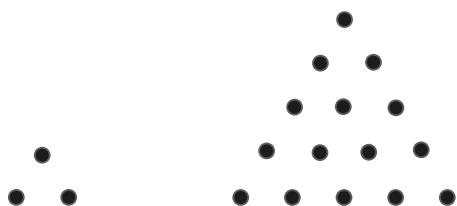


Patterns in Mathematics

Text Book Exercise 1.1

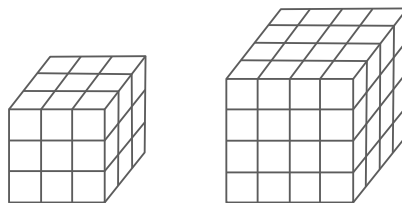
1. Numbers 1, 3, 6, 10, 15, are called triangular numbers because they can be represented by dots arranged in the shape of an equilateral triangle. For example : 3, dots form a triangle with two at the bottom and one at the top. As well 15 dots can be arranged as an equilateral triangle. Five at the bottom and above them respectively four, three, two and one. Look at the figures.



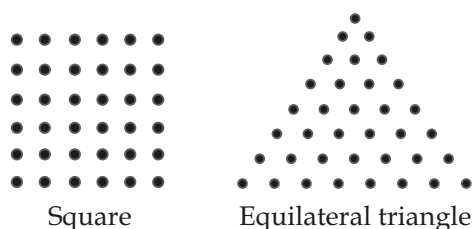
The numbers 1, 4, 9, 16, 25, are called squares because they can be arranged in a square grid, like 4 dots forming 2×2 square and 25 dots form a grid of 5×5 .



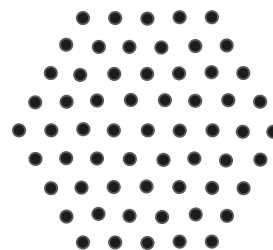
The numbers 1, 8, 27, 64, 125, represent the small cubes that fit into a larger cube with each number being the cube of an integer like $3 \times 3 \times 3$ for 27.



2.



3.



61

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

$$2^0 \rightarrow \square \text{ (1 block)}$$

$$2^1 \rightarrow \square \square \text{ (2 block)}$$

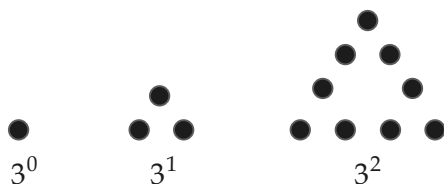
$$2^2 \rightarrow \square \square \square \square \text{ (4 block)}$$

$$2^3 \rightarrow \square \square \square \square \square \square \square \square \text{ (8 block)}$$

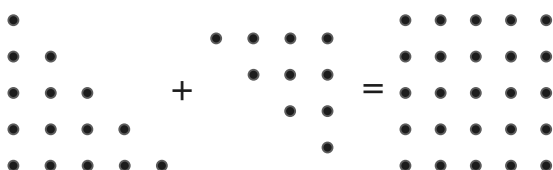
Similarly, we can move for more.

- (ii) Yes, the sequence of powers of 3 can be visualises triangular numbers represent power of 3 (

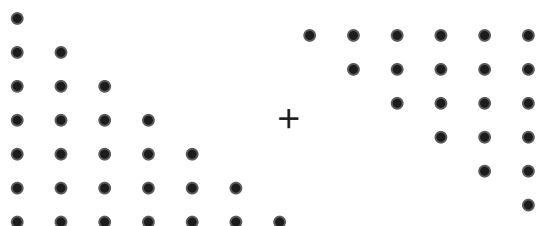
$3^0, 3^1, 3^2, \dots$) using triangular arrays of dots or blocks with each triangle's area growing exponentially.



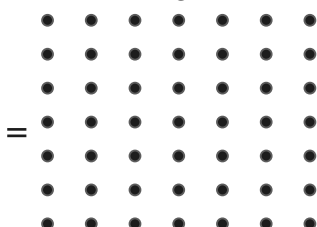
5. We place two triangular shapes obtained by adding upwards and downwards together. We get a square shape *i.e.*, 1 2 3 4 5 and 4 3 2 1



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, 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

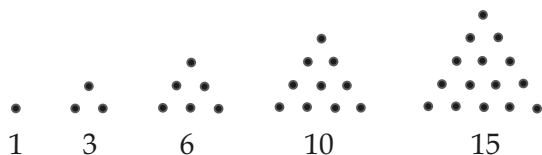
1, 0, 1, 0

8. When we start to add the counting numbers up, we get the sequence of triangular numbers. The n th 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 n th triangular can be calculated using the formula, $T_n = \frac{n(n+1)}{2}$. 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 ($2^2, 3^2, 4^2, \dots$)

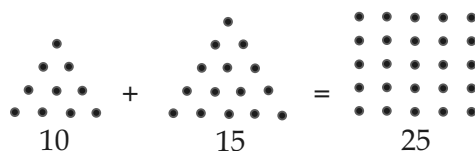
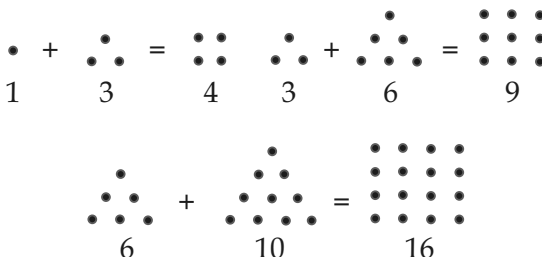
Explanation : Identify the pairs of consecutive triangular numbers

$$\begin{array}{ll} 1 & 1, & 1 & 3 & 4 \\ 3 & 6 & 9, & 6 & 10 & 16 \\ 10 & 15 & 25, & 15 & 21 & 36 \end{array}$$

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.

$$\begin{array}{l} 1 \quad 1, \\ 1 \quad 2 \quad 3 \\ 1 \quad 2 \quad 4 \quad 7, \\ 1 \quad 2 \quad 4 \quad 8 \quad 15 \\ 1 \quad 2 \quad 4 \quad 8 \quad 16 \quad 31, \\ 1 \quad 2 \quad 4 \quad 8 \quad 16 \quad 32 \quad 63 \end{array}$$

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.

$$\begin{array}{ll} 3 & 1 \quad 2 \quad 2^1, & 7 & 3 \quad 4 \quad 2^2 \\ 15 & 7 \quad 8 \quad 2^3, & 31 & 15 \quad 16 \quad 2^4 \\ 63 & 31 \quad 32 \quad 2^5 \end{array}$$

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

$$\begin{array}{ll} 1 & 1 \quad 2 \quad 2^1, & 3 & 1 \quad 4 \quad 2^2 \\ 7 & 1 \quad 8 \quad 2^3, & 15 & 1 \quad 16 \quad 2^4 \\ 31 & 1 \quad 32 \quad 2^5, & 63 & 1 \quad 64 \quad 2^6 \end{array}$$

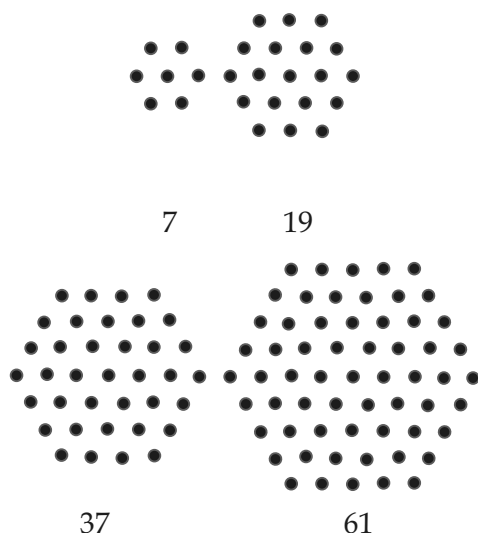
This happens because we are adding 1 to the every term of the series. So, adding 1, the power 2 is increased.

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.



12. The hexagonal numbers are 1, 7, 19, 37, 61, 91,

Adding 1 to them we get :

$$1 \quad (1)^3$$

$$1 \quad 7 \quad 8 \quad (2)^3$$

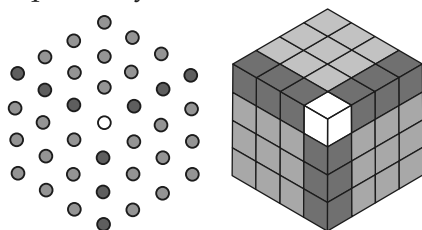
$$1 \quad 7 \quad 19 \quad 27 \quad (3)^3$$

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

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

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

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., $5^0, 5^1, 5^2, 5^3, 5^4, \dots$)

Concept Drill Exercise 1.1

- Square Number
- True
- (b) 1, 3, 6, 10, 15 (This is a sequence of triangular numbers.)
- ☐ , ☐

Textbook Exercise 1.2

- (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.

$$\frac{\text{Previous}}{1}, \frac{2 \swarrow 3}{1 \quad 4}$$

Concept Drill Exercise 1.2

1. Repeating

2. True

3. 1, 3, 5, 7, 9; square form :

$$1 + 3, 1 + 3 + 5, 1 + 3 + 5 + 7,$$

$$1 + 3 + 5 + 7 + 9$$

4. By optimizing arrangements, predicting outcomes and efficiently using space in areas like design construction and planning.



Lines and Angles

Textbook Exercise 2.1

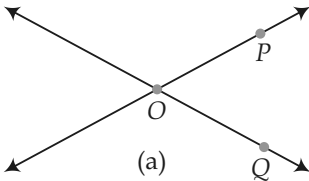
- (a) Infinite
(b) Only one unique line
- Line segments are $\overline{LM}$, $\overline{MP}$, $\overline{PQ}$ and $\overline{QR}$.

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

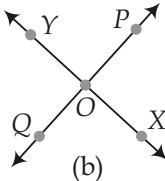
Point M, P and Q are on two of the line segments $\overline{LM}$, $\overline{MP}$, $\overline{PQ}$ and $\overline{QR}$.

- 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 .

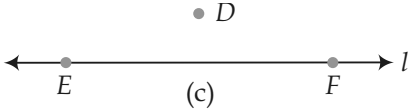
If we consider N as initial point, we get NB ray.

- 

(a)

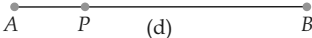


(b)



(c)

(d) Point P lies on AB .



(d)

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

(b) DB is a line.

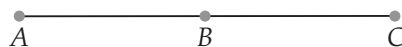
(c) Four rays are OB, OC, OD, OE, EB .

(d) Five line segments are DE, EO, OB, OC, DO .
- (a) Yes, we can name it as ray OB because starting point and the direction remain same.

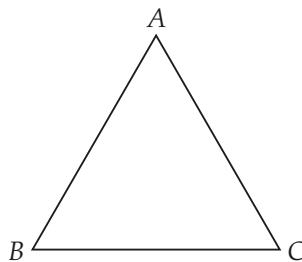
(b) We can not write ray OA as AO because starting point of the ray is O , not A . Also direction of the ray will be changed.

Concept Drill Exercise 2.1

- (a) If three points are collinear, a single line segment can be drawn joining them

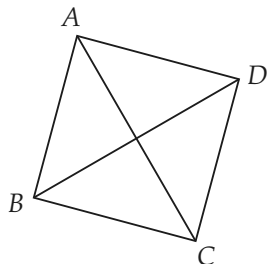


If three points are non-collinear, three line segments can be drawn. Since, three non-collinear points are used to form a triangle.



Line segments AB, BC, CA .

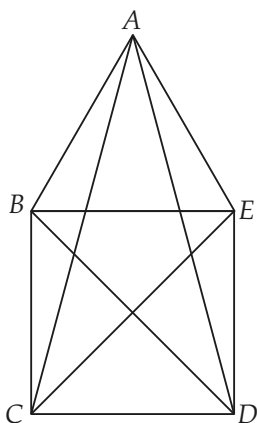
- (b) 6 line segments can be formed joining four points in which three points are non-collinear.



Line segments are AB , BC , CD , DA , AC and BD .

- (c) A line segment consists always of 2 points. Thus, the total number of line segments that can be drawn joining 5 points are 10.

Or The formula for calculating the number of line, that can be drawn through n collinear points. (Here $n = 5$).



Number of lines

$$\frac{n(n-1)}{2}$$

$$\frac{5(5-1)}{2} = 10 \text{ line segment.}$$

Line segments are

$AB, BC, CD, DE, EA, AC, AD, BD, BE, CE$.

2. As initial point is O . Hence, rays are OA, OB, OC and OD .

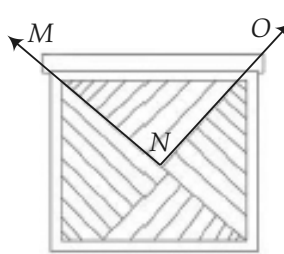
3. Since, points A, B, C are collinear, therefore line segments will be $\overline{AB}, \overline{AC}, \overline{BC}$. The line will be AC .

The rays depends on the initial point, so rays will be AC (if A consider as initial point), BC (if B consider as initial point), CA (if C consider starting point) and BA (if B consider starting point).

4. In the figure, O is the initial point, so rays are OA, OB, OC, OD, OE, OF .

Textbook Exercise 2.2

1. (a) ADB , BDC and vertex D .
 (b) MNO , Vertex; N
 (c) LMN , vertex M .

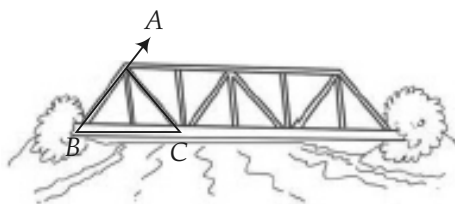


(b)



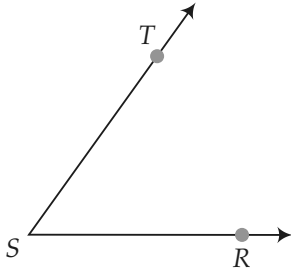
(c)

- (d) ABC , vertex; B



(d)

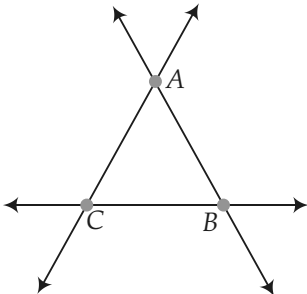
2.



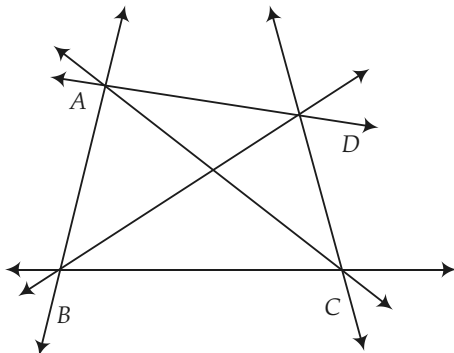
3. At point P there are three different angles. P may be meant APB or APC or BPC . To identify, we have to name them as APC or APB or BPC .

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..

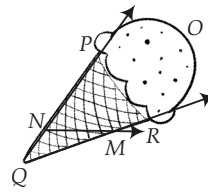


These lines are AB, BC, CD, DA, AC and BD . Also, we get twelve angles. These angles are

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

Concept Drill Exercise 2.2

1. (a)

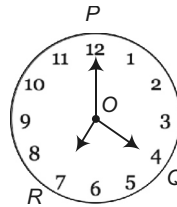


Vertices : Q and N .

Arms : PQ, QR, QN, MN .

Angles : PQR, MNQ .

(b)

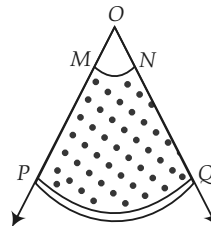


Vertex : O .

Arms : OP, OR, OQ .

Angles : ROQ, POR .

(c)

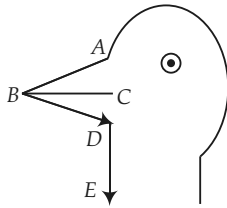


Vertex : O .

Arms : OM, ON, OP, OQ .

Angles : MON, POQ .

(d)

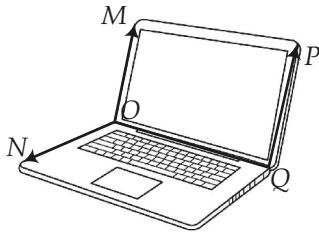


Vertices : B and D .

Arms : AB, BD, DE .

Angles : ABD, BDE .

(e)

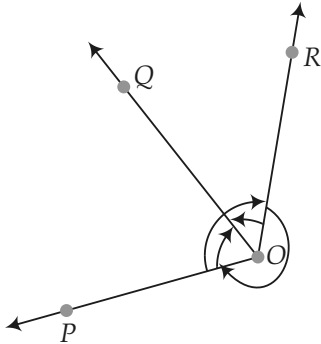


Vertices : O, Q .

Arms : OM, ON, OQ, PQ .

Angles : MON, PQO .

2.



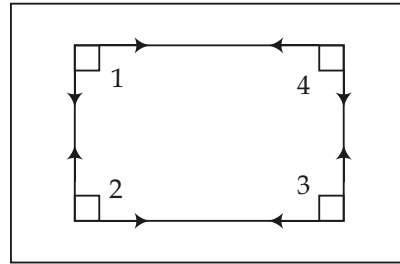
POQ, QOR, POR refer ROP

3. At point O , there are three different angles. O may be MON or NOQ or MOQ . We cannot label three different angles with same vertex. So to identify these angles we have to name them as MON or NOQ or MOQ . It should be noted that only one point can never for an angle.

4. AOB, COB, COD, AOD .

Textbook Exercise 2.3

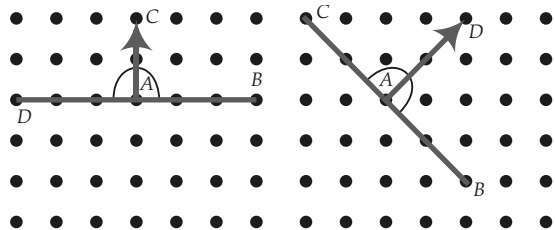
1.



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

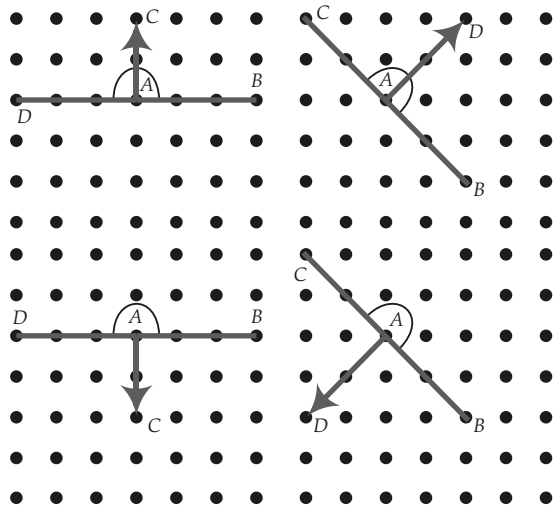
Yes, we see many other right angles at corners of the door, at corners of the greenboard, at corners of the classrooms, etc.

2.



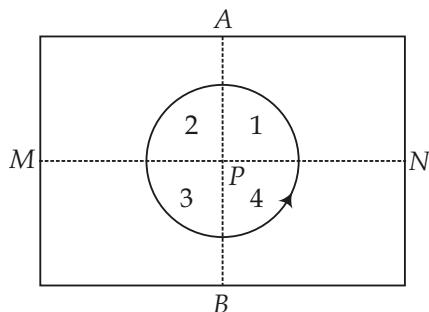
This can be done in only one way.

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.

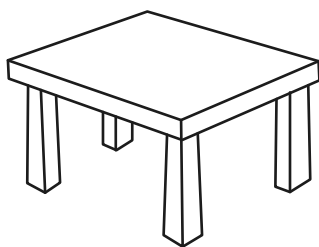
Step IV. Crease the fold.

Step V. Unfold both the crease.

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

Concept Drill Exercise 2.3

1.

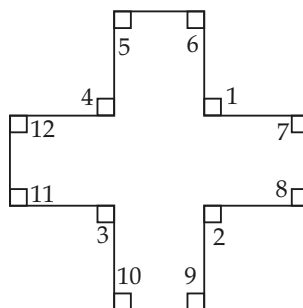


Four right angles at the square or rectangular shaped top-board and 8 right angles are made by four legs with board.

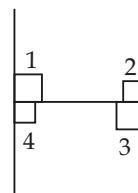
Hence, total right angles 4 + 8 = 12.

No, there is no smaller or larger angle than a right angle in it.

2. There are 12 right angles in total, 4 outside the shape and 8 inside it.



3. The letter H has four right angles.



4. A right angle forms, when two lines are perpendicular to each other. It's measurement is of 90° .

Textbook Exercise 2.4

1. On measuring, we get the following measures

(a) $\angle HJ$ 47° , (b) $\angle IHJ$ 24° ,

(c) $\angle IHJ$ 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°

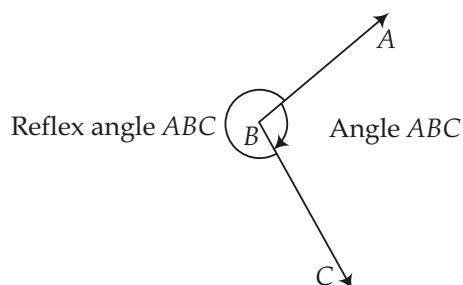
Angles of each corners of window

90°

3. (a) $\angle HJ$ 42° , (b) $\angle IHJ$ 116° .

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

4. We measure a reflex angle.



For this measure the smaller angle $ABC = 103^\circ$. We know a turn makes an angle of 360° .

Reflex $ABC = 360^\circ - \text{smallest } ABC$

Reflex $ABC = 360^\circ - 103^\circ = 257^\circ$.

5. (a) 80° , (b) 120° , (c) 60° , (d) 130° ,
(e) 130° , (f) 60° .
6. (a) $BXE = 115^\circ$, (b) $CXE = 85^\circ$,
(c) $AXB = 65^\circ$,
(d) $BXC = 95^\circ$, $AXC = 65^\circ$, $AXB = 30^\circ$.
7. $PQR = 45^\circ$, $PQS = 100^\circ$,
 $PQT = 150^\circ$.
8. Students should do it themselves with the help of their teachers or parents or class-mates.
9. For figure (a),

$A = 43^\circ$, $B = 65^\circ$, $C = 72^\circ$

$A + B + C$

$43^\circ + 65^\circ + 72^\circ = 180^\circ$.

For figure (b),

$A = 54^\circ$, $B = 65^\circ$, $C = 61^\circ$

$A + B + C = 54^\circ + 65^\circ + 61^\circ = 180^\circ$

For figure (c),

$A = 30^\circ$, $B = 50^\circ$, $C = 100^\circ$

$A + B + C$

$30^\circ + 50^\circ + 100^\circ = 180^\circ$

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

Concept Drill Exercise 2.4

1. $ABC = 10^\circ$, $DEF = 20^\circ$, $GHI = 30^\circ$,
 $JKL = 40^\circ$, $MNO = 50^\circ$, $PQR = 60^\circ$.
2. The four corners of bed and its legs indicate angle of 90° .

Four corners of study table and its legs make angle of 90° .

The corners of books and notebooks make the angle of 90° .

Corners of the gates and windows make the angle of 90° .

Four corners of the calendar hanging on the wall make the angle of 90° .

Corners of tiles on the floor make the angle of 90° .

3. Here,
 $ABC = 43^\circ$, $DEF = 39^\circ$, $GHI = 111^\circ$,
 $MNO = 89^\circ$, $JKL = 34^\circ$.

None of these angles can be measured by self made protractor as no degree measure of angles divide 360° without leaving a remainder.

4. $BOD = 45^\circ$, $COB = 45^\circ$,
 $DOA = 135^\circ$, $AOC = 135^\circ$.

Textbook 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, $360^\circ \div 12 = 30^\circ$.

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

$$2 \quad 30 \quad 60 .$$

Angle between hands at 4 o'clock

$$4 \quad 30 \quad 120 .$$

Angle between hands at 6 o'clock

$$6 \quad 30 \quad 180 .$$

(c) Angle between hands at 3 o'clock

$$3 \quad 30 \quad 90 .$$

Angle between hands at 5 o'clock

$$5 \quad 30 \quad 150 .$$

Angle between hands at 7 o'clock

$$7 \quad 30 \quad 210 .$$

Angle between hands at 8 o'clock

$$8 \quad 30 \quad 240 .$$

Angle between hands at 9 o'clock

$$9 \quad 30 \quad 270 .$$

Angle between hands at 10 o'clock

$$10 \quad 30 \quad 300 .$$

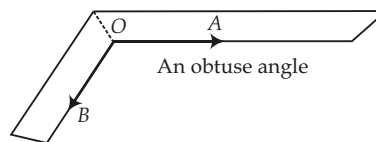
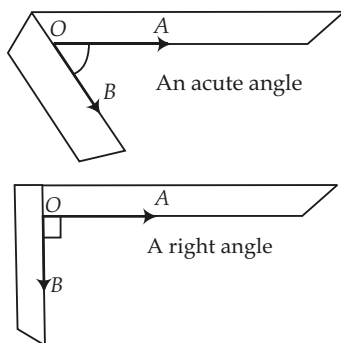
Angle between hands at 11 o'clock

$$11 \quad 30 \quad 330 .$$

and angle between hands at 12 o'clock

$$12 \quad 30 \quad 0 \text{ or } 360^\circ.$$

2. Yes, it is possible.

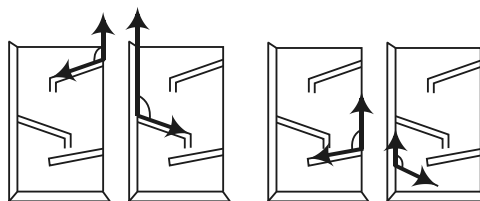


Here, vertex is O and arms are OA and OB .

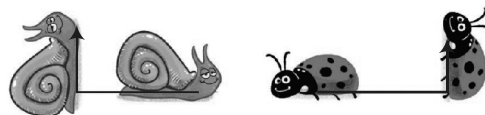
3. Yes, an angle can be seen by us.

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 slopes, therefore four angles can be formed with the side.

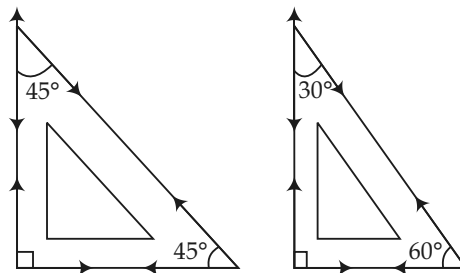


5. Both the insects are being rotated at an angle of 90° clockwise.



Concept Drill Exercise 2.5

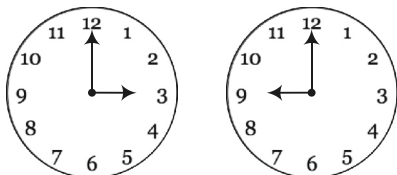
1. There are two set squares in the geometrical box. One of them has two equal sides, so it forms 90° , 45° , 45° angles and second form an 90° , 30° , 60° angles, as it's one side is double to the another.



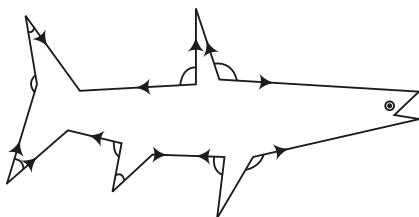
There are six angles in two figures.

Both the set squares form two sets of angles of same size.

2. 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.

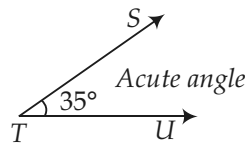
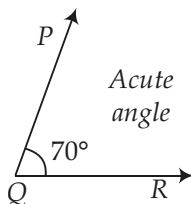
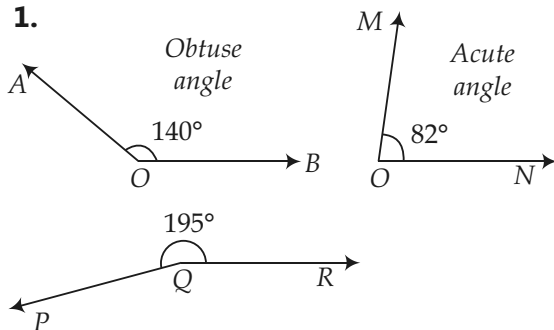


3. At both the times of 0 o'clock and 12 o'clock hands of the clock are at 12. In this position hands may form an angle of 0° or 360° . In starting, the angle will be called 0° and when it is twelve the angle will be 360° .
4. In the figure angles formed in the body of the fish are highlighted by arrows and angle marks.



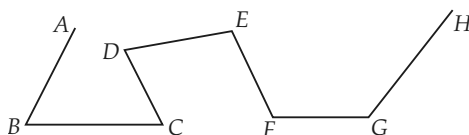
Textbook Exercise 2.6

1.



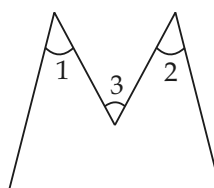
2. (a) 43 , on meaning we get, 45° (acute angle)
 (b) 159 , on meaning we get, 165° (obtuse angle)
 (c) 121 , on meaning we get, 120° (obtuse angle)
 (d) 33 , on meaning we get, 30° (acute angle)
 (e) 92 , on meaning we get, 95° (obtuse angle)
 (f) 355 , on meaning we get, 350° (reflex angle)

3.



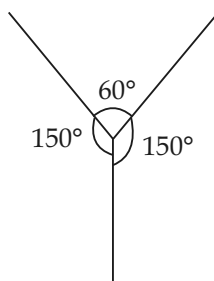
Acute angles ABC , DCB , EDC ,
 Right angle DEF ,
 Obtuse angles EFG , HGF .

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 .

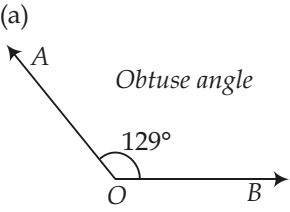
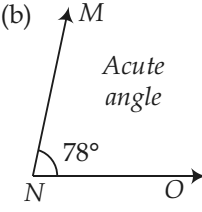
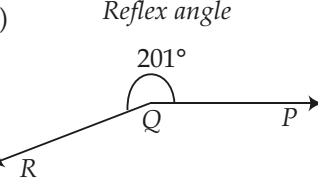
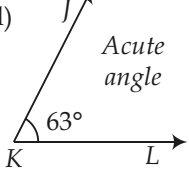
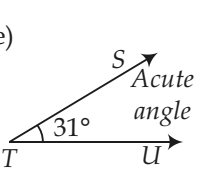
7. Let the degree measure of the angle be A , then $5A = 90$ but $4A = 90$.

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

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

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

Concept Drill Exercise 2.6

1. (a)  (b) 
- (c) 
- (d)  (e) 

Steps for construction for angle :

Step I. Draw a line segment OB with the help of base line of protractor.

Step II. Place the centre point of the protractor at O and align OB to the O line.

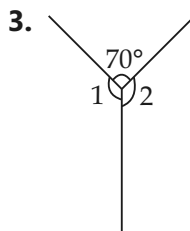
Step III. Now starting O , count degrees upto 129 on the protractor. Mark point A at the label 129 .

Step IV. Using a rule join point A to point O .

So, $\angle AOB = 129^\circ$

Similarly, write steps for other angles.

2. (a) $a = 50$ (Acute angle)
 (b) $b = 183$ (Reflex angle)
 (c) $c = 215$ (Reflex angle)
 (d) $d = 135$ (Obtuse angle)
 (e) $e = 20$ (Acute angle)
 (f) $f = 101$ (Obtuse angle)



A full turn forms an angle of 360° .

$$1 + 2 = 70 + 360$$

$$1 + 2 = 360 + 70 = 290$$

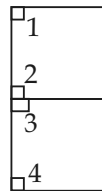
Since, third vertical line bisects the angle 290° .

So, $1 = 2$

$$2 = 1 = \frac{290}{2} = 145$$

Yes, they are equal.

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



Number Play

Textbook 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 $\frac{n+1}{2}$

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
------	------	------	------	------	------	------

Concept Drill Exercise 3.1

- We use the formula $\frac{n-1}{2}$, where n is odd number and expresses total number of cells in the table.

$$\text{Number of supercells} = \frac{57-1}{2} = \frac{56}{2} = 28.$$

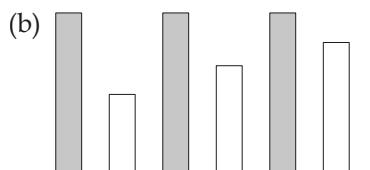
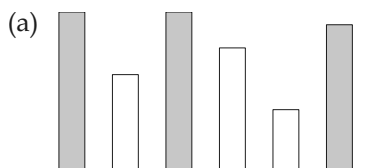
- Here, $n = 66$ an even number.

$$\text{Hence, maximum number of supercells in the table} = \frac{n}{2} = \frac{66}{2} = 33.$$

3.

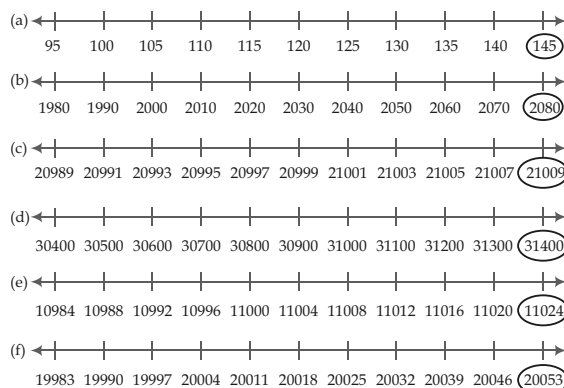
5681	4979	2455	7321	5642	8341	7101	6000
------	------	------	------	------	------	------	------

- The two arrangements are as follows :



Textbook Exercise 3.2

1.



- 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 is 59.

(c) The largest 5-digit number whose digit sum is 14 is 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 is 92111.

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

- 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.

Concept Drill Exercise 3.2

- Two digits, three digits, four digits and five digits have numbers respectively 99 9 90, 999 99 900, 9999 999 9000 and 99999 9999 90000.

2.

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

3.

Number	1234	2345	3456	4567	5678	6789
Sum of digits	10	14	18	22	26	30

Number	9876	8765	7654	6543	5432	4321
Sum of digits	30	26	22	18	14	10

If the digits are taken in ascending order, then six numbers can be formed.

When the digits are taken in descending order other six numbers are formed.

Hence total numbers formed

6 6 12

Yes, there is a pattern, the difference between two consecutive sums is 4.

Textbook Exercise 3.3

- (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
$\begin{array}{r} 8653 \\ - 3568 \\ \hline 5085 \end{array}$	$\begin{array}{r} 8550 \\ - 0558 \\ \hline 7992 \end{array}$	$\begin{array}{r} 9972 \\ - 2799 \\ \hline 7173 \end{array}$	$\begin{array}{r} 7731 \\ - 1377 \\ \hline 6354 \end{array}$	$\begin{array}{r} 6543 \\ - 3456 \\ \hline 3087 \end{array}$
	Round VI	Round VII		
	$\begin{array}{r} 8730 \\ - 0378 \\ \hline 8352 \end{array}$	$\begin{array}{r} 8532 \\ - 2358 \\ \hline 6174 \end{array}$		

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

Concept Drill Exercise 3.3

1. The largest numebr formed using the digits 1, 2, 3, 4, 7 74321

and the smallest number 12347

- (a) The sum of these two numbers

$$74321 + 12347 = 86668$$

$$86668 - 99999 = -13331$$

No, the number 86668 is a palindrome numbers.

- (b) The difference 74321 12347

$$74321 - 12347 = 61974$$

Yes, number 61974 is not a palindrome

- (c) Sum of the numbers 86668

$$86668 + 61947 = 148615$$

$$148615 - 148615 = 0$$

Not a palindromic number

- (d) Diffrence 86668

$$86668 - 61947 = 24721$$

$$24721 - 24721 = 0$$

Not a palindromic number.

(e) Only (a) is palindrome numbers, others are not.

2. 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)

3. It is time now 01:10

next palindromic time 02:20

So, 2:20 1:10 70 minutes or after 1 hour 10 minuts.

4. The largest number formed 9865

The smallest number formed 5689

Round I	Round II
$\begin{array}{r} 9865 \\ - 5689 \\ \hline 4176 \end{array}$	$\begin{array}{r} 7641 \\ - 1467 \\ \hline 6174 \end{array}$

The Kaprekar constant

Hence, in two rounds number 8965 will reach kaprekar constant.

Textbook Exercise 3.4

1. Divide 90,250 by 2.

$$\begin{array}{r} 90,250 \\ 2 \\ \hline 45,125 \end{array}$$

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

$\begin{array}{r} 53,325 \\ 98,450 \\ \hline \end{array}$	$\begin{array}{r} 46,398 \\ 93,641 \\ \hline \end{array}$
---	---

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.

$$\begin{array}{r} 99001 \\ + 999 \\ \hline 100000 \end{array} \quad \begin{array}{r} 99002 \\ + 999 \\ \hline 100001 \end{array} \quad \begin{array}{r} 99856 \\ + 583 \\ \hline 100439 \end{array}$$

and so on.

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

$$\begin{array}{r} 1,000 \\ + 1,000 \\ \hline 2,000 \end{array}$$

a four digit number

Now take a maximum 4-digit number 9999 and add

$$\begin{array}{r} 9999 \\ + 9999 \\ \hline 19,998 \end{array}$$

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.

$$\begin{array}{r} 56873 \\ + 62391 \\ \hline 119264 \end{array} \quad \begin{array}{r} 99876 \\ + 12341 \\ \hline 112217 \end{array}$$

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 number
gives a 4-digit number

$$\begin{array}{r} 10385 \text{ (a 5-digit number)} \\ 968 \text{ (a 3-digit number)} \\ \hline 9417 \text{ (a 4-digit number)} \end{array}$$

- (h) $\begin{array}{r} 19346 \text{ (a 5-digit number)} \\ 9876 \text{ (a 4-digit number)} \\ \hline 9470 \text{ (a 4-digit number)} \end{array}$

- (i) $\begin{array}{r} 72493 \text{ (a 5-digit number)} \\ 72143 \text{ (a 5-digit number)} \\ \hline 350 \text{ (a 3-digit number)} \end{array}$

- (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) $\begin{array}{r} 23,240 \\ 30,000 \\ \hline 53,240 \end{array} \text{ (5-digit number)}$

But 52000

$$\begin{array}{r} 63243 \\ \hline 1,15,243 \end{array} \text{ (6-digit number)}$$

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

For example :

$$\begin{array}{r}
 3568 \text{ (4-digit number)} \\
 + 99 \text{ (2-digit number)} \\
 \hline
 3667 \text{ (4-digit number)} \\
 + 9999 \text{ (4-digit number)} \\
 \hline
 11 \text{ (2-digit number)} \\
 \hline
 10,000 \text{ (5-digit number)}
 \end{array}$$

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

For example :

$$\begin{array}{r}
 8468 \text{ (4-digit number)} \\
 + 99 \text{ (2-digit number)} \\
 \hline
 8567 \text{ (4 digit-number)} \\
 + 9999 \text{ (4-digit number)} \\
 \hline
 99 \text{ (2-digit number)} \\
 \hline
 10098 \text{ (5-digit number)}
 \end{array}$$

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

For example :

$$\begin{array}{ll}
 \text{(i)} & \begin{array}{r} 98,546 \text{ (5-digit number)} \\ + 32,638 \text{ (5-digit number)} \\ \hline 65,908 \text{ (5-digit number)} \end{array} \\
 \text{(ii)} & \begin{array}{r} 40,907 \text{ (5 digit number)} \\ + 38562 \text{ (5-digit number)} \\ \hline 2,345 \text{ (4-digit number)} \end{array} \\
 \text{(iii)} & \begin{array}{r} 85,996 \text{ (5-digit number)} \\ + 85684 \text{ (5-digit number)} \\ \hline 312 \text{ (3-digit number)} \end{array}
 \end{array}$$

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

For example :

$$\begin{array}{ll}
 \text{(i)} & \begin{array}{r} 23465 \text{ (5-digit number)} \\ + 99 \text{ (2-digit number)} \\ \hline 23,366 \text{ (5-digit number)} \end{array}
 \end{array}$$

$$\begin{array}{ll}
 \text{(ii)} & \begin{array}{r} 10000 \text{ (5-digit number)} \\ + 86 \text{ (2-digit number)} \\ \hline 9914 \text{ (4-digit number)} \end{array}
 \end{array}$$

Concept Drill Exercise 3.4

- 23,000 800 800 24,600
 - 26,000 1200 1200 28,400
 - 50,000 800 1200 52,000
 - 1200 800 800 2,800
 - 50000 23000 1200 28,200
 - 50000 26000 23000 53000
 - 23,000 800 1200 25000
 - 50,000 23,000 1200 800 75,000

$$\begin{array}{ll}
 \text{2. (a) Half of 85,231} & \begin{array}{r} 85,231 \\ \hline 2 \end{array} 42615.5 \\
 \text{Hence,} & \begin{array}{r} 42,615 \text{ (5-digit)} \\ + 43,616 \text{ (5-digit)} \\ \hline 86,231 \end{array}
 \end{array}$$

- (b) The largest digit is 9 and
9 9 18 (2-digit)
It is impossible to get 3-digit
number.

$$\begin{array}{ll}
 \text{(c) Half of 8, 74,65} & 4,37,32.5 \\
 \text{Hence,} & \begin{array}{r} 51733 \text{ (5-digit)} \\ + 35432 \text{ (5-digit)} \\ \hline 87,165 \text{ (5-digit)} \end{array}
 \end{array}$$

- (d) The smallest 5-digit number is
10,000

$$\begin{array}{ll}
 \text{Hence,} & \begin{array}{r} 10,000 \text{ (5 digit)} \\ + 10,000 \text{ (5-digit)} \\ \hline 20,000 \text{ (5-digit)} \end{array}
 \end{array}$$

It is impossible to get 17,000 as a
sum.

$$\begin{array}{ll}
 \text{(e)} & \begin{array}{r} 999 \text{ (3-digit)} \\ + 999 \text{ (3-digit)} \\ \hline 1998 \text{ (4-digit)} \end{array}
 \end{array}$$

It is impossible to get a 5-digit
number.

$$\begin{array}{r} \text{(f)} \quad 61308 \quad (5\text{-digit}) \\ \quad 21212 \quad (5\text{-digit}) \\ \hline \quad 40096 \end{array}$$

$$\begin{array}{r} \text{(g)} \quad 109344 \quad (6\text{-digit}) \\ \quad 99346 \quad (5\text{-digit}) \\ \hline \quad 9898 \quad (4\text{-digit}) \end{array}$$

- (h) This number is close to the largest 5-digit number 99999. So, the difference of two 5-digit numbers cannot be 93,856.

$$\begin{array}{r} \text{(i)} \quad 35648 \quad (5\text{-digit}) \\ - 35616 \quad (5\text{-digit}) \\ \hline \quad 32 \quad (2\text{-digit}) \end{array}$$

$$\begin{array}{r} \text{(j)} \quad 10369 \quad (5\text{-digit}) \\ - 4846 \quad (4\text{-digit}) \\ \hline \quad 5523 \quad (4\text{-digit}) \end{array}$$

3. (a) The largest digit is 9, so, 9 9 18 (a 2-digit number).

Hence, 1-digit number 1 digit number is always gives a 2-digit number because sum of two digits is 10 to 19.

$$\begin{array}{r} \text{(b) (i)} \quad 5685 \quad (4\text{-digit number}) \\ \quad 7843 \quad (4\text{-digit number}) \\ \hline \quad 13528 \quad (5\text{-digit number}) \end{array}$$

$$\begin{array}{r} \text{(ii)} \quad 2564 \quad (4\text{-digit number}) \\ \quad 3857 \quad (4\text{-digit number}) \\ \hline \quad 6421 \quad (4\text{-digit number}) \end{array}$$

Hence, 4-digit number 4 digit number sometimes gives 5-digit number. If two numbers are closed to largest number then sum is a fine digit number.

$$\begin{array}{r} \text{(c)} \quad 999 \quad (\text{largest } 3\text{-digit number}) \\ \quad 9999 \quad (\text{largest } 4\text{-digit number}) \\ \hline \quad 10998 \quad (5\text{-digit number}) \end{array}$$

Hence, 3 digit number 4-digit number *never* gives a 6-digit number.

$$\begin{array}{r} \text{(d)} \quad 68680 \quad (5\text{-digit number}) \\ \quad 68578 \quad (5\text{-digit number}) \\ \hline \quad 102 \quad (3\text{-digit number}) \end{array}$$

Hence, 5-digit number 5-digit number *sometimes* gives 3-digit number.

$$\begin{array}{r} \text{(e)} \quad 246825 \quad (6\text{-digit number}) \\ \quad 246825 \quad (6\text{-digit number}) \\ \hline \quad 0 \end{array}$$

Hence 6-digit numbers 6 digit number *always* gives zero, if two numbers are equal.

Textbook 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 smallest number 0378

Difference 8352

Round III

The largest number 8532

The smallest number 2358

Difference 6174

And, that is the Kaprekar 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 with 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 with 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 counted on festivals like Deepawali, Holi, Rakshabandhan, Eid, Barawafat, Christmas 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. However 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 is 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 subsequent (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.

Concept Drill Exercise 3.5

- 1.** If we interchange the first and last digits of the central number, 64,171, we will get the required result.

After make this interchange the grid will be as follows :

17,500	40,644	31,065
24,909	14,176	45,606
20,681	51,619	39,708

Supercells are, 24,909, 40,644, 45,606 and 51,619.

2. Reshma's mother's birth year is 1989
The largest number formed with these digits 9981

The smallest number formed 1899

$$\begin{array}{r} \text{Round I} \quad 9981 \\ \quad \quad 1899 \\ \hline \quad \quad 8082 \end{array}$$

Round II 8820 (The largest number)

$$\begin{array}{r} 0288 \text{ (The smallest number)} \\ \hline 8532 \end{array}$$

Round III 8532 (The largest number)

$$\begin{array}{r} 2358 \text{ (The smallest number)} \\ \hline 6174 \end{array}$$

And that the Kaprekar constant.

Hence, it took 3 rounds to reach the Kaprekar constant from 1989.

3. The even digits are 0, 2, 4, 6, 8 and the odd digits are 1, 3, 5, 7, 9.

(a) The largest number formed with odd digits 79531

The largest number formed with even digits 84620

It is clear that; 84620 79531

(b) The smallest number formed with odd digits 31579

The smallest number formed with even digits 26840

It is clear that; 31579 26840

(c) (i) The number formed with odd digits closer to 50000 51379

And number formed with even digits 48620

The difference between 50000 and 51379 51379 50000 1379

and the difference between 50000 and 48620 50000 48620 1380

Now, 1380 1379.

Hence, The group formed with odd numbers to closer to 50000.

(ii) If the digits might the repeated.

Then first number 51111 and second number 48888

For Ist group difference between 51111 and 50000

$$51111 \quad 50000 \quad 1111$$

For IInd group difference between 50000 and 48888

$$50000 \quad 48888 \quad 1112$$

$$1112 \quad 1111$$

Hence, in this case group formed with odd digits is closer to 50000.

4. If you use approximately 20 litres of water every day as a common man do, then the estimated amount of water to supply

$$25 \quad 200 \quad 5000 \text{ litres.}$$

■ ■

Data Handling and Presentation

Textbook Exercise 4.1

- The largest shoe size in the class is 7.
 - The smallest shoe size in the class is 3.
 - There are 10 students who wear shoe size 5.
 - There are 15 students who wear shoe size larger than 4.
- 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, 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	
5	10	
6	4	
7	1	

- 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	
Neem	20	
Banyan	7	
Tamorind	11	
Champaka	21	

Amaltash	4	
Bel	5	

- Champaka tree was found in the greatest number.
- Amaltash tree was found in the smallest number.
- 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

- The letter found the most number of times is 'e'.
- The letter found the least number of times is 'x'.
- List the five letter 'c', 'e', 'i', 'r' and 'x' in ascending order of the frequency.

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

- 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.
- This comparison should be made by the students themselves
- If we do this task again, then we shall adopt same process.

Concept Drill Exercise 4.1

- (i) ✗, (ii) ✓, (iii) ✓, (iv) ✗, (v) ✓, (vi) ✓, (vii) ✓, (viii) ✓, (ix) ✗, (x) ✗
- (a)

Class Name	No. of Absent Students	Tally Signs
Class I	15	
Class II	13	
Class III	7	
Class IV	8	
Class V	12	

- (i) 55 students, (ii) Class I, (iii) Class III, (iv) 12 students, (v) 13 students

3. (a) 9, 9, 9, 9, 9, 8, 8, 8, 8, 8, 7, 7, 7, 7, 7, 6, 6, 6, 6, 5, 5, 5, 5, 5, 5, 5, 4, 4, 4, 4, 4, 4, 3, 3, 3, 3, 3, 2, 2, 2, 2, 2, 1, 1, 1, 1, 1.

(b)

Date of Birth	No. of Students	Tally Marks
1st	5	
2nd	6	
3rd	6	
4th	7	
5th	7	
6th	4	
7th	5	
8th	5	
9th	5	

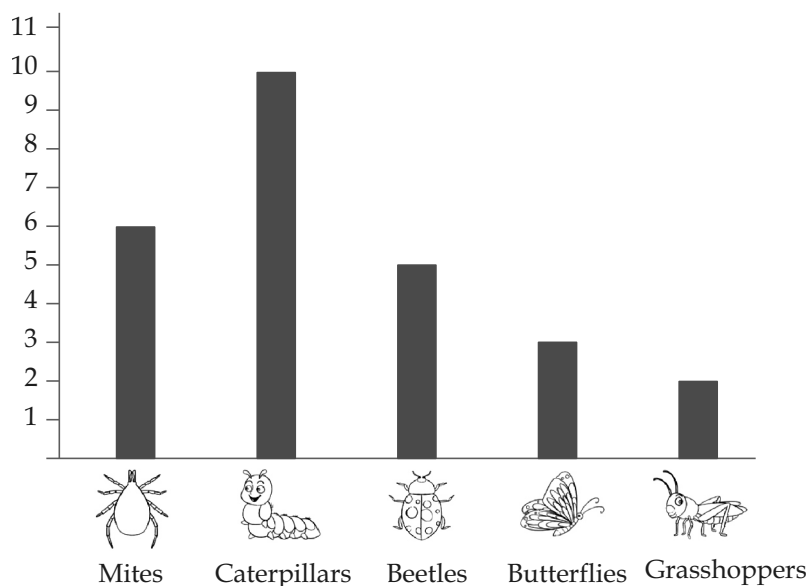
(c) It is 7.

(d) It is 5 5 0

(e) 7 4 5 5 21

Textbook Exercise 4.2

1. The bar graph below.



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

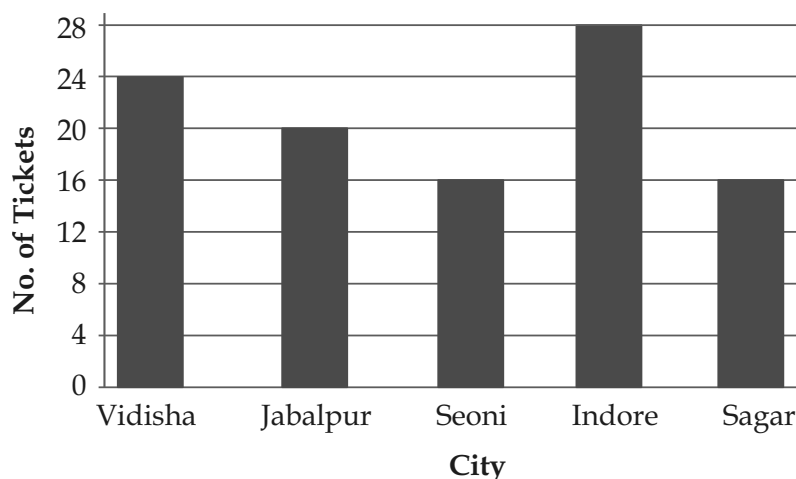
(b) The number of tickets sold for Jabalpur 20

(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.

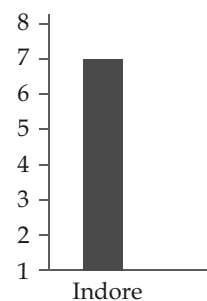


(e) The scale on the vertical line is given in above bar graph that is, 1 unit 4 tickets, 2 units 8, 3 units 12,.....

(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		13
Car		6
Bicycle		8
Scooter		9
Bus		4

Bullock cart		2
Auto		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		4
2		4
3		4
4		4
5		4
6		4

(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 wickets.

(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.

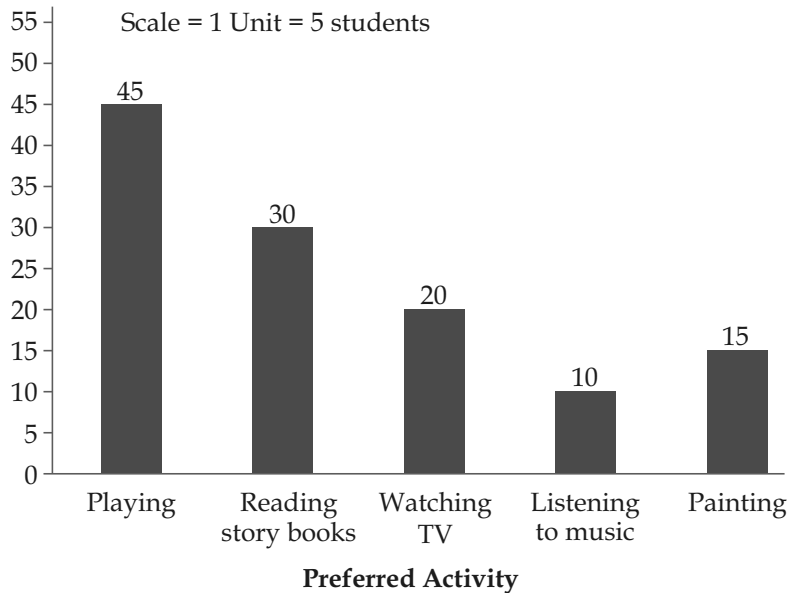
8. (a) Number of dogs in different villages are a multiples of 6. Hence, to draw a pictograph shall choose a scale 1  6 dogs.

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.

Concept Drill Exercise 4.2

1. (a) It is hotdog. (b) Burger and Patties.
 (c) No of plates of pizza are sold by the restaurant 5 2 10
 (d) Number of plates sold by patties 10 2 20,
 Number of plates sold by pastries 6 2 12,
 Difference 20 12 8 Plates.

- (e) Total number of plates sold 9 2 10 2 5 2 2 2 10 2 6 2
18 20 10 4 20 12 84 plates.

2. The pictograph drawn may be as below :

Name of the Fruits	Number of Persons ( 100 persons)
Mango	        
Apple	         
Guava	      
Papaya	   
Peach	 
Pomegranate	          

- (a) It is pomegranate. (b) It is apple.
(c) 850 1000 650 400 200 1100 4200 (d) It will be peach.

3. Frequency distribution table.

Bill, (in rupees)	No. of houses	Tally marks
108	4	
300	10	
320	6	
450	10	
540	4	
740	2	
780	4	

- (a) The highest bill ₹780
The lowest bill ₹108
Difference ₹672
(b) 4 households pay ₹108 for electricity bill.
(c) It is 10 6 10 4 30
(d) It is 10 4 2 4 20

4. The frequency table for related data :

Temperature C	Tally marks	Number of days
29		9
30		7
31		5
32		3
33		4
34		3

(a) It was 29 C.

(b) It was 34 C.

(c) 34 C 29 C 5 C

(d) 3 days

(e) 9 days.

Textbook Exercise 4.3

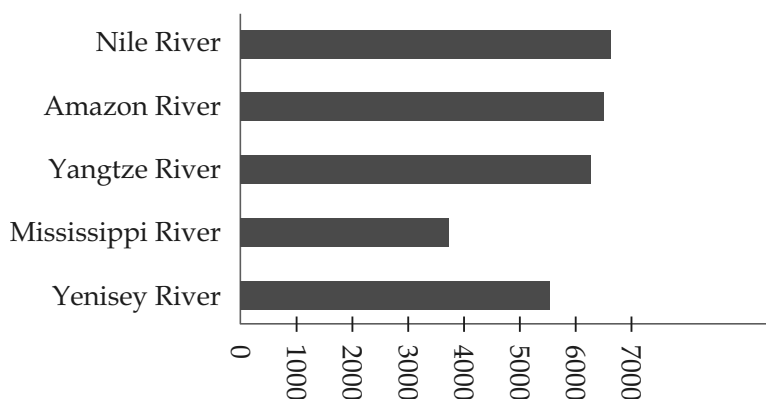
1. Graph with vertical bars. Vertical graphs are like pillars and show a better presentation of the person's height than that of horizontal graphs show.

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



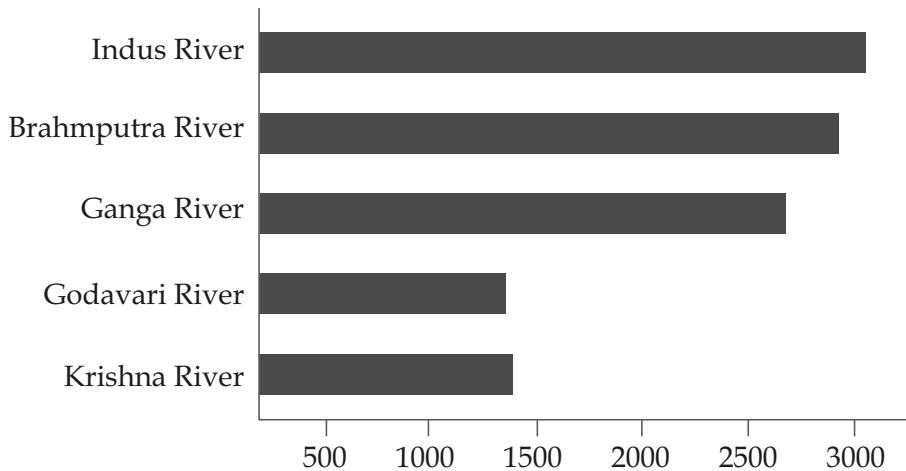
Concept Drill Exercise 4.3

1. I shall show them with the help of horizontal bars, because rivers flow on the ground horizontally.

It is also easy to compare them in one glance.

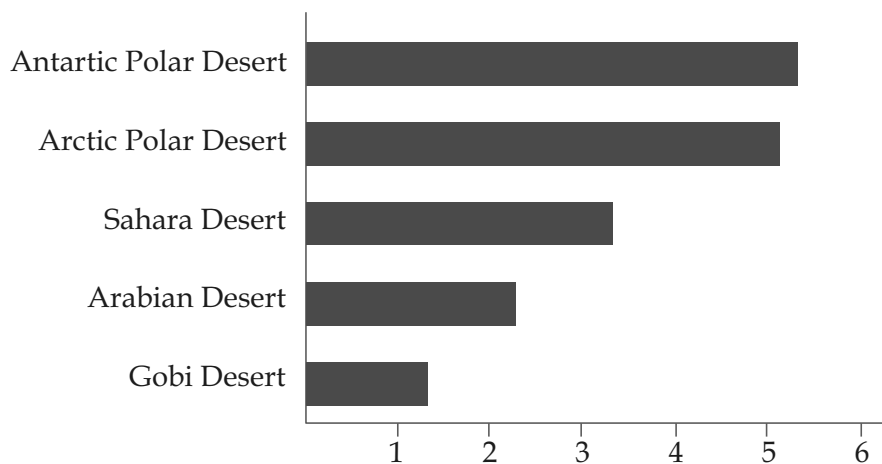
Rivers	Indus River	Brahmpu tra River	Ganga River	Godavari River	Krishna River
Length (in km)	3180	2900	2525	1450	1400

Scale : 1 unit = 500 km



2. We prefer to make bar graphs, with horizontally bars because the deserts lie on the land horizontally.

Scale : 1 unit = 1 million mile²



■ ■

Prime Time

Textbook 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.

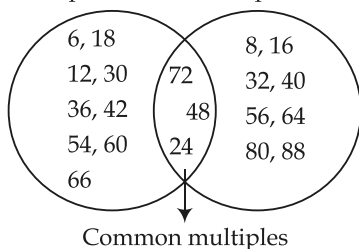
7. Factors of 28 = 1, 2, 4, 7, 14, 28.

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. Multiples of 6... Multiples of 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, $1 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

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, $2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 = 2520$

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

Concept Drill Exercise 5.1

1. (a) One of the factor of the number which is to identify is 9.

Multiples of 9: 9, 18, 27, 36, 45, 54, 63, 72, 81, 90. The number 72 is less than 80 and the sum of its digits $7 + 2 = 9$.

Hence, the number 72.

(b) 9 is a factor of the number we shall find out the multiples of 9 less than 100 and they are 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108.

The number is 99, because the difference between two digits, $9 - 9 = 0$.

Hence the number 99.

2. (a) Common factors of 16 and 40 except are :

$16 = 2 \times 2 \times 2 \times 2$ $40 = 2 \times 2 \times 2 \times 5$

The smallest common factor is 2. The highest common factor is $2 \times 2 \times 2 = 8$.

(b) Common factors of 35 and 42 :

$35 = 5 \times 7$

$42 = 6 \times 7$

There is only one common factor for both numbers.

Hence, the smallest and the highest common factor of 35 and 42 is 7.

(c) Common factors of 22 and 121 :

$22 = 11 \times 2$

$121 = 11 \times 11$

There is only one common factor for both numbers. Hence, the smallest and the highest common factor of 22 and 121 is 11.

(d) Common factors of 57, 114 and 171:

57 3 19
114 2 3 19
171 3 3 19

Hence, the smallest common factor 3

The highest common factor

3 19 57

3. Numbers 99 and 101 are very close to the number 100.

Factor of 99 1 3 3 11

or 1 9 11 or 1 3 33

Factors of 101 1 101.

The numbers 9 and 11 are very close to 10, and the least common multiple of both is 9 11 99.

Hence, the number for which Idli-vada was said for the first time is 99.

4. Factors of 39 1, 3, 13, 39.

Factors of 78 1, 2, 3, 13, 39, 78.

Common factors 1, 3, 13, 39.

Hence, jump sizes will land both 39 and 78 are 1, 3, 13, 39.

Textbook Exercise 5.2

- 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.
- 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.

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

Concept Drill Exercise 5.2

1. The largest prime number 97 and the least prime number 2.
Difference of two numbers
97 - 2 = 95.
The obtained result is a composite number as the factors of 95 are 1, 5, 19, 95.
2. 26 (3 × 23); 44 (3 × 41); 48 (7 × 41);
56 (3 × 53); 66 (5 × 61).
3. 25 = 3 × 5 × 17 (All three primes)
39 = 3 × 5 × 57 (All three primes)
55 = 3 × 5 × 47 (All three primes)
77 = 3 × 3 × 71 (All three primes)
87 = 3 × 5 × 79 (All three primes)
4. 66 = 2 × 3 × 11 (Product of three primes)
70 = 2 × 5 × 7 (Product of three primes)
85 = 5 × 17 (Product of two primes)

99 3 3 11 (Using only two primes)
 165 3 5 11 (Product of three primes)

Hence, the numbers 66, 70 and 165 are the product of three distinct primes.

Textbook 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 factorisation 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 multiply them together

2 3 5 30

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

(b) First four prime numbers 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

$$2 \times 3 \times 5 \times 7 = 210$$

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

Concept Drill Exercise 5.3

1. (a) Prime factorisation of 792

$$2 \times 2 \times 2 \times 3 \times 3 \times 11.$$

- (b) Prime factorisation of 810

$$2 \times 3 \times 3 \times 3 \times 3 \times 5.$$

- (c) Prime factorisation of 512

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2.$$

- (d) Prime factorisation of 1,512

$$2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7.$$

- (e) Prime factorisation of 1,104

$$2 \times 2 \times 2 \times 2 \times 3 \times 23.$$

- (f) Prime factorisation of 1,530

$$2 \times 3 \times 3 \times 5 \times 17.$$

- (g) Prime factorisation of 2,610

$$2 \times 3 \times 3 \times 5 \times 29.$$

- (h) Prime factorisation of 728

$$2 \times 2 \times 2 \times 7 \times 13.$$

- (i) Prime factorisation of 1,116

$$2 \times 2 \times 3 \times 3 \times 31.$$

- (j) Prime factorisation of 2,115

$$3 \times 3 \times 5 \times 47.$$

2. To find up the number, these prime factors are multiplied together.

So, two 2's three 3's two 5's
one 13

$$2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5 \times 13 = 35,100.$$

Thus, the number is 35,100.

3. To find these numbers, we prime factorise the given number 3,795.

$$3,795 = 3 \times 5 \times 11 \times 23$$

Obtained all numbers are less than 25 and their product is 3,795.

Hence, the four prime numbers whose product is 3,795 are 3, 5, 11 and 23.

4. (a) Prime factors of 34 = 2 × 17.

Prime factors of 56 = 2 × 2 × 2 × 7.

Prime factors of 91 = 7 × 13.

Combined prime factors of

$$34 \times 56 \times 91$$

$$2 \times 17 \times 2 \times 2 \times 2 \times 7 \times 7 \times 13$$

$$\text{or } 2 \times 2 \times 2 \times 2 \times 7 \times 7 \times 13 \times 17$$

- (b) Prime factors of 64

$$2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Prime factors of 81 = 3 × 3 × 3 × 3

Prime factors of 125 = 5 × 5 × 5

Combined factors of 64 × 81 × 125

$$2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 5$$

- (c) Prime factors of 168 = 2 × 2 × 2 × 3 × 7

Prime factors of 256

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Prime factors of 121 = 11 × 11

Combined prime factors of

$$168 \times 256 \times 121$$

$$2 \times 2 \times 2 \times 3 \times 7 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$2 \times 2 \times 2 \times 11 \times 11$$

$$\text{or } 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

$$2 \times 3 \times 7 \times 11 \times 11$$

- (d) Prime factors of 128

$$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Prime factors of 343 = 7 × 7 × 7

Prime factors of 9 = 3 × 3

Combined prime factors of
128 343 9

2 2 2 2 2 2 2 7 7
7 3 3

or 2 2 2 2 2 2 2 3
3 7 7 7

(e) Prime factors of 115 5 23

Prime factors of 217 7 31

Prime factors of 319 11 29

Combined prime factors of
115 217 319

5 23 7 31 11 29

or 5 7 11 23 29 31

Textbook 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.

Concept Drill Exercise 5.4

1. (a) Prime factorisation of 512 and 945

512 2 2 2 2 2 2 2 2 2

945 3 3 3 5 7

Since, two numbers 512 and 945 have no common factors.

Hence, 512 and 945 are co-prime numbers.

- (b) Prime factorisation of 1080 and 135

1080 2 2 2 5 27

135 5 27.

Since, two numbers 1080 and 135 have common factors 5 and 27.

Hence, these two numbers are not co-primes.

- (c) Prime factorisation of 735 and 147

735 3 5 7 7

147 3 7 7.

Since, two given numbers have 3, 7 and 7 have as common factor.

Hence, 735 and 147 are co-primes.

- (d) 1305 and 112, factorising these two numbers

1305 3 3 5 29

112 2 2 2 2 7

Since, 1305 and 112 have no common factors.

Hence, they are co-prime numbers.

2. (a) Prime factorisation of 2352 and 84

2352 2 2 2 2 3 7 7

84 2 2 3 7

Since, all factors of 84 are included in the prime factors of 2352.

Hence, the number 2352 is divisible by 84.

- (b) Prime factorisation of 1080 and 135.

1116 2 2 3 3 31

62 2 31

Since, all factors of 62 are included in the prime factors of 1116.

Hence, 1080 is divisible by 135.

- (c) Prime factorisation of 1377 and 162.

1377 3 3 3 3 17

162 2 3 3 3 3.

Since, all the prime factors of 162 are not included in the prime factors of 1377.

Hence, 1377 is not divisible by 162.

- (d) Prime factorisation of 1036 and 111 are

1036 2 2 7 37

111 3 37.

Since, all prime factors of 111 are not included in the prime factors of 1036.

Hence, 1036 is not divisible by 111.

3. Since, the prime number 11 is common in both the given numbers. So, these two numbers are not co-primes, because the first and only

condition for being a co-prime number is that there should be no common factor other than 1.

Since, all the prime factors of one of the given numbers are not included in the prime factors of other number.

Hence, one does not divide the other perfectly.

4. It cannot be possible because all even numbers has 2 as its prime factor. First and last condition for co-primes, that no common factor is included other than 1.

Textbook 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	(ii) 5) 78 (15	(iii) 2) 78 (39
<u>- 70</u>	<u>- 5</u>	<u>- 6</u>
<u>8</u>	28	18
Remainder 8	<u>- 25</u>	<u>- 18</u>
	<u>3</u>	<u>0</u>
	Remainder 3	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 confirmed that the 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 digits are not divisible by 8, so 572 is not divisible by 8.

The last two digits 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 is divisible by 2, 4 and 8. 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.

Concept Drill Exercise 5.5

- 1.** If the unit digit of a number is '0', then the number is divided by 2, 5 and 10.

So, the number 19400, 1234560 and 500000 are divisible by 2, 5 and 10.

- 2.** We know that if the numbers formed by the digits at unit and tens place of a number is divisible by 4, then the original number will also be divisible by 4, then the original number will also be divisible by 4. Therefore the numbers (i) 23408, (iii) 34972, (v) 58724, (vi) 19000, and (viii) 86336 are divisible by 4. As their last digits make numbers 08, 72, 24, 00 and 36 which are divisible by 4.

- 3. (a)** Factors of 7836 and 12

7836 2 2 3 653,

12 2 2 3

(b) 3456 2 2 2 2 2 2 2 3 3 3,
9 3 3

Hence, the number 3456 will be completely divisible by 9.

Since, the factors of 8890 include all the factors of 14.

Hence, the number 8890 will be completely divisible by 14.

Since, factors of 10725 include all the factors of 33.

Hence, the number 10725 will be completely divisible by 33.

Since, factors of 16250 do not include the factors of 39,

Hence, the number 16250 will not be completely divisible by 39.

Since the factors of 3993 do not include the factors of 122.

Hence, 3993 will not be completely divisible by 122.

- 4.** (a) If the unit digit of a number is 0 or 5, then the number is divisible by 5.

Hence, 0 will be filled.

(b) If the sum of digits in a number is a multiple of 3, then the number is divisible by 3 also. Hence, 1 will be filled.

(c) If the sum of digits in a number is the multiple of 6, then the number is divisible by 6.

Hence, numbers 4 and 2 respectively filled.

(d) If the number formed by the digits in unit and tens place of a number is divisible by 4, then the number is also divisible by 4. Hence, 0 and 2 respectively will be filled.

(e) If the last three digits of a number are divisible by 8, then the number is also divisible by 8. Hence, 0 will be filled in both places.

(f) If the difference between the sum of the digits in the odd places and the sum of the digits in the even places is 0 or a multiple of 11, then the number will be divisible by 11.

Hence, 0 and 1 respectively will be filled.



Perimeter and Area

Textbook Exercise 6.1

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

To find its length.

Perimeter of rectangle

$$2 (\text{Length} + \text{Breadth})$$

$$14 \text{ cm} = 2 (\text{Length} + 2 \text{ cm})$$

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

$$7 \text{ cm} = \text{Length} + 2 \text{ cm}$$

$$\text{Length} = 7 \text{ cm} - 2 \text{ cm} = 5 \text{ cm}$$

Hence, length of the rectangle 5 cm

- (b) Given, perimeter of square 20 cm

To find out side of square,

$$4 \times \text{side} = \text{perimeter}$$

$$4 \times \text{side} = 20 \text{ cm}$$

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

Hence, side of the square 5 cm.

- (c) Given, perimeter of rectangle

$$12 \text{ m, breadth } 3 \text{ m}$$

To find out length,

$$2 (\text{length} + \text{breadth}) = \text{Perimeter}$$

$$2 (3 \text{ m} + \text{breadth}) = 12 \text{ m}$$

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

$$\text{breadth} = 6 \text{ m} - 3 \text{ m} = 3 \text{ m}$$

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

$$\text{length } 5 \text{ cm and breadth } 3 \text{ cm}$$

To find perimeter,

$$\text{Perimeter} = 2 (\text{length} + \text{breadth})$$

$$= 2 (5 \text{ cm} + 3 \text{ cm})$$

$$= 2 \times 8 \text{ cm} = 16 \text{ cm}$$

Length of the wire used 16 cm

Since, with the same wire square is formed.

So, perimeter of square = length of wire

$$4 \times \text{side} = 16 \text{ cm}$$

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

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.

$$\text{Perimeter of triangle } AB + BC + CA$$

$$55 \text{ cm} = 20 \text{ cm} + 14 \text{ cm} + CA$$

$$CA = 20 \text{ cm} + (20 \text{ cm} + 14 \text{ cm})$$

$$CA = 55 \text{ cm} - 34 \text{ cm} = 21 \text{ cm}$$

Hence, length of third side of triangle 21 cm.

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

Cost of fencing ₹40 per meter

Length of fencing of the park

Perimeter of the park

$$2 \text{ (length + breadth)}$$

$$2 \text{ (150 m + 120 m)}$$

$$2 \text{ 270 m } 540 \text{ m}$$

Total cost of fencing

Rate per meter $\times$ length of fencing

$$\text{₹}40 \times 540 \text{ m } = \text{₹}21600$$

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

$$4 \text{ side } 36 \text{ cm}$$

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

(b) To form a triangle with equal sides.

Perimeter of the triangle formed

length of the wire used

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

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

(c) Perimeter of the regular hexagon

length of string

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

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

6. Given, length of rectangular field

230 m, breadth 160 m

Length of rope to fence 3 rounds the field.

Perimeter of rectangular field

$$2 \text{ (length + breadth)}$$

$$2 \text{ (230 m + 160 m)}$$

$$2 \text{ 390 m } 780 \text{ m}$$

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

Length of the rope needed to fence 3 rounds

$$3 \times 780 \text{ m } 2340 \text{ meter.}$$

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

Concept Drill Exercise 6.1

1. Given, length of one side of all polygon 5 cm

(a) A triangle has three sides.

So, perimeter of an equilateral triangle

$$3 \text{ side length}$$

$$3 \times 5 \text{ cm } 15 \text{ cm}$$

(b) A square is a special type of rectangle with all sides equal.

So, perimeter of rectangular shape

$$4 \text{ side length}$$

$$4 \times 5 \text{ cm } 20 \text{ cm}$$

(c) A pentagon has five sides.

So, perimeter of regular pentagon

$$5 \text{ side length}$$

$$5 \times 5 \text{ cm } 25 \text{ cm}$$

(d) A hexagon has six sides.

So, Perimeter of a regular hexagon

$$6 \text{ sides length}$$

$$6 \times 5 \text{ cm } 30 \text{ cm}$$

2. Given, length of a side of square shaped field 140 meter

Distance between two saplings 7 m

Perimeter of square shaped field

$$4 \times \text{length of one side}$$

$$4 \times 140 \text{ m} = 560 \text{ m}$$

Total number of mango saplings

Perimeter of the field

Distance between two saplings

$$\frac{560 \text{ m}}{7 \text{ m}} = 80$$

3. Given, length of the table cloth 85 cm, breadth of the table cloth 65 cm

Required length of the lace

perimeter of table cloth

$$2 \times (\text{length} + \text{breadth})$$

$$2 \times (85 \text{ cm} + 65 \text{ cm})$$

$$2 \times 150 \text{ cm} = 300 \text{ cm}$$

Now, we have to convert cm into m

$$300 \text{ cm} = \frac{300}{100} = 3 \text{ meter}$$

Rate of tying lace ₹15 per meter

Total cost Rate length

$$15 \text{ m} \times ₹3 \text{ per meter} = ₹45$$

Hence, total cost of lacing ₹45

4. (a) There are four triangles formed.
(b) Name of four triangles are AFE, BDF, CDE and DEF.

Perimeter of the largest triangle

$$ABC = 3 \times \text{length of the side}$$

$$3 \times 8 \text{ cm} = 24 \text{ cm}$$

(c) Total perimeter of 4 smaller triangle

$$3 + 3 + 3 + 3 + 3 + 3 + 3 + 3$$

$$9 + 9 + 9 + 9 = 36 \text{ cm}$$

(d) Yes, all the smaller triangles are equal in perimeter.

Textbook 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

$$25 \text{ m} \times \text{width} = 300 \text{ sq. m}$$

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

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

$$500 \times 200 \text{ m} = 100000 \text{ sq. m}$$

Cost of the tiling

Area of the plot rate of tiling

$$1,00,000 \text{ sq. m} \times ₹8 = ₹8,00,000$$

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

$$25 \text{ sq. m.}$$

To find the number of tree in the grove,

Area of the rectangular grove

length width

$$100 \text{ m} \times 50 \text{ m} = 5000 \text{ sq. m.}$$

Number of maximum tree in the grove

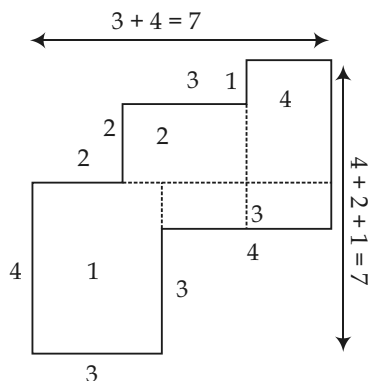
Area of the grove

Area required for one tree

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

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

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 4 \text{ cm} & 3 \text{ cm} & 12 \text{ sq. cm.} \end{array}$$

Area of rectangle 2

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 3 \text{ cm} & 2 \text{ cm} & 6 \text{ sq. cm.} \end{array}$$

Area of rectangle 3

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 4 \text{ cm} & 1 \text{ cm} & 4 \text{ sq. cm.} \end{array}$$

Area of rectangle 4

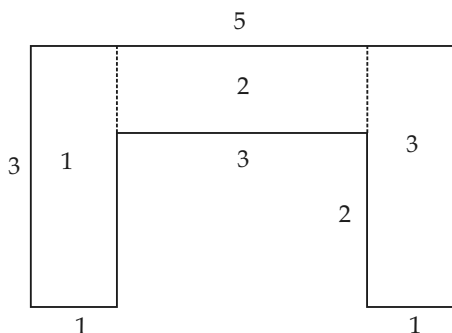
$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 3 \text{ cm} & 2 \text{ cm} & 6 \text{ sq. cm.} \end{array}$$

The total area of the whole figure

$$12 + 6 + 4 + 6 = 28 \text{ sq. cm}$$

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

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



Area of the rectangle 1

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 3 \text{ cm} & 1 \text{ cm} & 3 \text{ sq. cm} \end{array}$$

Area of the rectangle 2

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 3 \text{ cm} & 1 \text{ cm} & 3 \text{ sq. cm} \end{array}$$

Area of the rectangle 3

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 3 \text{ cm} & 1 \text{ cm} & 3 \text{ sq. cm} \end{array}$$

The total area of the figure

$$3 + 3 + 3 = 9 \text{ sq. cm}$$

Concept Drill Exercise 6.2

1. Given, length of a piece of paper required for envelope 20 cm

Its width 5 cm

Area of the piece of paper required for one envelope

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 20 \text{ cm} & 5 \text{ cm} & 100 \text{ sq. cm} \end{array}$$

Length of the paper sheet 100 cm

Its breadth 75 cm

Area of the paper sheet

$$\begin{array}{rcl} \text{length} & \text{breadth} & \\ 100 \text{ cm} & 75 \text{ cm} & \end{array}$$

Number of envelope made

$$\frac{\text{Area of the paper sheet}}{\text{Area of the piece of paper required for one envelope}}$$

$$\begin{array}{r} \frac{100 \text{ cm} \times 75 \text{ cm}}{100 \text{ sq. cm}} \\ 75 \text{ envelopes} \end{array}$$

Hence, envelopes that can be made with this paper sheet 75

2. Given, length of brick 26 cm

breadth of brick 10 cm

Therefore, area covered by one brick

length	width
26 cm	10 cm
260 sq. cm	

The length of footpath 130 m

breadth of the footpath 1.5 m

Area of the footpath

length	breadth
--------	---------

130 m	1.5 m
-------	-------

130	100 cm	1.5	100 cm
-----	--------	-----	--------

Number of bricks to lay

<u>Area of the footpath</u>			
-----------------------------	--	--	--

Area of one brick			
-------------------	--	--	--

130	100 cm	1.5	100 cm
260 sq.cm			

7500 bricks

Hence, number of bricks to lay a footpath 7500

3. Given, length of the plot 32 m

32	100 cm
----	--------

breadth of plot 18 m

18	100 cm
----	--------

Area of the plot length breadth

32	100 cm	18	100 cm
----	--------	----	--------

length of one tile 12 cm

breadth of one tile 8 cm

Area of the tile length breadth

12 cm	8 cm
-------	------

Number of tiles needed

<u>Area of the plot</u>			
-------------------------	--	--	--

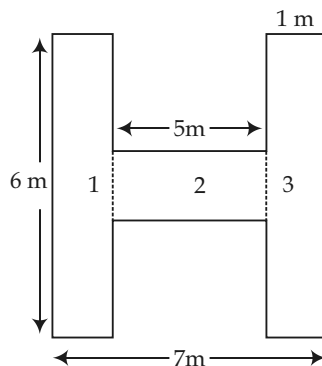
Area of one tile			
------------------	--	--	--

32	100	18	100
12 8			

60000 tiles

Hence, the number of tiles needed 60000.

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



Area of rectangle 1 length breadth

6 cm	1 cm	6 sq. m
------	------	---------

Area of rectangle 2 length breadth

5 m	1 m	5 sq. m.
-----	-----	----------

Area of rectangle 3 length breadth

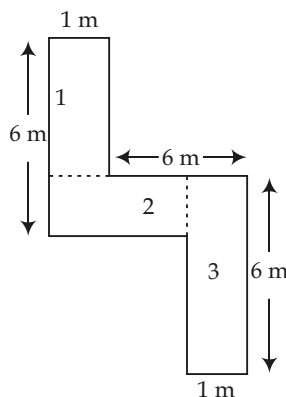
6 m	1 m	6 sq. m
-----	-----	---------

Total area of whole figure

6	5	6	17 sq. m
---	---	---	----------

Hence, the total area of the given figure 17 sq. m

(b) By splitting the given figure into 1, 2 and 3 as shown in the adjoining figure, we get



Area of rectangle 1 length breadth

5 m	1 m	5 sq. m
-----	-----	---------

Area of rectangle 2

$$\begin{array}{l} \text{length} \quad \text{breadth} \\ 6 \text{ m} \quad 1 \text{ m} \quad 6 \text{ sq. m} \end{array}$$

Area of rectangle 3

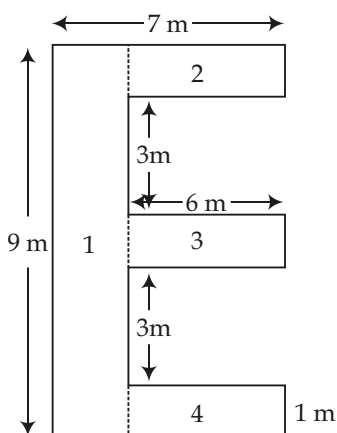
$$\begin{array}{l} \text{length} \quad \text{breadth} \\ 6 \text{ m} \quad 1 \text{ m} \quad 6 \text{ sq. m} \end{array}$$

Total area of whole figure

$$5 \quad 6 \quad 6 \quad 17 \text{ sq. m}$$

Hence, the total area of the given figure 17 sq. m.

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



Area of rectangle 1 length breadth

$$9 \text{ m} \quad 1 \text{ m} \quad 9 \text{ sq. m}$$

Area of rectangle 2 length breadth

$$6 \text{ m} \quad 1 \text{ m} \quad 6 \text{ sq. m}$$

Area of rectangle 3 length breadth

$$6 \text{ m} \quad 1 \text{ m} \quad 6 \text{ sq. m}$$

Area of rectangle 4 length breadth

$$6 \text{ m} \quad 1 \text{ m} \quad 6 \text{ sq. m}$$

Total area of whole figure

$$9 \quad 6 \quad 6 \quad 6 \quad 27 \text{ sq. m}$$

Hence, the total area of the given figure 27 sq. m

Textbook Exercise 6.3

1. Area of rectangle one 5 m 10 m
50 sq. m.

Area of rectangle two

$$2 \text{ m} \quad 7 \text{ m} \quad 14 \text{ sq. m.}$$

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 .

$$\text{Thus, } x \quad y \quad 64 \quad 1$$

$$\text{or } x \quad y \quad 32 \quad 2$$

$$\text{or } x \quad y \quad 16 \quad 4$$

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

$$\frac{\text{Area of the garden}}{\text{Length of the garden}} = \frac{1000 \text{ sq. m}}{50 \text{ m}} = 20 \text{ m}$$

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

$$\begin{array}{l} \text{length} \quad \text{breadth} \\ 5 \text{ m} \quad 4 \text{ m} \quad 20 \text{ sq. m} \end{array}$$

The area of the carpet side side

$$3 \text{ m} \quad 3 \text{ m} \quad 9 \text{ sq. m}$$

So, Not carpeted area of the floor

$$20 \text{ sq. m} - 9 \text{ sq. m} = 11 \text{ sq. m}$$

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

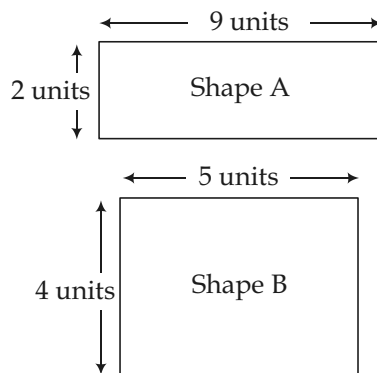
The perimeters of shape B may be

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 :



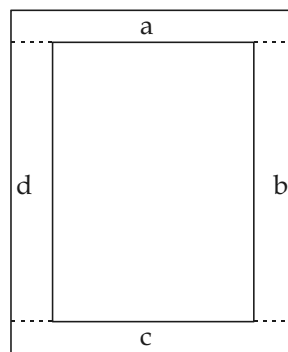
6. The length of a page of our Hindi book 24 cm (let)

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 rectangle c

Thus, the perimeter of rectangle

c 36 cm

length of the rectangle b

$24 + 1 + 1 + 22 \text{ cm}$
 and its breadth 1.5 cm
 Perimeter of rectangle b
 $2 (22 \text{ cm} + 1.5 \text{ cm})$
 $2 \times 23.5 \text{ cm}$
 47 cm

Since rectangle b = rectangle d
 Thus, the perimeter of rectangle
 $d = 47 \text{ cm}$

Total perimeter of the border
 $36 + 36 + 47 + 47$
 166 cm

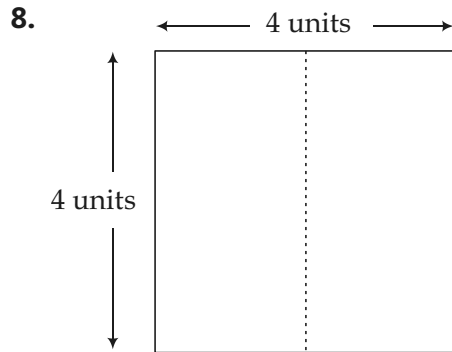
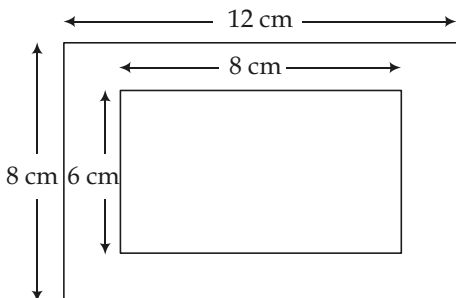
Hence, the perimeter of the border
 166 cm

- 7.** The area of the given rectangle
 $12 \text{ units} \times 8 \text{ units}$
 96 sq. units

And the area of the rectangle inside it
 $\frac{1}{2} \times 96 \text{ sq. units}$
 48 sq. units

Possible sides of the inside rectangle
 are $(48 \div 1)$, $(24 \div 2)$, $(16 \div 3)$, $(12 \div 4)$
 and $(8 \div 6)$

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 :



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

$4 \times 4 \text{ cm}$
 16 cm

and the area of the square

$4 \text{ cm} \times 4 \text{ cm}$
 16 sq. cm

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

Perimeter of the obtained rectangle
 $2 (2 \text{ cm} + 4 \text{ cm})$
 12 cm

Perimeter of the rectangle together
 $2 \times 12 \text{ cm}$
 24 cm

Area of the obtained rectangle
 $2 \text{ cm} \times 4 \text{ cm}$
 8 sq. cm

Area of the rectangles together
 $2 \times 8 \text{ sq. cm}$
 16 sq. cm

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

i.e., $8 \text{ sq. cm} < 16 \text{ sq. cm}$

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

i.e., $24\text{ cm} + 16\text{ cm}$

(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., $2 \times 4 + 2 \times 4$
 $8 + 8 = 16\text{ sq. cm}$

Area of the square

$4\text{ cm} \times 4\text{ cm}$

16 sq. cm.

Concept Drill Exercise 6.3

1. Given, Length of the garden 50 m

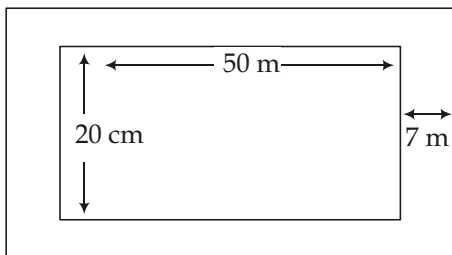
breadth of the garden 20 m

Area of the garden

length $\times$ breadth

$50\text{ m} \times 20\text{ m}$

1000 sq. m



Width of the path 7 cm

So, length of the garden including the width of the path

$50\text{ m} + 7\text{ m} + 7\text{ m}$

64 m

breadth of the garden including width of the path

$20\text{ m} + 7\text{ m} + 7\text{ m}$

34 m

Area of the garden including the area of the path

$64\text{ m} \times 34\text{ m}$

2176 sq. m

Area of the path

Area of the garden width path

Area of the garden

$2176\text{ sq. m} - 1000\text{ sq. m}$

1176 sq. m

Hence, the area of the path

1176 sq. m.

2. The length of the garden 55 meters

The breadth of the garden 25 meters

Width of the beds in side the garden

2.5 meters

Length of the garden without beds

$55\text{ m} - 2.5\text{ m} - 2.5\text{ m}$

$55\text{ m} - 5\text{ m}$

50 m

Breadth of the garden without beds

$25\text{ m} - 2.5\text{ m} - 2.5\text{ m}$

$25\text{ m} - 5\text{ m}$

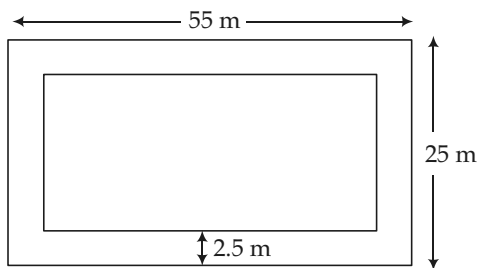
20 m

The area of the garden

length $\times$ breadth

$55\text{ m} \times 25\text{ m}$

1375 sq. m



Area of the garden without beds

$$50 \text{ m} \times 20 \text{ m} = 1000 \text{ sq. m}$$

Area of the beds

Area of garden

Area of garden without beds

$$1375 \text{ sq. m} - 1000 \text{ sq. m}$$

$$375 \text{ sq. m.}$$

Rate of the planting grass ₹15 sq. m

Cost of the planting grass

Rate Area

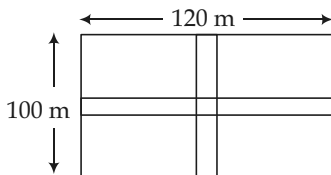
$$₹15 \text{ sq. per m} \times 375 \text{ sq. m}$$

$$₹5625$$

Hence, cost of the planting grass in the beds ₹5625

3. Clearly, similar

Breadth of the each road 5 m



Therefore the area of roads

$$100 \times 5 + 120 \times 5 + 5 \times 5$$

$$500 + 600 + 25$$

$$1100 + 25$$

$$1075 \text{ sq. m.}$$

Area of the park

$$120 \times 100$$

$$12000 \text{ sq. m}$$

Area of the remaining part of the park

$$12000 \text{ sq. m} - 1075 \text{ sq. m}$$

$$10925 \text{ sq. m}$$

Hence, the area of the roads 1075 sq. m and the area of the remaining part of garden 10925 sq. m

4. Given, Area of the triangle with perpendicular 36 m long Area of the square with side length 12 m

$$\text{So, } \frac{1}{2} \times \text{perpendicular} \times \text{base}$$

side side

$$\frac{1}{2} \times 36 \text{ m} \times \text{base} = 12 \text{ m} \times 12 \text{ m}$$

$$\text{base} = \frac{12 \text{ m} \times 12 \text{ m} \times 2}{36 \text{ m}} = 8 \text{ m}$$

Hence, the length of the base of the triangle 8 m

■ ■

Textbook 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.

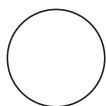
$\frac{1}{3}$		
---------------	--	--

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

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

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



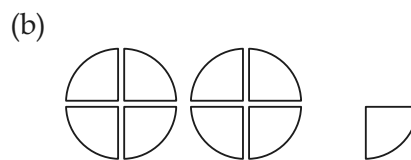
A whole roti represents one unit.



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 roti and a quarter roti.



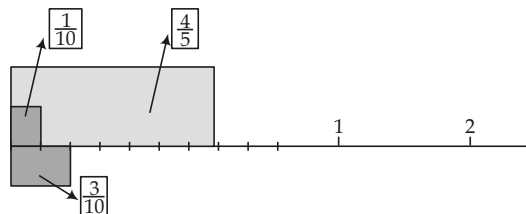
9 times of $\frac{1}{4}$ of a whole roti

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

2 whole rotis 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 :

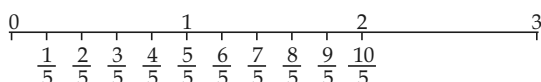
....., $\frac{1}{1000}$, $\frac{1}{999}$, $\frac{1}{998}$,, etc.

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

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

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

9.



Concept Drill Exercise 7.1

1. A pile (one unit) wheat was divided into 20 equal parts, so the amount of each part of wheat $\frac{1}{20}$

(a) It was shared among 5 poors.

So, $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$

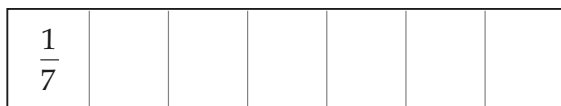
i.e., 5 times of $\frac{1}{20}$ $\frac{5}{20}$ part of the wheat.

(b) It was shared among 11 poors.

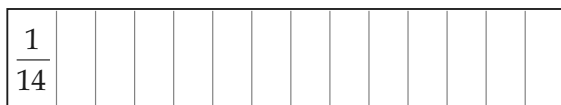
So, $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$ $\frac{1}{20}$

i.e., 11 times of $\frac{1}{20}$ $\frac{11}{20}$

2. (a) If we fold a paper strip into seven equal parts and then unfold it, each of the seven parts we get will be $\frac{1}{7}$.



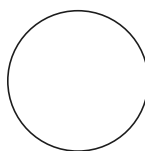
(b) If we fold it again in the same way and then fold the folded part from the middle and open it, then each part obtained will be $\frac{1}{14}$.



(c) No, we can not get $\frac{1}{21}$, we shall get

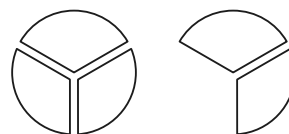
$\frac{1}{28}$ in this way.

3.



A whole roti represents one units.

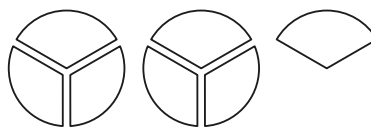
(a)



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

One whole roti and two, one third roti.

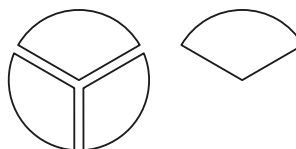
(b)



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

2 whole roti and one, one third roti.

(c)



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

One whole roti and one, one third roti.

4. Since smaller line length $\frac{1}{3}$

So, larger line length

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

Textbook Exercise 7.2

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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)

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

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)

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

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)

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

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

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

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

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

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

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

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

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

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

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

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

6. (a) $3\frac{1}{4}$ can be written as $3 \frac{1}{4}$ 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 $7 \frac{2}{3}$ 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 $9 \frac{4}{9}$ on

splitting 9, we get

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

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

$$\frac{85}{9}$$

- (d) $3\frac{1}{5}$ can be written as $3 \frac{1}{5}$ on

splitting 3, we get

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

- (e) $2\frac{3}{11}$ can be written as $2 \frac{3}{11}$ on

splitting 2, we get

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

- (f) $3\frac{9}{10}$, can be written as $3 \frac{9}{10}$ on

splitting 3, we get

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

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

Concept Drill Exercise 7.2

1. $\frac{10}{3}$ 10 times of $\frac{1}{3}$

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

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

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

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

Hence, there are 3 whole units in $\frac{10}{3}$.

- $\frac{14}{3}$ 14 times of $\frac{1}{3}$

$$\frac{14}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3} \quad \frac{1}{3}$$

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

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

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

$$1 \quad 1 \quad 1 \quad 1 \quad \frac{2}{3} \quad 4 \quad \frac{2}{3}$$

Hence, there are 4 whole units in $\frac{14}{3}$.

2. $\frac{7}{5}$ 7 times of $\frac{1}{5}$

$$\frac{7}{5} \quad \frac{1}{5} \quad \frac{1}{5} \quad \frac{1}{5} \quad \frac{1}{5} \quad \frac{1}{5} \quad \frac{1}{5} \quad \frac{1}{5}$$

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

Hence, there is one whole unit in $\frac{7}{5}$

$\frac{10}{5}$ 10 times of $\frac{1}{5}$

$\frac{10}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$

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

1 1 2

Hence, there are 2 whole units in $\frac{10}{5}$.

3. (a) $\frac{17}{6}$ $\frac{6}{6}$ $\frac{6}{6}$ $\frac{5}{6}$ 1 1 $\frac{5}{6}$ $2\frac{5}{6}$

Hence, number of whole units in $\frac{17}{6}$ 2

(b) $\frac{15}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ (15 5 5 5)

1 1 1 3

Hence, the number of whole units in $\frac{15}{5}$ 3

(c) $\frac{13}{4}$ $\frac{4}{4}$ $\frac{4}{4}$ $\frac{4}{4}$ $\frac{1}{4}$

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

Hence, the number of whole units in $\frac{13}{4}$ 3.

4. (a) $\frac{49}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{8}{8}$ $\frac{1}{8}$

1 1 1 1 1 1 $\frac{1}{8}$ $6\frac{1}{8}$

(b) $\frac{37}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{5}{5}$ $\frac{2}{5}$

1 1 1 1 1 1 $\frac{2}{5}$ $7\frac{2}{5}$

(c) $\frac{34}{7}$ $\frac{7}{7}$ $\frac{7}{7}$ $\frac{7}{7}$ $\frac{7}{7}$ $\frac{6}{7}$

1 1 1 1 $\frac{6}{7}$ $4\frac{6}{7}$

(d) $\frac{23}{11}$ $\frac{11}{11}$ $\frac{11}{11}$ $\frac{1}{11}$ 1 1 $\frac{1}{11}$ $2\frac{1}{11}$

(e) $\frac{65}{14}$ $\frac{14}{14}$ $\frac{14}{14}$ $\frac{14}{14}$ $\frac{14}{14}$ $\frac{9}{14}$

1 1 1 1 $\frac{9}{14}$ $4\frac{9}{14}$

(f) $\frac{71}{20}$ $\frac{20}{20}$ $\frac{20}{20}$ $\frac{20}{20}$ $\frac{11}{20}$

1 1 1 $\frac{11}{20}$ $3\frac{11}{20}$

Textbook Exercise 7.3

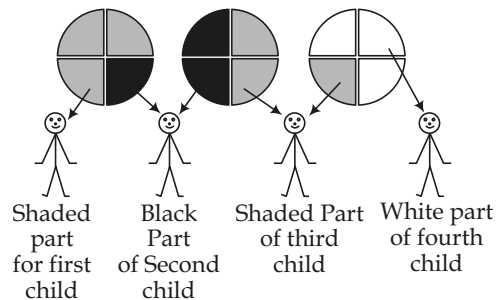
1. Since, lengths of strips $\frac{3}{6}$, $\frac{4}{8}$ and $\frac{5}{10}$ are equal as shown in the fractional wall.
So, $\frac{3}{6}$, $\frac{4}{8}$ and $\frac{5}{10}$ are equivalent.

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

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

3. $\frac{4}{6}$ $\frac{2}{3}$ $\frac{6}{9}$ $\frac{8}{12}$ $\frac{10}{15}$ $\frac{12}{18}$ $\frac{14}{21}$ $\frac{16}{24}$ $\frac{18}{27}$...

4.



The division facts.

3 whole papads divided into 4 parts

$3 \div 4 = \frac{3}{4}$

The addition facts.

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

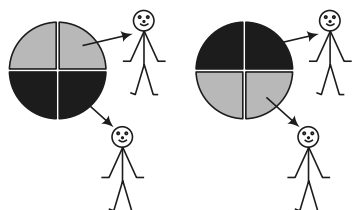
$$\frac{3}{4} \quad \frac{3}{4} \quad \frac{3}{4} \quad \frac{3}{4} \quad \frac{12}{4} \quad 3$$

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

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

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

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

and for $\frac{3}{5}$, multiply the numerator

and the denominator by 2, we get

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

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

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

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

$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}$$

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

$$\frac{3}{5} = \frac{3 \times 4}{5 \times 4} = \frac{12}{20}$$

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

$$\frac{6}{7} = \frac{6 \times 5}{7 \times 5} = \frac{30}{35}$$

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

$$\frac{8}{5} = \frac{8 \times 7}{5 \times 7} = \frac{56}{35}$$

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

$$\frac{5}{2} = \frac{5 \times 2}{2 \times 2} = \frac{10}{4}$$

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

$$\frac{1}{10} = \frac{1 \times 9}{10 \times 9} = \frac{9}{90}$$

And for $\frac{2}{9}$, multiply both numerator and denominator by 10, we get

$$\frac{2}{9} = \frac{2 \times 10}{9 \times 10} = \frac{20}{90}$$

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

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

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.

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

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

Now, both 75 and 16 have no common factor

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

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.

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

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.

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

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.

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

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

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.

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(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, $\frac{3}{4}, \frac{3}{4}, \frac{15}{15}, \frac{45}{60}$

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

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

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

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

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

Concept Drill Exercise 7.3

1. Since $\frac{3}{13}, \frac{3}{13}, \frac{1}{13}$ and $\frac{21}{91}, \frac{7}{7}, \frac{3}{13}$.

According to the fraction wall, the length of $\frac{3}{13}, \frac{9}{39}$ and $\frac{21}{91}$ are equal. So given fraction are equivalent.

2. (a) $\frac{2}{15}, \frac{2}{15}, \frac{2}{2}, \frac{2}{15}, \frac{3}{3}, \frac{2}{15}, \frac{4}{4}$

Hence, equivalent fraction of $\frac{2}{15}$ are

$\frac{4}{30}, \frac{6}{45}, \frac{8}{60}$.

(b) $\frac{3}{17}, \frac{3}{17}, \frac{2}{2}, \frac{3}{17}, \frac{3}{3}, \frac{3}{17}, \frac{4}{4}$

Hence, three equivalent fractions of $\frac{3}{17}$ are $\frac{6}{34}, \frac{9}{51}, \frac{12}{68}$

(c) $\frac{5}{11}, \frac{5}{11}, \frac{2}{2}, \frac{5}{11}, \frac{3}{3}, \frac{5}{11}, \frac{6}{6}$

Hence, three equivalent fractions of $\frac{5}{11}$

are $\frac{10}{22}, \frac{15}{33}, \frac{30}{66}$.

(d) $\frac{7}{8}, \frac{7}{8}, \frac{2}{2}, \frac{7}{8}, \frac{5}{5}, \frac{7}{8}, \frac{7}{7}$

Hence, three equivalent fractions of $\frac{7}{8}$

are $\frac{14}{16}, \frac{35}{40}, \frac{49}{56}$.

3. (a) $\frac{63}{105}$

Both 63 and 105 are the multiples of 3

So, $\frac{63}{105}, \frac{63}{105}, \frac{3}{3}, \frac{21}{35}$

Now, both 21 and 35 are the multiples of 7

So, $\frac{21}{35}, \frac{21}{35}, \frac{7}{7}, \frac{3}{5}$

Now, the numerator and denominator have no common factor other than 1.

Hence, the lowest form of $\frac{63}{105}$ is $\frac{3}{5}$.

$$(b) \frac{95}{114}$$

Both 95 and 114 are the multiples of 19.

$$\text{So, } \frac{95}{114} = \frac{95 \div 19}{114 \div 19} = \frac{5}{6}$$

Hence, the smallest form of $\frac{95}{114}$ is $\frac{5}{6}$.

$$(c) \frac{65}{325}$$

Both 65 and 325 are the multiples of 5.

$$\text{So, } \frac{65}{325} = \frac{65 \div 5}{325 \div 5} = \frac{13}{65}$$

Again, both 13 and 65 both are the multiples of 13.

$$\text{So, } \frac{13}{65} = \frac{13 \div 13}{65 \div 13} = \frac{1}{5}$$

Hence, the lowest form of $\frac{65}{325}$ is $\frac{1}{5}$.

$$(d) \frac{324}{408}$$

Both numerator and denominators are even, so divisible by 2.

$$\frac{324}{408} = \frac{324 \div 2}{408 \div 2} = \frac{162}{204}$$

Again, 162 and 204 are even, so divisible by 2

$$\frac{162}{204} = \frac{162 \div 2}{204 \div 2} = \frac{81}{102}$$

Now, 81 and 102 both are the multiples of 3.

$$\text{So, } \frac{81}{102} = \frac{81 \div 3}{102 \div 3} = \frac{27}{34}$$

Now, there is no common factor of 27 and 34 other than 1.

Hence, the lowest form of $\frac{324}{408}$ is $\frac{27}{34}$.

4. Firstly we make the denominators of all the given fraction pairs equal and then we will compare them

$$(a) \frac{7}{8} \dots \frac{8}{7} \quad \frac{7}{8} \quad \frac{7}{8} \quad \frac{7}{7} \quad \frac{49}{56}$$

$$\text{and } \frac{8}{7} \quad \frac{8}{7} \quad \frac{8}{8} \quad \frac{64}{56}$$

$$\text{Hence, } \frac{7}{8} \quad \frac{8}{7}$$

$$(b) \frac{4}{7} \dots \frac{5}{7} \quad \frac{4}{7} \quad \frac{5}{7}$$

$$(c) \frac{9}{11} \dots \frac{17}{20}$$

$$\frac{9}{11} \quad \frac{9}{11} \quad \frac{20}{20} \quad \frac{180}{220}$$

$$\frac{17}{20} \quad \frac{17}{20} \quad \frac{11}{11} \quad \frac{187}{220}$$

$$\text{Hence, } \frac{9}{11} \quad \frac{17}{20}$$

$$(d) \frac{8}{9} \dots \frac{64}{72}$$

$$\frac{8}{9} \quad \frac{8}{9} \quad \frac{8}{8} \quad \frac{64}{72}$$

$$\text{Hence, } \frac{8}{9} \quad \frac{64}{72}$$

$$(e) \frac{5}{6} \dots \frac{7}{8}$$

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

$$\frac{7}{8} \quad \frac{7}{8} \quad \frac{3}{3} \quad \frac{21}{24}$$

$$\text{Hence, } \frac{5}{6} \quad \frac{7}{8}$$

$$(f) \frac{5}{12} \dots \frac{6}{11}$$

$$\frac{5}{12} \quad \frac{5}{12} \quad \frac{11}{11} \quad \frac{55}{132}$$

$$\frac{6}{11} \quad \frac{6}{11} \quad \frac{12}{12} \quad \frac{72}{132}$$

$$\text{Hence, } \frac{5}{12} \quad \frac{6}{11}$$

Textbook 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.

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

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

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

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

$$\frac{4}{12}.$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\frac{4}{5} \frac{2}{3} = \frac{4 \times 3}{5 \times 3} = \frac{12}{15}$$

$$\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

$$\frac{12}{15} + \frac{10}{15} = \frac{22}{15}$$

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

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

$$\frac{3}{5} \frac{5}{8} = \frac{3 \times 8}{5 \times 8} = \frac{24}{40}$$

$$\frac{5}{8} = \frac{5 \times 5}{8 \times 5} = \frac{25}{40}$$

$$\frac{24}{40} + \frac{25}{40} = \frac{49}{40}$$

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

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

$$\frac{9}{2} \frac{5}{4} = \frac{9 \times 2}{2 \times 2} = \frac{18}{4}$$

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

$$\frac{18}{4} + \frac{5}{4} = \frac{23}{4}$$

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

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

$$\frac{8}{3} \frac{2}{7} = \frac{8 \times 7}{3 \times 7} = \frac{56}{21}$$

$$\frac{2}{7} = \frac{2 \times 3}{7 \times 3} = \frac{6}{21}$$

$$\frac{56}{21} + \frac{6}{21} = \frac{62}{21}$$

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

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

$$\frac{3}{4} \frac{1}{3} \frac{1}{5} = \frac{3 \times 15}{4 \times 15} = \frac{45}{60}$$

$$\frac{1}{3} = \frac{1 \times 20}{3 \times 20} = \frac{20}{60}$$

$$\frac{1}{5} = \frac{1 \times 12}{5 \times 12} = \frac{12}{60}$$

$$\frac{45}{60} + \frac{20}{60} + \frac{12}{60} = \frac{77}{60}$$

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

The LCM of 3, 5 and 7 is 105. Now, expressing as equivalent fractions with denominator 105, we get

$$\frac{2}{3} \frac{4}{5} \frac{3}{7} = \frac{2 \times 35}{3 \times 35} = \frac{70}{105}$$

$$\frac{4}{5} = \frac{4 \times 21}{5 \times 21} = \frac{84}{105}$$

$$\frac{3}{7} = \frac{3 \times 15}{7 \times 15} = \frac{45}{105}$$

$$\frac{70}{105} + \frac{84}{105} + \frac{45}{105} = \frac{199}{105}$$

$$(m) \frac{9}{2} \frac{5}{4} \frac{7}{6}$$

The LCM of 2, 4 and 6 is 12. Now, expressing as equivalent fractions with denominator 12, we get

$$\begin{array}{ccccccc} \frac{9}{2} & \frac{5}{4} & \frac{7}{6} & \frac{9}{2} & \frac{6}{6} & \frac{5}{4} & \frac{3}{3} & \frac{7}{6} & \frac{2}{2} \\ & & & \frac{54}{12} & \frac{15}{12} & \frac{14}{12} & \frac{83}{12} & & \\ & & 6 & \frac{12}{12} & \frac{11}{12} & 6 & \frac{11}{12} & 6 & \frac{11}{12} \end{array}$$

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

$$\frac{2}{3} + \frac{3}{4}$$

The LCM of the denominators 3 and 4 of given fractions is 12.

So, expressing as equivalent fractions with denominator 12, we get

$$\begin{array}{ccccccc} \frac{2}{3} & \frac{3}{4} & \frac{2}{3} & \frac{4}{4} & \frac{3}{4} & \frac{3}{3} & \\ & & \frac{8}{12} & \frac{9}{12} & \frac{8}{12} & \frac{9}{12} & \frac{17}{12} \text{ litres} \\ & & \frac{17}{12} & 1 & \frac{12}{12} & \frac{5}{12} & 1 & \frac{5}{12} & 1 & \frac{5}{12} \end{array}$$

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

$$\begin{array}{ccccccc} \frac{2}{5} & \frac{3}{4} & \frac{2}{5} & \frac{4}{4} & \frac{3}{4} & \frac{5}{5} & \\ & & \frac{8}{20} & \frac{15}{20} & \frac{8}{20} & \frac{15}{20} & \frac{23}{20} \\ & & \frac{20}{20} & \frac{3}{20} & 1 & \frac{3}{20} & 1 & \frac{3}{20} \end{array}$$

Hence, length of the lace that Geeta and Shamim bought $1\frac{3}{20}$ m

Since, $1\frac{3}{20} > 1$

So, the lace will be sufficient to cover the whole border.

4. (a) $\frac{6}{7} - \frac{4}{7}$

As the denominator is the same i.e., 7. So, we will simply subtract numerators keeping denominator as 7.

$$\frac{6}{7} - \frac{4}{7} = \frac{6-4}{7} = \frac{2}{7}$$

- (b) $\frac{7}{9} - \frac{5}{9}$

As the denominator is the same i.e., 9. So, we will simply subtract numerators keeping denominator as 9.

$$\frac{7}{9} - \frac{5}{9} = \frac{7-5}{9} = \frac{2}{9}$$

- (c) $\frac{10}{27} - \frac{1}{27}$

As the denominator is the same i.e., 27. So we will simply subtract the numerators keeping denominator as 27.

$$\text{So, } \frac{10}{27} - \frac{1}{27} = \frac{10-1}{27} = \frac{9}{27} = \frac{1}{3}$$

(The lowest form)

5. (a) $\frac{8}{15} \quad \frac{3}{15}$

The denominator of two fraction is the same *i.e.*, 15.

So, $\frac{8}{15} \quad \frac{3}{15} \quad \frac{8}{15} \quad \frac{3}{15} \quad \frac{5}{15} \quad \frac{1}{5}$

(The lowest form)

(b) $\frac{2}{5} \quad \frac{4}{15}$

The LCM of 5 and 15 is 15.

So, $\frac{2}{5} \quad \frac{4}{15} \quad \frac{2}{5} \quad \frac{3}{3} \quad \frac{4}{15}$

$$\frac{6}{15} \quad \frac{4}{15}$$

$$\frac{6}{15} \quad \frac{4}{15} \quad \frac{2}{15}$$

(c) $\frac{5}{6} \quad \frac{4}{9}$

The LCM of 6 and 9 is 18.

So, $\frac{5}{6} \quad \frac{4}{9} \quad \frac{5}{6} \quad \frac{3}{3} \quad \frac{4}{9} \quad \frac{2}{2}$

$$\frac{15}{18} \quad \frac{8}{18}$$

$$\frac{15}{18} \quad \frac{8}{18} \quad \frac{7}{18}$$

(d) $\frac{2}{3} \quad \frac{1}{2}$

The LCM of 3 and 2 is 6.

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

$$\frac{4}{6} \quad \frac{3}{6} \quad \frac{4}{6} \quad \frac{3}{6} \quad \frac{1}{6}$$

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

$$\frac{10}{3} \quad \frac{13}{4} \quad \frac{10}{3} \quad \frac{4}{4} \quad \frac{13}{4} \quad \frac{3}{3}$$

$$\frac{40}{12} \quad \frac{39}{12} \quad \frac{40}{12} \quad \frac{39}{12} \quad \frac{1}{12}$$

(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

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

$$\frac{115}{15} \quad \frac{54}{15} \quad \frac{115}{15} \quad \frac{54}{15} \quad \frac{61}{15}$$

$$\frac{61}{15} \quad 4 \quad \frac{15}{15} \quad \frac{1}{15}$$

$$4 \quad \frac{1}{15} \quad 4 \quad \frac{1}{15}$$

(c) $\frac{29}{7}$ from $\frac{45}{7}$

Since, the denominators of given fractions is the same. *i.e.*, 7.

So, $\frac{45}{7} \quad \frac{29}{7} \quad \frac{45}{7} \quad \frac{29}{7} \quad \frac{16}{7}$

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

7. (a) Total distance from Jaya's home to her school $\frac{7}{10}$ km

She covers a distance by an auto

$$\frac{1}{2} \text{ km}$$

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

$$\frac{7}{10} \quad \frac{1}{2} \quad \frac{7}{10} \quad \frac{1}{2} \quad \frac{5}{5} \quad \frac{7}{10} \quad \frac{5}{10}$$

$$\frac{7}{10} \quad \frac{5}{10} \quad \frac{2}{10} \quad \frac{1}{5} \text{ km}$$

Hence, she travels a distance daily $\frac{1}{5}$ km.

(b) Jeevika takes for one round

$$\frac{10}{3} \text{ minutes}$$

Namit takes for one round

$$\frac{13}{4} \text{ minutes}$$

Equallising the two denominator we get

$$\frac{10}{3} \quad \frac{10}{3} \quad \frac{4}{4} \quad \frac{40}{12}$$

and $\frac{13}{4} \quad \frac{13}{4} \quad \frac{3}{3} \quad \frac{39}{12}$

Clearly, $\frac{40}{12} \quad \frac{39}{12}$

Therefore, Jeevika takes more time.

Difference of two timing

$$\frac{40}{12} \quad \frac{39}{12}$$

$$\frac{40}{12} \quad \frac{39}{12} \quad \frac{1}{12} \text{ minutes}$$

Hence, Jeevika takes more time by $\frac{1}{12}$ minutes.

Concept Drill Exercise 7.4

1. (a) $\frac{5}{8} \quad \frac{3}{4} \quad \frac{4}{5}$

The LCM of 8, 4, 5 is 40.

Expressing as equivalent equations with denominator 40, we get

$$\frac{5}{8} \quad \frac{3}{4} \quad \frac{4}{5} \quad \frac{5}{8} \quad \frac{5}{5} \quad \frac{3}{4} \quad \frac{10}{10} \quad \frac{4}{5} \quad \frac{8}{8}$$

$$\frac{25}{40} \quad \frac{30}{40} \quad \frac{32}{40}$$

$$\frac{25}{40} \quad \frac{30}{40} \quad \frac{32}{40} \quad \frac{87}{40}$$

$$\frac{87}{40} \quad 2 \quad \frac{40}{40} \quad \frac{7}{40}$$

$$2 \quad \frac{7}{40} \quad 2 \frac{7}{40}$$

(b) $\frac{7}{10} \quad \frac{8}{9} \quad \frac{5}{6}$

LCM of 10, 9 and 6 is 90.

Expressing as equivalent fractions with denominator 90, we get

$$\frac{7}{10} \quad \frac{8}{9} \quad \frac{5}{6} \quad \frac{7}{10} \quad \frac{9}{9} \quad \frac{8}{9} \quad \frac{10}{10} \quad \frac{5}{6} \quad \frac{15}{15}$$

$$\frac{63}{90} \quad \frac{80}{90} \quad \frac{75}{90}$$

$$\frac{63}{90} \quad \frac{80}{90} \quad \frac{75}{90} \quad \frac{218}{90}$$

$$\frac{218}{90} \quad \frac{109}{45} \quad (\text{The lowest form})$$

$$2 \quad \frac{45}{45} \quad \frac{19}{45}$$

$$2 \quad \frac{19}{45} \quad 2 \frac{19}{45}$$

(c) $\frac{10}{21} \quad \frac{3}{7} \quad \frac{1}{3}$

LCM of 21, 7 and 3 is 21. Now expressing as equivalent fraction with denominator 21, we get

$$\frac{10}{21} \quad \frac{3}{7} \quad \frac{1}{3} \quad \frac{10}{21} \quad \frac{3}{7} \quad \frac{3}{3} \quad \frac{1}{3} \quad \frac{7}{7}$$

$$\frac{10}{21} \quad \frac{9}{21} \quad \frac{7}{21}$$

$$\frac{10}{21} \quad \frac{9}{21} \quad \frac{7}{21} \quad \frac{26}{21}$$

$$\frac{24}{21} \frac{5}{21} 1 \frac{5}{21} 1 \frac{5}{21}$$

(d) $\frac{5}{11} \frac{3}{4} \frac{19}{22}$

The denominator of 11, 4 and 22 is 88.
Expressing as equivalent fractions with denominator 88, we get

$$\frac{5}{11} \frac{3}{4} \frac{19}{22} \frac{5}{11} \frac{8}{8} \frac{3}{4} \frac{22}{22} \frac{19}{22} \frac{4}{4}$$

$$\frac{40}{88} \frac{66}{88} \frac{76}{88}$$

$$\frac{40}{88} \frac{66}{88} \frac{76}{88} \frac{182}{88}$$

$$\frac{182}{88} \frac{91}{44} \text{ (The lowest form)}$$

$$\frac{91}{44} 2 \frac{44}{44} \frac{3}{44} 2 \frac{3}{44} 2 \frac{3}{44}$$

(e) $\frac{13}{14} \frac{19}{21} \frac{2}{3}$

The LCM of 14, 21 and 3 is 42.

Expressing as equivalent fraction with denominator 42, we get

$$\frac{13}{14} \frac{19}{21} \frac{2}{3} \frac{13}{14} \frac{3}{3} \frac{19}{21} \frac{2}{2} \frac{2}{3} \frac{14}{14}$$

$$\frac{39}{42} \frac{38}{42} \frac{28}{42}$$

$$\frac{39}{42} \frac{38}{42} \frac{28}{42} \frac{105}{42}$$

$$\frac{105}{42} \frac{5}{2} \text{ (The simplest form)}$$

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

(f) $\frac{7}{13} \frac{2}{3} \frac{1}{2}$

The LCM of 13, 3 and 2 is 78.

Expressing as equivalent fraction with denominator 78, we get

$$\frac{7}{13} \frac{2}{3} \frac{1}{2} \frac{7}{13} \frac{6}{6} \frac{2}{3} \frac{26}{26} \frac{1}{2} \frac{39}{39}$$

$$\frac{42}{78} \frac{52}{78} \frac{39}{78}$$

$$\frac{42}{78} \frac{52}{78} \frac{39}{78} \frac{133}{78}$$

$$\frac{133}{78} \frac{78}{78} \frac{55}{78} 1 \frac{55}{78} 1 \frac{55}{78}$$

(g) $\frac{7}{9} \frac{17}{18} \frac{26}{27}$

The LCM of 9, 18 and 27 is 54.

Expressing as equivalent fractions with denominator 54, we get

$$\frac{7}{9} \frac{17}{18} \frac{26}{27} \frac{7}{9} \frac{6}{6} \frac{17}{18} \frac{3}{3} \frac{26}{27} \frac{2}{2}$$

$$\frac{42}{54} \frac{51}{54} \frac{52}{54}$$

$$\frac{42}{54} \frac{51}{54} \frac{52}{54} \frac{145}{54}$$

$$\frac{145}{54} 2 \frac{54}{54} \frac{37}{54}$$

$$2 \frac{37}{54} 2 \frac{37}{54}$$

(h) $\frac{3}{4} \frac{1}{5} \frac{8}{15}$

The LCM of 4, 5 and 15 is 60.

Expressing as equivalent fraction with denominator 60, we get

$$\frac{3}{4} \frac{1}{5} \frac{8}{15} \frac{3}{4} \frac{15}{15} \frac{1}{5} \frac{12}{12} \frac{8}{15} \frac{4}{4}$$

$$\frac{45}{60} \frac{12}{60} \frac{32}{60}$$

$$\frac{45}{60} \frac{12}{60} \frac{32}{60} \frac{89}{60}$$

$$\frac{89}{60} \frac{60}{60} \frac{29}{60} 1 \frac{29}{60} 1 \frac{29}{60}$$

$$(i) \frac{8}{17} \quad \frac{2}{3} \quad \frac{27}{51}$$

The LCM of 17, 3 and 51 is 51.

Expressing as equivalent fraction with denominator 51, we get

$$\frac{8}{17} \quad \frac{2}{3} \quad \frac{27}{51} \quad \frac{8 \times 3}{17 \times 3} \quad \frac{2 \times 17}{3 \times 17} \quad \frac{27}{51}$$

$$\frac{24}{51} \quad \frac{34}{51} \quad \frac{27}{51}$$

$$\frac{24}{51} \quad \frac{34}{51} \quad \frac{27}{51} \quad \frac{85}{51}$$

$$\frac{51}{51} \quad \frac{34}{51} \quad 1 \quad \frac{34}{51} \quad 1 \frac{34}{51}$$

2. Jack ate $\frac{3}{5}$ pie and Sara ate $\frac{2}{7}$ pie

They both ate altogether

$$\frac{3}{5} \quad \frac{2}{7} \quad \text{of pie}$$

The LCM of 5 and 7 is 35.

Expressing as equivalent fraction with denominator 35, we get

$$\frac{3}{5} \quad \frac{2}{7} \quad \frac{3 \times 7}{5 \times 7} \quad \frac{2 \times 5}{7 \times 5}$$

$$\frac{21}{35} \quad \frac{10}{35} \quad \frac{31}{35}$$

Hence, Jack and Sara ate altogether $\frac{31}{35}$ of the pie.

3. First man distributed 7 chapatis, second man distributed 9 chapatis and third man distributed 10 chapatis.

Number of beggars to whom chapati were given 5

The chapatis were equally distributed so each of the begger got $\frac{7}{5} \quad \frac{9}{5} \quad \frac{10}{5}$

of chapatis.

Since, the numerators of three fractions is same, $\frac{7}{5} \quad \frac{9}{5} \quad \frac{10}{5} \quad \frac{26}{5}$

$$\frac{26}{5} \quad 5 \quad \frac{5}{5} \quad \frac{1}{5} \quad 5 \quad \frac{1}{5} \quad 5 \quad \frac{1}{5}$$

Hence, each begger got $5 \frac{1}{5}$ chapatis.

4. He gave his wife $\frac{1}{3}$ of property

He gave his son $\frac{1}{2}$ of property

He gave his daughter $\frac{1}{3}$ of property

He gave in total $\frac{1}{3} \quad \frac{1}{2} \quad \frac{1}{3}$

$$\frac{2}{6} \quad \frac{3}{6} \quad \frac{2}{6} \quad \frac{2 \times 3}{6} \quad \frac{2}{6} \quad \frac{7}{6}$$

$$\frac{7}{6} \quad \frac{6}{6} \quad \frac{1}{6} \quad 1 \quad \frac{1}{6}$$

But $1 \frac{1}{6}$ is more than his property.

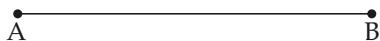
Hence, it is not possible.

■ ■

Playing with Constructions

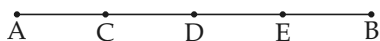
Textbook Exercise 8.1

1. **Step 1 :** We start it with a central line AB of length 12 cm.

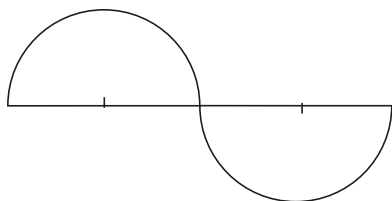


Step 2 : Since, a wave needs two halves circles. So mark 4 equidistant points on AB .

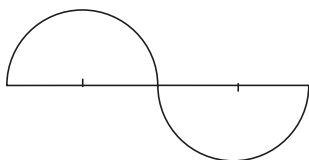
Where $AC = CD = DE = EB = 3$ cm each.



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 .

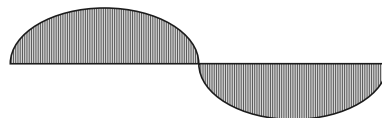


Step 4 : Shade inside the both half circles.



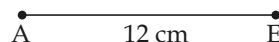
This is the required figure.

2. The 'Wavy Wave' should be drawn as given figure, appearing in the neck of figure of 'A Person'.

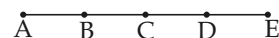


To draw this figure, necessary steps are given below :

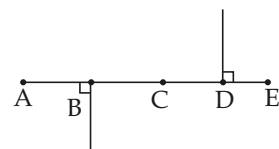
Step 1 : Draw a central line $AE = 12$ cm.



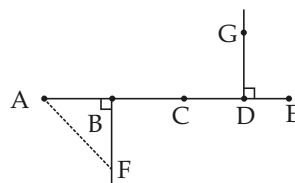
Step 2 : Since two equal arcs are to be drawn so divide AE into four equal parts with the help of a ruler such that $AB = BC = CD = DE = 3$ cm.



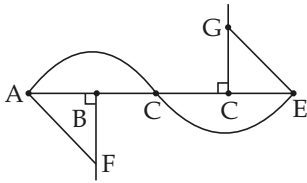
Step 3 : At B and D draw the perpendiculars with the help of protractor, as shown in the figure.



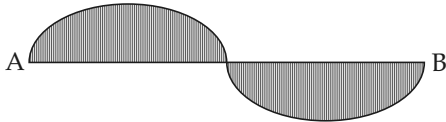
Step 4 : Using a ruler, mark points F and G on two perpendiculars such as $BF = DG = 1.5$ cm.



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.

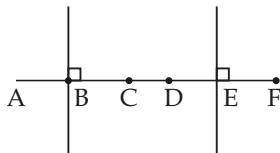


3. For this Artwork following steps will be followed :

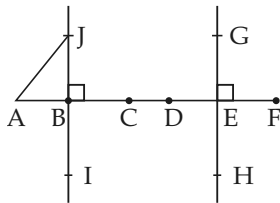
Step 1 : Draw a line segment AF 8.5 cm. With the help of a ruler mark points C and D on it such that AC 4 cm, CD 0.5 cm and DB 4 cm. Mark points B and E on it such that AB 2 cm and EF 2 cm.



Step 2 : Using a protractor draw perpendiculars on points B and E .

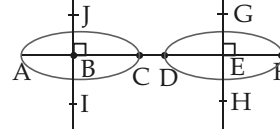


Step 3 : Using the compasses, draw arc to cut BJ BI EG EH 1.5 cm. Join A to J .

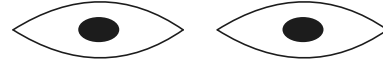


Step 4 : With the centre J and distance equal to AJ in the compass draw an arc from A to C , with the centre I and same distance draw another arc from A to C .

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.

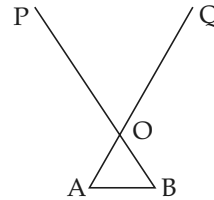


Hence, we get the shape of Eyes.

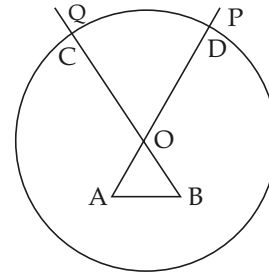
4. **Step 1 :** Draw a line segment AB 1 cm.



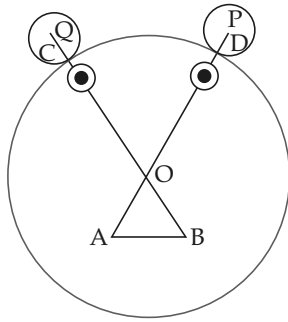
Step 2 : Using a protractor draw an angle of 60° on the points A and B both to cut the angle lines BP and AQ at the point O .



Step 3 : Taking O as centre and radius 2.5 cm draw a circle that intersect two lines of angle at C and D .



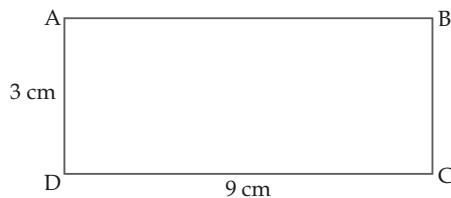
Step 5 : With the centres P and Q and radius in the compass equal to PD QC , draw circles. On the sides AD and BC draw small circles as shown in the figure below.



Hence, we obtained a face of a man.

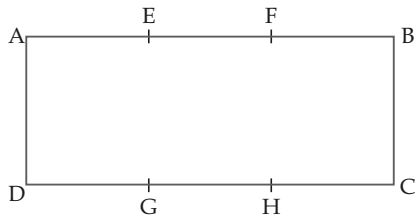
5. If this seem difficult, let us simplify the problem. For the purpose take the following steps :

Step 1. Construct a rectangle with length 9 cm and width 3 cm as you learnt just before topic.

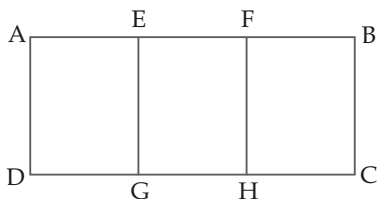


Step 2. Using a compass or a ruler divide AB into 3 equal parts *i.e.*, $AE = EF = FB = 3$ cm.

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 $A = D = 90^\circ$
(angle of rectangle)

$$AD = 3 \text{ cm}$$

(width of the given rectangle)

$$AE = DG = 3 \text{ cm (by construction)}$$

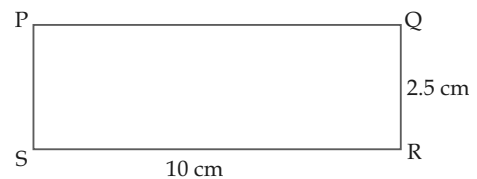
$$AD = EG = 3 \text{ cm}$$

Thus, $AEGD$ is a square.

Hence, $AEGD$, $EFHG$ and $FBCH$ are the squares whose sum is equal to rectangle $ABCD$.

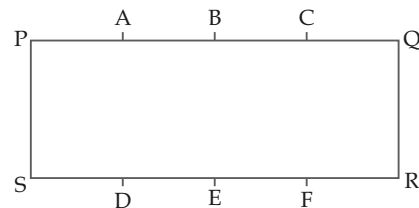
6. Using the steps given below, the problem can be made easier.

Step 1. Construct a rectangle with length 10 cm and width 2.5 cm.



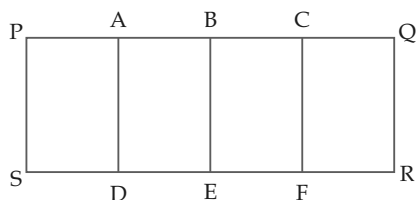
Step 2. Using a ruler or compass divide PQ into 4 equal parts such that $PA = AB = BC = CQ = 2.5$ cm.

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 $CQRF$.

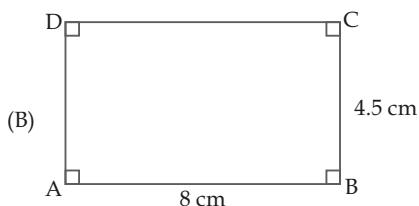
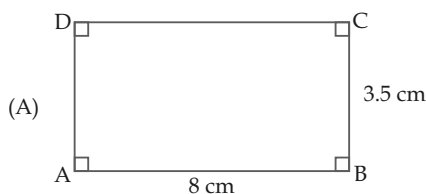
Hence, $PADS$, $ABED$, $BCFE$ and $CQRS$ are the required squares.



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.

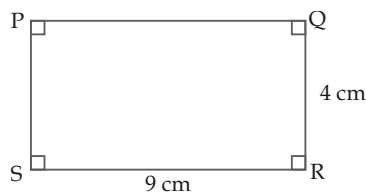
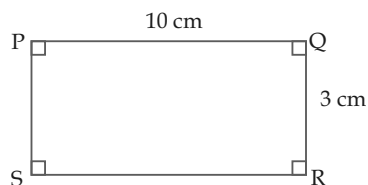


In these two cases, the rectangles can not be divided into two identical squares.

- (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.

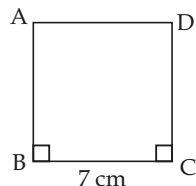
i.e., PQ 10 cm and QR 3 cm

or PQ 9 cm and QR 4 cm

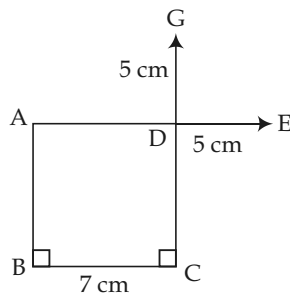


Above two cases, rectangles cannot be divided into two identical squares.

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.

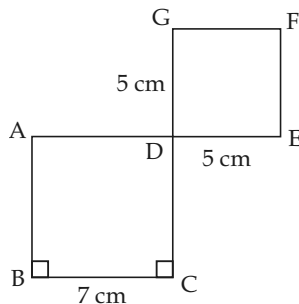


- Step 2.** Extend AD to E , such that DE 5 cm and extend CD to G , such that DG 5 cm

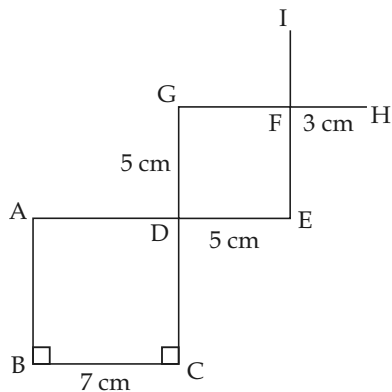


- Step 3.** Taking E and G as centres and keeping a distance of 5 cm in compass draw two arcs to intersect each other at F .

Join E to F and G to F .

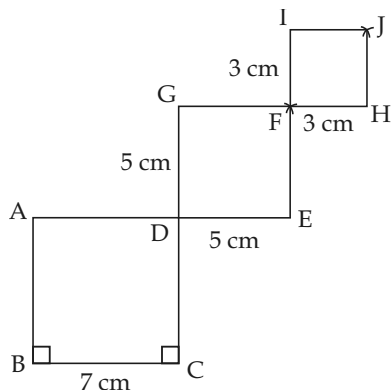


Step 4. Extend GF to H , such that $FH = 3$ cm extend EF to I such that $FI = 3$ cm.



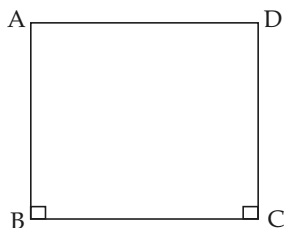
Step 5. Taking H and I as centres and keeping a distance of 3 cm in compass draw two arcs to intersect each other at J .

Join H to J and I to J



Hence, obtained shape is the required falling squares.

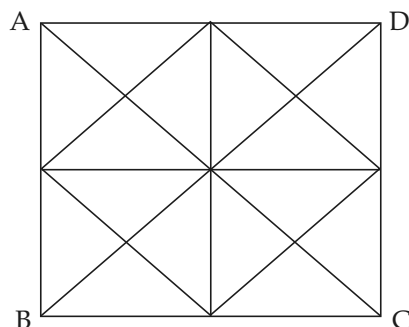
9. Step 1. Draw a square with its side 5 cm long as you have drawn earlier.



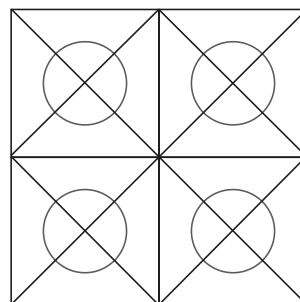
Step 2. Using a ruler or compass mark each side of the constructed square, dividing it into two equal parts and join the opposite marks as shown in the figure.



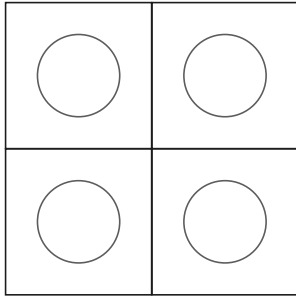
Step 3. Now draw the diagonals of each of the square to get the mid point of each square.



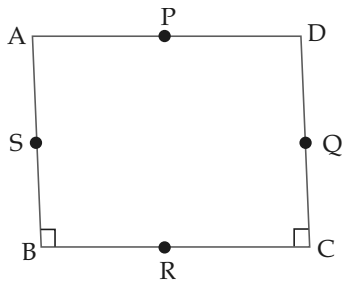
Step 4. With the centre of intersection points of the diagonals and distance 0.5 cm draw the circles.



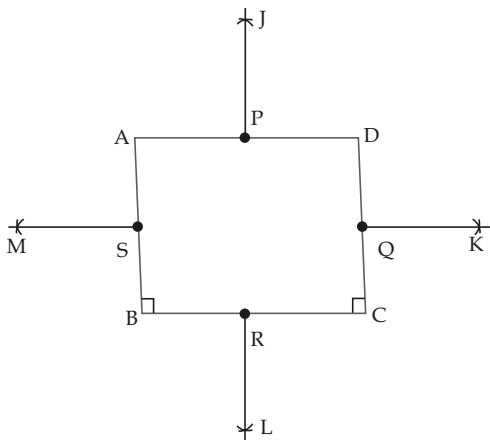
Hence, the following figure is required figure.



- 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 $PQRS$.



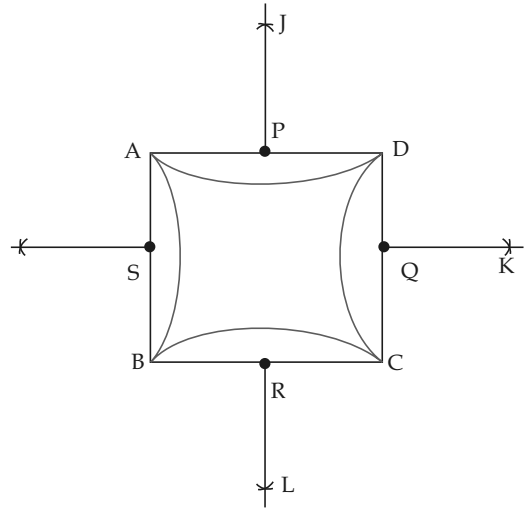
Step 2. Draw perpendiculars PJ , OK , RL and SM at the mid-points of the sides of the square such that PJ , QK , RL , SM 4 cm and join A to M .



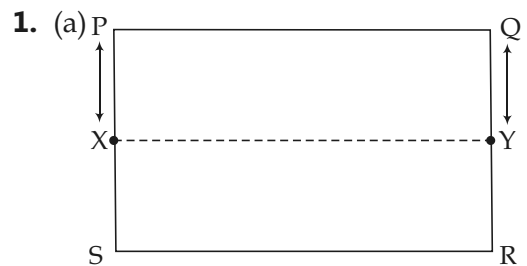
Step 3. Taking M as centre and distance in the compass, draw arc to meet A and B . Similarly, taking the

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.

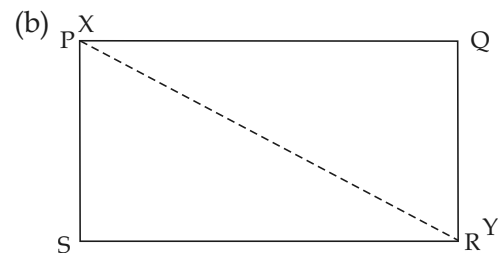
The image thus obtained is the desired image.



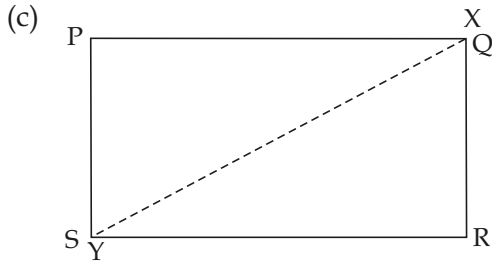
Concept Drill Exercise 8.1



Length of XY Length of PQ 8 cm



Using a ruler we find the length YX 10 cm.

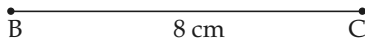


Using a ruler, we find the length of $XY = 10$ cm.

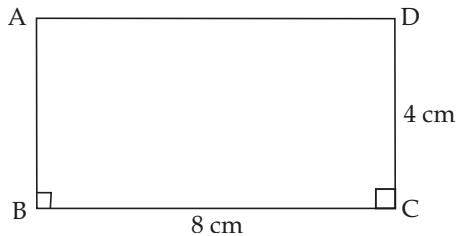
(d) X converses to S and Y converses to Q .

Hence, the length of $XY = SR = 8$ cm.

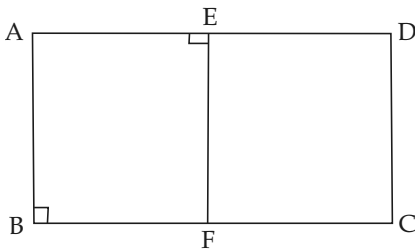
2. Step 1. Draw a line segment $BC = 8$ cm



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 into two equal parts. Join E to F .



$ABFE$ and $EFCD$ are the required square verification.

$$AB = EF = 4 \text{ cm}$$

$$AE = BF = 4 \text{ cm}$$

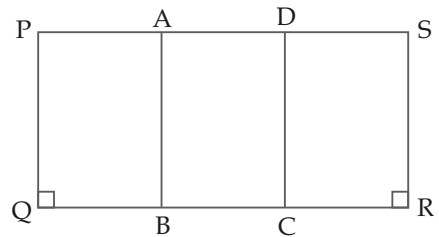
$$\angle A = \angle B = \angle F = \angle E = 90^\circ$$

Hence, 4 sides and 4 angles are equal, so $ABFE$ and $EFCD$ are the squares.

3. 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 $PQ = RS = 2.5$ 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 .



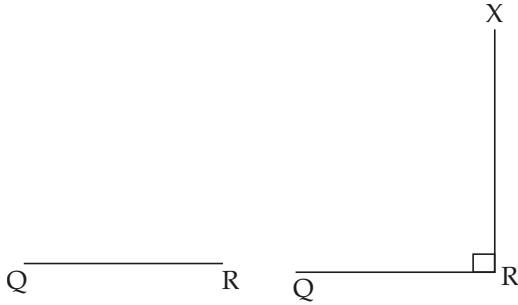
$PQBA$, $ABCD$ and $DCRS$ are the required squares.

4. (a) No, because the length of rectangle 8 cm is not twice its breadth 3 cm.
- (b) No, because the length of rectangle 10 cm is not thrice its breadth 3.5 cm.
- (c) Yes, because length of rectangle 12 cm is 4 times of its breadth 3 cm.

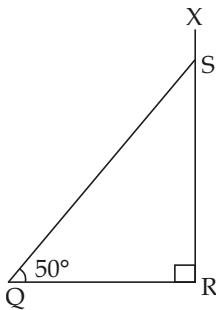
Textbook Exercise 8.2

- 1. Step 1.** Draw a line segment QR with an arbitrary length.

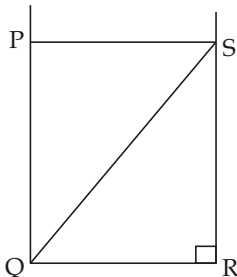
Step 2. Draw a perpendicular RX to QR passing through the point R .



Step 3. Draw a line making an angle of 50° with the point Q that intersects RX at S .



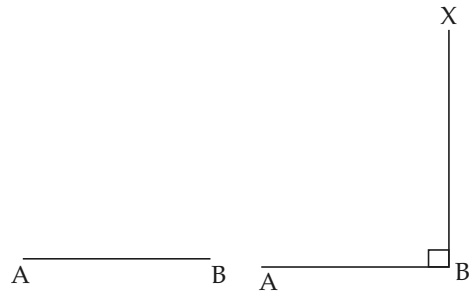
Step 4. Draw perpendiculars to QR and RS passing through the points Q and S respectively. Where these perpendicular lines intersect each other, mark P .



Hence, $PQRS$ is the required rectangle.

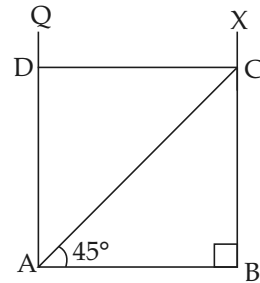
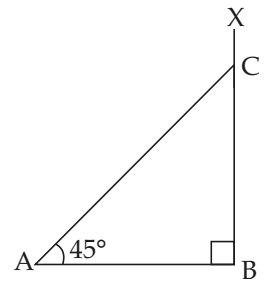
- 2. Step 1.** Draw a line segment AB with arbitrary length.

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.

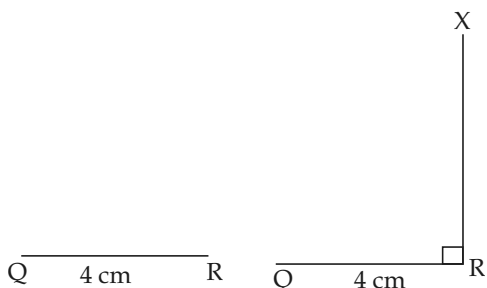
We obtain that the four sides of this rectangle are equal *i.e.*,

$$AB = BC = CD = DA.$$

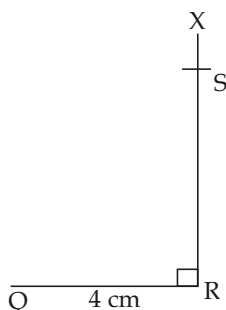
Note: square is a special type of rectangle.

3. Step 1. Draw a line segment QR 4 cm.

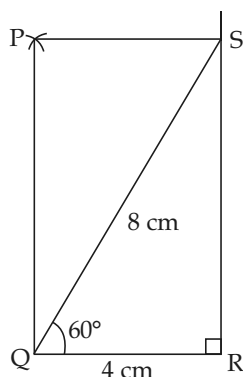
Step 2. Draw a perpendicular line RX passing through the point R .



Step 3. Taking Q as centre and radius 8 cm draw an arc that intersects RX at S .



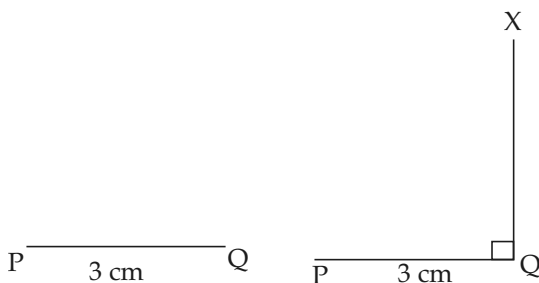
Step 4. Draw perpendiculars to QR and RS passing through the points Q and S respectively. At the intersection point of these two perpendiculars mark P .



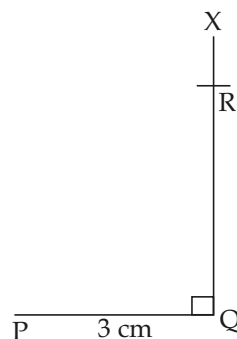
Hence, $PQRS$ is the required rectangle.

4. Step 1. Draw a line segment PQ 3 cm.

Step 2. Draw a perpendicular QX to PQ through Q .



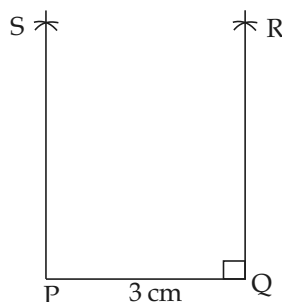
Step 3. Taking P as centre and a distance of 7 cm in a compass draw an arc to intersect QX at R .



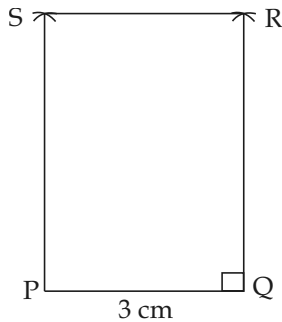
Step 4. Taking P as centre and distance equal to QR in the compass, draw an arc.

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 the arcs as S .



Step 7. Join S to R .



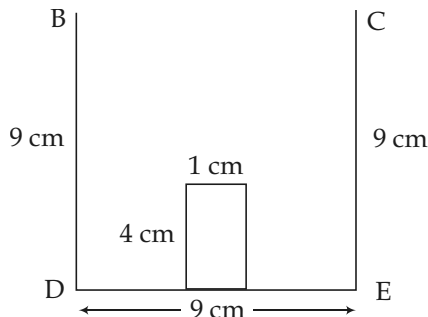
$PQRS$ is the required rectangle.

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.

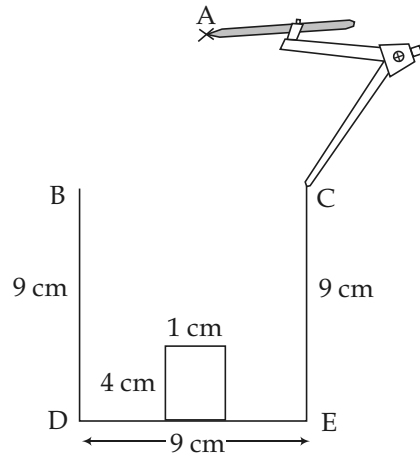
Step 4. Draw perpendiculars through these two dots with height 4 cm each and join the end points of two perpendiculars.



Step 5. With B as centre and a distance in the compass 9 cm draw an arc.

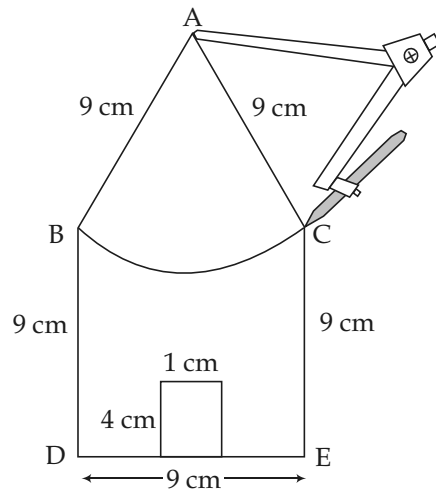
Step 6. Similarly draw another arc with centre C and distance 9 cm.

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.

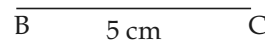


Now, your house is ready.

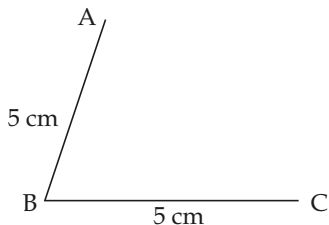
6. Yes, Rhombus is a 4-sided figure in which all sides are equal in length but is not a square.

To construct a rhombus, the following steps should be taken.

Step 1. Draw line segment BC 5 cm.

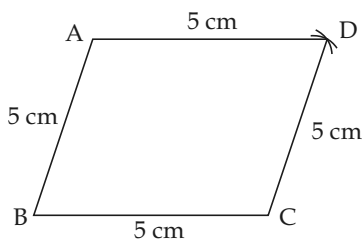


Step 2. Draw a side AB of length 5 cm from point B making an angle other than 90° .



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 .

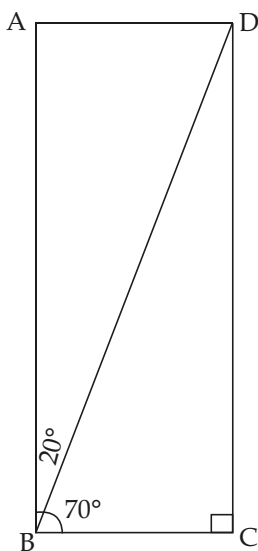
Step 4. Join A to D and C to D .



Hence, $ABCD$ is a rhombus, that has four equal sides but not 4 equal angles. So, it is not a square.

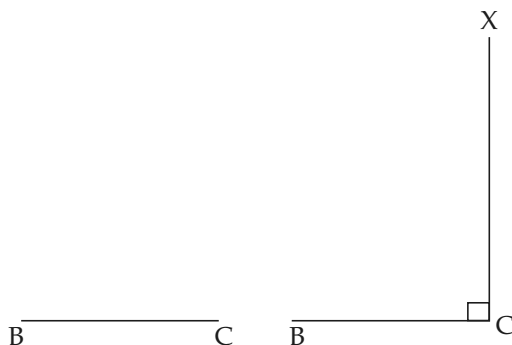
Concept Drill Exercise 8.2

1. First of all draw a rough sketch of rectangle $ABCD$.

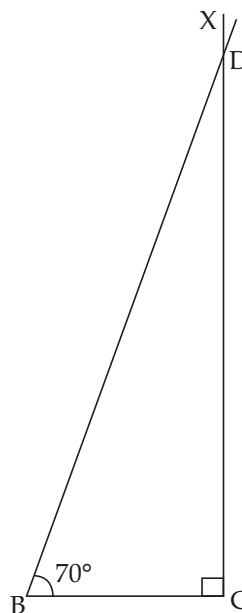


Step 1. Draw a line segment C with an arbitrary length.

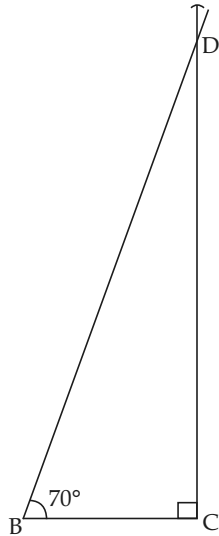
Step 2. Draw a perpendicular CX to BC passing through the point C .



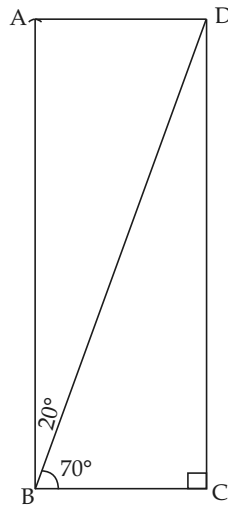
Step 3. Draw a line making an angle of 70° with BC at point B that intersects CX at D .



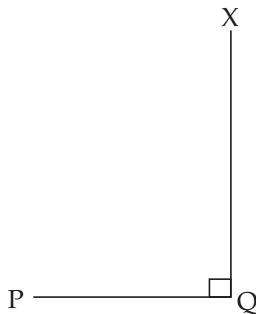
Step 4. Taking B as centre and a distance equal to CD in the compass draw an arc. Again, taking D as centre and a distance equal to BC draw another arc to intersect first arc at A .



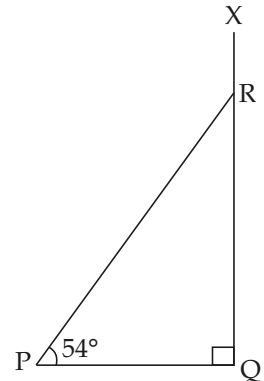
Step 5. Join A to B and A to D . Hence, $ABCD$ is the required rectangle.



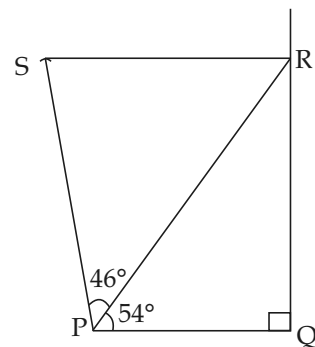
- 2. Step 1.** Draw a line segment PQ with a arbitrary length and draw a perpendicular line QX through the point Q .



Step 2. Draw a line segment at point P , making an angle of 54° with PQ which intersects QX at point R .

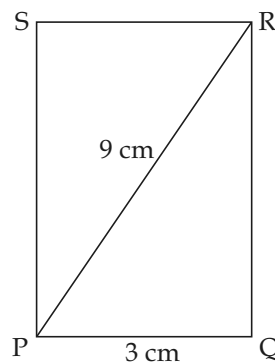


Step 3. Taking P and R as centres and taking distance equal to QR and PQ respectively in compass, draw arcs which intersect each other at point S .



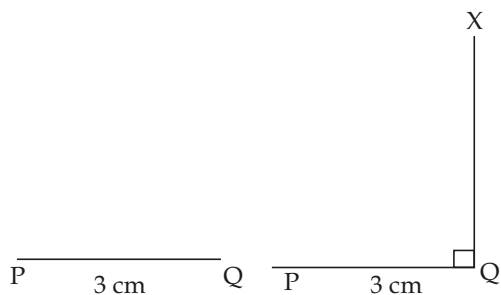
Hence, $PQRS$ is the required rectangle.

- 3.** Very first draw a rough diagram.



Step 1. Draw a line segment PQ 3 cm.

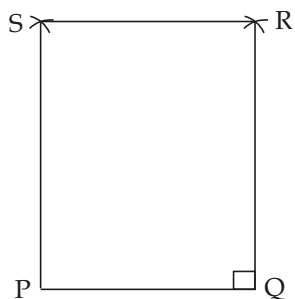
Step 2. Draw a perpendicular QX to PQ through the point Q .



Step 3. With centre P and a distance of the diagonal equal to 9 cm, draw an arc to intersect QX at R .

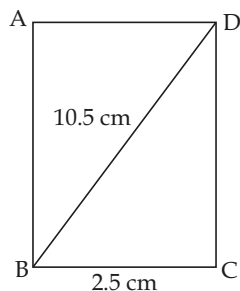
Step 4. Taking P and R as centres and distance equal to QR and PQ respectively, draw arcs to intersect each other at the point S .

Step 5. Join S to P and S to R .



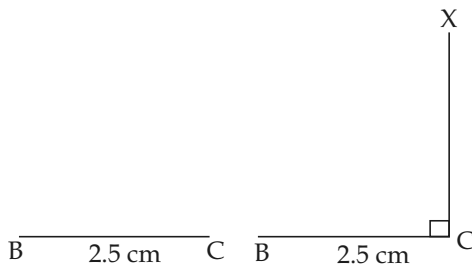
Hence, $PQRS$ is the required rectangle.

4. First of all draw a rough diagram.

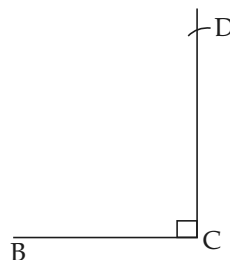


Step 1. Draw a line segment BC 2.5 cm.

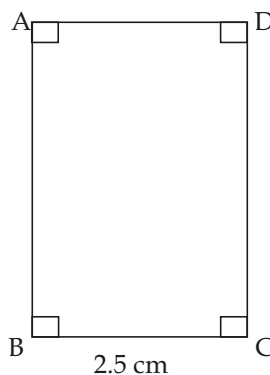
Step 2. Draw a perpendicular to BC through point C .



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.



Symmetry

Textbook Exercise 9.1

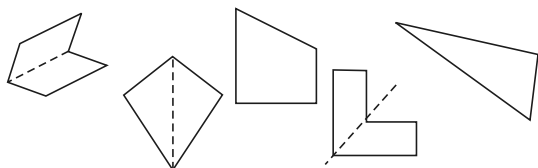
1. There are six lines of symmetry in flower.

There is only one line of symmetry in butterfly.

Rangoli has four lines of symmetry.

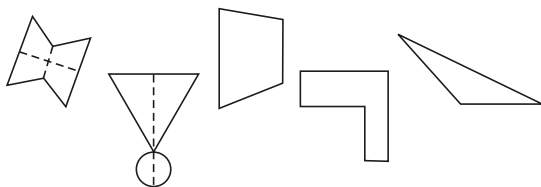
Pinwheel has no line of symmetry.

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 :

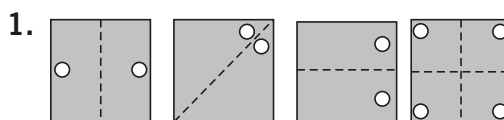


Concept Drill Exercise 9.1

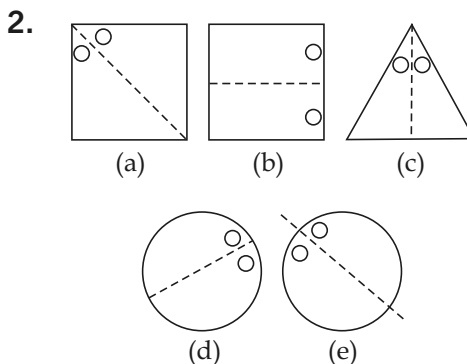
1. Spider's webs may be triangular or circular. It has shape of equilateral triangle, then it has three lines of symmetry otherwise infinite line of symmetry.
2. Here, figure (a) has two lines of symmetry. Figure (b) has one line of symmetry. Figure (c), (d) and (e) have no line of symmetry.



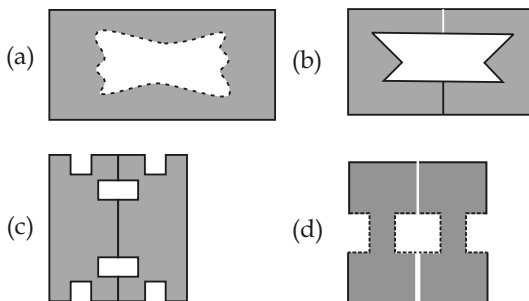
Textbook Exercise 9.2



Since the figure (d), has single hole, the paper was folded twice-first to create a half and then again to create a quarter.

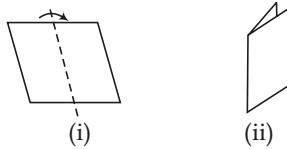


3. The images that we get are given below.



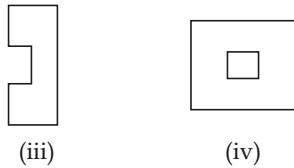
4. (a) To get each of these shapes, the following steps will be followed :
(i) Firstly fold the square paper in its middle line.

(ii) Now, pressing it make a crease.

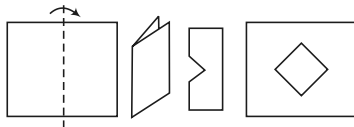


(iii) Now, cut it with the help of a scissors.

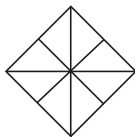
(iv) Now, open it



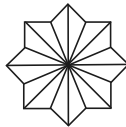
(b) Similarly,



5. (a)

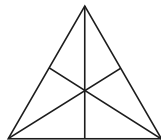


4-Lines symmetry

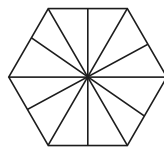


8-Lines of symmetry

(b) Three lines of symmetry.



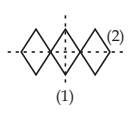
(c) Six lines of symmetry.



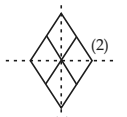
6.



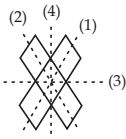
One line of symmetry



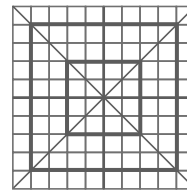
Two lines of symmetry



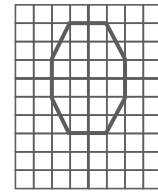
Two lines of symmetry



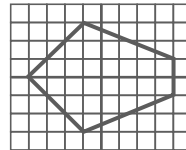
Four lines of symmetry



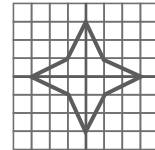
Four lines of Symmetry



Two lines of Symmetry



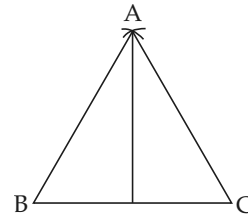
One line of Symmetry



Four lines of Symmetry

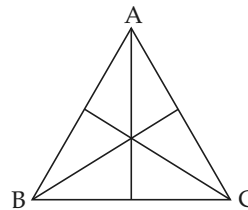
7. No line of symmetry is in this figure.

8. (a) If any two sides of a triangle are equal then one line of symmetry can be drawn.



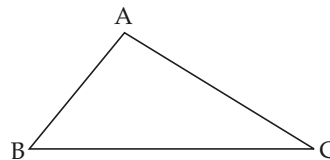
Here, side AB = side AC

(b) A triangle with three lines equal has three symmetric lines.



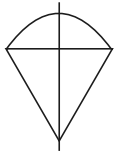
Here, AB = BC = CA

(c) No line of symmetry can be drawn for a triangle with unequal sides

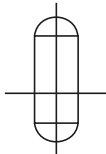


Here, AB ≠ BC ≠ CA

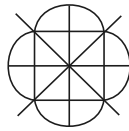
9.



(a)

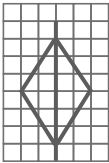


(b)

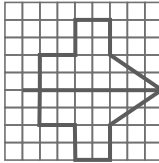


(c)

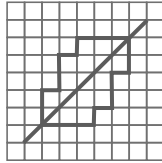
10.



(a)



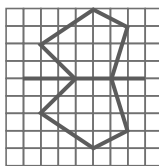
(b)



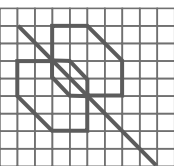
(c)



(d)

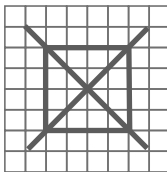


(e)

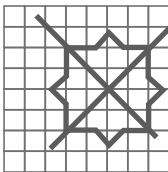


(f)

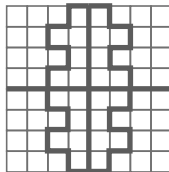
11.



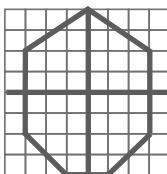
(a)



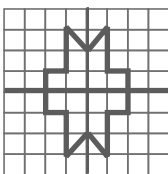
(b)



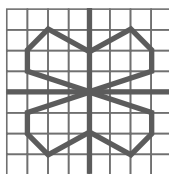
(c)



(d)

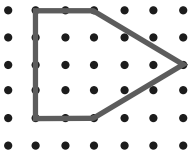
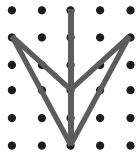
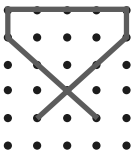
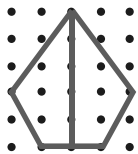
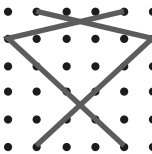


(e)



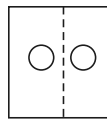
(f)

12.

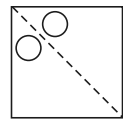


Concept Drill Exercise 9.2

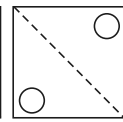
1.



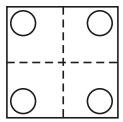
(a)



(b)

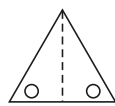


(c)

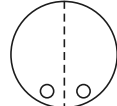


(d)

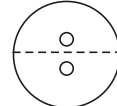
2.



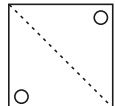
(a)



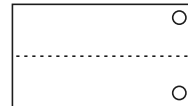
(b)



(c)

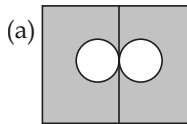


(d)

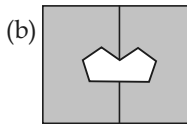


(e)

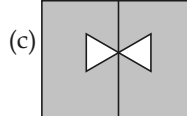
3.



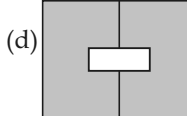
(a)



(b)



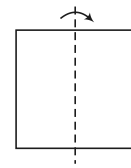
(c)



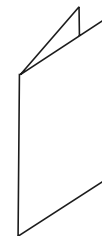
(d)

4. (a) To get each of the following shapes, the following steps will be followed :

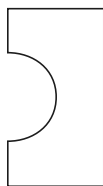
(i) First fold the square sheet of paper in the middle.



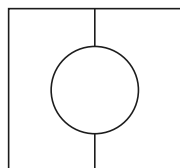
(ii) Now, pressing it make a crease.



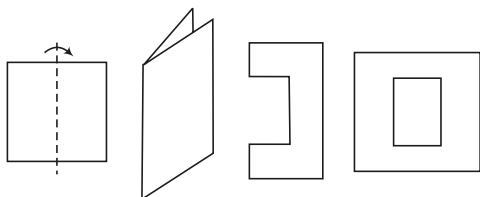
(iii) Now, cut it with the help of a scissors.



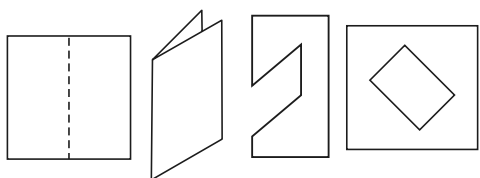
(iv) And then open it.



(b) Similarly

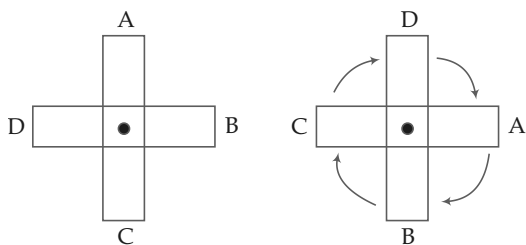


and Similarly



Textbook Exercise 9.3

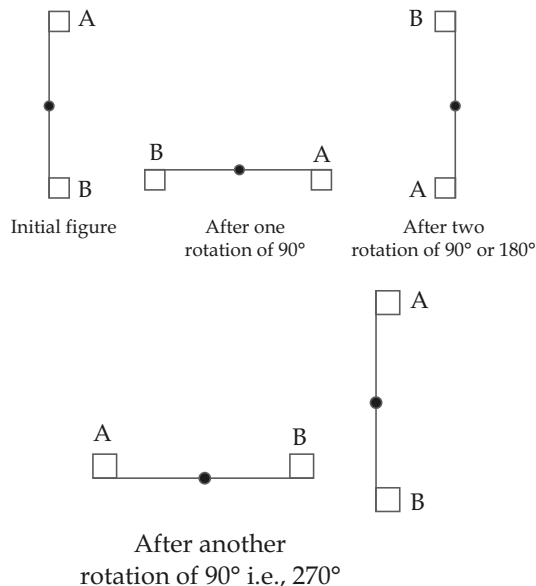
1. (a) To find the angle of symmetry rotate the figure by 90° .



The figure after rotation of 90° is exactly the same.

Hence, 90° is the angle of symmetry.

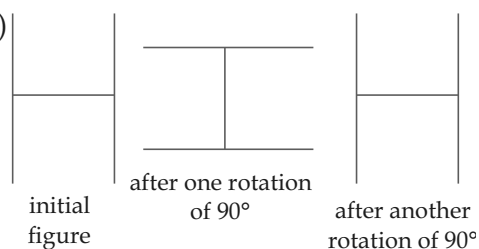
(b)



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 $90^\circ + 90^\circ + 90^\circ + 90^\circ = 360^\circ$

Hence, 360° is the angle of symmetry.

(c)



The figure after rotation of 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.

Concept Drill Exercise 9.3

1. (a) To find the angle of rotate symmetry rotate the figure by 90°

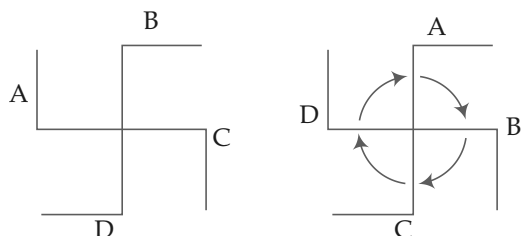
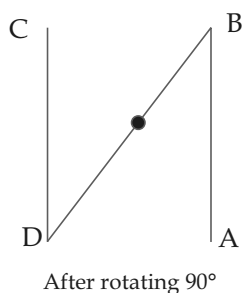
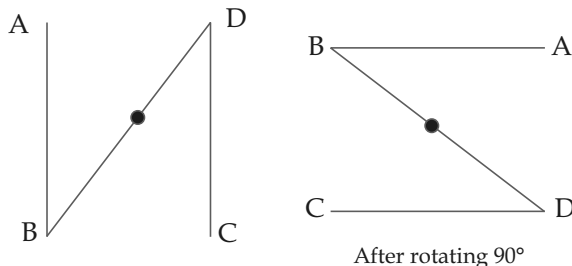
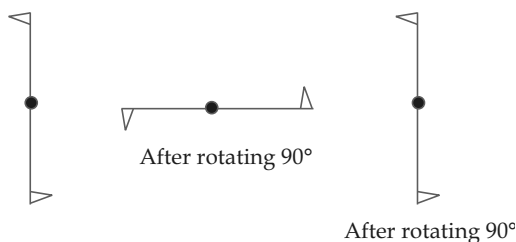


Figure after rotating at 90° is exactly the same

- (b) Figure after rotating at an angle of 180° is exactly the same.



- (c) Figure after rotating an angle of 180° is exactly the same as in the question.



2. Observing carefully it will be clear that the figures (b), (c), (d), (e) and (h) have more than one angle of symmetry. While the figure (a), (f) and (g) have only one angle 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) 2 (c) 1 (d) 6
(e) 3 (f) 4 (g) 3 (h) 2

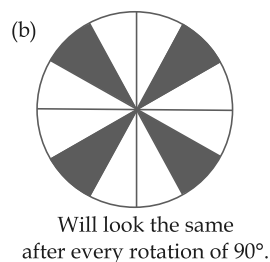
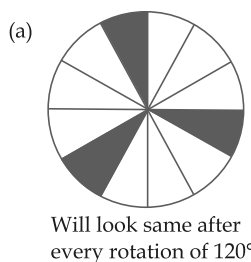
Observing carefully it will be clear that all the figures except (c) have more than one angle of symmetry.

4. The order of rotational symmetry is the number of time a shape can be rotated around a full circle and still look the same.

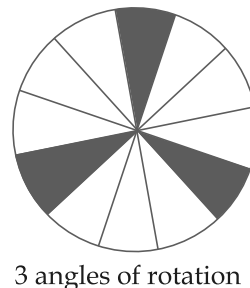
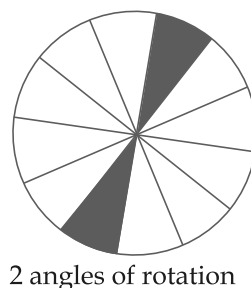
(a) 2 (b) 1 (c) 6
(d) 3 (e) 4 (f) 5

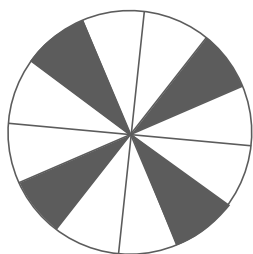
Textbook Exercise 9.4

1.

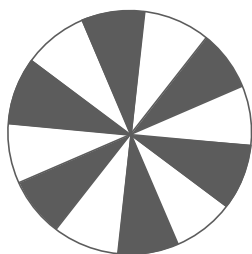


- (c) There are four possible ways



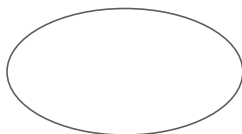


4 angles of rotation



6 angles of rotation

2.

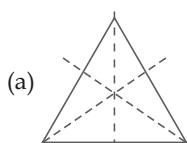


Oval



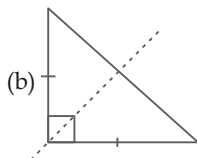
Rectangle

3.



(a)

Equilateral triangle



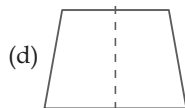
(b)

Right angled triangle



(c)

Parallelogram



(d)

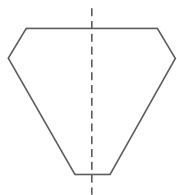
Trapezium

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.

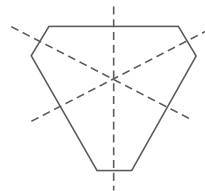
(b) No, as 360 is not a multiple of 17.

6. (a) The outer boundary of the picture shows reflection symmetry. It has only one line of symmetry.



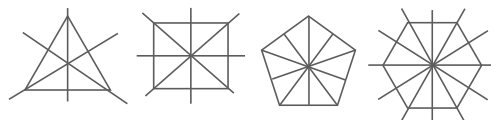
Picture shows the line of reflection symmetry.

(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.

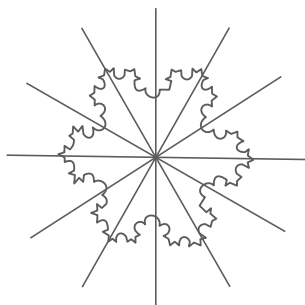
A 6-sided regular polygon that is called a regular hexagon has 6 lines of symmetry.

Hence, number sides in a regular polygon Number of lines of symmetry.

So a regular octagon has 8 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 $\frac{360}{12} = 30$

Concept Drill Exercise 9.4

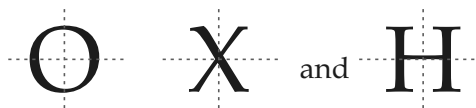
1. The letters given below have the reflection symmetry :



have reflection symmetry about vertical mirror letters.

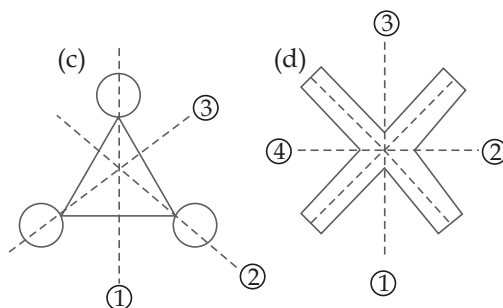
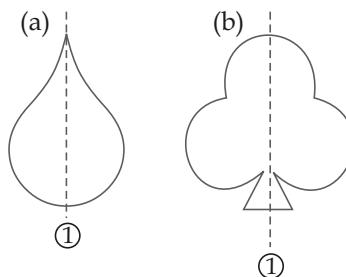


have reflection symmetry about horizontal mirror.

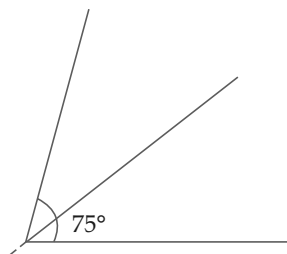


have reflection symmetry about both vertical and vertical mirror.

2.



3.



Hence, the angle of symmetry $\frac{75}{2} = 37.5$.

4. (a) Since, the wheel has 36 spokes, so pair of spokes $\frac{36}{2} = 18$

Thus, the number of line of symmetry 18

(b) Number of angles of symmetry
Number of lines of symmetry.

Hence, number of angles of symmetry 18

(c) The value of smallest angle of symmetry $\frac{360}{18} = 20$

(d) The order of symmetry 18



The Other Size of Zero

Textbook 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

(1) (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,

Target 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. $2 \text{ (7) } 5$

Example 2. Start at floor +4, press -9 to reach floor -5.

Sol. $4 \text{ (9) } 5$.

Example 3. Start at floor 0, press -5 to reach floor -5.

Sol. $0 \text{ (5) } 5$.

Example 4. Start at floor -3, press -2 to reach floor -5.

Sol. $3 \text{ (2) } 5$.

4. (a) $(1) \text{ (4) } 3$

(b) $(0) \text{ (2) } 2$

(c) $(4) \text{ (1) } 3$

(d) $(0) \text{ (2) } 2$

(e) $(4) \text{ (3) } 7$

(f) $(4) \text{ (3) } 1$

(g) $(1) \text{ (2) } 3$

(h) $(2) \text{ (2) } 0$

(i) $(1) \text{ (1) } 2$

(j) $(3) \text{ (3) } 6$

5. (a) Given $(40) \dots 200$

Let $(40) x 200$

or $x 200 \text{ (40)}$

$x 160$

Hence $(40) \text{ (160) } 200$

(b) Given, $(40) \dots 200$

Let $(40) x 200$

or $x 200 \text{ (40) } 240$

Hence $(40) \text{ (240) } 200$

(c) Given $(50) \dots 200$

Let $(50) x 200$

or $x 200 \text{ (50) } 250$

Hence $(50) \text{ (250) } 200$

(d) Given $(50) \dots 200$

Let $(50) x 200$

or $x 200 \text{ (50) } 150$

Hence $(50) \text{ (150) } 200$

(e) Given $(200) \text{ (40)}$

$(200) 40 160$

(f) Given $(200) \text{ (40) } \dots$

$(200) (40) 160$

(g) Given, $(200) \text{ (40) } \dots$

$200 40 160$

6. (a) $125 \text{ (30) } 155$

(b) $105 \text{ (55) } 105 55 160$

(c) $(105) \text{ (55) } 160$

(d) $80 \text{ (150) } 80 150 230$

(e) $80 \text{ (150) } 230$

(f) $99 \text{ (200) } 99 200 101$

(g) $99 \text{ (200) } 101$

(h) $1500 \text{ (1500) } 1500 1500$
 3000

Concept Drill Exercise 10.1

1. The starting floor is 4 (The Ice cream centre) and the number of button pressed is (5)

Therefore, Target floor

starting floor + movement

$(4) \text{ (5)}$

1 (The toys centre)

2. (a) $(2) \text{ (4) } \dots$

Given the starting floor is (2) (The Art Centre) and the number of button pressed 4

Therefore, Target floor

Starting floor + Movement

$(2) \text{ (4)}$

6 (The space centre)

$$(b) (5) - (3) \dots$$

Given, the starting floor is 5 (The Sports) and the number of button pressed is 3

Therefore, Target floor

$$\text{Starting floor} + \text{movement}$$

$$(5) - (3)$$

$$2 \text{ (The Art centre)}$$

$$(c) (6) - (4) \dots$$

Given the starting floor is 6 (The space centre) and the number of button pressed is 4.

Therefore, Target floor

$$\text{starting floor} - \text{movement}$$

$$(6) - (4)$$

$$2 \text{ (The Art Centre)}$$

$$(d) 0 - (3) \dots$$

Given the starting floor is 0 (The Reception Hall at ground floor) and other button pressed 3

Therefore, Target floor

$$= \text{starting floor} + \text{movement}$$

$$0 + (3)$$

$$3 \text{ (The Cinema Theater)}$$

$$(e) 0 - 5 \dots$$

Given the starting floor is 0 (The Reception Hall at ground floor) and the button pressed is 5

Therefore, The Target floor

$$\text{Starting floor} + \text{movement}$$

$$0 - (5)$$

$$5 \text{ (The Dinosaur)}$$

$$(f) (2) - (2) \dots$$

Given, the starting floor is 2 (The Art Centre) and the button pressed is 2

Therefore, The Target floor

$$\text{Starting floor} + \text{Movement}$$

$$(2) - (2)$$

$$0 \text{ (The Reception Hall on the}$$

$$\text{Ground floor)}$$

$$(g) (5) - (5) \dots$$

Given, the starting floor is 5 (Sport Centre) and the button pressed is 5

Therefore, Target floor

$$= \text{Starting floor} + \text{Movement}$$

$$(5) - (5)$$

$$0 \text{ (The Reception Hall at the}$$

$$\text{Ground Floor)}$$

$$3. (a) (23) - (23) = 46$$

$$(b) (8) - (15) = 7$$

$$(c) (17) - (24) = 7$$

$$(d) (68) - (68) = 0$$

$$(e) (149) - (151) = 2$$

$$(f) (30) - (45) = 15$$

$$(g) (124) - (69) = 55$$

$$(h) (58) - (29) = 87$$

$$(i) (17) - (28) = 11$$

$$(j) (65) - (96) = 31$$

$$4. (a) \text{ Given, } (229) \dots (550)$$

$$\text{Let } (229) - x = (550)$$

$$\text{or } x = (550) - (229)$$

$$x = 321$$

$$229 - (321) = (550)$$

$$(b) \text{ Given, } (345) \dots (246)$$

$$\text{Let } (345) - x = (246)$$

$$\text{or } x = 246 - (345)$$

$$246 - 345 = (99)$$

$$(345) - (99) = 246$$

(c) Given, $(-314) + \dots + (-314)$

Let $(-314) \times (-314)$

or $(-314) \times (-314) = 9872$

$(-314) \times 314 = 9872$

$(-314) \times 314 = 9872$

(d) Given, $(-216) + \dots + (-739)$

Let $(-216) \times (-739)$

or $(-216) \times (-739) = 161604$

Hence, $(-216) \times (-739) = 161604$

(e) $(-564) + \dots + (-126)$

Let $(-564) \times (-126)$

or $(-564) \times (-126) = 71124$

Hence, $(-564) \times (-126) = 71124$

(f) Given, $(-764) + \dots + (-524)$

Let $(-764) \times (-524)$

or $(-764) \times (-524) = 400336$

$(-764) \times 524 = 400336$

$(-764) \times 524 = 400336$

Hence, $(-764) \times (-524) = 400336$

(g) Given, $(-313) + \dots + (-224)$

Let $(-313) \times (-224)$

or $(-313) \times (-224) = 70112$

$(-313) \times 224 = 70112$

Hence, $(-313) \times (-224) = 70112$

(h) Given, $(-924) + \dots + (-648)$

Let $(-924) \times (-648)$

or $(-924) \times (-648) = 600672$

$(-924) \times 648 = 600672$

Hence, $(-924) \times (-648) = 600672$

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 $2 > -3$.

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.

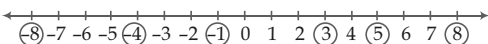
Hence $7 - (-7) = 7 + 7 = 14$

(vi) Given, $8 - (-10) = ?$

On subtracting a negative number is the same as adding the positive counter part of the number

Hence $8 - (-10) = 8 + 10 = 18$

Textbook Exercise 10.2

1. 

The positive numbers are right to 0 and they are 3, 5, 7.

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)

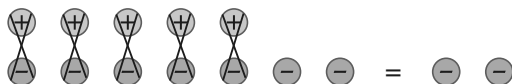
To show (5) we use 5 positive tokens.



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, $(-5) - (-7) = 2$

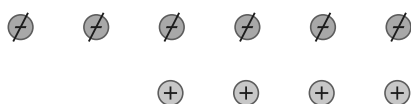
Now we can take out 7 negatives

(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, $(-7) - (-9) = 2$

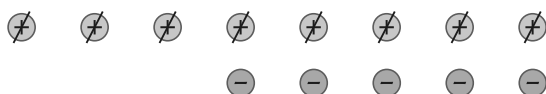
Now, we can take away 9 negatives.

(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 2 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

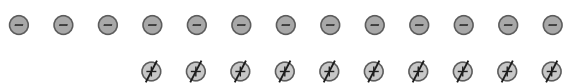
Hence, $(-3) - (-15) = 12$

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

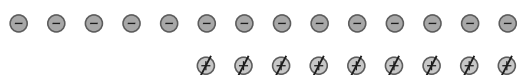
Hence, $(8) - (-7) = 15$

(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, $(-2) - (-7) = 9$

Concept Drill Exercise 10.2

1. (a) Both the numbers -2 and $+2$ are at the equal distance from 0, -2 is to the right and $+2$ is to the left of the 0.

(b) A positive number is always greater than all the negative numbers.

Hence $-10 < -100$

(c) Since, 0 has no sign with it, so the additive inverse of 0.

(d) The distance between -2 and $+2$ is

$$-2 - (-2) = -2 + 2 = 4 \text{ units.}$$

(e) Let x be added to -19 to get 10 therefore

$$-19 + x = 10$$

$$\text{or } x = 10 - (-19)$$

$$x = 29$$

Hence, $+29$ should be added.

(f) The distance between (-12) and $(+12)$ is

$$(-12) - (+12) = -12 - 12 = -24 \text{ units.}$$

2. Given $(-8) - (-6)$

On Representing the given number as tokens, we get



On combining two groups, we get



Hence, $(-8) - (-6) = -14$

(b) Given, $(-9) - (-18)$

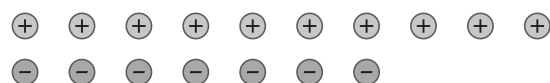
On representing the given numbers as tokens we get



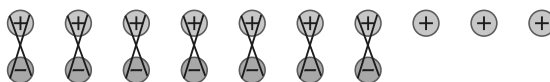
Hence $(-9) - (-18) = 17$

(c) Given, $(+10) - (-7)$

On representing the given numbers as tokens, we get



On combining two groups, we get



Hence, $(+10) - (-7) = 3$

(d) Given $(+10) - (+3)$

On representing the given numbers as tokens, we get



On combining these two groups of tokens, we get



Hence $(+10) - (+3) = 7$

(e) Given, $(-14) - (-12)$

On representing the given numbers as tokens, we get



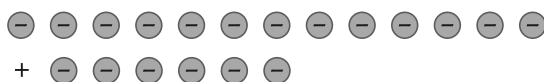
On combining these two groups of tokens, we get



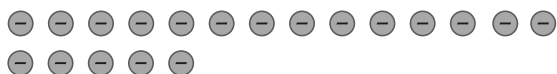
Hence $(14) - (12) = 2$

(f) Given $(13) - (6)$

On representing given numbers as tokens, we get



On combining these two groups of tokens, we get



Hence $(13) - (6) = 7$

5. (a) Given $(15) - (10)$

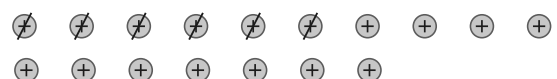
Here, from 15 positives take away 10 positives



Hence, $(15) - (10) = 5$

(b) Given $(17) - (6)$

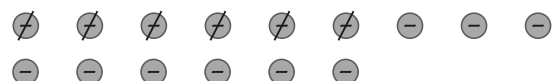
Here, from 17 positives tokens take away 6 positive tokens.



Hence, $(17) - (6) = 11$

(c) Given $(15) - (6)$

Here, from 15 negatives tokens take away 6 negative tokens.



Hence, $(15) - (6) = 9$

(d) Given $(20) - (18)$

Here, from 20 negative tokens take away 18 negative tokens.



Hence, $(20) - (18) = 2$

(e) Given $(6) - (15)$

Here, from 6 positive tokens take away 15 positive tokens. But there are not enough tokens to take out 15 positive tokens from 6 positive tokens.

So, put an extra 9 zero pairs of positive tokens and 8 negative tokens.

Now we can take away 15 positive tokens.



Hence, $(6) - (15) = -9$

(f) $(4) - (17)$

Here, from 4 negative take away 17 negatives but there are not enough negative tokens to take away 17 negatives from 4 negatives

So, put an extra 13 zero pairs of negative tokens and positive tokens.

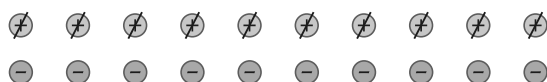


Now, we can take away 17 negative tokens.

Hence, $(4) - (17) = -13$

6. (a) Given, $0 - (10)$

Here, from 0 tokens take out 10 positive tokens. But there is no token to take away 10 positive tokens so, put an extra 10 zero pairs of positive and negative tokens.



Now we can take away to positive tokens.

Hence, $0 - (10) = 10$

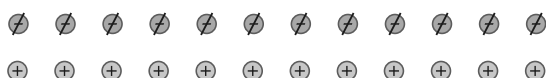
(b) Given, $0 - (12)$

Here, from zero tokens take away 12 negative tokens.

But there are not enough tokens to take away 12 negative tokens.

So put an extra 12 zero pairs of negative and positive tokens.

Now, we can take away 12 negative tokens.



Hence, $0 - (12) = 12$

(c) Given $(3) - (16)$

Here, from 3 positive tokens take away 16 positive tokens.

But there are not enough tokens to take away 16 positive token from 3 positive tokens. So, put an extra 13 zero pairs of positive and negative tokens.



Hence $(3) - (16) = 13$

(d) Given $(15) - (17)$

Here, from 15 positive take away 17 positives. But there are not enough tokens to take away 17 positive from 15 positive tokens.

So, put an extra 2 pairs of positive and negative tokens.

Now, we can take away 17 positive tokens.

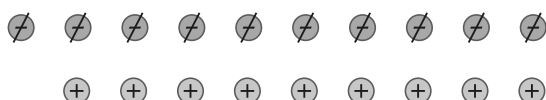


Hence, $(15) - (17) = 2$

(e) Given, $(1) - (10)$

Here, from 1 negative take away 10 negative. But there are not enough tokens to take away 10 negative from 1 negative token.

So, put an extra 9 pairs of negative and positive



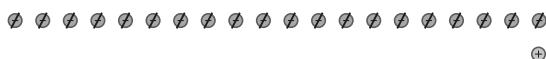
Now, we can take away 10 negative tokens.

Hence, $(1) - (10) = 9$

(f) Given, $(19) - (20)$

Here, from 19 negatives take away 20 negatives. But there are not enough tokens to take away 20 negative tokens from 19 negative tokens. So put an extra on zero pair of negative and positive tokens.

Now, we can take away 20 negatives



Hence $(19) - (20) = 1$

Textbook Exercise 10.3

1. 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 cope 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 world 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)

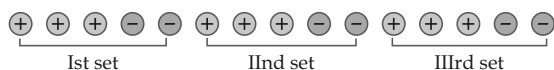
The result depends on the absolute value of the number subtracted. It may be positive, negative or zero. For example :

$$(-555) + (-450) = 105 \text{ (Negative)}$$

$$(-332) + (-400) = 68 \text{ (Positive)}$$

$$(-350) + (-350) = 0 \text{ (zero)}$$

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 Brahmagupta'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 arithmetic 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 explicitly described way back in the year 628 BCE for the modern development of Algebra, which will be learnt by us in the next classes.

Concept Drill Exercise 10.3

1. Bhavya starts his bank account with ₹0. His respective deposits are ₹2000, ₹5000 and ₹7000.

Total value of credits

₹2000 ₹5000 ₹7000 ₹14000

Bhavya's debits are ₹6000, ₹8000 and ₹9000 ₹23000

So Bhavya's bank account balance

Credit debits

₹14000 ₹23000 ₹9000

Hence Bhavya's bank account balance
₹9000

2. Shruti's credits ₹3000, ₹2000, ₹5000, ₹10000 and ₹1000 ₹21,000

Her debits are ₹7000 and ₹4000

Total amount of debits

₹7000 ₹4000 ₹11000

So, Shruti's bank account balance after the year Credit debits

₹21000 ₹11000 ₹10000

Hence, Shruti's bank account balance
₹10000

3.

(a)

8	-21	6
-18		-14
3	-11	1

(b)

-5	1	-2
-9		4
8	-6	-8

(c)

5	2	-8
-7		3
1	-6	4

(d)

8	-11	9
-5		-2
3	4	-1

(e)

-16	5	6
7		0
4	2	-11

(f)

2	5	-10
-9		-1
4	-15	8

4. The faces of two dice have same numbers : 1, 2, 3, 4, 5, 6. First of all we will find the possible numbers on rolling both the dice. Very first we list the sum of two negative numbers,

(2) (2) 4
(2) (4) 6
(2) (6) 8
(4) (4) 8
(4) (6) 10
(6) (6) 12

Secondly we list the sum of one negative and one positive.

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

Now, we find the list of sum of two positive numbers

1 1 2
1 3 4
1 5 6
3 3 6
3 5 8
5 5 10

Now, list all the possible number sequence in increasing order

(1),(3),(4),(5),(6),(8),(10),
(12), 1, 2, 3, 4, 6, 8, 10

Hence, the sum of numbers that are
not possible between (12) and 10 are
(11),(9),(7),(2), 0, 5, 7 and 9.

5. The value of one black token (5)

So the value of 5 black tokens

$$5 \times 5 = 25$$

The value of one red token 8

So the value 4 red token

$$8 \times 4 = 32$$

The value of one white token 3

So the value of 7 white token

$$3 \times 7 = 21$$

The value of one green token 6

So the value of 4 green tokens

$$6 \times 4 = 24$$

Total value of tokens in a bag

$$(25) + (32) + (21) + (24)$$

$$(53) + (49)$$

$$(53) + (49) = 4$$

The total value of 30 bags

$$4 \times 30 = 120$$

Hence, the total value of tokens in the
store 120

