CHAPTER

1

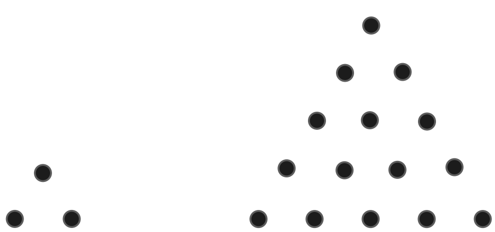
Patterns in Mathematics

TEXTBOOK EXERCISES

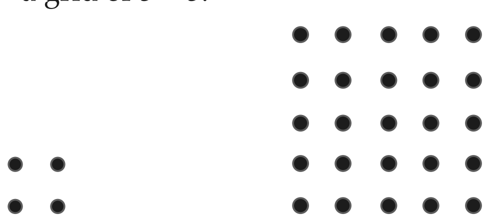
Exercise 1.1

1. Numbers 1, 3, 6, 10, 15, ... are called triangular numbers because they can be represented by dots arranged in the shape of an equilateral triangle.

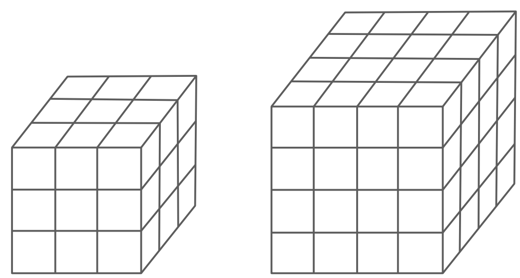
For example : 3, dots form a triangle with two at the bottom and one at the top. As well 15 dots can be arranged as an equilateral triangle. Five at the bottom and above them respectively four, three, two and one. Look at the figures.



The numbers 1, 4, 9, 16, 25, ... are called squares because they can be arranged in a square grid, like 4 dots forming 2 × 2 square and 25 dots form a grid of 5 × 5.



The numbers 1, 8, 27, 64, 125, ... represent the small cubes that fit into a larger cube with each number being the cube of an integer like 3 × 3 × 3 for 27 and 5 5 5 for 125.



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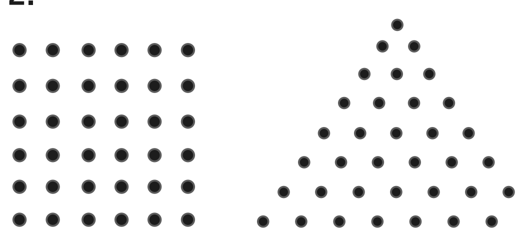
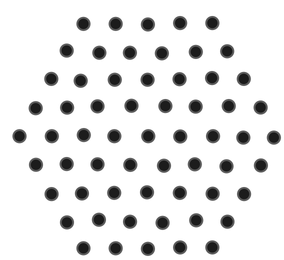


Square Equilateral triangle

3.



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4. (i) Yes, the pictorial ways to visualise the sequence of powers of 2 is a tower black.

$2^0 \longrightarrow$ □ (1 block)

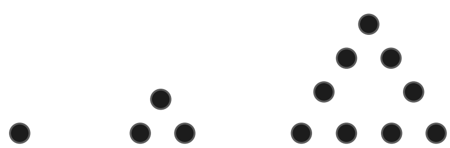
$2^1 \longrightarrow$ □ □ (2 block)

$2^2 \longrightarrow$ □ □ □ □ (4 block)

$2^3 \longrightarrow$ □ □ □ □ □ □ □ □ (8 block)

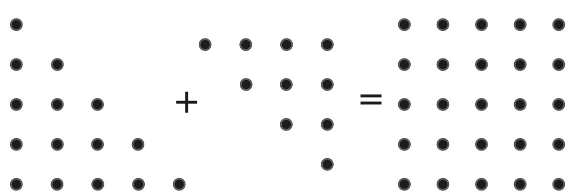
Similarly, we can move for more.

(ii) Yes, the sequence of powers of 3 can be visualises triangular numbers represent power of 3 ($3^0, 3^1, 3^2$ ......) using triangular arrays of dots or blocks with each triangle's area growing exponentially.

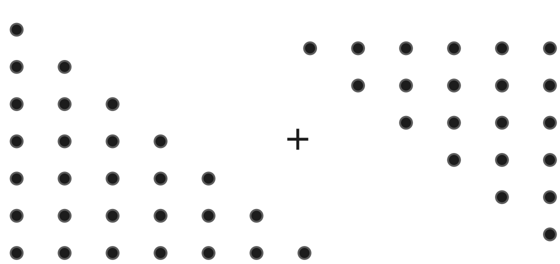


3^0 3^1 3^2

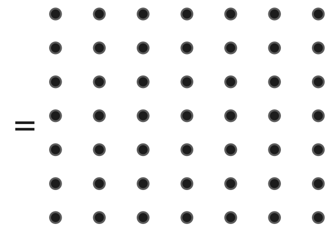
5. We place two triangular shapes obtained by adding upwards and downwards together. We get a square shape *i.e.,* 1 2 3 4 5 and 4 3 2 1



Similarly, we can see another example,



We get



6. In this sequence, numbers up to 100 are first added upwards and then downwards. We know that if counting numbers are added in this method, the result is always the square of the number.

So, 1 2 3 …… 99 100 99 …… 3 2 1 $(100)^2$ 100 100 10000

7. **1. Adding the all 1's sequence up :** When it is started adding the all 1's sequence up (*i.e.,* 1, 1, 1, 1, 1, ... taking partial sums of the sequence), we get

- Sum of the first term: 1
- Sum of the first two terms: 1 1 2
- Sum of the first three terms: 1 1 1 3

And so on,

So the sequence of partial sum is 1, 2, 3, 4, ...

which is the sequence of positive integers.

2. Adding the all 1's sequence up and down : When it is started alternate adding and subtracting the all 1's sequence (*i.e.,* 1, 1, 1, 1, 1, 1, ………) the partial sums will be

- The sum of first term: 1
- The sum of first two terms: 1 (1) 0

- The sum of first three terms

  1 (1) 1 1

- The sum of first four terms:

  1 (1) 1 (1) 0

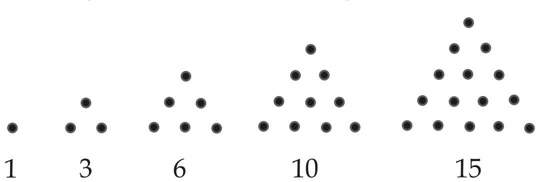
And so on.

So the sequence of partial sums alternates between 1 and 0

1, 0, 1, 0 .....

8. When we start to add the counting numbers up, we get the sequence of triangular numbers. The nth triangular number is the sum of the first n natural numbers. The sequence of triangular numbers starts as 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, ……… . The nth triangular can be calculated using the formula, $T_n \quad \frac{n(n \quad 1)}{2}$. Triangular numbers can be visualised as the number of dots in an equilateral triangle uniformly filled with dots.

Pictorially, these numbers represent the number of dots in progressively larger equilateral triangles.



9. When we add up pairs of consecutive triangular numbers, then we obtain a sequence of perfect square $(2^2, 3^2, 4^2, \ldots\ldots)$

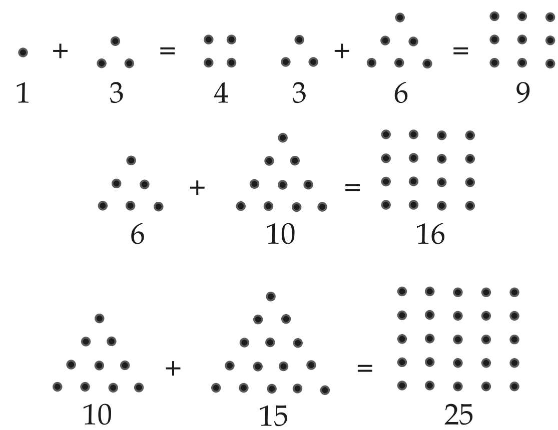
Explanation : Identify the pairs of consecutive triangular numbers

1 1,	1 3 4
3 6 9,	6 10 16
10 15 25,	15 21 36

The obtained results 1, 4, 9, 16, 25, 36 are the respectively perfect squares of $(1)^2, (2)^2, (3)^2, (4)^2, (5)^2, (6)^2$ conclude that the sum of pairs consecutive triangular numbers results in perfect squares.

It can be explained with the help of pictures the triangular numbers are 1, 3, 6, 10, 15, 21, 28, 36, …… .

Now,



10. Let us start to add up powers of 2 starting with 1.

1 1,

1 2 3

1 2 4 7,

1 2 4 8 15

1 2 4 8 16 31,

1 2 4 8 16 32 63

So, the series 1, 3, 7, 15, 31, 63, …… .

We can see the difference of two consecutive terms in the series is power of 2.

$3 \quad 1 \quad 2 \quad 2^1$

$7 \quad 3 \quad 4 \quad 2^2$

$15 \quad 7 \quad 8 \quad 2^3$

31 15 16 2^4

63 31 32 2^5

Now, Let's add up 1 to each of the term of the above series.

1 1 2 2^1

3 1 4 2^2

7 1 8 2^3

15 1 16 2^4

31 1 32 2^5

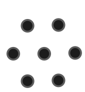
63 1 64 2^6

This happens because we are adding 1 to the every term of the series. So, adding 1, the power 2 is increased.

11. The triangular numbers are 1, 3, 6, 10, 15, 21, 28, ...

Now, multiplying each term of the sequence by 6 and adding 1 to it, we get 7, 19, 37, 61, 91, 127, 169, …

Conclude: We get an increase of multiple of 6 respectively. As shown above. Also numbers obtained so are the hexagonal numbers 7, 19, 37, 61, 91, ……… are the hexagonal numbers, that can be represented through a regular hexagone.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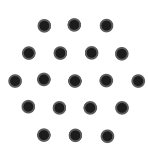
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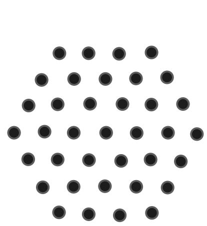
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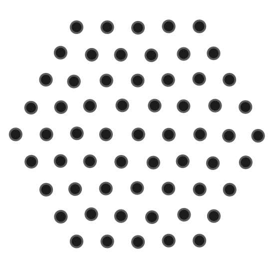
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12. The hexagonal numbers are 1, 7, 19, 37, 61, 91, ……… .

Adding 1 to them we get :

1 $(1)^3$

1 7 8 $(2)^3$

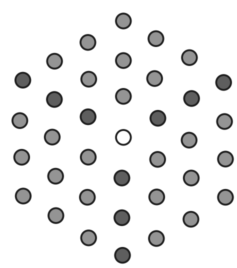
1 7 19 27 $(3)^3$

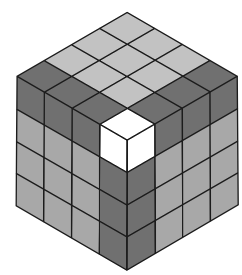
1 7 19 37 64 $(4)^3$

1 7 19 37 61 125 $(5)^3$

1 7 19 37 61 91 216 $(6)^3$

Concludes : It is clear that when hexagonal numbers are added up we get a number of power of 3 respectively.





13. The following patterns of numbers can be obtained:

(i) 2, 2, 2, 2, 2, … All 2's.

(ii) 3, 6, 9, 12, … The multiples of 3.

(iii) 2, 4, 6, 8, 10, … The sequence of even numbers.

(iv) 5, 10, 15, 20, 25, … The multiples of 5.

(v) 0, 1, 8, 21, 40, 65, … The octagonal number.

(vi) 1, 5, 25, 125, 625, … The powers of 5, ($i.e., 5^0, 5^1, 5^2, 5^3, 5^4, \ldots$)

Exercise 1.2

1. (a) **Regular polygons :** Triangle, quadrilateral, pentagon, hexagon, heptagon, Octagon, and decagon.

(b) **Complete graphs :** In the given figure number of lines are triangular number sequence.

(c) **Stacked squares :** The given sequence formed a square number sequence.

(d) **Stacked Triangles :** The given sequence is a square number sequence represented by triangles.

(e) **Koch snowflake :** The pattern shows that every consecutive term or figure has four times sides more than that of previous one.

2.

Polygon	**No. of sides**	**No. of corners or vertices**
Equilateral triangle	3	3
Square	4	4
Regular Pentagon	5	5
Regular Hexagon	6	6
Regular Heptagon	7	7
Regular Octagon	8	8
Regular Nonagon	9	9

Sequence of sides : 3, 4, 5, 6, 7, 8, 9, …

Sequence of corners : 3, 4, 5, 6, 7, 8, 9 …

It is clear that both the sequences are same because in a regular polygon number of sides is equal to the number of vertices.

3.

Graph	(a)	(b)	(c)	(d)	(e)
No. of Lines	1	3	6	10	15

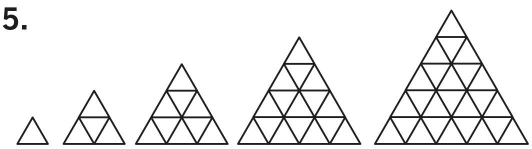
Hence, we get the sequence 1, 3, 6, 10, 15, 21, ... It is triangular number sequences.
The obtained terms of sequence can be arranged as an equilateral triangles.

4.

No. of rows of small squares	1	2	3	4	5
Total no. of small squares	1	4	9	16	25

The sequence that we get is 1, 4, 9, 16, 25 .... Every term of the sequence is the perfect square of respectively 1, 2, 3, 4, 5 .... and the sequence is a square number.

5.



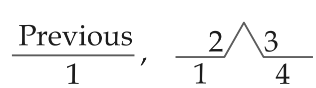
No. of rows of small triangles	1	2	3	4	5	6
Total no. of small triangles	1	4	9	16	25	36

We get the sequence of 1, 4, 9, 16, 25. This is a sequence of square numbers. The next number in the square sequence will come 36.

6.

Koch Snowflake	(a)	(b)	(c)	(d)	(e)
No. of Lines	3	12	48	192	768

In this way we get a sequence 3, 12, 48, 192, 768, 3072, ……… . The first term is 3. After that each term has been obtained by multiplying the previous term by 4. It should also be noted that in the next Koch Snowflake, for each line of the previous shape, 4 lines have been added in the next one.



Miscellaneous Exercises

1. 1 1 squre of 1.

1 3 4 square of 2.

1 3 5 9 square of 3.

1 3 5 7 16 square of 4.

1 3 5 7 9 25 square of 5.

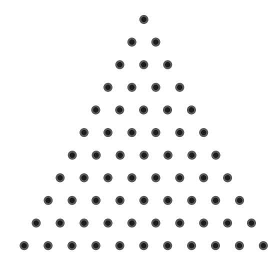
1 3 5 7 9 11 36 square of 6.

1 3 5 7 9 11 13 49 square of 7.

It is clear that when we start adding up odd numbers starting from 1, we get respectively get the consecutive square numbers.

2. There are 13 triangular numbers between 0 and 100. They are 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78 and 91.

3. Pictorial representation of triangular numbers 78 and 91.



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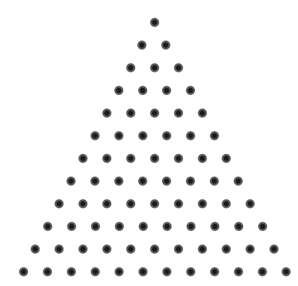

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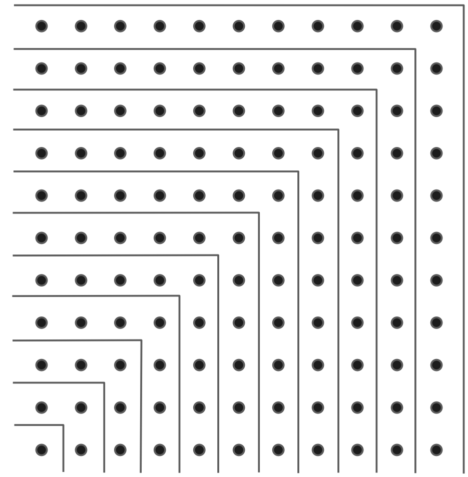
4. We can partition the dots in a square grid into odd number of dots 1, 3, 5, 7, 9, 11, as given below.



5. (a) The difference of two conecutive terms of the sequence 1, 5, 9, 13, ... is 4.

Hence, next terms of the sequence are 13 4 17, 17 4 21 and 21 4 25.

i.e., 17, 21, 25

(b) The given sequence is a series of even numbers

Hence, next three terms are 10, 12, 14.

(c) Every term of the sequence 5, 15, 25, 35, ... is a multiple of 5 of consecutive odd numbers

i.e., 1, 3, 5, 7.

Hence, next three terms of the sequence are 9 5, 11 5, 13 5

i.e., 45, 55, 65.

(d) Every term of the series 96, 84, 72, 60 is a multiple of 12 with counting numbers in decreasing order.

96 12 8   84 12 7

72 12 6   60 12 5

Hence, next three terms of the series are 12 4 48

12 3 36   12 2 24

(e) Every term of the seqqnce 14, 28, 42, 56 is a multiple of 14 of consecutive natural numbers.

i.e., 14 1 14

28 2 14

42 3 14

56 4 14

Hence, next three consecutive terms of the sequence are

5 14 70

6 14 84

7 14 98

6. The sequence can be represented as (3n 1). To obtain five terms, put 1, 2, 3, 4, 5 resepctively at the place of n.

3 1 1 3 1 4

3 2 1 6 1 7

3 3 1 9 1 10

3 4 1 12 1 13

3 5 1 15 1 16

Hence, the first five terms of the sequence are 4, 7, 10, 13, 16.

7. Seeing the series carefully we notice that

13 6 2 1,

27 13 2 1,

55 27 2 1

Every term of the sequence is one more than twice the previous term.

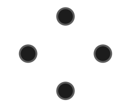
Hence, next term is

55 2 1 110 1 111.

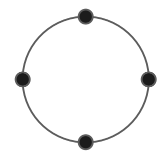
8. Triangular numbers 1, 36, 1225, can be arranged in squares, so these triangular numbers are also square numbers.

9. Every hexagonal number is a triangular number, but all triangular numbers are not hexagonal numbers. Only alternate, *i.e.,* every other triangular number (1st, 3rd, 5th, 7th, ……… etc) is a hexagonal number.

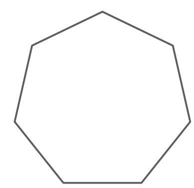
10. (a) Here a small circle is growing in place of one side of the square respectively. Hence next image is



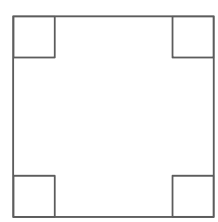
(b) Here, a small circle is respecting growing on the circumference of the circle. Hence, next image is



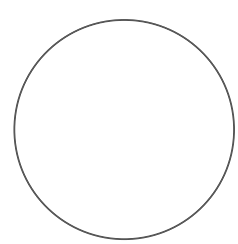
(c) Here one side of regular polygon is increasing respectively. Hence, next image is Regular heptagon.



(d) Here, one square shape at the corner of the square is increasing respectively. Hence, next image is



(e) Here, one radius of the four of circle is decreasing respectively. Hence, next image is



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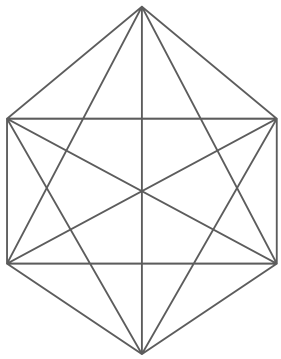
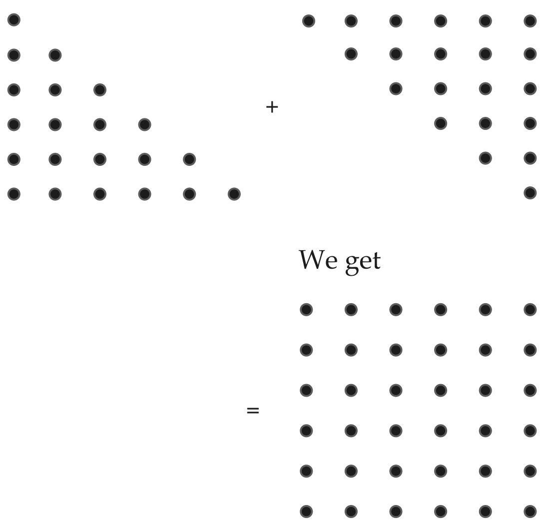


If we draw all the diagonals of a hexagon, it gives us 2 equilateral triangles, 6 isoscles (non-equilateral) and 12 triangles with a 90 angle, so 20 triangles are drown in total.

12.



13. (i) (c) A is true, R is false.

(ii) (c) A is true, R is false.

14. This is a pattern of trianglular numbers :

Step 1. 1   1,

Step 2. 1   2   3,

Step 3. 1   2   3   6,

Step 4. 1   2   3   4   10

(a) 1   2   3   2   4   5   15 blocks

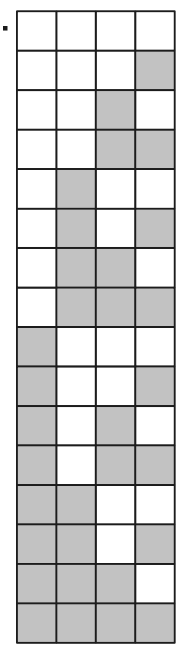
(b) Number of blocks $\frac{n(n \quad 2)}{2}$

where 'n' is the step number.

(c) Number of block

$\frac{7(7 \quad 1)}{2} \quad \frac{7 \quad 8}{2}$ 28 blocks

15.



CHAPTER

2 Lines and Angles

TEXTBOOK EXERCISES

Exercise 2.1

1. (a) Infinite

   (b) Only one unique line

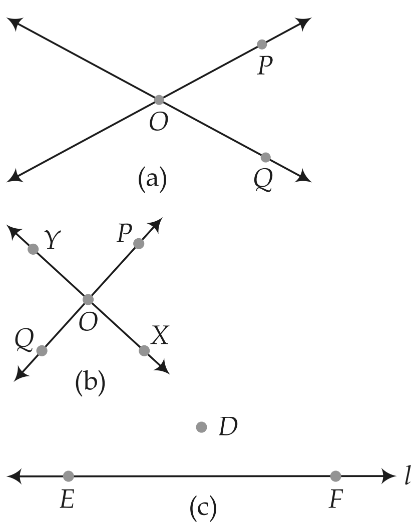
2. Line segments are $\overline{LM}$, $\overline{MP}$, $\overline{PQ}$ and $\overline{QR}$.

   The points are *L*, *M*, *P*, *Q* and *R*.

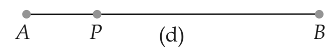
   Point *M*, *P* and *Q* are on two of the line segments $\overline{LM}$, $\overline{MP}$, $\overline{PQ}$ and $\overline{QR}$.

3. Since, starting point of each of these ray is *T*, so two rays are there *TA* and *TB* with this initial point another ray is also *TN*.

   If we consider *N* as initial point, we get *NB* ray.

4. 

   (d) Point *P* lines on *AB*.



5. (a) Five points are *B*, *C*, *D*, *E* and O.

   (b) *DB* is a line.

   (c) Four rays are *OB*, *OC*, *OD*, *OE*, *EB*.

   (d) Five line segments are *DE, EO, OB, OC, DO*.

6. (a) Yes, we can name it as ray *OB* because starting point and the direction remain same.

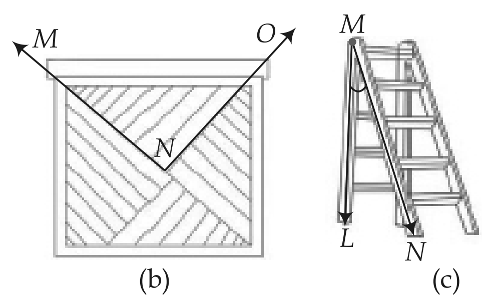
   (b) We can not write ray *OA* as *AO* because starting point of the ray is *O*, not *A*. Also direction of the ray will be changed.

Exercise 2.2

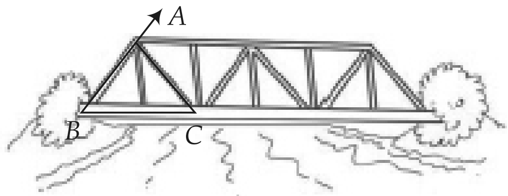
1. (a) *ADB*, *BDC* and vertex *D*.

   (b) *MNO*, Vertex; *N*

   (c) *LMN*, vertex *M*.

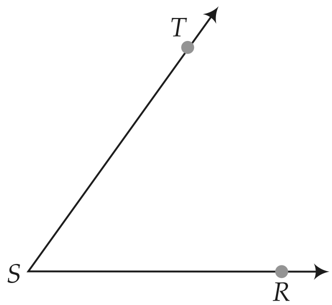


   (d) *ABC*, vertex; *B*



(d)

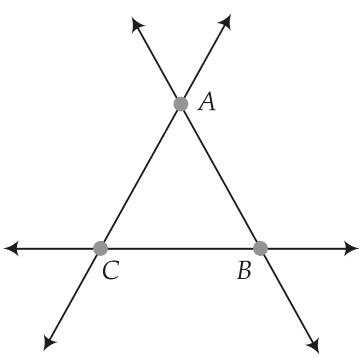
2.



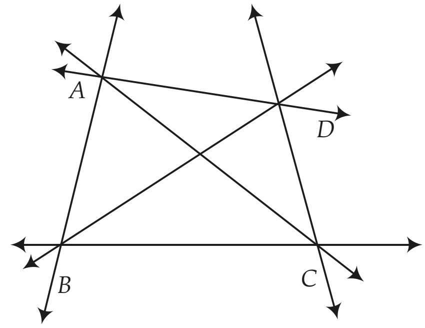
3. At point P there are three different angles. P may be meant APB or APC or BPC. To identify, we have to name them as APC or APB or BPC.

4. Angles given in the figure are : angle 1 is RTP and angle 2 is RTQ.

5. Through three points A, B and C we get three lines, as AB, BC and AC. We obtained three angles using A, B, C as ABC, CAB and ACB.



6. There are six possible lines going through pairs of four points in which no three of them are collinear..

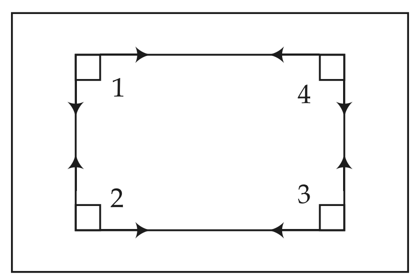


These lines are AB, BC, CD, DA, AC and BD. Also, we get twelve angles. These angles are

ABC, BCD, CDA, DAB, BAC, CAD, ADB, BDC, ACB, ACD, CBD, ABD.

Exercise 2.3

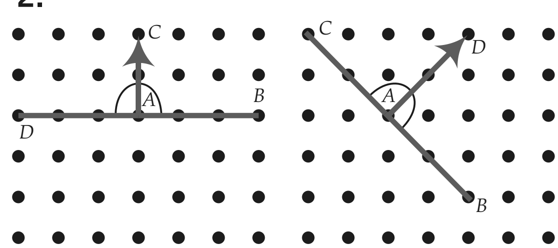
1.



A window has four right angles *i.e.,* 1, 2, 3 and 4.

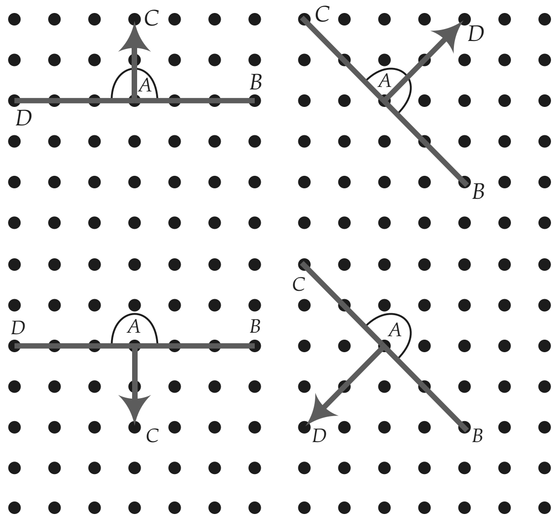
Yes, we see many other right angles at corners of the door, at corners of the greenboard, at corners of the classrooms, etc.

2.

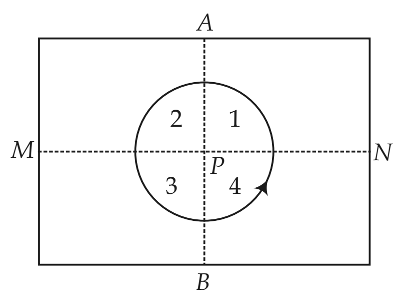


This can be done in only one way.

3.



4. (a) Let AB the given crease on the paper and another crease be that is perpendicular to the stating crease be MN. Let the intersecting point of two creases be P as shown in the figure :



Since, two creases are perpendicular lines meeting at P.

Hence, all four angles are right angles.

(b) **Step I.** Take a piece of rectangular paper and fold it.

Step II. Crease the fold.

Step III. Now, again fold the paper so that two parts of the crease coincide.

Step IV. Crease the fold.

Step V. Unfold both the crease.

We get two perpendicular lines and four right angles as shown above.

Exercise 2.4

1. On measuring, we get the following measures

(a) IHJ 47 , (b) IHJ 24 ,

(c) IHJ 110 .

2. Angles of each corners of greenboard 90

Angles of each corners of desk 90

Angles of each corners of classroom 90

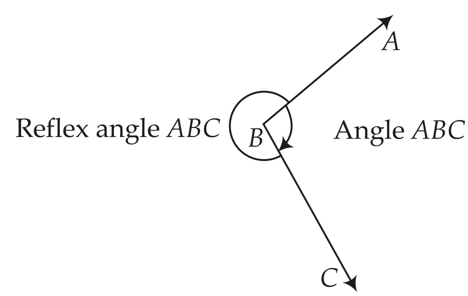
Angles of each corners of door 90

Angles of each corners of window 90

3. (a) IHJ 42 , (b) IHJ 116 .

Paper protractor made by the students can not be asked here.

4. We measure a reflex angle.



For this measure the smaller angle ABC 103 . We know a turn makes an angle of 360 .

Reflex ABC 360 smallest ABC

Reflex ABC 360 103 257 .

5. (a) 80 , (b) 120 (c) 60 , (d) 130 ,

(e) 130 , (f) 60 .

6. (a) BXE 115 , (b) CXE 85 ,

(c) AXB 65 ,

(d) BXC AXC AXB

95 65 30 .

7. PQR 45 , PQS 100 ,

PQT 150 .

8. Students should do it themselves with the help of their teachers or parents or class-mates.

9. For figure (a),

A 43 , B 65 , C 72

A B C

43 65 72 180 .

For figure (b),

A 54 , B 65 , C 61

A B C

= 54 65 61 180

For figure (c),

A 30 , B 50 , C 100

A B C

30 50 100 180

Conclusion : The sum of three internal angles of a triangle is 180 .

Exercise 2.5

1. (a) Numbers 1 to 12 are written along the circumference of a clock at equal distance and the angle of the circle is always 360°. So, 360 12 30 .

Hence, angle between two consecutive numbers is 30°.

At 1 o'clock two hands of the clock are at two consecutive numbers 12 (0) and 1.

Hence, at 1 o'clock, angle between these two numbers is 30°.

(b) We know that the angle between two consecutive numbers at the face of a clock is 30°.

Hence, angle between hands at 2 o'clock

2 30 60 .

Angle between hands at 4 o'clock

4 30 120 .

Angle between hands at 6 o'clock

6 30 180 .

(c) Angle between hands at 3 o'clock

3 30 90 .

Angle between hands at 5 o'clock

5 30 150 .

Angle between hands at 7 o'clock

7 30 210 .

Angle between hands at 8 o'clock

8 30 240 .

Angle between hands at 9 o'clock

9 30 270 .

Angle between hands at 10 o'clock

10 30 300 .

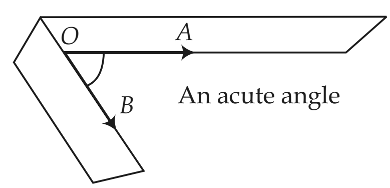
Angle between hands at 11 o'clock

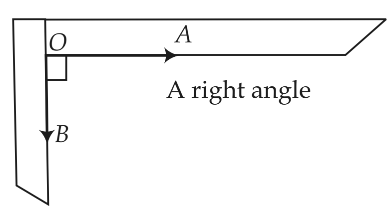
11 30 330 .

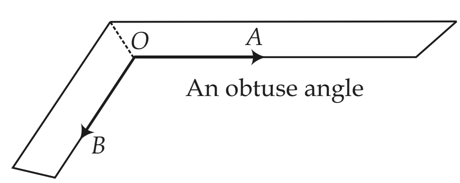
and angle between hands at 12 o'clock

12 30 0 or 360°.

2. Yes, it is possible.





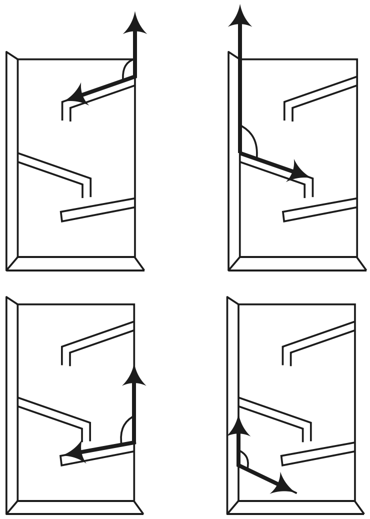


Here, vertex is *O* and arms are *OA* and *OB*.

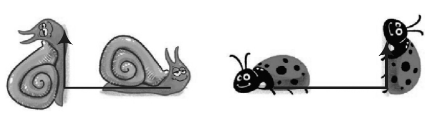
3. Yes, an angle can be seen by us.

4. The angle is as great as the slope. Greater the angle, greater the slope.

   For each angle one arm is a vertical side and other arm is the slope. There are four slops, therefore four angles can be formed with the side.

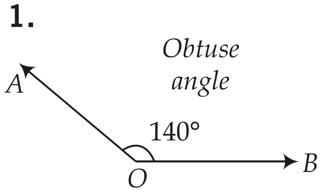


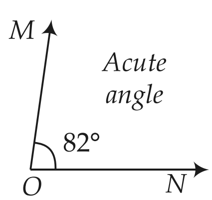
5. Both the insects are being rotated at an angle of 90 clockwise.

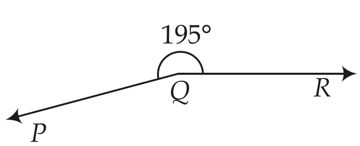


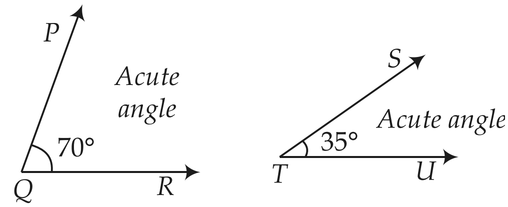
Exercise 2.6

1.









2. (a) 43 , on meaning we get, 45° (acute angle)

   (b) 159 , on meaning we get, 165° (obtuse angle)

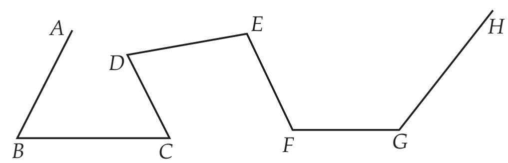
   (c) 121 , on meaning we get, 120° (obtuse angle)

   (d) 33 , on meaning we get, 30° (acute angle)

   (e) 92 , on meaning we get, 95° (obtuse angle)

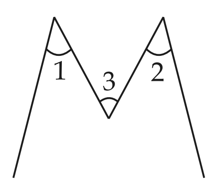
   (f) 355 , on meaning we get, 350° (reflex angle)

3.



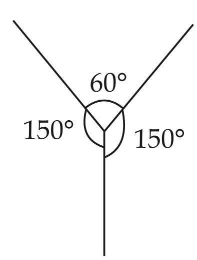
   Acute angles ABC, DCB, EDC, Right angle DEF, Obtuse angles EFG, HGF.

4.



   Here, 1 40 , 2 40 and 3 60 .

5.



   Here, 1 150 , 2 60 and 3 150 .

6. Angles between two consecutive spokes 360 24 15 .

The largest acute angle formed between two spokes 5 15 75 .

7. Let the degree measure of the angle be A, then $5A$ 90 but $4A$ 90 .

or $\frac{90}{5}$ A and $\frac{90}{4}$ A

Hence, A 18 but A $22\frac{1}{2}$.

Hence, degree measure of the angle may be 19° or 20° or 21°.

Miscellaneous Exercises

1. Arrows of length of AC and BD show that their lengths are infinite, so lines in the figure are $\overleftrightarrow{AC}$ and $\overleftrightarrow{BD}$ and line segments are $\overline{AB}, \overline{CD}, \overline{AD}, \overline{BC}$.

2. Letters E, F, H, L, P and T have right angles.

3. (a) Here, A 90 , B 90 , C 90 and D 90 .

Sum of four angles

A B C D

90 90 90 90 360

(b) Here, A 90 , B 90 , C 90 and D 90 .

Sum of four angles

A B C D

90 90 90 90 360

(c) Here, A 75 , B 105 , C 75 and D 105 .

Sum of four angles

A B C D

75 105 75 105 360

(d) Here, A 80 , B 100 , C 100 and D 100 .

Sum of four angles

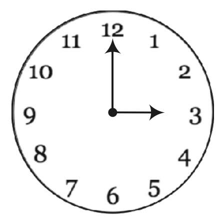
A B C D

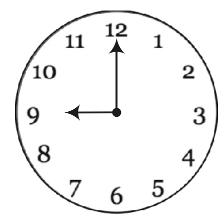
80 100 80 100

360

Conclusion : We get a fact that the sum of four internal angles of a quadrilateral is 360 .

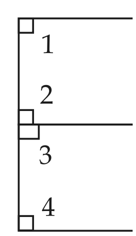
4. A right angle is formed four times in a clock. Twice during the day and twice at night. Whenever the time 3 o'clock or 9 o'clock, both the hands of the clock form a right angle.



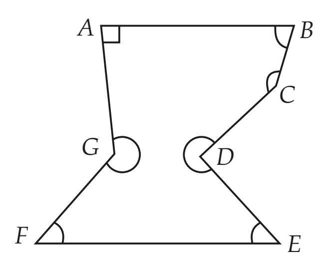


5. At both the times of 0 o'clock and 12 o'clock hands of the clock are at 12. In this position hands may form an angle of 0° or 360 . In starting, the angle will be called 0° and when it is twelve the angle will be 360°.

6. There are four right angles in the letter E.



7.



BAG is right angle, *ABC*, *DEF* and *GFE* are acute angles, *BCD* is obtuse angle *AGF* and *CDE* are reflex angles.

8. Reflex Angle.

9. Required angle = 180° – 110° = 70°.

10. (a) Yes

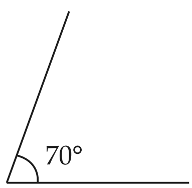
(b) complement angle of 70°

90° – 70° = 20°

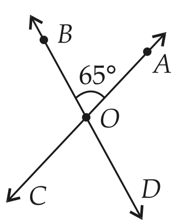
(c) Supplement angle of 70°

180° – 70° = 110 °

(d)



11.



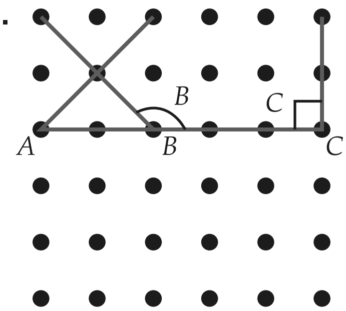
AOB *COD* 65

AOD *BOC* $\frac{1}{2}(360 \quad 65 \quad 65\ )$

$\frac{1}{2}(230\ )$

115

12.



13. (i) (c) A is ture, but R is false.

(ii) (c) A is ture, but R is false.

14. (a) 130° (180° – 50°).

(b) Acute angle (50°).

(c) 100° (50° + 50°).

(d) No, because AOC 90°.

15. Total angles *A*, *B*, *C*, *E*, *D*

Equal angles *A* *E* *D*

CHAPTER

3

Number Play

TEXTBOOK EXERCISES

Exercise 3.1

1.

6828	670	9435	3780	7308	8000	5583	52

2.

5346	6348	1212	1258	1221	1008	6843	9635	9754

3.

987	473	649	632	699	589	743	717	888

4. Out of 9 numbers, there are 5 supercells in the table above (see question 3) and these are 987, 649, 699, 743 and 888.

5. If number of cells in the table be n, an odd number, then the number of supercells $\frac{n \quad 1}{2}$

and if n is an even number, then number of supercells $\frac{n}{2}$.

Yes, there is a pattern. Alternate cells in the table may be supercells.

Method to fill a given table to get the maximum number of supercells :

(a) Make first cell of the table a supercell. After that every alternate cell is to be made supercell.

(b) Except in case of 4 cells, No consecutive cells can be made supercells, because in that case first and fourth cell may be supercells.

6. No, it can not be possible to fill a supercell table without repeating numbers such that there are no supercell. As there may be two cases :

Case I : If we fill the cells in descending order then the first cell would be the supercell.

Case II : If we fill the cells in ascending order then the last cell would be the supercell.

If we do not follow any order, then there will be atleast one supercell.

7. Yes, the cell having the largest number in a table always be a supercell, because if it is a corner cell, adjacent to it (either second from beginning or second last cell) will be smaller than it. If it is situated between two cells, then being the largest number, it will be larger than both adjacent cells.

No, the cell having smallest number in a table can not be supercell because number of cells adjacent to it will always be larger than it.

8.

989	980	941	901	895	873	807	799	743

Here 980 is the second largest number but it is not a supercell as 989, situated left to it is larger than it.

9.

2961	2900	2856	2777	2748	2565	2813	2562	2010	2111

Here, 2900 is the second largest number in the table such that it is not a supercell because number 2961 adjacent to it is larger than it.

2111 is the second smallest number but the cell having 2111 is a supercell because adjacent to it number 2010 is smaller than it.

10. For other variations

(a) We shall make a table with prime numbers such that coloured cells are supercells.

199	151	197	157	191	163	179	173	193

(b) We shall make a table with odd numbers such that coloured cells are supercells.

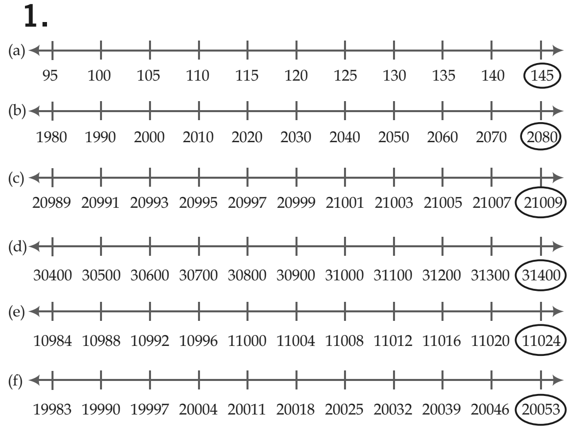
9997	8563	3563	9861	7427	8241	5555

(c) We shall make a table with even numbers such that coloured cells are supercells.

9428	3624	5242	3864	2002	5686	8208

Exercise 3.2

1.



2. Some numbers sum of whose digits is 14, are :

(a) 59, 77, 95, 248, 923, 2462, 5117, 6008.

(b) The smallest number whose digits sum is 14 59

(c) The largest 5-digit number whose digit sum is 14 95000

But zero is not considered as natural number so it can not be included here, then the largest five digit number whose sum of digits is 14 92111.

(d) A very big number having the digits sum 14 can be formed is 9500000000.

3. 4 0 4, 4 1 5, 4 2 6, …

Similarly perform till 70.

4.

Number	123	234	345	456	567	678	789
Sum of digits	6	9	12	15	18	21	24

If these numbers are formed reversing the digits, the sum of the digits will remain same.

Number	321	432	543	654	765	876	987
Sum of digits	6	9	12	15	18	21	24

Yes, there is a pattern

First number 1 3 3

Second number 2 3 6

Third number 3 3 9

Fourth number 4 3 12

Yes, this pattern will continue.

Exercise 3.3

1. (a) The digit are 7, 9, 2, 8

The largest number 9872

The smallest number 2789

Difference 9872 2789 7083

7083 5085

(b) The digits are 6, 8, 5, 4

The largest number 8654

The smallest number 4568

Difference 8654 4568 4086

4086 5085

(c) The digits are 4, 5, 6, 7

The largest number 7654

The smallest number 4567

Sum 7654 4567 12221

12221 9779

(d) Digits are 5, 1, 8, 9

The largest number 9851

The smallest number 1589

Difference 9851 1589 8262

8262 9779

2. There may be 2 conditions.

Case I. If the digits are different then

The largest 5 digit palindrome number 98789

The smallest 5 digit palindrome number 12321

Sum 98789 12321 111110

Difference 98789 12321 86468

Case II. If five digits are same then

The largest 5-digit palindrome 99999

The smallest 5-digit palindrome

11111

Sum 99999 11111 111110

Difference 99999 11111 88888

In both cases, sum of greatest and smallest 5 digits are same.

3. Time now 10 : 01

Next palindrom 11 : 11

So, 11 : 11 10 : 01 70 minutes.

i.e., after 1 hour 10 minutes.

4. The largest number formed by using digits 5, 6, 8, 3 8653 and the smallest number 3568

Round I	Round II	Round III	Round IV	Round V	Round VI	Round VII
8653	8550	9972	7731	6543	8730	8532
− 3568	− 0558	− 2799	− 1377	− 3456	− 0378	− 2358
5085	7992	7173	6354	3087	8352	6174

Hence, after seventh round we will reach the Kaprekar constant 6174.

Exercise 3.4

1. Divide 90,250 by 2.

$$\frac{90,250}{2} \quad 45,125$$

To obtain five digit number more than 90,250, at least one number or both numbers must be more than 45,125.

e.g.,

45,125	and	47,243
53,325		46,398
98,450		93,641

Hence, to get sum more than 90,250, at least one or both numbers must be more than 45,125.

(b) To get 6-digit sum by adding 5-digit number and a 3-digit numbers, the five digit number should be 99001 or more than it.

99001	99002	99856
+ 999	+ 999	+ 583
100000	100001	100439

and so on.

(c) Let's take minimum 4-digit number 1000 and add

1,000
+1,000
2,000

a four digit number

Now take a maximum 4-digit number 9999 and add

9999
+ 9999
19,998

a five digit number

Hence, it is impossible to get a six-digit number by adding two four-digit numbers.

(d) Take two 5-digit numbers and add them.

56873	99876
+ 62391	12341
119264	112217

It is clear that if we want to get a six digit number by adding two different five digit numbers, then both the number should be greater than 50,000. If one number is around the largest 5-digit number then the other might be around the smallest number.

(e) Half of the number $\frac{18,500}{2}$

9,250, which is a 4-digit number. If we take a 5-digit number then second will be 4-digit number.

So, it is impossible to get a sum of two 5-digit numbers as 18500.

(f) 5-digit number 5-digit number 86084 35,989 50095, gives a difference less than 56,503.

(g) 5-digit number 3-digit numer gives a 4-digit number

10385 (a 5-digit number)
968 (a 3-digit number)
9417 (a 4-digit number)

(h) 19346 (a 5-digit number)
9876 (a 4-digit number)
9470 (a 4-digit number)

(i) 72493 (a 5-digit number)
72143 (a 5-digit number)
350 (a 3-digit number)

(j) The smallest 5-digit number is 10,000 to get a difference of 91,500, the larger number must be 91,500 10,000 101500, a 6-digit number.

Hence, it can not be possible to obtain 91,500 as a result of difference of two 5-digits numbers.

2. (a) 5-digit number 5-digit number *sometimes* gives a 5-digit number and sometime not.

For example :

(i) 23,240
30,000
53,240 (5-digit number)

But 52000
63243
1,15,243 (6-digit number)

(b) 4-digit number 2-digit number *sometimes* gives a 4-digit number but sometimes not.

For example :

3568 (4-digit number)
+ 99 (2-digit number)
3667 (4-digit number)

9999 (4-digit number)
11 (2-digit number)
10,000 (5-digit number)

(c) 4-digit number 2-digit number *never* gives a 6-digit number.

For example :

8468 (4-digit number)
99 (2-digit number)
8567 (4 digit-number)

9999 (4-digit number)
99 (2-digit number)
10098 (5-digit number)

(d) 5-digit number   5-digit number gives some time 5-digit number some time not.

For example :

(i) 98,546 (5-digit number)
32,638 (5-digit number)
65,908 (5-digit number)

(ii) 40,907 (5 digit number)
38562 (5-digit number)
2,345 (4-digit number)

(iii) 85,996 (5-digit number)
85684 (5-digit number)
312 (3-digit number)

(e) 5-digit number   2-digit number *never* gives a 3-digit number.

For example :

(i) 23465 (5-digit number)
99 (2-digit number)
23,366 (5-digit number)

(ii) 10000 (5-digit number)
86 (2-digit number)
9914 (4-digit number)

Exercise 3.5

1. If we interchange the first and last digits of central number 62,871, we will get the required result.

16,200	39,344	29,765
23,609	12,876	45,306
19,381	50,319	38,408

Now, we have 4 supercells and they are 39,344, 50,319, 23,609 and 45,306.

2. If your year of birth is 2013.

Round I Now from the number digits are, 2, 1, 0, 3   2103

The largest number   3210
And the smallest number   0123
Then the difference   3087

Round II

The largest number   8730
The smllest number   0378
Difference   8352

Round III

The largest number   8532
The smallest number   2358
Difference   6174

And, that is the Kapraker constant.

Hence, it took 3 rounds to reach the Kaprekar constant of the number 2013.

3. The largest number with all odd digits between 35,000 and 75,000 is 73,951.

The largest numbers will all odd digits (repetitive) is 73,999.

The smallest number with all odd digits (non repetitive) between 35,000 and 75,000 is 35,179.

The smallest number will all odd digits (repetitive) is 35,111.

Closest to 50,000 (in case of non-repetition)   47,951.

Closest to 50,000 (in case of repetition)   51111

4. No definite number can be given in respect of holidays in schools, however there are 52 sundays in a year. Twenty holidays can be counte on festivals like Deepawali, Holi, Rakshabandhan, Eid, Barawafat, Chrismas Day etc. Apart from this about 40 days of summer vacations and fifteen days of winter vacation can be included.

Hence, an estimated number of holidays in the schools 52 20 40 15 127 approximately.

5. The capacity of mugs, buckets and tanks depends upon their size and shape. We all have them in different sizes in our homes. How ever a normal size mug can hold about 1 litre, a normal size bucket can hold 15 litres and tank can hold 500 litres of liquid.

Students should do this task of estimation in their homes and try to measure these with the help of their family members.

6.

5-digit number	18,000
First 3-digit number	334
Second 3-digit number	336
Sum	18,670

7.

5

10 10 10

15 15 15 15 15

20 20 20 20 20 20 20

Sum of 5 1 5 5

Sum of 10 3 10 30

Sum of 15 5 15 75

Sum of 20 7 20 140

Total 250

That lies between numbers 210 and 390.

8. The sequences of the power of 2 is

1, 2, 4, 8, 16, 32, 64, 128, 256 ………… .

Take the number 256, that is an even number

256 divided by 2 128 (an even number)

128 divided by 2 64 (an even number)

64 divided by 2 32 (an even number)

32 divided by 2 16 (an even number)

16 divided by 2 8 (an even number)

8 divided by 2 4 (an even number)

4 divided by 2 2 (an even number)

2 divided by 2 1

Hence, Collatz conjecture is correct in all numbers in sequence of power of 2.

9. Starting number 100 is an even

So, 100 divided by 2 50 (an even number)

50 divided by 2 25 (an odd number)

25 is multiplied by 3 and adding 1 76 (an even number)

76 is divided by 2 38 (an even number)

38 is divided by 2 19 (an odd number)

19 is multiplied by 3 and adding 1 58 (an even number)

58 is divided by 2 29 (an odd number)

29 is multiplied by 3 and adding 1 88 (an even number)

88 is divided by 2 44 (an even number)

44 is divided by 2 22 (an even number)

22 is divided by 2 11 (an odd number)

11 is multiplied by 3 and adding 1   34
(an even number)

34 is divided by 2   17
(an odd number)

17 is multiplied by 3 and adding 1 = 52
(an even number)

52 is divided by 2   26
(an even number)

26 is divided by 2   13
(an odd number)

13 is multiplied by 3 and adding 1   40
(an even number)

40 in divided by 2   20
(an even number)

20 is divided by 2   10
(an even number)

10 is divided by 2   5 (an odd number)

5 is multiplied by 3 and adding 1   16
(an even number)

16 is divided by 2   8
(an even number)

8 is divided by 2   4 (an even number)

4 is divided by 2   2 (an even number)

2 is divided by 2   1

Yes, The Collatz conjecture holds for the starting number 100.

10. Two players start from 0 and alternately add a number 1 or 2 or 3 to the sum. The player who reaches 22 wins. The winning strategy is to reach a number in which the digits are subsquent (e.g., 1, 2, 3) and control the game by jumping through all the numbers of this sequence. Once a player reaches 22, the opponent can only choose number 2 and the next answer can in any case be 21.

Miscellaneous Exercises

1. In two cases whether it is asending or descending order, the largest number will lie at the corner.
So only one supercell will be there in the table.

2. Let the different numbers be 1, 2, 3, 4, 5, 6, 7, 8. If we arrange them in the following manner, then there will be only one supercell.

1	2	3	7	8	6	5	4

The supercells activity can be done with more rows of cells.

3.

Number	2568	3657	7545	8922	9741	7734
Sum of digits	21	21	21	21	21	21

4. If the numbers are formed with same digit. Then,
The largest number   999999
And the smallest number   111111
The difference   999999   111111
888888 (a palindrome)
If the digits are different then
The largest number   987789
The difference   987789   123321
864468 (a palindromic)

5. The largest number   8654
The smallest number   4568

Round	Number	Subtract	Result
Round I	8654	– 4568	4086
Round II	8640	– 0468	8172
Round III	8721	– 1278	7443
Round IV	7443	– 3447	3996
Round V	9963	– 3699	6274
Round VI	7642	– 2467	5175
Round VII	7551	– 1557	5994
Round VIII	9954	– 4599	5355
Round IX	5553	– 3555	1998
Round X	9981	– 1899	8082
Round XI	8820	– 0288	8532
Round XII	8532	– 2358	6174

Hence, after 12th round we shall get the Kaprekar constant.

6. (a) 23,000 800 800 24,600
(b) 26,000 1200 1200 28,400
(c) 50,000 800 1200 52,000
(d) 1200 800 800 2,800
(e) 50000 23000 1200 28,200
(f) 50000 26000 23000 53000
(g) 23,000 800 1200 25000
(h) 50,000 23,000 1200 800 75,000

7.

5-digit number	80824
4-digit number	5683
3-digit number	735
3-digit number	345
Sum of all numbers	87587

8.

					5					
				10	10	10				
			15	15	15	15	15			
		20	20	20	20	20	20	20		
	25	25	25	25	25	25	25	25	25	
30	30	30	30	30	30	30	30	30	30	30

Sum of 5	1	5	5
Sum of 10	3	10	30
Sum of 15	5	15	75
Sum of 20	7	20	140
Sum of 25	9	25	225
Sum of 30	11	30	330
Total			805

9. India got independence in 1947.

Now, the digits of number in 1947 is 1, 4, 7 and 9.

Round I	The largest number	9741
	The smallest number	1479
	Difference	8262
Round II	The largest number	8622
	The smallest number	2268
	Difference	6354
Round III	The largest number	6543
	The smallest number	3456
	Difference	3087
Round IV	The largest number	8730
	The smallest number	0378
	Difference	8352
Round V	The largest number	8532
	The smallest number	2358
	Difference	6174

Number 1947 reaches the Kaprekar constant after 5 rounds.

10. (a) 30 12 43, 42 14 56

(b) The difference between consecutive terms follows the sequence of even numbers : 4, 6, 8, 10;

11. Make your own pattern.

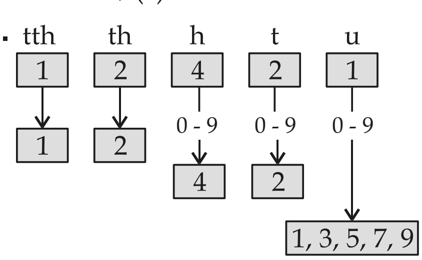
12. 6174

13. (i) (c) A is ture, but R is false.

(ii) (c) A is ture, but R is false.

14. (a) 15 blocks; (b) Add consecutive natural numbers to the previous number; (c) 28 blocks.

15.



Twelve throusand four hundred twenty one

CHAPTER
4
Data Handling and Presentation

TEXTBOOK EXERCISES

Exercise 4.1

1. (a) The largest shoe size in the class is 7.

(b) The smallest shoe size in the class is 3.

(c) There are 10 students who wear shoe size 5.

(d) There are 15 students who wear shoe size larger than 4.

2. The obtained data can be arranged either in ascending order or descending order. Ascending order of the data is 3, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 6, 6, 6, 6, 7 It becomes easier to answer questions by arranging numbers in ascending order.

Yes. The data can also be arranged in descending order. Another way to arrange data is frequency method. Above data can be arranged as.

Shoe Size	No. of Students (Frequency)	Tally Marks
3	3	|||
4	9	卌 ||||
5	10	卌 卌
6	4	||||
7	1	|

3. When I go to school from my home I saw many trees like : Peepal, Neem, Banyan, Tamarind, Champaka, Amaltash, Bel.

Trees	No. of Trees	Tally Marks
Peepal	12	卌 卌 ||

Neem	20	𝍸 𝍸 𝍸 𝍸
Banyan	7	𝍸 ||
Tamorind	11	𝍸 𝍸 |
Champaka	21	𝍸 𝍸 𝍸 𝍸 |
Amaltash	4	||||
Bel	5	𝍸

(a) Champaka tree was found in the greatest number.

(b) Amaltash tree was found in the smallest number.

(c) No, there were not any two trees found in the same numbers.

Note : Students should themselves find out the number of different trees while going somewhere and collect new data using this table as a sample.

4.

Letter	c	e	i	r	*x*
Number of times found in the news item	24	51	48	31	3

(a) The letter found the most number of times is 'e'.

(b) The letter found the least number of times is 'x'.

(c) List the five latter 'c', 'e', 'i', 'r' and 'x' in ascending order of the frequency.

Letter	*x*	c	r	i	*e*
Frequency	3	24	31	48	51

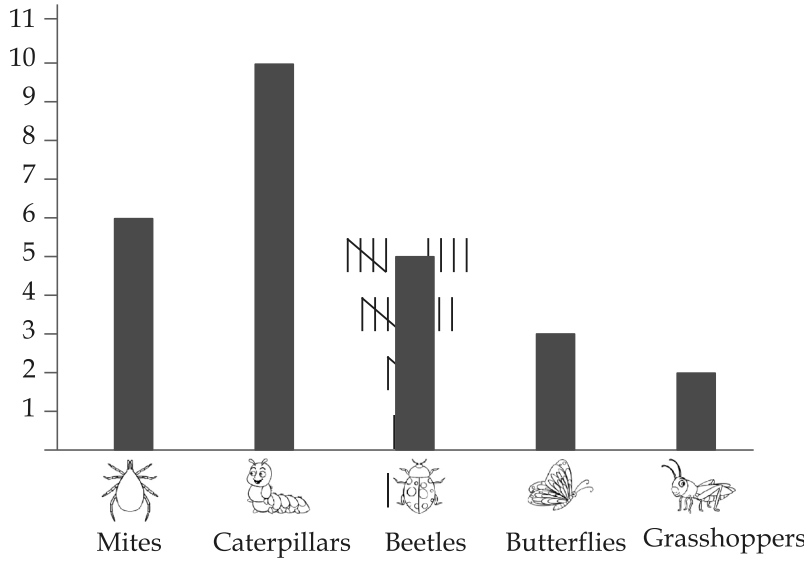
(d) To complete this task, we bought a newspaper name 'Times of India' and cut and posted the attached news have here. After this, We searched the given letters inside the news and wrote the numbers related to them.

(e) This comparision should be made by the students themselves

(f) If we do this task again, then we shall adopt same process.

Exercise 4.2

1. The bar graph below.



2. (a) The number of tickets sold for Vidisha 24

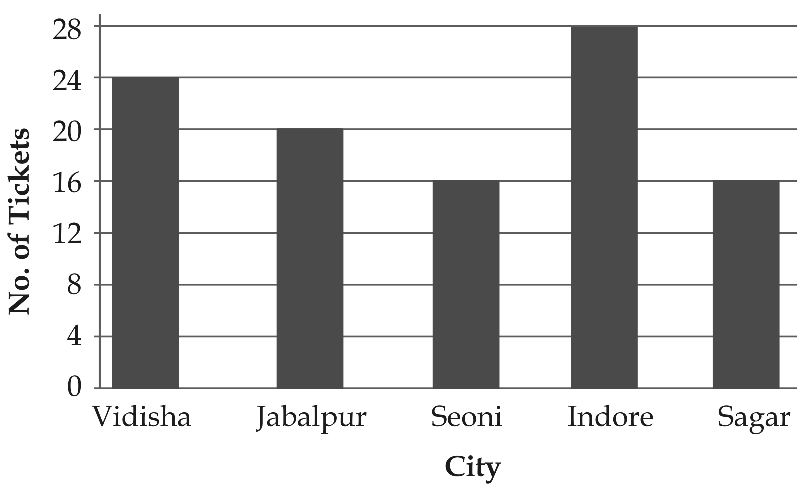
(b) The number of tickets sold for Jabalpur 20

(c) Since, 6 units 24 tickets, Thus, 1 unit $\frac{24}{6}$ 4 tickets

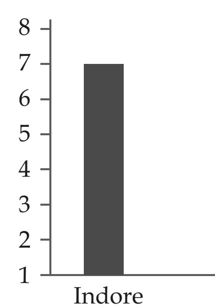
Similarly, 5 units 20 tickets, Thus, 1 unit $\frac{20}{5}$ 4 tickets

Hence, here scale is 1 unit 4 tickets.

(d) The bar graph for Sagar is given in bar graphs.



(e) The scale on the vertical line is given in bar graph that is,
1 unit 4 tickets, 2 units 8, 3 units 12, ….. .



(f) The bar drawn for Seoni is correct but it is not correct for Indore because the scale 1 unit 4 tickets.

Hence, 28 tickets $\frac{28}{4}$ 7 units.

Hence, the length of the bar for Indore must reach to 7 units, as given here.

3. (a) Frequency distribution table for the given data :

Name of vehicles	Tallymarks	No. of vehicles
Bike	𝍸 𝍸 |||	13
Car	𝍸 |	6
Bicycle	𝍸 |||	8
Scooter	𝍸 ||||	9
Bus	||||	4
Bullock cart	||	2
Auto	𝍸 |||	8

(b) Bike

(c) If I was asked to collect this data, I would take the following steps :

(i) I would keep in mind and purpose of data collection.

(ii) After that I would gather the informations about the relevant field.

(iii) Then, I make a plan keeping the deadline in mind time limit.

(iv) Finally, I collect data either by direct observation or by asking questions.

4. Let the numbers obtained of 30 times roll of a die be

5, 2, 1, 2, 4, 2, 2, 5, 1, 2, 6, 3, 4, 1, 2, 1, 3, 2, 5, 1, 5, 3, 5, 4, 6, 3, 2, 1, 2, 1

The frequency table for this data is given below :

Number seen on the die	Tally Marks	Frequency
1	𝍸 ||	7
2	𝍸 ||||	9
3	||||	4
4	|||	3
5	𝍸	5
6	||	2

(a) It is 6.

(b) It is 2.

(c) There are no numbers that appeared equal numbers of times.

5. (a) This table is giving the information how many times has Jaspreet Bumrah taken 0 to 7 wickets in last 30 cricket matches.

(b) Frequency distribution table indications the bowlings performance of Jaspreet Bumrah.

(c) Jaspreet Bumrah has taken 5 or more wickets 7 times.

(d) In 3 matches, Bumrah has taken 4 wickests.

(e) No, this calculation would have been correct, if Bumrah had taken one to seven wickets only once, but he has taken one or more wickets in multiple matches. For example, he has taken 5 wicket in five different matches.

(f) Total number of wickets taken by Jaspreet Bumrah can be calculated using the following method :

2 0 4 1 6 2 8 3 3 4 5 5 1 6 1 7 0 4 12 24 12 25 6 7 90

6. (a) Village D has the smallest number of tractors.

(b) Village C has the most number of tractors.

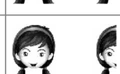
(c) Village C has 3 more tractors than that of Village B have.

(d) Yes, she is right.

7. (a) Class 8, has least number of girl students.

(b) Difference between class 5 and 6 4 4 2.5 4 16 10 6

(c) If 2 more girls were admitted in class 2 the graph will be changed as :

Classes	Number of Girl Students ( 4 Girls)
1	
2	
3	
4	
5	
6	
7	
8	

(d) There are (4 3) *i.e.,* 12 girls in class 7.

8. (a) Number of dogs in different villages are a multiples of 6. Hence, to draw a pictograph shall choose a scale 1 ⊠ 6 dogs.

Village	No. of dogs (⊠ 6 dogs)
A	⊠ ⊠ ⊠
B	⊠ ⊠ ⊠ ⊠ ⊠ ⊠
C	⊠ ⊠
D	⊠ ⊠ ⊠ ⊠ ⊠ ⊠ ⊠ ⊠
E	⊠ ⊠ ⊠
F	⊠ ⊠ ⊠ ⊠

(b) 6 symbols

(c) Yes, Total number of dogs in villages B and *D*

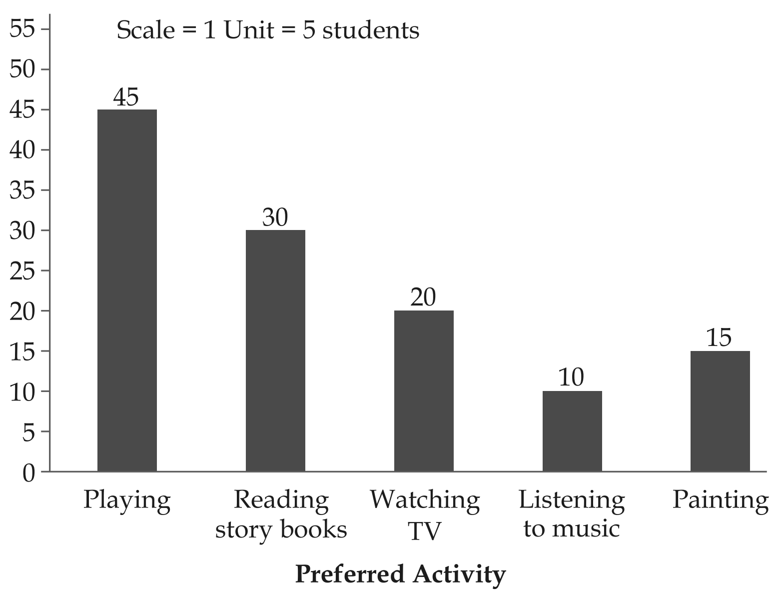
6 6 8 6 36 48 84

Total number dogs in 4 other villages

3 6 2 6 3 6 4 6 18 12 18 24 72

and 84 72.

9.



Reading story books is preferred by most students other than playing.

10. (a) The total number of saplings planted on wednesday and Thursday

30 40 70.

(b) The total number of saplings planted during the whole week

50 40 30 40 50 60 40 310

(c) Saturday and Wednesday. Number of student vary from Day 1 to Day 7

11. Yes, there are three mistakes in the graph.

(i) Number of tigers in 2006 is 1400, but it is shown in the graph less than 1000.

(ii) Number of tigers in 2014 is 2200, but it is shown in the graph more than 3000.

(iii) Number of tigers in 2018 is 3000, but it is shown in the graph less than 3000.

Exercise 4.3

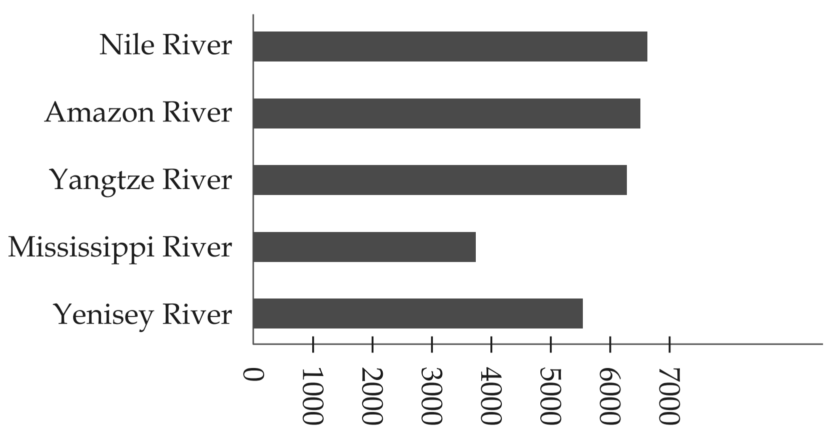
1. Graph with vertical bars. Vertical graphs are like pillars and show a better presentation of the person's height than that of horizontal graphs show.

2. Graph bars, because rivers flow on land horizontally not vertically.

In the following table five longest rivers in the world are given with lengths and the related country represent them with a suitable bar graph.

Rivers and Country	Nile River North eastern Africa	Amazon River South America	Yangtze River China	Mississippi River United States	Yenisey River Northern Asia
Length (in km)	6650	6400	6300	3766	5539

Scale : 1 unit = 1000 km



Miscellaneous Exercises

1. 3

2. Data

3. Raw data

4. Tally marks

5. (a) 1 : 4

6. (c) 3 ; 2

7. (i) Frequency table including pictograph

Marks obtained	Tally marks	Frequency (No. of students)	Pictograph ⊠ 2 students
15	||	2	⊠
20	卌 |	6	⊠⊠⊠
24	卌 |	6	⊠⊠⊠
25	卌 卌	10	⊠⊠⊠⊠⊠
35	卌 卌 |	11	⊠⊠⊠⊠⊠◸
36	卌 ||	7	⊠⊠⊠◸
46	卌 |||	8	⊠⊠⊠⊠
Total		**50**	

(ii) 14 students got less than 25 marks. (iii) 15 students got more than 35 marks.

(iv) 8 students got maximum marks (46). (v) 2 students got minimum marks (15).

8. (i) **Frequency Table**

Ages of Players	Tally marks	Frequency (No. of players)
12	|	1
14	卌 |	6
15	卌 |||	8
16	卌 ||||	9
18	|||	3
20	|||	3
Total		**30**

(ii) The number of players with age of 20 are 3.

(iii) The number of youngest player is 1.

(iv) Difference between number of players with ages 16 years and 14 years

9 6 3.

9. (i) Baldev Das & Co., 70; (ii) Brij Auto's, 30; (iii) 290 bikes;

(iv) There are no dealer who sale equal number of bikes.

(v) 10.

10. **Pictograph Table**

Years	Numbers of Children	Pictograph ☺ = 100 children
1985	500	☺ ☺ ☺ ☺ ☺
1990	400	☺ ☺ ☺ ☺
1995	600	☺ ☺ ☺ ☺ ☺ ☺
2000	700	☺ ☺ ☺ ☺ ☺ ☺ ☺
2005	800	☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺
Total	**3000**	

(i) 1990, (ii) 800, (iii) 1990.

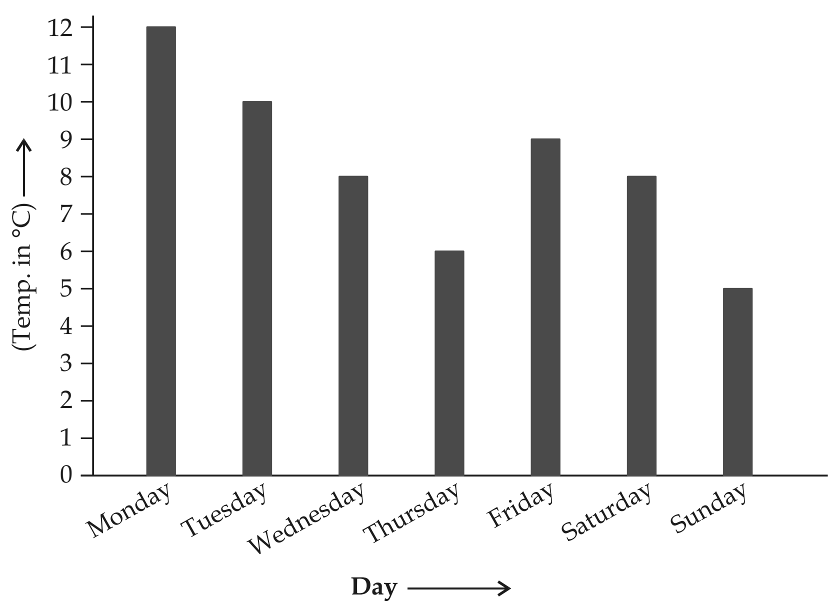
11. (i) (a) If both assertion and reason are true and reason is the correct explanation of assertion.

(ii) (a) If both assertion and reason are true and reason is the correct explanation of assertion.

(iii) (c) If assertion is true but reason is false.

12. (i) (c) 11, (ii) (a) 14, (iii) (c) 8, (iv) (a) 2

13. (a)



(b) Sunday (c) Monday (d) 0°C

14. (a) Bar graph (b) to (f) yourself

CHAPTER 5

Prime Time

TEXTBOOK EXERCISES

Exercise 5.1

1. 320, 360, 400.

Since multiples of 40 are 40, 80, 120, 160, 200, 240, 280, 320, 360, 400, 440, …… .

Out of which numbers 320, 360, 400 lie between the numbers 310 and 410.

2. (a) 7 is a factors of 7, 14, 21, 28, 35 which are less than 40. There is one number which has digit sum is

35   (3   5)   8. So, I am 35.

(b) Common factors of 3 and 5 are 15, 30, 45, 60, 75, 90, which are less than 100. There is only one number whose one of it's digit is 1 more than other and that is 45. So, I am 45.

3. The perfect number between 1 and 10 is 6. All factors or divisors of 6 are 1, 2, 3, 6.

Sum of all divisors   1   2   3   6   12

Here, 6 is a perfect number as 6   2   12.

4. (a) Factors of 20 are 1, 2, 4, 5, 10 and 20.

Factors of 28 are 1, 2, 4, 7, 14 and 28.

Common factors are 1, 2 and 4.

(b) Factors of 35 are 1, 5, 7 and 35.

Factors of 50 are 1, 2, 5, 10, 25 and 50.

Common factors   1, 5.

(c) Factors of 4   1, 2, 4.

Factors of 8   1, 2, 4, 8.

Factors of 12   1, 2, 3, 4, 6, 12.

Common factors   1, 2, 4.

(d) Factors of 5   1 and 5.

Factors of 15   1, 5 and 15.

Factors of 25   1, 5 and 25.

Common factors   1, 5.

5. Multiples of 25

25, 50, 75, 100, 125, 150, 175, …

Multiples of 50

50, 100, 150, 200, 250, …

Hence, three numbers multiples of 25 but not of 50   75, 125, 175.

6. If Idli vada is said after number 50, it means that the least common multiple of two numbers must be greater than 50. If we choose 8 and 9 then common multiple of these two numbers are 18, 36, 54. Number 54 is larger than fifty but idli-vada can not be used for this as it is the third multiple of 6 and 9. So, we take the numbers 7 and 9, as the least common multiple of these two numbers is 63 and 20. So, idli-vada can be used for it first time.

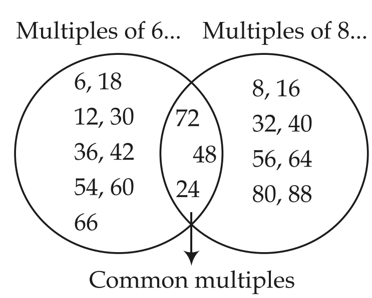
7. Factors of 28   1, 2, 4, 7, 14, 28.

Factors of 70   1, 2, 5, 7, 10, 14, 35, 70.

Common factors   1, 2, 7, 14.

Hence, jump sizes that will land both 28 and 70 are 1, 2, 7 and 14.

8.



Here number 6 can be replaced by 8 and the number 8 can be replaced by 12.

9. To find the smallest number that is a multiple of all the numbers from 1 to 10 except 7, we shall factorise first the given numbers

1 1 1   2 1 2   3 1 3

4 1 2 2   5 1 5   6 1 2 3

8 1 2 2 2   9 1 3 3

10 1 2 5

Now, we shall find the product of all common factors including the numbers that are not common.

Thus, 1 2 2 2 3 3 5 360

Hence, the smallest number that is a multiple of all the numbers from 1 to 10 except 7 is 360.

10. To find the smallest number that is a multiple of all the numbers from 1 to 10, we shall get the prime factors of given numbers.

1 1 1   2 1 2   3 1 3

4 1 2 2   5 1 5   6 1 2 3

7 1 7   8 1 2 2 2

9 1 3 3   10 1 2 5

Now we will find the product of all the common factors and those factors are not common.

Here, 2 2 2 3 3 5 7 2520

Hence, the smallest number that is a multiple of all numbers from 1 to 10 is 2520.

Exercise 5.2

1. No, 2 is the only even prime number. Since 2 is the only even number that meets the criteria of a prime number (the divisors of 2 are only 1 and 2 itself), it is the only even prime number. All other even numbers are divisible by 2 and at least one other number, so they are not prime.

2. To find the smallest difference between two successive prime numbers up to 100, we will make a list the prime numbers in the range of 1 to 100 and calculate the difference between two successive primes.

Prime numbers up to 100 are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89 and 97.

Difference between two successive primes

3 2 1   5 3 2   7 5 2

11 7 4   13 11 2   17 13 4

19 17 2   23 19 4   29 23 6

31 29 2   37 31 6   41 37 4

47 41 6   53 47 6   59 53 6

61 59 2   67 61 6   71 67 4

79 73 6   83 79 4   89 83 6

97 89 8.

The smallest difference between two successive primes 2 and 3 3 2 1.

And the largest difference between two successive primes 89 and 97 97 89 8.

3. There is not an equal number of primes in every row. It is different number of primes in among the rows.

The decade 90-99 has the least number of primes as there is only 1 prime in it, that is 97.

The decades 0-9 and 10-19 have the largest number of primes each with 4 primes.

4. Numbers 23 and 37 are primes because both have no divisor other than 1 and themselves.

5. The primes less than 20 are : 2, 3, 5, 7, 11, 13, 17, 19.

Three pairs of prime numbers whose sum is a multiple of 5 are (2, 3), (3, 7), (2, 13)

2 3 5   3 7 10   2 13 15

6. The pairs of prime numbers up to 100 that consists of the same digits are :

(13, 31), (17, 71), (37, 73) and (79, 97).

7. Seven consecutive composite numbers between 1 and 100 are : 90, 91, 92, 93, 94, 95, 96.

8. The twin primes other than (3, 5) and (17, 19) between 1 and 100 are :

(5, 7), (11, 13), (29, 31), (41, 43), (59, 61) and (71, 73).

9. (a) True. **Explanation :** Except 2 all other primes end in 1, 3, 7 or 9, because any number that ends in 0, 2, 4, 6 or 8 is always divisible by 2.

(b) False. **Explanation :** A product of prime numbers is only prime if it involves exactly one prime number. When two or more prime numbers are multiplied together, the result is always a composite number not a prime. As this number has more than two factors.

(c) False. **Explanation :** Prime numbers have exactly two factors first is one and second is the number itself.

(d) False. **Explanation :** The number 2 is an even number but not composite as it has only two factors 1 and itself.

(e) True. **Explanation :** For every prime number greater than 2, the next number is composite.

10. Here 45 1 3 3 5 (only 2 primes).

60 1 2 2 3 5 (3 primes)

91 1 7 13 (2 distinct primes)

105 1 3 5 7 (3 distinct primes)

330 1 2 3 5 11 (4 distinct primes)

Hence, the number 105 is the product of exactly three distinct primes and they are 3, 5, 7.

11. Digits 2, 4 and 5 can not form any prime numbers because, if the unit digit either 2 or 4, of the formed number, then it will be divisible by 2 and if the unit digit of the number so formed is 5, then the number will be divisible by 5.

So, the digits 2, 4 and 5 can not form a prime number.

12. The five prime number for which doubling and adding 1 gives another prime are

2 (2 2 1) 5

3 (2 3 1 7)

5 (2 5 1 11)

11 (2 11 1 23)

23 (2 23 1 47)

Exercise 5.3

1. (i) The prime factorisation of 64

2 2 2 2 2 2

(ii) The prime factorisation of 104

2 2 2 13

(iii) The prime factorisation of 105

3 5 7

(iv) The prime factorisation of 243

3 3 3 3 3

(v) The prime factorisation of 320

2 2 2 2 2 2 5

(vi) The prime factorisation of 141

3 47

(vii) The prime factorisation of 1728

2 2 2 2 2 2 3 3 3

(viii) The prime factorisation of 729

3 3 3 3 3 3

(ix) The prime factorisation of 1024

2 2 2 2 2 2 2 2 2 2

(x) The prime factorisation of 1331

11 11 11

(xi) The prime factorisation of 1000

2 2 2 5 5 5

2. Find up the numbers, these prime factors are multiplied together 2 two 3's one 11.

2 3 3 11 198

Thus, the number is 198.

3. To find these prime numbers, we prime factorise 1955.

1955 5 17 23

Obtained all numbers are less than 30 and their product is 1955.

Hence, the three prime numbers whose product is 1955 are 5, 17 and 23.

4. (a) Prime factors of 56 2 2 2 7.

Prime factors of 25 5 5.

Combined prime factoristaion of

56 25 2 2 2 7 5 5

or 2 2 2 5 5 7.

(b) Prime factors of 108

2 2 3 3 3.

Prime factors of 75 3 5 5.

Combined prime factorisation of 108 75

2 2 3 3 3 3 5 5.

(c) Prime factors of 1000

2 2 2 5 5 5.

Prime factors of 81 3 3 3 3

Combined prime factors of 1000 81

2 2 2 5 5 5 3 3 3 3

or 2 2 2 3 3 3 3 5 5 5

5. (a) Three different prime numbers are 2, 3 and 5. To find the smallest number with these primes as factors, we shall multiplying them together

2 3 5 30

Hence, the smallest number whose prime factorisation has three different primes is 30.

(b) First four prime numbes are 2, 3, 5 and 7. To find the smallest number whose prime factorisation has these four primes as factors, we shall multiply these together

2 3 5 7 210

Thus, the smallest number whose prime-factorisation has four different primes is 210.

Exercise 5.4

1. (a) No. **Verification :** Factors of 30 and 45

30 2 3 5

45 3 3 5.

Common factors, 3 5 15.

Hence, 30 and 45 are not a pair of co-prime numbers.

(b) Yes. **Verification :** Prime factorisation of 57 and 85.

57 3 19

85 5 17

There is no common factor.

Hence, 57 and 85 are co-prime numbers.

(c) No. **Verification :** Prime factors of 121 and 1331.

121 11 11

1331 11 11 11.

There is common factors is 11 11 121.

Hence, 121 and 1331 are not co-prime numbers.

(d) Yes. **Verification :** Prime factorisation of 343 and 216.

343 7 7 7

216 2 2 2 3 3 3.

There is no common factor.

Hence, 343 and 216 are co-prime numbers.

2. (a) Prime factorisation 225 and 27

225 3 3 5 5

27   3   3   3.

Since 225 has two 3's as prime factors, while 27 has three 3's. So, number of 3's in 225 are not enough to be divisible by 27.

Hence, 225 is not divisible by 27.

(b) Prime factors of 96 and 24

96   2   2   2   2   2   3

24   2   2   2   3

Since 96 has the required factors to match those in 24.

Hence, 96 is divisible by 24.

(c) Prime factors of 343 and 17.

343   7   7   7 and 17   1   17.

Since, the prime factorisation of 343 does not have 17 in it.

Hence, 343 is not divisible by 17.

(d) Prime factors of 999 and 99

999   3   3   3   37

99   3   3   11

Since, 999 does not have 11 as a factor in it.

Hence, 999 is not divisible by 99.

3. The two numbers have common factors 3 and 7.

So, they are not co-prime.

Since neither number has all the factors of the other number.

So, one of them can not divide other number.

4. Yes, he is right as all co-prime numbers have no common factor other than 1.

Exercise 5.5

1. (a) I was born in 2010. So, from the year 2010 till 2024, there are 4 leap years, 2012, 2016, 2020 and 2024.

(b) The leap years from 2024 till 2099 will be 2024, 2028, 2032, 2036, 2040, 2044, 2048, 2052, 2056, 2060, 2064, 2068, 2072, 2076, 2080, 2084, 2088, 2092 and 2096.

Hence, there will be 19 leap years from 2025 till 2099.

2. The largest 4-digit number divisible by 4 and also palindrom is 8888.

The smallest 4-digit number divisible by 4 and also palindrom is 2112.

3. (a) Sum of two even numbers gives a multiple of 4 is sometimes true. For example, 6   4   10, not divisible by 4. But 4   8   12 (divisible by 4).

(b) Sum of two odd numbers gives a multiple of 4 is sometimes true. For example, 3   5   8 is divisible by 4, but at the other hand 9   5   14 is not divisible by 4.

4.

(i) 10) 78 (7
– 70
8
Remainder   8

(ii) 5) 78 (15
– 5
28
– 25
3
Remainder   3

(iii) 2) 78 (39
– 6
18
– 18
0
Remainder   0

Similarly do yourself.

99   10, Remainder   9,

99   5, Remainder = 4

99   2, Remainder = 1

173   10, Remainder = 3

173   5, Remainder   3

173   2, Remainder   1

572   10, Remainder   2

572   5, Remainder   2

572   2, Remainder   0

980   10, Remainder   0,

980   5, Remainder   0

980   2, Remainder   0

1111 10, Remainder 1,

1111 5, Remainder 1

1111 2, Remainder 1

2345 10, Remainder 5,

2345 5, Remainder 0,

2345 2, Remainder = 1

5. The factors of 8 are 2 and 4 and the factors of 10 are 2 5.

Now, if a number is divisible by 10, then it will also be divisible by 2 and 5. Similarly, if a number is divisible by 8, then it will also be divisible by 2 and 4.

Therefore, checking divisibility by 8 and 10, it is confirm that number is also divisible by all other numbers (2, 4 and 5).

Hence, the pair of numbers that Guna checked to determine that 14560 is divisible by all 2, 4, 5, 8 and 10 are 10 and 8.

6. **572 :** The end digits of 572 is neither '0' nor 5. So, it is not divisible by 5 or 10.

The last three digit are not divisible by 8, so 572 is not divisible by 8.

The last two digit make a number 72 that is divisible by 4 and so the number is also divisible by 2.

Hence, the number 572 is divisible by 2 and 4 but not divisible by 5, 8 and 10.

2352 : The last digit of the number is neither 0 nor 5. So, 2352 is not divisible by 5 or 10.

The number formed by last 3 digits is 352 that is divisible by 8, so the number is divisible by 2, 4 and 8.

5600 : The last digit of the number is 0, and the number formed by last digits is 600, that is divisible by 8. Thus the number 5600 is divisible by all the numbers 2, 4, 5, 8 and 10.

6000 : The last 3 digits of this number 0, so the number is divisible by all the given numbers 2, 4, 5, 8 and 10.

77622160 : The last digit of this number is 0, so it is divisible by 5 and 10.

And last three digits form a number 160, which is divisible by 8, thus the number divisible by 2, 4 and 0. Hence, 77622160 is divisible by 2, 4, 5, 8 and 10.

Hence, the number 5600, 6000 and 77622160 are divisible all the given numbers 2, 4, 8, 5 and 10.

7. The prime factorisation of the number

10,000 2 2 2 2 5 5 5 5

Making groups, we have

(2 2 2 2) (5 5 5 5)

16 625

Hence, two numbers whose product is 10,000 but not have 0 as unit digit are 16 and 625.

Miscellaneous Exercises

1. Factor of 35 1, 5, 7, 35

Sum of factors 48

2. 1

3. 161

4. (i) 1, 2, 3, 4, 6, 8, 12, 24

(ii) 1, 3, 9, 27

(iii) 1, 2, 3, 4, 6, 12

(iv) 1, 2, 3, 4, 6, 9, 12, 18, 36

5. (i) 3 5 13; (ii) 3 5 23;

(iii) 13 17 23; (iv) 7 13 41

6.

		Factors	Common Factors
(i)	20	4 5	4
	28	4 7	
(ii)	15	3 5	5
	25	5 5	
(iii)	4	4 1	4
	8	4 2	
	12	4 3	
(iv)	5	5 1	5
	15	5 3	
	25	5 5	

7. 2 2 2 3 3 19

8. Factors of 8 2 2 2

Factors of 10 2 5

Factor of 12 2 2 3

Required number

2 2 2 2 5 2 2 3 960

9. 27 2 54, 27 3 81, 27 4 108

So smallest 3-digits multiple is 108.

10. Successive prime numbers between 20 and 30 = 23, 29

their product 23 29 667

11. No, since their common factor in not only 1.

12. (i) (d) (ii) (d) (iii) (a)

13. (i) (b) Prime factorization

6 2 3; 8 2^3; 9 3^2

LCM 2^3 3^2 72

(ii) (a) 72 minutes as LCM of 6, 8, 9

(iii) (c) Required time

9:00 am + 72 minutes

9:00 am + 1 hour + 12 minute

10:00 am + 12 minutes

10:12 am

(iv) (a) 12 midnight + 72 minutes

12:00 midnight + 1 hour + 12 minutes

1:12 am

14.

38	27	10	75
40	2	0	42
92	1	53	146
170	30	63	

Every row and column shows the sum of all the three respective elements.

15.

Numbers	Numbers of Factors				
	1	2	3	0	4
27	✓				
108		✓			
210					✓
97	✓				
512	✓				
960			✓		

Factors of 108 2^2 3^3

Factors of 210 2 3 5 7

Factors of 97 97

Factors of 512 2^9

Factors of 960 2^6 3 5

❍❍

CHAPTER

6 Perimeter and Area

TEXTBOOK EXERCISES

Exercise 6.1

1. (a) Given, perimeter of rectangle   14 cm, breadth   2 cm

To find its length.

Perimeter of rectangle   2   (Length + Breadth)

14 cm   2   (Length   2 cm)

$\frac{14 \text{ cm}}{2}$ Length   2 cm

7 cm   Length   2 cm

Length   7 cm – 2 cm   5 cm

Hence, length of the rectangle   5 cm

(b) Given, perimeter of square   20 cm

To find out side of square, 4   side perimeter

4   side   20 cm

side $\frac{20}{4}$ 5 cm

Hence, side of the square   5 cm.

(c) Given, perimeter of rectangle 12 m, breadth   3 m

To find out length,

2 (length   breadth)   Perimeter

2 (3 m + breadth)   12 m

3 m + breadth $\frac{12}{2}$ 6 m

breadth   6 m   3 m   3 m

Hence, breadth of the rectangle   3 m.

Note : Since length and breadth of given rectangle are same, so it is a square (a special type rectangle).

2. Given, side length of rectangle are 5 cm and 3 cm

length   5 cm and breadth   3 cm

To find perimeter,

Perimeter   2   (length + breadth)

2   (5 cm   3 cm)

2   8 cm   16 cm

Length of the wire used   16 cm

Since, with the same wire square is formed.

So, perimeter of square   length of wire

4   side   16 cm

side $\frac{16}{4}$ 4 cm

Hence, the length of the side of square   4 cm.

3. Given, perimeter of triangle   55 cm

Length of two sides   20 cm and 14 cm

To find the third side of triangle. Let sides of triangle ABC be AB, BC and CA.

Perimeter of triangle AB BC CA

55 cm   20 cm   14 cm CA

CA 20 cm   (20 cm   14 cm)

CA 55 cm   34 cm   21 cm

Hence, length of third side of triangle   21 cm.

4. Given, length of rectangular park 150 cm, its breadth 120 cm

Cost of fencing ₹40 per meter

Length of fencing of the park

Perimeter of the park

2 (length + breadth)

2 (150 m 120 m)

2 270 m 540 m

Total cost of fencing

Rate per meter length of fencing

₹40 540 m ₹21600

Hence, the cost of fencing ₹21600.

5. Given, length of piece of string

36 cm

To form, a square

(a) Length of string

perimeter of square

4 side 36 cm

side $\frac{36}{4}$ cm 9 cm

(b) To form a triangle with equal sides.

Perimeter of the triangle formed length of the wire used

3 length of one equal side 36 cm

length of one equal side $\frac{36}{3}$ 12 cm

(c) Perimeter of the regular hexagon

length of string

6 length of side 36 cm

length of side $\frac{36}{6}$ 6 cm

6. Given, length of rectangular field 230 m, breadth 160 m

Length of rope to fence 3 rounds the field.

Perimeter of rectangular field

2 (length + breadth)

2 (230 m 160 m)

2 390 m 780 m

Length of the rope needed to fence one round Perimeter of rectangular field 780 m

Length of the rope needed to fence 3 rounds 3 780 m 2340 meter.

Hence, the length of the rope needed for 3 rounds 2340 m

Exercise 6.2

1. Given, area of the rectangular garden

300 sq. m.

The length of the garden 25 m

length width area of the rectangular garden

25 m width 300 sq. m

width $\frac{300 \text{ sq. m}}{25 \text{ m}}$ 12 m

2. Given, the length of the rectangular plot 500 m

and its width 200 m

Rate of the tiling ₹8 per sq. m

Area of the rectangular plot

length width

500 200 m 100000 sq. m

Cost of the tiling

Area of the plot rate of tiling

1,00,000 sq. m ₹8 ₹8,00,000

Hence, the cost of the tiling the plot

₹8,00,000

3. Given, length and width of the rectangular grove is 100 m and 50 m

And the area required for one tree

25 sq. m.

To find the number of tree in the grove,

Area of the rectangular grove

length   width

100 m   50 m   5000 sq. m.

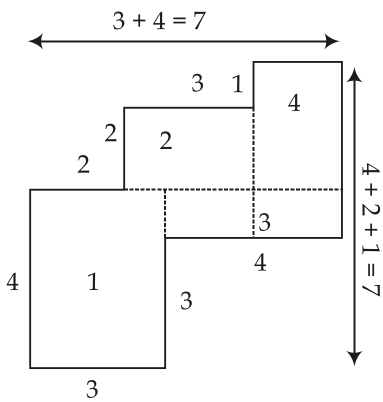
Number of maximum tree in the grove

$$\frac{\text{Area of the grove}}{\text{Area required for one tree}}$$

$$\frac{5000 \text{ sq. m}}{25 \text{ sq. m}} \quad 200$$

Hence, the maximum number of coconut trees that can be planted in to grove   200

4. (a) By splitting the given figure into 1, 2, 3 and 4 rectangles as shown in adjoining figure, we get



The area of rectangle 1

length   breadth

4 cm   3 cm   12 sq. cm.

Area of rectangle 2   length   breadth

3 cm   2 cm   6 sq. cm.

Area of rectangle 3   length   breadth

4 cm   1 cm   4 sq. cm.

Area of rectangle 4   length   breadth

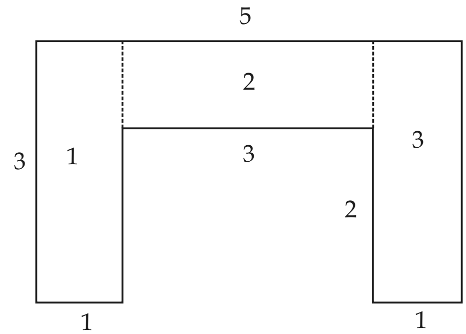
3 cm   2 cm   6 sq. cm.

The total area of the whole figure

12   6   4   6   28 sq. cm

Hence, the total area of the whole figure   28 sq. cm.

(b) By splitling figure, we get three rectangles 1, 2 and 3, as shown in the adjoining figure.



Area of the rectangle 1

length   breadth

3 cm   1 cm   3 sq. cm

Area of the rectangle 2

length   breadth

3 cm   1 cm   3 sq. cm

Area of the rectangle 3

length   breadth

3 cm   1 cm   3 sq. cm

The total area of the figure

3   3   3   9 sq. cm

Exercise 6.3

1. Area of rectangle one   5 m   10 m

50 sq. m.

Area of rectangle two

2 m   7 m   14 sq. m.

The sum of the areas of these two rectangles   50   14   64 sq. m

The area of new rectangle formed   64 sq. m

Let the sides of this rectangle be x and y.

Thus, x y 64 1

or x y 32 2

or x y 16 4

Hence, the dimensions of the rectangle may be (64 1), (32 2), (16 4).

2. Given, length of the garden 50 m

Area of the garden 1000 sq. m

Width of the garden

$$\frac{\text{Area of the garden}}{\text{Length of the garden}}$$

$$\frac{1000 \text{ sq. m}}{50 \text{ m}} \quad 20 \text{ m}$$

Hence, the width of the garden 20 m

3. Given, length of the floor 5 m

breadth of the floor 4 m

and each side of carpet laid 3 m

The area of the floor

length breadth

5 m 4 m 20 sq. m

The area of the carpet side side

3 m 3 m 9 sq. m

So, Not carpeted area of the floor

20 sq. m 9 sq. m

11 sq. m

4. Length of the flower bed 2 m

Its width 1 m

Length of the garden 15 m

It's width 12 m

Area of one flower bed

length breadth

2 m 1 m 2 sq. m

Area of 4 flower beds

2 sq. m 4 8 sq. m

Area of the garden

15 m 12 m 180 sq. m.

Available area for laying lawn

Area of the garden

Area of 4 flower beds

180 sq. m 8 sq. m

172 sq. m

Hence, the area available for laying lawn 172 sq. m.

5. Shape A has an area of 18 sq. units. Thus, the possible dimensions are

18 (18 1), (9 2) and (6 3)

And shape B has an area of 20 sq. units.

Thus, the possible dimensions are 20

(20 1), (10 2) and (5 4)

Here, perimeters of shape A may be

2 (18 1) 38 units

2 (9 2) 22 units

and 2 (6 3) 18 units

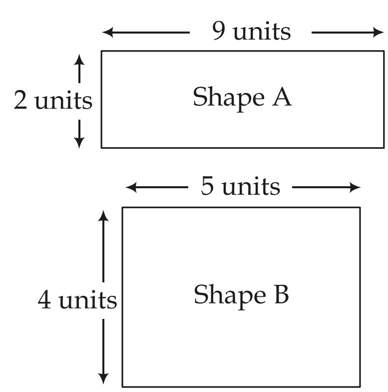
The perimeters of shape B may be

2 (20 1) 42 units

2 (10 2) 24 units

and 2 (5 4) 18 units

On comparing, we find the rectangular figures as follows :



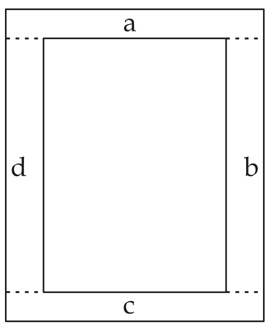
6. The length of a page of our Hindi book 24 cm (let)

The breadth of a page of our Hindi book 17 cm (let)

Distance of the border from top and bottom 1 cm

and the distance from right and left 1.5 cm

The border makes 4 rectangles a, b, c and d as shown in the figure.



Length of rectangle a 17 cm

and its breadth 1 cm

Perimeter 2 (length + breadth)

2 (17 cm 1 cm)

2 18 cm 36 cm

Rectangle a recgangle c

Thus, the perimeter of rectangle

c 36 cm

length of the rectangle b

24 1 1 22 cm

and its breadth 1.5 cm

Perimeter of rectangle b

2 (22 cm 1.5 cm)

2 23.5 cm

47 cm

Sincerectangle b rectangle d

Thus, the perimeter of rectangle

d 47 cm

Total perimeter of the border

36 36 47 47

166 cm

Hence, the perimeter of the border

166 cm

7. The area of the given rectangle

12 units 8 units

96 sq. units

And the area of the rectangle inside it

$\frac{1}{2}$ 96 sq. units

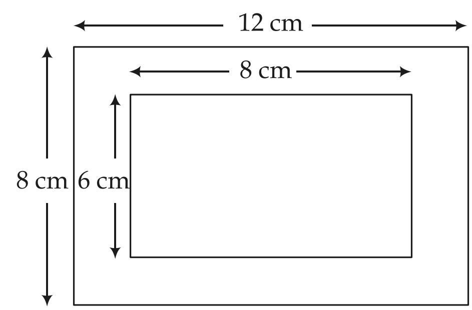
48 sq. units

Possible sides of the inside rectangle are

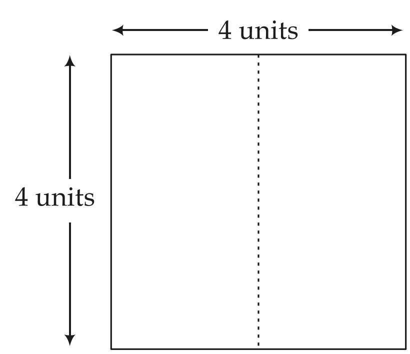
(48 1), (24 2), (16 3),

(12 4) and (8 6)

The condition is not to touch the outer rectangle so the sides of the rectangle are 8 cm and 6 cm as shown in the figure given below :



8.



We have square shaped paper with sides 4 cm each. Thus the perimeter of the square

4 4 cm 16 cm

and the area of the square

4 cm 4 cm 16 sq. cm

The square is folded and cut to get the rectangles of same dimensions.

Perimeter of the obtained rectangle

2 (2 cm 4 cm) 12 cm

Perimeter of the rectangle together

2 12 cm 24 cm

Area of the obtained rectangle

2 cm 4 cm 8 sq. cm

Area of the rectangles together

2 8 sq. cm 16 sq. cm

(a) The statement is not true as area of one rectangle obtained is smaller than the area of square.

i.e., 8 sq. cm 16 sq. cm

(b) The statement is not true as the perimeter of the square is smaller than the perimeters of both rectangles added together.

i.e., 24 cm 16 cm

(c) The statement is true as the perimeter of the square is 16 cm and the perimeters of two obtained rectangles together is 24 cm.

That is $\frac{3}{2}$ times of the 16.

(d) The statement is not true the area of the square and the areas of two rectangles together is same

i.e., 2 4 2 4 8 8 16 sq. cm

Area of the square 4 cm 4 cm

16 sq. cm.

Miscellaneous Exercises

1. Perimeter 9 9 5 23 cm

2. Square

3. Perimeter 2 (15 7)

2 22 44 m

Cost 44 45 ₹1980

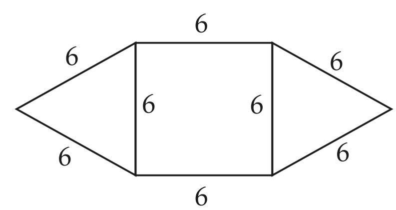
4. Area length breadth

108 12 breadth

Breadth 108 12 9 cm

5. Perimeter of figure = 2 sides of square + 4 sides of both triangle

(since one side of triangle is already counted)



Each triangle uses 2 extra sides

2 2 4 sides

Perimeter 2 6 4 6

12 24 36 cm

6. Outer rectangle

8 cm 6 cm

48 cm^2

Unshaded rectangle

4 cm 4 cm

16 cm^2

Shaded Area 48 16 32 cm^2

7. Add all sides :

Top 0.5 4 4 0.5 9 cm

Left vertical = 1 cm

slant sides 2.5 cm 2 5 cm

Total Perimeter 9 1 5 15 cm

8. (a) Triangle : 3 4 5 12 cm

(b) Equilateral triangle : 3 9 27 cm

(c) Isosceles : 8 8 6 22 cm

9. (a) Square : sides

30 4 7.5 cm

(b) Equilateral triangle: sides

30 3 10 cm

(c) Regular hexagon: side

30 6 5 cm

10. Perimeter 2 (175 125)

2 300 600 m

Cost 600 12 ₹7200

11. Sweety cover distance

4 75 300 m

Bulbul cover distance

2 (60 45)

2 105 210 m

Bulbul covers less distance (210 m)

12. Let's visuallly count (you can confirm)

(a) 6 squares

(b) 5 squares

13. Area 500 200 100,000 sq. m

Rate ₹8 per 100 sq. m

Total Cost 1000 8 ₹8000

Cost ₹8000

14. (i) (a) If both assertion and reason are true and reason is the correct explanation of assertion.

(ii) (b) If both assertion and reason are true but reason is not the correct explanation of assertion.

(iii) (c) If assertion is true but reason is false.

15. (i) (b) Required area

2 (1 4) 3 1 8 3

11 cm^2

(ii) (d) Required area

2 9 1 7 2 3

18 7 6 31 cm^2

(iii) (a) Required area

3 8 8 2

24 16 40 cm^2

(iv) (c) Required area

2 10 6 3

20 18 38 cm^2

(v) (a) Sarika

16. 1 1 26

2 2 9

3 3 4

4 4 1

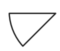
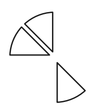
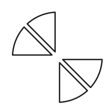
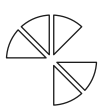
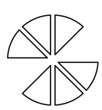
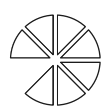
Total 40 squares.

CHAPTER
7 Fractions

TEXTBOOK EXERCISES

Exercise 7.1

1.

			
$\frac{1}{4}$ 1 time one-quarter	$\frac{1}{4}$ $\frac{1}{4}$ 2 times one-quarter	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ 3 times one-quarter	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ 4 times one-quarter
			
$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ 5 times one-quarter	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ 6 times one- quarter	$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ 7 times one-quarter	

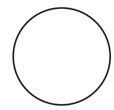
2.

$\frac{1}{3}$		

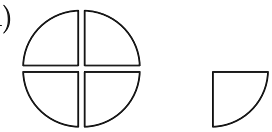
Yes, using $\frac{1}{3}$, we can make $\frac{1}{6}$.

On dividing $\frac{1}{3}$ into two equal parts we get $\frac{1}{6}$.

$\frac{1}{6}$					

3. 

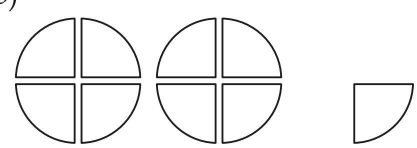
A whole rot represents one unit.

(a) 

5 times of $\frac{1}{4}$ of a whole roti

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{5}{4}$

One whole role and a quarter roti.

(b) 

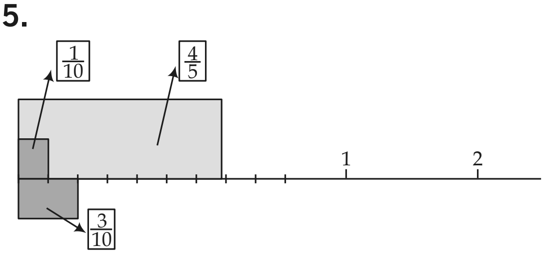
9 times of $\frac{1}{4}$ of a whole roti

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{9}{4}$

2 whole roti and one quarter roti.

4. A 3; B 4; C 1; D 2

5.



6. The fractions are

$$\frac{1}{11}, \frac{3}{11}, \frac{5}{11}, \frac{7}{11} \text{ and } \frac{10}{11}.$$

7. There are an infinite number of fractions lie between 0 and 1.

For example :

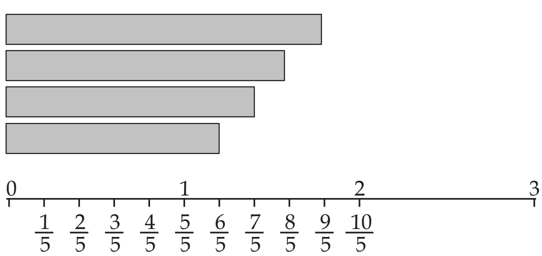
$$\ldots, \frac{1}{1000}, \frac{1}{999}, \frac{1}{998}, \ldots, \text{etc.}$$

8. Length of unshaded strip $\frac{1}{2}$

Length of shaded strip $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$

Fraction that gives length of shaded strip $\frac{3}{2}$.

9.



Exercise 7.2

1. Here, $\frac{7}{2} \quad 7 \text{ times of } \frac{1}{2}$

$$\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$$

$$\frac{1}{2} \quad \frac{1}{2} \qquad \frac{1}{2} \quad \frac{1}{2} \qquad \frac{1}{2} \quad \frac{1}{2} \qquad \frac{1}{2}$$

$$\frac{2}{2} \quad \frac{2}{2} \quad \frac{2}{2} \quad \frac{1}{2} \quad 1 \quad 1 \quad 1 \quad \frac{1}{2} \quad 3 \quad \frac{1}{2}$$

Hence, there are 3 whole units in $\frac{7}{2}$.

2. Here, $\frac{4}{3} \quad 4 \text{ times of } \frac{1}{3}$

$$\frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3}$$

$$\frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \qquad \frac{1}{3} \quad 1 \quad \frac{1}{3}$$

Hence, there is one whole unit in $\frac{4}{3}$.

$$\frac{7}{3} \quad 7 \text{ times of } \frac{1}{3}$$

$$\frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3}$$

$$\frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \qquad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \qquad \frac{1}{3}$$

$$1 \quad 1 \quad \frac{1}{3} \quad 2 \quad \frac{1}{3}$$

Hence, there are 2 whole units in $\frac{7}{3}$.

3. (a) $\frac{8}{3}$, since, denominator is 3, so numerator 8 is split into as many 3's (*i.e.,* numerator 8 3 3 2)

$$1 \quad 1 \quad \frac{2}{3} \quad 2\frac{2}{3}$$

Hence, number of whole units in $\frac{8}{3}$ 2.

(b) $\frac{11}{5} \quad \frac{5}{5} \quad \frac{5}{5} \quad \frac{1}{5}$

(Numerator 11 5 5 1)

$$1 \quad 1 \quad \frac{1}{5} \quad 2\frac{1}{5}$$

Hence, number of whole units in $\frac{11}{5}$ 2

(c) $\frac{9}{4} \quad \frac{4}{4} \quad \frac{4}{4} \quad \frac{1}{4}$

(Numerator 9 4 4 1)

$$1 \quad 1 \quad \frac{1}{4} \quad 2\frac{1}{4}$$

Hence, number of whole units in $\frac{9}{4}$ 2

4. Yes, all fractions greater than 1 can be written as mixed fractions/numbers.

5. (a) $\frac{9}{2} \quad \frac{2}{2} \quad \frac{2}{2} \quad \frac{2}{2} \quad \frac{2}{2} \quad \frac{1}{2}$

$1 \quad 1 \quad 1 \quad 1 \quad \frac{1}{2} \quad 4\frac{1}{2}$

(b) $\frac{9}{5} \quad \frac{5}{5} \quad \frac{4}{5} \quad 1 \quad \frac{4}{5} \quad 1\frac{4}{5}$

(c) $\frac{21}{19} \quad \frac{19}{19} \quad \frac{2}{19} \quad 1 \quad \frac{2}{19} \quad 1\frac{2}{19}$

(d) $\frac{47}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{2}{9}$

$1 \quad 1 \quad 1 \quad 1 \quad 1 \quad \frac{2}{9} \quad 5\frac{2}{9}$

(e) $\frac{12}{11} \quad \frac{11}{11} \quad \frac{1}{11} \quad 1 \quad \frac{1}{11} \quad 1\frac{1}{11}$

(f) $\frac{19}{6} \quad \frac{6}{6} \quad \frac{6}{6} \quad \frac{6}{6} \quad \frac{1}{6}$

$1 \quad 1 \quad 1 \quad \frac{1}{6} \quad 3\frac{1}{6}$

6. (a) $3\frac{1}{4}$ can be written as $3 \quad \frac{1}{4}$ on splitting 3, we get

$3 \quad \frac{1}{4} \quad 1 \quad 1 \quad 1 \quad \frac{1}{4} \quad \frac{4}{4} \quad \frac{4}{4} \quad \frac{4}{4} \quad \frac{1}{4} \quad \frac{13}{4}$

(b) $7\frac{2}{3}$ can be written as $7 \quad \frac{2}{3}$ on splitting 7, we get

$7 \quad \frac{2}{3} \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad \frac{2}{3}$

$\frac{3}{3} \quad \frac{3}{3} \quad \frac{3}{3} \quad \frac{3}{3} \quad \frac{3}{3} \quad \frac{3}{3} \quad \frac{3}{3} \quad \frac{2}{3} \quad \frac{23}{3}$

(c) $9\frac{4}{9}$ can be written as $9 \quad \frac{4}{9}$ on splitting 9, we get

$9 \quad \frac{4}{9} \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1 \quad \frac{4}{9}$

$\frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{9}{9} \quad \frac{4}{9}$

$\frac{85}{9}$

(d) $3\frac{1}{5}$ can be written as $3 \quad \frac{1}{5}$ on splitting 3, we get

$3 \quad \frac{1}{5} \quad 1 \quad 1 \quad 1 \quad \frac{1}{5} \quad \frac{5}{5} \quad \frac{5}{5} \quad \frac{5}{5} \quad \frac{1}{5} \quad \frac{16}{5}$

(e) $2\frac{3}{11}$ can be written as $2 \quad \frac{3}{11}$ on splitting 2, we get

$2 \quad \frac{3}{11} \quad 1 \quad 1 \quad \frac{3}{11} \quad \frac{11}{11} \quad \frac{11}{11} \quad \frac{3}{11} \quad \frac{25}{11}$

(f) $3\frac{9}{10}$, can be written as $3 \quad \frac{9}{10}$ on splitting 3, we get

$3 \quad \frac{9}{10} \quad 1 \quad 1 \quad 1 \quad \frac{9}{10}$

$\frac{10}{10} \quad \frac{10}{10} \quad \frac{10}{10} \quad \frac{9}{10} \quad \frac{39}{10}$

Exercise 7.3

1. Since, lengths of strips $\frac{3}{6}, \frac{4}{8}$ and $\frac{5}{10}$ are equal as shown in the fractional wall.

So, $\frac{3}{6}, \frac{4}{8}$ and $\frac{5}{10}$ are equivalent.

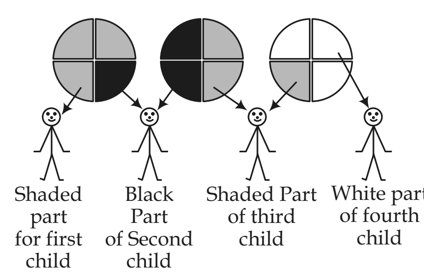
2. The equivalent fraction of $\frac{2}{6}$ are

$\frac{2}{6} \quad \frac{2}{2} \quad \frac{4}{12}$ and $\frac{2 \quad 3}{6 \quad 3} \quad \frac{6}{18}$

3. $\frac{4}{6} \quad \frac{2}{3} \quad \frac{6}{9} \quad \frac{8}{12} \quad \frac{10}{15} \quad \frac{12}{18}$

$\frac{14}{21} \quad \frac{16}{24} \quad \frac{18}{27} \ldots$

4.



The division facts.

3 whole papads divided into 4 parts

$$3 \quad 4 \quad \frac{3}{4}$$

The addition facts.

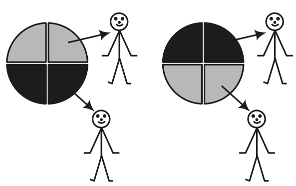
Four times of $\frac{3}{4}$ added gives 3 whole papad

$$\frac{3}{4} \quad \frac{3}{4} \quad \frac{3}{4} \quad \frac{3}{4} \quad \frac{12}{4} \quad 3$$

The multiplication facts.

4 parts of $\frac{3}{4}$ make 3 whole papad

$$4 \quad \frac{3}{4} \quad 3$$

5. 

Since, two papads of equal size, shape and mass. These papads are to be shared by 4 children. So, each of the children get one half of one papad.

Division facts

2 whole papads are divided into 4 parts

$$2 \quad 4 \quad \frac{2}{4} \quad \frac{1}{2}$$

Addition facts

$\frac{2}{4} \quad \frac{2}{4} \quad \frac{2}{4} \quad \frac{2}{4} \quad \frac{8}{4}$ 2 whole papads.

Multiplication facts $4 \quad \frac{2}{4} \quad 2$ whole papads.

6. Each child in Group I gets $\frac{4}{7}$ glasses of orange juice and each child in group II gets $\frac{5}{7}$ glasses.

Since, the fractions $\frac{4}{7}$ and $\frac{5}{7}$ have same denominator, so $\frac{4}{7} \quad \frac{5}{7}$

Hence, each child in group II got more orange juice.

> Clearly, if the denominators of two or more fractions are the same, then the fraction whose numerator is larger is also larger.

7. (a) $\frac{7}{2}$ and $\frac{3}{5}$

The denominators of given fractions are 2 and 5 and their least common multiple is 10.

Therefore both the fractions must have the denominator 10.

Now, for $\frac{7}{2}$, multiply numerator and denominator by 5

$$\frac{7}{2} \quad \frac{7 \quad 5}{2 \quad 5} \quad \frac{35}{10}$$

and for $\frac{3}{5}$, multiply the numerator and the denominator by 2, we get

$$\frac{3}{5} \quad \frac{3 \quad 2}{5 \quad 2} \quad \frac{6}{10}$$

Hence, the equivalent fractions with the same denominator are $\frac{35}{10}$ and $\frac{6}{10}$.

(b) $\frac{8}{3}$ and $\frac{5}{6}$, the denominators of given fractions are 3 and 6.

The least common multiple of 3 and 6 is 6. Now, for $\frac{8}{3}$ multiply both the numerator and denominator by 2

$$\frac{8}{3} \quad \frac{8 \quad 2}{3 \quad 2} \quad \frac{16}{6}$$

And $\frac{5}{6}$ already has a denominator 6.

Hence, the equivalent fractions with the same denominators are $\frac{16}{6}$ and $\frac{5}{6}$.

(c) $\frac{3}{4}$ and $\frac{3}{5}$

Here, the denominators of given fractions are 4 and 5.

And the least common multiple of 4 and 5 is 20.

Now, for $\frac{3}{4}$, multiply both numerator and denominator by 5, we get

$$\frac{3}{4} \quad \frac{3 \quad 5}{4 \quad 5} \quad \frac{15}{20}$$

and for $\frac{3}{5}$, multiply both numerator and denominator by 4, we get

$$\frac{3}{5} \quad \frac{3 \quad 4}{5 \quad 4} \quad \frac{12}{20}$$

Hence, the equivalent fractions with the same denominator are $\frac{15}{20}$ and $\frac{12}{20}$.

(d) $\frac{6}{7}$ and $\frac{8}{5}$

Here, the denominators are 7 and 5.

And the least common multiple of 7 and 5 is 35. Now, for $\frac{6}{7}$, multiply both the numerator and denominator by 5, we get

$$\frac{6}{7} \quad \frac{6 \quad 5}{7 \quad 5} \quad \frac{30}{35}$$

For $\frac{8}{5}$, multiply both numerator and denominator by 7, we get

$$\frac{8}{5} \quad \frac{8 \quad 7}{5 \quad 7} \quad \frac{56}{35}$$

Hence, the equivalent fractions with the same denominator are $\frac{30}{35}$ and $\frac{56}{35}$.

(e) $\frac{9}{4}$ and $\frac{5}{2}$

Here, the denominators are 4 and 2.

And the least common multiple of 4 and 2 is 4.

So, $\frac{9}{4}$ is already has the denominator 4 and for $\frac{5}{2}$, multiply both numerator and denominator by 2, we get

$$\frac{5}{2} \quad \frac{5 \quad 2}{2 \quad 2} \quad \frac{10}{4}$$

Hence, the equivalent fractions with the same denominator are $\frac{9}{4}$ and $\frac{10}{4}$.

(f) $\frac{1}{10}$ and $\frac{2}{9}$

The denominators of given fractions are 10 and 9 and the least common multiple of 9 and 10 is 90. For $\frac{1}{10}$, multiply both numerator and denominator by 9, we get

$$\frac{1}{10} \quad \frac{1 \quad 9}{10 \quad 9} \quad \frac{9}{90}$$

And for $\frac{1}{9}$, multiply both numerator and denominator by 10, we get

$$\frac{2}{9} \quad \frac{2 \quad 10}{9 \quad 10} \quad \frac{20}{90}$$

Hence, the equivalent fractions with the same denominator are $\frac{9}{90}$ and $\frac{20}{90}$.

(g) $\frac{8}{3}$ and $\frac{11}{4}$

The denominators of given fractions are 3 and 4 and the common multiple of 3 and 4 is 12,

For $\frac{8}{3}$, multiply both the numerator and the denominator by 4. We get

$$\frac{8}{3} \quad \frac{8 \quad 4}{3 \quad 4} \quad \frac{32}{12}$$

And for $\frac{11}{4}$, multiply both the denominator and the numerator by 3, we get

$$\frac{11}{4} \quad \frac{11 \quad 3}{4 \quad 3} \quad \frac{33}{12}$$

Hence, the equivalent fractions with same denominator are $\frac{32}{12}$ and $\frac{33}{12}$.

(h) $\frac{13}{6}$ and $\frac{1}{9}$

The denominators of the given fractions are 6 and 9. The least common multiple of 6 and 9 is 18,

For $\frac{13}{6}$, multiply both the numerator and the denominator by 3, we get

$$\frac{13}{6} \quad \frac{13 \quad 3}{6 \quad 3} \quad \frac{39}{18}$$

For $\frac{1}{9}$, multiply both the numerator and the denominator by 2, we get

$$\frac{1}{9} \quad \frac{1 \quad 2}{9 \quad 2} \quad \frac{2}{18}$$

Hence, the equivalent fractions with same denominator are $\frac{39}{18}$ and $\frac{2}{18}$.

8. (a) $\frac{17}{51}$

17 and 51 both are divisible by 17.

So, $\frac{17}{51} \quad \frac{1 \quad 17}{3 \quad 17} \quad \frac{1}{3}$

Hence, lowest form of $\frac{17}{51}$ is $\frac{1}{3}$.

(b) $\frac{64}{144}$

Numerator and denominator both are even, so divisible by 2.

$$\frac{64}{144} \quad \frac{64 \quad 2}{144 \quad 2} \quad \frac{32}{72}$$

Again 32 and 72 both are even, so divisible by 2.

$$\frac{32 \quad 2}{72 \quad 2} \quad \frac{16}{36}$$

16 and 36 both are even, so divisible by 2.

$$\frac{16}{36} \quad \frac{16 \quad 2}{36 \quad 2} \quad \frac{8}{18}$$

Again 8 and 18 both are even, so divisible by 2.

$$\frac{8}{18} \quad \frac{8 \quad 2}{18 \quad 2} \quad \frac{4}{9}$$

Now, there is common factor in 4 and 9. Therefore, $\frac{64}{144} \quad \frac{4}{9}$

Hence, the lowest form of $\frac{64}{144}$ is $\frac{4}{9}$

(c) $\frac{126}{147}$ Here, both numerator and denominator are divisible by 3.

$$\frac{126}{147} \quad \frac{126 \quad 3}{147 \quad 3} \quad \frac{42}{49}$$

Therefore, $\frac{126}{147} \quad \frac{6}{7}$

Hence, the lowest form of $\frac{126}{147}$ is $\frac{6}{7}$

(d) $\frac{525}{112}$

Here, 525 and 112 both are the multiple of 7.

So, $\frac{525}{112} \quad \frac{525 \quad 7}{112 \quad 7} \quad \frac{75}{16}$

Now, both 75 and 16 have no common factor

$$\frac{75}{16} \quad 4 \quad \frac{11}{16} \quad 4\frac{11}{16}$$

Hence, the lowest form of $\frac{525}{112}$ is $4\frac{11}{16}$.

9. (a) $\frac{8}{3}$ and $\frac{5}{2}$

The least common multiple of 3 and 2 is 6.

$$\frac{8}{3} \quad \frac{8 \quad 2}{3 \quad 2} \quad \frac{16}{6} \text{ and } \frac{5}{2} \quad \frac{5 \quad 3}{2 \quad 3} \quad \frac{15}{6}$$

Clearly, $\frac{16}{6} \quad \frac{15}{6}$

Hence, $\frac{8}{3} \quad \frac{5}{2}$

(b) $\frac{4}{9}$ and $\frac{3}{7}$

The least common multiple of 9 and 7 is 63.

So, $\frac{4}{9} \quad \frac{4 \quad 7}{9 \quad 7} \quad \frac{28}{63}$ and $\frac{3}{7} \quad \frac{3 \quad 9}{7 \quad 9} \quad \frac{27}{63}$

Clearly, $\frac{28}{63} \quad \frac{27}{63}$

Hence, $\frac{4}{9} \quad \frac{3}{7}$

(c) $\frac{7}{10}$ and $\frac{9}{14}$

The least common multiple of 10 and 14 is 70.

So, $\frac{7}{10} \quad \frac{7 \quad 7}{10 \quad 7} \quad \frac{49}{70}$

and $\frac{9}{14} \quad \frac{9 \quad 5}{14 \quad 5} \quad \frac{45}{70}$

Clearly, $\frac{49}{70} \quad \frac{45}{70}$

Hence, $\frac{7}{10} \quad \frac{9}{14}$

(d) $\frac{12}{5}$ and $\frac{8}{5}$

The denominator of two given fractions is same, but numerator 12 8.

Hence, $\frac{12}{5} \quad \frac{8}{5}$

(e) $\frac{9}{4}$ and $\frac{4}{2}$

The least common multiple of 4 and 2 is 4.

So, $\frac{9}{4} \quad \frac{9}{4}$ and $\frac{4}{2} \quad \frac{4 \quad 2}{2 \quad 2} \quad \frac{8}{4}$

Clearly, $\frac{9}{4} \quad \frac{8}{4}$

Hence, $\frac{9}{4} \quad \frac{4}{2}$

10. (a) $\frac{7}{10}, \frac{11}{15}, \frac{2}{5}$

The least common multiple of 10, 15 and 5 is 30.

So, $\frac{7}{10} \quad \frac{7 \quad 3}{10 \quad 3} \quad \frac{21}{30}$

$\frac{11}{15} \quad \frac{11 \quad 2}{15 \quad 2} \quad \frac{22}{30}$

and $\frac{2}{5} \quad \frac{2 \quad 6}{5 \quad 6} \quad \frac{12}{30}$

Clearly, $\frac{12}{30} \quad \frac{21}{30} \quad \frac{22}{30}$

Hence, $\frac{2}{5} \quad \frac{7}{10} \quad \frac{11}{15}$

(b) $\frac{19}{24}, \frac{5}{6}, \frac{7}{12}$

The least common multiple of 24, 6 and 12 is 24.

So, $\frac{19}{24} \quad \frac{19}{24}$

$\frac{5}{6} \quad \frac{5 \quad 4}{6 \quad 4} \quad \frac{20}{24}$

and $\frac{7}{12} \quad \frac{7 \quad 2}{12 \quad 2} \quad \frac{14}{24}$

Clearly, $\frac{14}{24} \quad \frac{19}{24} \quad \frac{20}{24}$

Hence, $\frac{7}{12} \quad \frac{19}{24} \quad \frac{5}{6}$

11. (a) $\frac{25}{16}, \frac{7}{8}, \frac{13}{4}, \frac{17}{32}$

The least common multiple of 16, 8, 4 and 32 is 32.

So, $\frac{25}{16} \quad \frac{25 \quad 2}{16 \quad 2} \quad \frac{50}{32}$

$\frac{7}{8} \quad \frac{7 \quad 4}{8 \quad 4} \quad \frac{28}{32}$

$\frac{13}{4} \quad \frac{13 \quad 8}{4 \quad 8} \quad \frac{104}{32}$

and $\frac{17}{32} \quad \frac{17}{32}$

Clearly, $\frac{104}{32} \quad \frac{50}{32} \quad \frac{28}{32} \quad \frac{17}{32}$

Hence, $\frac{13}{4} \quad \frac{25}{16} \quad \frac{7}{8} \quad \frac{17}{32}$

(b) $\frac{3}{4}, \frac{12}{5}, \frac{7}{12}, \frac{5}{4}$

The least common multiple of 4, 5 and 12 is 60.

So, $\frac{3}{4} \quad \frac{3 \quad 15}{4 \quad 15} \quad \frac{45}{60}$

$\frac{12}{5} \quad \frac{12 \quad 12}{5 \quad 12} \quad \frac{144}{60}$

$\frac{7}{12} \quad \frac{7 \quad 5}{12 \quad 5} \quad \frac{35}{60}$

and $\frac{5}{4} \quad \frac{5 \quad 15}{4 \quad 15} \quad \frac{75}{60}$

Clearly, $\frac{144}{60} \quad \frac{75}{60} \quad \frac{45}{60} \quad \frac{35}{60}$

Hence, $\frac{12}{5} \quad \frac{5}{4} \quad \frac{3}{4} \quad \frac{7}{12}$

Exercise 7.4

1. (a) $\frac{2}{7} \quad \frac{5}{7} \quad \frac{6}{7}$

The denominator of the given fraction is the same.

So, $\frac{2 \quad 5 \quad 6}{7} \quad \frac{13}{7}$

Hence, $\frac{13}{7} \quad 1 \quad \frac{6}{7} \quad 1\frac{6}{7}$

(b) $\frac{3}{4} \quad \frac{1}{3}$

Here the least common multiple of 4 and 3 is 12.

So, the equivalent fraction of $\frac{3}{4}$ with denominator 12 is $\frac{9}{12}$ and equivalent fraction of $\frac{1}{3}$ with denominator 12 is $\frac{4}{12}$.

Therefore, $\frac{9}{12} \quad \frac{4}{12} \quad \frac{9 \quad 4}{12} \quad \frac{13}{12}$

$\frac{12}{12} \quad \frac{1}{12} \quad 1 \quad \frac{1}{12} \quad 1\frac{1}{12}$

(c) $\frac{2}{3} \quad \frac{5}{6}$

Least common multiple of 3 and 6 is 6. Expressing as equivalent fractions with denominator 6, we get

$\frac{2}{3} \quad \frac{5}{6} \quad \frac{2 \quad 2}{3 \quad 2} \quad \frac{5}{6} \quad \frac{4}{6} \quad \frac{5}{6}$

$$\frac{9}{6} \quad \frac{3}{2} \text{ (The lowest form)}$$

$$\frac{2}{2} \quad \frac{1}{2} \quad 1 \quad \frac{1}{2} \quad 1\frac{1}{2}$$

(d) $\frac{2}{3} \quad \frac{2}{7}$

The least common multiple of 3 and 7 is 21. Expressing as equivalent fractions with denominator 21, we get,

$$\frac{2}{3} \quad \frac{2}{7} \quad \frac{2 \quad 7}{3 \quad 7} \quad \frac{2 \quad 3}{7 \quad 3} \quad \frac{14}{21} \quad \frac{6}{21} \quad \frac{20}{21}$$

(e) $\frac{3}{4} \quad \frac{1}{3} \quad \frac{1}{5}$

The least common multiple (LCM) of 4, 3, 5 is 60. Expressing as equivalent fractions with denominator 60, we get

$$\frac{3}{4} \quad \frac{1}{3} \quad \frac{1}{5} \quad \frac{3 \quad 15}{4 \quad 15} \quad \frac{1 \quad 20}{3 \quad 20} \quad \frac{1 \quad 12}{5 \quad 12}$$

$$\frac{45}{60} \quad \frac{20}{60} \quad \frac{12}{60}$$

$$\frac{45 \quad 20 \quad 12}{60} \quad \frac{77}{60}$$

$$\frac{60}{60} \quad \frac{17}{60} \quad 1 \quad \frac{17}{60} \quad 1\frac{17}{60}$$

(f) $\frac{2}{3} \quad \frac{4}{5}$

The LCM of 3 and 5 is 15. Expressing as equivalent fractions with denominator 15, we get

$$\frac{2}{3} \quad \frac{4}{5} \quad \frac{2 \quad 5}{3 \quad 5} \quad \frac{4 \quad 3}{5 \quad 3} \quad \frac{10}{15} \quad \frac{12}{15}$$

$$\frac{10 \quad 12}{15} \quad \frac{22}{15}$$

$$\frac{15}{15} \quad \frac{7}{15} \quad 1 \quad \frac{7}{15} \quad 1\frac{7}{15}$$

(g) $\frac{4}{5} \quad \frac{2}{3}$

The LCM of 5 and 3 is 15. Expressing as equivalent fractions with denominator 15, we get

$$\frac{4}{5} \quad \frac{2}{3} \quad \frac{4 \quad 3}{5 \quad 3} \quad \frac{2 \quad 5}{3 \quad 5}$$

$$\frac{12}{15} \quad \frac{10}{15} \quad \frac{12 \quad 10}{15} \quad \frac{22}{15}$$

$$\frac{15}{15} \quad \frac{7}{15} \quad 1 \quad \frac{7}{15} \quad 1\frac{7}{15}$$

(h) $\frac{3}{5} \quad \frac{5}{8}$

The LCM of 5 and 8 is 40. Expressing as equivalent fractions with denominator 40, we get

$$\frac{3}{5} \quad \frac{5}{8} \quad \frac{3 \quad 8}{5 \quad 8} \quad \frac{5 \quad 5}{8 \quad 5} \quad \frac{24}{40} \quad \frac{25}{40}$$

$$\frac{24 \quad 25}{40} \quad \frac{49}{40}$$

$$\frac{40}{40} \quad \frac{9}{40} \quad 1 \quad \frac{9}{40} \quad 1\frac{9}{40}$$

(i) $\frac{9}{2} \quad \frac{5}{4}$

The LCM of 2 and 4 is 4. Now, expressing as equivalent fractions with denominator 4, we get

$$\frac{9}{2} \quad \frac{5}{4} \quad \frac{9 \quad 2}{2 \quad 2} \quad \frac{5}{4} \quad \frac{18}{4} \quad \frac{5}{4}$$

$$\frac{18 \quad 5}{4} \quad \frac{23}{4} \quad 5 \quad \frac{4}{4} \quad \frac{3}{4}$$

$$5 \quad \frac{3}{4} \quad 5\frac{3}{4}$$

(j) $\frac{8}{3} \quad \frac{2}{7}$

The LCM of 3 and 7 is 21. Expressing as equivalent fractions with denominator 21, we get

$$\frac{8}{3} \quad \frac{2}{7} \quad \frac{8 \quad 7}{3 \quad 7} \quad \frac{2 \quad 3}{7 \quad 3} \quad \frac{56}{21} \quad \frac{6}{21}$$

$$\frac{56 \quad 6}{21} \quad \frac{62}{21}$$

$$2 \quad \frac{21}{21} \quad \frac{20}{21} \quad 2 \quad \frac{20}{21} \quad 2\frac{20}{21}$$

(k) $\frac{3}{4} \quad \frac{1}{3} \quad \frac{1}{5}$

The LCM of 4, 3 and 5 is 60. Expressing as equivalent fractions with denominator 60, we get

$$\frac{3}{4} \quad \frac{1}{3} \quad \frac{1}{5} \quad \frac{3 \quad 15}{4 \quad 15} \quad \frac{1 \quad 20}{3 \quad 20} \quad \frac{1 \quad 12}{5 \quad 12}$$

$$\frac{45}{60} \quad \frac{20}{60} \quad \frac{12}{60}$$

$$\frac{45 \quad 20 \quad 12}{60} \quad \frac{77}{60}$$

$$\frac{77}{60} \quad \frac{60}{60} \quad \frac{17}{60}$$

$$1 \quad \frac{17}{60} \quad 1\frac{17}{60}$$

(l) $\frac{2}{3} \quad \frac{4}{5} \quad \frac{3}{7}$

The LCM of 3, 5 and 7 is 105. Now, expressing as equivalent fractions with denominator 105, we get

$$\frac{2}{3} \quad \frac{4}{5} \quad \frac{3}{7} \quad \frac{2 \quad 35}{3 \quad 35} \quad \frac{4 \quad 21}{5 \quad 21} \quad \frac{3 \quad 15}{7 \quad 15}$$

$$\frac{70}{105} \quad \frac{84}{105} \quad \frac{45}{105}$$

$$\frac{199}{105} \quad \frac{105}{105} \quad \frac{94}{105} \quad 1 \quad \frac{94}{105}$$

$$1\frac{94}{105}$$

(m) $\frac{9}{2} \quad \frac{5}{4} \quad \frac{7}{6}$

The LCM of 2, 4 and 6 is 12. Now, expressing as equivalent fractions with denominator 12, we get

$$\frac{9}{2} \quad \frac{5}{4} \quad \frac{7}{6} \quad \frac{9 \quad 6}{2 \quad 6} \quad \frac{5 \quad 3}{4 \quad 3} \quad \frac{7 \quad 2}{6 \quad 2}$$

$$\frac{54}{12} \quad \frac{15}{12} \quad \frac{14}{12} \quad \frac{83}{12}$$

$$6 \quad \frac{12}{12} \quad \frac{11}{12} \quad 6 \quad \frac{11}{12} \quad 6\frac{11}{12}$$

2. The volume of yellow paint $\frac{2}{3}$ liters

The volume of blue paint $\frac{3}{4}$ liters

So, Total volume of green paint

$$\frac{2}{3} \quad \frac{3}{4}$$

The LCM of the denominators 3 and 4 of given fractions is 12.

So, expressing as equivalent fractions with denominator 12, we get

$$\frac{2}{3} \quad \frac{3}{4} \quad \frac{2 \quad 4}{3 \quad 4} \quad \frac{3 \quad 3}{4 \quad 3}$$

$$\frac{8}{12} \quad \frac{9}{12} \quad \frac{8 \quad 9}{12} \quad \frac{17}{12} \text{ litres}$$

$$\frac{17}{12} \quad 1 \quad \frac{12}{12} \quad \frac{5}{12} \quad 1 \quad \frac{5}{12} \quad 1\frac{5}{12}$$

Hence, the volume of green paint is $1\frac{5}{12}$ liters.

3. Lace that Geeta bought $\frac{2}{5}$ meter

Lace that Shamim bought $\frac{3}{4}$ meter

Length of total lace, Geeta and Shamim bought $\frac{2}{5}$ m $\frac{3}{4}$ m

The LCM of the denominators 5 and 4 of given fraction 20

Expressing as equivalent fractions with denominator 20, we get

$$\frac{2}{5} \quad \frac{3}{4} \quad \frac{2 \quad 4}{5 \quad 4} \quad \frac{3 \quad 5}{4 \quad 5}$$

$$\frac{8}{20} \quad \frac{15}{20} \quad \frac{8 \quad 15}{20} \quad \frac{23}{20}$$

$$\frac{20}{20} \quad \frac{3}{20} \quad 1 \quad \frac{3}{20} \quad 1\frac{3}{20}$$

Hence, length of the lace that Geeta and Shamim bought $1\frac{3}{20}$ m

Since, $1\frac{3}{20} \quad 1$

So, the lace will be sufficient to cover the whole border.

4. (a) $\frac{6}{7} \quad \frac{4}{7}$

As the denominator is the same *i.e.*, 7. So, we will simply subtract numerators keeping denominator as 7.

$$\frac{6}{7} \quad \frac{4}{7} \quad \frac{6 \quad 4}{7} \quad \frac{2}{7}$$

(b) $\frac{7}{9} \quad \frac{5}{9}$

As the denominator is the same *i.e.*, 9. So, we will simply subtract numerators keeping denominator as 9.

$$\frac{7}{9} \quad \frac{5}{9} \quad \frac{7 \quad 5}{9} \quad \frac{2}{9}$$

(c) $\frac{10}{27} \quad \frac{1}{27}$

As the denominator is the same *i.e.*, 27. So we will simply subtract the numerators keeping denominator as 27.

So, $\frac{10}{27} \quad \frac{1}{27} \quad \frac{10 \quad 1}{27} \quad \frac{9}{27} \quad \frac{1}{3}$

(The lowest form)

5. (a) $\frac{8}{15} \quad \frac{3}{15}$

The denominator of two fraction is the same *i.e.*, 15.

So, $\frac{8}{15} \quad \frac{3}{15} \quad \frac{8 \quad 3}{15} \quad \frac{5}{15} \quad \frac{1}{5}$

(The lowest form)

(b) $\frac{2}{5} \quad \frac{4}{15}$

The LCM of 5 and 15 is 15.

So, $\frac{2}{5} \quad \frac{4}{15} \quad \frac{2 \quad 3}{5 \quad 3} \quad \frac{4}{15}$

$$\frac{6}{15} \quad \frac{4}{15} \quad \frac{6 \quad 4}{15} \quad \frac{2}{15}$$

(c) $\frac{5}{6} \quad \frac{4}{9}$

The LCM of 6 and 9 is 18.

So, $\frac{5}{6} \quad \frac{4}{9} \quad \frac{5 \quad 3}{6 \quad 3} \quad \frac{4 \quad 2}{9 \quad 2}$

$$\frac{15}{18} \quad \frac{8}{18} \quad \frac{15 \quad 8}{18} \quad \frac{7}{18}$$

(d) $\frac{2}{3} \quad \frac{1}{2}$

The LCM of 3 and 2 is 6.

So, $\frac{2}{3} \quad \frac{1}{2} \quad \frac{2 \quad 2}{3 \quad 2} \quad \frac{1 \quad 3}{2 \quad 3}$

$$\frac{4}{6} \quad \frac{3}{6} \quad \frac{4 \quad 3}{6} \quad \frac{1}{6}$$

6. (a) $\frac{13}{4}$ from $\frac{10}{3}$

The LCM of 3 and 4 is 12. Expressing as equivalent fraction with denominator 12, we get

$$\frac{10}{3} \quad \frac{13}{4} \quad \frac{10 \quad 4}{3 \quad 4} \quad \frac{13 \quad 3}{4 \quad 3}$$

$$\frac{40}{12} \quad \frac{39}{12} \quad \frac{40 \quad 39}{12} \quad \frac{1}{12}$$

(b) $\frac{18}{5}$ from $\frac{23}{3}$

The LCM of 5 and 3 is 15. So, expressing as equivalent fraction with denominator 15, we get

$$\frac{23}{3} \quad \frac{18}{5} \quad \frac{23 \quad 5}{3 \quad 5} \quad \frac{18 \quad 3}{5 \quad 3}$$

$$\frac{115}{15} \quad \frac{54}{15} \quad \frac{115 \quad 54}{15} \quad \frac{61}{15}$$

$$\frac{61}{15} \quad 4 \quad \frac{15}{15} \quad \frac{1}{15} \quad 4 \quad \frac{1}{15} \quad 4\frac{1}{15}$$

(c) $\frac{29}{7}$ from $\frac{45}{7}$

Since, the denominators of given fractions is the same. *i.e.*, 7.

So, $\frac{45}{7} \quad \frac{29}{7} \quad \frac{45 \quad 29}{7} \quad \frac{16}{7}$

$$2 \quad \frac{7}{7} \quad \frac{2}{7} \quad 2 \quad \frac{2}{7} \quad 2\frac{2}{7}$$

7. (a) Total distance from Jaya's home to her school $\frac{7}{10}$ km

She covers a distance by an auto $\frac{1}{2}$ km

She covers a distance walking

Total distance

distance covered by an auto

$$\frac{7}{10} \quad \frac{1}{2}$$

Expressing as equivalent fraction with denominator 10, we get

$$\frac{7}{10} \quad \frac{1}{2} \quad \frac{7}{10} \quad \frac{1 \quad 5}{2 \quad 5} \quad \frac{7}{10} \quad \frac{5}{10}$$

$$\frac{7 \quad 5}{10} \quad \frac{2}{10} \quad \frac{1}{5} \text{ km}$$

Hence, she travels a distance daily $\frac{1}{5}$ km.

(b) Jeevika takes for one round $\frac{10}{3}$ minutes

Namit takes for one round $\frac{13}{4}$ minutes

Equallising the two denominator we get

$$\frac{10}{3} \quad \frac{10 \quad 4}{3 \quad 4} \quad \frac{40}{12}$$

and $\frac{13}{4} \quad \frac{13 \quad 3}{4 \quad 3} \quad \frac{39}{12}$

Clearly, $\frac{40}{12} \quad \frac{39}{12}$

Therefore, Jeevika takes more time.

Difference of two timing

$$\frac{40}{12} \quad \frac{39}{12} \quad \frac{40 \quad 39}{12} \quad \frac{1}{12} \text{ minutes}$$

Hence, Jeevika takes more time by $\frac{1}{12}$ minutes.

Miscellaneous Exercises

1. $\frac{4}{8}$

2. $\frac{13}{25}(0.32), \frac{7}{15}(0.46), \frac{11}{21}(0.52)$

3. $\frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

4. $\frac{4}{5}$ as all numerator are same, so least denominator consist in largest fraction.

5. $\frac{1}{3}, \frac{9}{24}, \frac{5}{8}, \frac{5}{6}, \frac{3}{2}$

0.33, 0.37, 0.62, 0.83, 1.5

0.33 0.37 0.62 0.83 1.5

True

6. According to question,

$$x \quad \frac{2}{5} \quad \frac{1}{8} \qquad x \quad \frac{1}{8} \quad \frac{2}{5} \quad \frac{5 \quad 16}{40} \quad \frac{21}{40}$$

7. Total CDs = 3 + 5 =8

Bought : $\frac{3}{8}$

Received as gift $\frac{5}{8}$

Bought = $\frac{3}{8}$, Gifted $\quad \frac{5}{8}$

8. (a) $\frac{8}{2} \quad \frac{\square}{7} \quad \square \quad 7 \quad 4 \quad 28$

(b) $\frac{5}{8} \quad \frac{10}{\square} \quad \square \quad \frac{10 \quad 8}{5} \quad 16$

(c) $\frac{3}{5} \quad \frac{\square}{20} \quad \square \quad \frac{3 \quad 20}{5} \quad 16$

(d) $\frac{18}{27} \quad \frac{\square}{4} \quad \square \quad \frac{18 \quad 4}{24} \quad 3$

9. Ramesh used 10 of 20 $\quad \frac{10}{20} \quad \frac{1}{2}$

Sheela used 25 of 50 $\quad \frac{25}{50} \quad \frac{1}{2}$

Jamal used 40 of 80 $\quad \frac{40}{80} \quad \frac{1}{2}$

Yes, all fractions are same.

10. (a) 5 $\square$ 2 (b) 12 $\square$ 12

(c) 9 $\square$ 10 (d) 24 $\square$ 8

(e) 24 $\square$ 10 (f) 15 $\square$ 30

(g) 63 $\square$ 27 (h) 8 $\square$ 8

(i) 30 $\square$ 40 (j) 24 $\square$ 28

(k) 30 $\square$ 30 (l) 105 $\square$ 75

11. In class A,

Total students = 25

Students getting 60% = 20

Requried fraction $\frac{20}{25} \quad \frac{4}{5}$

Similarly for Class B,

Required fraction $\quad \frac{24}{30} \quad \frac{4}{5}$

Both sections have similar fractions.

12. (a) $\frac{1 \quad 1}{18} \quad \frac{2}{18} \quad \frac{1}{9}$ (b) $\frac{8 \quad 3}{15} \quad \frac{11}{15}$

(c) $\frac{7 \quad 5}{7} \quad \frac{2}{7}$ (d) $\frac{1 \quad 21}{22} \quad \frac{22}{22} \quad 1$

(e) $\frac{12 \quad 7}{15} \quad \frac{5}{15} \quad \frac{1}{3}$ (f) $\frac{5 \quad 3}{8} \quad \frac{8}{8} \quad 1$

13.

(a)

$\frac{2}{3}$	$\frac{4}{3}$	$\frac{6}{3} = 2$
$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3} = 1$
$\frac{1}{3}$	$\frac{2}{3}$	1

(b)

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{5}{6}$
$\frac{1}{3}$	$\frac{1}{4}$	$\frac{7}{12}$
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{4}$

14. (i) (d) If assertion is false but reason is true.

(ii) (c) If assertion is true but reason is false.

(iii) (a) If both assertion and reason are true and reason is the correct explanation of assertion.

15. (i) Requried distance

$$1\frac{2}{5} \quad 1\frac{5}{8} \quad (1 \quad 1) \quad \frac{2}{5} \quad \frac{5}{8}$$

$$2 \quad \frac{16 \quad 25}{40} \quad 2 \quad \frac{41}{40} \quad 3\frac{1}{40} \text{ km}$$

(ii) Required distance

$$1\frac{2}{5} \quad 1\frac{5}{8} \quad 1\frac{1}{10} \quad 4\frac{1}{8} \text{ km}$$

(iii) Required distance $\quad 2\frac{1}{3} \quad \frac{7}{3}$ km

(iv) Required distance

$$4\frac{1}{8} \quad 2\frac{1}{3} \quad \frac{33}{8} \quad \frac{7}{3}$$

$$\frac{99 \quad 56}{24} \quad \frac{43}{24} \quad 1\frac{19}{24} \text{ km}$$

(v) $\frac{95}{4} \quad x \quad 25 \quad x \quad 25 \quad \frac{95}{4}$

$$\frac{100}{4} \quad \frac{95}{4} \quad \frac{5}{4} \quad 1\frac{1}{4}$$

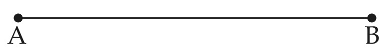
16. Do yourself

CHAPTER 8 Playing with Constructions

Textbook Exercises

Exercise 8.1

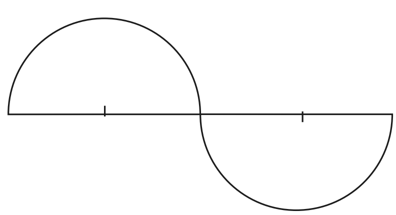
1. Step 1 : We start it with a central line *AB* of length 12 cm.



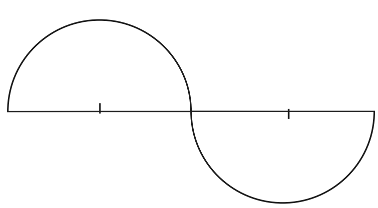
Step 2 : Since, a wave needs two halves circles. So mark 4 equidistant points on *AB*.

Where *AC* *CD* *DE* *EB* 3 cm each.

Step 3 : Taking *C* as centre and radius equal to *AC* in the compass, draw a half circle above *AB*. Similarly with *E* as centre and radius equal to *EB*, draw another half circle below the line *AB*.

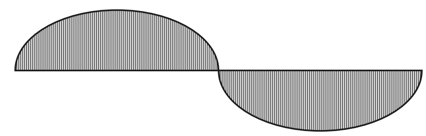


Step 4 : Shade inside the both half circles.



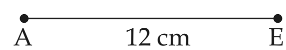
This is the required figure.

2. The 'Wavy Wave' should be drawn as given figure, appearing in the neck of figure of 'A Person'.



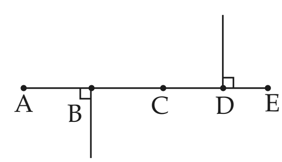
To draw this figure, necessary steps are given below :

Step 1 : Draw a central line *AE* 12 cm.

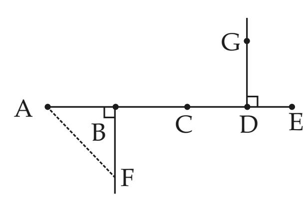


Step 2 : Since two equal ares are to be drawn so divide *AE* into four equal parts with the help of a ruler such that *AB* *BC* *CD* *DE* 3 cm.

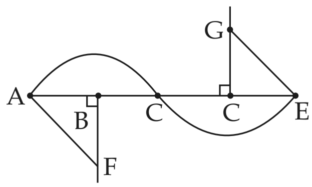
Step 3 : At *B* and *D* draw the perpendiculars with the help of protractor, as shown in the figure.



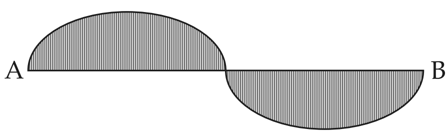
Step 4 : Using a ruler, mark points *F* and *G* on two perpendiculars such as *BF* *DG* 1.5 cm.



Step 5 : Join *A* to *F* and *E* to *G*. Taking *F* and *G* as centres and radius equal to *AF* or *EG* draw two arcs, one above and other below the line *AE*.



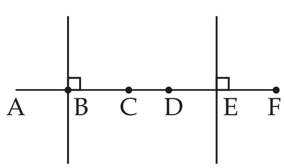
Step 6 : Shade inside two arcs.



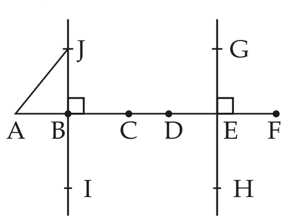
3. For this Artwork following steps will be followed :

Step 1 : Draw a line segment *AF*   8.5 cm. With the help of a ruler mark points *C* and on it such that *AC*   4 cm, *CD*   0.5 cm and *DB*   4 cm. Mark points *B* and *E* on it such that *AB*   2 cm and *EF*   2 cm.

Step 2 : Using a protractor draw perpen- diculars on points *B* and *E*.

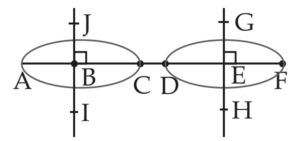


Step 3 : Using the compasses, draw arc to cut *BJ*   *BI*   *EG*   *EH*   1.5 cm. Join *A* to *J*.

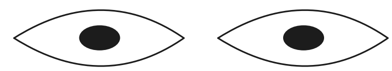


Step 4 : With the centre *J* and distance equal to *AJ* in the compass draw an arc from *A* to *C*, with the centre *I* and same distance draw another arc from *A* to *C*.

Similarly, Taking *G* and *H* as centres draw two arcs from *D* to *F*.

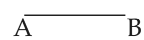


Step 5 : The points *B* and *E* change as black dark circles.

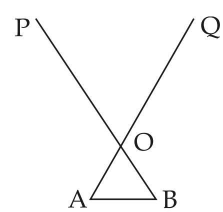


Hence, we get the shape of Eyes.

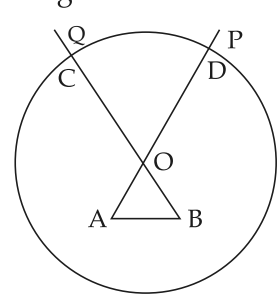
4. **Step 1 :** Draw a line segment *AB*   1 cm.



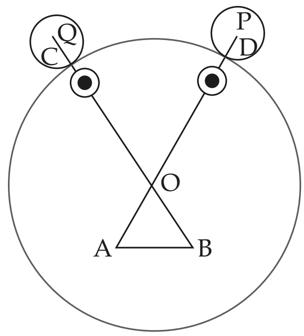
Step 2 : Using a protractor draw an angle of 60   on the points *A* and *B* both to cut the angle lines *BP* and *AQ* at the point *O*.



Step 3 : Taking *O* as centre and radius 2.5 cm draw a circle that intersect two lines of angle at *C* and *D*.



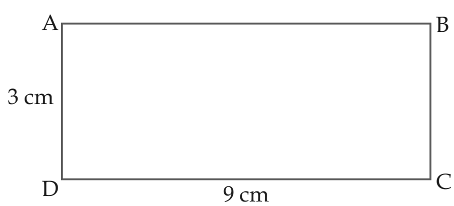
Step 5 : With the centres *P* and *Q* and radius in the compass equal to *PD* *QC*, draw circles. On the sides *AD* and *BC* draw small circles as shown in the figure below.



Hence, we obtained a face of a man.

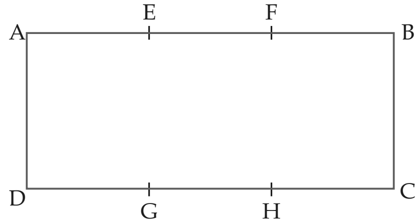
5. If this seem difficult, let us simplify the problem. For the purpose take the following steps :

Step 1. Construct a rectangle with length 9 cm and width 3 cm as you learnt just before topic.

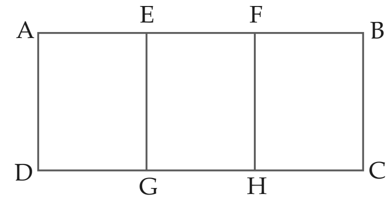


Step 2. Using a compase or a ruler divide *AB* into 3 equal parts *i.e.,* *AE* *EF* *FB* 3 cm.

Similarly, divide *DC* into 3 equal parts such as *DG* *GH* *HC*.



Step 3. Join *E* to *G* and *F* to *H*



AEGD, *EFHG* and *FBCH* are required squares.

Verification : Angle *A* *D* 90

(angle of rectangle)

AD 3 cm

(width of the given rectangle)

AE *DG* 3 cm (by construction)

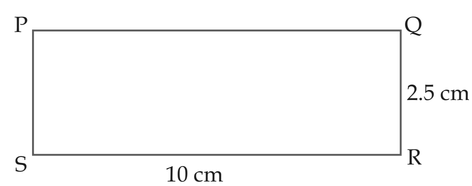
AD *EG* 3 cm

Thus, *AEGD* is a square.

Hence, *AEGD*, *EFHG* and *FBCH* are the squares whose sum is equal to rectangle *ABCD*.

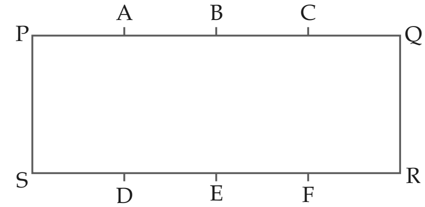
6. Using the steps given below, the problem can be made easier.

Step 1. Construct a rectangle with length 10 cm and width 2.5 cm.



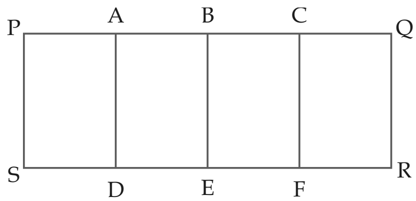
Step 2. Using a ruler or compass divide *PQ* into 4 equal parts such that *PA* *AB* *BC* *CQ* 2.5 cm.

Similarly divide *RS* also into 4 equal parts such that *SD* *DE* *EF* *FR* 2.5 cm as shown the figure.



Step 3. Join A to D, B to E and C to F to get the squares $PADS$, $ABED$, $BCFE$ and $CQRF$.

Hence, $PADS$, $ABED$, $BCFE$ and $CQRS$ are the required squares.

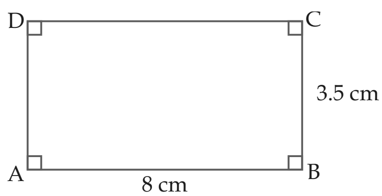


7. (a) When the length of a given rectangle is not exactly twice of its width, the rectangle cannot be divided into two identical squares.

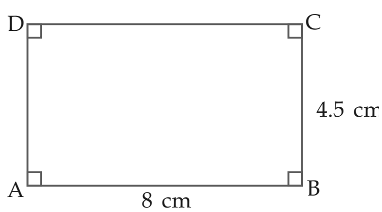
i.e., the length AB 8 cm and width BC 3.5 cm.

or the length AB 8 cm and width BC 4.5 cm.

(A)



(B)

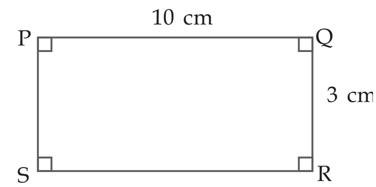


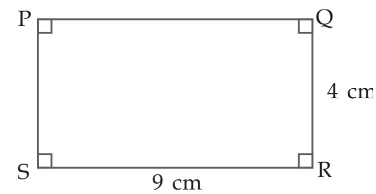
In these two cases, the rectangles can not be divided into two identical squares.

(b) If the length of a rectangle is not exactly three times larger than its width, the rectangle cannot be divided into three identical squares.

i.e., PQ 10 cm and QR 3 cm

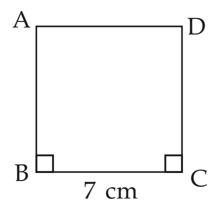
or PQ 9 cm and QR 4 cm



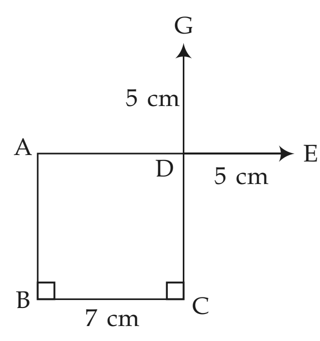


Above two cases, rectangles cannot be divided into two identical squares.

8. Step 1. Draw a line segment BC 7 cm. Using protractor draw perpendiculars on points B and C, such that BA CD 7 cm.

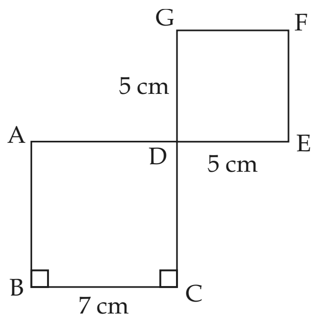


Step 2. Extend AD to E, such that DE 5 cm and extend CD to G, such that DG 5 cm

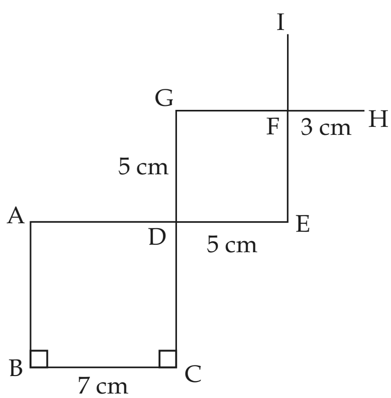


Step 3. Taking E and G as centres and keeping a distance of 5 cm in compass draw two arcs to intersect each other at F.

Join E to F and G to F.

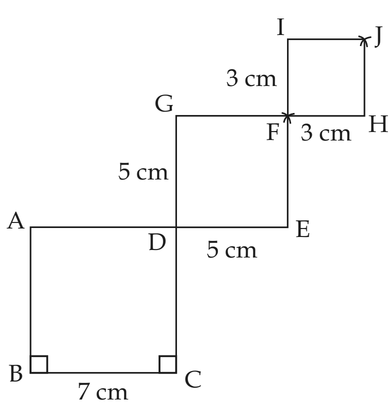


Step 4. Extend GF to H, such that FH 3 cm extend EF to I such that FI 3 cm.



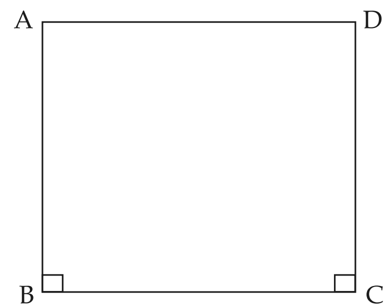
Step 5. Taking H and I as centres and keeping a distance of 3 cm in compass draw two arcs to intersect each other at J.

Join H to J and I to J

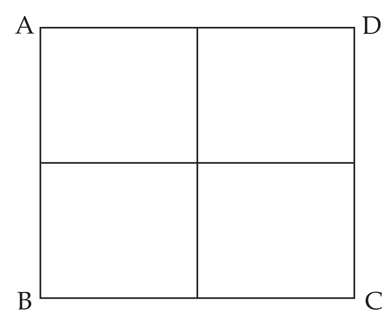


Hence, obtained shape is the required falling squares.

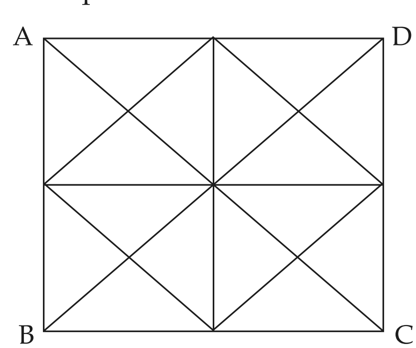
9. **Step 1.** Draw a square with its side 5 cm long as you have drawn earlier.



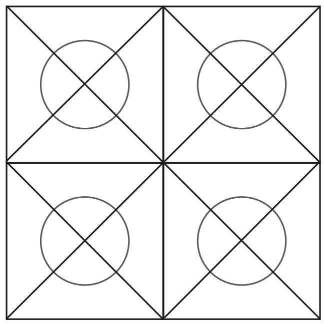
Step 2. Using a ruler or compass mark each side of the constructed square, dividing it into two equal parts and join the opposite marks as shown in the figure.



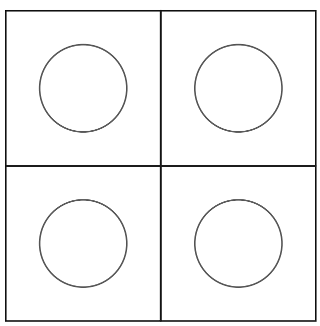
Step 3. Now draw the diagonals of each of the square to get the mid point of each square.



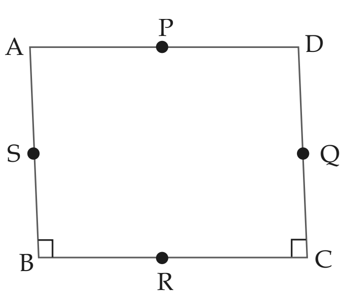
Step 4. With the centre of intersection points of the diagonals and distance 0.5 cm draw the circles.



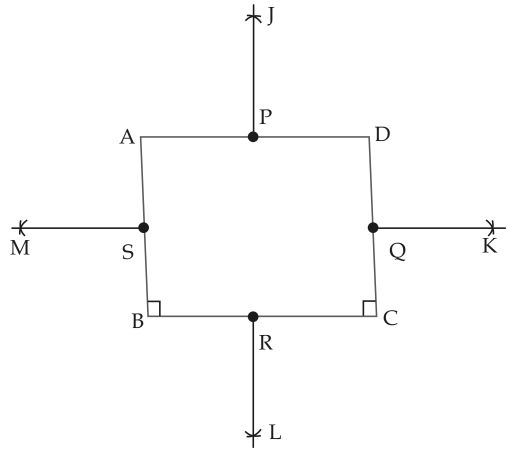
Hence, the following figure is required figure.



10. Step 1. Draw a square with its side length equal to 8 cm and mark the mid-points of four sides of it and mark them *PQRS*.

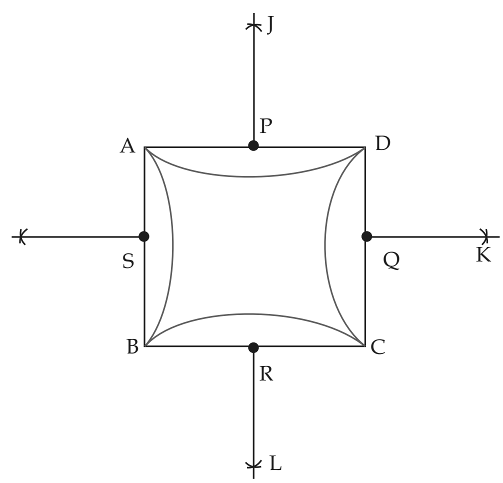


Step 2. Draw perpendiculars *PJ, OK, RL* and *SM* at the mid-points of the sides of the square such that *PJ* *QK* *RL* *SM* 4 cm and join *A* to *M*.



Step 3. Taking *M* as centre and distance in the compass, draw arc to meet *A* and *B*. Similarly, taking the points *J*, *K* and *L* as the centre and keeping the same distance in the compass, draw arcs so that they meet the respective arms both sides.

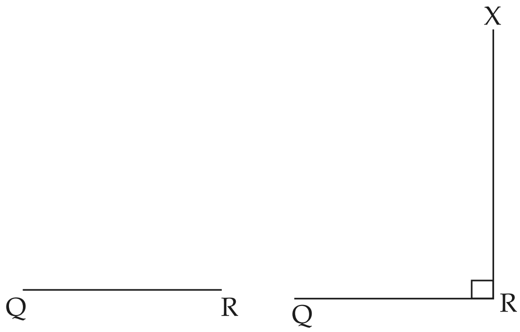
The image thus obtained is the desired image.



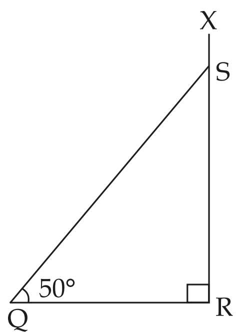
Exercise 8.2

1. Step 1. Draw a line segment *QR* with an arbitrary length.

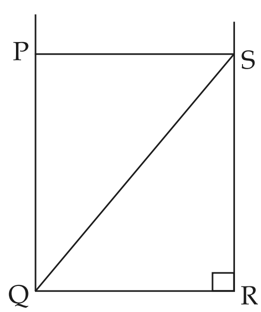
Step 2. Draw a perpendicular *RX* to *QR* passing through the point *R*.



Step 3. Draw a line making an angle of 50° with the point Q that intersects RX at S.



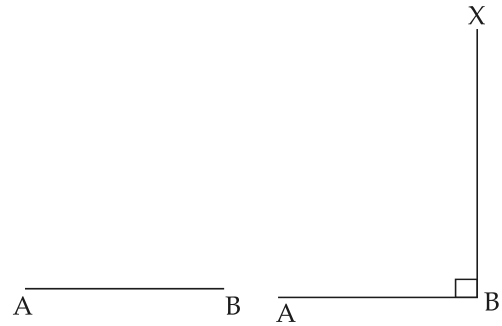
Step 4. Draw perpendiculars to QR and RS passing through the points Q and S respectively. Where these perpendicular lines intersect each other, mark P.



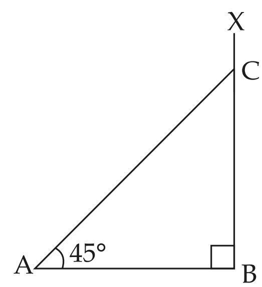
Hence, $PQRS$ is the required rectangle.

2. **Step 1.** Draw a line segment AB with arbitrary length.

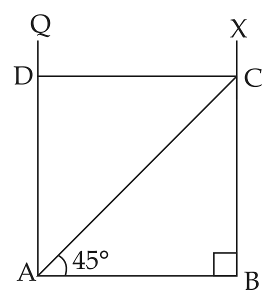
Step 2. Draw a perpendicular to AB through B.



Step 3. Draw a line with A making an angle of 45°, that intersect BX at C.



Step 4. Draw perpendiculars to AB and BC passing through the points A and C respectively. Where these perpendiculars intersect each other mark D.



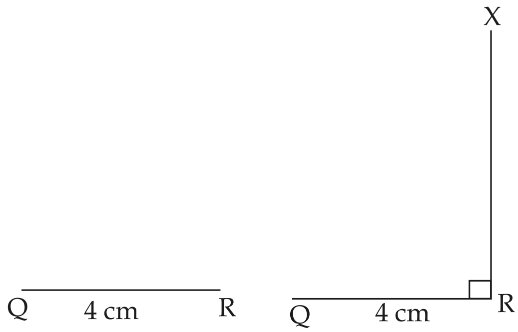
Hence, $ABCD$ is the required rectangle.

We obtain that the four sides of this rectangle are equal *i.e.,*

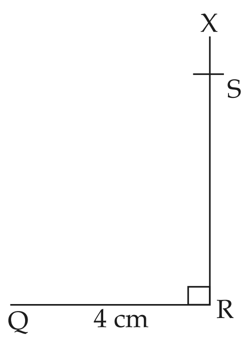
$AB \quad BC \quad CD \quad DA.$

3. **Step 1.** Draw a line segment QR 4 cm.

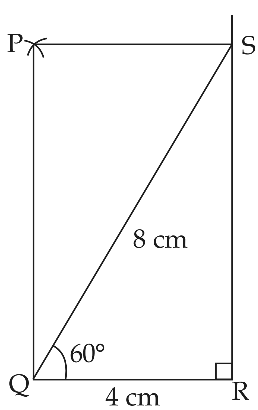
Step 2. Draw a perpendicular line RX passing through the point R.



Step 3. Taking Q as centre and radius 8 cm draw an arc that intersects RX at S.



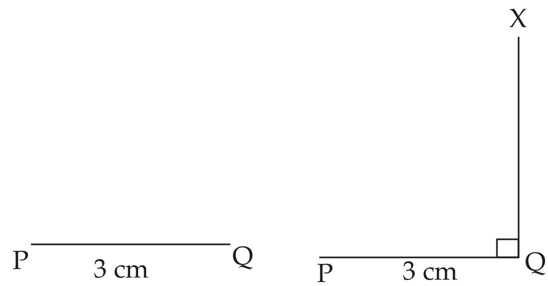
Step 4. Draw perpendiculars to QR and RS passing through the points Q and S respectively. At the intersection point of these two perpendiculars mark P.



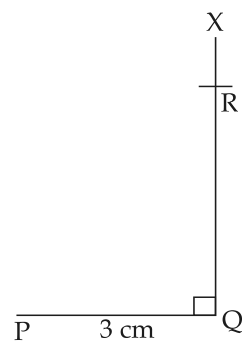
Hence, $PQRS$ is the required rectangle.

4. **Step 1.** Draw a line segment PQ 3 cm.

Step 2. Draw a perpendicular QX to PQ through Q.



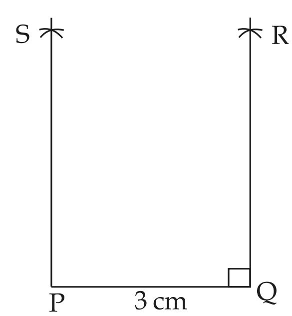
Step 3. Taking P as centre and a distance of 7 cm in a compass draw an arc to intersect QX at R.



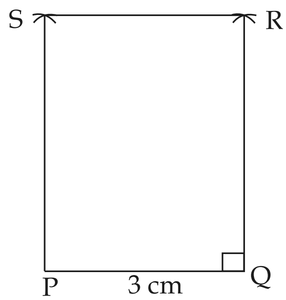
Step 4. Taking P as centre and distance equal to QR in the compass, draw an arc.

Step 5. Taking R as centre and a distance equal to PQ 3 cm, draw another arc to intersect the first arc.

Step 6. Mark the intersection point of to arcs as S.



Step 7. Join *S* to *R*.



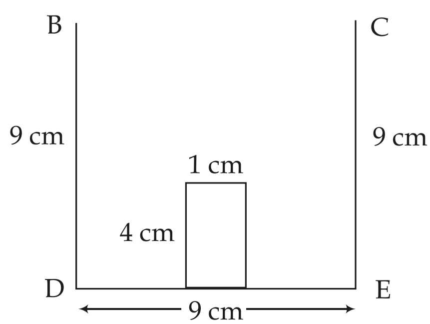
PQRS is the required rectangle.

5. **Step 1.** Draw a line segment *DE* 9 cm.

Step 2. Draw perpendiculars *BD* and *CE* of length 9 cm to *DE* through points *D* and *E* respectively.

Step 3. Mark dots on *DE*, 4 cm away from *D* and *E* respectively.

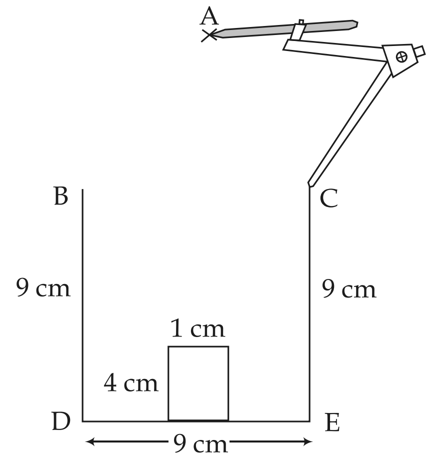
Step 4. Draw perpendiculars through these two dots with height 4 cm each and join the end points of two perpendiculars.



Step 5. With *B* as centre and a distance in the compass 9 cm draw an arc.

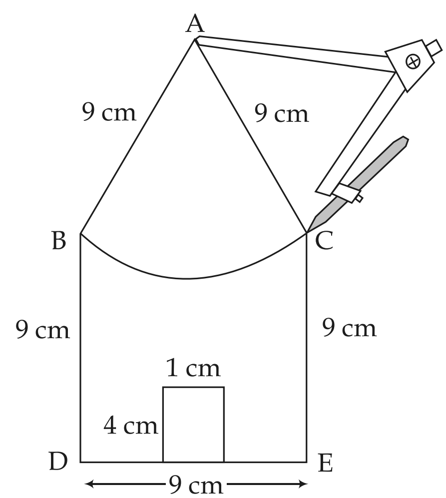
Step 6. Similarly draw another arc with centre *C* and distance 9 cm.

Step 7. Mark as *A* at the intersection point two arcs.



Step 8. Join *A* to *B* and *A* to *C*.

Step 9. Taking 9 cm radius in the compass and from the point *A*, draw an arc touching *B* and *C* as shown in the figure.

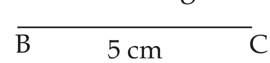


Now, your house is ready.

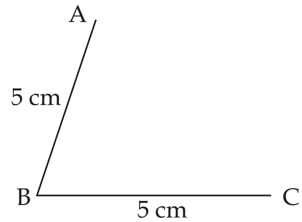
6. Yes, Rhombus is a 4-sided figure in which all sides are equal in length but is not a square.

To construct a rhombus, the following steps should be taken.

Step 1. Draw line segment *BC* 5 cm.

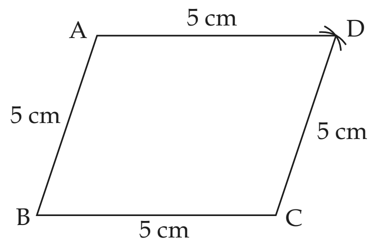


Step 2. Draw a side *AB* of length 5 cm from point *B* making an angle other than 90°.



Step 3. Now, taking *A* and *C* as centres, draw arcs with a compass at a distance of 5 cm which cut each other at point *D*.

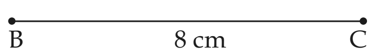
Step 4. Join *A* to *D* and *C* to *D*.



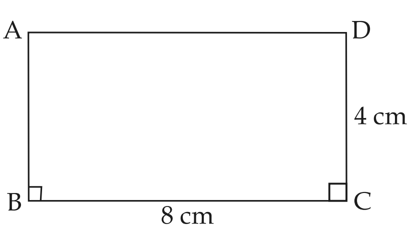
Hence, *ABCD* is a rhombus, that has four equal sides but not 4 equal angles. So, it is not a square.

Miscellaneous Exercises

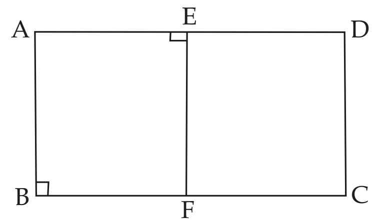
1. **Step 1.** Draw a line segment *BC* 8 cm



Step 2. Using a protractor, draw perpendiculars *AB* and *CD* on the points *B* and *C*. Such that *AB* *CD* 4 cm. Join *A* to *D*



Step 3. Using a scale or compass, mark points *E* and *F* on *AD* and *BC* to divide them two equal parts. Join *E* to *F*.



ABFE and *EFCD* are the required square verification.

AB *EF* 4 cm

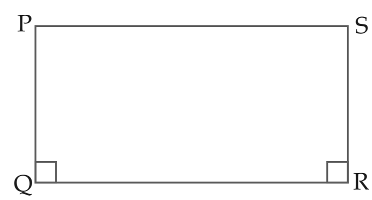
AE *BF* 4 cm

A *B* *F* *E* 90

Hence, 4 sides and 4 angles are equal, so *ABFE* and *EFCD* are the squares.

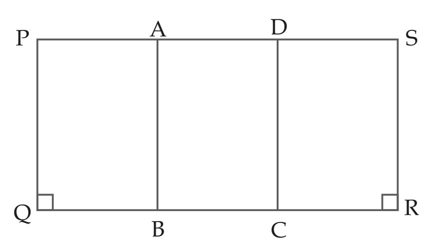
2. **Step 1.** Draw a line segment *QR* 7.5 cm using a protractor, draw the perpendiculars *PQ* and *RS* on points *Q* and *R* such that *PQ* *RS* 4 cm.

Join *P* to *S* to get *PS*.



Step 2. Taking a distance of 2.5 cm and centre *P* and *Q* draw arcs *A* on *PS* and *B* on *QR*. Similarly with centres *S* and *R* and with same distance of 2.5 cm. Draw arcs *D* on *PS* and *C* on *QR*.

Join *A* to *B* and *D* to *C*.

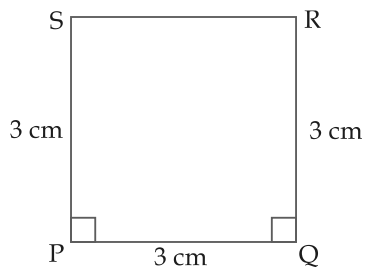


PQBA, *ABCD* and *DCRS* are the required squares.

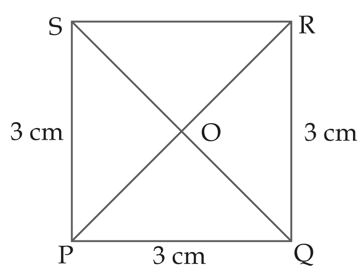
3. **Step 1.** Draw a line segment *PQ* 3 cm.

Step 2. Draw perpendiculars *PS* and *QR* to the points *P* and *Q*, such that *PS* *QR* 3 cm.

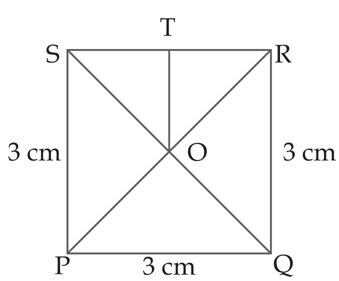
Step 3. Join *S* to *R*.



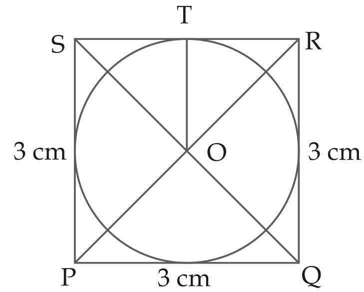
Step 4. Join *P* to *R* and *Q* to *S* to intersect at each other at *O*.



Step 5. Draw perpendicular *OT* from point *O* to *RS*.



Step 6. Taking *O* as centre and distance equal to *OT* in the compass, draw a circle that touches the four sides of square *PQRS*.

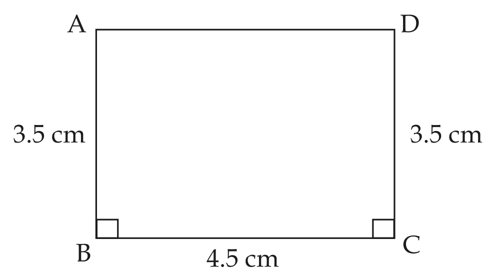


Hence, obtained circle is the required circle.

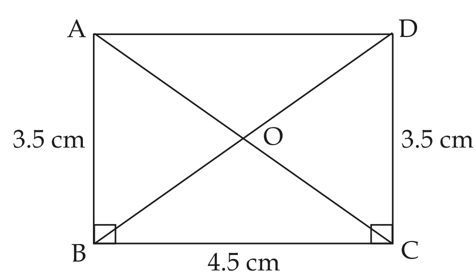
4. **Step 1.** Draw a line segment *BC* 4.5 cm.

Step 2. Draw perpendiculars *AB* and *CD* to the points *B* and *C*, such that *AB* *CD* 3.5 cm.

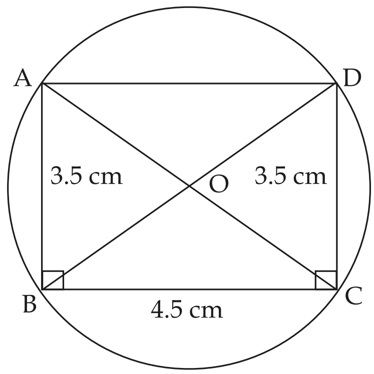
Step 3. Join *A* to *D*.



Step 4. Join *A* to *C* and *B* to *D* to intersect each other at *O*.



Step 5. Taking *O* as centre and distance equal to *OA*, in the compass, draw a circles that goes through the points *A*, *B*, *C* and *D*.

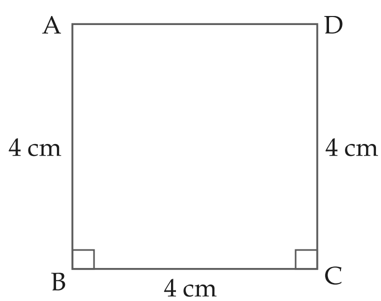


This is the required circle.

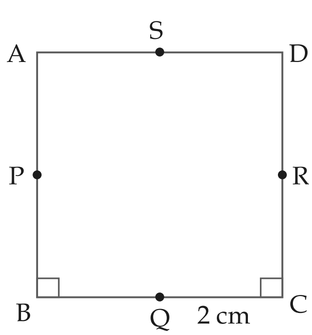
5. **Step 1.** Draw a line segment BC 4 cm.

Step 2. Draw perpendiculars AB and CD to the points B and C such that AB CD 4 cm.

Step 3. Join A to D.



Step 4. With the help of ruler or a compass find the mid points P, Q, R, S of sides AB, BC, CD and DA respectively.

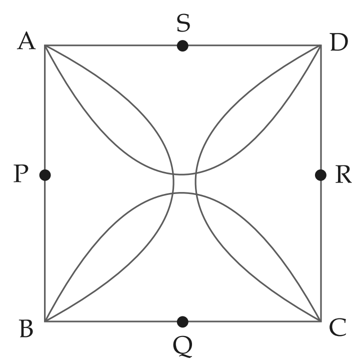


Step 5. Taking P as centre and distance equal to AP or BP 2 cm in the compass, draw a half circle.

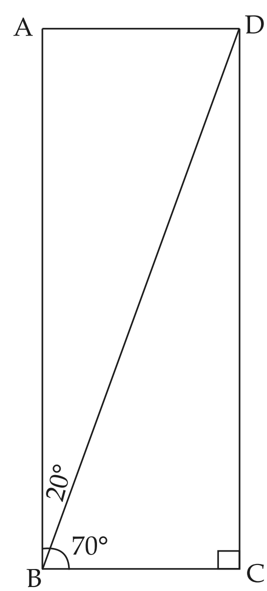
Step 6. Taking Q as centre and distance QB QC 2 cm in the compass, draw another half circle.

Step 7. With the centres R and S and keeping same distance in the compass, draw two other half circles.

All these circles touches each other at the point O.

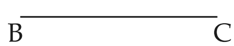


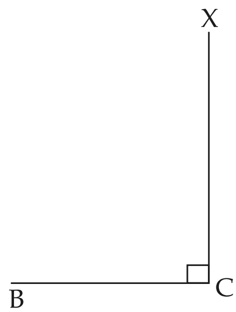
6. First of all draw a rough sketch of rectangle $ABCD$.



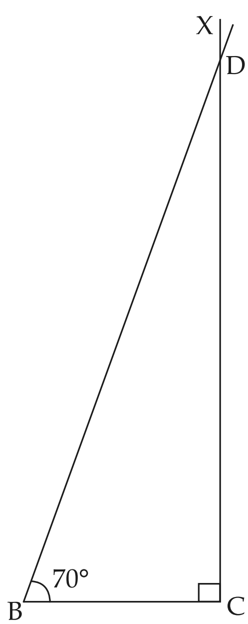
Step 1. Draw a line segment *C* with an arbitrary length.

Step 2. Draw a perpendicular *CX* to *BC* passing through the point *C*.

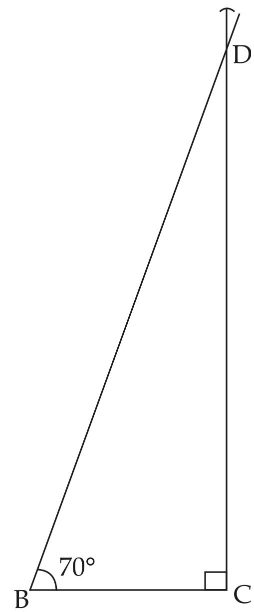




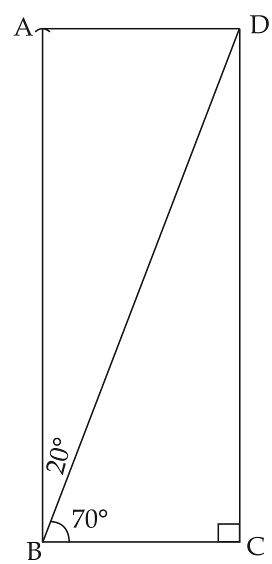
Step 3. Draw a line making an angle of 70° with *BC* at point *B* that intersects *CX* at *D*.



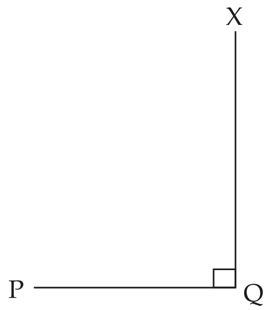
Step 4. Taking *B* as centre and a distance equal to *CD* in the compass draw an arc. Again, taking *D* as centre and a distance equal to *BC* draw another arc to intersect first arc at *A*.



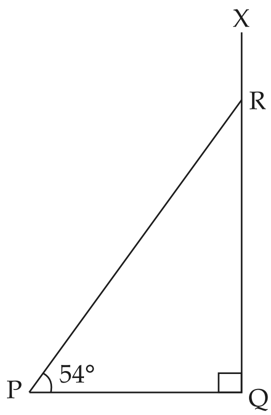
Step 5. Join *A* to *B* and *A* to *D*. Hence, *ABCD* is the required rectangle.



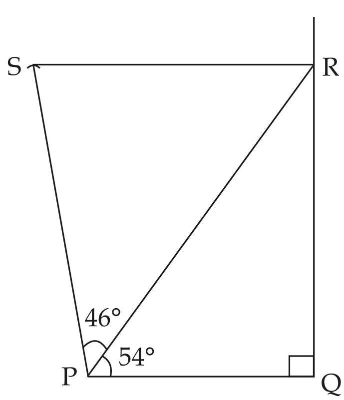
7. **Step 1.** Draw a line segment *PQ* with a arbitrary length and draw a perpendicular line *QX* through the point *Q*.



Step 2. Draw a line segment at point P, making an angle of 54° with PQ which intersects QX at point R.

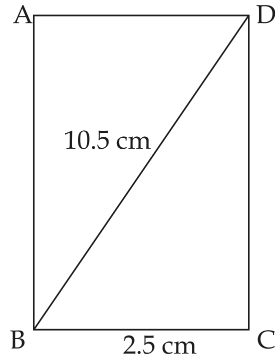


Step 3. Taking P and R as centres and taking distance equal to QR and PQ respectively in compass, draw arcs which intersect each other at point S.



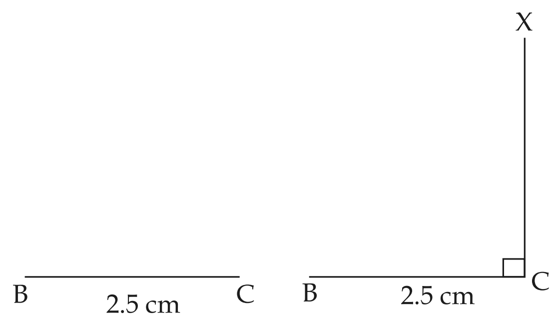
Hence, $PQRS$ is the required rectangle.

8. First of all draw a rough diagram.

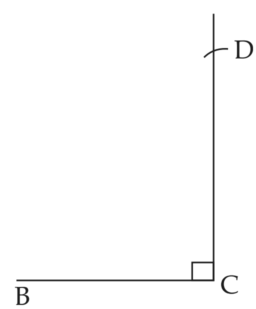


Step 1. Draw a line segment BC 2.5 cm.

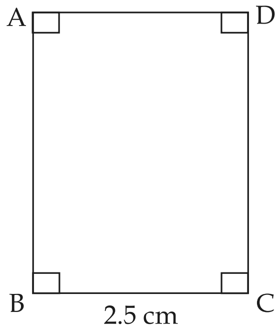
Step 2. Draw a perpendicular to BC through point C.



Step 3. Taking B as centre and a distance of 10.5 cm in the compass draw an arc that intersects the perpendicular drawn at D.



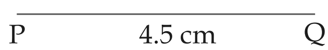
Step 4. Draw perpendiculars to BC and CD through points B and D respectively. Mark A at the intersection point of perpendicular



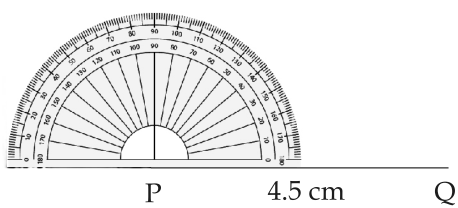
Hence, *ABCD* is the required rectangle.

9. (a) T, (b) T, (c) T, (d) T

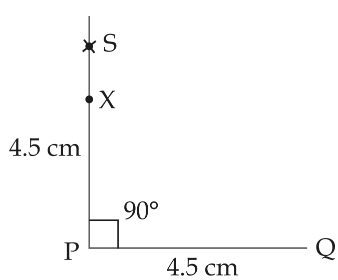
10. **Step 1.** Draw a straight line segment *PQ* 4.5 cm.



Step 2. Mark a point *X* to draw a perpendicular above to *PQ* through *P*.

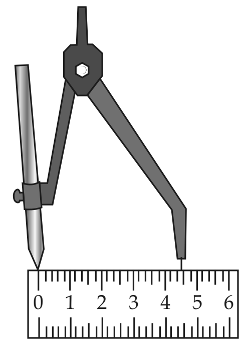


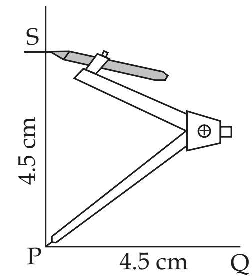
Step 3. Mark S on the perpendicular such that *PS* = 4.5 cm using a ruler



An other method to mark the point *S* such that *PS* 4.5 cm with the help of the compass.

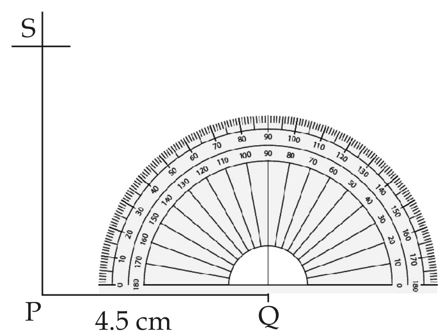
For this open the arms of compass 4.5 cm. Taking *P* as centre and draw an arc to intersect perpendicular at *S*. As shown the fig. given below.

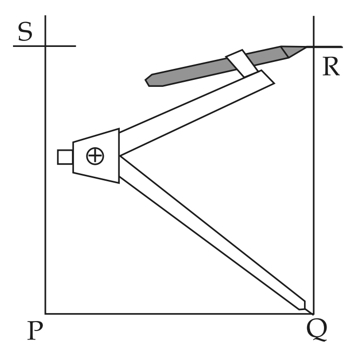




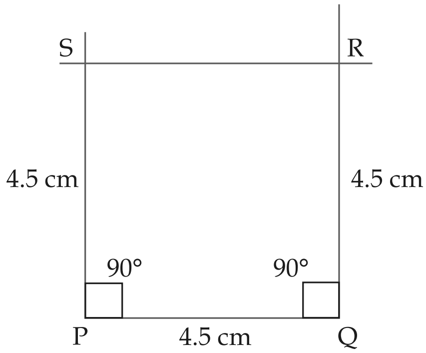
Step 4 : Draw perpendicular to line sgment *PQ* through *Q*.

Step 5 : If we had used the compass, then the next point can easily be amrked using it, as we marked on the first line perpendicular.



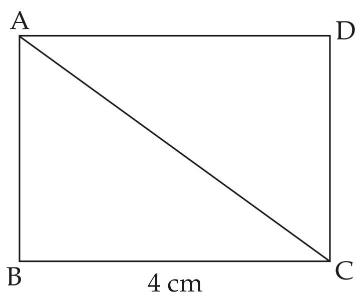


Step 6 : Now join *R* to *S* to get *RS*. Here, *RS* *PQ* 4.5 cm and *R* *S* 90

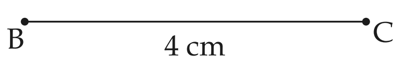


The fig satisfies the properties of a square. Hence *PQRS* is a square.

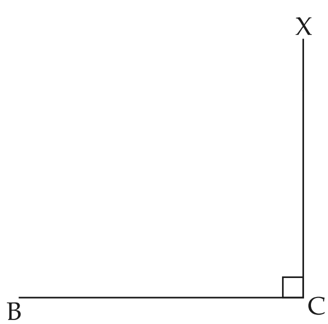
11. First of all we should draw a rough diagram and decide the steps of construction.



Step 1. Draw the base *BC* 4 cm.

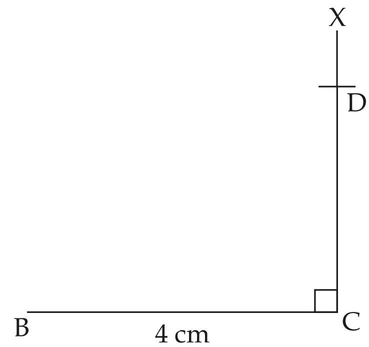


Step 2. Draw a perpendicular *XC* to line segment *BC* at the point *C*.

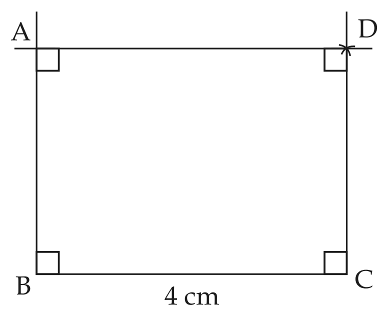


The point *D* should be somewhere on the line *RX* and the distance of diagonal *BD* 7 cm.

Step 3. Draw an arc of radius 7 cm with the point *B* as the centre, that intersect *XC* at *C*.



Step 4. Construct perpendicular to *BC* and *DC* passing through *B* and *D* respectively.



Hence, *ABCD* is the required rectangle.

12. No. of Rectangle

$$\frac{(m \quad 1) \quad (n \quad 1) \quad m \quad n}{4}$$

(where m = No. of rown,
n No. of column)

$$\frac{(5 \quad 1) \quad (2 \quad 1) \quad 5 \quad 2}{4}$$

$$\frac{6 \quad 3 \quad 5 \quad 2}{4} \quad 45$$

❍❍

CHAPTER

9 Symmetry

TEXTBOOK EXERCISES

Exercise 9.1

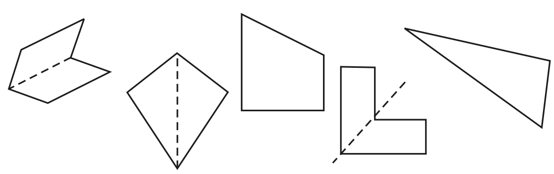
1. There are six lines of symmetry in flower.

There is only one line of symmetry in butterfly.

Rangoli has four lines of symmetry.

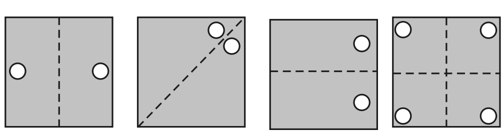
Pinwheel has no line of symmetry.

2. First two figures have one line of symmetry but next three figures have no line of symmetry, as shown in the figures given below :



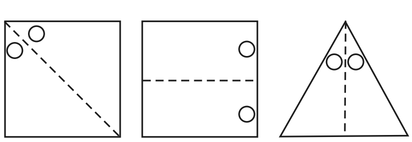
Exercise 9.2

1.

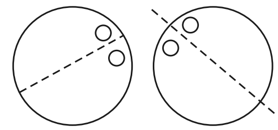


Since the figure (d), has single hole, the paper was folded twice-first to create a half and then again to create a quarter.

2.

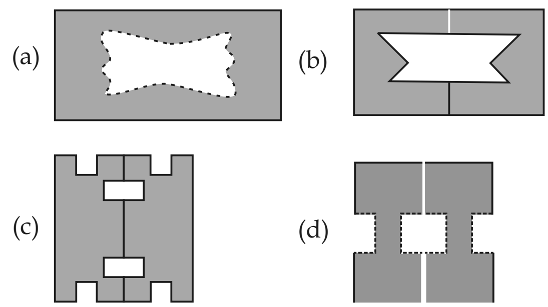


(a) (b) (c)



(d) (e)

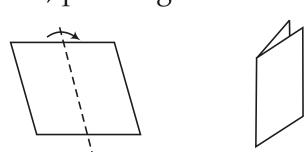
3. The images that we get are given below.



4. (a) To get each of these shapes, the following steps will be followed :

(i) Firstly fold the square paper in its middle line.

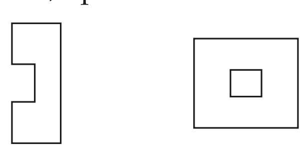
(ii) Now, pressing it make a crease.



(i) (ii)

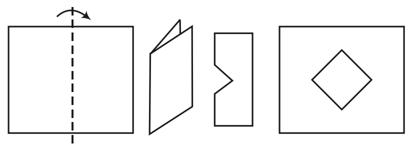
(iii) Now, cut it with the help of a scissors.

(iv) Now, open it

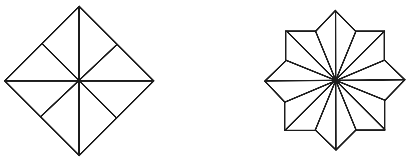


(iii) (iv)

(b) Similarly,

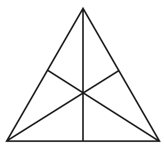


5. (a)

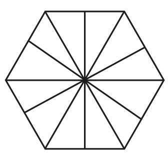


4-Lines symmetry   8-Lines of symmetry

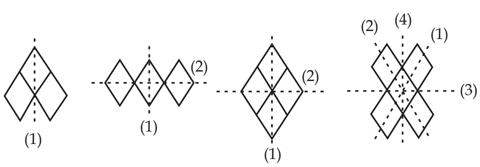
(b) Three lines of symmetry.



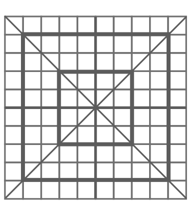
(c) Six lines of symmetry.



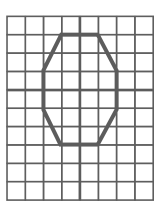
6.



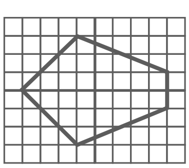
One line of symmetry | Two lines of symmetry | Two lines of symmetry | Four lines of symmetry



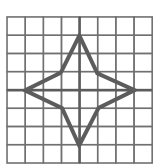
Four lines of Symmetry



Two lines of Symmetry



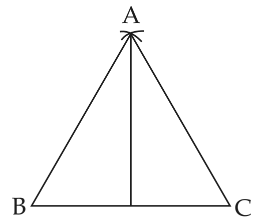
One line of Symmetry



Four lines of Symmetry

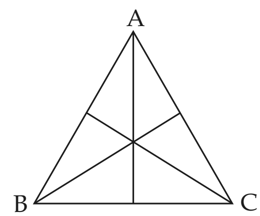
7. No line of symmetry is in this figure.

8. (a) If any two sides of a triangle are equal then one line of symmetry can be drawn.



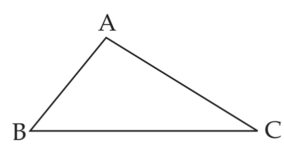
Here, side *AB*   side *AC*

(b) A triangle with three lines equal has three symmetric lines.



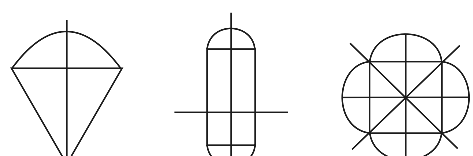
Here, *AB*   *BC*   *CA*

(c) No line of symmetry can be drawn for a triangle with unequal sides



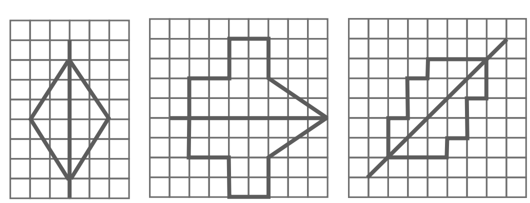
Here, *AB*   *BC*   *CA*

9.

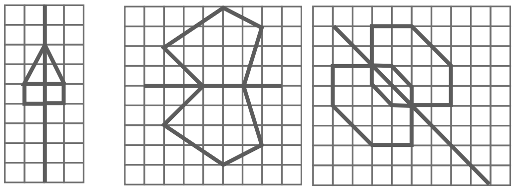


(a)   (b)   (c)

10.

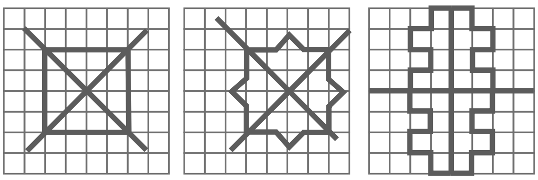


(a)   (b)   (c)

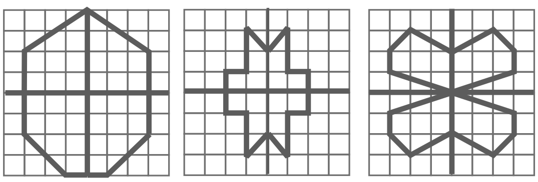


(d) (e) (f)

11.

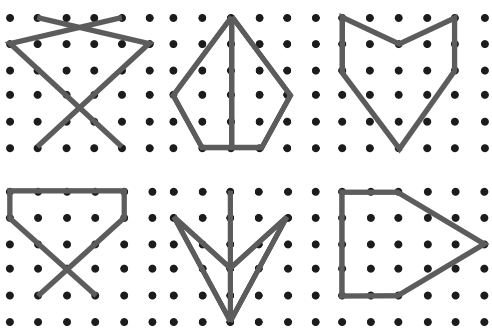


(a) (b) (c)



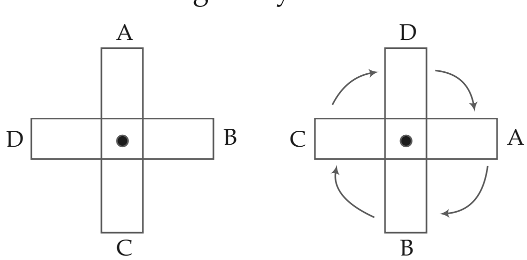
(d) (e) (f)

12.



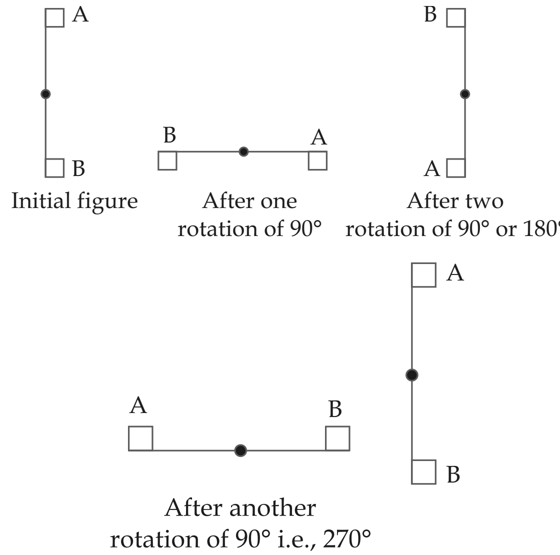
Exercise 9.3

1. (a) To find the angle of symmetry rotate the figure by 90 .



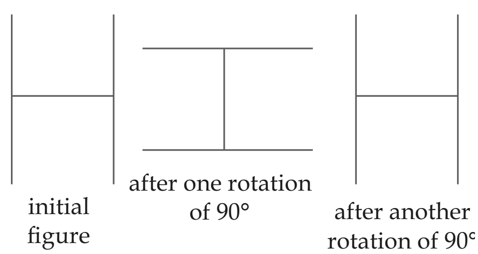
The figure after rotation of 90 is exactly the same.

Hence, 90 is the angle of symmetry.



A rotation of 90 result in the figure above. And it does not overlap the initial figure. The figure comes back to its original shape only after one complete rotation 90° + 90° + 90° + 90° = 360°

Hence, 360 is the angle of symmetry.



The figure after rotation of 90 90 180 is exactly the same.

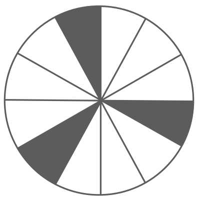
Hence, 180 is the angle of symmetry.

2. All options except (g) have multiple angles of symmetry. This indicates that these figures passes various ways to rotate and maintain their original appearance.

Exercise 9.4

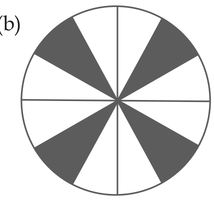
1.

(a)



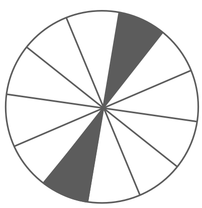
Will look same after every rotation of 120°

(b)

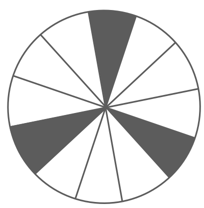


Will look the same after every rotation of 90°.

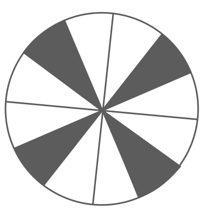
(c) There are four possible ways



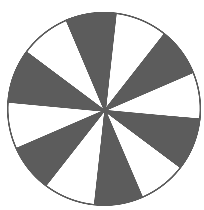
2 angles of rotation



3 angles of rotation

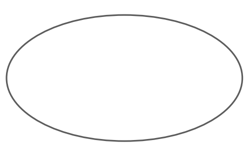


4 angles of rotation

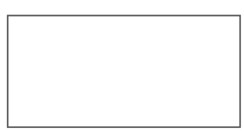


6 angles of rotation

2.



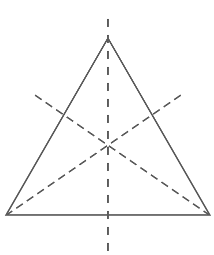
Oval



Rectangle

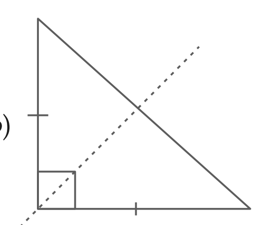
3.

(a)



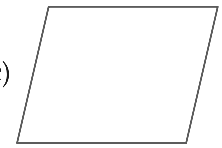
Equilateral triangle

(b)



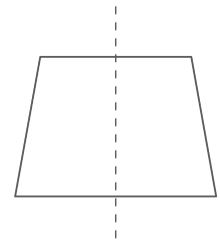
Right angled triangle

(c)



Parallelogram

(d)



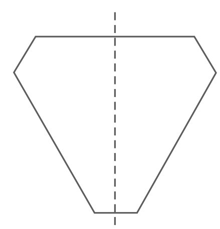
Trepezium

4. As 60 is the smallest angle, other angles of symmetry will be the multiple of 60 upto 360 . Here, the angles are 120 , 180 , 240 , 300 and 360 .

5. (a) Yes, as 360 is a multiple of 45 .

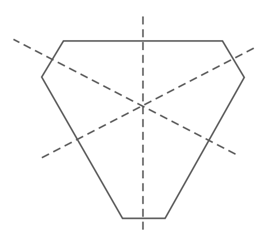
(b) No, as 360 is not a multiple of 17 .

6. (a) The outer boundary of the picture shows reflection symmetry. It has only one line of symmetry.



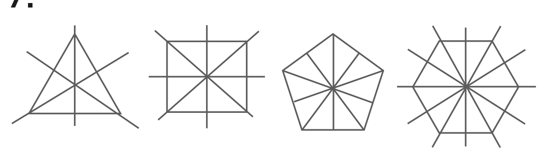
Picture shows the line of reflection symmetry.

(b) Yes, it has rotational symmetry.



It has 3 lines of symmetry.

7.



A 3-sided regular polygon that is called equilateral triangle has 3 lines of symmetry.

A 4-sided regular polygon that is called a square has 4 lines of symmetry.

A 5-sided regular polygon that is called regular pentagon has 5 lines of symmetry.

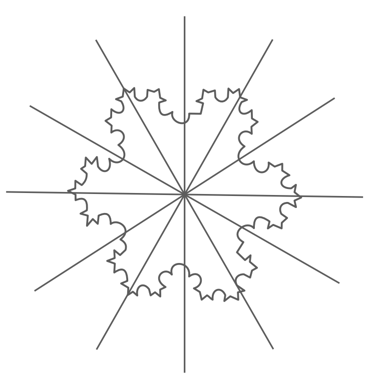
A 6-sided regular polygon that is called a regular hexagon has 6 lines of symmetry

Hence, number sides in a regular polygon Number of lines of symmetry.

So a regular octagon has 7 lines of symmetry, a regular octagon has 8 lines of symmetry, a regular nonagon has 9 lines of symmetry and a regular decagon has 10 lines of symmetry.

We can see a clear pattern : the number of sides in a regular polygon equals the number of lines of symmetry, the number sequence is : 3, 4, 5, 6, 7, …… .

8.



9. The Ashoka Chakra has 24 spokes at an equal distance in the circle. 24 spokes make 12 pairs. Line through the circle joining to two points is a line of symmetry.

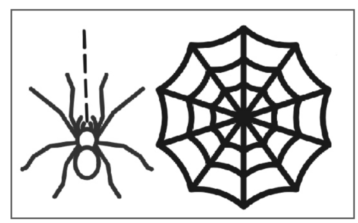
Hence, the Ashoka Chakra has 12 lines of symmetry.

The number of angle of symmetry Number of lines of symmetry

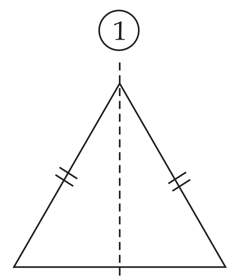
Hence, Ashoka Chakra has 12 angles of symmetry. The smallest angle of symmetry 360 12 30

Miscellaneous Exercises

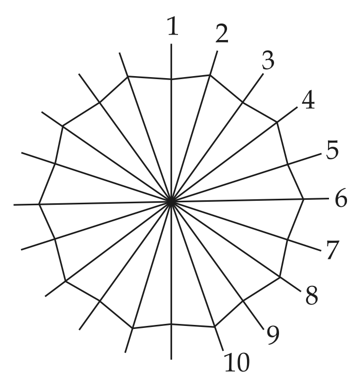
1. Beechives are regular hexagonal figures, so it has six line of symmetry.



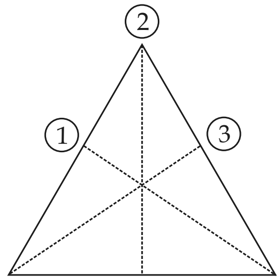
2. (a) Only one line of symmetry.



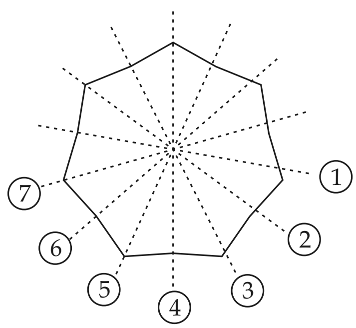
(b) A decagon has 10 sides with it, so it has 10 lines of symmetry.



(c) Three lines of symmetry.



(iv) A regular seven sided polygon has seven lines of symmetry.



3. The order of rotational symmetry is the number of times a shape can be rotated around a full circle and still look the same. Here

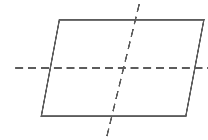
(a) 2 (b) 6

4. F, G, J, L, N, P, Q, R, S, Z are the letters whose no line of symmetry can be drawn.

5. A figure with a smallest angle of 83 cannot have rotational symmetry since 83 is not a factor of 360.

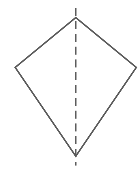
A figure with a smallest angle of 6° can have rotational symmetry because $\frac{360}{6}$ 60, meaning it has 60 angles of symmetry.

6. (a) Rhombus



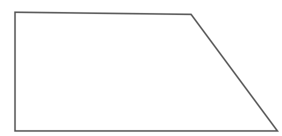
order of rotational symmetry = 2

(b)



order of rotational symmetry = 1

(c) An irregular quadrilatural



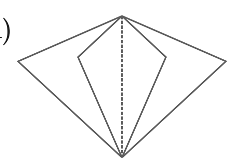
order of rotational symmetry = 1

7. (a) **8.** (b)

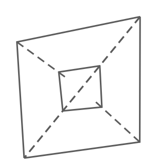
9. (a) **10.** (b) $\frac{360}{8}$ 45°

11. (i) 2, (ii) 2 **12.** (i) 0, (ii) 0

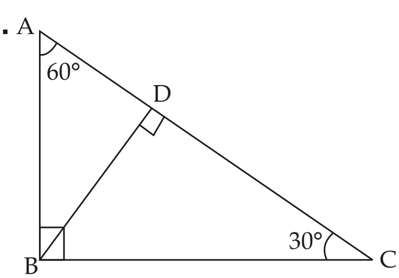
13. (i)



(ii)



14.



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CHAPTER

10 The Other Size of Zero

TEXTBOOK EXERCISES

Exercise 10.1

1. The starting floor is 2 (Art centre) and the number of button pressed is (3)

Therefore, target floor

Starting floor Movement

2 (3)

1 (The Toys Store)

2. (a) (1) (4) ….

Given, the starting floor is 1 (Food corner) and the number of button pressed is +4.

Therefore, target floor

Starting floor + Movement

( ) (4)

5 (The Sport Centre)

(b) (4) (1) …

Given the starting floor is 4 (*i.e.*, cream centre) and number of button is 1 (The food court)

Therefore, Target

Starting floor Movement

(4) (1)

(5) (The Sport Centre)

(c) (4) (3)

Given, the starting floor is 4 (ice cream centre) and the number of button pressed is 3. Therefore,

Targer floor

Starting floor + Movement

(4) (3)

1 (The Food Court)

(d) (1) (2) …

Given the starting floor is (1) (Toys centre) and the number of button pressed is 2

Therefore, target floor

Starting floor + Movement

(1) (2)

1 (The Food Court)

(e) (1) (1) …

Given, the starting floor is 1 (Toys centre) and the number of button pressed is 1

Therefore, Target floor

Starting floor + Movement

(1) (1)

0

(The Reception hall *i.e.*, Ground floor)

(f) 0 (2) …

Given the starting floor is 0 (The ground floor) and the number of button pressed is 2

Therefore, Target floor

Starting floor + Movement

0 (2)

2 (The Art Centre)

(g) 0 (2) ….

Given, the starting floor is 0 (The ground floor) and the number of button pressed is +2

Therefore, target floor

starting floor + Movement

0 (2)

2 (The Video Games)

3. Starting from different floors, find the movements required to reach floor –5.

Example 1. If you start at floor +2, press –7 to reach floor –5.

Sol. 2 (7) 5

Example 2. Start at floor +4, press –9 to reach floor –5.

Sol. 4 (9) 5.

Example 3. Start at floor 0, press –5 to reach floor –5.

Sol. 0 (5) 5.

Example 4. Start at floor –3, press –2 to reach floor –5.

Sol. 3 (2) 5.

4. (a) (1) (4) 3

(b) (0) (2) 2

(c) (4) (1) 3

(d) (0) (2) 2

(e) (4) (3) 7

(f) (4) (3) 1

(g) (1) (2) 3

(h) (2) (2) 0

(i) (1) (1) 2

(j) (3) (3) 6

5. (a) Given (40) … 200

Let (40) x 200

or x 200 (40) 160

Hence (40) (160) 200

(b) Given, (40) … 200

Let (40) x 200

or x 200 (40) 240

Hence (40) (240) 200

(c) Given (50) … 200

Let (50) x 200

or x 200 (50) 250

Hence (50) (250) 200

(d) Given (50) … 200

Let (50) x 200

or x 200 (50) 150

Hence (50) (150) 200

(e) Given (200) (40)

(200) 40 160

(f) Given (200) (40) …

(200) (40) 160

(g) Given, (200) (40) …

200 40 160

6. (a) 125 (30) 155

(b) 105 (55) 105 55 160

(c) (105) (55) 160

(d) 80 (150) 80 150 230

(e) 80 (150) 230

(f) 99 (200) 99 200 101

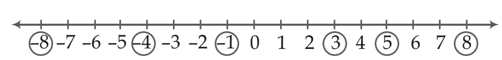
(g) 99 (200) 101

(h) 1500 (1500) 1500 1500

3000

Exercise 10.2

1.



The positive numbers are right to 0 and they are 3, 5, 7.

The negative numbers are left to 0, and they are 1, 4, 8.

2. Yes, we know that a positive number is greater than any negative number.

Hence 2 is greater than 3.

Yes, 2 is less than 3. Because 2 is a negative number and 3 is a positive number.

Hence, 2 3.

3. (i) Given 5 0 ?

On adding 0 to a number or a number to 0, the result is always that number

Hence, 5 0 5

(ii) Given, 7 (7)

If the inverse of a number is added to it then the result is always 0.

Hence, 7 (7) 0

(iii) Given 10 20

For adding the numbers with different signs, subtract the smaller absolute value from the larger absolute value and mark the sign from the larger absolute value.

Hence, 10 20 10

(iv) Given, 10 20.

On subtracting a larger number from a smaller number gives a negative value.

Hence, 10 20 10

(v) Given, 7 (7)

On subtracting a negative number is the same as adding the counter part of the number.

Hence 7 (7) 7 7 14

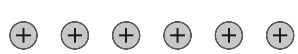
(vi) Given, 8 (10)

On subtracting a negative number is the same as adding the positive counter part of the number

Hence 8 (10) 8 10 2.

4. (a) Given (6) (4)

To show (6) we use 4 positive (red) tokens



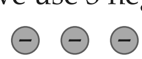
On combining these two groups, we get

Counting all these tokens, we get 10

Hence (6) (4) 10

(b) Given (3) (2)

To show 3, we use 3 negative tokens



To show 2 we use 2 negative tokens

Combining these two groups, we get

Counting these all we get (5)

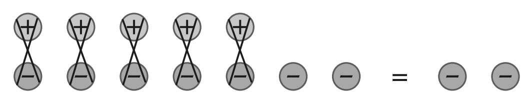
Hence (3) (2) 5

(c) Given, (5) (7)

To show (5) we use 5 positive tokens.

To show (7) we use 7 negative tokens

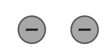
Combining these two groups of token, we get



Hence, (5) (7) 2

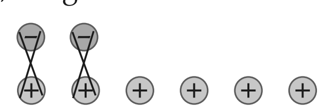
(d) Given, (2) (6)

To show 2, we use 2 negative (black) tokens.



To show +6, we use 6 positive (red) tokens.

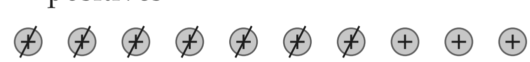
On combining these two groups of tokens, we get



Hence, (2) (6) 4

5. (a) Given (10) (7)

Here, from 10 positives take away 7 positives



Hence, (10) (7) 3

(b) Given (8) (4)

Here, from 8 negatives take away 4 negatives

Hence, (8) (4) 4

(c) Given, (9) (4)

Here, from 9 negatives take away 4 negatives

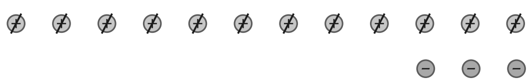
Hence, (9) (4) 5

(d) Given, (9) (12)

Here, from 9 positives take away 12 positive

But there are not enough tokens to take out 12 positives from 9 positives.

So, put an extra zero pairs of positives and negatives should be added.



Now, we can take out 12 positives

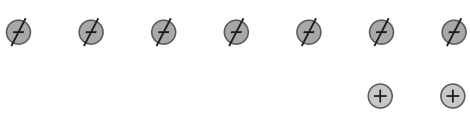
Hence (9) (12) 3

(e) Given, (5) (7)

Here, from 5 negatives take away 7 negatives.

But there are not enough tokens to take out 7 negatives from 5 negatives

So put an extra 2 zero pairs of negatives and positives should be added



Hence, (5) (7) 2

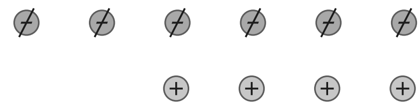
Now we can take out 7 negatives

(f) (2) (6)

Here, from 2 negatives take away 6 negatives.

But there are not enough tokens to take away 6 negatives from 2 negatives

So, put an extra 4 zero pairs of negatives and positives



Now, we can take out 6 negatives

Hence, (2) (6) 4

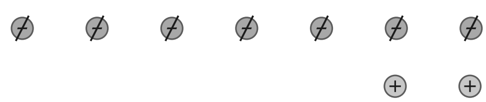
6. (a) Given (5) (7)

Here, from 5 negatives take away 7 negatives

But there are not enough tokens to take away 7 negatives from 5 negatives.

So, we put an extra 2 zero pairs of negatives and positives.

Now, we can take out 7 negatives



Hence (5) (7) 2

(b) Given (10) (13)

Here from 10 positives take away 13 positives.

But there are not enough tokens to take away 13 positives from 10 positives.

So, put an extra 3 zero pairs of positives and negatives.

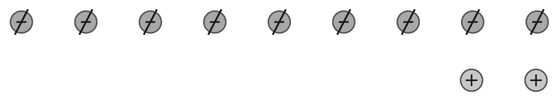
Now, we can take out 13 positives.

Hence, (10) (13) 3

(c) Given, (7) (9)

Here from 7 negatives take away 9 negatives. But there are not enough tokens to take away 9 negatives from 7 negatives

So, put an extra two zero pairs of negatives and now, we can take away a negatives



Hence, (7) (9) 2

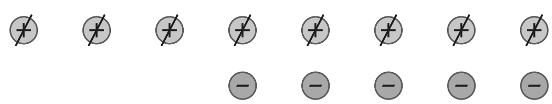
Now, we can take away 9 negatives.

(d) Given (3) (8)

Here, from 3 positives take away 8 positives. But there are not enough tokens to take away 8 positives from 3 positives.

So, we put an extra 5 zero pairs of positives and negatives.

Now, we can take away 8 positives



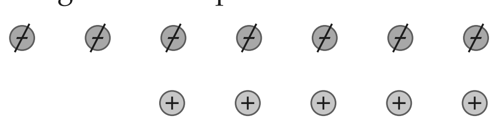
Hence, (3) (8) 5

(e) Given (2) (7)

Here, from 2 negatives take away 7 negatives.

But there are not enough tokens to take away 7 negatives from 3 negatives.

So, put an extra 5 zero pairs of negatives and positives.



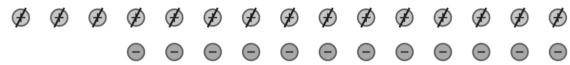
Now we can take away 7 negatives

Hence (2) (7) 5

(f) Given (3) (15)

Here, from 3 positives take away 15 positives. But there are not enough tokens to take out 15 positives from 3 positives.

So, put an extra 12 zero pairs of positives and negatives.



Now we can take away 15 positive tokens

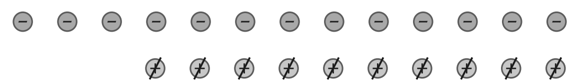
Hence, (3) (15) 12

7. (a) Given, (3) (10)

Here, from 3 negatives tokens take out 10 positives tokens. But there is no positive token in to take out in the set.

So, we put an extra 10 zero pairs of negatives and positive tokens.

Thus, we get



Now, we can take away 10 positive tokens.

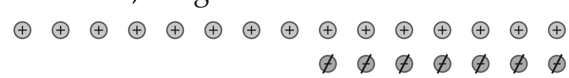
Hence, (3) (10) 13

(b) Given, (8) (7)

Here, from 8 positives tokens, take away 7 negatives tokens. But there is no negative token in the set.

So, we put an extra 7 zero pairs of negatives and positives tokens.

Thus, we get



Now, we can take away 7 negative tokens

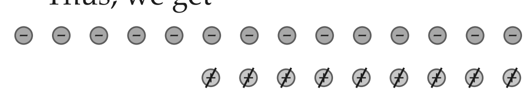
Hence, (8) (7) 15

(c) Given, (5) (9)

Here, from 5 negative tokens take away 9 positive tokens. But there is no negative token in the set to take out.

So, we put an extra 7 zero pairs of negatives and positive tokens.

Thus, we get



Now, we can take away 9 positive tokens.

Hence, (5) (9) 14

(d) Given, (9) (10)

Here, from 9 negative tokens take away 10 positives tokens. But there is no positive token in the set to take out.

So, we put an extra zero pairs of negatives and positive tokens.

Thus, we get

Now, we can take away 10 positive tokens

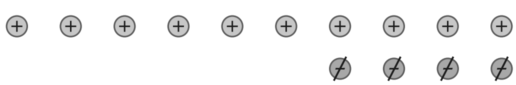
Hence, (9) (10) 19

(e) Given, (6) (4)

Here, from 6 positive tokens take away 4 negatives token. But there is no negative token to take away in the set.

So, we put an extra 4 zero pairs of negatives and positive token to take away.

Thus, we get



Now, we can take away 4 negative tokens

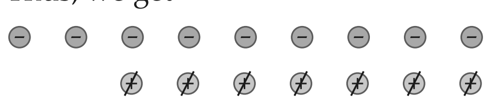
Hence, (6) (4) 10

(f) Given, (2) (7)

Here, from 2 negative tokens take out 7 positive tokens.

But there is no positive token to take away. So we put an extra 7 zero pairs of negatives and positive tokens.

Thus, we get



Now, we can take away 7 positive tokens.

Hence, (2) (7) 9

Exercise 10.3

1. Given, credits are ₹30, ₹40 and ₹50

Total value of credits ₹256

Total value of debits

₹1 ₹2 ₹4 ₹8 ₹16

₹32 ₹64 ₹128

₹255

So, Balance = Credits Debits

₹256 ₹255 ₹1

Hence, your bank account balance ₹1

2. Keeping a positive bank account balance is normally good because :

1. In case of having a negative bank account balance. We have to pay extra charges to the bank. We can avoid this if our bank account balance is positive.
2. We find ourselves able to cape with any unexpected disaster in the future because we have some savings in the bank.
3. If your bank account balance is positive, then it can be helpful for you when you want to borrow money from the bank for any work or business.

There might be a few specific situations where temporarily having a negative balance could be considered.

1. Most of the banks offer overdraft protection which can help avoid bounced checks or declared transactions.

2. If you know you will have a large income soon and need to make essential purchases a temporary negative.

From the above description it becomes clear that both positive and negative numbers along with zero are extremely useful in the word of banking and accounting.

3. Based on the heights the sequence of decreasing order is A, E, C, G, F, B, D

And the sequence of increasing order is

$$D, B, F, G, C, E, A$$

4. The Mount Everest is the highest point above the sea level on Earth. It's height is 8,848 meters above the sea level.

5. The lowest point on land in the world is the shoreline of the 'Dead Sea'.

The height of this point is about 413 meters.

6. Here are completed grids.

(a)

–10	–2	16
5		–5
9	2	–7

Border sum is +4

(b)

6	8	–16
11		–5
–19	–2	19

Border sum is –2

(c)

7	–4	–7
–2		–5
–9	–3	8

Border sum is –4

The missing numbers are filled to ensure the sum of each row and column is equal to the given border sum.

(a) In the first grid to get a border sum of +4. The missing numbers in top row –2 and +16 and 9. The missing number is the bottom row are 2 and 7.

The missing number in the left column is 5, and 9. The missing numbers in the right column are 7 and 16.

(b) To get the border sum of –2.

The missing number in the top row is –16.

The missing number in the bottom row are –19 and 19.

The missing number in left column are 11 and –19.

The missing numbers in right column are –16 and 19.

(c) To get the border sum –4.

The missing number in the top row are –4 and –7.

The missing numbers in the bottom row are 8, –9 and –3.

The missing number in the left column are –2 and –9.

The missing number in the right column are –7 and 8.

7. There are many ways to fill the last grid with a border sum of –4. Two of them are given below.

8	–19	7
–3		–4
–9	12	–7

7	6	–17
9		8
–20	11	5

8. (a) The integers between 0 and 7 in increasing order are

6, 5, 4, 3, 2, 1.

(b) The integers between 4 and 4 in increasing order are

3, 2, 1, 0, 1, 2, 3.

(c) The integers between 8 and 15 in increasing order are

14, 13, 12, 11, 10, 9.

(d) The integers between 30 and 23 in increasing order are

29, 28, 27, 26, 25, 24.

9. Three numbers whose sum is 8 are 6, 5 and 3.

10. The faces of two given dice have same numbers 1, 2, 3, 4, 5, 6. First of all we will find the possible numbers on rolling both the dice. First of all we list the sum of two negative numbers.

(1) (1) 2, (1) (3) 4

(1) (5) 6, (3) (3) 6

(3) (5) 8 and (5) (5) 10

Secondly we list the sum of one negative and one positive numbers

(1) 2 1, (1) 4 3

(1) 6 5, (3) 2 1

(3) 4 1, (3) 6 3

(5) 2 3, (5) 4 1

(5) 6 1

Now, we find the list sum of two positive numbers.

2 2 4, 2 4 6

2 6 8, 4 4 8

4 6 10, 6 6 12

Now, list all the possible number sequence in increasing order.

10, 8, 6, 4, 3, 2, 1,
1, 3, 4, 5, 6, 8, 10, 12

Hence, the sum of numbers that are not possible between –10 and +12 are 9, 7, 5, 0, 2, 7, 9 and 11

11. (a) 8 13 5

(b) (8) (13) 8 13 5

(c) (13) (8) 13 8 5

(d) (13) (8) 21

(e) (8) (13) 5

(f) (8) (13) 8 13 5

(g) 13 8 5

(h) 13 (8) 13 8 21

12. (a) Present year is 2025, so 150 years ago from the year 2025

2025 150 1875

Hence, it was the year of 1875.

(b) Present year is 2025, so 2200 years ago from the year 2025

2025 2200 175.

Hence, it was the year of 175.

But the year can not be calculated in negative terms.

Thus, the year 175 corresponding to 176 BCE (Before the common Era)

Hence, 2200 years ago, it was the year 176 BCE .

(c) We can regard the year christ birth as 0 year. Thus, the year 680 BCE can be written as 680.

Hence, the year before 320 often BCE is

680 320 360 360 BCE.

13. (a) The difference between two consecutive numbers that are given is

(34) (40) (34) 40 6

and (28) (34) 28 34 6

So, next three terms will be

(22) 6 (16)

(16) 6 10

and (10) 6 4

Hence, the sequence is

(40), (34), (28), (22), (16), (10), (4).

(b) Let us split the sequence into two interleaved patterns :

❖ odd position : 3, 2, 1, 0 decreasing by 1, next –1, –2, –3.

❖ even position : 4, 5, 6, 7 increasing by 1, next 8, 9, 10.

Hence, the sequence is 3, 4, 2, 5, 1, 6, 0, 7, 1, 8, 2, 9, –3, 10.

(c) In the sequence, difference between 2 consecutive terms of the sequence ..., ..., 12, 6, 1, 3, 6, ..., ..., ...

6 12 6

1 6 5

(3) 1 4

(6) (3) 6 3 3

So, the difference between two consecutive numbers of the sequence is decreasing by 1. The difference of 1st, 2 pairs of the two groups must be 7 and 8.

Now, let the first number of the sequence be x and second number is y.

Thus, 12 y 7 y 12 7 19

and 19 x 8 x 19 8 27

Hence, the sequence takes the form as 27, 19, 12, 6, 1, (3), (6)

In this way, we can find next three terms

a (6) 2 a 2 6 8

b (8) 1 b 1 8 9

c (9) 0 c 9

Hence, the given sequence is

27, 19, 12, 6, 1, (3), (6), (8), (9), (9)

14. The cards can be picked as below

(i) (7) (18) (5)

(7) (18) 5 30

(ii) (18) (5) (9)

(18) 5 9 32 closer to 30

(iii) (18) (1) (7) (2)

= 18 1 7 2 28

(iv) (18) (9) (5) (2)

(18) (9) (5) (2)

32 2 30

(v) (18) (7) (5) (18) (7)

(1) (5) 31 closer to 30

15. (a) (Positive) (Negative)

Subtracting a negative number is the same as adding its positive counter part.

Thus, it will be always positive. For example :

(100) (100) 100 (100) 200

(b) (Positive) + (Negative)

The result depends on the value of given numbers. If the absolute value of negative is greater than it will be negative otherwise positive and if equal then 0. For example :

(800) (900) 100

(800) (700) 100

(800) (800) 0

(c) (Negative) + (Negative)

The sum of two negative numbers is always a negative number. For example :

(800) (800) 1600

(d) (Negative) (Negative)

Subtracting a negative number is the same as adding its positive counter part. Its result depends on the absolute value of given number. For example :

(500) (700) (500) 700 200

(600) (400) (600) 400 200

(800) (800) (800) 800 0

(e) (Negative) (Positive)

Subtracting a positive number is the same as adding its negative counter part. So, there result is always negative. For example :

(800) (800) 800 (800) 1600

(f) (Negative) + (Positive)

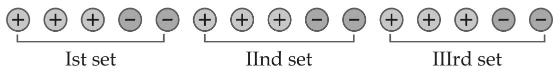
The result depends on the absolute value of the number subtracted. It may be positive, negative or zero. For example :

(555) (450) 105 (Negative)

(332) (400) 68 (Positive)

(350) (350) 0 (zero)

16.



There are a total of 100 tokens in string which are divided into sets. Each set has five tokens, three positives and two negatives. Thus there are $\frac{100}{5}$ 20 sets of 5 tokens in the string.

The value of Ist set (3) (2) 1

Hence, the total value of the string

Value of one set

Number of sets

1 20 20

17. Yes, each of Brahmangupta's rules in terms of Annebelle's Building of fun or in term of a number line can be used as below :

(i) Adding two positive numbers, results in a positive number.

In Annebelle's Building of fun, if we starts on the 2nd floor and move up 3 floors, we end up with 5 floor. *i.e.*, (2) (3) 5, on a number line we can move 11 to 18 by adding 7.

i.e., (11) (7) 18

(ii) Adding two negative numbers results in a negative number.

In Annebelle's Building of fun, if we starts from 2 floors below the ground level (2) and move down 2 more floors (–2), we end up 4 floors below the ground floor (4).

On a number line moving from (8) to (15) by adding (7)

i.e., (8) (7) 15

(iii) Subtract the smaller absolute value from the larger absolute value and keep the sign of the larger absolute value.

In Annebelle's Building of fun if we start on the 3rd above the ground level and moves down 5 floors, we end up below 2 floors below the ground floor (2), on a number line starting from (+5) we move 11 by adding (16)

(*i.e.*,) 5 (16) 11

(iv) Subtracting a positive number from a negative number is the same as adding the two numbers and keeping the negative sign.

In Annebelle's Building of fun, if we are 3 floors below the ground floor (3) and move down 2 more floors we end up 5 floors below the ground floor (5).

On a number line, 13 12 25

(v) Subtracting a negative from a positive number is the same as adding two positive numbers.

In Annebelle's Building of fun, if we start from the 3rd floor above the ground floor (3) and go up 2 floors. We end up on the 5th floor above the ground floor (5).

On number line,

19 (20) 19 20 39

(vi) Subtracting a negative number from another negative number is the same adding the absolute values and keeping the negative sign.

In Annebelle's Building of fun, if we are at 3rd floor below the ground floor (3) and moves up 2 floor (2). We end up one floor below the ground floor (1).

Let us understand rule behind these,

(i) Addition of positive numbers.

(19) (29) (48)

(ii) Addition of Negative number.

(49) (21) (70)

(iii) Addition of a positive and a negative number.

(39) (40) 1

(iv) Subtraction of a positive number from a negative number.

38 (86) 38 86 124

(v) Subtraction of a negative number from a positive number.

39 (38) 39 38 77

(vi) Subtraction of a number from a negative number.

(87) (96) (87) 96 9

Brahmagupta was the first mathematician to describe zero as a number on an equal footing with positive numbers and with negative numbers. He was the first to give explicit rule for performing arithmatic operations on all such numbers including positive, negative and zero-forming, what is now called a ring. It changed the way the word of mathematics.

However it took many centuries to adopt zero and negative integers as numbers. These numbers were transmitted to be accepted by and further studied by the Arab world by the 9th centuries, before making this way to Europe by the 13th century.

It was a great surprise that negative numbers were still not accepted by many of the European mathematicians even in the 18th century. Lazar Carnot, a French mathematician in the 18th century, called negative numbers **absured**. But over time, zero and negative numbers proved to be indispensable to be critical numbers just as Brahmagupta had recommended and explicity described way back in the year 628 BCE for the modern development of Algebra, which will be learnt by us in the next classes.

Miscellaneous Exercises

1. (5) 8 3

2. Minus (–)

3. True, 3238 < 6511

4. Sign of larger number.

5. True

6. (a) (–), (b) (+), (c) (–), (d) (–)

7. Draw circle on the digits given in question.

8. (a) >, (b) <, (c) <, (d) >

9. 1

10. (a) (11) (12) 23

(b) (10) (4) 14

(c) (32) (25) 57

(d) (23) (40) 63

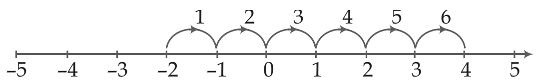
11. (a) (7) (8) 1

(b) (9) (13) 4

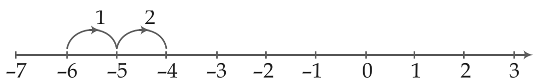
(c) (7) (10) 3

(d) (12) (7) 5

12. (a) (2) 6



(b) (6) 2



Students can make such more questions.

13. (a) (7) (11) 4

(b) (13) (10) 3

(c) (7) (9) 2

(d) (10) (5) 5

14. 4, 7, 0, 1, 2, 3, 6

In decreasing order, it will be

7, 3, 0, 2, 4, 6

15. (a) Given (8) (6)

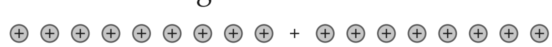
On Representing the given number as tokens, we get

On combining two groups, we get

Hence, (8) (6) 14

(b) Given, (9) (18)

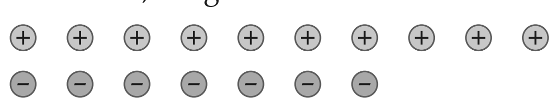
On representing the given numbers as tokens we get



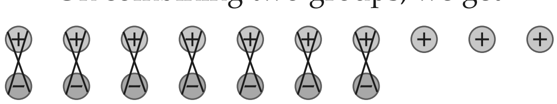
Hence (9) (8) 17

(c) Given, (10) (7)

On representing the given numbers as tokens, we get



On combining two groups, we get



Hence, (10) (2) 3

(d) Given (10) (3)

On representing the given numbers as tokens, we get

On combining these two groups of tokens, we get

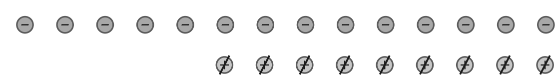
Hence (10) (3) 13

16. (a) Given, (5) (9)

Here, from 5 negatives tokens take away 9 positive tokens.

But there is no positive token to be taken out in the set so we put an extra 9 zero pairs of negative and positive token.

Thus, we get



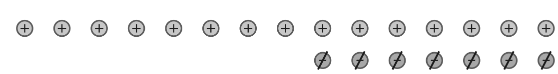
Now, we can take out 9 positive tokens.

Hence, (5) (9) 14

(b) Given, (8) (7)

Here, from 8 positive tokens take away 7 negative tokens. But there is no positive token to be taken out in the set. So, we put an extra 7 zero pairs of negatives and positives tokens.

Thus, we get



Now, we can take out 7 negative tokens

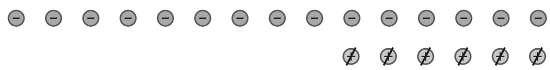
Hence, (8) (7) 15

(c) Given, (9) (6)

Here, from 9 negative tokens take out 6 positive tokens. But there is no positive token to be token out in the set

So, we put an extra 6 zero pairs of negatives and positive tokens.

Thus, we get



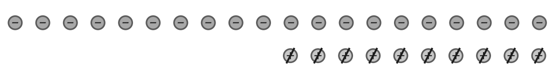
Now, we can take away 6 positive tokens

Hence, (9) (6) 15

(d) Given, (10) (10)

Here from 10 negative tokens take away 10 positive tokens. But there is no positive token to be taken away in the set. So we put an extra 10 zero pairs of negative and positive tokens.

Thus, we get



Now, we can take away 10 positive tokens.

Hence, (10) (10) 20

17. The Kuttand (Karttanand) in kerala is the lowest point in India on land. It's height is 2.2 meters.

18. The highest point in India is Kanchenjunga. It's height is 8,586 meters with respect to the sea level.

19. The Deccan Pitaeau in India is the highest piateau. Its aaverage elevation is 600-900 metres approx above the level.

20. (i) (a) (ii) (d) (ii) (c)

21. (i) (b) 5 (ii) (c) 8

(iii) (a) 14 (iv) (c) 13

(v) (b) 5 4 3 2 1 0 1 2 3 9

22.

○ + △ = 8

○ – △ = 4

2 ○ = 12

Adding these two

= 2 ○ = 12 ○ = $\frac{12}{2}$ = 6

○ = 6

and 6 + △ = 8

So, △ = 8 – 6 = 2

△ = 2

☆ – □ = □

☆ = □ + □ = 2 □

□ + ☆ = 12

□ + 2 □ = 12

3 □ = 12

□ = 4

Here, 2 + ☆ = 12

☆ = 8

Now, △ + ○ – ☆ + □

= 2 + 6 – 8 + 4

= 4