7. (a) 36,44,06,200 = **36** crore **44** lakh **06** thousand **200**.

(b) 20 crtore 1 lakh 10 thousand 5 = **20,01,10,005**

(c) 278,001,123 = *278* million **1** thousand one hundred and twenty-three.

8. The place value of the digit 2 in the number 84235 is 200.
And, the face value of the digit 2 is 2.
So, the difference between the place value and the face value of the digit 2 in the number 84235 is (200 – 2) = 198.

```
 H T O
 ① ⑨ ⑩
 2̸ 0̸ 0̸
   – 2
 1 9 8
```

9. The place value of first 8 in the number 98378324 is 8,000,000.
And the place value of second 8 in the number 98378234 is 8,000.
So, the difference of the place value of two 8's in 98378234 is (8,000,000 – 8,000) = 7,992,000

```
TL L Tth Th H T O
⑦  ⑨  ⑨  ⑩
8̸  0̸  0̸  0̸  0 0 0
       – 8  0 0 0
7  9  9  2  0 0 0
```

10. The place value of 3 in the number 16234507 is 30,000.
And, the place value of 5 in the number 16234507 is 500.
So, the product of the place values of 3 and 5 in the number 16234507 is (30,000 × 500) = 15,000,000.

```
      3 0 0 0 0
      ×   5 0 0
1 5 0 0 0 0 0 0
```

11. The three digit numbers using the digits 5, 4 and 0 are 405, 450, 504 and 540.

12. Thousand's place digit = 7,
Hundred's place digit = 8
Tens place digit = 0
and one's place digit = 5
So, the required number is 7805.

13. Given, the number = 543
And, the number obtained buy reversing the digit = 345
So, the difference between the number 543 and the number obtained by reversing the digits is $(543-345)=198$.

$$\begin{array}{r} \overset{4}{\cancel{5}}\,\overset{13}{\cancel{4}}\,\overset{13}{\cancel{3}} \\ -\ 3\ 4\ 5 \\ \hline \boxed{1\ 9\ 8} \end{array}$$

14. Given, the number = 4485
And, the number obtained by interchanging the digits of hundred's and ten's places in 4485 is 4845.
Thus, the obtained number is increased by
$(4845-4485)=360$.

$$\begin{array}{rrrr} Th & H & T & O \\ & & 7 & 14 \\ 4 & \cancel{8} & \cancel{4} & 5 \\ -4 & 4 & 8 & 5 \\ \hline 0 & 3 & 6 & 0 \end{array}$$

15. Given, the number = 78654325
In the number 7,86,54,325.
(a) The value of the digit at hundred's place = 3 × 100 = 300.
(b) The value of the digit at ten thousand's place $=5\times 10{,}000=50{,}000$.
(c) The value of the digit at hundred thousand's place
$=6\times 100{,}000 \ =600{,}000$.
(d) The value of the digit at crore's place $=7\times 1{,}00{,}00{,}000=7{,}00{,}00{,}000$.
(e) The value of the digit at million's place $=8\times 1{,}00{,}000=8{,}000{,}000$.
(f) The value of the digit at ten million's place $=7\times 10{,}000{,}000=70{,}000{,}000$.

16. (a) Given numbers : 13,45,068; 7,63,048; 27,08,935; 27,09,835;
$\therefore$ The greatest number = 27,09,835.
And the smallest number = 7,63,048.
(b) Given numbers : 17,36,892; 92,31,y768; 3,68,92,173; 12,37,689
$\therefore$ The greatest number = 3,68,92,173.
And the smallest number = 12,37,689.

Exercise 1.2

1. (a) 2934 rounded off to the nearest thousand is 3000.
(b) 3764 rounded off to the nearest thousand is 4000.
(c) 7951 rounded off to the nearest thousand is 8000.

2. (a) 585856 rounded off to the nearest ten thousand is 5,90,000.
(b) 899132 rounded off to the nearest ten thousand is 90,000.
(c) 183246 rounded off to the nearest ten thousand is 1,80,000.

3. (a) 165263 rounded off to the nearest lakh is 2,00,000.
(b) 254305 rounded off to the nearest lakh is 3,00,000.
(c) 2639215 rounded off to the nearest lakh is 26,00,000.

4. The actual difference between the numbers 56,735 and 62,542 is :
$62{,}542-56{,}735=5807$
Now, 56,735 rounded off to the nearest thousand is 57,000.
And, 62,542 rounded off to the nearest thousand is 63,000.
So, the estimate difference = 63,000 – 57,000 = 6000.
Hence, the estimated difference is 193 more than the actual difference of 56,735 and 62,542.

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

$$\begin{array}{r} 6\ 3\ 0\ 0\ 0 \\ -\ 5\ 7\ 0\ 0\ 0 \\ \hline 0\ 6\ 0\ 0\ 0 \\ \hline \end{array}$$

5. 46 rounded up to 50.

And, 88 rounded down to 80.

So, the estimated product of 46 and 88 = $50 \times 80 = 4000$.

6. (a) $63 \div 29$

63 rounded off to 60 and 29 rounded off to 30.

So, the estimated quotient of $(63 \div 29) = 60 \div 30 = 2$..

(b) 2698 ÷ 61

2698 rounded off to 3000 and

61 rounded off to 60.

So, the estimated quotient of $(2698 \div 61) = 3000 \div 60 = 50$.

7. Given 31750 + 47807 + 12397

31750 rounded off to nearest thousand is 32,000.

47807 rounded off to nearest thousand is 48,000.

And, 12397 rounded off to nearest thousand is 12,000.

So, the estimated sum of (31750 + 47807 + 12397)

is (32,000 + 48,000 + 12,000) $\Rightarrow$ 92,000.

8. (a) 3655 + 498

3655 rounded off to 3700 and 498 rounded off to 500.

$\therefore$ (3655 + 498) $\approx$ 3700 + 500 $\Rightarrow$ 4200.

(b) 2894 + 6873 + 1350

2894 rounded off to 3000, 6873 rounded off to 7000 and 1350 rounded off to 1000.

$\therefore$ (2894 + 6873 + 1350) $\approx$ (3000 + 7000 + 1000) $\Rightarrow$ 11,000.

(c) 7006 – 3864

7006 rounded off to 7000 and 3864 rounded off to 4000.

$\therefore$(7006 – 3864) $\approx$ (7000 – 4000) $\Rightarrow$ 3000.

(d) 863 – 534

863 rounded off to 900 and 534 rounded off to 500.

$\therefore (863 - 534) \approx$ (900 – 500) $\Rightarrow$ 400.

(e) 7347 – 2167

7347 rounded off to 7000 and 2167 rounded off to 2000

$\therefore (7347 - 2167) \approx (7000 - 2000) \Rightarrow$ 5000.

9. (a) 25×73

25 rounded off to 30 and 73 rounded to 70.

So, the estimated product of (25×73) is $(30 \times 70) \Rightarrow 2100$.

(b) 491×421

491 rounded off to 500 and 421 rounded off to 400.

So, the estimated product of (491×421) is $(500 \times 400) = 200{,}000$.

(c) 659×34

659 rounded off to 700 and 34 rounded off to 30.

So, the estimated product of (659×34) is $(700 \times 30) \Rightarrow$ 21000.

10. The number of coins in a red bag = 1712

And, the number of coins in green bag = 1238

1712 rounded off to the nearest hundred is 1700.

And, 1238 rounded off to the nearest hundred is 1200.

So, the estimated number of coins to the near4est hundred in both the bags = (1700 + 1200) = 2900.

11. A shopkeeper has the sugar = 568 kg
He sells sugar everyday = 48 kg
568 rounded off to 600 and 48 rounded off to 50.
$\therefore$ Estimated quantity of sugar sold in 8 days = 8 × 50 kg = 400 kg
Now, the estimate4d quantity of sugar left with the shopkeeper = 600 kg – 400 kg = 200 kg.

12. Number of students going for a picnic = 355
And, the seating capacity of each bus = 62 students
355 rounded off to 360 and 62 rounded off to 60.
So, the estimated number of buses needed to take the students for the picnic = 360 ÷ 60 = 6

Exercise 1.3

1. Write each of the following as a Hindu-Arabic numeral :
(a) V = 5 (b) X = 10
(c) V = 10 + 5 = 15 (d) XX = 10 + 10 = 20
(e) XXV = 10 + 10 + 5 = 25
(f) XXIX = 10 + 10 + (10 – 1) = 20 + 9 = 29
(g) XXX = 10 + 10 + 10 = 30
(h) XXXV = 10 + 10 + 10 + 5 = 35
(i) XL = 50 – 10 = 40 (j) L = 50
(k) LX = 50 + 10 = 60 (l) XC = 100 – 10 = 90
(m)C = 100 (n) CI = 100 + 1 = 101
(o) CIX = 100 + (10 – 1) = 109
(p) CL = 100 + 50 = 150
(q) CC = 100 + 100 = 200
(r) CCXLIX = 100 + 100 + (50 – 10) + (10 – 1) = 200 + 40 + 9 = 249
(s) CCCL = 100 + 100 + 100 + 50 = 350
(t) CD = 500 – 100 = 400
(u) DCL = 500 + 100 + 50 = 650
(v) DCCLXVIII = 500 + 200 + 60 + 8 = 768
(w) CM = 1000 – 100 = 900 (x) M = 1000
(y) MCCL = 1000 + 200 + 50 = 1250

2. (a) 9 = 10 – 1 = IX (b) 19 = 10 + 9 = XIX
(c) 35 = 30 + 5 = XXXV (d) 39 = 30 + 9 = XXXIX
(e) 40 = 50 – 10 = XL (f) 59 = 50 + 9 = LIX
(g) 84 = 50 + 30 + 4 = LXXXIV (h) 79 = 50 + 20 + 9 = LXXIX
(I) 66 = 50 + 10 + 6 = LXVI (u) 69 = 50 + 10 + 9 = LXIX
(k) 75 = 50 + 20 + 5 = LXXV (l) 85 = 50 + 30 + 5 = LXXXV
(m) 44 = (50 – 10) + 4 = XLIV (n) 23 = 20 + 3 = XXIII
(o) 62 = 50 + 10 + 2 = LXII

3. (a) 341 = 300 + 40 + 1 = (100 + 100 + 100) + (50 – 10) + 1 = CCCXLI
(b) 226 = 200 + 20 + 6 = (100 + 100) + (10 + 10) + (5 + 1) = CCXXVI
(c) 195 = 100 + 90 + 5 = 100 + (100 – 10) + 5 = CXCV
(d) 164 = 100 + 60 + 4 = 100 + (50 + 10) + (5 – 1) = CLXIV
(e) 759 = 700 + 50 + 9 = (500 + 100 + 100) + 50 + (10 – 1) = DCCLIX
(f) 611 = 600 + 10 + 1 = (500 + 100) + 10 + 1 = DCXI
(g) 596 = 500 + 90 + 6 = 500 + (100 – 10) + (5 + 1) = DXCVI
(h) 475 = 400 + 70 + 5 = (500 – 100) + (50 + 10 + 10) + 5 = CDLXXV
(i) 334 = 300 + 30 + 4 = (100 + 100 + 100) + (10 + 10 + 10) + (5 – 1)
= CCCXXXIV
(j) 989 = 900 + 80 + 9 = (1000 – 100) + (50 + 10 + 10 + 10) + (10 – 1)
= CMLXXXIX

Multiple Choice Questions

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

Brain Teaser

1. The greatest for-digit number using 2 differed digits is 9,998.
2. The place value of ones digit of a number is always equal to its face value in respective of its position.
3. The greatest number on rounding off gives 5,400 is 5,449.
And, the smallest number on rounding off gives 5,400 is 5,350.
So, the difference between the greatest and the smallest numbers each of which on rounding off gives 5,400 is 5,449 – 5,350 = 99.

$$\begin{array}{r} 5\ 4\ 4\ 9 \\ -\ 5\ 3\ 5\ 0 \\ \hline 0\ 0\ 9\ 9 \end{array}$$

4. Given, India's population after some decades, according to a survay will be = 1,329,854,134.
(a) Population of India in words in International system of numeration :
1,3429,854,134 = One Billion three hundred twenty-nine.
Million eight hundred fifty-four thousand and one hundred thirty-four.
(b) Population of India in words in Indian system of numeration :
1,32,98,54,134 = one arab thirty-two crore ninety-eight lakh fifty-four thousand one hundred thirty-four.
5. The largest for-digit number formed by 0, 2, 5 and 7 is 7520.
And, the smallest for-digit number formed by 0, 2, 5 and 7 is 2057.
So, the difference between the smallest and the largest for-digit number formed by the digits 0, 2, 5 and 7 is 7520 – 2057 ⇒ 5463.

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

2 Whole Numbers

Exercise 2.1

1. (a) False, (b) False, (c) True, (d) False, (e) False

2. (a) ∵ 2221 < 2251

So, 2221 is on the left of the 2251 on the number line.

(b) ∵ 9521 > 5921

So, 5921 is on the left of the 9521 on the number line.

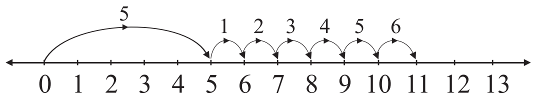
(c) Largest 2-digit number = 99

And, smallest three digit number = 100

∵ 99 < 100

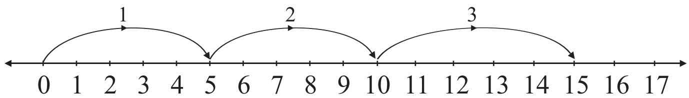
So, 99 is on the left of the 100 on the number line.

3.



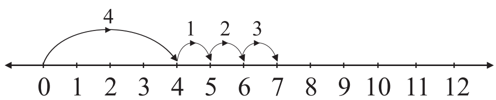
So, 5 + 6 = 11

4.



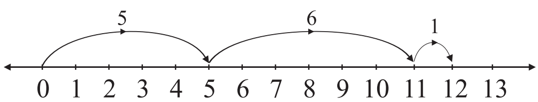
So, $5 \times 3 = 15$

5. (a) 4 + 3



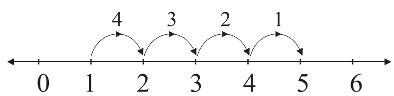
So, 4 + 3 = 7

(b) 5 + 6 + 1



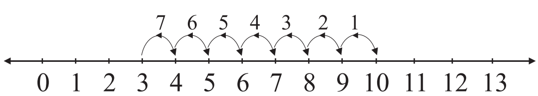
So, 5 + 6 + 1 = 12

(c) 5 – 4



So, 5 – 4 = 1

(d) 10 – 7



So, 10 – 7 = 3

Exercise 2.2

1. (a) $753+807+947$

$=(753+947)+807$

$=1700+807$

$=2507$

(b) $1983+647+217+353$

$=(1983+217)+(647+353)$

$=2200+1000$

$=3200$

(c) $186+278+314+422+2053$

$=(186+314)+(278+422)+2053$

$=500+700+2053$

$=1200+2053$

$=3253$

2. (a) 3, 5, 7

Now, $3+(5+7)=3+12 \Rightarrow 15$

And, $(3+5)=8+7 \Rightarrow 15$

So, $[3+(5+7)=(3+5)+7]$

(b) 2, 4, 6

Now, $2+(4+6)=2+10 \Rightarrow 12$

And, $(2+4)+6=6+6 \Rightarrow 12$

So, $[2+(4+6)=(2+4)+6]$

3. (a) $4\times 572\times 50$

$=572\times(50\times 4)$

$=572\times 200$

$=114400$

(b) $625\times 777\times 16$

$=777\times(25\times 25\times 4\times 4)$

$=777\times 100\times 100$

$=7770000$

(c) $125\times 799\times 4$

$=799\times(125\times 4)$

$=799\times 500$

$=399500$

(d) $50\times 29\times 80$

$=(50\times 80)\times 29$

$=4000\times 29$

$=116000$

4. Given, $a=256$ and $b=175$

Now, $a-b=256-175 \Rightarrow 81$

And, $b-a=175-256 \Rightarrow -81$

$\because 81 \neq -81$

So, $[a-b \neq b-a]$ **Proved.**

5. (a) $661\times 93+7\times 661$

$=661\times(93+7)$

$=661\times 100$

$=66,100$

(b) $562\times 4\times 80+281\times 20\times 8\times 4$

$=80\times(562\times 4+281\times 8)$

$=80\times(2248+2248)$

$=80\times 4496$

$=80\times(4500-1)$

$=360000-320$

$=359680$

(c) $265\times 7265-7265\times 265$

$=265\times(7265-7265)$

$=265\times 0$

$=0$

(d) $697\times 25\times 282+3485\times 5\times 718$

$=25\times(697\times 282)+25\times(697\times 718)$

$=25\times 297\times(282+718)$

$=25\times(700-3)\times 1000$

$= (17500 - 75) \times 1000$
$= 17425 \times 1000$
$= 17425000$

6. Given, $a = 12$, $b = 8$ and $c = 5$

Thus, $a - (b - c) = 12 - (8 - 5)$
$= 12 - 3 \Rightarrow 9$

And, $(a - b) - c = (12 - 8) - 5$
$= 4 - 5 \Rightarrow -1$

$\because \quad 9 \neq -1$

So, $[a - (b - c) \neq (a - b) - c]$ **Proved**.

7. Given, $a = 10$ and $b = 6$

Thus, $a - b = 10 - 6 \Rightarrow 4$

And, $b - a = 6 - 10 \Rightarrow -4$

$\because \quad 4 \neq -4$

So, $[a - b \neq b - a]$ **Proved**.

8. Given, $a = 256$, $b = 362$ and $c = 182$

Thus, $a - (b - c) = 256 - (362 - 182)$
$= 256 - 180 \Rightarrow 76$

And, $(a - b) - c = (256 - 362) - 182$
$= -106 - 182 \Rightarrow -288$

$\because \quad 76 \neq -288$

So, $[a - (b - c) \neq (a - b) - c]$ **Proved**

9. Given, $a = 4$, $b = 3$ and $c = 6$

(a) $a \times (b + c) = 4 \times (3 + 6)$
$= 4 \times 9$
$= 36$

(b) $ab + ac$
$= (4 \times 3) + (4 \times 6)$
$= 12 + 24$
$= 36$

So, $[a \times (b + c) = ab + ac]$

10. Verify that $b + c = a$ if $a - b = c$ for :

(a) $a = 5$, $b = 3$
$\because \; a - b = c$
$\therefore \; c = 5 - 3 \Rightarrow 2$
Thus, $b + c = 3 + 2$
$= 5 = a$
So, $[b + c = a]$ **Proved.**

(b) $a = 23$, $b = 9$
$\because \; a - b = c$
$\therefore \; c = 23 - 9 \Rightarrow 14$
Thus, $b + c = 9 + 14$
$= 23 = a$
So, $[b + c = a]$ **Proved.**

11. Given, $a = 8$, $b = 5$ and $c = 2$

(a) $a \times (b - c) = 8 \times (5 - 2)$
$= 8 \times 3$
$= 24$

(b) $ab - ac$
$= (8 \times 5) - (8 \times 2)$
$= 40 - 16$
$= 24$

So, $[a \times (b - c) = ab - ac]$

12. Given, $a = 84$ and $b = 4$

Thus, $a \div b = 84 \div 4 = \frac{84}{4} = 21$

And, $b \div a = 4 \div 84 = \frac{4}{84} = \frac{1}{21}$

$\because \quad 21 \neq \frac{1}{21}$

So, $[a \div b \neq b \div a]$ **Proved**.

13. The largest 5-digit number = 99,999
And, the smallest 3-digit number = 100
$\therefore$ Their difference = 99,999 – 100 = 99,899
So, the difference between the largest 5-digit number and smallest 3-digit number is 99,899.

14. The cost of each bedsheet = ₹ 350
And, the cost of each pillow cover = ₹ 50
$\therefore$ Total cost of 7 bedsheets and 13 pillow covers

= ₹ 350 × 7 + ₹ 50 × 13

= ₹ 50 × [49 + 13]

= ₹ 50 × 62 ⇒ ₹ 3100

Hence, the shopkeeper earns ₹ 3100 by selling the bedsheets and pillow covers.

15. (a) $4129 \times \mathbf{0} = 0$ (b) $78 \times 87 \times 15 = 87 \times \mathbf{78} \times 15$

(c) $195 \times \mathbf{405} = 405 \times \mathbf{195}$ (d) $7 \times 0 = \mathbf{0} = 0 \times \mathbf{7}$

(e) $1275 \div 1 = \mathbf{1275}$ (f) $5 \times 92 \times 20 = \mathbf{100} \times 92$

(g) $4 \times (25 \times 679) = (\mathbf{4} \times 25) \times 679$ (h) $\mathbf{0} + 515 = 515$

Exercise 2.3

1. (a) $37 \times 3 = 111$
$37 \times 6 = 222$
$37 \times 9 = 333$
$37 \times 12 = 444$
$37 \times 15 = 555$
$37 \times 18 = 666$

(b) $1 + 2 = 3$
$1 + 2 + 3 = 6$
$1 + 2 + 3 + 4 = 10$
$1 + 2 + 3 + 4 + 5 = 15$
$1 + 2 + 3 + 4 + 5 + 6 = 21$
$1 + 2 + 3 + 4 + 5 + 6 + 7 = 28$

(c) $9 \times 9 + 7 = 88$
$9 \times 98 + 6 = 88$
$9 \times 987 + 5 = 8888$
$9 \times 987 + 5 = 8888$
$9 \times 98765 + 3 = 888888$
$9 \times 987654 + 2 = 8888888$

(d) $99 \times 1 + 1 = 100$
$99 \times 2 + 2 = 200$
$99 \times 3 + 3 = 300$
$99 \times 4 + 4 = 400$
$99 \times 5 + 5 = 500$
$99 \times 6 + 6 = 600$

Multiple Choice Questions

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

Brain Teaser

71,234 + 0 = 71,234	45,638 × 0 = 0
6815 ÷ 6815 = 1	3636 − 3636 = 0
0 × 65,329 = 1	53,817 ÷ 1 = 53,817
2963 − 1 = 2962	79,643 + 1 = 79,644

NEP

Do it yourself

3 Playing with Numbers

Exercise 3.1

1. (a) First five multiples of 11 are 11, 22, 33, 44 and 55.
(b) First five multiples of 19 are 19, 38, 57, 76 and 95.
(c) First five multiples of 25 are 25, 50, 75, 100 and 125.
(d) First five multiples of 30 are 30, 60, 90, 120 and 150.

2. (a) All the factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.
(b) All the factors of 60 are 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60.
(c) All the factors of 56 are 1, 2, 4, 7, 8, 14, 28 and 56.
(d) All the factors of 144 are 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72 and 144.

3. (a) 13 (odd) (b) 26 (even)
(c) 38 (even) (d) 163 (odd)

4. All prime numbers between 10 and 50 are 11, 13, 17, 19, 23, 29, 31, 37, 41, 43 and 47.

5. Yes, A composite number can be an odd number. The smallest odd composite number is 9.

6. All pairs of twin prime numbers between 40 and 80 are (41, 43), (59, 61) and (71, 73).

7. All the odd composite numbers which are less than 30 are 9, 15, 21, 25 and 27.

8. (a) 24 = 11 + 13 = 17 + 7 = 19 + 5
(b) 44 = 3 + 41 = 7 + 37 = 13 + 31.
(c) 76 = 3 + 73 = 5 + 71 = 17 + 59 = 23 + 53 = 29 + 47
(d) 80 = 7 + 73 = 13 + 67 = 19 + 61 = 37 + 43

9. (a) 31 = 3 + 5 + 23 = 3 + 11 + 17 = 5 + 7 + 19 = 5 + 13 + 13 = 7 + 11 + 13
= 7 + 7 + 17
(b) 61 = 3 + 5 + 53 = 3 + 11 + 47 = 3 + 17 + 41 = 3 + 29 + 29
= 5 + 13 + 43 = 5 + 19 + 37 = 7 + 7 + 47 = 7 + 11 + 43 = 7 + 13 + 41
= 7 + 17 + 37 = 7 + 23 + 31 = 11 + 13 + 37 = 11 + 19 + 31 = 13 + 17 + 31
= 13 + 19 + 29 = 19 + 19 + 23

(c) 71 = 3 + 7 + 61 = 3 + 31 + 37 = 5 + 5 + 61 = 5 + 7 + 59 = 5 + 13 + 53
= 5 + 19 + 47 = 5 + 23 + 43 = 5 + 29 + 37 = 7 + 11 + 53 = 7 + 17 + 47
= 7 + 23 + 41 = 11 + 13 + 47 = 11 + 17 + 43 = 11 + 19 + 41 = 11 + 23 + 37
= 11 + 29 + 31 = 13 + 17 + 41 = 13 + 29 + 29 = 17 + 17 + 37
= 17 + 23 + 31 = 19 + 23 + 29

(d) 35 = 3 + 3 + 29 = 3 + 13 + 19 = 5 + 7 + 23 = 5 + 11 + 19 = 5 + 13 + 17
= 7 + 11 + 17 = 11 + 11 + 13

10. (a) False (b) True (c) True (d) False,
(e) False (f) False (g) False (h) False (i) True

11. Factors of 24 are 1, 2, 3, 4, 6, 8, 12 and 24.
Thus, the sum of factors = 1 + 2 + 3 + 4 + 6 + 8 + 12 + 24 = 60 (not divisible by 24)
So, 24 is not a perfect number.

12. All the prime numbers less than 100 and having 3 as the digit at its one's place are 3, 13, 23, 43, 53, 73 and 83.

Exercise 3.2

1. (a) 652

652 is not divisible by 8.

∵ 52 is divisible by 4.

∴ 652 is also divisible by 4 and 2.

Hence, 652 is divisible by 2 and 4 only.

8) 652 (81
− 64
12
− 8
4

(b) 4896

∵ 896 is divisible by 8.

∴ 4896 is also divisible by 8, 4 and 2.

Hence, 4896 is divisible by 2, 4 and 8.

(c) 37780

∵ 780 is not divisible by 8.

∴ 37780 is not divisible by 8.

∵ 80 is divisible by 4.

∴ 37780 is also divisible by 4 and 2.

Hence, 37780 is divisible by 2 and 4 only.

(d) 5086

∵ 86 is not divisible by 4 and 8.

∴ 5086 is also not divisible by 4 and 8.

∵ 5086 is an even number.

∴ 5086 is divisible by 2.

Hence, 5086 is divisible by 2 only.

(e) 19334

∵ 334 is not divisible by 8.

∴ 19334 is also not divisible by 8.

∵ 34 is not divisible by 4.

∴ 19334 is also not divisible by 4.

∵ 19334 is an even number.

∴ 19334 is divisible by 2.
Hence, 19334 is divisible by 2 only.

(f) 21084
∵ 84 is not divisible by 8 and divisible by 4.
∴ 21084 is also not divisible by 8 and divisible by 4.
∵ 21084 is an even number.
21084 is divisible by 2.
Hence, 21084 is divisible by 2 and 4 only.

2. (a) 3522
Sum of all the digits of the number = 3 + 5 + 2 + 2 ⇒ 12
∵ 12 is divisible by 3 and not divisible by 9.
∴35 is also divisible by 3 and not divisible by 9.
Sum of even place digits = 2 + 3 = 5
And, sum of odd place digits = 2 + 5 = 7
Now, the difference between the sums of odd and even places values
= 7 – 5 ⇒ 2 (not divisible by 11).
∴3522 is not divisible by 11.
∵ 3522 is an even number and divisible by 3.
∴3522 is divisible by 6.
∵ Unit place value of 3522 is not 5 or 0.
∴3522 is not divisible by 5 and 10.
Hence, 3522 is divisible by 3 and 6 only.

(b) 756
Sum of all the digits of the number = 7 + 5 + 6 ⇒ 18
∵ 18 is divisible by 3 and 9.
∴756 is also divisible by 3 and 9.
Sum of even place digits = 5
And, sum of odd place digits = 7 + 6 = 13
Now, the difference between the sums of odd and even place digits
= 13 – 5 ⇒ 8 (not divisible by 11).
∴756 is not divisible by 11.
∵ 756 is an even number and divisible by 3.
∴756 is divisible by 6.
The unit place value of 756 is not 0 or 5.
∴756 is not divisible by 5 and 10.
Hence, 756 is divisible by 3, 6 and 9 only.

(c) 21335
Sum of all the digits of the number = 2 + 1 + 3 + 3 + 5 ⇒ 14
∵ 14 is not divisible by 3 and 9.

21335 is also not divisible by 3 and 9.
Now, sum of even place digits = 3 + 1 ⇒ 4
And, sum of odd place digits = 5 + 3 + 2 ⇒ 10

Now, the difference between the sums of even and odd place digits
$= 10 - 4 \Rightarrow 6$

$\because$ 6 is not divisible by 11.

$\therefore$ 21335 is also not divisible by 11.

$\because$ 21335 is not an even number.

$\therefore$ 21335 is not divisible by 6 and 10.

The unit place of 21335 is 5.

$\therefore$ 21335 is divisible by 5.

Hence, 21335 is divisible by only 5.

(d) 50391

Sum of all digits of the number $= 5 + 0 + 3 + 9 + 1 \Rightarrow 18$

$\because$ 18 is divisible by 3 and 9.

$\therefore$ 50391 is also divisible by 3 and 9.

Sum of even place digits $= 9 + 0 \Rightarrow 9$

And, sum of odd place digits $= 1 + 3 + 5 \Rightarrow 9$

Now, the difference between the sums of even and odd digits of number $= 9 - 9 = 0$ (divisible by 11).

$\therefore$ 50391 is divisible by 11.

$\because$ 50391 is not an even number.

$\therefore$ 50391 is not divisible by 6 and 10.

The unit place of 50391 is not 0 or 5.

$\therefore$ 50391 is not divisible by 5 and 10.

Hence, 50391 is divisible by 3, 9 and 11 only.

(e) 8964

Sum of all the digits of the number $= 8 + 9 + 6 + 4 \Rightarrow 27$

$\because$ 27 is divisible by 3 and 9.

$\therefore$ 8964 is also divisible by 3 and 9.

Sum of even place digits $= 6 + 8 \Rightarrow 14$

And, sum of odd place digits $= 4 + 9 \Rightarrow 13$

Now, the difference between the sums of even and odd places digits
$= 14 - 13 \Rightarrow 1$ (not divisible by 11).

$\therefore$ 8964 is not divisible by 11.

$\because$ 8964 is an even number and divisible by 3.

$\therefore$ 8964 is divisible by 6.

The unit place digit of number 8964 is not 0 or 5.

$\therefore$ 8964 is not divisible by 5 and 10.

Hence, 8964 is divisible by 3, 6 and 9 only.

(f) 100090

Sum of all the digits of the number $= 1 + 0 + 0 + 0 + 9 + 0 \Rightarrow 10$

$\because$ 10 is not divisible by 3 and 9.

$\therefore$ 100090 is also not divisible by 3 and 9.

Sum of even place digits $= 9 + 0 + 1 \Rightarrow 10$

And, sum of odd place digits $= 0 + 0 + 0 \Rightarrow 0$.

Now, the difference between the sums of even and odd place digits

$= 10 - 0 \Rightarrow 10$ (not divisible by 11).

$\therefore$ 100090 is not divisible by 11.

$\because$ 100090 is not divisible by 3.

$\therefore$ 100090 is also not divisible by 6.

The unit place digit of number 100090 is 0.

$\therefore$ 100090 is divisible by 5 and 10 both.

Hence, 100090 is divisible 5 and 10 only.

(g) 103081

The sum of all the digits of number $= 1 + 0 + 3 + 0 + 8 + 1 \Rightarrow 13$

$\because$ 13 is not divisible by 3 and 9.

$\therefore$ 103081 is also not divisible by 3 and 9.

Sum of even place digits $= 8 + 3 + 1 \Rightarrow 12$

And, sum of odd place digits $= 1 + 0 + 0 \Rightarrow 1$

Now, the difference between the sums of even and odd places digits

$= 12 - 1 \Rightarrow 11$ (divisible by 11).

$\therefore$ 103081 is divisible by 11.

$\because$ 103081 is not an even number.

$\therefore$ 103081 is not divisible by 6 and 10.

The unit digit of number 103081 is not 5 or 0.

$\therefore$ 103081 is not divisible by 5 and 10.

Hence, 103081 is divisible by 11 only.

(h) 50391

The sum of all the digits of number $= 5 + 0 + 3 + 9 + 1 \Rightarrow 18$

$\because$ 18 is divisible by 3 and 9.

$\therefore$ 50391 is also divisible by 3 and 9.

Sum of even place digits $= 9 + 0 \Rightarrow 9$

And, sum of odd place digits $= 1 + 3 + 5 \Rightarrow 9$

Now, the difference between the sums of even and odd place digits

$= 9 - 9 \Rightarrow 0$ (divisible by 11).

$\therefore$ 50391 is divisible by 11.

$\because$ 50391 is not an even number.

$\therefore$ 50391 is not divisible by 6 and 10.

The unit digit of number 50391 is not 0 or 5.

$\therefore$ 50391 is not divisible by 5 and 10.

Hence, 50391 is divisible by 3, 9 and 11 only.

(i) 20834

The sum of all the digits of number $= 2 + 0 + 8 + 3 + 4 \Rightarrow 17$

$\because$ 17 is not divisible by 3 and 9.

$\therefore$ 20834 is not divisible by 3 and 9.

Sum of even place digits $= 3 + 0 \Rightarrow 3$

And, sum of odd place digits $= 4 + 8 + 2 \Rightarrow 14$

Now, the difference between the sums of even and odd place digits

$= 14 - 3 \Rightarrow 11$ (divisible by 11).

$\therefore$ 20834 is divisible by 11.

$\because$ 20834 is not divisible by 3.

$\therefore$ 20834 is also not divisible by 6.

The unit place digit of number 20834 is not 0 or 5.

$\therefore$ 20834 is not divisible by 5 and 10.

Hence, 20834 is divisible by 11 only.

3. (a) 4129* divisible by 3.

Sum of all digits of the number = 4 + 1 + 2 + 9 + * = 16 + *

$\because$ 4129* divisible by 3.

$\therefore$ 16 + * divisible by 3

Thus, 16 + * = 18

$\therefore$ * = $18 - 16 \Rightarrow 2$

So, the smallest number of the value of * is 2.

(b) 157* divisible by 2.

$\because$ An even number is divisible by 2.

$\therefore$ 1570 is divisible by 2.

So, the smallest value of * is 0.

(c) 7158* by 6

$\because$ An even number is divisible by 6.

$\therefore$ The value of * is an even number

Now, the sum of the number = 7 + 1 + 5 + 8 + *

= 21 + *

$\because$ 7158 is divisible by 6.

$\therefore$ 21 + * is also divisible by 3.

Thus, 21 + * = 21

* = $21 - 21 \Rightarrow 0$

So, the smallest value of * is 0.

(d) 260*2 divisible by 4.

$\because$ 260 * 2 is divisible by 4.

$\therefore$ * 2 is divisible by 4.

$\because$ 12 is divisible by 4.

So, the smallest value of * is 1.

(e) 1305* divisible by 10.

If the unit place digit of a number is 0.

Thus, the number is divisible by 10.

$\because$ 1305* is divisible by 10.

$\therefore$ 13050 is divisible by 10.

So, the smallest value of * is 0.

(f) 6511*2 divisible by 9.

Now, the sum of all digits of number = 6 + 5 + 1 + 1 + * + 2 = 15 + *

$\because$ 6511*2 is divisible by 9.

$\therefore$ 15 + * is also divisible by 9.

Thus, 15 + * = 18

* = 18 – 15 $\Rightarrow$ 3

So, the smallest value of * is 3.

(g) 637*8 divisible by 8.

$\because$ 637*8 is divisible by 8.

$\therefore$ 7 * 8 is also divisible by 8.

$\because$ 728 is divisible by 8.

So, the smallest value of * is 2.

(h) 215*173 divisible by 11.

Now, the sum of odd place digits = 3 + 1 + 5 + 2 $\Rightarrow$ 11

And, the sum of even place digits = 7 + * + 1 $\Rightarrow$ 8 + *

If the difference of the sums of even and odd place digits is 0 or a multiple of 11.

Thus, the number is divisible by 11.

$\because$ 215 * 173 is divisible by 11.

$\therefore$ 8 + * – 11 = 0

* = 11 – 8 $\Rightarrow$ 3

So, the smallest value of * is 3.

(i) 2*7* divisible by 5.

If the unit place digit of a number is 0 or 5.

Thus, the number is divisible by 5.

$\because$ 2 * 7 * is divisible by 5.

Thus, 2070 and 2575 are divisible by 5.

So, the smallest value of * is 0.

4. (a) True, (b) False, (c) True, (d) True,
(e) True, (f) False, (g) True;

5. (a) 39

$\because 39 < 7^2$

Now, we divide 39 by 2, 3, 5 and 7.

$\because$ 39 is divisible by 3.

So, 39 is not a prime number.

(b) 193

$\because 193 < 14^2$

Now, we divide 193 by 2, 3, 5, 7, 11 and 13.

$\because$ 193 is not divisible by 2, 3, 5, 7, 11 and 13.

So, 193 is a prime number.

(c) 307

$\because 307 < 18^2$

Now, we divide 307 by 2, 3, 5, 7, 11, 13 and 17.

$\because$ 307 is not divisible by 2, 3, 5, 7, 11, 13 and 17.

So, 307 is a prime number.

(d) 327

$\because 327 < 19^2$

Now, we divide 327 by 2, 3, 5, 7, 11, 13, 17 and 19.

$\because$ 327 is divisible by 3.

So, 327 is not a prime number.

(e) 283

$\because 283 < 17^2$

Now, we divide 283 by 2, 3, 5, 7, 11, 13 and 17.

$\because$ 283 is not divisible by 2, 3, 5, 7, 11, 13 and 17.

So, 283 is a prime number.

(f) 129

$\because 129 < 12^2$

Now, we divide 129 by 2, 3, 5, 7 and 11.

$\because$ 129 is divisible by 3.

So, 129 is not a prime number.

(g) 397

$\because 397 < 20^2$

Now, we divide 397 by 2, 3, 5, 7, 11, 13, 17 and 19.

$\because$ 397 is not divisible by 2, 3, 5, 7, 11, 13, 17 and 19.

So, 397 is a prime number.

(h) 187

$\because 187 < 14^2$

Now, we divide 187 by 2, 3, 5, 7, 11 and 13.

$\because$ 187 is divisible by 11.

So, 187 is not a prime number.

6. (a) 137

$\because 11^2 < 137 < 12^2$

Now, we divide 137 by 2, 3, 5, 7 and 11.

$\because$ 137 is not divisible by any of these numbers.

Hence, 137 is a prime number.

(b) 203

$\because 14^2 < 203 < 15^2$

Now, we divide 203 by 2, 3, 5, 7, 11 and 13.

$\because$ 203 is divisible by 7.

Hence, 203 is not a prime number.

(c) 317

$\because 17^2 < 317 < 18^2$

Now, we divide 317 by 2, 3, 5, 7, 11, 13 and 17.

$\because$ 317 is not divisible by any of these numbers.

Hence, 317 is a prime number.

(d) 407

$\because 20^2 < 407 < 21^2$

Now, we divide 407 by 2, 3, 5, 7, 11, 13, 17 and 19.

$\because$ 407 is divisible by 11.

Hence, 407 is not a prime number.

Exercise 3.3

1. The prime factorisation of a prime number is (1× number itself).

2. $\because 9 = 3 \times 3$

$\therefore 9 = 1 \times 9$ is not the prime factorisaton of 9.

3. (a) 945

945
3 × 315
3 × 105
3 × 35
5 × 7

So, 945 = 3 × 3 × 3 × 5 × 7;

(b) 3502

3502
2 × 1751
17 × 103

So, 3502 = 2 × 17 × 103;

(c) 2907

2907
3 × 969
3 × 323
17 × 19

So, 2907 = 3 × 3 × 17 × 19;

4. (a) 216

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

So, $216 = 2\times 2\times 2\times 3\times 3\times 3$;

(b) 2121

3	2121
7	707
101	101
	1

So, $2121 = 3\times 7\times 101$;

(c) 1729

7	1729
13	247
19	19
	1

So, $1729 = 7\times 13\times 19$;

(d) 1197

3	1197
3	399
7	133
19	19
	1

So, $1197 = 3\times 3\times 7\times 19$;

(e) 12000

2	1200
2	6000
2	3000
2	1500
2	750
3	375
5	125
5	25
5	5
	1

So, $12000 = 2\times 2\times 2\times 2\times 2\times$
$3\times 5\times 5\times 5$

(f) 20570

2	20570
5	10285
11	2057
11	187
17	17
	1

So, 20570
$= 2\times 5\times 11\times 11\times 17$;

5. The smallest six-digit number = 1,00,000
So, the prime factorisation of the smallest six-digit number
$1,00,000 = 2\times 2\times 2\times 2\times 2\times 5\times 5\times 5\times 5\times 5;$

2	100000
2	50000
2	25000
2	12500
2	6250
5	3125
5	625
5	125
5	25
5	5
	1

6. The largest four-digit number = 9999
So, the prime factorisation of the largest four-digit number is
$9999 = 3\times 3\times 11\times 101;$

3	9999
3	3333
11	1111
101	101
	1

7. (a) 36 and 84
Prime factorsation of 36 and 84 are :
$36 = 2 \times \boxed{2} \times \boxed{3} \times 3$
and, $84 = 2 \times \boxed{2} \times \boxed{3} \times 7$
$\therefore$ HCF $= 2\times 2\times 3 \Rightarrow 12$
So, the HCF of 36 and 84 is 12.

2	36
2	18
3	9
3	3
	1

2	84
2	42
3	21
7	7
	1

(b) 44 and 110
Prime factorisation of 44 and 110 are :
$44 = \boxed{2} \times 2 \times \boxed{11}$
and $110 = \boxed{2} \times 5 \times \boxed{11}$
$\therefore$ HCF $= 2\times 11 \Rightarrow 22$
So, the HCF of 44 and 110 is 22.

2	44
2	22
11	11
	1

2	110
5	55
11	11
	1

(c) 117 and 81
Prime factorisation of 117 and 81 are :
$117 = \boxed{3} \times \boxed{3} \times 13$
and $81 = \boxed{3} \times \boxed{3} \times 3 \times 3$
$\therefore$ HCF $= 3\times 3 \Rightarrow 9$
So, the HCF of 117 and 81 is 9.

3	117
3	39
13	13
	1

3	81
3	27
3	9
3	3
	1

(d) 70, 35 and 49
Prime factorisation of 70, 35 and 49 are :
$70 = 2 \times 5 \times \boxed{7}$
$35 = 5 \times \boxed{7}$
and $49 = 7 \times \boxed{7}$
$\therefore$ HCF = 7
So, the HCF of 70, 35 and 49 is 7.

2	70
5	35
7	7
	1

5	35
7	7
	1

7	49
7	7
	1

(e) 234, 519 and 78
Prime factorisation of 234, 519 and 78 are :

$234 = 2 \times 3 \times 3 \times 13$
$519 = 3 \times 173$
And, $78 = 2 \times 3 \times 13$
$\therefore$ HCF = 3
So, the HCF of 234, 519 and 78 is 3.

2	234		2	2346		3	4761
3	117		3	1173		3	1587
3	39		17	391		23	529
13	13		23	23		23	23
	1			1			1

(f) 1794, 2346 and 4761

Prime factorisation of 1794, 2346 and 4761 are :

$1794 = 2 \times 3 \times 13 \times 23$
$2346 = 2 \times 3 \times 17 \times 23$
and $4761 = 3 \times 3 \times 23 \times 23$
$\therefore \text{HCF} = 3 \times 23 \Rightarrow 69$
So, the HCF of 1794, 2346 and 4761 is 69.

2	1794		2	2346		3	4761
3	897		3	1173		3	1587
13	299		17	391		23	529
23	23		23	23		23	23
	1			1			1

8. (a) 161, 325

By division method :

```
161)325( 2
   -322
     3)161(53
      -159
         2)3 (1
         - 2
           1)2 ( 2
             - 2
               ×
```

So, the HCF of 161 and 325 is 1.

(b) 345, 506

By division method :

```
345)506(1
   -345
    161)345(2
       -322
         23)161(7
           - 161
              ×
```

So, the HCF of 345 and 506 is 23.

(c) 615, 1599

```
615)1599(2
   -1230
     369)615(1
         369
        246)369( 1
            246
            123)246( 2
               - 246
                  ×
```

So, the HCF of 615 and 1599 is 123.

(d) 4130, 7021

```
4130)7021(1
    -4130
     2891)4130(1
         -2891
          1239)2891(2
              -2478
                413)1239(3
                   - 1239
                       ×
```

So, the HCF of 4130 and 7021 is 413.

(e) 289, 391 and 884

First, we find the HCF of 289 and 391.

```
289)391(1
   -289
    102 )289(1
        -204
          85)102 (2
             -85
              17) 85 (5
                 -85
                   ×
```

$\therefore$ HCF of 289 and 391 is 17

Now, we find the HCF of 17 and 884.

17)884(5
– 85
34
– 34
×

∴HCF of 17 and 884 is 17.
Hence, the HCF of 289, 391 and 8984 is 17.

(f) 2103, 9945 and 9216
First, we find the HCF of 2103 and 9945.

2103)9945(4
–8412
1533)2103(2
–1533
570)1533(2
–1140
393)570(1
–393
177)393(2
–354
39)177(4
–156
21) 39 (1
– 21
18)21(1
–18
3)18(6
–18
×

∴HCF of 2103 and 9945 is 3.
Now, we find the HCF of 3 and 9216

3) 9216(3072
– 9
021
– 21
06
– 6
×

∴HCF of 3 and 9216 is 3.
Hence, the HCF of 2103, 9945 and 9216 is 3.

9. Given, a number devides 445, 572 and 699, leaving remainders 4, 5 and 6 respectively.
Thus, the required number = HCF of $(445-4), (572-5)$ and $(699-6)$
= HCF of 441, 567 and 693
Now, prime factorisation of

3	441	3	567	3	693
3	147	3	189	3	231
7	49	3	63	7	77
7	7	3	21	11	11
	1	7	7		1
			1		

441 = 3 × 3 × 7 × 7
Prime factorisation of 567 = 3 × 3 × 3 × 3 × 7
and prime factorsation of 693 = 3 × 3 × 7 × 11

$\therefore$ HCF of 441, 567 and 693 $= 3\times 3\times 7 = 63$

Hence, the required largest number is 63.

10. Given, a number divides 719 and 930, leaving remainders 5 and 6 respectively.

Thus, the required number

$= \text{HCF of } (719-5) \text{ and } (930-6)$

= HCF o 714 and 924

2	924
2	462
3	231
7	77
11	11
	1

Now, prime factorisation of 714 $= 2\times 3\times 7\times 17$

And, prime factorisation of 924 $= 2\times 2\times 3\times 7\times 11$

$\therefore$ HCF of 714 and 924 $= 2\times 3\times 7 = 42$

Hence, the required largest number is 42.

11. Given, a number divides 2273, 1823 and 977 learing a remainder 5 in each case.

Thus, the required number

= HCF of

$(2273-5), (1823-5)$ and $(977-5)$

= HCF of 2268, 1818 and 972.

2	2268
2	1134
3	567
3	189
3	63
3	21
7	7
	1

2	1828
3	909
3	303
101	101
3	1

2	972
2	486
3	243
3	81
3	27
3	9
3	3
	1

Now, prime factorisation of 2268 $= 2\times 2\times 3\times 3\times 3\times 7$

prime factorisation of 1818 $= 2\times 3\times 3\times 101$

and prime factorisation of 972 $= 2\times 2\times 3\times 3\times 3\times 3\times 3$

$\therefore$ HCF of 2268, 1818 and 972 $= 2\times 3\times 3 = 18$

Hence, the required largest number is 18.

12. Required length of the measuring scale

= HCF of 180 metres and 192 metres

Prime factorisation of $192 = 2\times 2\times 2\times 2\times 2\times 2\times 3$

and, prime factorisation of $180 = 2\times 2\times 3\times 3\times 5$

$\therefore$ HCF of 180 and 192 $= 2\times 2\times 3 = 12$

Hence, the required length of the measuring scale is 12 metres, which can be used to measure exactly 180 metres and 192 metres.

2	180
2	90
3	45
3	15
5	5
	1

2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

13. Given, the length of the floor of a room

$= 6$ m 30 cm

$= (6\times 100+30)$ cm

= 630 cm

and, the width of the floor of the room

= 5 m 85 cm

$= (5\times 100+85)$ cm

= 585 cm

2	630
3	315
3	105
5	35
7	7
	1

3	585
3	195
5	65
13	13
	1

Now, prime factorisation of 630 $= 2 \times 3 \times 3 \times 5 \times 7$
and, prime factorisation of 585 $= 3 \times 3 \times 5 \times 13$

$\therefore$ HCF of 630 and 585 $= 3 \times 3 \times 5 = 45$

$\therefore$ Length of the largest sided tile which is paved to the floor = HCF of 630 and 585 (in cm) = 45 cm.

So, the required number of tiles $= \dfrac{\text{Area of the folder of the room}}{\text{Area of a tile}}$

$$= \frac{630 \text{ cm} \times 585 \text{ cm}}{45 \text{ cm} \times 45 \text{ cm}} = 14 \times 13 = 182.$$

Hence, the side of largest sized square marble tile is 45 cm. And the required number of tiles is 182.

14. Given, the length of a room = 8 m 25 cm $\Rightarrow$ 825 cm
The breath of the room = 6 m 75 cm $\Rightarrow$ 675 cm
And, the height of the room = 4 m 50 cm $\Rightarrow$ 450 cm

3	825
5	275
5	55
11	11
	1

3	675
3	225
3	75
5	25
5	5
	1

2	450
3	225
3	75
5	25
5	5
	1

Now, prime factorisation of 825 $= 3 \times 5 \times 5 \times 11$
prime factorisation of 675 $= 3 \times 3 \times 3 \times 5 \times 5$
and prime factorisation of 450 $= 2 \times 3 \times 3 \times 5 \times 5$

$\therefore$ HCF of 825, 675 and 450 $= 3 \times 5 \times 5 = 75$

Thus, the length of the required tape which can measure the three dimension of the room exactly
= HCF of 825, 675 and 450 (in cm)
= 75 cm

So, the length of the longest tape which can measure the three dimensions of the room exactly is 75 cm.

15. (a) $\dfrac{65}{91}$

$\because$ HCF of 65 and 91 is 13

$\therefore \dfrac{65}{91} = \dfrac{65 \div 13}{91 \div 13} \Rightarrow \dfrac{5}{7}$

(b) $\dfrac{289}{408}$

$\because$ HCF of 289 and 408 is 17.

$\therefore \dfrac{289}{408} = \dfrac{289 \div 17}{408 \div 17} \Rightarrow \dfrac{17}{24}$

(c) $\dfrac{399}{437}$

$\because$ HCF of 399 and 437 is 19.

$\therefore \dfrac{399}{437} = \dfrac{399 \div 19}{437 \div 19} \Rightarrow \dfrac{21}{23}$

(d) $\dfrac{623}{833}$

$\because$ HCF of 623 and 833 is 7.

$\therefore \dfrac{623}{833} = \dfrac{623 \div 7}{833 \div 7} \Rightarrow \dfrac{89}{119}$

Exercise 3.4

1. (a) 24 and 117

2	24
2	12
2	6
3	3
	1

3	117
3	39
13	13
	1

Prime factorization of 24 $= 2\times 2\times 2\times 3$
and, Prime factorization of 117 $= 3\times 3\times 13$
$\therefore$ LCM $= 2\times 2\times 2\times 3\times 3\times 13 = 936$
So, the LCM of 24 and 117 is 936.

(b) 48 and 60

2	48
2	24
2	12
2	6
3	3
	1

2	60
2	30
3	15
5	5
	1

Prime factorization of 48 $= 2\times 2\times 2\times 2\times 3$
and, prime factorization of 60 $= 2\times 2\times 3\times 5$
$\therefore$ LCM $= 2\times 2\times 2\times 2\times 3\times 5 = 240$
So, the LCM of 48 and 60 is 240.

(c) 11, 22, 24 and 36

2	22
11	11
	1

2	24
2	12
2	6
3	3
	1

2	36
2	18
3	9
3	3
	1

Prime factorization of 11 $= 1\times 11$
Prime factorization of 22 $= 2\times 11$
Prime factorization of 24 $= 2\times 2\times 2\times 3$
and, prime factorization of 36 $= 2\times 2\times 3\times 3$
$\therefore$ LCM $= 2\times 2\times 2\times 3\times 3\times 11 = 792$
So, the LCM of 11, 22, 24 and 36 is 792.

(d) 102, 170 and 136

2	102
3	51
17	17
	1

2	170
5	85
17	17
	1

2	136
2	68
2	34
17	17
	1

Prime factorization of 102 $= 2\times 3\times 17$
Prime factorization of 170 $= 2\times 5\times 17$
and, prime factorization of 136 $= 2\times 2\times 2\times 17$
$\therefore$ LCM $= 2\times 2\times 2\times 3\times 5\times 17 = 2040$
So, the LCM of 102, 170 and 136 is 2040.

(e) 114, 180 and 57.

2	114
3	57
19	19
	1

2	180
2	90
3	45
3	15
5	5
	1

3	57
19	19
	1

Prime factorization of 114 $= 2\times 3\times 19$
Prime factorization of 180 $= 2\times 2\times 3\times 3\times 5$
and, prime factorization of 57 $= 3\times 19$
$\therefore$ LCM $= 2\times 2\times 3\times 3\times 5\times 19 = 3420$
So, the LCM of 114, 10 and 57 is 3420.

(f) 108, 96, 72, 54 and 36

2	108
2	54
3	27
3	9
3	3
	1

2	96
2	48
2	24
2	12
2	6
3	3
	1

2	72
2	36
2	18
3	9
3	3
	1

2	54
3	27
3	9
3	3
	1

2	36
2	18
3	9
3	3
	1

Prime factorization of $108 = 2\times 2\times 3\times 3\times 3$
Prime factorization of $96 = 2\times 2\times 2\times 2\times 2\times 3$
Prime factorization of $72 = 2\times 2\times 2\times 3\times 3$
Prime factorization of $54 = 2\times 3\times 3\times 3$
and, prime factorization of $36 = 2\times 2\times 3\times 3$
$\therefore$ LCM $= 2\times 2\times 2\times 2\times 2\times 3\times 3\times 3 = 864$
So, the LCM of 108, 96, 72, 54 and 36 is 864.

2. (a) 20, 24 and 45

2	20, 24, 45
2	10, 12, 45
2	5, 6, 45
3	5, 3, 45
3	5, 1, 15
5	5, 1, 5
	1, 1, 1

$\therefore$ LCM $= 2\times 2\times 2\times 3\times 3\times 5 = 360$
So, the LCM of 20, 24 and 45 is 360.

(b) 56 and 70

2	56, 70
2	28, 35
2	14, 35
5	7, 35
7	7, 7
	1, 1

$\therefore$ LCM $= 2\times 2\times 2\times 5\times 7 = 280$
So, the LCM of 56 and 70 is 280.

(c) 660, 420 and 240

2	660, 420, 240
2	330, 210, 120
2	165, 105, 60
2	165, 105, 30
3	165, 105, 15
5	55, 35, 5
7	11, 7, 1
11	11, 1, 1
	1, 1, 1

$\therefore$ LCM $= 2\times 2\times 2\times 2\times 3\times 5 \times 7\times 11 = 18{,}480$
So, the LCM of 660,420 and 240 is 18,480.

(d) 24, 19, 40 and 60

2	24, 19, 40, 60
2	12, 19, 20, 30
2	6, 19, 10, 15
3	3, 19, 5, 15
5	1, 19, 5, 5
19	1, 19, 1, 1
	1, 1, 1, 1

$\therefore$ LCM $= 2\times 2\times 2\times 3 \times 5\times 19 = 2280$
So, the LCM of 24, 19, 40 and 60 is 2280.

(e) 9, 12, 15, 18 and 24

$\therefore$ LCM $= 2\times 2\times 2\times 3 \times 3\times 5 = 360$

2	9, 12, 15, 18, 24
2	9, 6, 15, 9, 12
2	9, 3, 15, 9, 6
3	9, 3, 15, 9, 3
3	3, 1, 5, 3, 1
3	1, 1, 5, 1, 1
	1, 1, 1, 1, 1

So, the LCM of 9, 12, 15, 18 and 24 is 360.

(f) 5, 10, 12, 15, 18, 25 and 30

$\therefore$ LCM $= 2\times 2\times 3\times 3\times 5\times 5 = 900$

2	5, 10, 12, 15, 18, 25, 30
2	5, 5, 6, 15, 9, 25, 15
3	5, 5, 3, 15, 9, 25, 15
3	5, 5, 1, 5, 3, 25, 5
5	5, 5, 1, 5, 1, 25, 5
5	1, 1, 1, 1, 1, 5, 1
	1, 1, 1, 1, 1, 1, 1

So, the LCM of 5, 10, 12, 15, 18 25, and 30 is 900.

3. We know that the smallest number

= (LCM of 112, 140 and 168) + 8.

$\therefore$ The LCM of 112, 140 and 168 is

$= 2\times 2\times 2\times 2\times 3\times 5\times 7 = 1680$

Hence, the required number $= 1680 + 8 = 1688$.

2	112, 140, 168
2	56, 70, 84
2	28, 35, 42
2	14, 35, 21
3	7, 35, 21
5	7, 35, 7
7	7, 7, 7
	1, 1, 1

4. First we find the LCM of 9, 12, 15, 18 and 24.

2	9, 12, 15, 18, 24
2	9, 6, 15, 9, 12
2	9, 3, 15, 9, 6
3	9, 3, 15, 9, 3
3	3, 1, 5, 3, 1
5	1, 1, 5, 1, 1
	1, 1, 1, 1, 1

```
360) 99999 (277
    -720
     2799
    -2520
      2799
     -2520
       279
```

$\therefore$ LCM $= 2\times 2\times 2\times 3\times 3\times 5 = 360$

Now, greatest number of 5-digits $= 99999$

We find that when 99999 is divided by 360, the remainder is 279.

So, the greatest number of 5-digits exactly divisible by 9, 12, 15, 18 and 24 is $99999 - 279 = 99720$.

Hence, the required number $= 99720$.

5. First we find the LCM of 12, 18, 20, 21, 28 and 30.

LCM of the given numbers

$= 2\times 2\times 3\times 3\times 5\times 7$

$= 1260$

$\because$ 35 is subtracted from the number.

Hence, the required number

$= 1260 + 35 = 1295$

2	12, 18, 20, 21, 28, 30
2	6, 9, 10, 21, 14, 15
3	3, 9, 5, 21, 7, 15
3	1, 3, 5, 7, 7, 5
5	1, 1, 5, 7, 7, 5
7	1, 1, 1, 7, 7, 1
	1, 1, 1, 1, 1, 1

6. First we find the LCM of 7, 15, 20, 21, 28, 30 and 35.

2	7, 15, 20, 21, 28, 30, 35
2	7, 15, 10, 21, 14, 15, 35
3	7, 15, 5, 21, 7, 15, 35
5	7, 5, 5, 7, 7, 5, 35
7	7, 1, 1, 7, 7, 1, 7
	1, 1, 1, 1, 1, 1, 1

LCM of the given numbers

$= 2\times 2\times 3\times 5\times 7 = 420$

Hence, the required least number is 420.

7. Required time = LCM of 12, 16 and 24 minutes.

2	12, 16, 24
2	6, 8, 12
2	3, 4, 6
2	3, 2, 3
3	3, 1, 3
	1, 1, 1

$\therefore$ LCM of 12, 16 and $24 = 2\times 2\times 2\times 2\times 3 = 48$ minutes.

So, all the bells will toll together again after 48 minutes i.e., they toll together again at 8 :48 am.

8. To find the minimum value of weight which can measure bags of 250 g, 400 g and 500 g exact number of times, we need to find the LCM of 250, 400 and 500 (in grams).

2	250, 400, 500
2	125, 200, 250
2	125, 100, 125
2	125, 50, 125
5	125, 25, 125
5	25, 5, 25
5	5, 1, 5
	1, 1, 1

$\therefore$ LCM of 250, 400 and $500 = 2\times 2\times 2\times 2\times 5\times 5\times 5 = 2000$ g $= 2$ kg

Hence, the minimum value of weight required to measure the bag is 2 kg.

9. First we find the LCM of 35, 40 and 25.

2	35, 40, 25
2	35, 20, 25
2	35, 10, 25
5	35, 5, 25
5	7, 1, 5
7	7, 1, 1
	1, 1, 1

$\therefore$ LCM of 35, 40 and $25 = 2\times 2\times 2\times 5\times 5\times 7 = 1400$

Hence, 1400 books are required for the class library for equal distribution in section A, B and C.

10. First we find the LCM of 9, 12, 45, 54 and 72.

2	9, 12, 45, 54, 72
2	9, 6, 45, 27, 36
2	9, 3, 45, 27, 18
3	9, 3, 45, 27,9
3	3, 1, 15, 9, 3
3	1, 1, 5, 3, 1
5	1, 1, 3, 1, 1
	1, 1, 1, 1, 1

1080) 10000 (9
−9720
280

LCM $= 2\times 2\times 2\times 3\times 3\times 3\times 5 = 1080$

Now, smallest number of five-digits =10000

We find that when 10000 is divided by 1080, the remainder is 280.
So, least number of 5-digits which exactly divisible by 9, 12, 45, 54 and 72 is
$(10000 - 280) + 1080 = 10800$
Hence, the required number is 10800.

11. We know that the smallest number
= (LCM of 63, 12 and 84) + 7

2	63, 12, 84
2	63, 6, 42
3	63, 3, 21
3	21, 1, 7
7	7, 1, 7
	1, 1, 1

∴ The LCM of 63, 12 and 84 is
$2 \times 2 \times 3 \times 3 \times 7 = 252$
Hence, the required number $= 252 + 7 = 259$.

12. First we find the LCM of 16, 28, 40 and 56.

2	16, 28, 40, 56
2	8, 14, 20, 28
2	4, 7, 10, 14
2	2, 7, 5, 7
5	1, 7, 5, 7
7	1, 7, 1, 7
	1, 1, 1, 1

560) 10000 (17
−560
4400
− 3920
480

∴ LCM of 16, 28, 40 and 56 is $2 \times 2 \times 2 \times 2 \times 5 \times 7 = 560$.
We find that when 10000 is divided by 560, the remainder is 480.
So, the two numbers nearest to 10000 are [10,000 – 480] and [10000 – 480 + 560] = 9520 and 10,080
Hence, the required numbers are 9520 and 10,080.

Exercise 3.5

1. (a) First we find the HCF of 54 and 444.

54) 444 (8
− 432
12) 54 (4
− 48
6) 12 (2
−12
×

∴ HCF of 54 and 444 is 6.

Now, their LCM $= \dfrac{\text{Product of two numbers}}{\text{Their HCF}}$

$= \dfrac{444 \times 54}{6}$

$= 3996$.

(b) First we find the HCF of 145 and 232.

145) 232 (1
−145
87) 145 (1
−87
58) 87 (1
58
29) 58 (2
−58
×

∴ HCF of 145 and 232 is 29.

Now, their LCM $= \dfrac{\text{Product of two numbers}}{\text{Their HCF}}$

$= \dfrac{145 \times 232}{29} = 1160$.

(c) First we find the HCF of 576 and 720.

$\therefore$ HCF of 576 and 720 is 144.

```
576) 720 (1
    – 576
     144) 576 (4
        – 576
           ×
```

Now, their LCM $= \dfrac{\text{Product of two numbers}}{\text{Their HCF}} = \dfrac{576 \times 720}{144} = 2880$

(d) First we find the HCF of 861 and 1358.

$\therefore$ HCF of 861 and 1353 is 123.

```
861) 1353 (1
    –861
     492) 861 (1
         –492
          369) 492 (1
              –369
               123) 369 (3
                   –369
                     x
```

Now, their LCM $= \dfrac{\text{Product of two numbers}}{\text{Their HCF}} = \dfrac{861 \times 1353}{123} = 9471.$

(e) First we find the HCF of 225 and 575.

$\therefore$ HCF of 225 and 575 is 25.

```
225)  575 (2
    – 450
      125) 225 (1
          –125
           100) 125 (1
               –100
                 25) 100 (4
                    –100
                      ×
```

Now, their LCM $= \dfrac{\text{Product of two numbers}}{\text{Their HCF}} = \dfrac{225 \times 575}{25} = 5175.$

(f) First we find the HCF of 720 and 1296.

$\therefore$ HCF of 720 and 1296.

```
720) 1296 (1
    –720
     576) 720 (1
         –576
          144) 576 (4
              –576
                ×
```

LCM $= \dfrac{\text{Product of two number}}{\text{Their HCF}} = \dfrac{720 \times 1296}{144} = 6480$

2. Given, HCF $= 89$, LCM $= 1335$

and, One number $= 267$

Other number $= ?$

Thus, the other number $= \dfrac{\text{HCF} \times \text{LCM}}{\text{One number}}$

$= \dfrac{89 \times 1335}{267} = 445.$

3. Given, HCF $= 13$, LCM $= 1989$ and one number $= 117$

Other number $= ?$

Thus, the other number $= \dfrac{\text{HCF} \times \text{LCM}}{\text{One number}} = \dfrac{13 \times 1989}{117} = 221$

4. Given, Product of two numbers $= 7623$

and their HCF $= 11$

LCM $= ?$

$\because$ LCM × HCF = Product of two numbers

$\text{LCM} \times 11 = 7623$

$\text{LCM} = 7623/11$

$\text{LCM} = 693$

Thus, the LCM of two numbers is 693.

Multiple Choice Questions

1. (b) 2. (c) 3. (a) 4. (c) 5. (d) 6. (b), 7. (c), 8. (a) 9. (a) 10. (a)

Brain Teaser

1. **Fill in the blanks :**

(a) A natural number greater than 1, which has no factor other than 1 and itself is called a **prime** number.

(b) Write the prime numbers between 20 and 30; **23 and 29.**

(c) The product of H.C.F. and L.C.M. of two numbers is equal to the **product of these numbers.**

(d) The H.C.F. of two co-prime numbers is **1.**

2. (a) False (b) False (c) True

4 Basic Geometrical Ideas

Exercise 4.1

1. (a) A point has no **length**, **breadth** and **height**.

(b) A line segment has **definite** length.

(c) Ray has only **one** end point.

(d) Two distinct lines can intersect at **one** point.

(e) Only one line can pass through **two points**.

2. (a) Letter X represents intersecting lines.

(b) Letter E represents parallel lines as well as intersecting lines.

(c) Letter A represents intersecting lines.

3. (a) 5 points are A, O, D, C and B.

(b) A line is l.

(c) 4 rays are $\overrightarrow{OA}, \overrightarrow{OB}, \overrightarrow{OC}$ and $\overrightarrow{OD}$.

4. There are five rays, $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}, \overrightarrow{AE}$ and $\overrightarrow{AO}$ which has initial point A.

5. (a) PQ, QR, RS and ST are line segments i.e, in figure (a) has four line segments.

(b) QP, PR, RS and ST are four line segments.

(c) OP, PQ and QR are three line segments.

(d) $AE, EB, BC, CD, DA, AO, EO, BO, CO$ and DO are ten line segments.

6. (a) p and q are a pair of parallel lines.

(b) r and q are two lines that intersect at point E.

(c) q and m are two lines that intersect at point D.

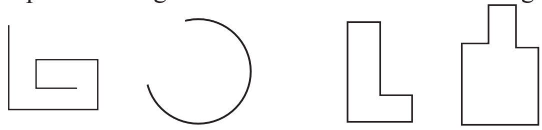
(d) Rays AC, AB and AD having its initial point as A.

(e) line r is passing through B and E.

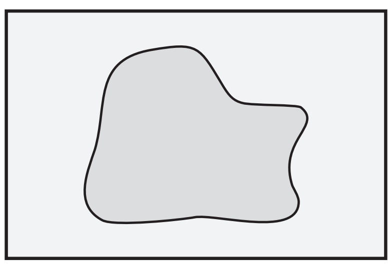
Exercise 4.2

1.

Open curve figure — Closed curve figures



2.



3. (a), (b), (c), (g), (h), (i) and (j) are closed curve figures.

(d), (e) and (f) are open curve figures.

4. (a) Points P, Q and S are lie on the boundry of the curve.

Points A, B and C are lie in the interior of the curve.

Points K, L, M, N and R lie in the enterior of the curve.

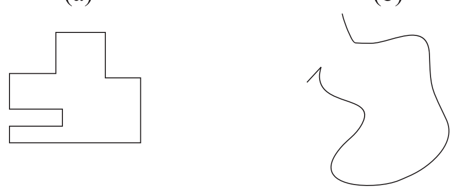
(b) Points A, B, C and D are lie on the boundry of the curve.

Points P, Q and R are lie in the interior of the curve.

Points K, L and M are lie in the exterior of the curve.

Exercise 4.3

1. (a) (b)



2. $\angle AOB$, $\angle BOC$, $\angle COD$ and $\angle DOA$ are four angles of given figure.

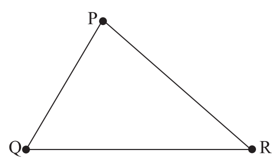
3. $\angle DOC$, $\angle COA$, $\angle DOB$, $\angle BOA$, $\angle AOD$ and $\angle BOC$ are all the angles of given figures.

4. (a) opposite side to $\angle B$ is AC.

(b) Opposite angle to side BC is $\angle A$.

(c) Opposite vertex to side AB is C.

5.



Thus, the figure will be a triangle.

6. (a) There are 5 triangles *i.e.*, $\Delta AFE, \Delta BDF, \Delta FED, \Delta CED$ and ΔABC.

(b) Triangles with vertex E are $\Delta AFE, \Delta FED$ and ΔCED.

7. In the given figure :

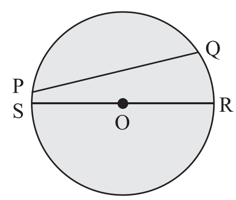
(a) PQ is a chord.

(b) O is a centre.

(c) OR or OS is a radius.

(d) SR is a diameter.

(e) Shaded region of the circle is the interior of circle.



8. Let the other two angles be x and $2x$.

So, $x + 2x + 60° = 180°$ ($\because$ Angle sum property of triangle.)

$3x + 60° = 180°$

$3x = 180° - 60°$

$$\boxed{x = \frac{120°}{3} = 40°}$$

$x = 40°$ and $2x = 40° \times 2 = 80°$

So, the other two angles of the triangle are 40° and 80° respectively.

9. **Adjacent angles :** ($\angle R$ and $\angle Q$); ($\angle Q$ and $\angle P$); ($\angle P$ and $\angle S$); ($\angle S$ and $\angle R$).

Adjacent side : (PQ and QR) (QR and RS), (RS and SP), (SP and PQ).

Multiple Choice Questions

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

NEP

Do it yourself.

---

5 Understanding Elementary Shapes

Exercise 5.1

1. (a) 2.6 cm (b) 3.7 cm (c) 5.1 cm

2. (a) DC, CB and BA are line segments.

(b) AB, BC and CA are line segments.

(c) AB, BC, CD, DE, EA, BE and EC are line segments.

(d) $AB, BC, CD, DA, AE, EC, DE, EB, AC$ and BD are line segments.

3. Do it yourself

4. (a) Adjacent edges of a table. The position of a clock, when one hand at 3 and other at 12, it represent right angle.

(b) One side of a table, it represent straight angle.
The position of a clock, when one hand is at 6 and other at 12, it represent straight angle.

(c) One round of big hand of the clock. One rotation of a wheel, it represent complete angle.

5. (a) 3:30

Magnitude of an angle formed by the two hands $= \frac{2.5}{6} \times 180°$

$= 2.5 \times 30° = 75°$

(b) 3:00

Magnitude of an angle formed by the two hands

$= \frac{3}{12} \times 360° = 90°$

(c) 6:00

Magnitude of an angle formed by the two hands

$= \frac{6}{12} \times 360° = 180°$

(d) 9:00

Magnitude of an angle formed by the two hands

$= \frac{9}{12} \times 360° = 270° \text{ or } \frac{3}{12} \times 360° = 90°$

(e) Magnitude of an angle formed by the two hands

$= \frac{0}{12} \times 360° = 0° \text{ or } \frac{12}{12} \times 360° = 360°$

(f) Magnitude of an angle formed by the two hands

$$= \frac{4}{12} \times 360° = 120°$$

(g) Magnitude of an angle formed by the two hands

$$= \frac{1}{12} \times 360° = 30°$$

(h) Magnitude of an angle formed by the two hands

$$= \frac{8}{12} \times 360° = 240° \text{ or } \frac{4}{12} \times 360° = 120°$$

6. (a) $\angle A = \frac{360°}{3} = 120°$ ($\because$ given circle create complete angle)

$\angle B = \angle A = 120°$

(b) Since, $\angle B$ is a straight angle

$\therefore \ \angle B = 180°$

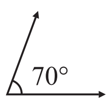
$\angle A = \frac{1}{3} \angle B = \frac{1}{3} \times 180° = 60°$

(c) Since, $\angle B$ is a straight angle

$\therefore \ \angle B = 180°$

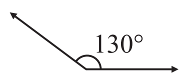
$\angle A = \frac{2}{4} \angle B = \frac{1}{2} \times 180° = 90°$

7. (a)



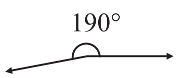
acute angle

(b)



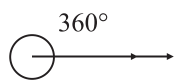
obtuse angle

(c)



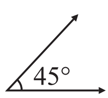
reflex angle

(d)



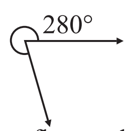
complete angle

(e)



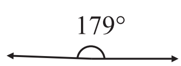
acute angle

(f)



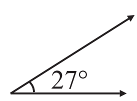
reflex angle

(g)



obtuse angle

(h)



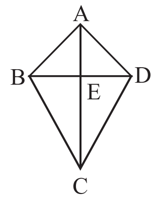
acute angle

8. (a) (i) $\angle ADE =$ **acute angle.**

(ii) $\angle ABC =$ **obtuse angle.**

(iii) $\angle DEC =$ **right angle.**

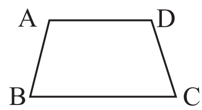
(iv) $\angle AEC =$ **straight angle.**



(b) (i) $\angle ABC =$ **acute angle.**

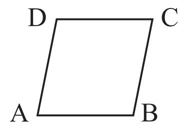
(ii) $\angle ADC =$ **obtuse angle.**

(iii) $\angle DCB =$ **acute angle.**



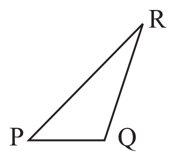
9. (a) (i) $\angle DAB =$ **acute angle.**

(ii) $\angle ABC =$ **obtuse angle.**

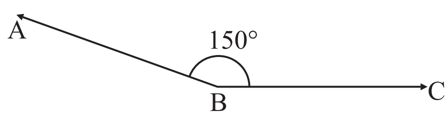


(b) (i) $\angle PQR =$ **obtuse angle.**

(ii) $\angle PRQ =$ **acute angle.**



10. $\angle ABC = 150°$, its arms are *BA* and *BC*. *B* is the vertex of $\angle ABC$.



Exercise 5.2

1. (a) All sides are unequal, hence ΔABC is a scalene triangle.
(b) Two sides are equal, hence ΔPQR is an isosceles triangle.
(c) Two sides are equal, so ΔLMN is an isosceles triangle.
(d) All sides are unequal, hence ΔRST is a scalene triangle.
(e) All sides are equal, hence ΔPQR is an equilateral triangle.

2. (a) One angle is greater than 90°, hence ΔABC is an obtuse-angled triangle.
(b) One angle is greater than 90°, hence ΔMNO is an obtuse-angled triangle.
(c) Here, $\angle M = 90°$, hence ΔLMN is a right-angled triangle.
(d) All angles are less than 90°, hence ΔPQR is an acute-angled triangle.
(e) One angle is greater than 90°, hence ΔXYZ is an acute-angled triangle.
(f) Here, $\angle B = 90°$, hence ΔABC is a right-angled triangle.

3. (a) All sides are unequal, hence it is a scalene triangle.
(b) Two sides are equal, hence it is an isosceles triangle.
(c) All sides are equal, hence it is an equilateral triangle.
(d) Two sides are equal, hence it is an isosceles triangle.
(e) All sides are unequal, hence it is a scalene triangle.
(f) All sides are unequal, hence it is a scalene triangle.

4. Since, $ST \parallel QR$

So, $\angle SPQ = \angle RQP$ (Alternate angle)

$\therefore \quad \angle 1 = 70^\circ$

Similarly,

$\angle TPR = \angle QRP$

$45^\circ = \angle 3$

or $\quad \angle 3 = 45^\circ$

In ΔPQR,

$\angle P + \angle Q + \angle R = 180^\circ$

$\angle 2 + 70^\circ + 45^\circ = 180^\circ$ (Angle sum property of triangle)

$\angle 2 = 180^\circ - (70^\circ + 45^\circ)$

$\angle 2 = 180^\circ - 115^\circ$

$\angle 2 = 65^\circ$

5. (a) $\angle DBA = 90^\circ$ (Given)

$\angle DBC + \angle CBA = \angle DBA$

$\therefore \quad x + 75^\circ = 90^\circ$

$x = 90^\circ - 75^\circ$

So, $\quad x = 15^\circ$

(b) Since, $\angle RSQ + \angle RSP = 180^\circ$ (linear pair)

$\therefore \quad x + 60^\circ = 180^\circ$

$x = 180^\circ - 60^\circ$

So, $\quad x = 120^\circ$

6. Given, $\angle A = 70^\circ$, $\angle C = 50^\circ$

And, $\quad AD \perp BC$

Since, $\quad AD \perp BC$

So, $\quad \angle ADC = \angle ADB = 90^\circ$

In ΔADC,

$\angle ADC + \angle DCA + \angle CAD = 180^\circ$ (Angle sum property of triangle)

$90^\circ + 50^\circ + \angle CAD = 180^\circ$

$\angle CAD = 180^\circ - (90^\circ + 50^\circ)$

$\angle DAC = \angle CAD = 180^\circ - 140^\circ = 40^\circ$

In ΔABC,

$\angle A + \angle B + \angle C = 180^\circ$ (Angle sum property of triangle)

$70^\circ + \angle ABC + 50^\circ = 180^\circ$

$\angle ABC = 180^\circ - (70^\circ + 50^\circ)$

$\angle ABC = 180^\circ - 120^\circ$

$\angle ABC = 60^\circ$.

7. (a) ΔABC is a right-angled triangle.

(b) ΔECD is a obtuse-angled triangle.

(c) ΔEAC is a acute-angled triangle.

(d) ΔAEC and ΔABC are scalene triangle.

(e) ΔECD is a isosceles triangle.

Exercise 5.3

1. (a) A parallelogram in which opposite sides are equal and each angle is a right angle is called a **rectangle.**

(b) A rhombus in which all angles are **right** angleds is called a square.

(c) A quadrilateral with two pairs of equal adjacent sides is called a **kite.**

(d) A square is also a **rectangle**, **parallelogram and rhombus.**

(e) A rhombus and a rectangle are also a **parallelogram.**

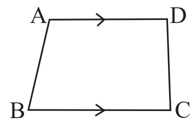
2. (a) Isosceles Trapezium (b) Rhombus

(c) Kite (d) Rectangle

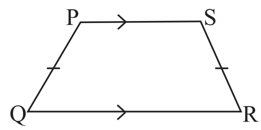
3. **Trapezium** : A quadrilateral with one pair parallel sides is called a trapezium. In fig (a) $ABCD$ is a trapezium in which $AD \parallel BC$.

A trapezium in which the non-parallel sides are equal is called an **isosceles trapezium**.

In Fig (b) $PQRS$ is an isosceles trapezium with $PS \parallel QR$ and $PQ = SR$.



(a)



(b)

4. (a) $PQRS$ and $AQCB$ are two parallelogram.

(b) $DEFG$ is a rectangle.

(c) $DPRG$ is a trapezium.

Exercise 5.4

1. (a) A **solid** is an object that occupies space.

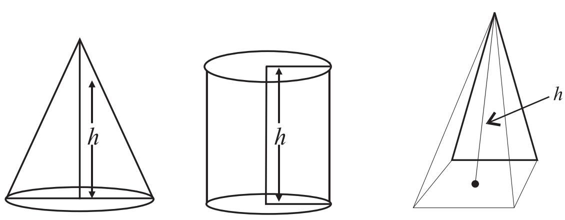
(b) A **ice-cream cone** is an example of cone.

(c) The **opposite** faces of a cuboid are identical.

(d) A **cube** is a cuboid with equal length, breadth and height.

(e) A **triangular pyramid** has triangular base and three triangular lateral faces.

2.



cone cylinder square pyramid

3. (a) dice (b) paper weight (c) a pen (d) marble

4. (a) sphere (b) cylinder (c) square pyramid

Multiple Choice Questions

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

Brain Teaser

Fill in the blanks :

1. A triangle can have two **acute** angles.
2. A triangle cannot have two **right or obtuse** angles.
3. The sum of angles of a triangle is **180°**.
4. An acute angle is always **less** than right angle.
5. An angle **greater** than 180° but less than 360° is called a reflex angle.
6. Two lines can intersect only at **one point.**
7. Lines which are not intersecting at any point are called **parallel lines.**
8. Two skew lines lie in **different**

6 Integers

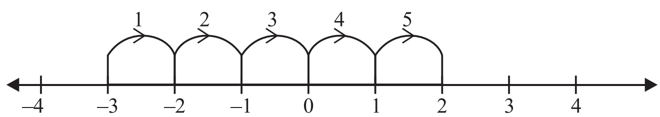
Exercise 6.1

1. (a) 30 km above sea level. (b) Spending ₹2500.
(c) An increase of 10. (d) Moving 7 km to the south.

2. (a) All integers between -5 and 1 are $-4, -3, -2, -1$ and 0.
(b) All integers between -4 and 3 are $-3, -2, -1$, 0, 1 and 2.
(c) All integers between -6 and -1 are $-5, -4, -3$, and -2.
(d) All integers between 0 and 5 are 1, 2, 3 and 4.
(e) All integers between -3 and 3 are $-2, -1$, 0, 1 and 2.
(f) All integers between -2 and 0 is -1.

3. (a) The opposite of -8 is 8. (b) The opposite of -2 is 2.
(c) The opposite of 6 is -6. (d) The opposite of 15 is -15.

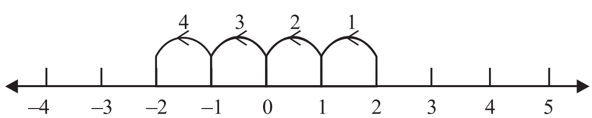
4. (a) On the number line, we start from -3 and move 5 steps to the right and we reach at 2.



So, $-3 + 5 = 2$

Hence, 5 more than -3 is 2.

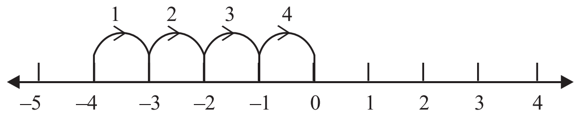
(b) On the number line, we start from 2 and move 4 steps to the left and we reach at -2.



So, $2 - 4 = -2$

Hence, 4 less than 2 is – 2.

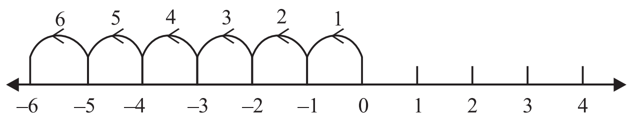
(c) On the number line, we start from -4 and move 4 steps to the right and we reach at 0.



So, $-4+4=0$

Hence, 4 more than -4 is 0.

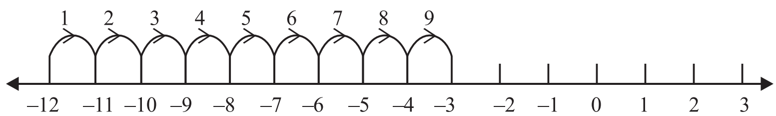
(d) On the number line, we start from 0 and move 6 steps to the left and we reach at -6.



So, $0-6=-6$

Hence, 6 less than 0 is – 6.

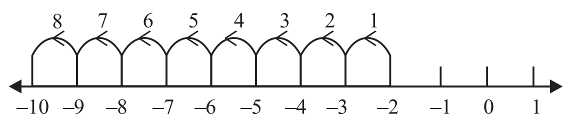
(e) On the number line, we start from -12 and move 9 steps to the right and we reach at -3.



So, $-12+9=-3$

Hence, 9 more than -12 is -3.

(f) On the number line, we start from -2 and move 8 steps to the left and we reach at -10.



So, $-2-8=-10$.

Hence, 8 less than – 2.

5. (a) -123 or 12

Since, -123 lies left of 12 on the number line.

$\therefore$ -123 is smaller than 12.

(b) -55 or -35

Since, -55 lies left of -35 on the number line.

$\therefore$ -55 is smaller than -35.

(c) -135 or -131.

Since, -135 lies left of -131 on the number line.

$\therefore$ -135 is smaller than -131.

(d) 33 or 11

Since, 11 lies left of 33 on the number line.

∴ 11 is smaller than 33.

(e) −100 or −90

Since, −100 lies left of −90 on the number line.

∴ −100 is smaller than −90.

(f) −257 or −389

Since, −389 lies left of −257 on the number line.

∴ −389 is smaller than −257.

6. (a) −39, −45

Since, −45 lies left of −39 on the number line.

∴ −39 is greater than −45.

(b) 0, 5

Since, 0 lies left of 5 on the number line.

∴ 5 is greater than 0.

(c) 210, −405

Since, −405 lies left of 210 on the number line.

∴ 210 is greater than −405.

(d) −150, −165

Since, −165 lies left of −150 on the number line.

∴ −150 is greater than −165.

(e) 0, −9

Since, −9 lies left of 0 on the number line.

∴ 0 is greater than −9.

(f) 140, 130

Since, 130 lies left of 140 on the number line.

∴ 140 is greater than 130.

7. (a) $-7 \boxed{<} -5$ (b) $0 \boxed{<} 2$ (c) $-6 \boxed{>} -8$

(d) $-9 \boxed{<} 2$ (e) $-3 \boxed{<} 0$ (f) $+5 \boxed{>} 1$

8. (a) 6, −10, 4, −5, 1, −2, 0, 15

The increasing order is $-10 < -5 < -2 < 0 < 1 < 4 < 6 < 15$

(b) −7, 6, 0, 2, −8, 7

The increasing order is $-8 < -7 < 0 < 2 < 6 < 7$.

(c) 4, −3, 5, −8, −5, 1, 10

The increasing order is $-8 < -5 < -3 < 1 < 4 < 5 < 10$.

(d) −19, 15, 10, −7, 8, 1, −2

The increasing order is $-19 < -7 < -2 < 1 < 8 < 10 < 15$.

9. (a) −2, 5, −1, 0, 8

The decreasing order is $8 > 5 > 0 > -1 > -2$

(b) 7, −3, −4, 0, 4, −10

The decreasing order is $7 > 4 > 0 > -3 > -4 > -10$.

(c) −10, 6, −1, 3, −5, 7

The decreasing order is $7 > 6 > 3 > -1 > -5 > -10$

(d) $-15, 10, 8, -7, 0, 2$

The decreasing order is $10 > 8 > 2 > 0 > -7 > -15$.

10. (a) $|-11|$ $= 11$ (b) $|0|$ $= 0$ (c) $|5|$ $= 5$ (d) $|-7|$ $= 7$

(e) $|8|$ $= 8$ (f) $|-2|$ $= 2$ (g) $|10|$ $= 10$ (h) $|-5|$ $= 5$

11. (a) $|-7| + |-2|$ $= 7 + 2 = 9$ (b) $|0| - |3|$ $= 0 - 3 = -3$ (c) $|-4| - |0|$ $= 4 - 0 = 4$

(d) $|-5| - |-5|$ $= 5 - 5 = 0$ (e) $|13| - |-7|$ $= 13 - 7 = 6$ (f) $|-9| + |9|$ $= 9 + 9 = 18$

12. (a) Zero is greater than every negative integer.

(b) The absolute value of zero is **zero.**

(c) There are **four** integers between 3 and -2.

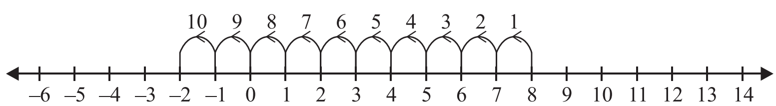
(d) All natural numbers are **positive** integers.

13. (a) False (b) True (c) True (d) True

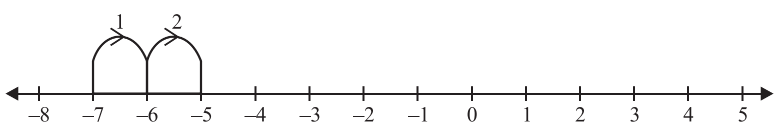
(e) True (f) False

Exercise 6.2

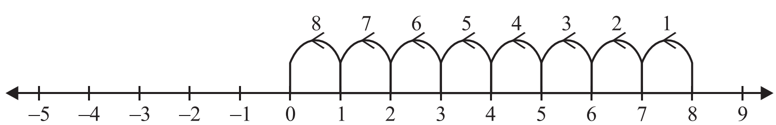
1. (a) $8 + (-10) = 8 - 10 = -2$



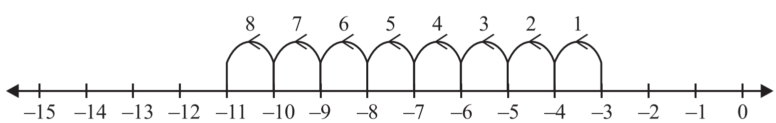
(b) $(-7) + 2 = -7 + 2 = -5$



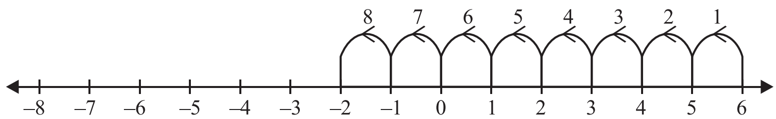
(c) $8 + (-8) = 8 - 8 = 0$



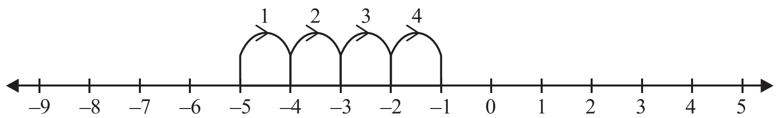
(d) $(-3) + (-8) = -3 - 8 = -11$



(e) $6+0+(-8)=6-8=-2$



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



2. (a) $(-549)+435=-114$ (b) $362+(-623)=-261$

(c) $405+323=728$ (d) $(-323)+(-124)=-447$

3. (a) $325+(25+15)$
$=325+40=365$

(b) $(600+50)+54$
$=650+54=704$

(c) $(902+88)+105$
$=990+105=1095$

(d) $835+(19+238)$
$=835+257=1092$

4. (a) $(-6)+(-12)+15+(-8)$
$=-6-12+15-8$
$=15-[6+12+8]$
$=15-26=-11$

(b) $42+(-63)+33+41$
$=42+33+41-63$
$=116-63=53$

(c) $153+(-97)+63+(-54)$
$=153+63-(97+54)$
$=216-151=65$

(d) $1095+(-98)+20+(-33)$
$=1095+20-(98+33)$
$=1115-131=984$

5. (a) The additive inverse of (-10) is 10.

(b) The additive inverse of 2015 is -2015.

(c) The additive inverse of -1315 is 1315.

(d) The additive inverse of 15 is -15.

6. (a) The successor of -357 is $(-357+1)=-356$.

(b) The successor of 475 is $(475+1)=476$.

(c) The successor of -1019 is $(-1019+1)=-1018$.

(d) The successor of 535 is $(535+1)=536$.

7. (a) False, (b) False, (c) False, (d) True

Exercise 6.3

1. (a) $-10+\mathbf{10}=0$ (b) $13+(-11)=\mathbf{2}$

(c) $232+\mathbf{(-272)}=-40$ (d) $\mathbf{-250}+215=-35$

(e) $-109+\mathbf{(-101)}=-210$ (f) $-15+(-16)=-\mathbf{31}$

2. (a) $(-5)+(5)=9+(-9)$ (b) $30-(-62)=62+30$

(c) $13+(-8)<13+8$ (d) $15+(-9)>(-15)-(-9)$

(e) $-65+(-40)>(-100)+(-25)$ (f) $(-32+392)>(-32)-392$

3. (a) 36 from -292

$= -292 - 36 = -328$

(b) -318 from -318

$= (-318) - (-318)$

$= -318 + 318 = 0$

(c) 0 from -453

$= (-453) - 0 = -453$

(d) -453 from 0

$0 - (-453) = 0 + 453 = 453$

(e) -450 from 450

$= 450 - (-450)$

$= 450 + 450 = 900$

(f) -68 from -55

$= (-55) - (-68)$

$= -55 + 68 = 13$

4. (a) $-15 + [(-5) - (-10)]$

$= -15 + (-5 + 10)$

$= -15 + 5 = -10$

(b) $[-100 - (-25)] + 75$

$= (-100 + 25) + 75$

$= -75 + 75 = 0$

(c) $32 + [(-20) - 40)] - (-10)$

$= 32 + [-20 - 40] + 10$

$= 32 - 60 + 10$

$= 42 - 60 = -18$

(d) $21 + [(-7) - 35]$

$= 21 + [-7 - 35]$

$= 21 + (-42)$

$= 21 - 42 = -21$

(e) $[76 - (-51)] + [(-31) - 20]$

$= [76 + 51] + [-31 - 20]$

$= 127 - 51$

$= 76$

(f) $-120 + [(-89) - 92]$

$= -120 + (-89 - 92)$

$= -120 + (-181)$

$= -120 - 181$

$= -301$

5. (a) The predecessor of 10 is $= (10 - 1) = 9$

(b) The predecessor of -579 is $= (-579 - 1) = -580$

(c) The predecessor of 688 is $= (688 - 1) = 687$

(d) The predecessor of -453 is $= (-453 - 1) = -454$

(e) The predecessor of 200 is $= (200 - 1) = 199$

(f) The predecessor of -1000 is $= (-1000 - 1) = -1001$

(g) The predecessor of 350 is $= (350 - 1) = 349$

(h) The predecessor of -15 is $= (-15 - 1) = -16$

6. The given operation is $\boldsymbol{a * b = a - (b + 1) + (-2)}$

(a) $(-3) * (-5)$

$= (-3) - [(-5) + 1] + (-2)$

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

$= -5 - (-4)$

$= -5 + 4 = -1$

(b) $2 * (-3)$

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

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

$= 2 - (-2) - 2$

$= 2 + 2 - 2 = 2$

(c) $(-5) * (-3)$

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

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

$= -5 - (-2) - 2$

$= -5 + 2 - 2 = -5$

(d) $(-3) * 2$

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

$= -3 - 3 - 2 = -8$

Take a first part of Questions No. 6.

(a) $(-3) * (-5)$

Let, $a * b = b * a$

LHS $= a * b = a - (b + 1) + (-2)$
$= (-3) - \{(-5) + 1\} + (-2)$
$= -3 - (-5 + 1) - 2$
$= -3 - (-4) - 2$
$= -5 + 4 = -1$
RHS $= b * a = b - (a + 1) + (-2)$
$= (-5) - \{(-3) + 1\} + (-2)$
$= -5 - \{-3 + 1\} - 2$
$= -5 - (-2) - 2$
$= -5 + 2 - 2 = -5$
Since, LHS $\neq$ RHS
Hence, $a * b \neq b * a$

7. The sum of two integers $= -20$
One integer $= -9$
Other integer $= ?$
$\therefore$ Other integer $= -20 - (-9)$
$= -20 + 9 = -11$
Hence, -11 is the other integer.

8. First place = 40 m above sea level and second place = 31 m below sea level.
$\therefore$ The distance between two places $= 40\text{ m} - (-31\text{ m})$
$= 40\text{ m} + 31\text{ m} = 71\text{ m}$

9. $[100 - (-210)] + (-55)$
$= (100 + 210) - 55$
$= 310 - 55 = 255$

10. $4 - 7 + (-5) - (-3) + 5$
$= 4 - 7 - 5 + 3 + 5$
$= (4 + 3 + 5) - (7 + 5)$
$= 12 - 12 = 0$

Exercise 6.4

1. Add :

(a) $78 + (-15)$
$= 78 - 15 = 63$

(b) $620 + (-315)$
$= 620 - 315 = 305$

(c) $-48 + 89$
$= 89 - 48 = 41$

(d) $-1567 + 312$
$= -(1567 - 312) = -1255$

(e) $(-882) + 205 + (-20)$
$= -882 + 205 - 20$
$= -(882 + 20) + 205$
$= -902 + 205 = -697$
$= -(902 - 205) = -697$

(f) $-7 + 7 = 0$

(g) $6 + (-11)$
$= 6 - 11 = -5$

2. Subtract :

(a) 0 from (-20)
$= (-20) - 0$
$= -20$

(b) 460 from 640
$= 640 - 460 = 180$

(c) -315 from 0
$= 0 - (-315) = 315$
$= 0 + 315 = 315$

(d) -239 from 200
$= 200 - (-239)$
$= 200 + 239 = 439$

(e) 15 from (-16)
$= (-16) - 15$
$= -16 - 15 = -31$

(f) 25 from 0
$0 - 25 = -25$

(g) 2 from (7)
$= 7 - 2 = 5$

(h) 3 from 2
$= 2 - 3 = -1$

3. Multiply :

(a) $(-8) \times 3 = -24$

(b) $130 \times (-10) = -1300$

(c) $(-12) \times (-12) = +144 = 144$

(d) $8 \times (-5) \times (-4) \times (-6)$
$= -40 \times 24 = -960$

(e) $(-3) \times (-5) \times (-2) \times 5 \times (-9)$
$= 15 \times (-10) \times (-9)$
$= (-150) \times (-9) = 1350$

(f) $(-1) \times (-3) \times (+6)$
$= 3 \times (+6) = 18$

(g) $(-1) \times 6 = -6$

(h) $0 \times (-8) = 0$

4. Divide :

(a) $(-64) \div 16$
$= -64 \times \frac{1}{16}$
$= -\frac{64}{16} = -4$

(b) $(-35) \div (-1)$
$= -35 \times \frac{1}{-1}$
$= \frac{-35}{-1} = 35$

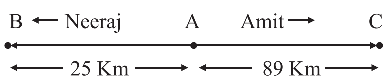
(c) $0 \div (-8) = 0$

(d) $15625 \div (-25)$
$= 15625 \times \frac{1}{-25}$
$= \frac{15625}{-25} = -625$

(e) $6 \div (-6)$
$= 6 \times \frac{1}{-6} = \frac{6}{-6} = -1$

(f) $-56 \div 8$
$= -56 \times \frac{1}{8}$
$= \frac{-56}{8} = -7$

(g) $99 \div (-99)$
$= 99 \times \frac{1}{-99}$
$= \frac{99}{-99} = -1$

5. 

Neeraj travelled North = 25 km
Amit travelled South = 89 km
So, the distance between the final destination of the two points B to C = 25 km + 89 km = 114 km.

6. $[(-15) + 35] - [(-8) + (-28)]$
$= (-15 + 35) - (-8 - 28)$
$= 20 - (-36)$
$= 20 + 36 = 56$

7. The sum of two integers $= -250$
One integer $= -172$

Other integer = ?

$\therefore$ Other integer $= (-250) - (-172)$

$= -250 + 172$

$= -78$

8. Let the required integer be *x*.

$\therefore \quad x \div (-1) = -42$

$x \times \frac{1}{(-1)} = -42$

$x = (-42) \times (-1) = 42$ (By cross multiplication)

Hence, the required integer is 42.

9. Let the required integer be *x*.

Then, $x \times (-1) = 85$

$x = 85 \div (-1)$

$x = \frac{85}{-1} = -85$

Hence, the required integer is -85.

Multiple Choice Questions

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

Brain Teaser

1. The successor of – 45 is $(-45 + 1) = -44$.

2. The predecessor of -99 is $(-99 - 1) = -100$.

3. A plane flies west of Mumbai $= 990$ km

Then, the plane flies to east $= 1678$ km

Thus, distance of plane from Mumbai $= -990$ km $+ 1678$ km

$= 1678$ km – 990 km

$= 688$ km.

Hence, the plane is 688 km for to east from the Mumbai now.

4. Raman played a game in casino :

He won in first game = ₹ 500

He lost in second game = ₹ 700

He lost in third game = ₹ 1000

He won in fourth game = ₹ 1500

And, he lost in fifth game = ₹ 1600

Thus, his gain = ₹ 500 – ₹ 700 – ₹ 1000 + ₹ 1500 – ₹ 1600

= ₹ [500 + 1500 – (700 + 1000 + 1600)]

= ₹ [2000 – 3300] = ₹ (– 1300)

= ₹ 1300 loss

Hence, Raman lost ₹1300 in all.

NEP

Do it yourself.

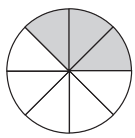
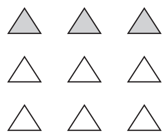
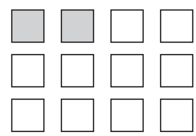
7 Fractions

Exercise 7.1

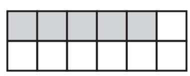
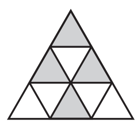
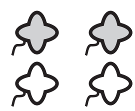
1. (a) $\frac{2}{5}$ (b) $\frac{2}{6}=\frac{1}{3}$ (c) $\frac{1}{3}$ (d) $\frac{10}{16}=\frac{5}{8}$

(e) $\frac{4}{10}=\frac{2}{5}$ (f) $\frac{2}{4}=\frac{1}{2}$ (g) $\frac{4}{8}=\frac{1}{2}$ (h) $\frac{3}{8}$

2. (a) $\frac{3}{8}$ (b) $\frac{3}{9}$ (c) $\frac{2}{12}$

(d) $\frac{5}{12}$ (e) $\frac{4}{9}$ (f) $\frac{2}{4}$

3. $\because$ 1 day $=24$ hours

$\therefore 6 \text{ hours} = \frac{6}{24}\text{ day} = \frac{1}{4}\text{ day}$

So, 6 hours are $\frac{1}{4}$ of a day.

4. $\because$ 1 kg $=1000$ g

$\therefore 550 \text{ g} = \frac{550}{1000}\text{ kg} = \frac{11}{20}\text{ kg}$

So, 550 g are $\frac{11}{20}$ of 1 kg.

5. $\because$ 1 hour $=60$ minutes

$\therefore$ 20 minutes $=\frac{20}{60}$ hour $=\frac{1}{3}$ hour

So, 20 minutes are $\frac{1}{3}$ of an hour.

6. Number of cricket matches in all $=6$

Number of losted matches $=2$

$\therefore$ number of won matches $=(6-2)=4$

So, the fraction of won matches $=\frac{4}{6}=\frac{2}{3}$.

7. Total study time of puru $=10$ hours

Spend time by puru on Mathematics $=2$ hours

So, the fraction of his study devoted to Mathematics

$=\frac{2}{10}=\frac{1}{5}$.

8. Radha had pens $= 50$

She gave pens to her friend $= 30$

So, the fraction of pens she gave to her friend $= \frac{30}{50} = \frac{3}{5}$.

9. Number of white balls $= 20$

Number of black balls $= 15$

Number of red balls $= 10$

$\therefore$ Total number of balls in the beg $= 20 + 15 + 10 = 45$

(a) The fraction of red balls to total number of balls $= \frac{10}{45} = \frac{2}{9}$

(b) The fraction of black balls to total number of balls $= \frac{15}{45} = \frac{1}{3}$

(c) The fraction of white balls to total number of balls $= \frac{20}{45} = \frac{4}{9}$

10. All naturals from 20 to 35 are 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34 and 35.

$\therefore$ Total number of these numbers = 16

(a) Prime numbers from 20 to 35 are 23, 29 and 31

Thus, the fraction of prime numbers to all natural numbers from 20 to 35 $= \frac{3}{16}$.

(b) Even numbers from 20 to 35 are 20, 22, 24, 26, 28, 30, 32 and 34.

Thus, the fraction of even numbers to all natural numbers from 20 to $35 = \frac{8}{16} = \frac{1}{2}$.

(c) Composite numbers from 20 to 35 are 20, 21, 22, 24, 25, 26, 27, 28, 30, 32, 33, 34 and 35.

Thus, the fraction of composite numbers to all natural numbers from 20 to $35 = \frac{13}{16}$.

11. Total number of students in class VI $= 45$

Number of students who like Mathematics $= 15$

Number of students who don't like Mathematics $= (45 - 15) = 30$

So, the fraction of students who don't like Mathematics to total number of students $= \frac{30}{45} = \frac{2}{3}$.

Exercise 7.2

1. (a) $\frac{20}{3} = \frac{3 \times 6 + 2}{3} = 6\frac{2}{3}$ (b) $\frac{15}{4} = \frac{4 \times 3 + 3}{4} = 3\frac{3}{4}$

(c) $\frac{17}{5} = \frac{5 \times 3 + 2}{5} = 3\frac{2}{5}$ (d) $\frac{23}{5} = \frac{5 \times 4 + 3}{5} = 4\frac{3}{5}$

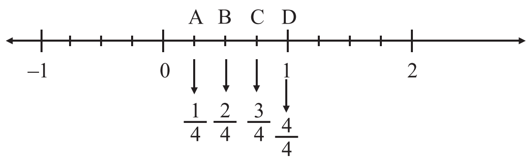
(e) $\frac{75}{6} = \frac{6 \times 12 + 3}{6} = 12\frac{3}{6}$ (f) $\frac{29}{4} = \frac{4 \times 7 + 1}{4} = 7\frac{1}{4}$

2. (a) $4\frac{5}{6} = \frac{4 \times 6 + 5}{6} = \frac{24 + 5}{6} = \frac{29}{6}$ (b) $6\frac{1}{7} = \frac{6 \times 7 + 1}{7} = \frac{42 + 1}{7} = \frac{43}{7}$

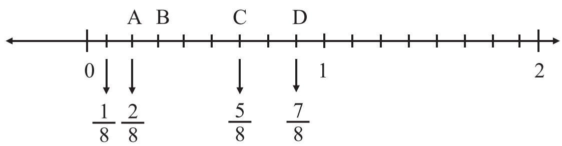
(c) $10\frac{3}{5} = \frac{10 \times 5 + 3}{5} = \frac{50 + 3}{5} = \frac{53}{5}$ (d) $14\frac{1}{7} = \frac{14 \times 7 + 1}{7} = \frac{98 + 1}{7} = \frac{99}{7}$

(e) $16\frac{2}{3} = \frac{16 \times 3 + 2}{3} = \frac{48 + 2}{3} = \frac{50}{3}$ (f) $19\frac{4}{5} = \frac{19 \times 5 + 4}{5} = \frac{95 + 4}{5} = \frac{99}{5}$

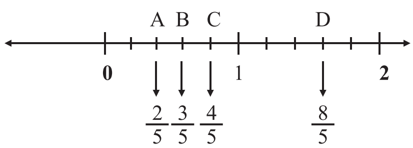
3. (a) A, B, C and D are represent $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}$ and $\frac{4}{4}$ respectively.



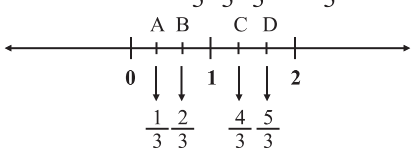
(b) A, B, C and D are represent $\frac{1}{8}, \frac{2}{8}, \frac{5}{8}$ and $\frac{7}{8}$ respectively.



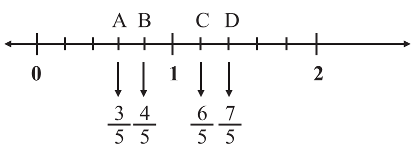
(c) A, B, C and D are represent $\frac{2}{5}, \frac{3}{5}, \frac{4}{5}$ and $\frac{8}{5}$ respectively.



(d) A, B, C and D are represent $\frac{1}{3}, \frac{2}{3}, \frac{4}{3}$ and $\frac{5}{3}$ respectively.



(e) A, B, C and D are represent $\frac{3}{5}, \frac{4}{5}, \frac{6}{5}, \frac{7}{5}$ and $\frac{3}{5}$ respectively.



4. (a) $\frac{2}{5} = \frac{\square}{50}$

$\because\ 50 \div 5 = 10$

So, $\frac{2}{5} = \frac{2 \times 10}{5 \times 10} = \frac{\boxed{20}}{50}$

(b) $\frac{4}{7} = \frac{12}{\square}$

$\because 12 \div 4 = 3$

So, $\frac{4}{7} = \frac{4 \times 3}{7 \times 3} = \frac{12}{21}$

(c) $\frac{6}{9} = \frac{2}{\square}$

$\because 6 \div 2 = 3$

So, $\frac{6}{9} = \frac{6 \div 3}{9 \div 3} = \frac{2}{3}$

(d) $\frac{16}{14} = \frac{32}{\square}$

$\because\ 32 \div 16 = 2.$

So, $\frac{16}{14} = \frac{16 \times 2}{14 \times 2} = \frac{32}{\boxed{28}}$

(e) $\frac{15}{70} = \frac{3}{\square}$

$\because\ 15 \div 3 = 5.$

So, $\frac{15}{70} = \frac{15 \div 5}{70 \div 5} = \frac{3}{\boxed{14}}$

(f) $\frac{45}{\square} = \frac{15}{4}$

$\because\ 45 \div 15 = 3.$

So, $\frac{15}{4} = \frac{15 \times 3}{4 \times 3} = \frac{45}{\boxed{12}}$

(g) $\frac{8}{14} = \frac{40}{\square}$

$\because\ 40 \div 8 = 5$

So, $\frac{8}{14} = \frac{8 \times 5}{14 \times 5} = \frac{40}{\boxed{70}}$

(h) $\frac{3}{11} = \frac{\square}{55}$

$\because 55 \div 11 = 5$

So, $\frac{3}{11} = \frac{3 \times 5}{11 \times 5} = \frac{15}{55}$

5. (a) Equivalent fraction of $\frac{3}{4}$ with denominator 16 can be obtained by multiplying its numerator and denominator by 4.

$\therefore\ \frac{3}{4} = \frac{3 \times 4}{4 \times 4} = \frac{12}{16}$

So, fraction $\frac{12}{16}$ is equivalent to $\frac{3}{4}$.

(b) Equivalent fraction of $\frac{5}{7}$ with numerator 35 can be obtained by multiplying it numerator and denominator by 7.

$\therefore\ \frac{5}{7} = \frac{5 \times 7}{7 \times 7} = \frac{35}{49}$

So, fraction $\frac{35}{49}$ is equivalent to $\frac{5}{7}$.

(c) Equivalent fraction of $\frac{25}{45}$ with denominator 9 can be obtained by dividing its numerator and denominator by 5.

$\therefore\ \frac{25}{45} = \frac{25 \div 5}{45 \div 5} = \frac{5}{9}$

So, fraction $\frac{25}{45}$ is equivalent to $\frac{5}{9}$.

(d) Equivalent fraction of $\frac{15}{75}$ with numerator 3 can be obtained by dividing its numerator and denominator by 5.

$\therefore \frac{15}{75} = \frac{15 \div 5}{75 \div 5} = \frac{3}{15}$

So, fraction $\frac{15}{75}$ is equivalent to $\frac{3}{15}$.

(e) Equivalent fraction of $\frac{20}{150}$ with denominator 75 can be obtained by dividing its numerator and denominator by 2.

$\therefore \frac{20}{150} = \frac{20 \div 2}{150 \div 2} = \frac{10}{75}$

So, fraction $\frac{20}{150}$ is equivalent to $\frac{10}{75}$.

(f) Equivalent fraction of $\frac{4}{8}$ with numerator 8 can be obtained by multiplying its numerator and denominator by 2.

$\therefore \frac{4}{8} = \frac{4 \times 2}{8 \times 2} = \frac{8}{16}$

So, fraction $\frac{8}{16}$ is equivalent to $\frac{4}{8}$.

(g) Equivalent fraction of $\frac{7}{5}$ with denominator 30 can be obtained by multiplying its numerator and denominator by 6.

$\therefore \frac{7}{5} = \frac{7 \times 6}{5 \times 6} = \frac{42}{30}$

So, fraction $\frac{7}{5}$ is equivalent of $\frac{42}{30}$.

(h) Equivalent fraction of $\frac{1}{2}$ with denominator 8 can be obtained by multiplying its numerator and denominator by 4.

$\therefore \frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$

So, fraction $\frac{1}{2}$ is equivalent to $\frac{4}{8}$.

6. By cross multiplication method :

(a) $\frac{2}{3}, \frac{5}{9}$

$\because 2 \times 9 = 18$ and $3 \times 5 = 15$

Since, $2 \times 9 \neq 3 \times 5$

Therefore, $\frac{2}{3} \neq \frac{5}{9}$

(b) $\frac{3}{8}, \frac{9}{24}$

$\because 3 \times 24 = 72$ and $8 \times 9 = 72$

Since, $3 \times 24 = 8 \times 9$

Therefore, $\frac{3}{8} = \frac{9}{24}$

So, $\frac{2}{3}$ and $\frac{5}{9}$ are not equivalent.

So, $\frac{3}{8}$ and $\frac{9}{24}$ are equivalent.

(c) $\frac{5}{25}, \frac{1}{5}$

$\because 5\times 5 = 25$ and $25 \times 1 = 25$

Since, $5 \times 5 = 25 \times 1$

Therefore, $\frac{5}{25} = \frac{1}{5}$

So, $\frac{5}{25}$ and $\frac{1}{5}$ are equivalent.

(d) $\frac{15}{20}, \frac{2}{3}$

$\because 15\times 3 = 45$ and $20 \times 2 = 40$

Since, $15 \times 3 \neq 20 \times 2$

Therefore, $\frac{15}{20} \neq \frac{2}{3}$

So, $\frac{15}{20}$ and $\frac{2}{3}$ are not equivalent.

(e) $\frac{7}{13}, \frac{5}{11}$

$7 \times 11 = 77$ and $13 \times 5 = 65$

Since, $7 \times 11 \neq 13 \times 5$

Therefore, $\frac{7}{13} \neq \frac{5}{11}$

So, $\frac{7}{13}$ and $\frac{5}{11}$ are not equivalent.

(f) $\frac{4}{7}, \frac{8}{14}$

$4 \times 14 = 56$ and $7 \times 8 = 56$

Since, $4 \times 14 = 7 \times 8$

Therefore, $\frac{4}{7} = \frac{8}{14}$

So, $\frac{4}{7}$ and $\frac{8}{14}$ are equivalent.

(g) $\frac{11}{66}, \frac{2}{12}$

$11 \times 12 = 132$ and $66 \times 2 = 132$

Since $11 \times 12 = 66 \times 2$

Therefore, $\frac{11}{66} = \frac{2}{12}$

So, $\frac{11}{66}$ and $\frac{2}{12}$ are equivalent.

(h) $\frac{25}{32}, \frac{32}{25}$

$25 \times 25 = 625$ and

$32 \times 32 = 1024$

Since $25 \times 25 \neq 32 \times 32$

Therefore, $\frac{25}{32} \neq \frac{32}{25}$

So, $\frac{25}{32}$ and $\frac{32}{25}$ are not equivalent.

7. To reduce fraction in its lowest form we find HCF of numerator and denominator.

(a) $\because$ HCF of 150 and 250 is 50.

$\therefore \frac{250}{150} = \frac{250 \div 50}{150 \div 50} = \frac{5}{3}$

```
150)250(1
   -150
   ----
    100)150(1
       -100
       ----
         50)100(2
           -100
           ----
             ×
```

Hence, $\frac{5}{3}$ is the simplest form of $\frac{250}{150}$.

(b) $\because$ HCF of 95 and 75 is 5.

$\therefore \frac{95}{75} = \frac{95 \div 5}{75 \div 5} = \frac{19}{15}$

Hence, $\frac{19}{15}$ is the simplest form of $\frac{95}{75}$.

75) 95 (1
−75
20) 75 (3
60
15) 20 (1
− 15
5) 15 (3
15
×

(c) $\because$ HCF of 42 and 68 is 2.

$\therefore \frac{42}{68} = \frac{42 \div 2}{68 \div 2} = \frac{21}{34}$

Hence, $\frac{21}{34}$ is the simplest form of $\frac{42}{68}$.

42) 68 (1
42
26) 42 (1
26
16) 26 (1
16
10) 16 (1
10
6) 10 (1
6
4) 6 (1
4
2) 4 (2
4
×

(d) $\because$ HCF of 46 and 76 is 2.

$\therefore \frac{46}{76} = \frac{46 \div 2}{76 \div 2} = \frac{23}{38}$

Hence, $\frac{23}{38}$ is the simplest form of $\frac{46}{76}$.

46) 76 (1
−46
30) 46 (1
−30
16) 30 (1
−16
14) 16 (1
−14
2) 14 (7
−14
×

(e) $\because$ HCF of 12 and 54 is 6.

$\therefore \frac{12}{54} = \frac{12 \div 6}{54 \div 6} = \frac{2}{9}$

Hence, $\frac{2}{9}$ is the simplest form of $\frac{12}{54}$.

12) 54 (4
−48
6) 12 (2
−12
×

8. Sakshi had pencils = 50

Sakshi used pencils = 25

So, the fraction of used pencils by Sakshi $= \frac{25}{50} = \frac{1}{2}$

Aanchal had pencils = 90

Aanchal used pencils = 45

So, the fraction of used pencils by Aanchal $= \frac{45}{90} = \frac{1}{2}$

Chanchal had pencils = 48

Chanchal used pencils = 24

So, the fraction of used pencils by Chanchal $= \frac{24}{48} = \frac{1}{2}$

Yes, they used equal fraction of pencils.

9. Equivalent fraction of $\frac{7}{12}, \frac{3}{8}, \frac{1}{4}$ and $\frac{60}{72}$ with denominator 144 can be obtained by multiplying its numerator and denominator by 12, 18, 36 and 2 respectively.

$\therefore \quad \frac{7}{12} = \frac{7 \times 12}{12 \times 12} = \frac{84}{144}, \frac{3}{8} = \frac{3 \times 18}{8 \times 18} = \frac{54}{144},$

$\frac{1}{4} = \frac{1 \times 36}{4 \times 36} = \frac{36}{144}$ and $\frac{60}{72} = \frac{60 \times 2}{72 \times 2} = \frac{120}{144}$

$\therefore$ Ascending order : $\frac{36}{144} < \frac{54}{144} < \frac{84}{144} < \frac{120}{144}$

or $\frac{1}{4} < \frac{3}{8} < \frac{7}{12} < \frac{60}{72}$.

10. (a) $\frac{25}{40} \rightarrow$ (iii) $\frac{5}{8}, \frac{10}{16}, \frac{15}{24}$ (b) $\frac{160}{480} \rightarrow$ (iv) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}$

(c) $\frac{550}{770} \rightarrow$ (v) $\frac{5}{7}, \frac{10}{14}, \frac{15}{21}$ (d) $\frac{190}{380} \rightarrow$ (vi) $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}$

(e) $\frac{220}{1100} \rightarrow$ (i) $\frac{1}{5}, \frac{2}{10}, \frac{3}{15}$ (f) $\frac{750}{1000} \rightarrow$ (ii) $\frac{3}{4}, \frac{6}{8}, \frac{9}{12}$

Exercise 7.3

1. (a) $\frac{11}{24}$ □ $\frac{9}{24}$

By cross multiplication, we see that

$\frac{11}{24} \times \frac{9}{24}$

$\because \quad 11 \times 24 = 264$ and $9 \times 24 = 216$

Since, $264 > 216$

So, $\frac{11}{24}$ $\boxed{>}$ $\frac{9}{24}$.

(b) $\frac{3}{7}$ □ $\frac{5}{3}$

By cross multiplication, we see that

$\frac{3}{7} \times \frac{5}{3}$

$\because$ $3 \times 3 = 9$ and $5 \times 7 = 35$

Since, $9 < 35$

So, $\frac{3}{7}$ $\boxed{<}$ $\frac{5}{3}$.

(c) $\frac{7}{15}$ □ $\frac{3}{5}$

By cross multiplication, we see that

$\frac{7}{15} \times \frac{3}{5}$

$\because$ $7 \times 5 = 35$ and $3 \times 15 = 45$

Since, $35 < 45$

So, $\frac{7}{15}$ $\boxed{<}$ $\frac{3}{5}$

(d) $\frac{4}{9}$ □

By cross multiplication, we see that

$\frac{4}{9} \times \frac{24}{54}$

$\because \quad 4 \times 54 = 216$ and $24 \times 9 = 216$

Since, $216 = 216$

So, $\frac{4}{9}$ $\boxed{=}$ $\frac{24}{54}$

(e) □ $2\frac{1}{4}$

By cross multiplication, we see that

(f) $1\frac{1}{4}$ □

By cross multiplication, we see that

$\frac{5}{2} \times \frac{9}{4}$

Since, $20 > 18$

So, $2\frac{1}{2}$ $\boxed{>}$ $2\frac{1}{4}$

$\frac{5}{4} \times \frac{5}{1}$

Since, $5 < 20$

So, $1\frac{1}{4}$ $\boxed{<}$ 5

(g) $\frac{3}{5} \square \frac{30}{50}$

By cross multiplication, we see that

$\frac{3}{5} \times \frac{30}{50}$

$\because 3 \times 50 = 150$

and $30 \times 5 = 150$

Since, $150 = 150$

So, $\frac{3}{5}$ $\boxed{=}$ $\frac{30}{50}$

(h) $\frac{7}{5} \square \frac{4}{7}$

By cross multiplication, we see that

$\frac{7}{5} \times \frac{4}{7}$

$\because 7 \times 7 = 49$

and $4 \times 5 = 20$

Since, $49 > 20$

So, $\frac{7}{5}$ $\boxed{>}$ $\frac{4}{7}$

(i) $\frac{4}{3} \square \frac{5}{4}$

By cross multiplication, we see that

$\frac{4}{3} \times \frac{5}{4}$

$\because 4 \times 4 = 16$

and $5 \times 3 = 15$

Since, $16 > 15$

So, $\frac{4}{3} > \frac{5}{4}$

(j) $\square \frac{9}{4}$

By cross multiplication, we see that

$\frac{9}{4} \times \frac{18}{8}$

$\because 9 \times 8 = 72$

and $18 \times 4 = 72$

Since, $72 = 72$

So, $\frac{9}{4} = \frac{18}{8}$

2. (a) $\frac{1}{6}, \frac{4}{6}, \frac{11}{6}, \frac{7}{6}$ and $\frac{5}{6}$

Denominators of given fractions are already same.

Clearly, $\frac{11}{6} > \frac{7}{6} > \frac{5}{6} > \frac{4}{6} > \frac{1}{6}$

Hence, the given fractions in the descending order are $\frac{11}{6}, \frac{7}{6}, \frac{5}{6}, \frac{4}{6}$, and $\frac{1}{6}$.

(b) $\frac{1}{12}, \frac{4}{12}, \frac{3}{12}, \frac{7}{12}, \frac{9}{12}$

Denominator of given fractions are already same.

Clearly, $\frac{9}{12} > \frac{7}{12} > \frac{4}{12} > \frac{3}{12} > \frac{1}{12}$

Hence, the given fractions in the descending order are $\frac{9}{12}, \frac{7}{12}, \frac{4}{12}, \frac{3}{12}$ and $\frac{1}{12}$.

(c) $\frac{4}{6}, \frac{4}{3}, \frac{4}{2}, \frac{4}{7}, \frac{4}{9}.$

Since, the numerator of the given fractions are same, then the fraction with smaller denominator is greater than the fraction with greater denominator.

So, $\frac{4}{2} > \frac{4}{3} > \frac{4}{6} > \frac{4}{7} > \frac{4}{9}$

Hence, the given fractions in the descending order are $\frac{4}{2}, \frac{4}{3}, \frac{4}{6}, \frac{4}{7}$ and $\frac{4}{9}$.

(d) $\frac{1}{2}, \frac{3}{2}, \frac{4}{5}, \frac{5}{4}$

2	2, 2, 5, 4
2	1, 1, 5, 2
5	1, 1, 5, 1
	1, 1, 1, 1

Denominator of the fractions are 2, 2, 5 and 4.

$\because$ LCM of 2, 2, 5 and 4 is $(2\times 2\times 5) = 20$.

So, we convert each one of the given fraction into an equivalent fraction with denominator 20.

$\therefore \ \frac{1}{2} = \frac{1\times 10}{2\times 10} = \frac{10}{20}; \frac{3}{2} = \frac{3\times 10}{2\times 10} = \frac{30}{20};$

$\frac{4}{5} = \frac{4\times 4}{5\times 4} = \frac{16}{20}$ and $\frac{5}{4} = \frac{5\times 5}{4\times 5} = \frac{25}{20}$

Clearly, $\frac{30}{20} > \frac{25}{20} > \frac{16}{20} > \frac{10}{20}$

$\therefore \quad \frac{3}{2} > \frac{5}{4} > \frac{4}{5} > \frac{1}{2}$

Hence, the given fraction in the decreasing order are $\frac{3}{2}, \frac{5}{4}, \frac{4}{5}$ and $\frac{1}{2}$.

3. (a) $\frac{3}{5}, \frac{13}{7}$

$\because$ LCM of $(5, 7) = 35$

So, $\frac{3}{5} = \frac{3\times 7}{5\times 7} = \frac{21}{35}$ and $\frac{13}{7} = \frac{13\times 5}{7\times 5} = \frac{65}{35}$

Hence, the equivalent like fractions are $\frac{21}{35}$ and $\frac{65}{35}$.

(b) $\frac{17}{21}, \frac{19}{7}$

LCM of $(21, 7) = 21$

So, $\frac{17}{21} = \frac{17\times 1}{21\times 1} = \frac{17}{21}$ and $\frac{19}{7} = \frac{19\times 3}{7\times 3} = \frac{57}{21}$

Hence, the equivalent like fractions are $\frac{17}{21}$ and $\frac{57}{21}$.

(c) $\frac{7}{10}, \frac{8}{15}$

$\because$ LCM of $(10, 15) = 30$

So, $\frac{7}{10}=\frac{7\times 3}{10\times 3}=\frac{21}{30}$ and $\frac{8}{15}=\frac{8\times 2}{15\times 2}=\frac{16}{30}$

Hence, the equivalent like fractions are $\frac{21}{30}$ and $\frac{16}{30}$.

(d) $\frac{2}{3},\frac{3}{4}$

LCM of (3, 4) $=12$

So, $\frac{2}{3}=\frac{2\times 4}{3\times 4}=\frac{8}{12}$ and $\frac{3}{4}=\frac{3\times 3}{4\times 3}=\frac{9}{12}$

Hence, the equivalent like fractions are $\frac{8}{12}$ and $\frac{9}{12}$.

(e) $\frac{3}{5},\frac{4}{7}$

LCM of (5, 7) $=35$

So, $\frac{3}{5}=\frac{3\times 7}{5\times 7}=\frac{21}{35}$ and $\frac{4}{7}=\frac{4\times 5}{7\times 5}=\frac{20}{35}$

Hence, the equivalent like fractions are $\frac{21}{35}$ and $\frac{20}{35}$.

(f) $\frac{2}{5},\frac{1}{4}$

LCM of (5, 4) $=20$

So, $\frac{2}{5}=\frac{2\times 4}{5\times 4}=\frac{8}{20}$ and $\frac{1}{4}=\frac{1\times 5}{4\times 5}=\frac{5}{20}$

Hence, the equivalent like fractions are $\frac{8}{20}$ and $\frac{5}{20}$.

(g) $1\frac{1}{2}, 4\frac{1}{5}$ or $\frac{3}{2}, \frac{21}{5}$

LCM of (2, 5) $=10$

So, $\frac{3}{2}=\frac{3\times 5}{2\times 5}=\frac{15}{10}$ and $\frac{21}{5}=\frac{21\times 2}{5\times 2}=\frac{42}{10}$

Hence, the equivalent like fractions are $\frac{15}{10}$ and $\frac{42}{10}$.

(h) $2\frac{1}{4}, 3\frac{1}{5}$ or $\frac{9}{4}, \frac{16}{5}$

$\because$ LCM of (4, 5) $=20$

So, $\frac{9}{4}=\frac{9\times 5}{4\times 5}=\frac{45}{20}$ and $\frac{16}{5}=\frac{16\times 4}{5\times 4}=\frac{64}{20}$

Hence, the equivalent like fractions are $\frac{45}{20}$ and $\frac{64}{20}$.

4. Let us find the pages of the book read by Pradeep

$$= \frac{2}{7} \times 280 = 2 \times 40 = 80 \text{ pages}$$

Nitin read the pages of the book $= 120$ pages

Since, $80 < 120$

So, Nitin read more pages of the book.

5. Dhruv spent time for completing his homework $= 2\frac{1}{4}$ hr

And, Sagar spent time for completing his homework $= 2\frac{2}{5}$ hr

Compare $2\frac{1}{4}$ and $2\frac{2}{5}$ or $\left(\frac{9}{4} \text{ and } \frac{12}{5}\right)$.

We see that the denominator are different. So, we find their LCM.

$\because$ LCM of (4, 5) $= 20$

$\therefore$ $\frac{9}{4} = \frac{9 \times 5}{4 \times 5} = \frac{45}{20}$ and $\frac{12}{5} = \frac{12 \times 4}{5 \times 4} = \frac{48}{20}$

Since, $\frac{45}{20} < \frac{48}{20}$

So, Sagar took more time for completing the homework.

6. Ms. Komal bought apples $= 15\frac{1}{4}$ kg $= \frac{61}{4}$ kg

Ms Leena bought apples $= 15\frac{2}{3}$ kg $= \frac{47}{3}$ kg

Now, let us compare $\frac{61}{4}$ and $\frac{47}{3}$.

$\because$ LCM of (4, 3) $= 12$

$\therefore$ $\frac{61}{4} = \frac{61 \times 3}{4 \times 3} = \frac{183}{12}$

$\frac{47}{3} = \frac{47 \times 4}{3 \times 4} = \frac{188}{12}$

Since, $\frac{183}{12} < \frac{188}{12}$ or $\frac{61}{4} < \frac{47}{3}$

Hence, Ms Komal bought less amount of apples.

7. Let us find the fraction of school $A = \frac{250}{650} = \frac{5}{13}$

Similarly, the fraction of selected students of school $B = \frac{300}{750} = \frac{2}{5}$

Now, let us compare $\frac{5}{13}$ and $\frac{2}{5}$.

$\because$ LCM of (13, 5) $= 65$

$\therefore \quad \frac{5}{13} = \frac{5 \times 5}{13 \times 5} = \frac{25}{65}$

And, $\frac{2}{5} = \frac{2 \times 13}{5 \times 13} = \frac{26}{65}$

Since, $\frac{25}{65} < \frac{26}{65}$ or $\frac{5}{13} < \frac{2}{5}$

Hence, more students were selected from school *B*.

Exercise 7.4

1. (a) $\frac{1}{5} + \frac{3}{5} = \frac{1+3}{5} = \frac{4}{5}$

(b) $\frac{1}{6} + \frac{2}{6} = \frac{1+2}{6} = \frac{3}{6} = \frac{1}{2}$

(c) $\frac{6}{17} + \frac{3}{17} + \frac{4}{17} = \frac{6+3+4}{17} = \frac{13}{17}$

(d) $\frac{1}{40} + \frac{13}{40} + \frac{23}{40} = \frac{1+13+23}{40} = \frac{37}{40}$

2. (a) $\frac{5}{2} + \frac{7}{3} = \frac{5 \times 3 + 7 \times 2}{6} = \frac{15+14}{6} = \frac{29}{6} = 4\frac{5}{6}$

(b) $4\frac{1}{6} + \frac{2}{3} = \frac{25}{6} + \frac{2}{3} = \frac{25 \times 1 + 2 \times 2}{6} = \frac{25+4}{6} = \frac{29}{6} = 4\frac{5}{6}$

(c) $3\frac{1}{3} + 4\frac{3}{5} = \frac{10}{3} + \frac{23}{5} = \frac{10 \times 5 + 23 \times 3}{15} = \frac{50+69}{15} = \frac{119}{15} = 7\frac{14}{15}$

(d) $\frac{51}{8} + \frac{16}{6} = \frac{51 \times 3 + 16 \times 4}{24} = \frac{153+64}{24} = \frac{217}{24} = 9\frac{1}{24}$

(e) $\frac{5}{8} + \frac{1}{4} = \frac{5 \times 1 + 1 \times 2}{8} = \frac{5+2}{8} = \frac{7}{8}$

(f) $\frac{8}{24} + \frac{3}{8} = \frac{8 \times 1 + 3 \times 3}{24} = \frac{8+9}{24} = \frac{17}{24}$

(g) $3 + \frac{2}{11} = \frac{3 \times 11 + 2 \times 1}{11} = \frac{33+2}{11} = \frac{35}{11} = 3\frac{2}{11}$

(h) $5 + 1\frac{1}{4} = 5 + \frac{5}{4} = \frac{5 \times 4 + 5 \times 1}{4} = \frac{20+5}{4} = \frac{25}{4} = 6\frac{1}{4}$

(i) $\frac{1}{2} + \frac{3}{4} + 1\frac{1}{3} = \frac{1}{2} + \frac{3}{4} + \frac{4}{3} = \frac{1 \times 6 + 3 \times 3 + 4 \times 4}{12} = \frac{6+9+16}{12} = \frac{31}{12} = 2\frac{7}{12}$

(j) $6\frac{3}{4} + 2\frac{1}{5} = \frac{27}{4} + \frac{11}{5} = \frac{27 \times 5 + 11 \times 4}{20} = \frac{135+44}{20} = \frac{179}{20} = 8\frac{19}{20}$

(k) $\frac{4}{9} + \frac{2}{15} + \frac{3}{5} = \frac{4 \times 5 + 2 \times 3 + 3 \times 9}{45} = \frac{20+6+27}{45} = \frac{53}{45} = 1\frac{8}{45}$

(l) $2 + \frac{1}{13} + 1\frac{1}{13} = 2 + \frac{1}{13} + \frac{14}{13}$

$= \frac{2 \times 13 + 1 + 14}{13} = \frac{26+1+14}{13} = \frac{41}{13} = 3\frac{2}{13}$

3. (a) $6-\frac{3}{4}=\frac{6\times 4-3\times 1}{4}=\frac{24-3}{4}=\frac{21}{4}=5\frac{1}{4}$

(b) $8-2\frac{1}{4}=8-\frac{9}{4}=\frac{8\times 4-9\times 1}{4}=\frac{32-9}{4}=\frac{23}{4}=5\frac{3}{4}$

(c) $2\frac{3}{8}-1\frac{3}{16}=\frac{19}{8}-\frac{19}{16}=\frac{19\times 2-19\times 1}{16}=\frac{38-19}{16}=\frac{19}{16}=1\frac{3}{16}$

(d) $\frac{8}{24}-\frac{3}{18}=\frac{8\times 3-3\times 4}{72}=\frac{24-12}{72}=\frac{12}{72}=\frac{1}{6}$

(e) $\frac{7}{12}-\frac{1}{6}=\frac{7\times 1-1\times 2}{12}=\frac{7-2}{12}=\frac{5}{12}$

(f) $\frac{8}{15}-\frac{3}{20}=\frac{8\times 4-3\times 3}{60}=\frac{32-9}{60}=\frac{23}{60}$

(g) $6\frac{3}{4}-2\frac{1}{5}=\frac{27}{4}-\frac{11}{5}=\frac{27\times 5-11\times 4}{20}=\frac{135-44}{20}=\frac{91}{20}=4\frac{11}{20}$

(h) $14-5\frac{1}{2}=14-\frac{11}{2}=\frac{14\times 2-11\times 1}{2}=\frac{28-11}{2}=\frac{17}{2}=8\frac{1}{2}$

(i) $\frac{7}{12}-\frac{4}{15}=\frac{7\times 5-4\times 4}{60}=\frac{35-16}{60}=\frac{19}{60}$

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

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

(l) $\frac{4}{5}-\frac{3}{7}=\frac{4\times 7-3\times 5}{35}=\frac{28-15}{35}=\frac{13}{35}$

4. The length of two ribbons are $5\frac{1}{3}$ m and $6\frac{1}{5}$ m.

So, the total length of two ribbons $=\left(5\frac{1}{3}+6\frac{1}{5}\right)$ m $=\left(\frac{16}{3}+\frac{31}{5}\right)$ m

$=\left(\frac{80+93}{15}\right)$ m $=\frac{173}{15}$ m $=11\frac{8}{15}$ m

Hence, the total length of two ribbons is $11\frac{8}{15}$ m.

5. Mr. Sharma purchased vegetable oil $=20$ litres

He gave oil to his son $=5\frac{3}{4}$ litres $=\frac{23}{4}$ litres

He gave oil to his daughter $=6\frac{1}{5}$ litre $=\frac{31}{5}$ litres

He gave total oil $=\left(\frac{23}{4}+\frac{31}{5}\right)$ litres $=\left(\frac{115+124}{20}\right)$ litres $=\frac{239}{20}$ litres

So, the oil left with Mr. Sharma $=\left(20-\frac{239}{20}\right)$ litres

$$= \left(\frac{400 - 239}{20}\right) \text{ litres}$$

$$= \frac{161}{20} \text{ litres} = 8\frac{1}{20} \text{ litres.}$$

6. Rohan purchased books worth $= ₹\ 65\frac{3}{4}$

He gave amount to the shopkeeper $=$ ₹ 100

$\therefore$ The amount returned by the shopkeeper

$$= ₹\left(100 - 65\frac{3}{4}\right) = ₹\left(100 - \frac{263}{4}\right)$$

$$= ₹\ \frac{(400 - 263)}{4} = ₹\ \frac{137}{4} = ₹\ 34\frac{1}{4}.$$

7. Arpit bought apples $= 6\frac{1}{3}$ kg $= \frac{19}{3}$ kg

Arpit bought oranges $= 5\frac{1}{7}$ kg $= \frac{36}{7}$ kg

So, the total weight of fruits bought by Arpit $= \left(\frac{19}{3} + \frac{36}{7}\right)$ kg

$$= \left(\frac{133 + 108}{21}\right) \text{ kg} = \frac{241}{21} \text{ kg} = 11\frac{10}{21} \text{ kg.}$$

8. Two vessels contain milk $= 5\frac{1}{6}$ litre.

One of them contain milk $= 3\frac{1}{4}$ litre

So, the Milk in the other vessel $= \left(5\frac{1}{6} - 3\frac{1}{4}\right)$ litres

$$= \left(\frac{31}{6} - \frac{13}{4}\right) \text{ litres} = \left(\frac{62 - 39}{12}\right) \text{ litres}$$

$$= \frac{23}{12} \text{ litres} = 1\frac{11}{12} \text{ litres.}$$

9. Mrs Kapoor travelled by car $= 20\frac{2}{5}$ km $= \frac{102}{5}$ km

Mrs Kapoor travelled by bus $= 10\frac{1}{4}$ km $= \frac{41}{4}$ km

So, the total distance covered by her $= \left(\frac{102}{5} + \frac{41}{4}\right)$ km.

$$= \left(\frac{408 + 205}{20}\right) \text{km} = \frac{613}{20} \text{km} = 30\frac{13}{20} \text{km.}$$

10. A recipe needs milk $= 2\frac{3}{4}$ cup $= \frac{11}{4}$ cup

And, the recipe needs cream $= 1\frac{2}{3}$ cup $= \frac{5}{3}$ cup

Compare the quantity $\frac{11}{4}$ and $\frac{5}{3}$.

$\because \quad \frac{11}{4} = \frac{11 \times 3}{4 \times 3} = \frac{33}{12}$

and, $\frac{5}{3} = \frac{5 \times 4}{3 \times 4} = \frac{20}{12}$

Since, $\frac{33}{12} > \frac{20}{12}$

$\therefore$ their difference $= \frac{33 - 20}{12} = \frac{13}{12} = 1\frac{1}{12}$

Hence, milk is required in more quantity than cream and by $1\frac{1}{12}$ cup.

Multiple Choice Questions

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

8 Decimals

Exercise 8.1

1. (a) $\frac{17}{10} = \mathbf{1.7}$ (b) $\frac{7}{100} = \mathbf{0.07}$ (c) $\frac{68}{100} = \mathbf{0.68}$ (d) $\frac{95}{1000} = \mathbf{0.095}$

2. (a) $10.049 = 10 + 0.04 + 0.009 = 10 + \frac{4}{100} + \frac{9}{1000}$

(b) $44.444 = 40 + 4 + 0.4 + 0.04 + 0.004 = 40 + 4 + \frac{4}{10} + \frac{4}{100} + \frac{4}{1000}$

(c) $193.26 = 100 + 90 + 3 + 0.2 + 0.06 = 100 + 90 + 3 + \frac{2}{10} + \frac{6}{100}$

(d) $205.19 = 200 + 5 + 0.1 + 0.09 = 200 + 5 + \frac{1}{10} + \frac{9}{100}$

3. (a) Twelve-hundredths = 0.12

(b) Twenty-three point zero five = 23.05

(c) Nine point zero-zero nine = 9.009

(d) One hundred sixty-seven point three zero seven = 167.307

4.

Column A	**Column B**
(a) 6.1	(iii) Six and one-tenth
(b) 1.3	(iv) One and three-tenths
(c) 3.5	(ii) Three and five-tenths
(d) 1.6	(i) One and six tenths

5. (a) $1+1+\frac{3}{10}=2+\frac{3}{10}=\mathbf{2.3}$ (b) $\frac{30}{100}=\mathbf{0.30}$

(c) $\frac{2}{10}=\mathbf{0.2}$ (d) $\frac{45}{100}=\mathbf{0.45}$

6. (a) $3.69 = 3+\frac{6}{\boxed{10}}+\frac{9}{\boxed{100}}$ (b) $\boxed{25.309}=20+5+\frac{3}{10}+\frac{9}{1000}$

(c) $47.906 = 40+\boxed{7}+\frac{9}{10}+\frac{6}{\boxed{1000}}$ (d) $83.708 = 80+3+\frac{7}{10}+\frac{\boxed{8}}{1000}$

(e) $123.658 = 100+\boxed{20}+3+\frac{6}{10}+\frac{\boxed{5}}{100}+\frac{\boxed{8}}{1000}$

7. (a) 0.8 + 0.07 + 0.009 = **0.879**

(b) 3 + 0.008 + 0.0005 = **3.0085**

(c) 30 + 1 + 0.2 + 0.08 = **31.28**

(d) 10 + 7 + 0.5 + 0.02 + 0.006 = **17.526**

(e) 30 + 9 + 0.008 + 0.0005 = **39.0085**

8. (a) 1.1, 1.2, 1.3 **1.4**, **1.5**, **1.6**

(b) 6.123, 6.124, 6.125, **6.126**, **6.127**, **6.128**

(c) 11.8, 11.9, 12.0, **12.1**, **12.2**, **12.3**

(d) 9.001, 9.002, 9.003, **9.004**, **9.005**, **9.006**

(e) 27.14, 27.15, 27.16, **27.17**, **27.18**, **27.19**

Exercise 8.2

1. (a) $\frac{7}{10}=\mathbf{0.7}$ (b) $\frac{23}{10}=\mathbf{2.3}$ (c) $\frac{153}{10}=\mathbf{15.3}$

(d) $\frac{12}{100}=\mathbf{0.12}$ (e) $\frac{8}{100}=\mathbf{0.08}$ (f) $\frac{1030}{100}=\mathbf{10.30}$

(g) $\frac{30}{1000}=\mathbf{0.030}$ (h) $\frac{87}{1000}=\mathbf{0.087}$ (i) $\frac{9}{1000}=\mathbf{0.009}$

(j) $\frac{255}{1000}=\mathbf{0.255}$

2. **Converting the given decimal into like decimals :**

(a) 7.800, 3.990, 1.682

(b) 16.700, 18.360, 2.007

(c) 561.5000, 389.6001, 175.0002

(d) 0.7800, 9.1000, 0.0075

(e) 13.6680; 1.2000, 6.7389

(f) 1.9500, 6.0050, 3.2966

3. (a) $0.3\boxed{<}2.34$ (b) $0.5\boxed{>}0.15$ (c) $6.6\boxed{>}6.066$

(d) $7.3\boxed{=}7.30$ (e) $6.359\boxed{<}6.4$ (f) $0.81\boxed{>}0.18$

(g) $9.099\boxed{<}9.99$ (h) $70.08\boxed{<}70.7$ (i) $96.550\boxed{=}96.55$

4. (a) 0.04, 1.04, 0.14, 1.14

The ascending order is : 0.04 < 0.14 < 1.04 < 1.14

(b) 20, 19.09, 20.001, 19.9

The ascending order is : 19.09 < 19.9 < 20 < 20.001

(c) 6.23, 6.32, 6.4, 6

The ascending order is : 6 < 6.23 < 6.32 < 6.4

(d) 19.4, 19.45, 1.945, 194.5

The ascending order is : 1.945 < 19.4 < 19.45 < 194.5

5. (a) $\frac{3}{5}=\frac{3\times 2}{5\times 2}=\frac{6}{10}=\mathbf{0.6}$ (b) $\frac{5}{2}=\frac{5\times 5}{2\times 5}=\frac{25}{10}=\mathbf{2.5}$

(c) $\frac{7}{4}=\frac{7\times 25}{4\times 25}=\frac{175}{100}=\mathbf{1.75}$ (d) $\frac{1}{8}=\frac{1\times 125}{8\times 125}=\frac{125}{1000}=\mathbf{0.125}$

(e) $\frac{3}{25}=\frac{3\times 4}{25\times 4}=\frac{12}{100}=\mathbf{0.12}$ (f) $\frac{17}{20}=\frac{17\times 5}{20\times 5}=\frac{85}{100}=\mathbf{0.85}$

(g) $\frac{33}{30}=\frac{33\div 3}{30\div 3}=\frac{11}{10}=\mathbf{1.1}$ (h) $\frac{8}{125}=\frac{8\times 8}{125\times 8}=\frac{64}{1000}=\mathbf{0.064}$

(i) $1\frac{5}{10}=\frac{1\times 10+5}{10}=\frac{10+5}{10}=\frac{15}{10}=\mathbf{1.50}$

(j) $2\frac{3}{5}=\frac{2\times 5+3}{5}=\frac{10+3}{5}=\frac{13}{5}=\frac{13\times 2}{5\times 2}=\frac{26}{10}=\mathbf{2.6}$

6. (a) $1\frac{1}{4}=\frac{1\times 4+1}{4}=\frac{4+1}{4}=\frac{5}{4}=1.25$

$$\begin{array}{l} 4\,)\,5.00\,(\,1.25 \\ \underline{-4} \\ \;\;10 \\ \;\;\underline{-8} \\ \;\;\;\;20 \\ \;\;\underline{-20} \\ \;\;\;\;\times \end{array}$$

Thus, $1\frac{1}{4}=\mathbf{1.25}$

(b) $\frac{5}{8}=0.625$

$$\begin{array}{l} 8\,)\,5.000\,(\,0.625 \\ \underline{-4\,8} \\ \;\;\;20 \\ \;\underline{-16} \\ \;\;\;\;40 \\ \;\;\underline{-40} \\ \;\;\;\;\times \end{array}$$

Thus, $\frac{5}{8}=\mathbf{0.625}$

(c) $\frac{3}{5}=0.6$

$$\begin{array}{l} 5\,)\,3.0\,(\,0.6 \\ \underline{-3\,0} \\ \;\;\times \end{array}$$

Thus, $\frac{3}{5}=\mathbf{0.6}$

(d) $\frac{12}{25}=\mathbf{0.48}$

$$\begin{array}{l} 25\,)\,12.00\,(\,0.48 \\ \underline{-100} \\ \;\;\;200 \\ \;\underline{-200} \\ \;\;\;\;\times \end{array}$$

Thus, $\frac{12}{25}=\mathbf{0.48}$

(e) $9\frac{3}{5}=\frac{9\times 5+3}{5}=\frac{45+3}{5}=\frac{48}{5}=9.6$

$$\begin{array}{l} 5\,)\,48.0\,(\,9.6 \\ \underline{-45} \\ \;\;\;30 \\ \;\underline{-30} \\ \;\;\;\;\times \end{array}$$

Thus, $9\frac{3}{5}=\mathbf{9.6}$

(f) $7\frac{3}{4} = \frac{7\times 4+3}{4} = \frac{28+3}{4} = \frac{31}{4} = 7.75$

$$\begin{array}{r|l} 4\overline{)31.0}(7.75 \\ -28 \\ \hline 30 \\ -28 \\ \hline 20 \\ -20 \\ \hline \times \end{array}$$

Thus, $7\frac{3}{4} = \mathbf{7.75}$

(g) $4\frac{1}{8} = \frac{4\times 8+1}{8} = \frac{32+1}{8} = \frac{33}{8} = 7.75$

$$\begin{array}{r|l} 8\overline{)33.000}(4.125 \\ -32 \\ \hline 10 \\ -8 \\ \hline 20 \\ -16 \\ \hline 40 \\ -40 \\ \hline \times \end{array}$$

Thus, $4\frac{1}{8} = \mathbf{4.125}$

(h) $8\frac{6}{10} = \frac{8\times 10+6}{10}$

$= \frac{80+6}{10} = \frac{86}{10} = 8.6$

$$\begin{array}{r|l} 10\overline{)8.60}(8.6 \\ -8\,0 \\ \hline 60 \\ -60 \\ \hline \times \end{array}$$

Thus, $8\frac{6}{10} = \mathbf{8.6}$

7. (a) Numbers $< \frac{1}{2}$ | Numbers $> \frac{1}{2}$

Numbers $< \frac{1}{2}$	Numbers $> \frac{1}{2}$
(b) 0.125	(a) 0.9
(d) 0.499	(c) 0.506
(e) 0.3	(h) 0.867
(f) 0.089	(g) 0.007

Exercise 8.3

1. (a) 6.3 + 12.37

Converting into like decimals

6.30 + 12.37

= **18.67**

$$\begin{array}{r} 6.30 \\ +\ 12.37 \\ \hline 18.67 \\ \hline \end{array}$$

(b) 2.167 + 3.64

Converting into like decimals

= 2.167 + 3.640

= **5.807**

$$\begin{array}{r} 2.167 \\ +\ 3.640 \\ \hline 5.807 \\ \hline \end{array}$$

(c) 14.354 + 19.109

= **33.463**

$$\begin{array}{r} 14.354 \\ +\ 19.109 \\ \hline 33.463 \\ \hline \end{array}$$

(d) 27.653 + 106.778

= **134.431**

$$\begin{array}{r} 27.653 \\ +\ 106.778 \\ \hline 134.431 \\ \hline \end{array}$$

(e) 3.58 + 4.13 + 8.9

Converting into like decimals

3.58 + 4.13 + 8.90

= **16.61**

$$\begin{array}{r} 3.58 \\ 4.13 \\ +\ 8.90 \\ \hline 16.61 \\ \hline \end{array}$$

(f) 16.5 + 26.47 + 3.9

Converting into like decimals

16.50 + 26.47 + 3.90

= 46.87

$$\begin{array}{r} 16.50 \\ 26.47 \\ +\ 3.90 \\ \hline 46.87 \\ \hline \end{array}$$

2. (a) 29.674 – 22.26
Converting into like decimals
29.674 – 22.260
= **7.414**

$$\begin{array}{r} 29.674 \\ -\ 22.260 \\ \hline 7.414 \\ \hline \end{array}$$

(b) 90.001 – 71.9
Converting into like decimals.
90.001 – 71.900
= **18.101**

$$\begin{array}{r} 90.001 \\ -\ 71.900 \\ \hline 18.101 \\ \hline \end{array}$$

(c) 100 – 99.999
Converting into like decimals
100.000 – 99.999
= **0.001**

$$\begin{array}{r} 100.000 \\ -\ 99.999 \\ \hline 0.001 \\ \hline \end{array}$$

(d) 11.111 – 1.1111
Converting into like decimals.
11.1110–1.1111
= 9.9999

$$\begin{array}{r} 11.1110 \\ -\ 1.1111 \\ \hline 9.9999 \\ \hline \end{array}$$

(e) 300.6 – 197.715
Converting into like decimals.
300.600 – 197.715
= **102.885**

$$\begin{array}{r} 300.600 \\ -149.715 \\ \hline 102.885 \\ \hline \end{array}$$

(f) 107.032 – 85.8
Converting into like decimals.
107.032–25.800
= **21.232**

$$\begin{array}{r} 107.032 \\ -\ 85.800 \\ \hline 21.232 \\ \hline \end{array}$$

3. (a) 3 – 3.3 + 2.8
= 3 + 2.8 – 3.3
= 5.8 – 3.3 = **2.5**

(b) 2.9 + 1.2 – 3.5
= 4.1 – 3.5
= **0.6**

(c) 101.28 + 29.19 – 30.27
= 130.47 – 30.27 = **100.20**

4. The sum of two numbers = 16.25
One of the number = 9.28
So, the other number = 16.25 – 9.28 = 6.97
Hence, the other number is 6.97.

$$\begin{array}{r} 16.25 \\ -\ 9.28 \\ \hline \boxed{6.97} \end{array}$$

5. Ravi had amount = ₹ 701.50
Shyam had amount = ₹ 35.25 more than Ravi had
= ₹ 35.25 + ₹ 701.50 = ₹ 736.75
Hence, Shyam had amount ₹ 736.75.

$$\begin{array}{r} ₹\ 701.50 \\ +\ ₹\ \ 35.25 \\ \hline \boxed{₹\ 736.75} \end{array}$$

6. Sudhir walked on Tuesday = 5.2 km
He Walked on Wednesday = 7.25 km
He Walked on Thursday = 3.655 km
So, the total distance walked by Sudhir during these three days = (5.200 + 7.250 + 3.655) km
= 16.105 km
Hence, Sudhir walked 16.105 km during these three days.

$$\begin{array}{r} 5.200 \text{ km} \\ 5.200 \text{ km} \\ +\ 3.655 \text{ km} \\ \hline \boxed{16.105 \text{ km}} \end{array}$$

7. Johny bought rice = 4.5 kg = 4.50 kg
Titoo bought rice = 7.25 kg = 7.25 kg
Albert bought rice = 6 kg = 6.00 kg

$$\begin{array}{r} 4.50 \text{ kg} \\ 7.25 \text{ kg} \\ +\ 6.00 \text{ kg} \\ \hline \boxed{17.75 \text{ kg}} \end{array}$$

So, Rice bought by together = (4.50 + 7.25 + 6.00) kg
= 17.75 kg

Hence, 17.75 kg of rice was bought by them together.

8. Abhinav carry a bag of mass = 1.75 kg

His father carrys a bag of mass = 10.25 kg

So, the mass of both bags = (1.75 + 10.25) kg = 12 kg

Hence, the mass of both the bags together is 12 kg.

$$\begin{array}{r} 1.75 \text{ kg} \\ +\ 10.25 \text{ kg} \\ \hline \boxed{12.00 \text{ kg}} \end{array}$$

9. Petrol filled in a car = 23 L 400 mL = 23.400 L

Petrol filled in a two-wheeler = 6 L 250 mL = 6.250 L

Petrol filled in an autorickshaw = 9.375 L

So, the total quantity of petrol sold

= (23.400 + 6.250 + 9.375) L
= 39.025 L

$$\begin{array}{r} 23.400 \text{ L} \\ 6.450 \text{ L} \\ +\ 9.375 \text{ L} \\ \hline \boxed{39.025 \text{ L}} \end{array}$$

Hence, 39.025 L petrol was sold. At the petrol station.

10. Rakhee had amount = ₹ 500

She bought a purse = ₹ 75.50

She also bought some medicines = ₹ 121.35

So, money left with her = ₹ 500 – ₹ (75.50 + 121.35)
= ₹ 500 – ₹ 196.85
= ₹ 303.15

$$\begin{array}{r} ₹\ 500.00 \\ -\ ₹\ 196.85 \\ \hline \boxed{₹\ 303.15} \end{array}$$

Hence, ₹ 303.15 was left with Rakhee.

Multiple Choice Questions

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

Brain Teaser

1. T **2.** F **3.** F **4.** F **5.** F

HOTS

1. $0.31 = \frac{3}{10} + \frac{1}{100}$

$0.024 = \frac{2}{100} + \frac{4}{1000}$

$0.135 = \frac{1}{10} + \frac{3}{100} + \frac{5}{1000}$

2. In Once-place decimal, $\frac{2}{5} = 0.4$

In two-place decimal, $\frac{2}{5} = 0.40$

In three-place decimal, $\frac{2}{5} = 0.400$

9 Data Handling

Exercise 9.1

1.

Grades obtained by Students	Tally marks	Frequency
A	卌 卌	10
B	卌 ||||	9
C	卌 ||||	9
D	卌 |||	8
E	||||	4
	Total	40

(a) 10 students got *A* grade. (b) There are 4 students failed.

(c) There are 40 students appeared for the music test.

2. Arranging the data in increasing order : 37, 39, 44, 48, 48, 50, 52, 53, 55, 56, 58, 58, 59, 60, 60, 60, 61, 62, 64, 67, 68, 70, 75, 77, 78, 84, 88, 90, 98, 100

(a) In $30 - 39 = 37, 39$

Group	Marks Obtained by Students
30-39	37, 39
40-49	44, 48, 48
50-59	50, 52, 53, 55, 56, 58, 58, 59
60-69	60, 60, 60, 61, 62, 64, 67, 68
70-79	70, 75, 77, 78
80-89	84, 88
90-99	90, 98
100-109	100

(b) The highest score is 100 marks.

(c) The lowest scored is 37 marks.

(d) 2 students failed.

(e) 5 students scored less than 50 marks.

3.

No. of children in each family	Tally marks	Frequency
0	卌	5
1	卌 ||	7
2	卌 卌 ||	12
3	卌	5
4	卌 |	6
5	|||	3
6	|||	3
	Total	41

4.

Number on die	Tally marks	Frequency
1	卌	5
2	卌 卌	10
3	卌 ||||	9
4	卌 ||||	9
5	卌 ||||	9
6	卌 ||||	9
	Total	51

5.

Weight of Students	Tally marks	Frequency
39 kg	||||	4
40 kg	||||	4
41 kg	||||	5
42 kg	|||| ||	7
43 kg	||||	5
44 kg	|||	3
45 kg	|	1
46 kg	|	1
	Total	30

Exercise 9.2

1. (a) Chowmein is liked by the maximum number of students.
(b) Pav-Bhaji is liked by the minimum number of students.
(c) Burger and Pizza are equally liked by the students.
(d) 13 students like Dosa.

2. (a) The sale was maximum in fourth week.
(b) The sale was minimum in second week.
(c) 200 baskets were sold in the first week.
(d) 225 baskets were sold in the third week.
(e) Total 850 baskets were sold in the month.

3. Before we start drawing the pictograph, we need to decide the symbol and the scale. Let us choose M as the symbol as it represents marks and is easy to draw. Choosing a scale of 1, 10, or 20 for one number are all multiples of 10.
∴ Let, scale : M =10 student

Subject	Marks obtained
English	ⓂⓂⓂⓂⓂⓂⓂ
Hindi	ⓂⓂⓂⓂⓂⓂ◖
Maths	ⓂⓂⓂⓂⓂⓂⓂⓂⓂ
Science	ⓂⓂⓂⓂⓂⓂⓂⓂ
Social Science	ⓂⓂⓂⓂⓂⓂⓂ◖

4. Given, Scale : ☺ = 5 students

Day	No. of students absent
Monday	☺ ☺ ☺ ☺ ☺
Tuesday	☺ ☺ ☺ ☺
Wednesday	☺ ☺ ☺ ☺
Thursday	☺ ☺ ☺
Friday	☺ ☺
Saturday	☺ ☺ ☺

Exercise 9.3

1. (a) The bar graph shows the number of bikes manufactured in 7 sucessive year.

(b) Scale : 1 cm = 200 bikes.

(c) In year 2010, the production of bikes was minimum.

(d) In year 2016 the production of bikes was maximum.

(e) In year 2012 and 2014, was the production of bikes was same.

(f) (i) 900 bikes were manufactured in year 2011.

(ii) 1200 bikes were manufactured in year 2013.

(iii) 1500 bikes were manufactured in year 2015.

2. (a) the bar graph shows the number of books sold on 6 successive days.

(b) Scale : 1 cm = 50 books.

(c) In Saturday, the sale of books was maximum.

(d) In Wednesday, the sale of books was minimum.

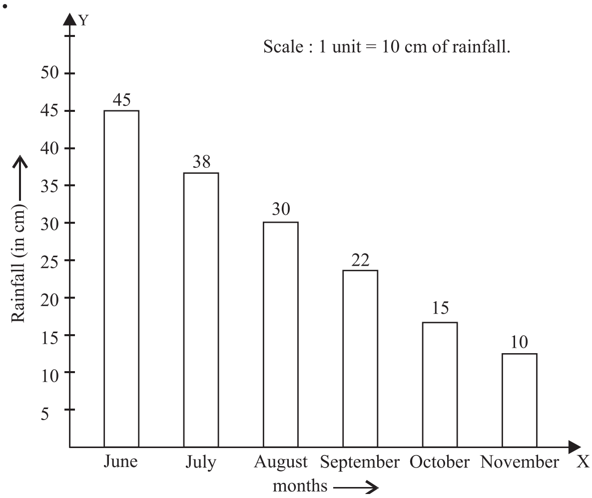
(e) In Monday and Thursday, the sale was equal.

(f) 350 books were sold on Tuesday.

(g) 400 books were sold on Friday.

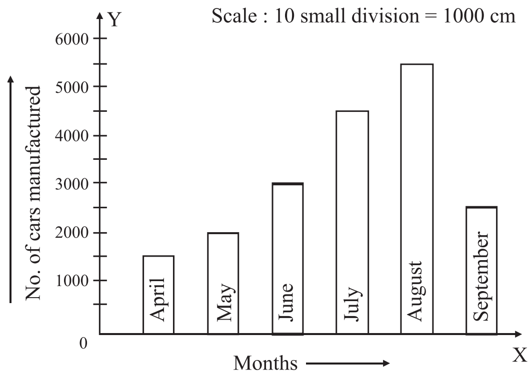
(h) We think the shop was closed in Sunday.

3. **Scale :**



1. First draw two perpendicular lines-one horizontal and one vertical on a graph paper. Name the horizontal axis as x-axis and vertical axis as y-axis.
2. Take months along x-axis and rainfall (in cm) along y-axis.
3. Along the x-axis choose convenient uniform width of bars. The graph should be uniform between six bars (rectangles).
4. Choose a suitable scale to determine the height of the bar. Take 1 unit as 5 cm of rainfall.
5. The bar graph showing the rainfall (in cm) in different months is as follows.

4. Scale : 1 cm = 100 cars



1. Draw the two axes OX and OY.
2. On the X-axis mark the places for 6 bars equal in width and equal distance apart. (6 bars as we have to show the strength for 6 months.)
3. Write the various months below the marked space.
4. Choose an appropriate scale. As maximum strength is 5500 we can take the sacle 1 unit length (1 cm) for 1000 cars.
5. Mark the numbers 500, 1000, 1500, 2000 ..... up to 6000 on the Y-axis at unit length intervals.
6. Above April, construct a bar up to the 1500 cars.
7. Construct the other bars neatly.
8. Similarly for bars above may, June, July, August, September, we have to count the appropriate number of small lines.
9. Shade the bars (or pattern them).

5. **Scale :** 1 cm = 10 percentage

1. First draw two perpendicular lines-one horizontal and one vertical on a graph paper. Name the horizontal axis as x-axis and vertical axis as y-axis.
2. Take subject along x-axis and percentage along y-axis.
3. Along the x-axis choose convenient uniform width of bars. The graph should be uniform between six bars (rectangles).
4. Choose a suitable scale to determine the height of the bar. Take 1 cm as 10 percentages.
5. The bar graph showing the percentage in different subject is as follows :

Multiple Choice Questions

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

Brain Teaser

Fill in the blanks :

1. The numerical facts collected from an observation is called **data.**
2. In the bar graphs, the **width** of the bars is uniform throughout.
3. Data can be arranged in a tabular form using **pictures.**
4. In a bar graph, the space between the two bars is kept **same distance.**
5. The data collected directly from the source is called the **primary data.**

NEP

Do it yourself.

10 Perimeter and Area

Exercise 10.1

1. (a) Perimeter of the given figure $= (10 + 10 + 10 + 10 + 10)$ cm $= 50$ cm.

(b) Perimeter of the given figure $= (17 + 19 + 16)$ cm $= 52$ cm.

(c) Perimeter of the given figure $= (40 + 80 + 70 + 40)$ cm $= 230$ cm.

(d) Perimeter of the given figure $= (14 + 14 + 7)$ cm $= 35$ cm.

2. Since, the perimeter of a rectangle $= 2(l + b)$

$\therefore$ (a) The perimeter of given figure $= 2(10 + 5)$ cm
$= 2 \times 15$ cm $= 30$ cm.

(b) The perimeter of given figure $= 2(15 + 12)$ cm
$= 2 \times 27$ cm $= 54$ cm.

(c) The perimeter of given figure $= 2 \times (25 + 25)$ cm
$= 2 \times 50$ cm $= 100$ cm.

(d) The perimeter of given figure $= 2(50 + 20)$ cm
$= 2 \times 70$ cm $= 140$ cm.

3. Since, the perimeter of a square $= 4 \times$ side

$\therefore$ (a) The perimeter of a square $= 4 \times 9$ cm $= 36$ cm

(b) The perimeter of a square $= 64$ m

$\therefore$ $4 \times$ side $= 64$ m

side $= (64 \div 4)$ m $= 16$ m.

(c) The perimeter of a square $= 4 \times$ side

$= 4 \times 19.5$ cm $= 78$ cm.

(d) The perimeter of a square $= 4 \times$ side

$\therefore$ $4 \times$ side $= 120$ cm.

side $= (120 \div 4)$ cm $= 30$ m.

4. One side of a square $= 30$ cm

So, the perimeter of the square $= 4 \times$ side

$= 4 \times 30$ cm $= 120$ cm.

5. The perimeter of a square $= 36$ m

So, the side of the square $=$ perimeter $\div 4$

$= 36 \div 4 = 9$ m.

6. The side of a square field $= 25$ m

$\therefore$ The perimeter of the square $= 4 \times$ side

$= 4 \times 25$ m $= 100$ m

$\because$ cost of fencing $=$ ₹ 10.50 per m

So, the cost of fencing the square field $=$ ₹ $100 \times 10.50 =$ ₹ 1050

7. Length of a rectangular park $= 615$ m

Breadth of a rectangular park $= 550$ m

Perimeter of the field $= 2$ (length + breadth)

$= 2(615 + 550)$ m $= 2 \times 1165$ m $= 2330$ m

$\because$ Cost of fencing $=$ ₹ 9.25 per metre

So, the Cost of fencing the park $=$ ₹ $9.25 \times 2330 =$ ₹ 21552.50

8. Length of a piece of wire $= 78$ m

Since, length of a piece of wire $=$ Perimeter of a regular pentagon

$\therefore$ $5 \times$ side $= 78$ m

side $= (78 \div 5)$ m $= 15.6$ m

Similarly, the side of hexagon $= (78 \div 6)$ m $= 13$ m

Thus, the difference in the lengths of the sides of the hexagon and the pentagon

$= 15.6$ m $- 13$ m $= 2.6$ m.

9. The perimeter of the square park $= 4 \times 135$ m $= 540$ m

$\therefore$ Distance covered by Shyam in 2 rounds $= 2 \times 540$ m $= 1080$ m

$\therefore$ The perimeter of the rectangular park $= 2(70 + 45)$m $= 2 \times 115$m $= 230$m

Distance covered by Seema in 3 rounds

$= 3 \times 230$ m $= 690$ m

Since, 1080 m $>$ 690 m

So, their difference $= (1080 - 690)$ m $= 390$ m

Hence, Shyam covers 390 m more distance than Seema.

10. (a) The perimeter of the given figure

$= (5 + 5 + 5 + 6 + 9 + 5 + 9 + 6)$ cm $= 50$c m.

(b) The perimeter of the given figure

$= (6 + 1 + 2 + 3 + 2 + 1 + 6 + 1 + 2 + 3 + 2 + 1)$ cm $= 30$ cm.

(c) The perimeter of the given figure $= (4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4)$ m $= 48$ cm

(d) The perimeter of the given figure

$= (1 + 2 + 1 + 2 + 1 + 2 + 1 + 2 + 4 + 8)$ m $= 24$ m

(e) The perimeter of the given figure $= (3 + 3 + 4 + 4 + 4)$ m $= 18$ m

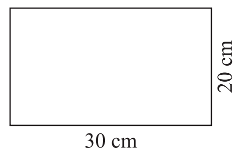
Exercise 10.2

1. (a) Length of the rectangle $= 20$ cm

So, the area of the rectangle $= l \times b$

$= 30\,\text{cm} \times 20\,\text{cm}$

$= 600\,\text{cm}^2$.



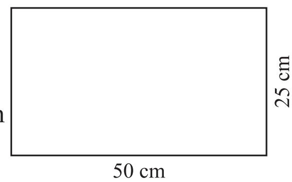
(b) Length of the rectangle $= 50$ cm

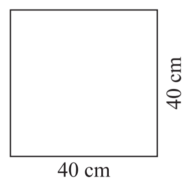
Breadth of the rectangle $= 25$ cm

So, the area of the rectangle $= l \times b$

$= 50\,\text{cm} \times 25\,\text{cm}$

$= 1250\,\text{cm}^2$





(c) Each side of square $= 40$ cm

So, the area of the square = side × side

$= 40\,\text{cm} \times 40\,\text{cm}$

$= 1600\,\text{cm}^2$.

2. (a) Length $= 4$ cm, Breadth $= 3$ cm, Area = ?, Perimeter = ?

So, the area of the rectangle $= l \times b = 4$ cm $\times$ 3 cm $= 12\,\text{cm}^2$.

And the perimeter of the rectangle $= 2(l + b)$

$= 2(4 + 3)$ cm $= 14$ cm.

(b) Length = ? Breadth $= 12$ cm, Area $= 240\,\text{cm}^2$

Perimeter = ?

$\because$ Area of the rectangle $= l \times b$

$\therefore \quad 240 = l \times 12$

$l = (240 \div 12)$ cm $= 20$ cm

And the perimeter of the rectangle $= 2(l + b)$

$= 2(20 + 12)$ cm $= 64$ cm.

(c) Length $= 5$ cm, Breadth $= 8.5$ cm, Area = ?, Perimeter = ?

So, the area of the rectangle $= l \times b = 5\,\text{cm} \times 8.5$ cm $= 42.5\,\text{cm}^2$

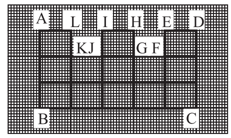
And the perimeter of the rectangle $= 2(l + b) = 2(5 + 8.5)$ cm

$= 27$ cm

The table are :

S.No.	Length	Breadth	Area	Perimeter
a	4 cm	3 cm	**12 cm^2**	**14 cm**
b	**20 cm**	12 cm	240 cm^2	**64 cm**
c	5 cm	8.5 cm	**42.5 cm^2**	**27 cm**

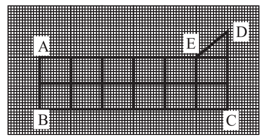
3. (a) Number of complete squares enclosed $= 13$



Number of more than half squares enclosed $= 0$
Number of half squares enclosed $= 0$
So, the area of figure (ABCDEFGHIJKL)

$$= 13 \times 1 + 0 \times 1 + 0 \times 1$$
$$= 13 \text{ cm}^2.$$

(b) Number of complete square enclosed $= 12$

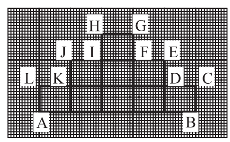


Number of more than half squares enclosed $= 0$
Number of half squares enclosed $= 1$

So, the area of figure(ABCDE) $= 12 \times 1 + 0 \times 1 + \frac{1}{2} \times 1$

$$= 12 + 0 + \frac{1}{2} = 12\frac{1}{2} \text{ cm}^2.$$

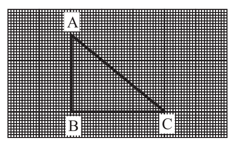
(c) Number of complete squares enclosed $= 9$



Number of more than half squares enclosed $= 0$
Number of half squares enclosed $= 0$
So, the area of figure (ABCDEFGHIJKL)

$$= 9 \times 1 + 0 \times 1 + 0 \times 1 = (9 + 0 + 0) \text{ cm}^2 = 9 \text{ cm}^2.$$

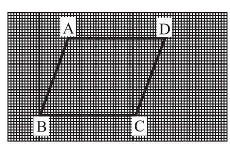
(d) Number of complete squares enclosed $= 3$



Number of more than half squares enclosed $= 0$
Number of half squares enclosed $= 3$
So, the area of figure

$$(\text{ABC}) = 3 \times 1 + 0 \times 1 + \frac{1}{2} \times 3 = \left(3 + 0 + \frac{3}{2}\right) \text{cm}^2$$
$$= \left(\frac{6 + 3}{2}\right) \text{cm}^2 = \frac{9}{2} \text{ cm}^2 = 4.5 \text{ cm}^2.$$

(e) Number of complete squares enclosed $= 6$



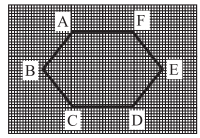
Number of more than half squares enclosed $= 2$
Number of half squares enclosed $= 2$
So, the are of figure $(ABCD)$

$$= \left(6 \times 1 + 2 \times 1 + 2 \times \frac{1}{2}\right) \text{cm}^2$$
$$= (6 + 2 + 1) \text{cm}^2 = 9 \text{cm}^2$$

(f) Number of complete squares enclosed $= 6$

Number of more than half squares enclosed $= 2$

Number of half squares enclosed $= 0$



So, the Area of (ABCDEF) $= 6 \times 1 + 2 \times 1 + 0 \times \frac{1}{2}$

$= (6 + 2 + 0)\ \text{cm}^2 = 8\ \text{cm}^2$

4. Length of a rectangle $= 5$ cm

And, breadth of the rectangle $= 4$ cm

So, the area of the rectangle $= l \times b = (5 \times 4)\ \text{cm}^2 = 20\ \text{cm}^2$.

And the perimeter of the rectangle $= 2(l + b) = 2(5 + 4)$ cm $= 18$ cm.

5. The area of rectangle $= 20\ \text{cm}^2$

Breadth $= 4$ cm

Length $= ?$

So, the length of the rectangle $= (20 \div 4)$ cm $= 5$ cm.

6. Length of the plot of land $= 35.5$ m

Breadth of the plot of land $= 17.5$ m

So, the area of a plot of land $= l \times b$

$= (35.5 \times 17.5)\ \text{m}^2 = 621.25\ \text{m}^2$

$\because$ the cost of the plot of land per square metre $=$ ₹ 220

$\therefore$ the cost of the plot of land 621.25 m^2 $=$ ₹ 220×621.25

$=$ ₹ 136675.

7. The area of a rectangular field $= 4800\ \text{m}^2$

length $= 80$ m

breadth $= ?$

So, the breadth of the rectangular field $= (4800 \div 80)$ m $= 60$ m.

8. Length of the playground $= 30$ m

Breadth of the playground $= 15$ m

So, the area of a playground $= (30 \times 15)\ \text{m}^2 = 450\ \text{m}^2$

$\because$ the cost of levelling per square metre = ` 3

$\therefore$ the cost of levelling of playground 450 m^2 = ` $3 \times 450$ = ` 1350.

9. Let the length of a rectangle be l unit.

And, its breadth $= b$ unit

So, the area of the rectangle $= l \times b$ unit^2 $= A$

Now, according to the question

if $L = 2l$ $B = b$

So, the new area of a rectangle $= L \times B = 2l \times b$ unit^2

$= 2A$

Hence, the area of the new rectangle is 2 time the area of the actual rectangle.

10. Let the breadth of a rectangle be b.

Then, the length will be $2b$ of the rectangle.

So, the area of the rectangle $= l \times b$

$= 2b \times b = 2b^2$

Hence, the area of the rectangle is 2 times of the square of breadth or 2 $(\text{breadth})^2$.

11. Let a be the side of a square.
Further, let A be the area of the square.
Then, $A = a^2$
Now, new side $= 2a$
$\therefore$ New area $= (2a)^2 = 4a^2 = 4A$
Hence, the area of the new square is 4 times of the previous area.

12. The cost of flooring a rectangular area = ₹ 125
The cost of flooring a rectangular area per square metre = ₹ 2.50
So, the area of the rectangular floor

$$= \frac{\text{Total cost of flooring the rectangular area}}{\text{Cost of per square metre}}$$

$$= \frac{125}{2.50} = 50 \text{ m}^2.$$

13. Side of a square $= 16$ cm
$\therefore$ area of the square $= (\text{side})^2 = (16 \text{ cm})^2 = 256 \text{ cm}^2$
Length of the rectangle $= 64$ cm
$\therefore$ area of rectangle $= l \times b = 64 \times b$ cm
But the area of a square is the same area of the rectangle
So, $64 \times b = 256$
$b = (256 \div 64)$ cm
$b = 4$ cm
Hence, the breadth of the rectangle is 4 cm.

14. Given,
The side of a square $= 15.6$ m
So, the area of the square $= (\text{side})^2 = (15.6 \text{ m})^2$
$= 243.36 \text{ m}^2$
$\because$ the cost of polishing the floor per m^2 = ₹ 30.50
$\therefore$ the cost of polishing the floor 243.36 m^2 = ₹ 30.50×243.36
= ₹ 7422.48

15. Side of a square $= 12.5$ m
So, the area of the square $= (\text{side})^2 = (12.5 \text{ m})^2$
$= 156.25 \text{ m}^2$
$\because$ The cost of polishing the floor of the square hall per m^2 = ₹ 15
$\therefore$ The cost of polishing the floor of the square hall.
= ₹ 15×156.25
= ₹ 2343.75

Multiple Choice Questions

1. (a) 2. (b) 3. (c) 4. (b) 5. (d) 6. (b) 7. (c) 8. (b) 9. (d) 10. (a)

Brain Teaser

1. Fill in the blanks :

(a) The area of a rectangle is **length × breadth.**

(b) The area of a square field is 324 m^2. Then the perimeter of the square is **72** cm.

(c) The length and breadth of a rectangle are in the ratio 2 : 1. If its breadth is 20 m, then its perimeter is **120 m.**

(d) The length of rectangle is thrice its breadth. The area of the rectangle is $\mathbf{3b^2}$**.**

2. Write T for 'True' or F for 'False' :

(a) T (b) F (c) F (d) T (e) T

HOTS

1. Total area of the rectangle $= 20\text{ m} \times 15\text{ m} = 300\text{ m}^2$

Area of the square $= 4\text{ m} \times 4\text{ m} = 16\text{ m}^2$

$\therefore$ area of 4 squares $= 4 \times 16\text{ m}^2 = 64\text{ m}^2$

Therefore, the area of the shaded region in the figure = Total area of the rectangle − area of 4 squares $= (300 - 64)\text{ m}^2 = 236\text{ m}^2$.

NEP

Do it yourself.

11 Introduction to Algebra

Exercise 11.1

1. (a) $3 \times 2 \times a \times a \times a \times b \times b$

$= 6 \times a^3 \times b^2$

$= 6a^3b^2$

(b) $x \times x \times x \times x \times x \times x$

$= x^6$

(c) $p \times p \times q \times q \times q \times r \times r$

$= p^2 \times q^3 \times r^2$

$= p^2q^3r^2$

2. (a) The numerical coefficient of $7x^2 - 8x^2 + 9$ is $7, -8$ and 9.

(b) The numerical coefficient of $5y^2 + 7x^2 - 9y^3 + x^3$ is 5,7, −9 and 1.

(c) The numerical coefficient of $4x^4 - 5x^2 + 7x$ is 4, −5 and 7.

3.

	Algebraic Expression	Terms	Factors
(a)	$x^2 + 3xy - 27$	x^2	$x \times x$
		$3xy$	$3 \times x \times y$
		-27	$-1 \times 3 \times 3 \times 3$
(b)	$3p^2 - 6pq + q^2 + 2$	$3p^2$	$3 \times p \times p$
		$-6pq$	$-1 \times 2 \times 3 \times p \times q$
		q^2	$q \times q$
		2	2

	Algebraic Expression	Terms	Factors
(c)	$2q-3p+4r$	$2q$	$2\times q$
		$-3p$	$-1\times 3\times p$
		$4r$	$2\times 2\times r$
(d)	$8a^2b^2c$	$8a^2b^2c$	$2\times 2\times 2\times a\times a\times b\times b\times c$
(e)	ax^2+bx+c	ax^2	$a\times x\times x$
		bx	$b\times x$
		c	c
(f)	$9x^2+3y-9$	$9x^2$	$3\times 3\times x\times x$
		$3y$	$3\times y$
		-9	$-1\times 3\times 3$

4.

	Terms containing *x*	Coefficient of *x*
(a)	$-5xy^2$	$-5y^2$
(b)	$-3yx$	$-3y$
(c)	x	1

5. (a) Binomial (b) Binomial (c) Monomial
(d) Trinomial (e) Polynomial (f) Monomial
(g) Binomial

6. (a) $a+b-c$ if $a=5$, $b=4$ and $c=-5$

Putting these values given above equation, we get

$a+b-c=5+4-(-5)$

$=9+5=\mathbf{14}$

(b) $4a^2+5b-c$ if $a=2$, $b=3$ and $c=5$

Putting these values given above equation, we get

$4a^2+5b-c=4\times(2)^2+5\times 3-5$

$=4\times 4+15-5$

$=16+15-5$

$=31-5=\mathbf{26}$

7. (a) $xy-(a+b)$ (b) $2x+6$ (c) $\frac{p}{3}+7$

8. (a) $5xy+3x^2y+(-3)=5xy+3x^2y-3$

(b) $4x^2+(-7y^2)+(-15)=4x^2-7y^2-15$

(c) $45+9x^2yz+(-5xy^2z)+(-yz^2)$

$=9x^2yz-5xy^2z-yz^2+45$

Multiple Choice Questions

1. (b) **2.** (d) **3.** (d) **4.** (c) **5.** (d) **6.** (c) **7.** (a) **8.** (b) **9.** (d) **10.** (a)

Brain Teaser

1. The given, $x=4$, $y=3$ and $z=1$

(a) $x^2+y+z=4^2+3+1=16+3+1=20.$

(b) $3x - 2y + z = 3 \times 4 - 2 \times 3 + 1 = 12 - 6 + 1 = 7.$

2. (a) The constant term of $5a + 9$ is 9.

(b) The constant term of $x^2 + y^2 - 7$ is -7.

3. (a) The coefficient of a in $(-8ab^2c)$ is $-8b^2c$.

(b) The coefficient of a in $(6a + 5x)$ is 6.

(c) The coefficient of a in $(ab + d)$ is b.

4. (a) The numerical coefficient of $5a^2b$ is 5.

(b) The numerical coefficient of $-xyz$ is -1.

(c) The numerical coefficient of a is 1.

(d) The numerical coefficient of $11x$ is 11.

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12 Linear Equations in One Varibale

Exercise 12.1

1. (b) $7x + 6 = 12$ and

(d) $\frac{x}{3} + \frac{2}{3} = 5$ are the linear equations of one variable.

2. (a) $x = 5 + 3$ (b) $3x + 15 = 42$ (c) $x - 3 = 0$

(d) $\frac{1}{3}y = 9$ (e) $\frac{2x}{5} = 3$ (f) $6x = x + 5$

3. (a) A number x added to y is 4.

(b) Twice a number x subtracted from 9 is 5.

(c) Three times of a number x added to two times of another number y is 0.

(d) 5 less than from twice a number x is 15.

(e) Three times of a number y subtracted from nine times of another number x is 7.

(f) 10 increased by thrice a number x is 15.

4. (a) $2x + \frac{3}{2} = \frac{23}{2}$

Putting $(x = 5)$ in this equation.

$\text{LHS} = 2 \times 5 + \frac{3}{2} = 10 + \frac{3}{2} = \frac{20 + 3}{2} = \frac{23}{2} = \text{RHS}$

Hence, the equation is satisfied by $x = 5$. Therefore, $x = 5$ is the solution (or root) of this equation.

(b) $4x - 1 = 3$

Putting $(x = 1)$ in this equation.

$\text{LHS} = 4x - 1 = 4 \times 1 - 1 = 4 - 1 = 3 = \text{RHS}$

Hence, the equation is satisfied by $x = 1$. Therefore, $x = 1$ is the solution (or root) of this equation.

(c) $3-9x=0$

Putting $\left(x=\frac{1}{3}\right)$ in th

LHS $=3-9x=3-9\times\frac{1}{3}=3-3=0 \; =$ RHS

Hence, the equation is satisfied by $x=\frac{1}{3}$. Therefore, $x=\frac{1}{3}$ is the solution (or root) of this equation.

(d) $2x-2=5x-8$

Putting $(x=2)$ in this equation.

LHS $=2x-2=2\times2-2=4-2=2$

RHS $=5x-8=5\times2-8=10-8=2$

Since, LHS $=$ RHS

Hence, the equation is satisfied by $x=2$. Therefore, $x=2$ is the solution (or root) of this equation.

5. We substitute a number of values for x or y or z and stop only when the value satisfies both sides, LHS and RHS.

(a) $x-7=10$

x	LHS	RHS
1	$1-7=-6$	10
2	$2-7=-5$	10
5	$5-7=-2$	10
10	$10-7=3$	10
15	$15-7=8$	10
17	$17-7=10$	10

when $x=17$, then LHS = RHS

$\therefore$ $x=17$ is the root of this equation.

(b) $3x-7=x-3$

s	LHS	RHS
1	$3\times1-7=-4$	$1-3=-2$
2	$3\times2-7=-1$	$2-3=-1$

When $x=2$, then LHS $=$RHS

$\therefore$ $x=2$ is the root of this equation."

(c) $\frac{y}{2}=4$

y	LHS	RHS
1	$\frac{1}{2}$	4
2	$\frac{2}{2}=1$	4

4	$\frac{4}{2}=2$	4
6	$\frac{6}{2}=3$	4
8	$\frac{8}{2}=4$	4

When $x=8$, then LHS $=$RHS

$\therefore$ $x=8$ is the root of this equation.

(d) $\frac{1}{2}x+7=11$

x	LHS	RHS
1	$\frac{1}{2}\times 1+7=\frac{15}{2}$	11
2	$\frac{1}{2}\times 2+7=8$	11
4	$\frac{1}{2}\times 4+7=9$	11
6	$\frac{1}{2}\times 6+7=10$	11
8	$\frac{1}{2}\times 8+7=11$	11

When $x=8$, then LHS $=$ RHS

$\therefore$ $x=8$ is the root of this equation.

Exercise 12.2

1. (a) $3z+12=15$

Subtracting 12 from both sides of the equation, we get

$$3z+12-12=15-12$$

$$3z=3$$

Dividing both sides of the equation by 3, we get

$$\frac{3z}{3}=\frac{3}{3}$$

$$z=1$$

$\therefore z=1$ is the solution of this equation.

(b) $4x=40$

Dividing both sides of the equation by 4, we get

$$\frac{4x}{4}=\frac{40}{4}$$

$$x=10$$

$\therefore$ $x=10$ is the solution of this equation.

(c) $\frac{20x}{3} = 40$

Multiplying both sides of the equation by $\frac{3}{20}$,

We get

$$\frac{20x}{3} \times \frac{3}{20} = 40 \times \frac{3}{20}$$

$$x = 2 \times 3 = 6$$

$\therefore$ $x = 6$ is the solution of this equation.

(d) $3(x-2) = 15$

Dividing both sides of the equation by 3, we get

$$\frac{3(x-2)}{3} = \frac{15}{3}$$

$$x - 2 = 5$$

Adding 2 to both sides of the equation, we get

$$x - 2 + 2 = 5 + 2$$

$$x = 7$$

$\therefore$ $x = 7$ is the solution of this equation.

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

Adding 4 to both sides of the equation, we get $\frac{x}{2} - 4 + 4 = 1 + 4$

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

Multiplying both sides of the equation by 2, we get

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

$$x = 10$$

$\therefore$ $x = 10$ is the solution of this equation.

(f) $\frac{3x}{7} = 21$

Multiplying both sides of the equation by $\frac{7}{3}$, we get

$$\frac{3x}{7} \times \frac{7}{3} = 21 \times \frac{7}{3}$$

$$x = 7 \times 7 = 49$$

$\therefore$ $x = 49$ is the solution of this equation.

(g) $5x - 3 = x + 17$

Adding 3 to both sides of the equation, we get

$$5x - 3 + 3 = x + 17 + 3$$

$$5x = x + 20$$

Subtracting x from both sides of the equation, we get

$$5x - x = x - x + 20$$

$$4x = 20$$

Dividing both sides of the equation by 4, we get

$$\frac{4x}{4} = \frac{20}{4}$$

$$x = 5$$

$\therefore\ x = 5$ is the solution of this equation.

(h) $3(x+2) - 2(x-1) = 7$

Removing the brackets on both sides, we get

$$3x + 6 - 2x + 2 = 7$$

$$3x - 2x + 6 + 2 = 7$$

$$x + 8 = 7$$

Subtracting 8 from both sides, we get

$$x + 8 - 8 = 7 - 8$$

$$x = -1$$

$\therefore\ x = -1$ is the solution of the equation.

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

Multiplying both sides of the equation by 4, we get

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

$$3(x-2) = 4(x-3)$$

Removing the brackets on both sides, we get $3x - 6 = 4x - 12$

Subtracting $4x$ from both sides of the equation, we get

$$3x - 6 - 4x = 4x - 12 - 4x$$

$$-x - 6 = -12$$

Adding 6 to both sides of the equation, we get

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

$$-x = -6$$

Multiplying both sides of the equation, by (-1), we get

$$-x \times (-1) = -6 \times (-1)$$

$$x = 6$$

$\therefore\ x = 6$ is the solution of this equation.

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

Transposing $\frac{x}{3}$ to the LHS and $-\frac{1}{3}$ to the RHS of the equation, we get

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

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

$$\frac{1}{6}x = \frac{2}{3}$$

Multiplying both sides by 6, we get

$$\frac{1}{6}x \times 6 = \frac{2}{3} \times 6$$

$$x = 2 \times 2 = 4$$

$\therefore$ $x = 4$ is the solution of this equation.

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

Transposing $\frac{x}{3}$ to the LHS of the equation, we get

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

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

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

Multiplying both sides by 6, we get

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

$$x = 6$$

$\therefore$ $x = 6$ is the solution of this equation.

(c) $\frac{2x}{3} + 8 = \frac{x}{2} - 1$

Transposing $\frac{x}{2}$ to the LHS and 8 to the RHS of the equation, we get

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

$$\left(\frac{4x - 3x}{6}\right) = -9$$

$$\frac{1}{6}x = -9$$

Multiplying both sides by 6, we get

$$\frac{1}{6}x \times 6 = -9 \times 6$$

$$x = -54$$

$\therefore$ $x = -54$ is the solution of this equation.

(d) $\frac{x-3}{5} - 2 = \frac{2x}{5}$

Transposing $\frac{2x}{5}$ to the LHS and -2 to the RHS of the equation, we get

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

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

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

Multiplying both sides by 5, we get

$$\frac{-(x+3)\times 5}{5}=2\times 5$$

$$-(x+3)=10$$

$$-x-3=10$$

Transposing (-3) to the RHS of the equation, we get

$$-x=10+3$$

$$-x=13$$

or $$x=-13$$

$\therefore\ x=-13$ is the solution of the given equation.

(e) $\frac{3x}{10}-4=14$

Transposing -4 to the RHS, we get

$$\frac{3x}{10}=14+4$$

$$\frac{3x}{10}=18$$

Multiplying both sides by $\frac{10}{3}$, we get

$$\frac{3x}{10}\times\frac{10}{3}=18\times\frac{10}{3}$$

$$x=6\times 10=60$$

$\therefore\ x=60$ is the solution of the given equation.

(f) $\frac{x}{8}-\frac{1}{2}=\frac{x}{6}-2$

Transposing $\frac{x}{8}$ to the RHS and -2 to the LHS, we get

$$\frac{-1}{2}+2=\frac{x}{6}-\frac{x}{8}$$

$$\frac{-1+4}{2}=\left(\frac{4-3}{24}\right)x$$

$$\frac{3}{2}=\frac{1}{24}x$$

Multiplying both sides by 24, we get

$$\frac{3}{2}\times 24=\frac{1}{24}x\times 24$$

$$3\times 12=x$$

$$36 = x$$

or $$x = 36$$

$\therefore$ $x = 36$ is the solution of the given equation.

(g) $6(7-4x)+7(2+5x)=45$

Removing the brackets, we get

$$42-24x+14+35x=45$$

$$11x+56=45$$

$$11x=45-56 \quad \text{[By transposing]}$$

$$11x=-11$$

$$\frac{11}{11}x=\frac{-11}{11} \quad \text{[Dividing both sides by 11]}$$

$$x=-1$$

$\therefore$ $x=-1$ is the solution of the given equation.

(h) $5(3x+4)-8(6x-7)=9x-8$

Removing the brackets, we get

$$15x+20-48x+56=9x-8$$

$$-33x+76=9x-8$$

$$9x+33x=76+8 \quad \text{[By transposition]}$$

$$42x=84$$

$$\frac{42}{42}x=\frac{84}{42} \quad \text{[Dividing both sides by 42.]}$$

$$x=2$$

$\therefore$ $x=2$ is the solution of the given equation.

(i) $5(x-3)=4(x-2)$

Removing the brackets on both sides, we get

$$5x-15=4x-8$$

$$5x-4x=15-8 \quad \text{[By transposition]}$$

$$x=7$$

$\therefore$ $x=7$ is the solution of the given equation.

(j) $2x-\frac{3x}{5}=7$

$$\frac{10x-3x}{5}=7$$

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

$$\frac{7x}{5}\times\frac{5}{7}=7\times\frac{5}{7} \quad \text{[Multiplying both sides by } \tfrac{5}{7}.\text{]}$$

$$x=5$$

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

Multiple Choice Questions

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

HOTS

1. (a) $\because$ All four sides of a square are equal in length.

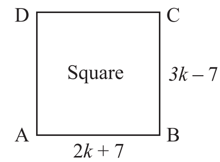
$\therefore AB = BC$ {sides of square}

Thus, $2k+7=3k-7$

$7+7=3k-2k$

$14=k$

Hence, the value of k is 14.



(b) $\because$ All three sides of an equilateral triangle are equal in length.

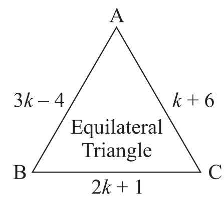
$\therefore \quad AB = BC$

Thus, $3k-4=2k+1$

$3k-2k=1+4$

$k=5$

Hence, the value of k is 5.



(c) $\because$ perimeter of a scalene triangle = sum of all + hree sides

$\therefore$ perimeter = $AB + BC + AC$

Thus, $4x+25=(x+1)+(5x+7)+(2x+1)$

$4x+25=x+1+5x+7+2x+1$

$4x+25=8x+9$

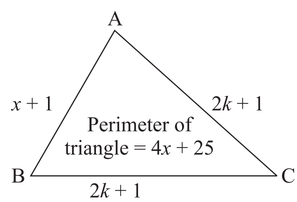
$25-9=8x-4x$

$16=4x$

$\therefore \quad x=\frac{16}{4}$

$x=4$

Hence, the value of x is 4.



NEP

Do it yourself.

13 Ratio and Proportion

Exercise 13.1

1. (a) $120 : 700 = \frac{120}{700}$

$= \frac{6}{35}$

$= \mathbf{6 : 35}$

(b) $540 : 240 = \frac{540}{24}$

$= \frac{27}{12}$

$= \frac{9}{4} = \mathbf{9 : 4}$

(c) $\frac{1}{4} : \frac{3}{4} = \frac{1/4}{3/4}$

$= \frac{1 \times 4}{3 \times 4}$

$= \frac{1}{3} =$ **1 : 3**

(d) 6 m to 150 cm

$\because$ 6 m $= 6 \times 100$ cm $= 600$ cm

$\therefore$ 600 cm to 150 cm = **600 : 150**

$= \frac{600}{150} = \frac{4}{1} =$ **4 : 1**

(e) 75 paise to ₹ 5

$\because$ ₹ $5 = 5 \times 100\,\text{p} = 500$ paise

$\therefore$ 75 paise to 500 paise

$= 75 : 500 = \frac{75}{500} = \frac{3}{20} =$ **3 : 20**

(f) 20 minutes to 3 hrs

$\because 3\text{ hrs} = 3 \times 60\text{ min} = 180$ minutes

$\therefore$ 20 minutes to 180 minutes

= 20 : 180

$\frac{20}{180} = \frac{1}{9} = 1 : 9$

(g) 4 litres to 250 mL

$\because$ 4 litres $= 4 \times 1000$ mL

$\therefore$ 4000 mL to 250 mL

$= 4000 : 250 = \frac{4000}{250} = \frac{16}{1}$

= **16 : 1**

(h) 250 g to 10 kg

$\because$ 10 kg $= 10 \times 1000$ g $= 10000$ g

$\therefore$ 250 g to 10000 g = 250 : 10000

$= \frac{250}{10000} = \frac{1}{40} =$ **1 : 40**

2. (a) We have, $2 : 5 = \frac{2}{5} = \frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10} = 4 : 10$; $\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{6}{15} = 6 : 15$

Hence, 4 : 10 and 6 : 15 are two equivalent ratio of 2 : 5.

(b) We have, $3 : 2 = \frac{3}{2}$

$\frac{3}{2} = \frac{3 \times 2}{2 \times 2} = \frac{6}{4} = 6 : 4$; $\frac{3 \times 3}{2 \times 3} = \frac{9}{6} = 9 : 6$

Hence, 6 : 4 and 9 : 6 are two equivalent ratio of 3 : 2.

(c) We have, $2 : 7 = \frac{2}{7}$

$\frac{2}{7} = \frac{2 \times 2}{7 \times 2} = \frac{4}{14} = 4 : 14$; $\frac{2}{7} = \frac{2 \times 3}{7 \times 3} = \frac{6}{21} = 6 : 21$

Hence, 4 : 14 and 6 : 21 are two equivalent ratio of 2 : 7.

3. (a) 3 : 10 and 2 : 15

$3 : 10 = \frac{3}{10}$ and $2 : 15 = \frac{2}{15}$

Now, compare the two fraction $\frac{3}{10}$ and $\frac{2}{15}$ making their denominators equal.

LCM of 10 and 15 = 30

$$\frac{3}{10} = \frac{3 \times 3}{10 \times 3} = \frac{9}{30} \text{ and } \frac{2}{15} = \frac{2 \times 2}{15 \times 2} = \frac{4}{30}$$

$\because\ 9 > 4$

So, $\frac{9}{30} > \frac{4}{30}$ or $\frac{3}{10} > \frac{2}{15}$

Hence, $3:10 > 2:15$.

(b) 3 : 4 and 51 : 68

$3:4 = \frac{3}{4}$ and $51:68 = \frac{51}{68}$

Now, compare the two fraction $\frac{3}{4}$ and $\frac{51}{68}$ making their denominators equal.

$\because$ LCM of 4 and $68 = 68$.

$$\therefore\ \frac{3}{4} = \frac{3 \times 17}{4 \times 17} = \frac{51}{68} \text{ and } \frac{51}{68} = \frac{51 \times 1}{68 \times 1} = \frac{51}{68}$$

$\because\ 51 = 51$

So, $\frac{51}{68} = \frac{51}{68}$ or $\frac{3}{4} = \frac{51}{68}$

Hence, $3:4 = 51:68$.

(c) $6:11$ and $9:44$

$6:11 = \frac{6}{11}$ and $9:44 = \frac{9}{44}$

Now, compare the two fraction $\frac{6}{11}$ and $\frac{9}{44}$ making their denominators equal.

$\because$ LCM of 11 and $44 = 44$

$$\therefore\ \frac{6}{11} = \frac{6 \times 4}{11 \times 4} = \frac{24}{44} \text{ and } \frac{9}{44} = \frac{9 \times 1}{44 \times 1} = \frac{9}{44}$$

$\because\ 24 > 9$

So, $\frac{24}{44} > \frac{9}{44}$ or $\frac{6}{11} > \frac{9}{44}$

Hence, $6:11 > 9:44$.

(d) $3:14$ and $9:35$

$3:14 = \frac{3}{14}$ and $9:35 = \frac{9}{35}$

Now, compare the two fraction $\frac{3}{14}$ and $\frac{9}{35}$ making their denominators equal.

$\because$ LCM of 14 and $35 = 70$

$$\therefore\ \frac{3}{14} = \frac{3 \times 5}{14 \times 5} = \frac{15}{70} \text{ and } \frac{9}{35} = \frac{9 \times 2}{35 \times 2} = \frac{18}{70}$$

Since, $15 < 18$

So, $\frac{15}{70} < \frac{18}{70}$ or $\frac{3}{14} < \frac{9}{35}$

Hence, $3:14 < 9:35$.

(e) 5 : 18 and 7 : 24

$5:18 = \frac{5}{18}$ and $7:24 = \frac{7}{24}$

Now, compare the two fraction $\frac{5}{18}$ and $\frac{7}{24}$ making their denominators equal.

$\because$ LCM of 18 and 24 = 72

$\therefore \frac{5}{18} = \frac{5\times 4}{18\times 4} = \frac{20}{72}$ and $\frac{7}{24} = \frac{7\times 3}{24\times 3} = \frac{21}{72}$

Since, $20 < 21$

So, $\frac{20}{72} < \frac{21}{72}$ or $\frac{5}{18} < \frac{7}{24}$

Hence, $5:18 < 7:24$.

(f) $2:5$ and $6:12$

$2:5 = \frac{2}{5}$ and $6:12 = \frac{6}{12}$

Now, compare the two fraction $\frac{2}{5}$ and $\frac{6}{12}$ making their denominators equal.

$\because$ LCM of 5 and 12 = 60

$\therefore \frac{2}{5} = \frac{2\times 12}{5\times 12} = \frac{24}{60}$ and $\frac{6}{12} = \frac{6\times 5}{12\times 5} = \frac{30}{60}$

Since, $24 < 30$

So, $\frac{24}{60} < \frac{30}{60}$ or $\frac{2}{5} < \frac{6}{12}$

Hence, $2:5 < 6:12$.

4. (a) $\frac{15}{18} = \frac{\square}{6} = \frac{\square}{30}$

Taking first two ratio, we get

$$\frac{15}{18} = \frac{\square}{6}$$

$\square \times 18 = 15\times 6$ [By cross multiplication method]

$\square = \frac{15\times 6}{18}$

$\square = 5$

Now, taking first and last ratio, we get

$$\frac{15}{18} = \frac{\square}{30}$$

$\square \times 18 = 15\times 30$ [By cross multiplication method]

$$\square = \frac{15\times 30}{18} = 5\times 5$$

$$\square = 25$$

Hence, $\frac{15}{18} = \frac{\boxed{5}}{6} = \frac{\boxed{25}}{30}$

(b) $\frac{1}{7} = \frac{\square}{35} = \frac{6}{\square}$

Taking first two ratio, we get

$$\frac{1}{7} = \frac{\square}{35}$$

$\square \times 7 = 1\times 35$ [By cross multiplication method]

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

Now, taking first and last ratio, we get

$$\frac{1}{7} = \frac{6}{\square}$$

$\square = 7\times 6 = 42$ [By cross multiplication method]

Hence, $\frac{1}{7} = \frac{\boxed{5}}{35} = \frac{6}{\boxed{42}}$

(c) $\frac{6}{5} = \frac{\square}{25} = \frac{60}{\square}$

Taking first two ratio, we get

$$\frac{6}{5} = \frac{\square}{25}$$

$\square \times 5 = 6\times 25$ [By cross multiplication method]

$$\square = \frac{6\times 25}{5}$$

$$\square = 30$$

Now, taking first and last ratio, we get

$$\frac{6}{5} = \frac{60}{\square}$$

$\square \times 6 = 5\times 60$ [By cross multiplication method]

$$\square = \frac{5\times 60}{6}$$

$$\square = 50$$

Hence, $\frac{6}{5} = \frac{\boxed{30}}{25} = \frac{60}{\boxed{50}}$

(d) $\frac{13}{15} = \frac{\square}{30} = \frac{39}{\square}$

Taking first two ratio, we get

$$\frac{13}{15} = \frac{\square}{30}$$

$$\square \times 15 = 13 \times 30$$

$$\square = \frac{13 \times 30}{15} = 26$$

Now, taking first and last ratio, we get

$$\frac{13}{15} = \frac{39}{\square}$$

$$\square \times 13 = 15 \times 39$$

$$\square = \frac{15 \times 39}{13}$$

$$\square = 45$$

Hence, $\frac{13}{15} = \frac{\boxed{26}}{30} = \frac{39}{\boxed{45}}$

5. Anita earns = ₹ 8000

Sunita earns in a month = ₹ 20000

(a) Ratio of Anita's monthly income to Sunita's monthly income

$$= \frac{8000}{20000} = \frac{2}{5} = 2:5$$

(b) Ratio of Anita's income to their total income $= \frac{8000}{(8000 + 20000)}$

$$= \frac{8000}{28000} = \frac{2}{7} = 2:7$$

(c) Ratio of Sunita's income to their total income $= \frac{20000}{(8000 + 20000)}$

$$= \frac{20000}{28000} = \frac{5}{7} = 5:7$$

6. Some of the term of the ratio $= (7 + 8) = 15$

∴ Sum of total money = ₹ 150

∴ First part $= \frac{7}{15} \times$ ₹ 150 = ₹ 70

And, Second part $= \frac{8}{15} \times$ ₹ 150 = ₹ 80

So, ₹ 150 devided in ₹ 80 and ₹ 70.

7. Ratio of distance of the school from Maya's home to the distance of school from Riya's home $= 3:2$

(a) Riya lives nearer to the school because their ratio is minimum.

(b) Maya lives farther from the school because their ratio is maximum.

8. Speed of Rohit $= \frac{48}{2} = 24$ km/h

Speed of Avinash $= \frac{66}{2} = 33$ km/h

So, the ratio of speed of Rohit to the speed of Avinash

$$= 24:33 = \frac{24}{33} = \frac{8}{11} = 8:11$$

9. Number of male teachers in the school $= 102$

Number of female teachers in the school $= 51$

Total number of teachers in the school $= 153$

Number of students in the school $= 3400$

(a) Ratio of male teachers to female teachers $= 102 : 51 = \frac{102}{51} = \frac{2}{1} = 2 : 1$

(b) Ratio of male teachers to the number of students

$$= 102 : 3400 = \frac{102}{3400} = \frac{3}{100} = 3 : 100$$

(c) Ratio of female teachers to the number of students

$$= 51 : 3400 = \frac{51}{3400} = \frac{3}{200} = 3 : 200$$

10. Total number of students in school $= 2100$

Students opted for basketball $= 700$

Students opted for cricket $= 600$

Students opted for football $= (2100 - 700 - 600) = 800$

(a) Ratio of number of students who opted basket ball to the total number of students

$$= 700 : 2100 = \frac{700}{2100} = \frac{1}{3} = 1 : 3$$

(b) Ratio of number of students who opted football to the number of students who opted for basket ball $= 800 : 700$

$$= \frac{800}{700} = \frac{8}{7} = 8 : 7$$

(c) Ratio of number of students who opted cricket to the number of students who opted basket ball $= 600 : 700 = \frac{600}{700} = \frac{6}{7} = 6 : 7$

11. Sum of the term of the ratio $= (2 + 3 + 5) = 10$

$\therefore$ A's share $= \frac{2}{10} \times ₹\ 2000 = ₹\ 400$

B's share $= \frac{3}{10} \times ₹\ 2000 = ₹\ 600$

And, C's share $= \frac{5}{10} \times ₹\ 2000 = ₹\ 1000$.

12. Sum of the term of the ratio $= 2 + 3 = 5$

$\therefore$ Amit's share $= \frac{2}{5} \times ₹\ 5000 = ₹\ 2000$

And, Sumit's share $= \frac{3}{5} \times ₹\ 5000 = ₹\ 3000$.

13. Seema earns $=$ ₹ 150000 per year

Her saving $=$ ₹ 70000 per year

(a) Ratio of money she saves to the money she earns

$$= 70000 : 150000 = \frac{70000}{150000} = \frac{7}{15} = 7 : 15$$

$$= 7 : 15$$

(b) Ratio of money she saves to money she spends

$$= 70000 : (150000 - 70000)$$

$$= 70000 : 80000 = \frac{70000}{80000} = \frac{7}{8} = 7 : 8$$

(c) Ratio of money she spends to the money she earns

$$= 80000 : 150000 = \frac{80000}{150000} = \frac{8}{15} = 8 : 15.$$

14. Cost of a dozen bananas = ₹ 36

And, Cost of 7 oranges = ₹ 28

∴ Ratio of cost of a banana to the cost of an orange

$$= (36 \div 12) : (28 \div 7)$$

$$= 3 : 4$$

15. The present age of father = 45 years

And, The present age of her daughter = 20 years

(a) The ratio of present age of father to present age of daughter

$$= 45 : 20 = \frac{45}{20} = \frac{9}{4} = 9 : 4$$

(b) The ratio of age of father to the age of daughter when daughter was 15 year old $= (45 - 5) : (20 - 5) = 40 : 15$

$$= \frac{40}{15} = \frac{8}{3} = 8 : 3$$

(c) The ratio of age of daughter to father when father was 30 years old $= (20 - 15) : (45 - 15)$

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

Exercise 13.2

1. (a) 16 : 24 :: 20 : 30

Now,

Product of extremes $= 16 \times 30 = 480$

And, Product of means $= 24 \times 20 = 480$

∵ Product of extremes = Product of means

Hence, 16, 24, 20 and 30 are in continued proportion.

(b) 21 : 7 :: 18 : 6

Now,

Product of extremes $= 21 \times 6 = 126$

And, Product of means $= 7 \times 18 = 126$

∵ Product of extremes = Product of means

Hence, 21, 7, 18 and 6 are in continued proportion.

(c) 12 : 18 :: 18 : 12
Now,
Product of extremes $= 12 \times 12 = 144$
And, Product of means $= 18 \times 18 = 324$
$\because$ Product of extremes $\neq$ Product of means
Hence, 12, 18, 18 and 12 are not in continued proportion.

(d) 8 : 9 :: 32 : 36
Now,
Product of extremes $= 8 \times 36 = 288$
And, Product of means $= 9 \times 32 = 288$
$\because$ Product of extremes $=$ Product of means
Hence, 8, 9, 32 and 36 are in continued proportion.

(e) 5.2 : 3.9 :: 3 : 4
Now,
Product of extremes $= 5.2 \times 4 = 20.8$
And, Product of means $= 3.9 \times 3 = 11.7$
$\because$ Product of extremes $\neq$ Product of means
Hence, 5.2, 3.9, 3 and 4 are not in continued proportion.

(f) 0.9 : 0.36 :: 10 : 4
Now,
Product of extremes $= 0.9 \times 4 = 3.6$
Product of means $= 0.36 \times 10 = 3.6$
$\because$ Product of extremes $=$ Product of means
Hence, 0.9, 0.36, 10 and 4 are in continued proportion.

(g) ₹ 36 : ₹ 26 :: 63 m : 35 m
Now,
Product of extremes $= 36 \times 35 = 1260$
And, Product of means$= 26 \times 63 = 1638$
$\because$ Product of extremes $\neq$ Product of means
Hence, ₹ 36, ₹ 26, 63 m and 35 m are not in continued proportion.

(h) 36 kg : 32 g :: 9 kg : 8 g
Now,
Product of extremes $= 36 \times 8 = 288$
And, Product of means $= 32 \times 9 = 288$
$\because$ Product of extremes $=$ Product of means
Hence, 36 kg, 32 g, 9 kg and 8 g are in continued proportion.

(i) 440 mL : 2 L :: 55 cm : 4 cm
Now,
Product of extremes $= 440 \times 4 = 1760$
And, Product of means $= 2000 \times 55 = 110{,}000 \{\because 2l = 2000 \text{ ml}\}$
$\because$ Product of extremes $\neq$ Product of means
Hence, 440 mL, 2 L, 55 cm and 4 cm are not in continued proportion.+

(j) 15 : 40 :: 3 : 8

Now,

Product of extremes $= 15 \times 8 = 120$

And, Product of means $= 40 \times 3 = 120$

$\because$ Product of extremes = Product of means

Hence, 15, 40, 3 and 8 are in continued proportion.

(k) 12 kg : 8 kg :: 27 kg : 18 kg

Now,

Product of extremes $= 12 \times 18 = 216$

Product of means $= 8 \times 27 = 216$

$\because$ Product of extremes = Product of means

Hence, 12 kg, 8 kg, 27 kg and 18 kg are in continued proportion.

2. (a) $3 : 6 = 12 : \square$

Using the proportion formula, we have

$3 \times \square = 6 \times 12$ (Product of extremes = Product of means)

$$\square = \frac{6 \times 12}{3}$$

$$\square = 24$$

Hence, $3 : 6 = 12 : 24$

(b) $2 : 5 = 8 : \square$

Using the proportion formula, we have

$2 \times \square = 5 \times 8$ ($\because$ Product of extremes = Product of means)

$$\square = \frac{5 \times 8}{2} = 20$$

Hence, $2 : 5 = 8 : 20$

(c) $9 : \square = 3 : 15$

Using the proportion formula, we have

$9 \times 15 = \square \times 3$ ($\because$ Product of extremes = Product of means)

$$\square = \frac{9 \times 15}{3} = 45$$

Hence, $9 : 45 = 3 : 15$

(d) $\square$: 68 girls = 48 m : 64 m

Using the proportion formula, we have

$\square \times 64 = 68 \times 48$ ($\because$ Product of extremes = Product of means)

$$\square = \frac{68 \times 48}{64} = 51 \text{ girls}$$

Hence, 51 girls : 68 girls = 48 m : 64 m

(e) ₹ 6 : ₹ 24 :: 2 min : $\square$

Using the proportion formula, we have

$6 \times \square = 24 \times 2$ ($\because$ Product of extremes = Product of means)

$$\square = \frac{24 \times 2}{6} = 8 \text{ min}$$

Hence, ₹ 6 : ₹ 24 :: 2 min : 8 min

(f) $\square$: 64 :: 30 : 24

Using the proportion formula, we have

$\square \times 24 = 64 \times 30$ ($\because$ Product of extremes = Product of means)

$\square = \dfrac{64 \times 30}{24} = 80$

Hence, 80 : 64 :: 30 : 24

(g) 12 : 12 :: 21 : $\square$

Using the proportion formula, we have

$12 \times \square = 12 \times 21$ ($\because$ Product of extremes = product of means)

$\square = \dfrac{12 \times 21}{12} = 21$

Hence, 12 : 12 :: 21 : 21

3. 10, 60, 150, 125

(a) Now,

Product of extremes $= 10 \times 125 = 1250$

And, Product of means $= 60 \times 150 = 9000$

$\because$ Product of extremes $\neq$ Product of means

Hence, 10, 60, 150 and 125 are not proportion.

(b) 34, 48, 70, 210

Now,

Product of extremes $= 34 \times 210 = 7140$

And, Product of means $= 48 \times 70 = 3360$

$\because$ Product of extremes $\neq$ Product of means

Hence, 34, 48, 70 and 210 are not in proportion.

(c) 3, 4, 2, 3

Now,

Product of extremes $= 3 \times 3 = 9$

And, Product of means $= 4 \times 2 = 8$

$\because$ Product of extremes $\neq$ Product of means

Hence, 3, 4, 2 and 3 are not proportional.

(d) 10, 27, 3, 3

Now,

Product of extremes $= 10 \times 3 = 30$

And, Product of means $= 27 \times 3 = 81$

$\because$ Product of extremes $\neq$ Product of means

Hence, 10, 27, 3 and 3 are not proportional.

(e) 12, 16, 6, 8

Now,

Product of extremes $= 12 \times 8 = 96$

And, Product of means $= 16 \times 6 = 96$

$\because$ Product of extremes = Product of means

Hence, 12, 16, 6 and 8 are proportional.

4. (a) $x : 6 = 55 : 11$

$\therefore \quad \frac{x}{6} = \frac{55}{11}$

$x = \frac{55 \times 6}{11} = 5 \times 6 = 30$

Hence, the value of x is 30.

(b) 12, 48, x

When three numbers are given, we make them four numbers by repeating the middle term.

i.e., 12, 48, x are in proportion mean 12, 48, 48, x are in proportion.

i.e., 12 : 48 :: 48 : x

$12 \times x = 48 \times 48$

$x = \frac{48 \times 48}{12} = 4 \times 48 = 192$

Hence, the value of x is 192.

(c) 25, 35, x

When three numbers are given, we make them four numbers by repeating the middle term.

i.e., 25, 35, x are in proportion mean 25, 35, 35, x are in proportion.

i.e., $25 : 35 :: 35 : x$

$25 \times x = 35 \times 35$

$x = \frac{35 \times 35}{25} = \frac{7 \times 35}{5}$

$= 7 \times 7 = 49$

Hence, the value of x is 49.

(d) 12 : 24 :: 8 : x

$\frac{12}{24} = \frac{8}{x}$

$x \times 12 = 24 \times 8$

$x = \frac{24 \times 8}{12}$

$x = 2 \times 8 = 16$

Hence, the value of x is 16.

5. Let the expenditure be ₹ x

Then the ratio of income to the expenditure = ₹ 14000 : ₹ x

But the ratio of income to the expenditure is given as 7 : 6

$\therefore$ 7 : 6 = ₹ 14000 : ₹ x

$\therefore \quad \frac{7}{6} = \frac{14000}{x}$

$7x$ = ₹ 14000×6 (By cross multiplication method)

x = ₹ $\frac{14000 \times 6}{7}$

x = ₹12000

So, the savings = Income − Expenditure

= ₹ (14000 − 12000)

= ₹ 2000.

6. Let the total sale of eggs during the whole week be x.

Then, the ratio of the sale of eggs on a Sunday to that of the whole week $= 36 : x$

But the ratio of the sale of eggs on a Sunday to that of the whole week is given as 3 : 7

$\therefore \quad 3 : 7 = 36 : x$

$$\frac{3}{7} = \frac{36}{x}$$

$$3x = 36 \times 7$$

$$x = \frac{36 \times 7}{3} = 12 \times 7 = 84 \text{ eggs}$$

Hence, the total sale of eggs during the whole week is 84.

7. Let the breadth of the school ground be x m.

Then, the ratio of the length to the breadth $= 54 : x$

But the ratio of the length to its breadth is given as 3 : 2

$\therefore \quad 3 : 2 = 54 : x$

$$\frac{3}{2} = \frac{54}{x}$$

$$3x = 54 \times 2$$

$$x = \frac{54 \times 2}{3} = 18 \times 2$$

$$x = 36 \text{ m.}$$

Hence, the breadth of the school ground is 36 m.

8. Let the quantity of water be x L.

Then, the ratio of the milk and water in the mixture $= 14.7 : x$

But the ratio of milk and water in the mixture is given as 7 : 8

$\therefore \quad 7 : 8 = 14.7 : x$

$$\frac{7}{8} = \frac{14.7}{x}$$

$$7x = 14.7 \times 8$$

$$x = \frac{14.7 \times 8}{7}$$

$x = 2.1 \times 8 = 16.8\ l$

Hence, the quantity of water in the minture is 16.8 litres.

Exercise 13.3

1. The income of Shobha in 15 months = ₹ 144000

$\therefore$ The income of Shobha in 1 month = ₹ $\frac{144000}{15}$

Thus, the income of Shobha in 7 months = ₹ $\frac{144000 \times 7}{15}$

= ₹ 9600 × 7 = ₹ 67200.

2. The cost of 1 dozen a of oranges = ₹ 21

∴ The cost of a orange = ₹ $\frac{21}{12}$

Thus, the cost of 1 score of oranges = ₹ $\frac{21}{12} \times 20 =$ ₹35.

3. The cost of 12 kg of oil = ₹ 624

∴ The cost of 1 kg of oil = ₹ $\frac{624}{12} =$ ₹ 52

Thus, the cost of 7 kg of oil = ₹ $52 \times 7 =$ ₹364.

4. Time required to cover 165 km of distance = 3 hrs

∴ Time required to cover 1 km of distance $= \frac{3}{165}$ hrs

Thus, time required to cover 440 km of distance $= \frac{3}{165} \times 440$ hrs = 8 hrs.

5. A machine manufacturers the parts in 8 hrs = 48

∴ The machine manufacturers in 1 hr $= \frac{48}{8}$

Thus, the machine manufacturers the parts in 6 hrs $= \frac{48}{8} \times 6$ parts = 36.

6. Number of packets of tea bought for ₹ 4320 = 120

∴ Number of packets of tea bought for 1 ₹ $= \frac{120}{4320}$

Thus, the number of packets of tea bought for ₹ 6480 $= \frac{120}{4320} \times 6480$

= 180 packets.

7. The cost of 15 postcards = ₹ 7.50

∴ The cost of 1 postcard = ₹ $\frac{7.50}{15} =$ ₹ 0.5

Thus, the cost of 36 such postcards = ₹ 0.5 × 36 = ₹ 18

And the number of postcards will buy for ₹ 45 $= \frac{45}{0.5} = 90$.

8. The cost of 3 dozen of bananas = ₹ 72

∴ The cost of 1 dozen of bananas = ₹ $\frac{72}{3} =$ ₹ 24

Thus, the cost of 120 bananas or 10 dozen of bananas = ₹ 24 × 10 = ₹240.

9. Distance covered by train in 5 hrs = 240 km

∴ Distance covered by train in 1 hr $= \frac{240}{5}$ km = 48 km.

Thus, the distance covered by train in 10 hrs = 48 × 10 km = 480 km.

10. The quantity of rain in the last five days = 30 cm

$\therefore$ The quantity of rain in one day $= \frac{30}{5}$ cm

Thus, the quantity of rain in a week (or 7 days) $= \frac{30}{5} \times 7$ cm

$= 6 \times 7$ cm $= 42$ cm.

11. The cost of 19 chairs = ₹ 38000

$\therefore$ The cost of 1 chair = ₹ $\frac{38000}{19}$ = ₹ 2000

(a) Number of chairs that can be purchased for

= ₹ 26000 $= \frac{26000}{2000} = 13.$

(b) The cost of 30 chairs = ₹ 2000 × 30 = ₹ 60,000.

12. An employee earns in 15 months = ₹ 18000

$\therefore$ The employee earns in 1 month = ₹ $\frac{18000}{15}$ = ₹ 1200

(a) He will earn in 9 months = ₹ 1200 × 9 = ₹ 10800.

(b) Number of months in which he earns ₹ 12000 $= \frac{12000}{1200} = 10$

13. Distance covered by army truck in 11 litres of diesel $= 852$ km

$\therefore$ Distance covered by army truck in 1 litre of diesel $= \frac{852}{11}$ km

(a) Distance covered by army truck in 15 litres of diesel $= \frac{852}{11} \times 15$ km

$= 1161.81$ km

$= 1162$ km (approx).

(b) The quantity of diesel are required to cover a distance of 852 km

$= \frac{4260 \times 11}{852} = 55$ litres.

14. Distance covered by car in 5 hrs $= 275$ km

$\therefore$ Distance covered by car in 1 hr $= \frac{275}{5}$ km $= 55$ km

(a) Distance covered by car in 35 hrs $= 55 \times 35$ km $= 1925$ km.

(b) Time taken by the car to cover 825 km $= \frac{825}{55}$ hrs = 15 hrs.

15. An aeroplane flies in 5 hrs $= 4000$ km

$\therefore$ The aeroplane flies in 1 hr $= \frac{4000}{5}$ km $= 800$ km

(a) The aeroplane flies in 7 hrs $= 800$ km $\times 7 = 5600$ km.

(b) Time taken by the aeroplane to fly 8800 km $= \frac{8800}{800}$ hrs = 1 hrs.

Multiple Choice Questions

1. (a) **2.** (b) **3.** (a) **4**. (b) **5.** (c) **6.** (c) **7.** (a) **8.** (b)

Brain Teaser

1. (a) True (b) True (c) False (d) True (e) False

2. (a) The ratio of ` 8 to 20 p is **40 : 1.**

(b) The value of x in the proportion 15 : 13 = 225 : x is **195.**

(c) 6 men do a work in 20 days. 15 men will do the same work in **8** days.

(d) If the first, second, third terms of a proportion are 2, 3 and 6, then the fourth term is **9.**

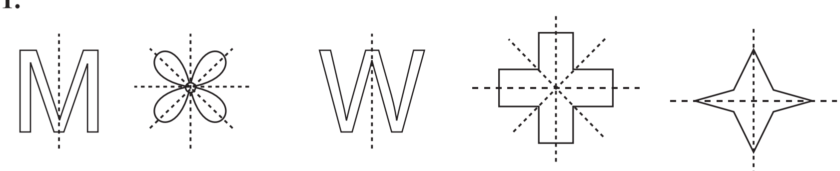
NEP

Do it yourself.

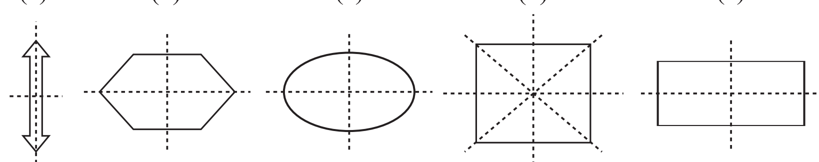
14 Symmetry

Exercise 14.1

1.



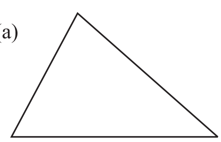
(a) (b) (c) (d) (e)



(f) (g) (h) (i) (j)

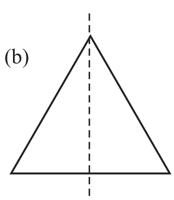
2.

(a)



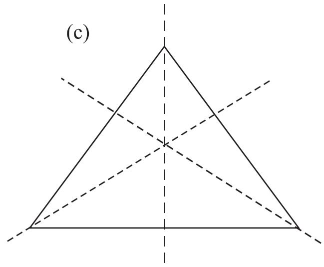
Scalene triangle
with no axis of symmetry

(b)



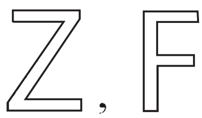
Isosceles triangle
with one axis of symmetry

(c)

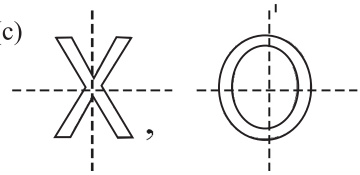


Equilateral triangle
with three axis of symmetry

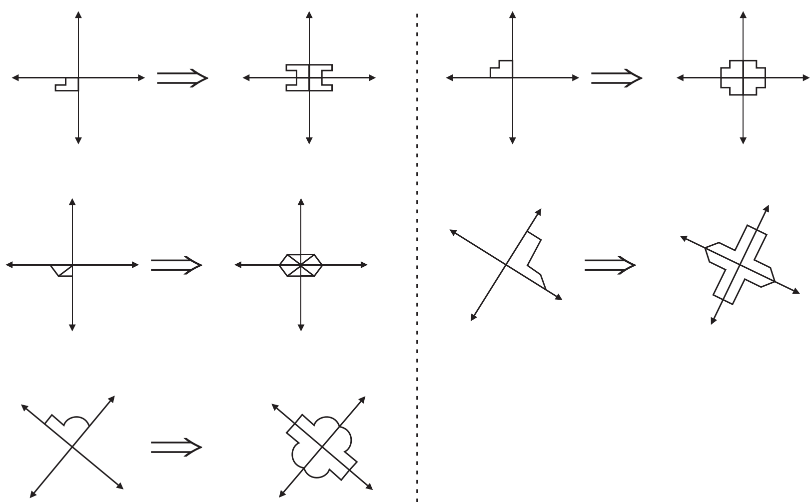
3.

(a) 

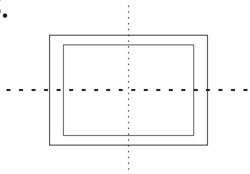
(b) 

(c) 

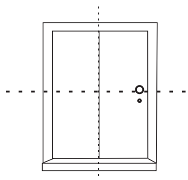
4.



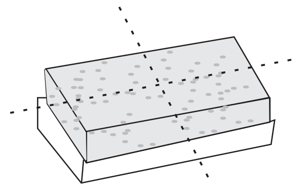
5.



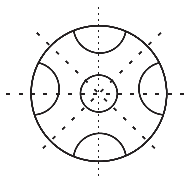
Black board



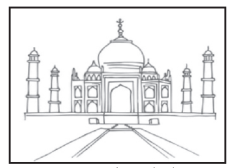
Door



Duster



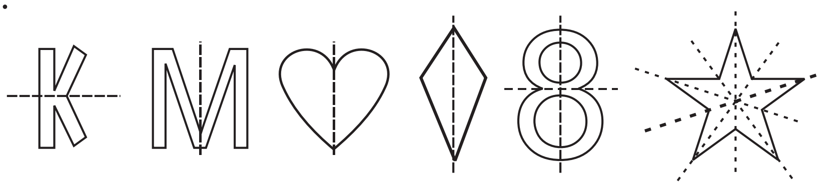
Foot ball



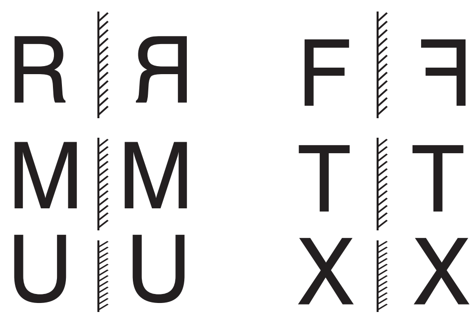
Taj Mahal

Exercise 14.2

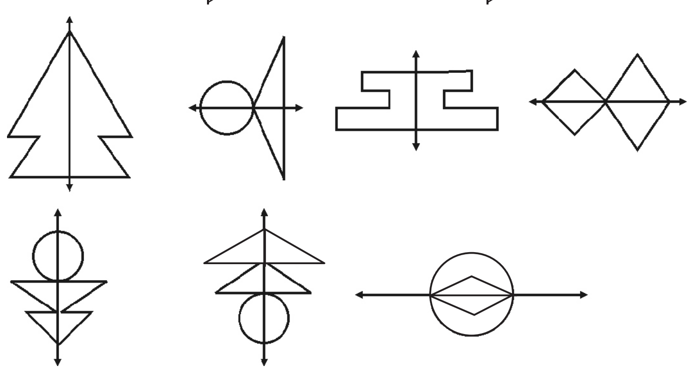
1.



2.



3.



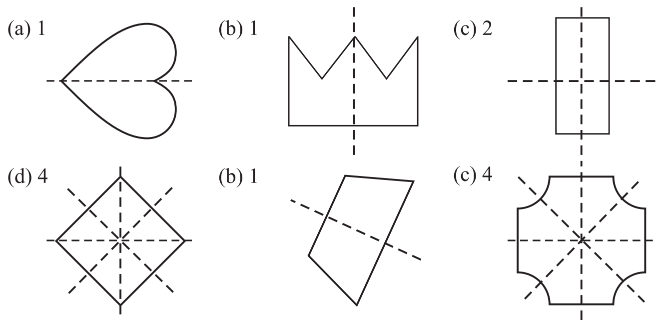
4. Do it yourself

Multiple Choice Questions

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

Brain Teaser

1. Draw the axes of symmetry for the following figures and write the number of axes below each figure.



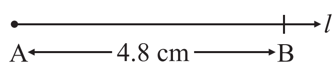
2. Fill in the blanks :

(a) A scalene triangle has **no** axis of symmetry.
(b) An equilateral triangle has **three** axis of symmetry.
(c) A rectangle has **two** axis of symmetry.
(d) A square has **four** axis of symmetry.
(e) A circle has **infinite** axis of symmetry.
(f) The letter *M* has **one** axis of symmetry.
(g) The letter *N* has **no** axis of symmetry.
(h) The letter *X* has **two** axis of symmetry.

15 Constructions

Exercise 15.1

1. (a) Steps of Construction :



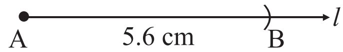
Step-1. Draw a line *l* and mark a point *A* on line.

Step-2. Take compasses and place its pointer end at the zero and open its pencil end to place it marked at a point 4.8 cm on the ruler.

Step-3. Without disturbing the opening of the compases, place its needle at point *A* and draw an arc to cut the line *l* at point *B*.

So, *AB* is the required line segment of length 4.8 cm.

(b) Steps of Construction :



Step-1. Draw a line l and mark a point A on line.

Step-2. Take compasses and place its pointer end at the zero and open its pencil end to place it marked at a point 5.6 cm on the ruler.

Step-3. Without disturbing the opening of the compasses, place its needle at point A and draw an arc to cut the line l at point B.

So, AB is the required line segment of length 5.6 cm.

(c) Steps of Construction :

Step-1. Draw a line l and mark a point A on line.

Step-2. Take compasses and place its pointer end at the zero end oepn its pencil end to place it marked at a point 6.2 cm on the ruler.

Step-3. Without disturbing the opening of the compasses, place its needle at point A and draw an arc to cut the line l at point B.

So, AB is the required line segment of length 6.2 cm.

(d) Steps of construction :

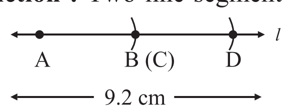
Step-1. Draw a line l and mark a point A on line.

Step-2. Take compasses and place its pointer end at the zero and open its pencil end to place it marked at a point $7\frac{1}{2}$ cm on the ruler.

Step-3. Without disturbing the opening of the compasses, place its needle at point A and draw an arc to cut the line l at point B.

So, AB is the required line segment of length $7\frac{1}{2}$ cm.

2. (a) Steps of construction : Two line segments $\overline{AB}$ and $\overline{CD}$.



Step-1. Construct a line segment, say AD, such that $\overline{AD} = \overline{AB} + \overline{CD}$.

Step-2. Draw a line l and mark point A on it.

Step-3. Take the compasses and measure $\overline{AB}$ = 3.7 cm.

Step-4. Without disturbing the opening, place its needle at A and draw an arc cutting line l at point B / C.

Step-5. Again adjust the compasses and measure the line segment $\overline{CD}$ =5.5 cm.

Step-6. Without disturbing the opening, place the pointer at point B / C on the line l and draw an arc cutting the line l at point D.

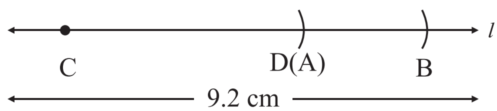
So, $\overline{AD}$ is the required line segment whose length is equal to the sum of the lengths of line segmens $\overline{AB}$ and $\overline{CD}$.

i.e, $\overline{AD} = \overline{AB} + \overline{CD}$ = 3.7 cm + 5.5 cm = 9.2 cm

(b) Steps of construction : Two line segments *CD* and *AB*.

Step-1. Construct a line segment, say $\overline{CB}$, such that $\overline{CB} = \overline{CD} + \overline{AB}$.

Step-2. Draw a line *l* and mark point *C* on it.



Step-3. Take the compasses and measure $\overline{CD}$.

Step-4. Without disturbing the opening, place its needle at *C* and draw an arc cutting line *l* at point *D*/*A*.

Step-5. Again adjust the compasses and measure the line segment *AB*.

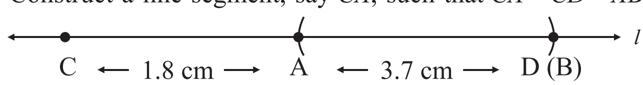
Step-6. Without disturbing the opening, place the pointer at point *D* / *A* on the line *l* and draw an arc cutting the line *l* at point *B*.

So, $\overline{CB}$ is the required line segment whose length is equal to the sum of the lengths of line segments *CD* and *AB*.

i.e., $\overline{CB} = \overline{CD} + \overline{AB}$ = 5.5 cm + 3.7 cm = 9.2 cm.

(c) Steps of construction : Two line segments *CD* and *AB*.

Step 1. Construct a line segment, say $\overline{CA}$, such that $\overline{CA} = \overline{CD} - \overline{AB}$



Step 2. Draw a line *l* and mark a point *C* on it.

Step 3. Take the compasses and measure $\overline{CD}$.

Step 4. Without disturbing the opening, place the pointer at point *D* / *B* on the line *l* and draw an arc on the left of *D* / *B*, cutting the line *l* at point *A*.

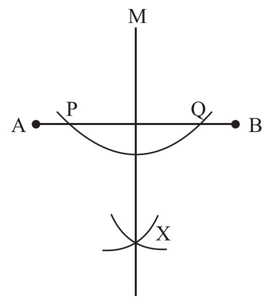
So, $\overline{CA}$ is the required line segment whose length is equal to the difference of the lengths of *CD* and *AB*.

i.e., $\overline{CA} = \overline{CD} - \overline{AB}$ = 5.5 cm – 3.7 cm = 1.8 cm.

3. Steps of Construction :

Step-1. Draw a line segment $\overline{AB}$ of length 5 cm and mark point *M* outside the line segment *AB*.

Step-2. Taking M as the centre and with any convenient radius, draw an arc cutting $\overline{AB}$ at P and Q.



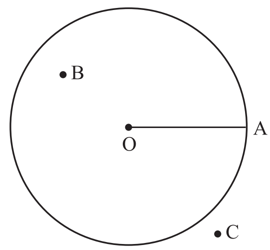
Step-3. Taking P and Q as centres and with radius more than half of PQ draw two arcs below $\overline{AB}$ which intersecting each other at point X.

Step-4. Join M and X.

Hence, MX is the required perpendicular to the line segments $\overline{AB}$ from point M lying outside the line segment AB.

4. Steps of Construction :

Step-1. Mark a point O on a sheet of paper, where a circle is to be drawn.



Step-2. Take a pair of compasses and measure 4.2 cm using a ruler.

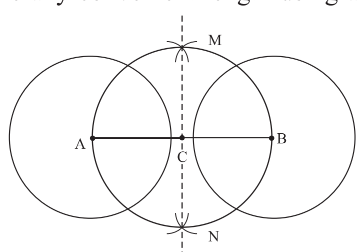
Step-3. Without disturbing the opening of the compasses keep the needle at mark O and draw a complete arc holding the compasses from its knob. After completing one complete round we get the desired circle.

Step 4. Mark three points, A, B and C such that point A is on the circle. Point B is in the interior of the circle and point C is the the exterior of the circle.

5. Steps of construction :

Step-1. Mark two points on a sheet of paper where the circles are too be drawn.

Step-2. Take a pair of compasses and measure any convenient length using a rular.



Step-3. Draw two circles same radius at centers A and B respectively.

Step-4. Join A and B.

Step 5. Taking A and B centres and with radius more than half of $\overline{AB}$ draw two arcs above which interests each other at point M, and two arcs below AB which intersects each other at point N.

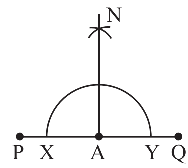
Step 6. Join MN, and MN interesect $\overline{AB}$ at point C.

Step 7. Taking C as centre and with radius $AC = BC$ draw a circle who touches points A and B.

6. Steps of construction :

Step-1. Draw a line segment PQ of length 3.5 cm and make a point A on it.

Step-2. Taking A as the centre and with any convenient radius, draw an arc cutting PQ at X and Y.



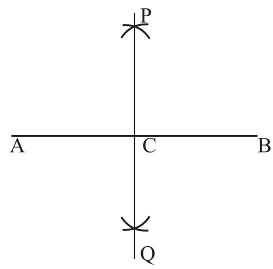
Step-3. Taking X and Y as centres and with any suitable radius draw two arcs which interesting each other at N.

Step-4. Join A and N.

So, AN is perpendicular to PQ passing through the point A.

Exercise 15.2

1. Steps of construction :



Step-1. Draw a line segment $AB = 9$ cm.

Step-2. With A as centre and radius more than half of AB, draw two arcs, one on each side of AB.

Step-3. With B as centre and the same radius as before, draw two arcs, cutting the previously drawn arcs at p and Q respectively.

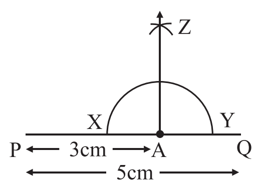
Step-4. Join PQ, which intersecting AB at C.

Then $AC = BC = \dfrac{AB}{2}$

2. Steps of construction :

Step-1. Draw a line segment $PQ = 5$ cm and mark a point A on PQ.

Step-2. With A as centre and taking any suitable radius draw an arc intersecting the line PQ at X and Y.

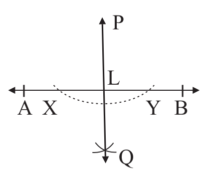


Step-3. With X and Y as centres and more than XA radius, draw two arcs on any side of line PQ which intersect each other at point Z.

Step-4. Join AZ and produce.

Then $AZ \perp PQ$.

3. Steps of construction :



Step-1. Draw a line segment AB and mark a point P outside the line se-gment AB.

Step-2. With P as a centre and taking any suitable radius, draw an arc intersecting AB at X and Y.

Step-3. With X as centre and a radius more than half XY, draw an arc.

Step-4. With Y as centre and the same radius, draw another arc, which cuts the previous arc at Q.

Step-5. Join PQ, which intersects AB at L.

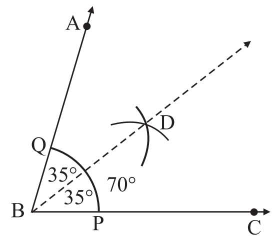
Then PL is the required perpendicular on XY.

4. Steps of Construction :

Step-1. Draw an angle $\angle ABC = 70°$ with the help of a protractor.

Step-2. Taking B as the centre and draw an arc PQ which intersect rays $\overrightarrow{BA}$ and $\overrightarrow{BC}$ at points Q and P respectively.

Step-3. Taking P and Q as centres and a radius more than half of PQ, draw two arcs which intersect each other at point D.



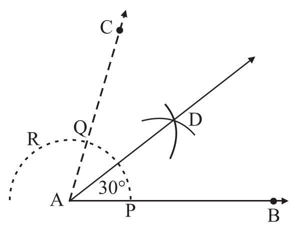
Step-4. Join B and D to get the ray $\overrightarrow{BD}$.
So, BD is the angular bisector of $\angle ABC$.
Therefore, $\angle ABD = \angle DBC = 35°$ is the required angle.

5. (a) Steps of construction :

Step-1. Draw a ray $\overrightarrow{AB}$.

Step-2. Taking A as centre and with any suitable radius, draw an arc PR which intersect $\overrightarrow{AB}$ at P.

Step-3. Taking P as centre and a radius equal to AP, draw an arc which intersect previous arc PR at point Q.



Step-4. Taking P as the centre and a radius greater than half of PQ, draw an arc. Taking Q as the centre and with the same radius draw another arc, cutting the previous arc at D.

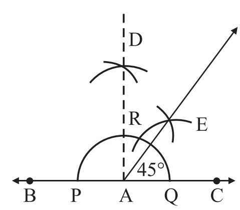
Step-5. Join AD to get the ray AD.
So, AD is the angular bisector of $\angle CAB$. Therefore, $\angle DAB = 30°$ is the required angle.

(b) Steps of construction :

Step-1. Draw a line $\overleftrightarrow{BC}$ and mark a point A on it.

Step-2. Taking A as the centre and with any suitable radius, draw an arc PQ cutting BC at P and Q.

Step-3. Taking P and Q as the centres and any convenient radius, draw two arcs which intersecting each other at D.



Step-4. Join A and D to get the ray $\overrightarrow{AD}$ which intersect the arc PQ at R.

Step 5. Taking Q as a centre and a radius more than half of QR, draw an arc.

Step-6. Taking R as the centre and the same radius, draw an arc cutting the previous arc at E.

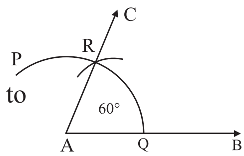
Step-7. Join A and E to get the ray $\overrightarrow{AE}$.

So, $\overrightarrow{AE}$ is the angular bisector of $\angle DAC$. Therefore, $\angle DAE = \angle EAC = 45°$ is the required angle.

(c) Steps of construction :

Step-1. Draw a ray $\overrightarrow{AB}$.

Step-2. Taking A as the centre and with any suitable radius, draw an arc PQ that cuts AB at Q.



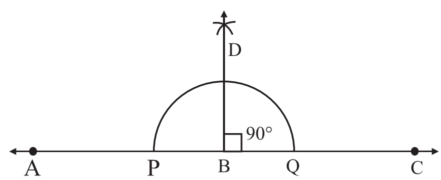
Step-3. Taking Q as the centre and a radius equal to AQ, draw an arc cutting the previous arc PQ at R.

Step-4. Join AR and produce it to get $\overrightarrow{AC}$.

Step-5. $\angle BAC$ is the required angle equal to 60°.

(d) Steps of construction :

Step-1. Draw a line AC and mark a point B on it.



Step-2. Taking B as the centre and with any suitable radius, draw an arc PQ cutting AC at P and Q.

Step-3. Taking P and Q as the centres and with any convenient radius, draw two arcs which intersecting each other at point D.

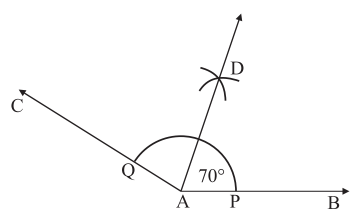
Step-4. Join B and D to get the ray $\overrightarrow{BD}$.

Then, $\angle ABD = \angle DBC = 90°$ is the required angle.

6. Steps of construction :

Step-1. Draw an angle of $\angle CAB = 140°$ with the help of a protractor.

Step-2. Taking A as centre and any suitable radius draw an arc PQ which cus $\overrightarrow{AB}$ at P and $\overrightarrow{AC}$ at Q.



Step-3. Taking P as centre and a radius greater than half of PQ, draw an arc.

Step-4. Taking Q as the centre and with the same radius draw another arc, cutting the previous arc at D.

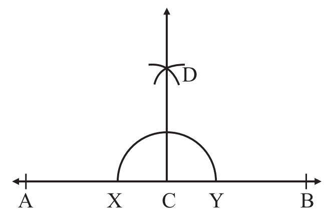
Step-5. Join A and D to get the ray $\vec{AD}$.

Thus, AD is the angular bisector of $\angle CAB$.

Therefore, $\angle CAD = \angle DAB = 70°$ is the required angle.

7. Steps of construction :

Step-1. Draw a line AB and marks a point C on line AB.



Step-2. Taking C as centre and taking any suitable radius draw an arc intersecting the line AB at X and Y.

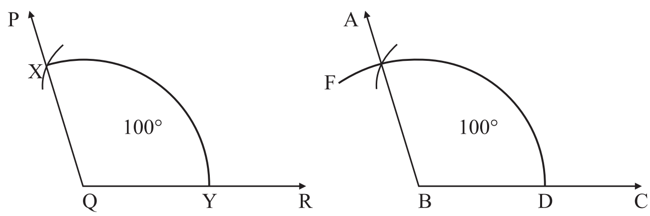
Step-3. Taking X and Y as centre and a radius more than XC, draw two arcs on any side of line AB and which intersect each other at D.

Step-4. Join CD and produce.

Then, $CD \perp AB$ and $\angle ACD = \angle DCB = 90°$.

8. Steps of construction :

Step-1. Draw an angle $\angle PQR = 100°$ with the help of a protractor.



Step-2. Taking Q as centre and taking convenient radius draw an arc XY which intersect $\vec{QP}$ at X and $\vec{QR}$ at Y.

Step-3. Draw a line BC with using ruler.

Step-4. Place the needle of compasses on point Q and open it equal to the length of QY.

Step-5. Without disturbing the opening, place the needle of the compasses at point B and draw an arc DF intersecting the line BC at D.

Step-6. Now, place the needle of compasses on point D and open it equal to the length of YX.

Step-7. Without disturbing the opening, place the needle of the compasses at point D and draw an arc intersecting the previous arc DF at E.

Step-8. Join BE and produce it to get $\vec{BA}$.

Hence, $\angle ABC = \angle PQR$.

Multiple Choice Questions

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

Brain Teaser

Fill in the blanks :

a. If image of points A and B in the line l are P and Q respectively then PQ is equal to ***AB***.

b. To bisect a line segment of length 6 cm, the opening of the compass should be more than **3 cm**.

c. If an angle of measure 60° is bisected twice, the angle so obtained measures **15°**.

d. In an isosceles ΔABC, the bisector of $\angle B$ and $\angle C$ meet at O. If $\angle BOC = 140°$ then $\angle A$ measures **100**°.

e. The set squares are two triangular pieces having of **30°, 60°, 90°** and **45°, 45°, 90°** at their vertices.

HOTS

1. **Steps of construction :**

Step-1. Draw a ray $\overrightarrow{BC}$.

Step-2. Taking B as the centre and with any suitable radius, draw an arc PQ that cut $\overrightarrow{BC}$ and P.

Step-3. Taking P as the centre and a radius equal to BP, draw an arc cutting the previous arc PQ at R.

Step-4. Join BR and produce it to get $\overrightarrow{BA}$.

Step-5. Thus, $\angle ABC$ is the required angle equal to 60°.

Step-6. Taking P as the centre and a radius greater than half of PR, draw an arc.Taking R as the centre and with the same radius draw another arc, cutting the previous arc at D.

Step-7. Join D and B to get the ray $\overrightarrow{BD}$.

Step-8. Thus, $\angle DBC$ is the required angle equal to 30°.

Step-9. Similarly, we can make $\angle DBE = \angle EBC$ is the required angle equal to 15°.

2. **Steps of construction :** As above like question no. 1