Board – NCERT	Class – 6^{th}	Topic – Understanding Elementary Shapes

Exercise – 5.1

Q1. What is the disadvantage in comparing a line segment by meter observation?

Sol. Comparing the lengths of two-line segments simply by 'observation' may not be accurate. So we use a divider to compare the length of the given line segments.

Q2. Why is it better to use a divider than a ruler, while measuring the length of a line segment?

Sol. Measuring the length of a line segment using a ruler, we may have the following errors:

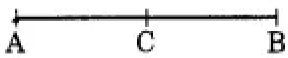
(i) Thickness of the ruler

(ii) Angular viewing

These errors can be eradicated by using a divider. So, it is better to use a divider than a ruler, while measuring the length of a line segment.

Q3. Draw any line segment, say $\overline{AB}$. Take any point C lying in between A and B. Measure the lengths of AB, BC, and AC. Is AB = AC + CB?

Sol. Let us consider



A, B and C such that C lies between A and B and AB = 7 cm.

AC = 3 cm, CB = 4 cm.

$\therefore$ AC + CB = 3 cm + 4 cm = 7 cm.

But, AB = 7 cm.

So, AB = AC + CB.

Q4. If A, B, C are three points on a line such that AB = 5 cm, BC = 3 cm, and AC = 8 cm, which one of them lies between the other two?

Sol. We have, AB = 5 cm; BC = 3 cm

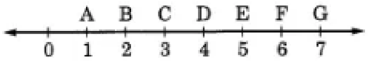
$\therefore$ AB + BC = 5 + 3 = 8 cm

But, AC = 8 cm

Hence, B lies between A and C.

Q5.Verify, whether D is the midpoint of $\overline{AG}$

Sol.



From the given figure, we have

AG = 7 cm – 1 cm = 6 cm

AD = 4 cm – 1 cm = 3 cm

and DG = 7 cm – 4 cm = 3 cm

∴ AG = AD + DG.

Hence, D is the midpoint of $\overline{AG}$

Q6. If B is the midpoint of $\overline{AC}$and C is the midpoint of $\overline{BD}$, where A, B, C, D lie on a straight line, explain why AB = CD?

Sol. We have

B is the midpoint of $\overline{AC}$.

∴ AB = BC ...(i)

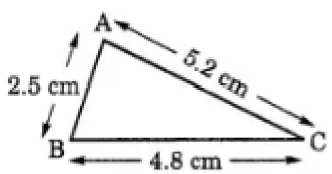
C is the mid-point of $\overline{BD}$.

BC = CD

From Eq.(i) and (ii), We have

AB = CD

Q7. Draw five triangles and measure their sides. Check in each case, if the sum of the length of any two sides is always less than the third side.



Case I. In ΔABC

Let AB = 2.5 cm

BC = 4.8 cm

and AC = 5.2 cm

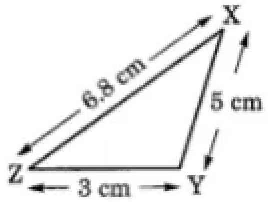
AB + BC = 2.5 cm + 4.8 cm

= 7.3 cm

Since, 7.3 > 5.2

So, AB + BC > AC

Hence, sum of any two sides of a triangle is greater than the third side.



Case II. In ΔPQR,

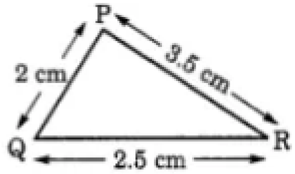
Let PQ = 2 cm

QR = 2.5 cm

and PR = 3.5 cm

PQ + QR = 2 cm + 2.5 cm = 4.5 cm

Since, 4.5 > 3.5



So, PQ + QR > PR

Hence, sum of any two sides of a triangle is greater than the third side.

Case III. In ΔXYZ

Let XY = 5 cm

YZ = 3 cm

and ZX = 6.8 cm

XY + YZ = 5 cm + 3 cm

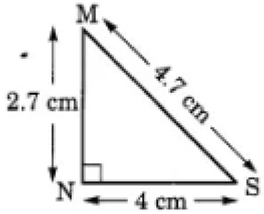
= 8 cm

Since, 8 > 6.8

So, XY + YZ > ZX

Hence, the sum of any two sides of a triangle is greater than the third side.

Case IV. In ΔMNS,



Let MN = 2.7 cm

NS = 4 cm

MS = 4.7 cm

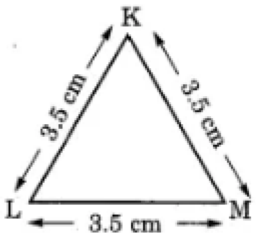
and MN + NS = 2.7 cm + 4 cm = 6.7 cm

Since, 6.7 >4.7

So, MN + NS > MS

Hence, the sum of any two sides of a triangle is greater than the third side.

Case V. In ΔKLM,



Let KL = 3.5 cm

LM = 3.5 cm

KM = 3.5 cm

and KL + LM = 3.5 cm + 3.5 cm = 7 cm

7 cm > 3.5 cm

So, KL + LM > KM

Hence, the sum of any two sides of a triangle is greater than the third side.

Hence, we conclude that the sum of any two sides of a triangle is never less than the third side.

Exercise -5.2

Q1. What fraction of a clockwise revolution does the hour hand of a clock turn through, when it goes from

(a) 3 to 9

(b) 4 to 7

(c) 7 to 10

(d) 12 to 9

(e) 1 to 10

(f) 6 to 3

Sol. (a) 3 to 9

$9 - 3 = 6 \div 12 = \frac{1}{2}$ of a revolution

(b) 4 to 7

$7 - 4 = 3 \div 12 = \frac{1}{4}$ of a revolution

(c) 7 to 10

$10 - 7 = 3 \div 12 = \frac{1}{4}$ of a revolution

(d) 12 to 9 i.e., 0 to 9

$9 - 0 = 9 \div 12 = \frac{3}{4}$ of a revolution

(e) 1 to 10

$10 - 1 = 9 \div 12 = \frac{3}{4}$ of a revolution

(f) 6 to 3 i.e., 6 to 12 and then 12 to 3

6 to 12 = 12 – 6 = 6 and 12 to 3 = 0 to 3 = 3 – 0 = 3

$6 + 3 = 9 \div 12 = \frac{3}{4}$ of a revolution

Q2. Where will the hand of a clock stop if it

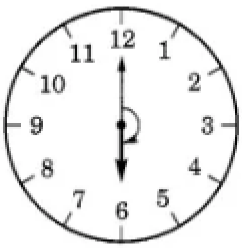
(a) starts at 12 and makes $\frac{1}{2}$ of a revolution, clockwise?

(b) starts at 2 and makes $\frac{1}{2}$ of a revolution, clockwise?

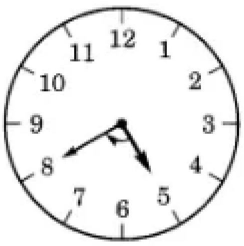
(c) starts at 5 and makes $\frac{1}{2}$ of a revolution, clockwise?

(d) starts at 5 and makes $\frac{1}{2}$ of a revolution, clockwise?

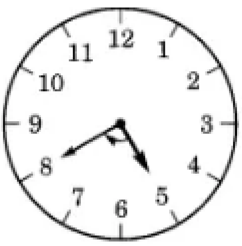
Sol. (a) Starting from 12 and making $\frac{1}{2}$ of a revolution, the clock hand stops at 6.



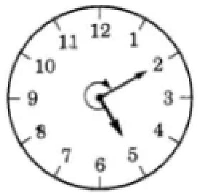
(b) Starting from 2 and making $\frac{1}{2}$ of a revolution, the clock hand stops at 8.



(c) Starting from 5 and making $\frac{1}{2}$ of a revolution, the clock hand stops at 8.



(d) Starting from 5 and making $\frac{1}{2}$ of a revolution, the clock hand stops at 2.



Q3. Which direction will you face if you start facing

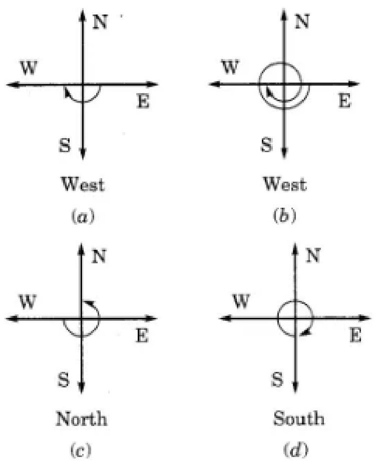
(a) east and make $\frac{1}{2}$ of a revolution clockwise?

(b) east and make $1\backslash\frac{1}{2}$ of a revolution clockwise?

(c) west and make $\frac{3}{4}$ of a revolution anticlockwise?

(d) south and make one full revolution? (Should we specify clockwise or anticlockwise for this last question? Why/ Why not?)

Sol.



Taking one full revolution we will reach back to the original (starting) position. Therefore, it make no difference whether we turn clockwise or anticlockwise.

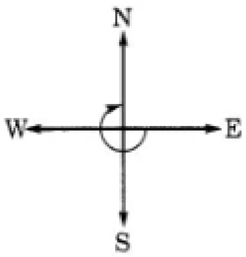
Q4. What part of a revolution have you turned through if you stand facing

(a) east and turn clockwise to face north?

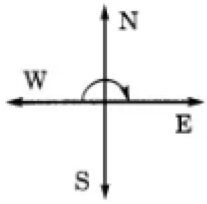
(b) south and turn clockwise to face east?

(c) west and turn clockwise to face east?

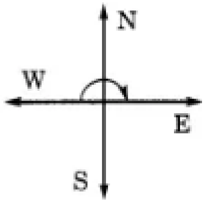
Sol. (a) If we start from east and reach north (turning clockwise) $\frac{3}{4}$ of a revolution is required.



(b) If we start from south turning clockwise to face east, $\frac{3}{4}$ of a revolution is required.

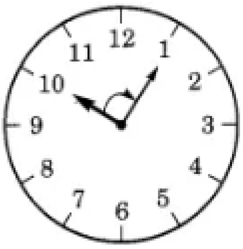


(c) If we start from west turning clockwise to face east, $\frac{1}{2}$ of a revolution is required.



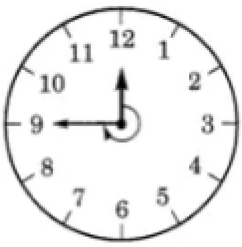
Starting from 5 to 11, the hour hand turns through 2 right angles.

(d) 10 to 1



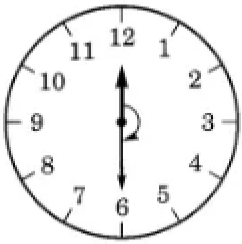
Starting from 10 to 1, the hour hand turns through 1 right angle.

(e) 12 to 9



Starting from 12 to 9, the hour hand turns through 3 right angles.

(f) 12 to 6



Starting from 12 to 6, the hour hand turns through 2 right angles.

Q6. How many right angles do you make if you start facing

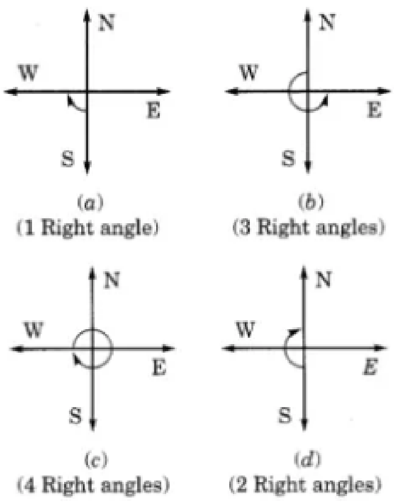
(a) south and turn clockwise to west?

(b) north and turn anticlockwise to east?

(c) west and turn to west?

(d) south and turn to north?

Sol.



Q7. Where will the hour hand of a clock stop if it starts

(a) from 6 and turns through 1 right angle?

(b) from 8 and turns through 2 right angles?

(c) from 10 and turns through 3 right angles?

(d) from 7 and turns through 2 straight angles?

Sol. (a) Starting from 6 and turning through 1 right angle, the hour hand stops at 9.

(b) Starting from 8 and turning through 2 right angles, the hour hand stops at 2.

(c) Starting from 10 and turning through 3 right angles, the hour hand stops at 7.

(d) Starting from 7 and turning through 2 right angles, the hour hand stops at 7.

Exercise – 5.3

Q1. Match the following:

(i) Straight angle — (a) Less than one-fourth of a revolution.
(ii) Right angle — (b) More than half a revolution.
(iii) Acute angle — (c) Half of a revolution.
(iv) Obtuse angle — (d) One-fourth of a revolution.
(v) Reflex angle — (e) Between $\frac{1}{4}$ and $\frac{1}{2}$ of a revolution.
– — (f) One complete revolution.

Sol. (i) Straight angle ↔ (c) Half of a revolution.
(ii) Right angle ↔ (d) One-fourth of a revolution.
(iii) Acute angle ↔ (a) Less than one-fourth of a revolution.
(iv) Obtuse angle ↔ (e) Between $\frac{1}{4}$ and $\frac{1}{2}$ of a revolution.
(v) Reflex angle ↔ (f) One complete revolution, right, acute, obtuse or reflex.

Q2. Classify each one of the following angles

Sol. (a) Acute angle
(b) Obtuse angle
(c) Right angle
(d) Reflex angle
(e) Straight angle
(f) Acute angle

Exercise – 5.4

Q1. What is the measure of (i) a right angle (ii) a straight angle?

Sol. (i) Measure of a right angle = $90°$
(ii) Measure of a straight angle = $180°$

Q2. Say True or False:

(a) The measure of an acute angle $< 90°$
(b) The measure of an obtuse angle $< 90°$
(c) The measure of a reflex angle $> 180°$
(d) The measure of one complete revolution $= 360°$
(e) If $m\angle A = 53°$ and $\angle B = 35°$, then $m\angle A > m\angle B$.

Sol. (a) True
(b) False

(c) True

(d) True

(e) True

Q3. Write down the measures of

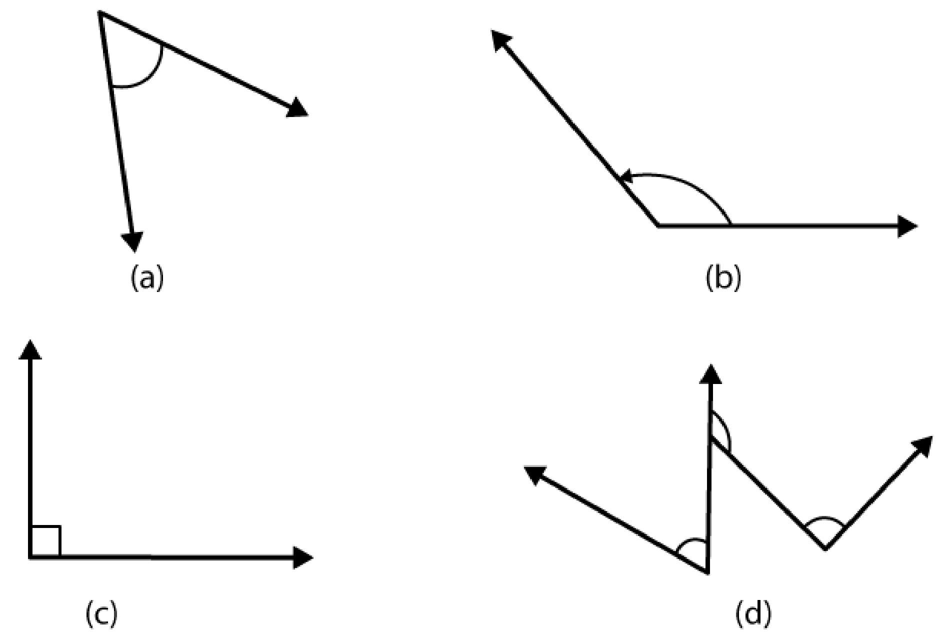
(a) some acute angles

(b) some obtuse angles

Sol. (a) 25°, 63°, and 72° are acute angles.

(b) 105°, 120°, and 135° are obtuse angles.

Q4. Measure the angles given below using the protractor and write down the measurement.



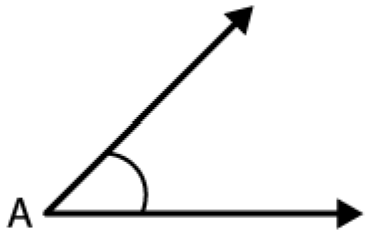
Sol. (a) 45°

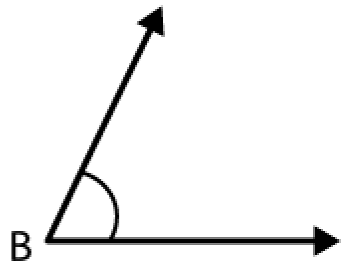
(b) 125°

(c) 90°

(d) $\angle 1 = 60°, \angle 2 = 90°, \angle 3 = 125°$

Q5. Which angle has a large measure? First estimate and then measure.





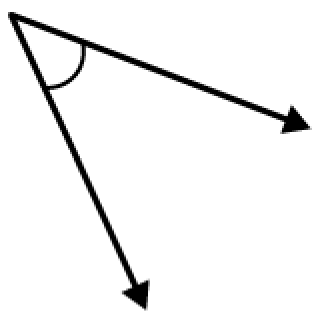
The measure of Angle A =

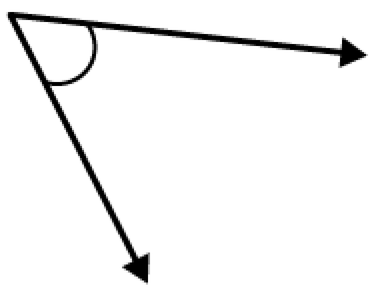
The measure of Angle B =

Sol. The measure of Angle A = 40°

The measure of Angle B = 60°.

Q6. From these two angles which have large measures? Estimate and then confirm by measuring them.





Sol. The opening of angle (b) is more than angle (a).

∴ Measure of angle (a) = 45°

and the measure of angle (b) = 60°

Q7. Fill in the blanks with acute, obtuse, right, or straight:

(a) An angle whose measure is less than that of a right angle is ....

(b) An angle whose measure is greater than that of a right angle is ....

(c) An angle whose measure is the sum of the measures of two right angles is ....

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is ....

(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be ....

Sol. (a) acute

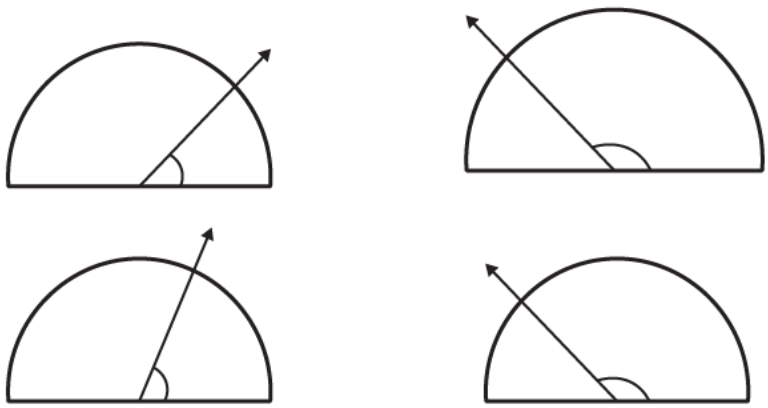
(b) obtuse

(c) straight

(d) acute

(e) obtuse

Q8. Find the measure of the angle shown in each figure. (First estimate with your eyes and then find the actual measurement with a protractor).



Sol. (a) Measure of the angle = 40°

(b) Measure of the angle = 130°

(c) Measure of the angle = 65°

(d) Measure of the angle = 135°.

Q9. Find the angle measure between the hands of the clock in each figure:

9.00 am

1.00 pm

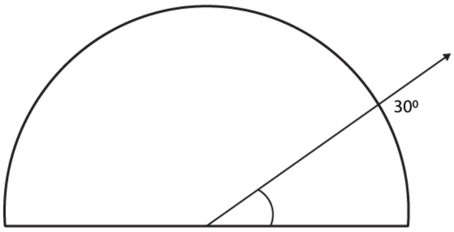
6.00 pm

Sol. (i) The angle between the hour hand and minute hand of a clock at 9.00 a.m = 90°

(ii) The angle between the hour hand and minute hand of a clock at 1.00 p.m = 30°

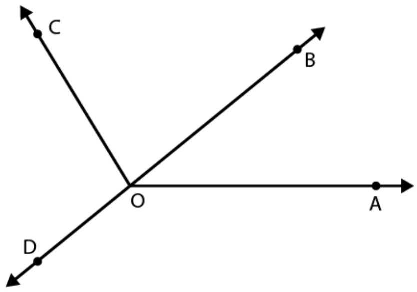
(iii) The angle between the hour hand and minute hand of a clock at 6.00 p.m = 180°.

Q10. Investigate: In the given figure, the angle measures 30°. Look at the same figure through a magnifying glass. Does the angle become larger? Does the size of the angle change?



Sol. It is an activity. So try it yourself.

Q11. Measure and classify each angle:



Angle	Measure	Type
∠AOB		
∠AOC		
∠BOC		
∠DOC		
∠DOA		
∠DOB		

Solutions:

Angle	Measure	Type
∠AOB	40^0	Acute
∠AOC	125^0	Obtuse
∠BOC	85^0	Acute
∠DOC	95^0	Obtuse
∠DOA	140^0	Obtuse
∠DOB	180^0	Straight

Exercise -5.5

Q1. Which of the following are models for perpendicular lines:

(a) The adjacent edges of a tabletop.

(b) The lines of a railway track.

(c) The line segments forming the letter ‘L’.

(d) The letter V.

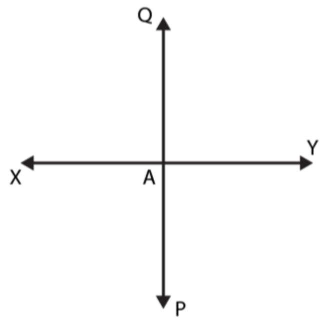
Sol. (a) Yes, the adjacent edges of a tabletop are the models of perpendicular lines.

(b) No, the lines of railway tracks are parallel to each other. So they are not a model for perpendicular lines.

(c) Yes, the two line segments of ‘L’ are the model for perpendicular lines.

(d) No, the two line segments of ‘V’ are not a model for perpendicular lines.

Q2. Let $\boxed{PQ}$ be the perpendicular to the line segment $\boxed{XY}$. Let $\boxed{PQ}$ and $\boxed{XY}$ intersect at point A. What is the measure of ∠PAY?



From the figure, it is clear that the measure of ∠PAY is 900

Q3. There are two set-squares in your box. What are the measures of the angles that are formed at their corners? Do they have any angle measure that is common?

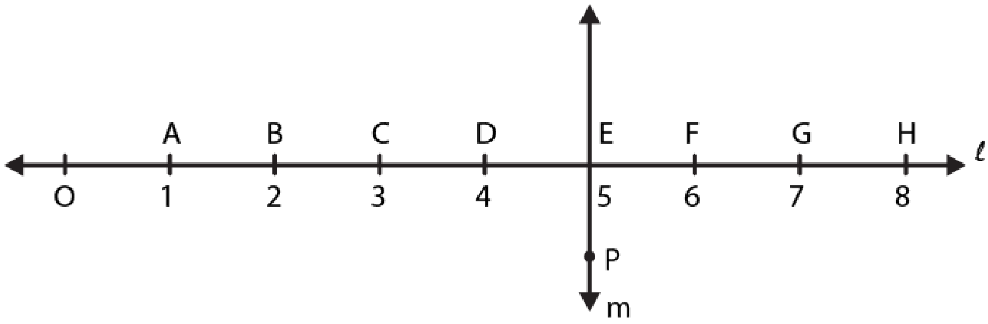
Sol. The figures of the two set-squares are given below:

The measured angles of set square (a) are 30°, 60°, and 90°.

The measured angles of set square (b) are 45°, 45°, and 90°.

Yes, they have a common angle of measure 90°.

Q3. Study the diagram. The line l is perpendicular to line m.



(a) Is CE = EG?

(b) Does PE bisects CG?

(c) Identify any two line segments for which PE is the perpendicular bisector.

(d) Are these true?

(i) AC > FG

(ii) CD = GH

(iii) BC < EH

Sol. (a) Yes,

Since, CE = 2 units and EG = 2 units

Hence, CE = EG.

(b) Yes, PE bisects CG

(d) (i) True (ii) True (iii) True

Exercise -5.6

Q1. Name the types of following triangles:

(a) Triangle with length of sides 7 cm, 8 cm and 9 cm.

(b) ΔABC with AB = 8.7 cm, AC = 7 cm and BC = 6 cm.

(c) ΔPQR such that PQ = QR = PR = 5 cm.

(d) ΔDEF with $\angle D = 90°$

(e) ΔXYZ with $\angle Y = 90°$ and XY = YZ.

(f) ΔLMN with $\angle L = 30°$, $\angle M = 70°$, and $\angle N = 80°$.

Sol. (a) Lengths of the sides of a triangle are given as 7 cm, 8 cm, and 9 cm.

Since the length of all sides of the given triangle are different, it is a Scalene triangle.

(b) Given that: AB = 8.7 cm, AC = 7 cm and BC = 6 cm

Here $AB \neq AC \neq BC$ Hence, ΔABC is Scalene triangle.

(c) Given that: PQ = QR = PR = 5 cm

Since all the sides are equal.

Hence, it is an equilateral triangle.

(d) Given that: In ΔDEF, $\angle D = 90°$

Hence it is a right angled triangle.

(e) Given that: In ΔXYZ, $\angle Y = 90°$ and $XY = YZ$

Hence it is a right angled triangle.

(f) Given that: ΔLMN, $\angle L = 30°$, $\angle M = 70°$ and $\angle N = 80°$.

Hence it is an acute-angled triangle.

Q2. Match the following:

Measure of triangle	Type of triangle
(i) 3 sides of equal length	(a) Scalene
(ii) 2 sides of equal length	(b) Isosceles right angled
(iii) All sides are of different length	(c) Obtuse angled
(iv) 3 acute angles	(d) Right angled
(v) 1 right angle	(e) Equilateral
(vi) 1 obtuse angle	(f) Acute angled
(vii) 1 right angle with two sides of equal length	(g) Isosceles

Sol. (i) ↔ (e)

(ii) ↔ (g)

(iii) ↔ (a)

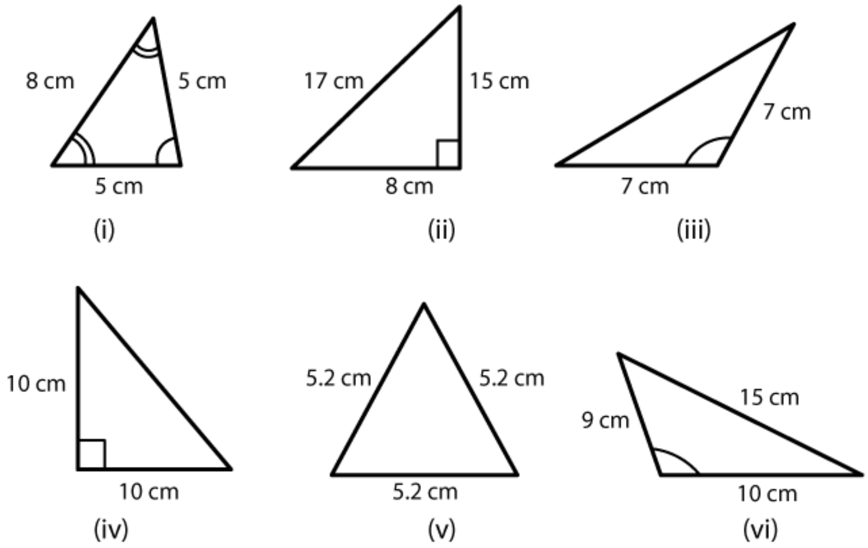
(iv) ↔ (f)

(v) ↔ (d)

(vi) ↔ (c)

(vii) ↔ (b)

Q3. Name each of the following triangles in two different ways: (You may judge the nature of the angle by observation)



Sol. (a) (i) Acute angled triangle

(ii) Isosceles triangle

(b) (i) Right angled triangle

(ii) Scalene triangle

(c) (i) Obtuse angled triangle

(ii) Isosceles triangle

(d) (i) Right angled triangle

(ii) Isosceles triangle

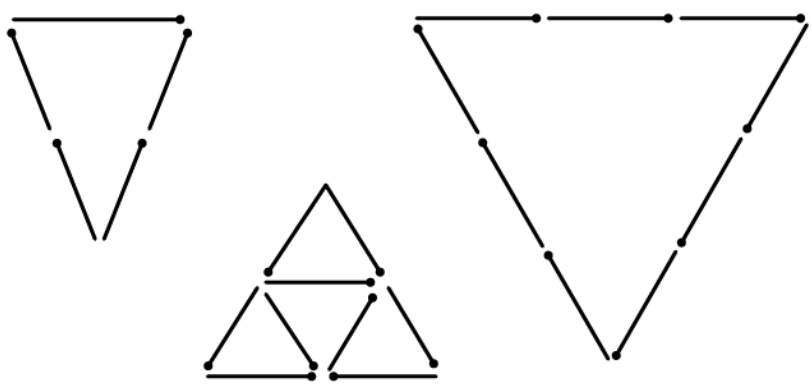
(e) (i) Acute angled triangle

(ii) Equilateral triangle

(f) (i) Obtuse angled triangle

(ii) Scalene triangle.

Q4. Try to construct triangles using matchsticks. Some are shown here.



Can you make a triangle with

(a) 3 matchsticks?

(b) 4 matchsticks?

(c) 5 matchsticks?

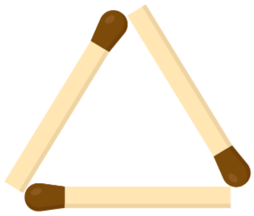
(d) 6 matchsticks?

(Remember you have to use all the available matchsticks in each case)

Name the type of triangle in each case.

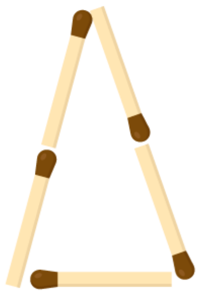
If you cannot make a triangle, give reasons for it.

Sol. (a) Yes, we can make an equilateral triangle with 3 matchsticks.

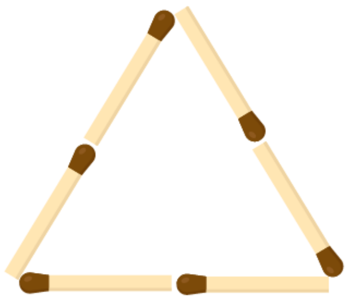


(b) No, we cannot make a triangle with 4 matchsticks.

(c) Yes, we can make an isosceles triangle with five matchsticks.



(d) Yes, we can make an equilateral triangle with 6 matchsticks.



Exercise – 5.7

Q1. Say True or False:

(a) Each angle of a rectangle is a right angle.

(b) The opposite sides of a rectangle are equal in length.

(c) The diagonals of a square are perpendicular to one another.

(d) All the sides of a rhombus are of equal length.

(e) All the sides of a parallelogram are of equal length.

(f) The opposite sides of a trapezium are parallel.

Sol. (a) True

(b) True

(c) True

(d) True

(e) False

(f) False

Q2. Give reasons for the following:

(a) A square can be thought of as a special rectangle.

(b) A rectangle can be thought of as a special parallelogram.

(c) A square can be thought of as a special rhombus.

(d) Square, rectangles, parallelograms are all quadrilaterals.

(e) Square is also a parallelogram.

Sol. (a) A square has all the properties as that of a rectangle. So, it is a special rectangle.

(b) A rectangle has the same properties as that of a parallelogram. So, it is a special parallelogram.

(c) A square has the same properties as that of a rhombus. So, it is a special rhombus.

(d) Square, rectangles, and parallelogram are all quadrilaterals as they are all enclosed by four sides.

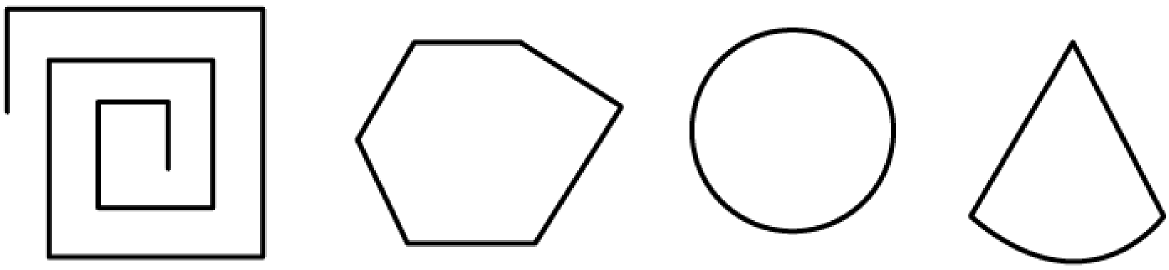
Q3. A figure is said to be regular if its sides are equal in length and angles are equal in measure. Can you identify the regular quadrilateral?

Sol. Square is only the regular quadrilateral with equal sides and equal angles.

Therefore, a square is a regular quadrilateral.

Exercise – 5.8

Q1. Examine whether the following are polygons. If anyone among them is not, say why?



(i) (ii) (iii) (vi)

Sol. (a) The given figure is not closed. Therefore, it is not a polygon.

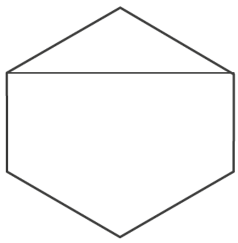
(b) The given figure is a polygon.

(c) The given figure is not a polygon because every polygon is enclosed with line segments.

(d) The given figure is not a polygon because it is enclosed by an arc and two line segments.

Q2. Draw a rough sketch of a regular hexagon. Connecting any three of its vertices, draw a triangle. Identify the type of triangle you have drawn.

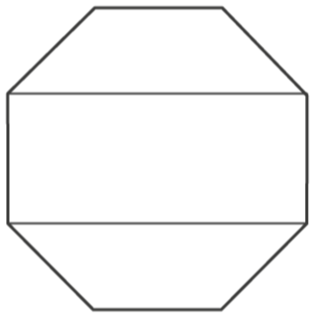
Sol. ABCDEF is a rough sketch of a regular hexagon. If we join any three vertices like D, A and B, we get a scalene triangle DAB.



But if we join the alternate vertices, we get an equilateral triangle EAC.

Q3. Draw a rough sketch of a regular octagon. (Using squared paper if you wish). Draw a rectangle by joining exactly four of the vertices of the octagon.

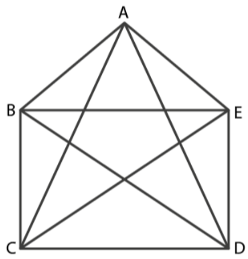
Sol. ABCDEFGH is a rough sketch of a regular octagon. GHCD is the rectangle formed by joining the four vertices of the given octagon.



Q4. A diagonal is a line segment that joins any two vertices of the polygon and is not a side of the polygon. Draw a rough sketch of a pentagon and draw its diagonals.

Sol. A B C D E is the rough sketch of a pentagon.

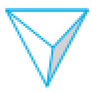
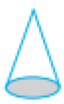
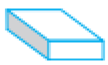
By joining any two vertices, we get, the following diagonals.



Exercise 5.9

Q1. Match the following:

Give two examples of each shape.

(a) Cone	(i)	
(b) Sphere	(ii)	
(c) Cylinder	(iii)	
(d) Cuboid	(iv)	
(e) Pyramid	(v)	

Sol. (a) 4 ↔ (ii)

Examples:

(i) An ice-cream cone

(ii) Birthday cap

(b) ↔ (iv)

Examples:

(i) Tennis ball

(ii) Cricket ball

(c) ↔ (v)

Examples:

(i) A road roller

(ii) A lawn roller

(d) ↔ (iii)

Examples:

(i) Math book

(ii) A brick

(e) ↔ (i)

Examples:

(i) A diamond

(ii) Egypt-Pyramids

Q2. What shape is

(a) Your instrument box?

(b) A brick?

(b) A matchbox?

(d) A road-roller?

(e) A sweet laddu?

Sol. (a) The shape of the instrument box is a cuboid.

(b) Shape of a brick is a cuboid.

(c) Shape of a matchbox is a cuboid.

(d) Shape of a road-roller is a cylinder.

(e) Shape of a sweet laddu is a sphere.