Shapes and Angles

Look around yourself. What do you see? Buildings, trees, books, tables, chairs, notebooks, sun, moon, stars, etc. Are they all same? Do they have the same shape? No, not all of them are alike. The shape of the sun is different from that of a book. The notebooks are of the same shape but different size. Today we will discuss the various shapes and the properties of these shapes.

Shapes

What is shape? The literal meaning of shape is the external form of a thing or its appearance. A figure can be made of different types of shapes. Figures can be broadly classified as open or closed. Open figures are those which do not end where they start. The figures that start and end at the same point are closed figures.

Browse more Topics under Shapes And Angles

- Angles in Real Life

Classification of Shapes

Let us learn more about the closed figure. The shapes are made of lines or line segments arranged in an organized manner. Every object around us has a definite shape. Shapes can be classified into curves (circles) and polygons.

Polygons

A polygon is a simple closed figure with three or more than three line segments. Poly means “many”.

Terminologies Associated with Polygon

- Sides: The lines segments that form the exterior of the polygon are the sides of the polygons.
- Adjacent Sides: Two sides of a polygon having a common end-point are adjacent to each other.
- Vertex: The point where the sides of a polygon meet is called the vertex of the polygon. It is also referred to as end-point. The plural of vertex is vertices.
- Adjacent Vertices: The end-points of the same side of a polygon are adjacent vertices.

Polygons are classified into Regular and Irregular Polygons. A Polygon in which all sides and all angles are equal is a regular polygon. The sum of all interior angles of a regular polygon = 180° × (n − 2), where n is the number of sides. A Polygon in which all sides and all angles are not equal is an irregular polygon.

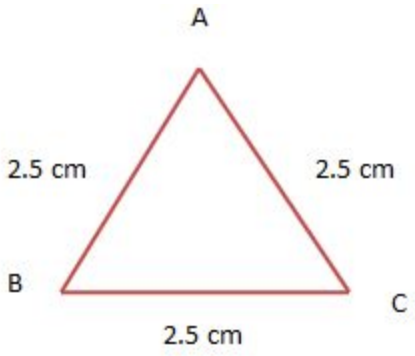
Types of Polygons

Let us discuss the types of polygons on the basis of the number of sides.

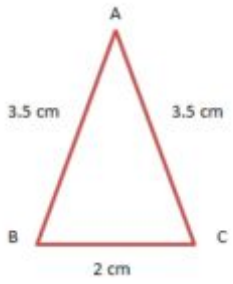
Triangles

A polygon bounded by three line segments or sides is a triangle. The sum of the interior angle of a triangle is 180°. On the basis of equality of sides, triangles are of three types:

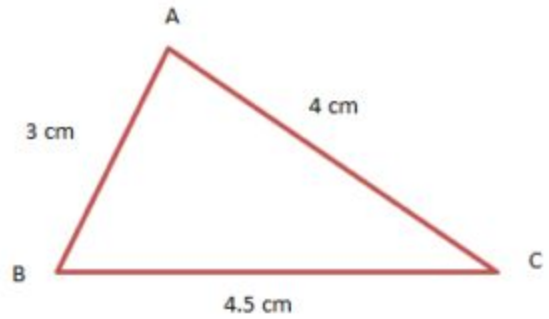
- Equilateral Triangle: A triangle with all sides equal is an equilateral triangle.



- Isosceles Triangle: A triangle with two sides of equal length is an isosceles triangle.

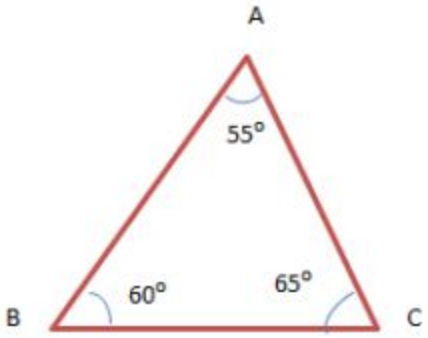


- Scalene Triangle: A scalene triangle is the one with all unequal sides.

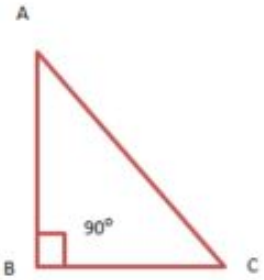


On the basis of the measure of angles, triangles are of following types:

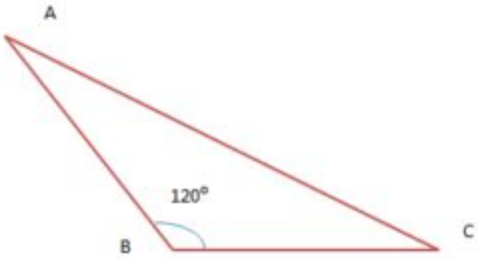
- Acute-angled Triangle: A triangle in which each angle is acute (less than 90°) is an acute-angled triangle.



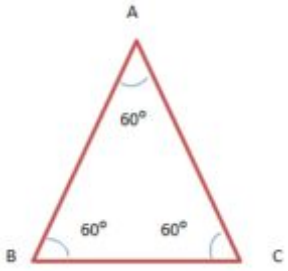
- Right-angled Triangle: A right-angled triangle is the one in which one of the angles is a right angle (90°).



- Obtuse-angled Triangle: An obtuse-angled triangle is the one in which one of the angles is obtuse.



- Equiangular Triangle: If all the three angles are equal, the triangle is an equiangular triangle.



Quadrilaterals

A closed figure bounded by four line segments is known as a quadrilateral. A quadrilateral has four sides, four vertices, and four angles. There are various types of the quadrilateral.

Parallelogram

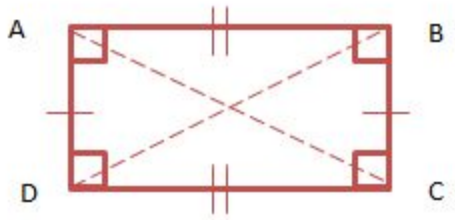
A quadrilateral in which the pairs of opposite sides are parallel is a parallelogram. The sides of a quadrilateral that have no common endpoint are opposite sides.

Properties of a Parallelogram:

- Opposite sides are equal and parallel.
- Opposite angles are equal
- Diagonals bisect each other.

Rectangle

A rectangle is a special case of a parallelogram. In a rectangle, each angle is of 90°.

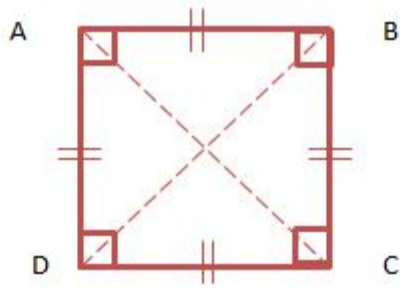


Properties of a Rectangle:

- Opposite sides are equal and parallel.
- All angles are right angles
- Both the diagonals are equal in length and bisect each other.

Square

A parallelogram with all sides of the same length and all the angles of 90° is a square.

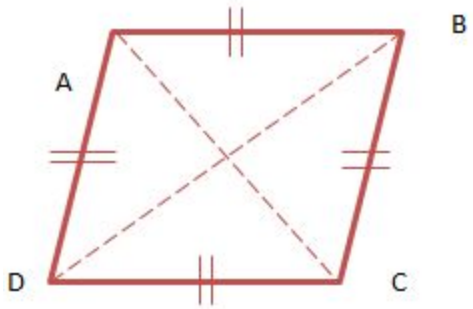


Properties of a Square:

- All sides are equal.
- Opposite sides are parallel (||).
- All angles are right angles.
- Both the diagonals are equal in length and bisect each other at right angles.

Rhombus

A parallelogram in which all the four sides are equal in length is a rhombus. A square is a special type of rhombus.

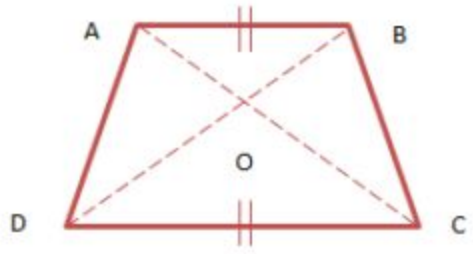


Properties of Rhombus:

- All sides are equal in length.
- Opposite sides are parallel.
- Opposite angles are equal.
- The diagonals bisect each other at right angles.

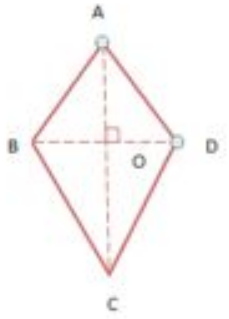
Trapezium

A quadrilateral in which only one pair of opposite sides is parallel is a trapezium.



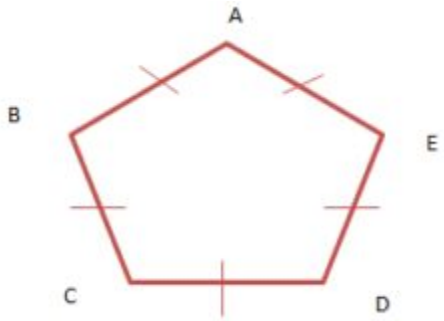
Kite

A quadrilateral in which two pairs of adjacent sides are equal is a kite. Its diagonals bisect each other at right angle.



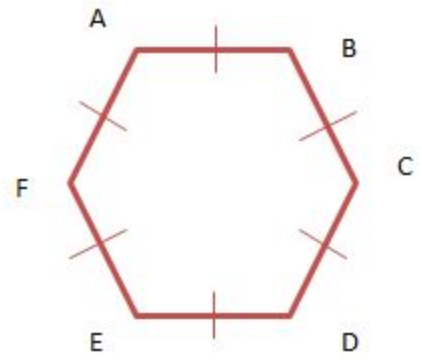
Pentagon

It is a five-sided polygon. The sum of the interior angles of a pentagon is 540°. ABCDE is a regular pentagon with all equal sides.



Hexagon

A hexagon is a six-sided polygon. The sum of the angles is 720°.



A polygon with seven sides is a heptagon. With 8 sides it is an octagon. A 9-sided polygon is a nonagon.

Circle

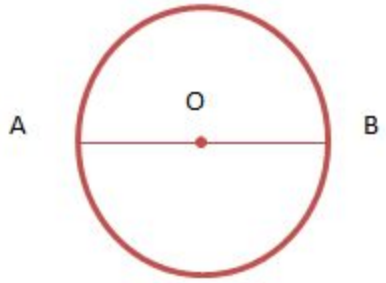
When a set of points is at the same distance from a fixed point the figure obtained is a circle.

Terminologies Associated with Circle

- Centre: The fixed point of the circle which is equidistance from all the points on the circle is its centre. Point O is the centre of the circle.
- Radius: The line segment with one endpoint at the centre and the other on the boundary of the circle is a radius of the circle. OA is the radius of the circle.

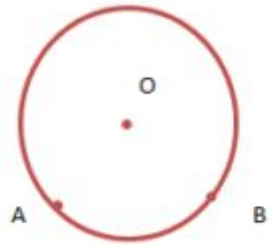
- Diameter: A line segment with both of its endpoints on the boundary of the circle and passes through the centre is the diameter of the circle. AB is the diameter of the circle.

  Diameter $= 2 \times$ Radius.

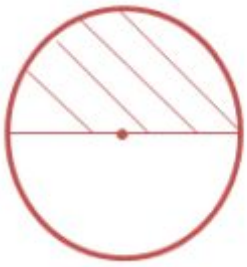


- Chord: Any line segment with its endpoints on the boundary of the circle is a chord. The diameter is the longest chord which passes through the centre. AB is a chord of the circle.

- Circumference: The length of the circle is the circumference of the circle.
- Arc: A part between any two points on a circle is an arc.



- Semicircle: Half of a circle is semicircle. Each part is a semicircle. A diameter divides a circle into two semicircles.



Solved Examples for You

Problem: If the diameter of a circle is 40 cm, what is the value of its radius?

Solution: Diameter $= 2 \times$ Radius.

Solving we have, Radius = 40 / 2 = 20 cm.

Problem: What is the name of a polygon with the smallest number of sides?

Solution: Triangle (with 3 sides).

Problem: Is a triangle possible with angles 54°, 63°, and 92°?

Solution: No, the sum of the angles = 54° + 63° + 92° = 209° which is not possible. The sum of angles of the triangle must be 180°.

Angles in Real Life

Did you ever notice the two hands of a clock? The two hands together make different sets of lines from a common point. These sets of lines from a common point is called angle. The two hands form different angles every minute of the time. A clock forms an example of angles in real life. What are the other examples of angles in real life? Let's

study the various types of angles, say acute angle, in real life and their examples in detail.

Angles

Before studying angle, let us do one interesting thing. Take a piece of paper and drawn a dot anywhere on it. Name this dot O. This dot O is called point. From this point draw as many straight lines as you can. How many did you get?

Draw another dot and name it P. Join OP. What did you get? A line segment OP with endpoints O and P. A line segment is a part of a line. Do you know a line has no endpoints like line segment? A line has many line segments in it.

Have you ever thought why we say sun rays and not sun line? Is ray different from a line? Yes, it is. A ray has one fixed point. It cannot go in both the direction like that a line. For sun rays, the Sun is the fixed point and thus we say the light coming as sun rays.

Draw one more point other than O and P and call it R. Now join OR and OP. What will you find? Two lines and a common point O. This is

an angle. Ask your friend to do this activity. Are the two angles same every time? Maybe it is not.

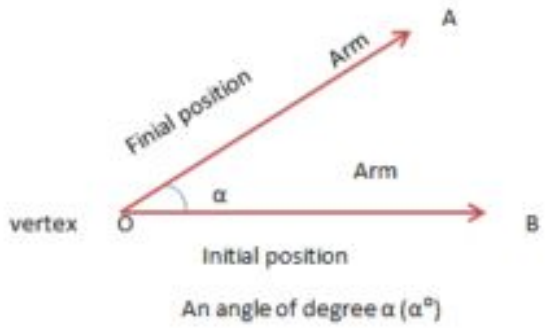
Browse more Topics under Shapes And Angles

- Introduction to Shapes and Angles

Terminologies in Angles

Two lines or line segments or rays with a common point form an angle. An angle is denoted by a symbol $\angle$. An angle is measured in an anti-clockwise manner with the help of a protector in degree.

- Vertex: The common starting point in an angle is a vertex.
- Arms: The two rays forming an angle from a fixed point are arms. They are also called the sides of the angle.



- Measuring Angle: Place the center of the protector at the fixed point, say O of the angle at one of the arm. The other arm shows the degree of the angle when measured from the initial arm in an anti-clockwise manner.

Types of Angles

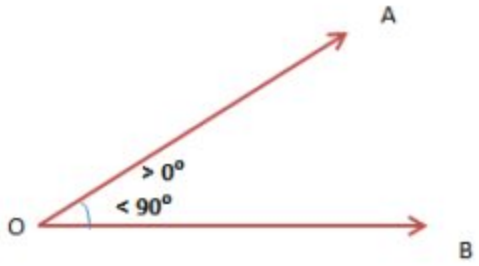
There are different types of angles formed by two lines or rays with one common starting point. Based on the degree of measurement, the angles are classified as:

Zero Angle

An angle whose measure is 0° is zero angle. The initial and the final arms are at the same position. ∠AOB is zero angle.

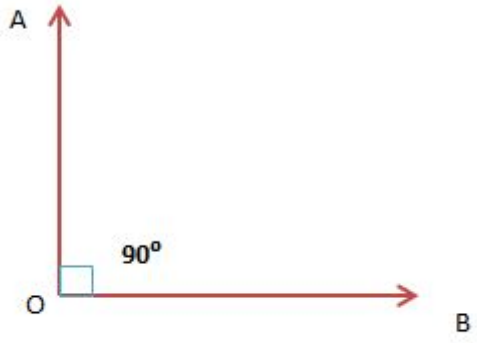
Acute Angle

An acute angle is the one that is greater than 0° and less than 90°.



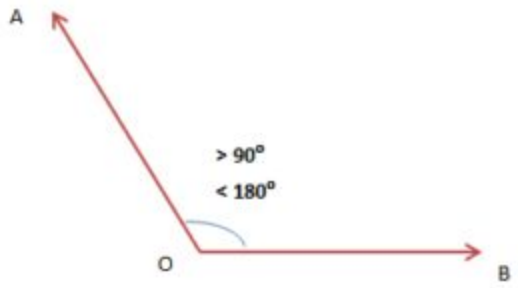
Right Angle

Any angle whose measure is equal to 90° is a right angle.



Obtuse Angle

An angle is said to be an obtuse angle if it is greater than 90° but is less than 120°.

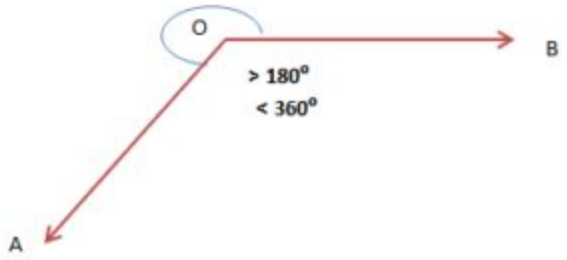


Straight Angle

An angle whose measure is 180° is a straight angle. This angle got its name as it forms a straight line. ∠AOB is a straight angle.

Reflex Angle

A reflex angle is the one that is greater than 180° and less than 360°.



Complete Angle

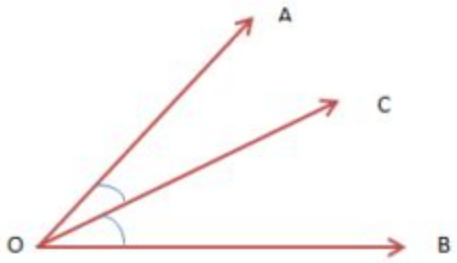
If the measure of an angle is 360°, it is a complete angle. This angle is formed as the arm makes one completes turn and returns to its starting position.

Other Type of Angles

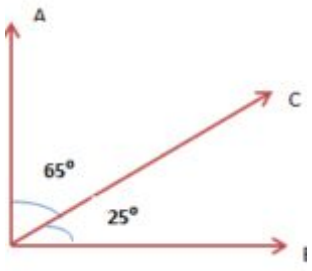
Apart from the above-mentioned angles, there are other types of angles too.

- Adjacent Angles: Two angles are adjacent if both of them have one common arm and a common vertex. ∠AOB and ∠COB are the adjacent angles. Is there any other pair of adjacent

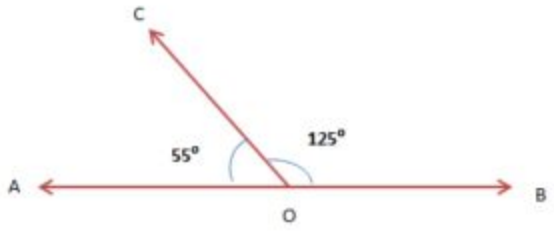
angles? ∠AOC and ∠COB, and ∠AOB and ∠AOC are another sets of adjacent angles.



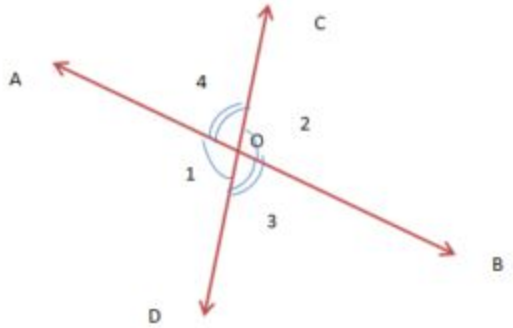
- Complementary Angles: Two angles are complementary to each other if the sum of both the adjacent angles is 90°.



- Supplementary Angles: When the sum of a pair of adjacent angles is 180°, the angles are supplementary angles.



- Vertically Opposite Angles: Suppose two straight lines AB and CD intersect each other at a point O. The pairs of the opposite angles are vertically opposite angles (V.O.A). The V.O.A. are equal in measurement. Here, $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$.



Angles in Real Life

In the beginning, we have talked about angles formed by the hands of a clock. Consider an example, the clock shows the time is 3 o'clock in the morning. What is the angle made by both hands of the clock? It is

a right angle. In direction, we can find various angles. Where else can we find angles?

Cloth-hangers, scissors, arrowhead, partly opened-doors, pyramids, Set squares, an edge of a ruler, an edge of tables, cycle spokes, wheels etc are examples of angles in real life. Different alphabets also form the examples of angles. What is the angle in letter V? An acute angle. Even we make different angles in different postures while doing yoga and exercises.

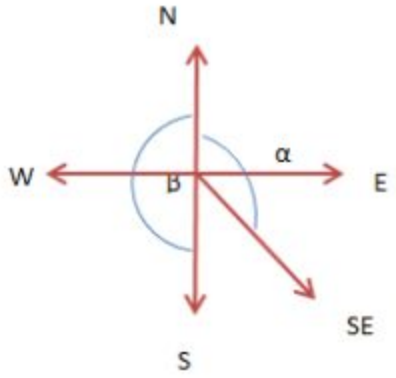
Solved Examples for You

Problem: Name the angle when the time in a clock is 3: 40 pm? Is it Obtuse or Reflex or Acute Angle?

Solution: The angle is measured in an anti-clockwise manner and thus the angle formed is reflex and not obtuse or acute angle.

Problem: What is the value of angles α, β?

Solution: $\alpha = 90° + 45° = 135°$ and $\beta = 180°$.


N
W
α
β
E
SE
S