Geometry

In our daily life we observe different geometrical shapes. These geometrical shapes are not only the matter of study of mathematics but are directly related with our daily life. The basic geometrical figures are made up of lines and angles.

Line Segment

It is the straight path between two points. In other words we can say that it has two end points and is of finite length.

Ray

When a line segment extends infinitely in one direction, it is called a ray. Simply we can say that a ray has one end point and infinite length.

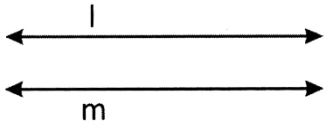
Line

When both end of a line segment extended infinitely, it is known as a line. Simply we can say that a line has no end point and infinite length.

Parallel Lines

Two lines are said to be parallel if the distance between them always remains same at each and every point. The parallel lines never intersect each other.

In other words we can say that if two lines do not have any common point than they are said to be parallel. In the figure l and m are parallel lines.



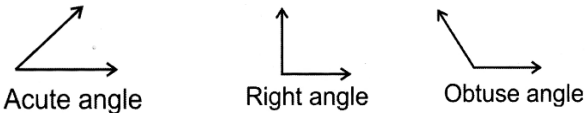
Angle

If two rays have common end point then the inclination between two rays is called an angle.

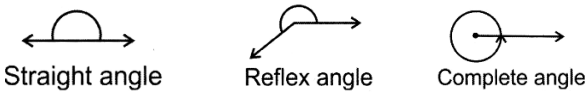
Types of Angles

The following are different types of angles:

- **Acute Angle:** The angle whose measure is more than 0° and less than 90° is called an acute angle.
- **Right Angle:** The angle of measure 90° is called a right angle.
- **Obtuse Angle:** The angle whose measure is more than 90° and less than 180° is called an obtuse angle.



- **Straight Angle:** The angle whose measure is 180° is called a straight angle.
- **Reflex Angle:** The angle whose measure is more than 180° and less than 360° is called a reflex angle.
- **Complete Angle:** The angle whose measure is 360° is called a complete angle.



- **Equal Angles:** Two angles are said to be equal if they are of same measure.
- **Complementary Angles:** If the sum of measures of two angles is 90° then they are said to be complementary angles.

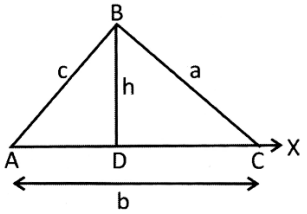
- **Supplementary Angles:** If the sum of measures of two angles is 180^o then they are said to be supplementary angles.

Triangles

The word triangle is derived from Greek word, tri means three and hence, it refers to a shape consisting of three internal angles. Obviously the shape consists of three sides. Hence, a triangle can be defined as a polygon having three sides.

Basic Concepts of Triangles

The general shape of a triangle is shown below:



- The vertices of a triangle are denoted by the capital letters of English alphabets. In the above figure, the sides ΔABC are AB, BC and CA.
- A perpendicular drawn from a vertex to the opposite side is called the altitude of the triangle and denoted as h.
- a, b and c are the lengths of BC, AC and AB respectively of triangle ABC.

Properties of a Triangle

Triangles are one of the basic geometrical shape and have different properties based on their sides and angles.

- In any triangle, sum of any two sides is always greater than the 3^{rd} side i.e $b+c>a$ or $a+c>b$ or $c+b>a$
- The sum of all interior angles of a triangle is 180^o

Types of Triangle

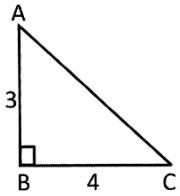
- If one angle of a triangle is right angle then it is called a right- angled triangle. In a right- angled triangle, the square of the hypotenuse is equal to the sum of the square of the other two sides and is known as Pythagoras theorem.
- If all the angles of triangle are less than 90^o, then it is called an acute angled triangle.
- If one angle of a triangle is more than 90^o, then it is called an obtuse angled triangle. The other two angles are acute.
- A triangle in which all sides are equal is known as equilateral triangle.
- A triangle in which any two sides are equal is said to be an isosceles triangle.
- A triangle in which all sides are unequal is said to be a scalene triangle.

Congruent Triangles

Two geometrical figures are said to be congruent if they have same shape and size. For example, two angles are said to be congruent if they have same measure similarly two line segments are said to be congruent if they have same length. So two triangles are said to be congruent if their corresponding sides and angles are equal.

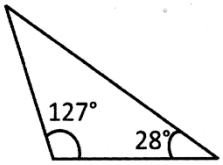
Example:

In a right-angled triangle AB = 3 units, BC = 4 units then AC is equal to:



(a) 3 units (b) 4 units
(c) 5 units (d) 6 units
(e) None of these
Answer (c)
Explanation: $AC^2 = AB^2 + BC^2 \Rightarrow AC^2 = 3^2 + 4^2 \Rightarrow AC = 5$ Units

Example:
In the following figure, the missing angle of the triangle is:

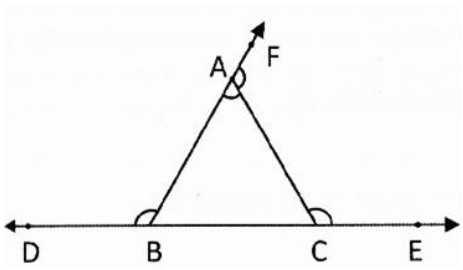


(a) 30^o (b) 25^o
(c) 20^o (d) 60^o
(e) None of these
Answer (b)

Explanation: Missing angle of the triangle
$= 180^o - (127^o + 28^o) = 180^o - 155^o = 25$

Exterior Angle of a Triangle

The angle between the produced side and the adjacent side of the triangle is called exterior angle. The exterior angle is equal to the sum of two opposite interior angles of the triangle. In the figure below $\angle ABD$, $\angle CAF$, and $\angle ACE$ are the exterior angles of the triangle.



Thus,

$$\angle ACE = \angle BAC + \angle ABC$$
$$\angle ABD = \angle BAC + \angle ACB$$
$$\angle CAF = \angle ABC + \angle ACB$$