CHAPTER

5

VI-MATHEMATICS-NCERT-2024-25

6 UNDERSTANDING ELEMENTARY SHAPES (NOTES)

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https://sureshmathsmaterial.com/

1. All the shapes we see around us are formed using curves or lines.
2. The ruler is marked along one of its edges. It is divided into 15 parts. Each of these 15 parts is of length 1cm.
3. Millimetre= mm; Centimetre=cm.
4. 10 mm=1 cm.
5. 1mm=0.1 cm.
6. 2.3 cm=2 cm and 3 mm.
7. length of $\overline{AB}$=5.8 cm then we write AB=5.8 cm

EXERCISE 5.1

1. **What is the disadvantage in comparing line segments by mere observation?**

Sol: The disadvantage of comparing the lengths of two line segments by mere observation is that the lengths might not be accurate. Hence, a divider is used to compare the lengths of the line segments

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

Sol: The thickness of the ruler may cause difficulties in reading off the marks on it. Errors can happen due to angular viewing. So, it is better to use a divider than a ruler, while measuring the length of a line segment.

3. **Draw any line segment, say AB. Take any point C lying in between A and B. Measure the lengths of AB, BC and AC. Is AB = AC + CB?**
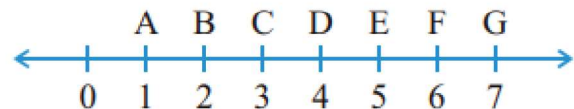
Sol: Yes, **AB = AC + CB**

4. **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: B lie between A and C.

5. **Verify, whether D is the mid-point of AG**

Sol: AD= DG=3 units . So, D is the mid-point of AG.

6. **If B is the mid point of $\overline{AC}$ and C is the mid point of $\overline{BD}$, where A,B,C,D lie on a straight line, say why AB = CD?**

Sol: If B is the mid-point of $\overline{AC}$ then AB=BC→(1)

If C is the mid-point of $\overline{BD}$ then BC=CD→(2)

From (1) and (2) : AB=CD.

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

Sol: The sum of the lengths of any two sides of a triangle can never be less than the length of the third side.

Try These 🔍

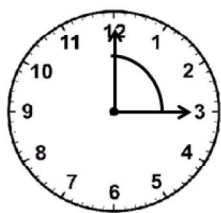1. **What is the angle name for half a revolution?**

Sol: straight angle.

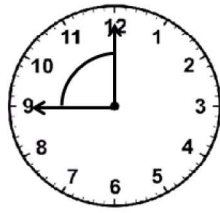2. **What is the angle name one-fourth revolution?**

Sol: Right angle.

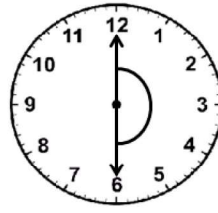3. **Draw five other situations of one-fourth, half and three-fourth revolution on a clock**
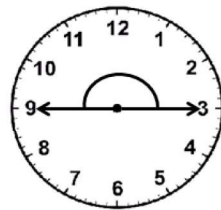
Sol:

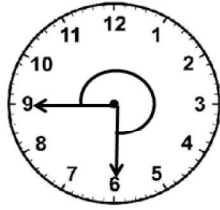One-fourth revolution   One-fourth revolution   Half revolution
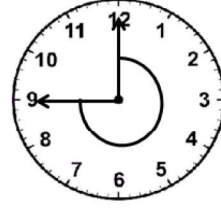
Half revolution   Three-fourth revolution   Three-fourth revolution

EXERCISE 5.2

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

(a) **3 to 9** (A) $\frac{1}{2}$ (c) **7 to 10** (A) $\frac{1}{4}$ (e) **1 to 10** (A) $\frac{3}{4}$

(b) **4 to 7** (A) $\frac{1}{4}$ (d) **12 to 9** (A) $\frac{3}{4}$ (f) **6 to 3** (A) $\frac{3}{4}$

2. **Where will the hand of a clock stop if it**

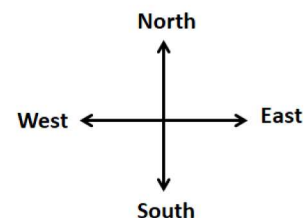(a) **starts at 12 and makes** $\frac{1}{2}$ **of a revolution, clockwise?**

Sol: 6

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

Sol: 8

(c) **starts at 5 and makes** $\frac{1}{4}$ **of a revolution, clockwise?**

Sol: 8

North

West ←——→ East

South

(d) starts at 5 and makes $\dfrac{3}{4}$ of a revolution, clockwise?

Sol: 2

3.   Which direction will you face if you start facing

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

Sol: West.

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

Sol: West.

(c)west and make $\dfrac{3}{4}$ of a revolution anti $-$ clockwise?

Sol: North.

(d) south and make one full revolution?

Sol: South.

4.   What part of a revolution have you turned through if you stand facing.
   (a) east and turn clockwise to face north?

Sol: $\dfrac{3}{4}$

 (b) south and turn clockwise to face east?

Sol: $\dfrac{3}{4}$

(c) west and turn clockwise to face east?

Sol: $\dfrac{1}{2}$

5.   Find the number of right angles turned through by the hour hand of a clock when it goes from

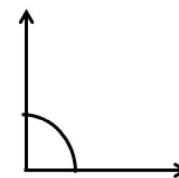(a)3 to 6   (A) 1 right angle.
(b)2 to 8   (A) 2 right angles.
(c)5 to 11   (A) 2 right angles.
(d)10 to 1   (A) 1 right angle.
(e)12 to 9   (A) 3 right angles.
(f)12 to 6   (A) 2 right angles.

Right angle

6.   How many right angles do you make if you start facing
   (a) south and turn clockwise to west?
   Sol: 1 right angle.
   (b) north and turn anti-clockwise to east?
   Sol: 3 right angles.
   (c) west and turn to west?
   Sol: 4 right angles.
   (d) south and turn to north?
   Sol: 2 right angles.

North

West ← → East

South

7. Where will the hour hand of a clock stop if it starts.
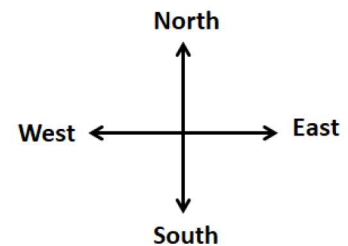   (a) from 6 and turns through 1 right angle?
   Sol: 9
   (b) from 8 and turns through 2 right angles?
   Sol: 2
   (c) from 10 and turns through 3 right angles?

Sol: 7

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

Sol: 7

Angles – 'Acute', 'Obtuse' and 'Reflex'

1. An angle smaller than a right angle is called an acute angle.
2. If an angle is larger than a right angle, but less than a straight angle, it is called an obtuse angle.
3. A reflex angle is larger than a straight angle.

Acute angle   Right angle   Obtuse angle   Straight angle   Reflex angle
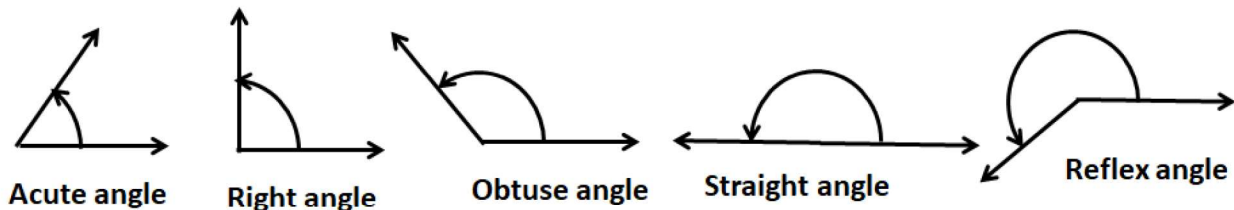
EXERCISE 5.3

1. **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)→(c); (ii)→(d); (iii)→(a); (iv)→(e); (v)→(b)

2. **Classify each one of the following angles as right, straight, acute, obtuse or reflex :**

(a)   (b)   (c)

(d)   (e)   (f)
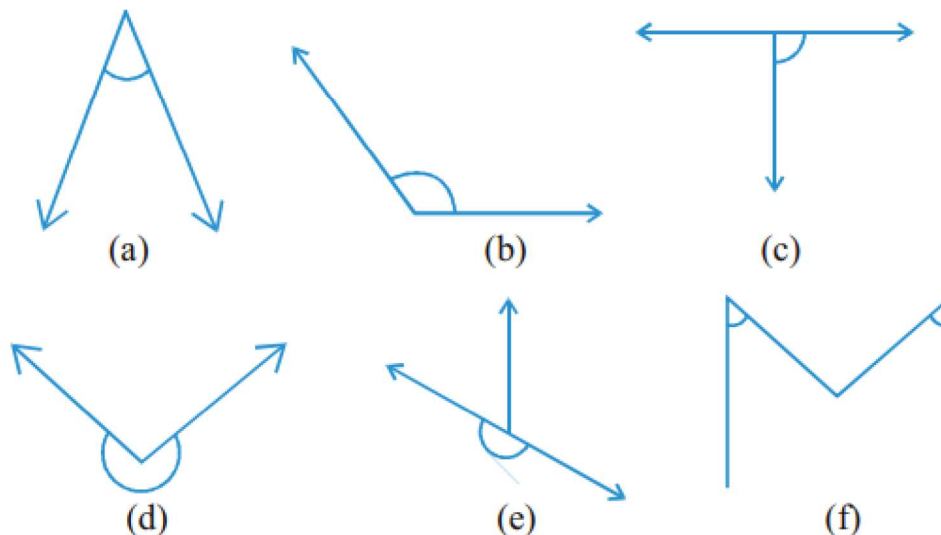
Sol: (a)→Acute angle;   (b)→Obtuse angle;   (c) →Right angle;   (d) →Reflex angle;

(e) →Straight angle;   (f) →Acute angle.

The measure of angle

One complete revolution is divided into 360 equal parts. Each part is a degree. We write 360° to say 'three hundred sixty degrees'.

1. Right angle=90^0
2. Straight angle=180^0
3. We use Protractor to measure angles

EXERCISE 5.4

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

Sol: (i) 90^0 (ii) 180^0.

2. Say True or False :

(a) The measure of an acute angle < 90°.(True)

(b) The measure of an obtuse angle < 90°. (False)

(c) The measure of a reflex angle > 180°. (True)

(d) The measure of one complete revolution = 360°. (True)

(e) If m $\angle$A = 53° and m $\angle$B = 35°, then m $\angle$A > m $\angle$B (True)

3. Write down the measures of

(a) Some acute angles.   (b) Some obtuse angles

Sol:40^0, 60^0,89^0 Sol:145^0, 120^0,160^0

4. Measure the angles given below using the Protractor and write down the measure.
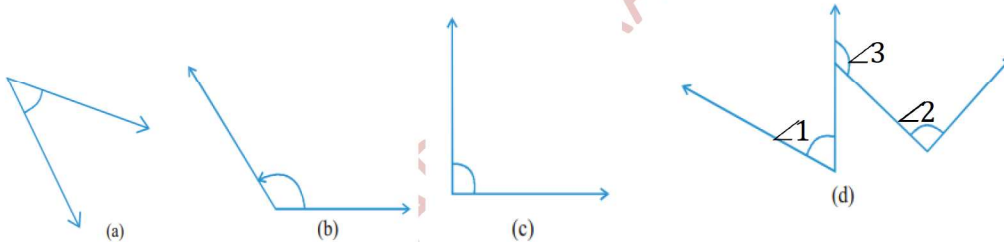
Sol: (a) 45^0;   (b) 120^0; (c) 90^0; (d) $\angle$1 = 60°, $\angle$2 = 90°, $\angle$3 = 125°

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

Measure of Angle A = 40^0

Measure of Angle B = 50^0
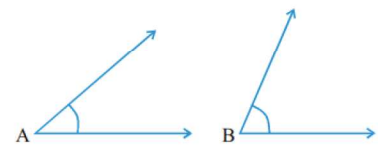
**6. From these two angles which has larger measure? Estimate and then confirm by measuring them.**

Sol: (i) 45^0; (ii) 60^0

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

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

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

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

(d) When the sum of the measures of two angles is that of a right angle, then each one of them is **acute**.
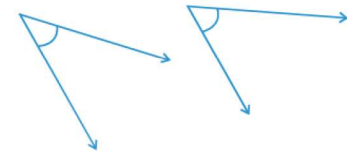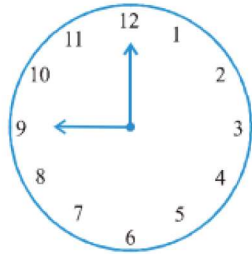
(e) When the sum of the measures of two angles is that of a straight angle and if one of them is acute then the other should be **an obtuse angle**..
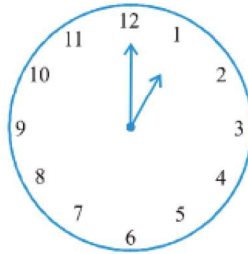
8. **Find the measure of the angle shown in each figure. (First estimate with your eyes and then find the actual measure with a protractor).**
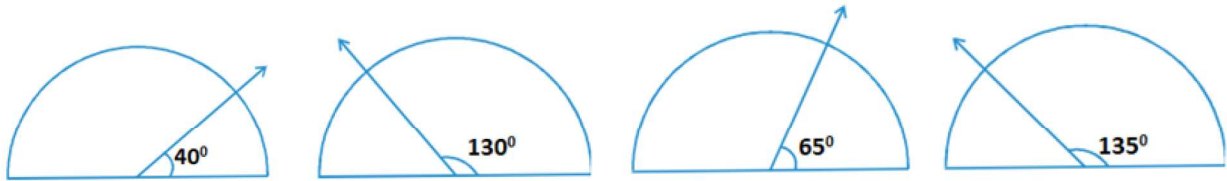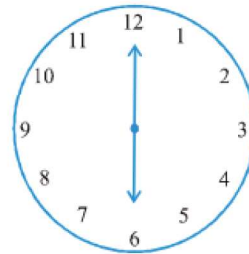

9. **Find the angle measure between the hands of the clock in each figure :**
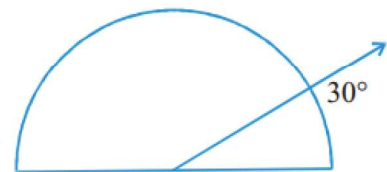

9.00 a.m.   1.00 p.m.   6.00 p.m.

Sol: (i) 90^0 ;   (ii) 30^0 ; (iii) 180^0.

10. **In the given figure, the angle measures 30°. Look at the same figure through a magnifying glass. Does the angle becomes larger? Does the size of the angle change?**

**Sol:** The measure of angle does not change.

11. **Measure and classify each angle :**

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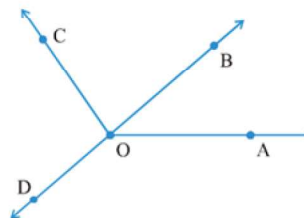
Perpendicular Lines

1. When two lines intersect and the angle between them is a right angle, then the lines are said to be perpendicular
2. If a line AB is perpendicular to CD, we write AB ⊥CD .
3. If AB ⊥CD , then CD ⊥AB also.
4. $\overleftrightarrow{MN} \perp \overline{AB}$ *and* MN divide AB into two equal parts. we say MN is the perpendicular bisector of $\overline{AB}$
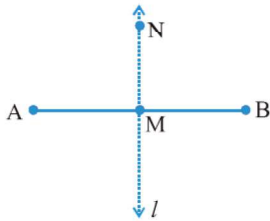
EXERCISE 5.5

1. **Which of the following are models for perpendicular lines :**
   (a) The adjacent edges of a table top.
   (b) The lines of a railway track.
   (c) The line segments forming the letter 'L'.
   (d) The letter V.

Sol: (a) and (c) are models for perpendicular lines

2. **Let $\overline{PQ}$ be the perpendicular to the line segment $\overline{XY}$. Let $\overline{PQ}$ and XY intersect in the point A. What is the measure of ∠PAY ?**

Sol: ∠PAY=90⁰.

3. **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: (i) 30⁰, 60⁰, 90⁰.
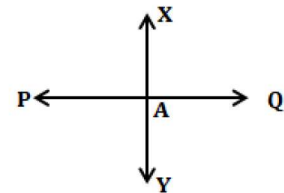
   (ii) 45⁰, 45⁰, 90⁰

4. **Study the diagram. The line *l* is perpendicular to line *m***
(a) **Is CE = EG?**
Sol: Yes, CE = EG.
(b) **Does PE bisect CG?**
Sol: Yes, CE=EG=2 units
(c) **Identify any two line segments for which the perpendicular bisector.**   PE is
Sol: $\overline{DF}$; $\overline{CG}$; $\overline{BH}$
(d) **Are these true?**
(i) **AC > FG**
Sol: AC =2 unit, FG=1 unit.
   Hence, AC> FG is true.
(ii) **CD = GH**
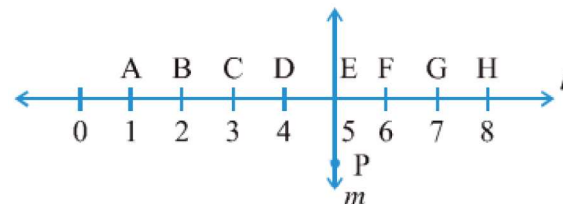**Sol:** CD =1 unit, GH=1 unit.
   Hence CD = GH is true.
(iii) **BC < EH**
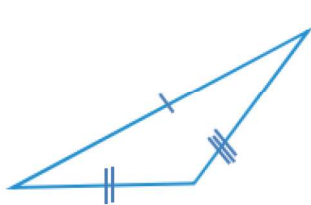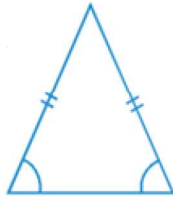**Sol:** BC =1 unit, EH=3 units .
   Hence BC < EH is true.

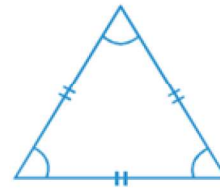## Classification of Triangles

Naming triangles based on sides.

(i)   A triangle having all three unequal sides is called **a Scalene Triangle.**
(ii)   A triangle having two equal sides is called an **Isosceles Triangle.**
(iii) A triangle having three equal sides is called an **Equilateral Triangle**

Scalene triangle   Isosceles triangle   Equilateral triangle

Naming triangles based on angles

(i)   If each angle is less than 90°, then the triangle is called an **acute angled triangle**
(ii)   If anyone angle is a right angle then the triangle is called a **right angled triangle**.
(iii) If anyone angle is greater than 90°, then the triangle is called an **obtuse angled triangle.**
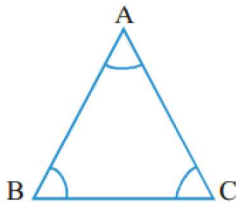
Acute Angled
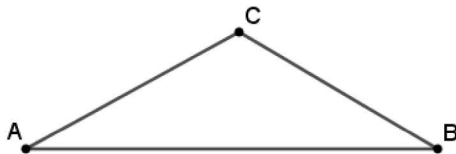Triangle
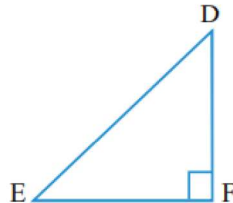
Right Angled
Triangle
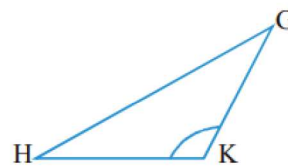
Obtuse Angled
Triangle

Do This ✂

Try to draw rough sketches of
(a) a scalene acute angled triangle.
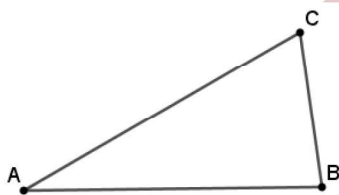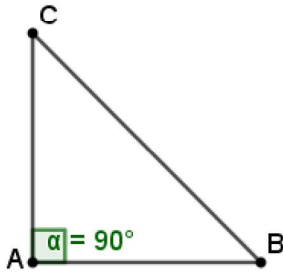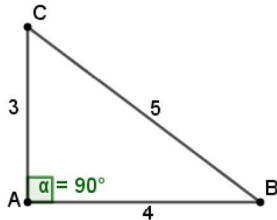
(b) an obtuse angled isosceles triangle.

(c) a right angled isosceles triangle.

(d) a scalene right angled triangle.

Do you think it is possible to sketch Think, discuss and write your conclusions.

(a) an obtuse angled equilateral triangle ?

Sol: Not possible.

(b) a right angled equilateral triangle ?

Sol: Not possible

(c) a triangle with two right angles?

Sol: Not possible

EXERCISE 5.6

1. Name the types of following triangles :

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

Sol: Scalene triangle.

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

Sol: Scalene triangle.

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

Sol: Equilateral triangle.

(d) ∆DEF with m∠ D = 90°

Sol: Right angled triangle.

(e) ∆XYZ with m∠ Y = 90° and XY = YZ.

Sol: Isosceles right triangle.

(f) ∆LMN with m ∠L = 30°, m ∠M = 70° and m ∠N = 80°

Sol: Acute-angled triangle.

2. Match the following :

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

3. Name each of the following triangles in two different ways: (you may judge the nature of the angle by observation)
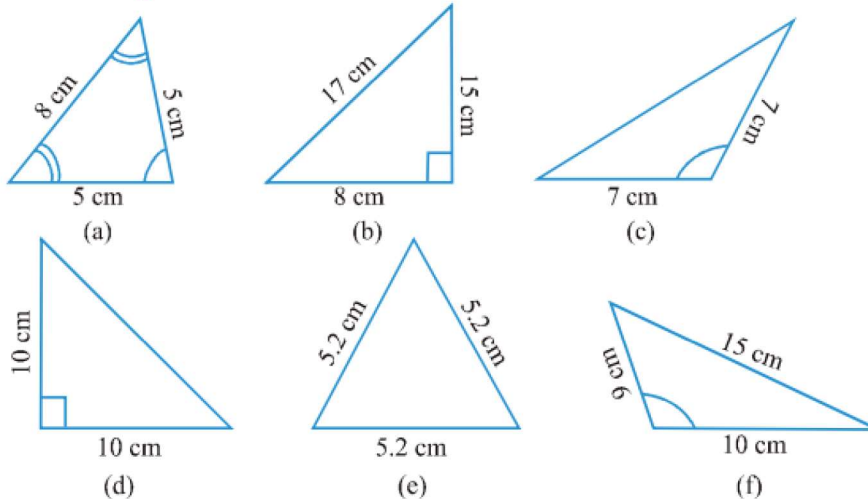
Sol: (a) Acute-angled and isosceles. (b) Right-angled and scalene. (c) Obtuse-angled and isosceles.

(d) Right-angled and isosceles triangle. (e) Equilateral and acute angled. (f) Obtuse-angled and Scalene.

4. Try to construct triangles using match sticks. Some are shown here. Can you make a triangle with given and name the type of triangle in each case. If you cannot make a triangle, think of reasons for it.

(a) 3 matchsticks?

Sol: Equilateral triangle.
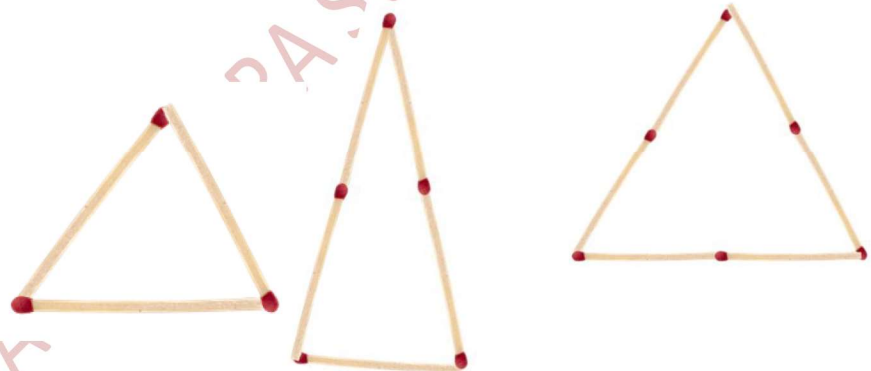
(b) 4 matchsticks?

Sol: Not possible.

(c) 5 matchsticks?

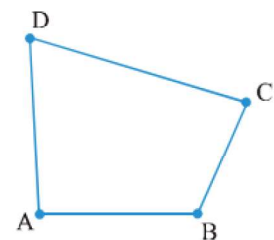**Sol:** Isosceles triangle.

(d) 6 matchsticks?

Sol: Equilateral triangle.

Quadrilaterals

A quadrilateral is a polygon which has four sides.

 (i) The sides of the quadrilateral are AB, BC , CD,DA.

 (ii) The 4 angles of quadrilateral are ∠BAD , ∠ADC, ∠DCB and ∠ABC.

 (iii) The diagonals are AC and BD.

1. Using four unequal sticks, as you did in the above activity, see if you can form a quadrilateral such that

(a) all the four angles are acute.

Sol: Not possible.

(b) one of the angles is obtuse.

Sol: Yes.

(c) one of the angles is right angled.

Sol: Yes.
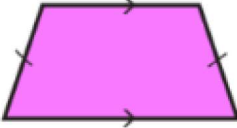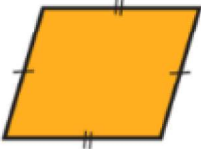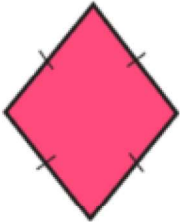
(d) two of the angles are obtuse.

Sol: Yes.

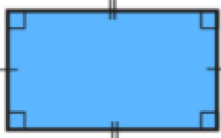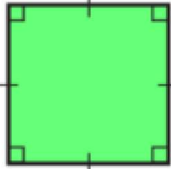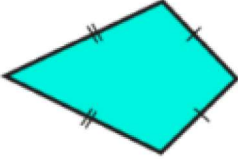**(e)** two of the angles are right angled.

Sol: Yes.

(f) the diagonals are perpendicular to one another.

Sol: Not possible.

Types of Quadrilaterals:

Quadrilateral	Figure	Properties
Trapezium A quadrilateral with a pair of parallel sides.		1. One pair of parallel lines
Parallelogram: A quadrilateral with each pair of opposite sides parallel		1. Opposite sides are equal. 2. Opposite angles are equal. 3. Diagonals not equal and bisect one another. 4. Adjacent angles are supplementary
Rhombus: A parallelogram with sides of equal length.		1. All sides are equal. 2. Opposite angles are equal 3. Diagonals are not equal and perpendicularly bisect one another. 4. Adjacent angles are supplementary
Rectangle: A parallelogram with a right angle		1. Opposite sides are equal 2. All angles are equal(right angle=90^0). 3. Diagonals are equal and bisect one another.
Square: A rectangle with sides of equal length.		1. All sides are equal. 2. Each of the angles is a right angle. 3. Diagonals are equal and perpendicularly bisect one another.
Kite: A quadrilateral with exactly two pairs of equal consecutive sides		1. The diagonals are perpendicular to one another. 2. One of the diagonals bisects the other.

Quadrilateral	Opposite sides		All sides	Opposite Angles	Diagonals	
	Parallel	Equal	Equal	Equal	Equal	Perpendicular
Parallelogram	Yes	Yes	No	Yes	No	No
Rectangle	Yes	Yes	No	Yes	Yes	No
Square	Yes	Yes	Yes	Yes	Yes	Yes
Rhombus	Yes	Yes	Yes	Yes	No	Yes
Trapezium	No	No	No	No	No	No

EXERCISE 5.7

1. Say True or False :

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

Sol: True.

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

Sol: True.

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

Sol: False.

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

Sol: True.

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

Sol: False.

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

Sol: False

2. Give reasons for the following :

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

Sol: A rectangle with all sides equal becomes a square.

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

Sol: A parallelogram with each angle a right angle becomes a rectangle.

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

Sol: A rhombus with each angle a right angle becomes a square.

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

Sol: All these are four-sided polygons made of line segments.

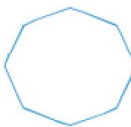(e) Square is also a parallelogram.

Sol: The opposite sides of a square are parallel, so it is a parallelogram.

3. 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?
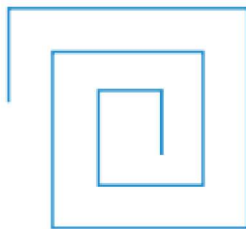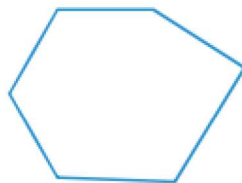
Sol: A square is a 'regular' quadrilateral

Polygons

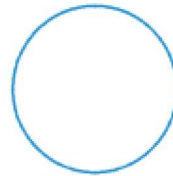| Number of sides	Name	Illustration
3	Triangle	
4	Quadrilateral	
5	Pentagon	
6	Hexagon	
8	Octagon	

EXERCISE 5.8

1. Examine whether the following are polygons. If anyone among them is not, say why?
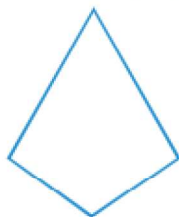
   (a)   (b)   (c)   (d)

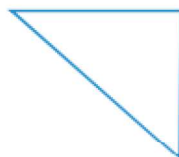Sol: (a) is not a closed figure and hence is not a polygon.

(b) is a polygon of six sides.

(c) and (d) are not polygons since they are not made of line segments

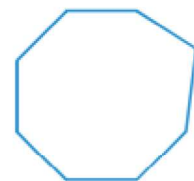2. Name each polygon and Make two more examples of each of these.
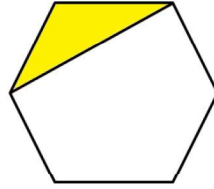
   (a)   (b)   (c)   (d)

Sol: (a) A Quadrilateral (b) A Triangle (c) A Pentagon (5-sided) (d) An Octagon (8-sided)

3. Draw a rough sketch of a regular hexagon. Connecting any three of its vertices, draw a triangle. Identify the type of the triangle you have drawn.
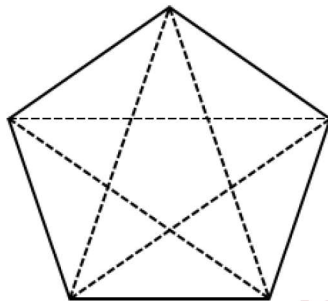
Sol: An isosceles triangle can be drawn.

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

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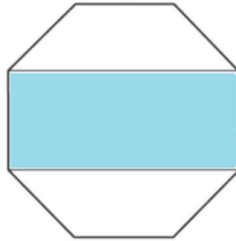
5. A diagonal is a line segment that joins any two vertices of the polygon and is not a side of the polygon. Draw a rough sketch of a pentagon and draw its diagonals.

Sol:

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