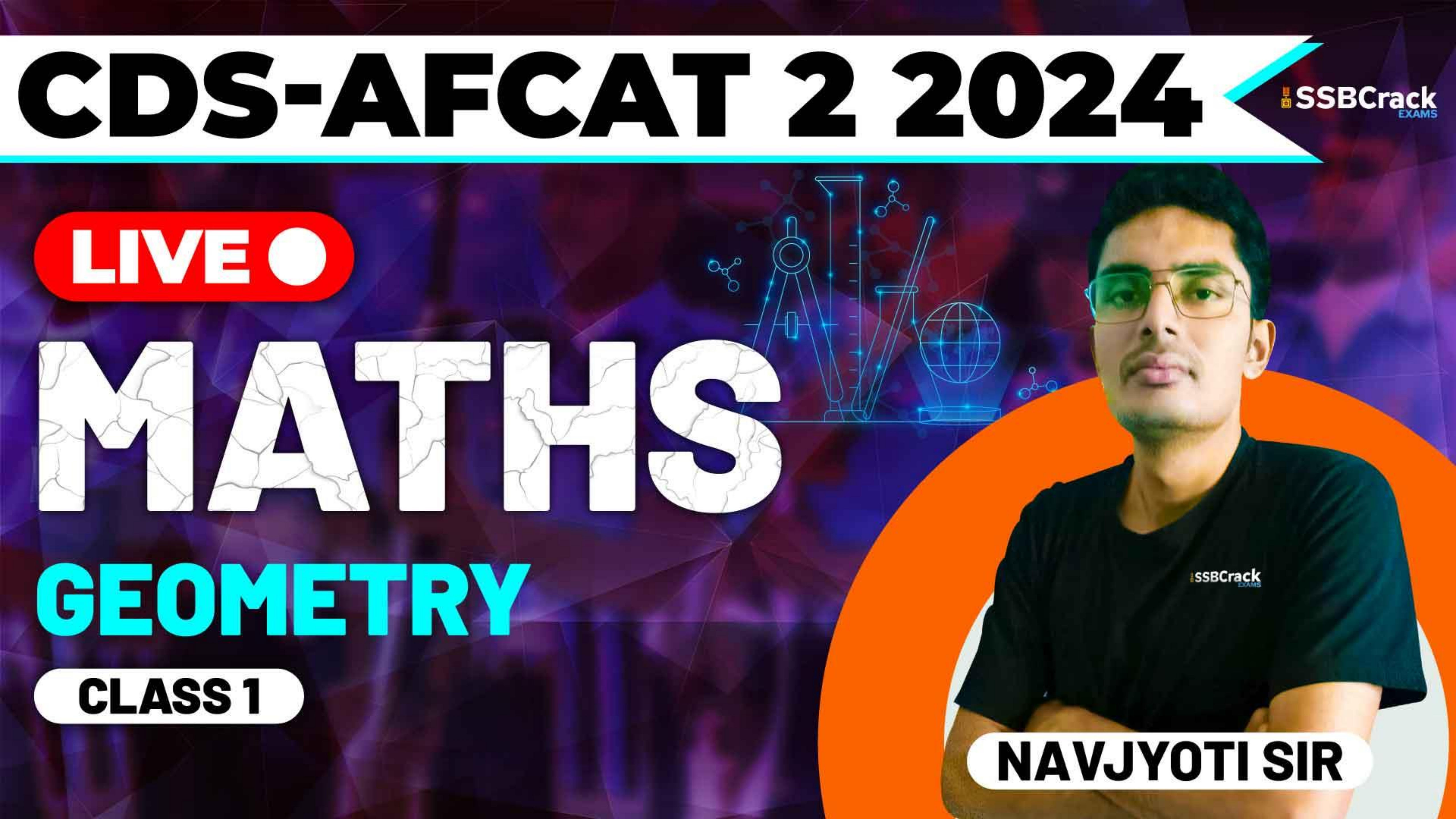

CDS-AFCAT 2 2024
SSBCrack EXAMS
LIVE
MATHS
GEOMETRY
CLASS 1
SSBCrack EXAMS
NAVJYOTI SIR

14 June 2024 Live Classes Schedule

8:00AM	14 JUNE 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF GPE & PRACTICE	ANURADHA MA'AM

AFCAT 2 2024 LIVE CLASSES

4:00PM	MATHS - GEOMETRY - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - CLOZE TEST - CLASS 3	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - INDIAN GEOGRAPHY - CLASS 3	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 5	SHIVANGI MA'AM
5:30PM	ENGLISH - CLOZE TEST - CLASS 3	ANURADHA MA'AM
6:30PM	MATHS - GEOMETRY - CLASS 1	NAVJYOTI SIR

CDS 2 2024 LIVE CLASSES

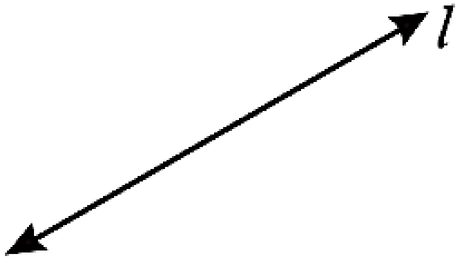
11:30AM	GK - INDIAN GEOGRAPHY - CLASS 3	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 5	SHIVANGI MA'AM
4:00PM	MATHS - GEOMETRY - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - CLOZE TEST - CLASS 3	ANURADHA MA'AM

SSBCrack EXAMS

LINE

A line is defined as a group of points. Which are straight one after another. Each line is extended infinitely in two directions.

$\overleftrightarrow{AB}$

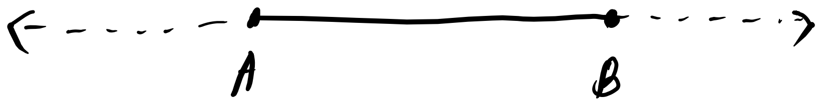


LINE SEGMENT

If a part of the line is cut out, then this cut out piece of the line is called a line segment. A line segment has no arrow at its any end.

This means that no line segment is extended infinitely in any direction.

$\overline{AB}$



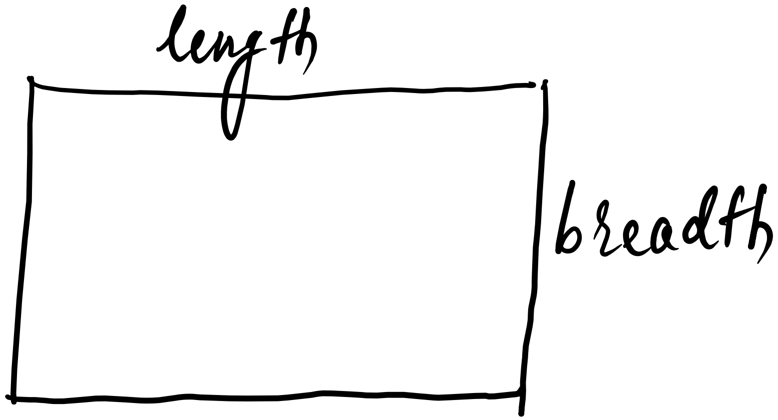
RAY

A ray is a part of a line extended infinitely in any one direction only. Example:

$\overrightarrow{AB}$

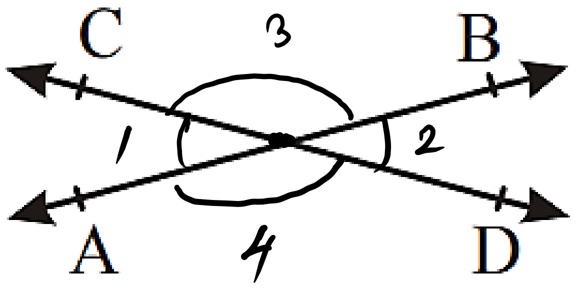
PLANE

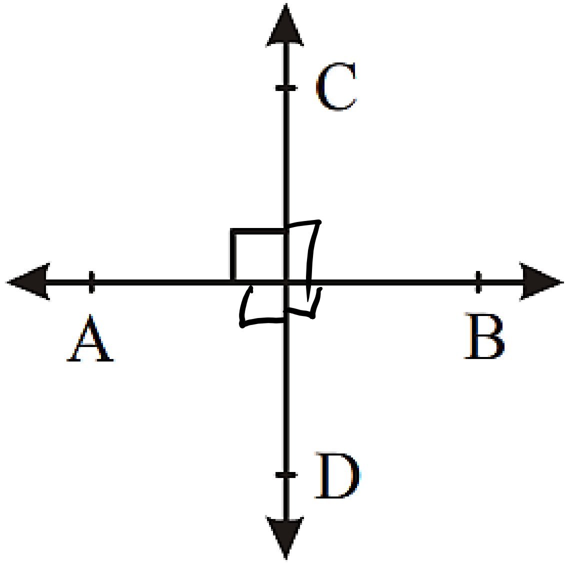
It is a flat surface extended infinitely. It has only length and breadth but no thickness. Surface of a black board, surface of a wall, surface of a table are some examples of parts of planes because they are flat surfaces but not extended infinitely.



INTERSECTING LINE

If two or more lines intersect each other, then they are called intersecting lines. In the figure *AB* and *CD* are intersecting lines.





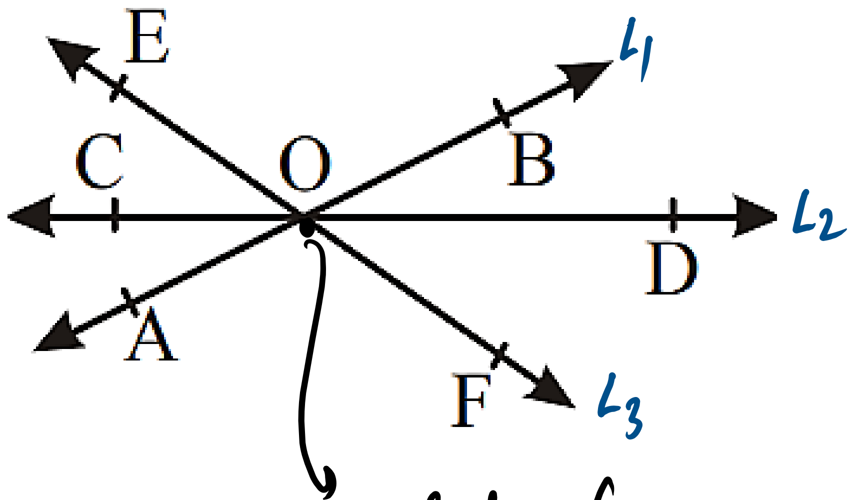
$\angle 1 = \angle 2$
$\angle 3 = \angle 4$

vertically opposite angles

CONCURRENT LINE

If three or more lines pass through a point,
then they are called concurrent lines and the point through which these all lines pass is called point of concurrent.

$$L_1 \equiv a_1x + b_1y + c_1 = 0$$
$$L_2 \equiv a_2x + b_2y + c_2 = 0$$
$$L_3 \equiv a_3x + b_3y + c_3 = 0$$



point of concurrence

3 lines are concurrent

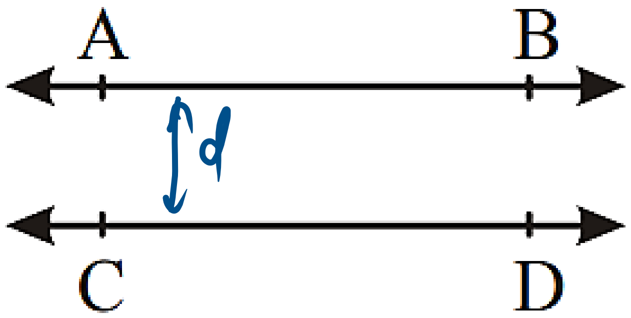
$\Rightarrow$ The 3 lines have one common point of intersection.

(intersecting point of two lines should lie on third line)

PARALLEL LINE

Two straight lines are parallel if they lie in the same plane and do not intersect even if they produced.

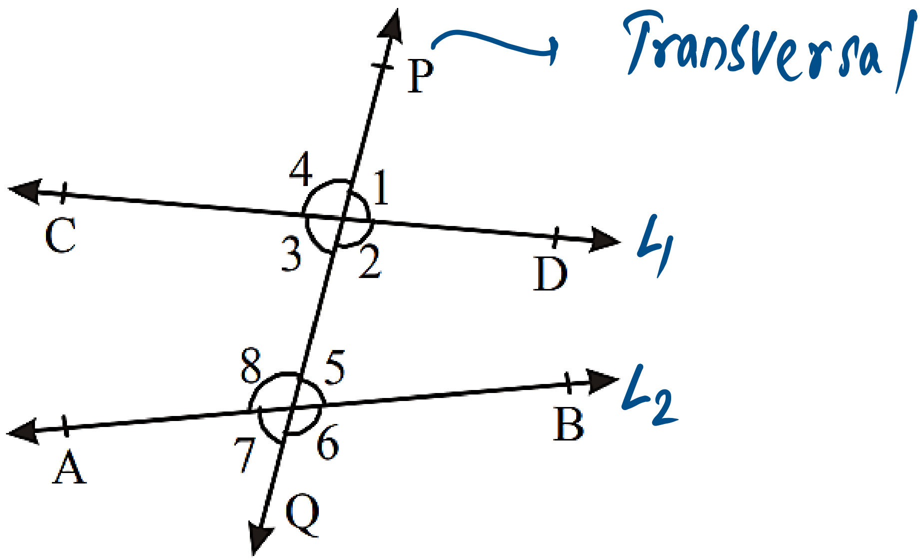
Perpendicular distances between two parallel lines are the same at all places.



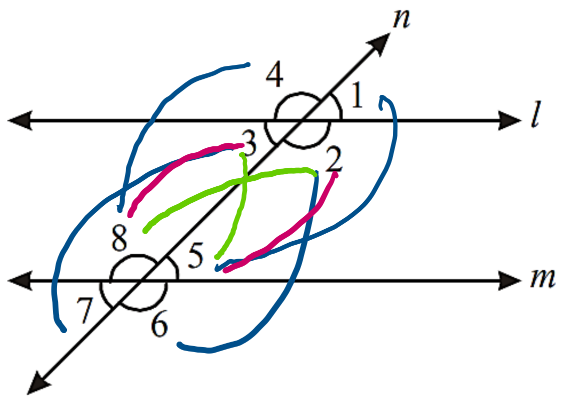
d is constant.

TRANSVERSAL LINE

A line which intersects two or more given lines at distinct points is called a transversal of the given lines.



PARALLEL TRANSVERSAL LINE



$\angle 3 = \angle 5$, $\angle 2 = \angle 8$ } alternate interior angles

$\angle 3 + \angle 8 = 180°$, $\angle 2 + \angle 5 = 180°$ } angles on same side of transversal

Two angles of each pair of corresponding angles are equal

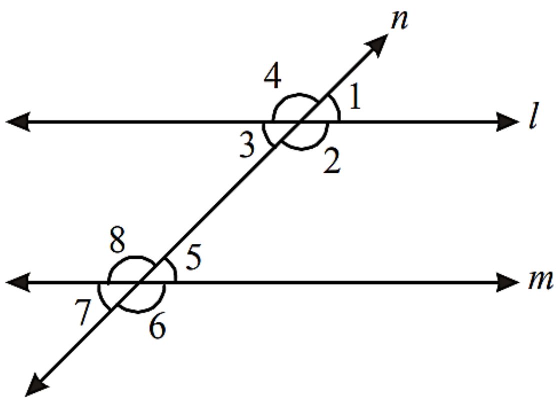
i.e. $\angle 1 = \angle 5$; $\angle 2 = \angle 6$; $\angle 4 = \angle 8$; $\angle 3 = \angle 7$ } corr. angles

$\angle 4 = \angle 2$, $\angle 1 = \angle 3$, $\angle 8 = \angle 6$, $\angle 5 = \angle 7$ } Vertically opposite angles

Two angles of each pair of alternate interior angles are equal i.e.

$\angle 2 = \angle 8$; $\angle 3 = \angle 5$

PARALLEL TRANSVERSAL LINE



Two angles of each pair of alternate exterior angles are equal i.e.

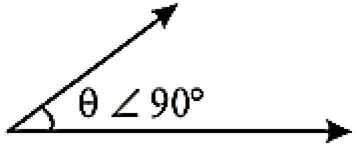
$\angle 1 = \angle 7$; $\angle 4 = \angle 6$

Any two consecutive interior angles are supplementary. i.e. their sum is 180°. Hence

$\angle 2 + \angle 5 = 180°$; $\angle 5 + \angle 8 = 180°$; $\angle 8 + \angle 3 = 180°$; $\angle 3 + \angle 2 = 180°$

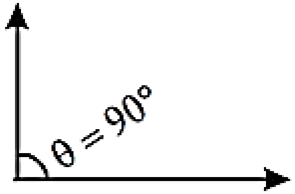
ANGLE

Acute angle: An angle is said to be acute angle if it is less than 90°.



Here $0° \angle \theta \angle 90°$, hence θ is acute angle.

Right angle: An angle is said to be right angle if it is of 90°.



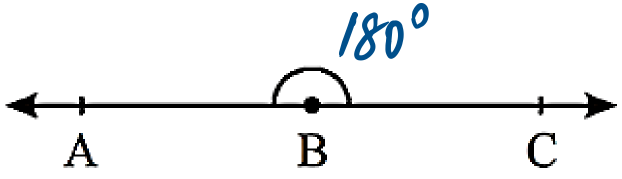
Here θ is right angle.

Obtuse angle: An angle is said to be obtuse angle if it is of more than 90°.

SSBCrack EXAMS

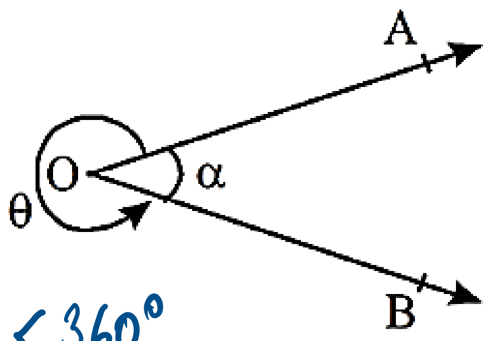
ANGLE

Straight angle: An angle is said to be straight angle if it is of 180°.



Here θ is a straight angle.

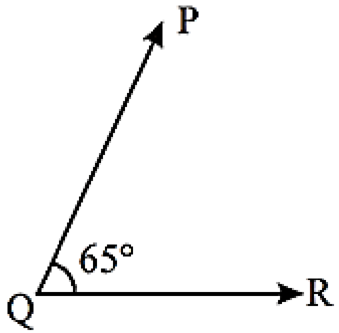
Reflex angle: An angle is said to be reflex angle if it is of greater than 180°.

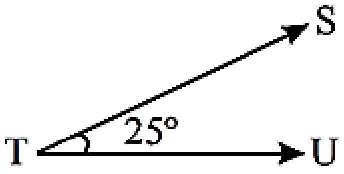


$180° < \theta < 360°$

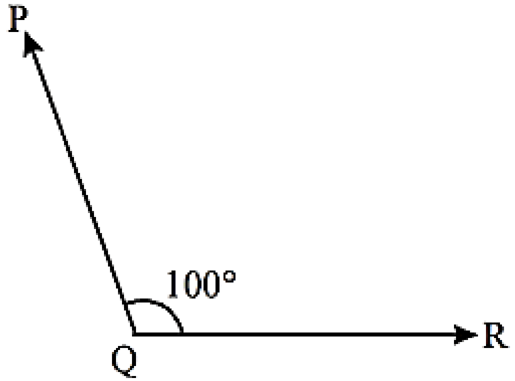
ANGLE

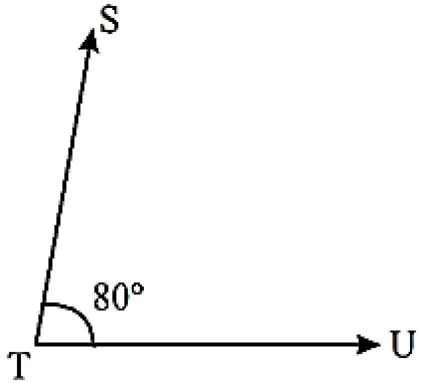
Complementary angles: Two angles, the sum of whose measures is 90°, are called the complementary angles.





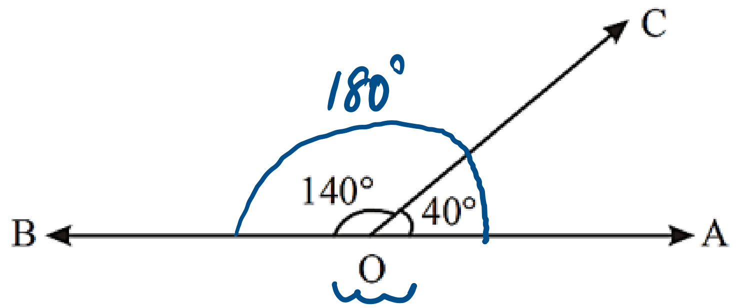
Supplementary angles: Two angles, the sum of whose measures is 180°, are called the supplementary angles.



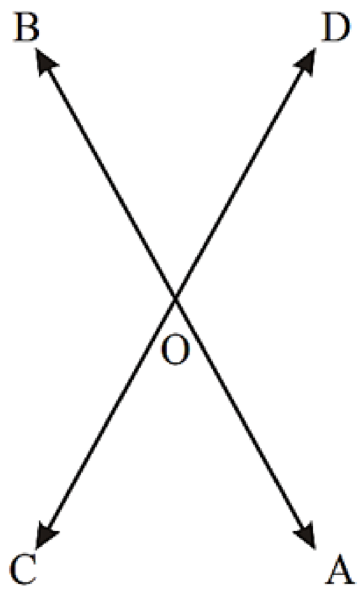


ANGLE

Linear pair of angles:



Vertically opposite angles:



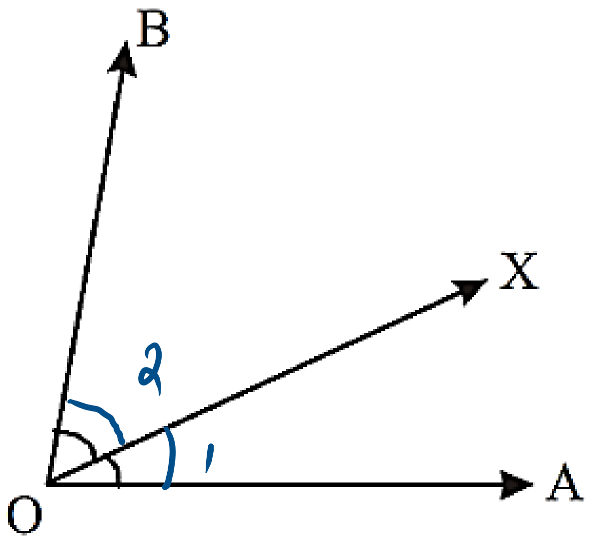
ADJACENT ANGLE

Adjacent angles: Two angles are called adjacent angles, if

(i) they have the same vertex

(ii) they have a common arm and

(iii) non-common arms are on either side of the common arm

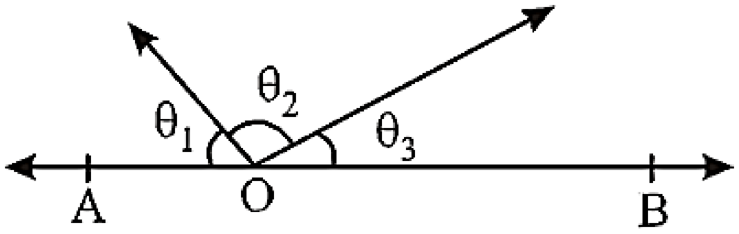


$\underbrace{\angle AOX , XOB}$

$\angle 1 , \angle 2$

ANGLE

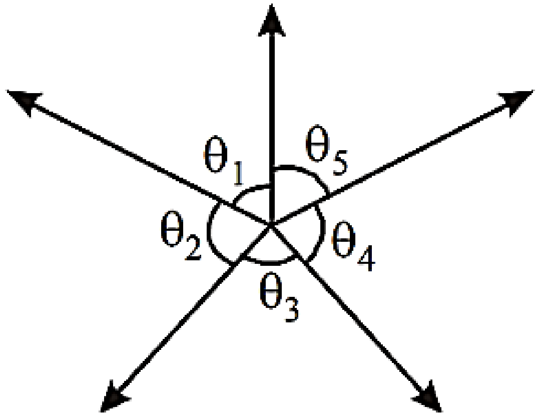
Angles on one side of a line at a point on the line:



$$\theta_1 + \theta_2 + \theta_3 = 180^\circ.$$

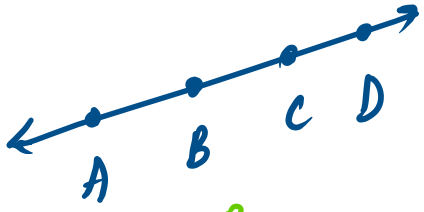
Angle around a point:

$$\theta_1 + \theta_2 + \theta_3 + \theta_4 + \theta_5 = 360^\circ$$

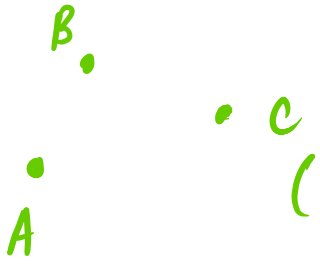


PROPERTIES

- Three or more points are said to be collinear if they lie on a line, otherwise they are said to be non-collinear. only for more than 2 points.
- Two or more lines are said to be coplanar if they lie in the same plane, otherwise they are said to be non-coplanar.
- A line, which intersects two or more given coplanar lines in distinct points, is called a transversal of the given lines.



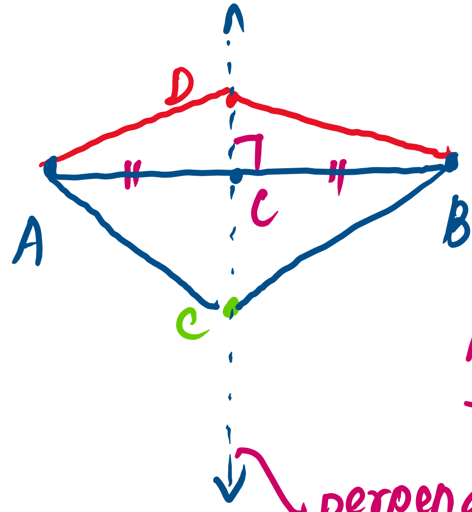
(A, B, C, D are collinear points)



(A, B, C are non-collinear points)

PROPERTIES

- A line which is perpendicular to a line segment, i.e., intersect at 90° and passes through the mid point of the segment is called the perpendicular bisector of the segment.
- Every point on the perpendicular bisector of a segment is equidistant from the two endpoints of the segment.
- If two lines are perpendicular to the same line, they are parallel to each other.
- Lines which are parallel to the same line are parallel to each other.

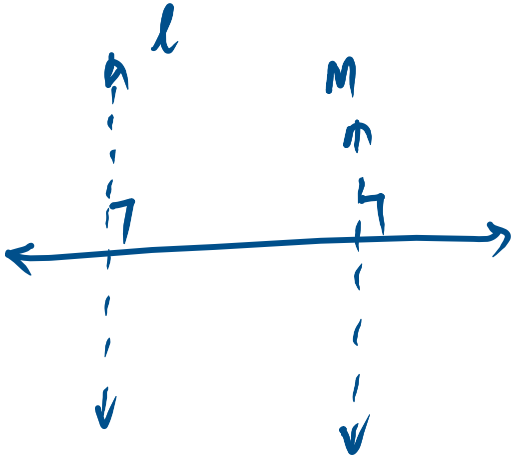


$AC = BC$

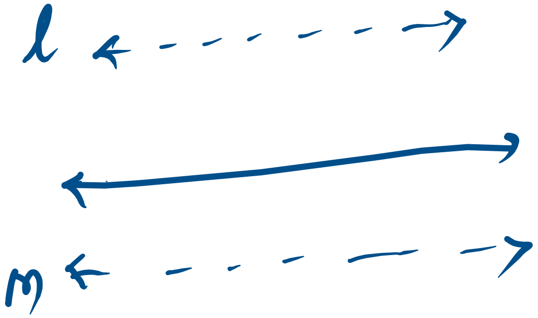
perpendicular bisector of AB.

$AC = BC$

$AD = BD$



$l \parallel m$

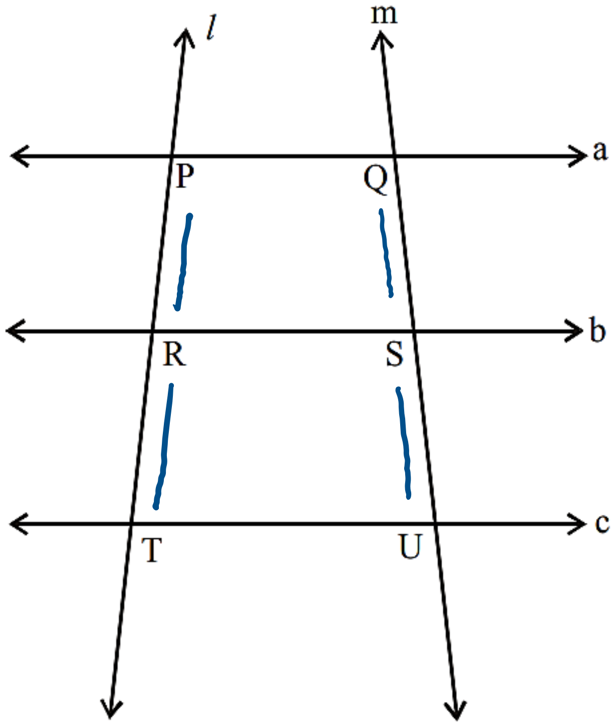


$l \parallel m$

PROPORTIONALITY THEOREM

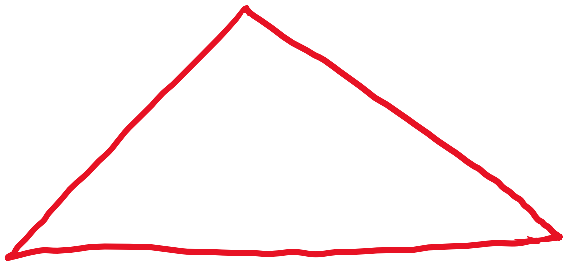
If line a || b || c, and lines *l* and *m* are two transversals, then

$$\frac{PR}{RT} = \frac{QS}{SU}$$



TRIANGLE

3-sided polygon (closed figure made of line segments).

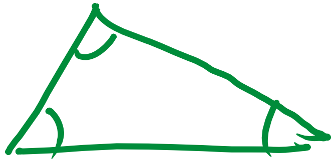


sides

1. equilateral
2. isosceles
3. scalene

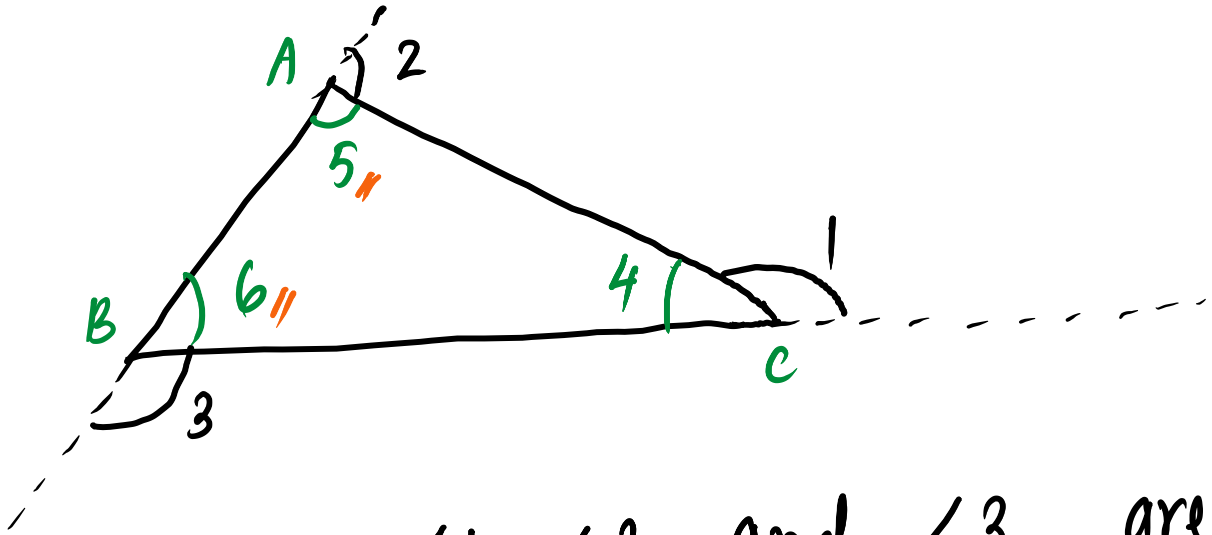
angles

1. acute-angled
2. right-angled
3. obtuse-angled



(one angle)

sum of all 3 angles = 180°



$\angle 2 = \angle 4 + \angle 6$

$\angle 3 = \angle 5 + \angle 4$

$\angle 1$, $\angle 2$, and $\angle 3$ are exterior angles.

$\angle 1 + \angle 4 = 180^\circ$

$\angle 4 + \angle 5 + \angle 6 = 180^\circ$

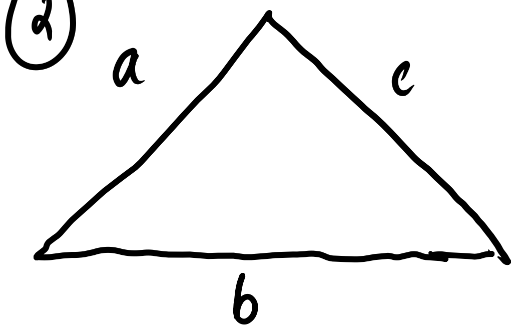
$\angle 1 + \angle 4 = \angle 4 + \angle 5 + \angle 6$

$\angle 1 = \angle 5 + \angle 6$ { Exterior angle is equal to sum of interior opposite angles }

TRIANGLE IMPORTANT PROPERTIES

1. The exterior angle of a triangle is equal to the sum of the opposite (not adjacent) interior angles
2. Sum of the lengths of any two sides of a triangle is greater than the length of the third side. Difference of two sides is less than the third side.
3. In any triangle, side opposite to greatest angle is largest and side opposite to smallest angle is smallest.
4. In a right angled triangle, the line joining the vertex of the right angle to the mid point of the hypotenuse is half the length of the hypotenuse.

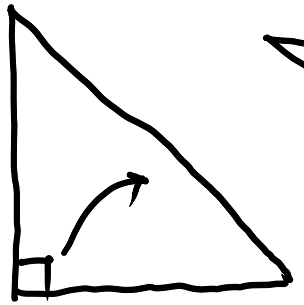
2



$a+b > c$ | $a-b < c$

$a+c > b$ | $a-c < b$

$b+c > a$ | $b-c < a$



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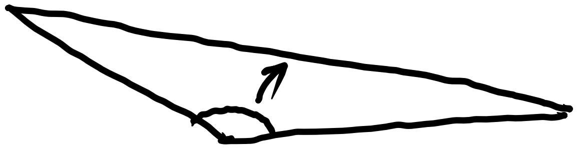
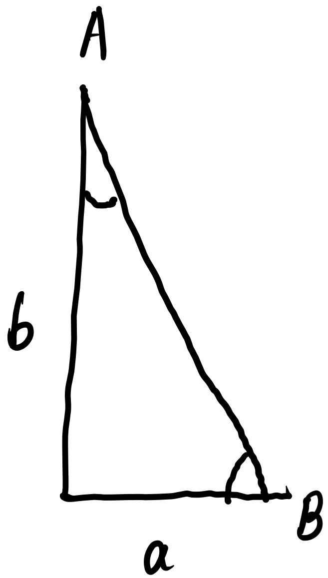


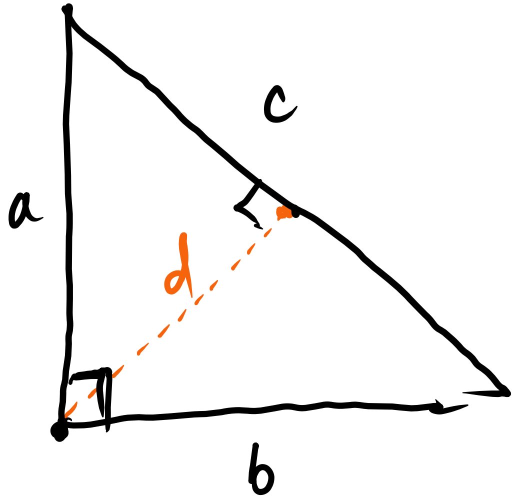
CDS & AFCAT 2 2024 LIVE CLASS - MATHS - PART 1



$\angle A < \angle B$

$a < b$

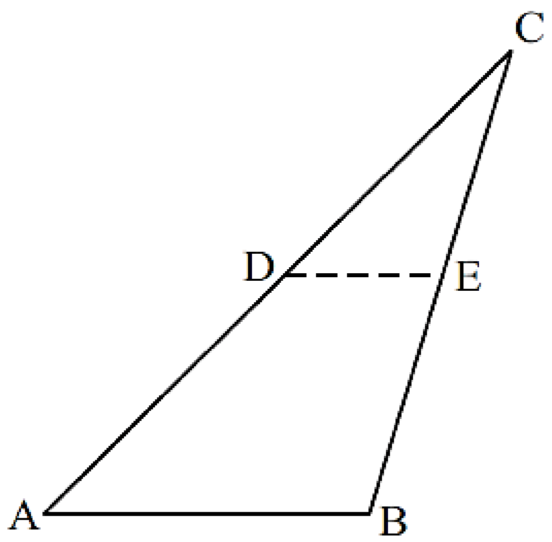
4



$d = \frac{c}{2}$

TRIANGLE IMPORTANT PROPERTIES

In any triangle, line segment joining the mid points of any two sides is parallel to the third side and equal to half of the length of third side.



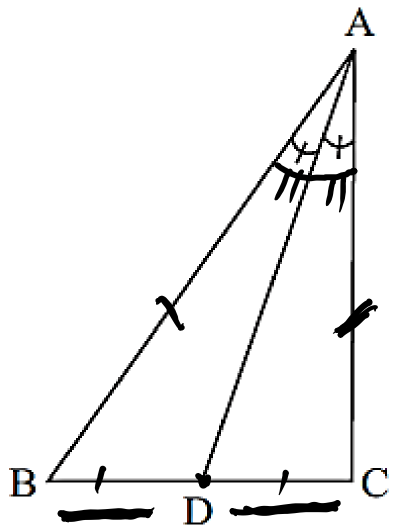
In ΔABC, D and E are mid points of sides AC and BC, then

DE is parallel to AB i.e. $DE \parallel AB$ and $DE = \frac{1}{2}\ AB$

ANGLE BISECTOR THEOREM

Bisector of an angle (internal or external) of a triangle divides the opposite side (internally or externally) in the ratio of the sides containing the angle.

For example:

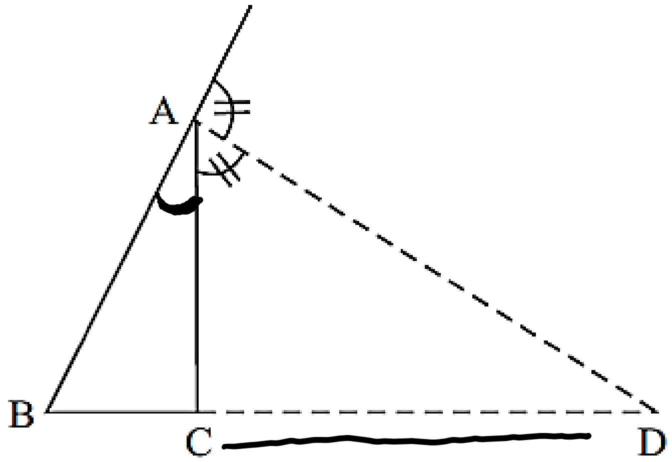


$$\left\{\frac{AB}{AC} = \frac{BD}{DC}\right\}$$

In figure AD is the bisector of exterior $\angle BAC$

$$\therefore \qquad \frac{AB}{AC} = \frac{BD}{DC}$$

ANGLE BISECTOR THEOREM



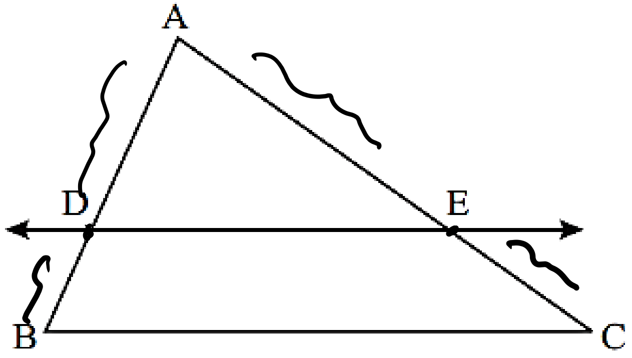
In figure AD is the bisector of exterior $\angle BAC$.

$$\therefore \quad \frac{AB}{AC} = \frac{BD}{DC}$$ (external division)

Converse of the angle bisector theorem is also true.

BASIC PROPORTIONALITY THEOREM

If a line is drawn parallel to one side of a triangle which intersects the other two sides in distinct points, the other two sides are divided in the same ratio.

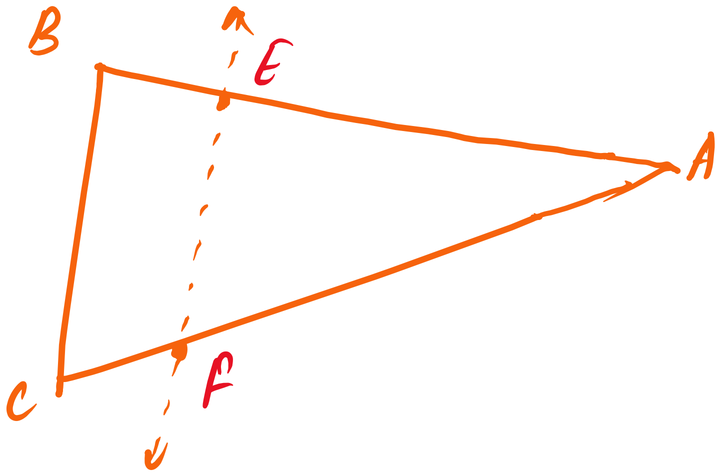


In ΔABC, $DE \parallel BC$,

Then, $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

This theorem is also known as Thalse theorem.

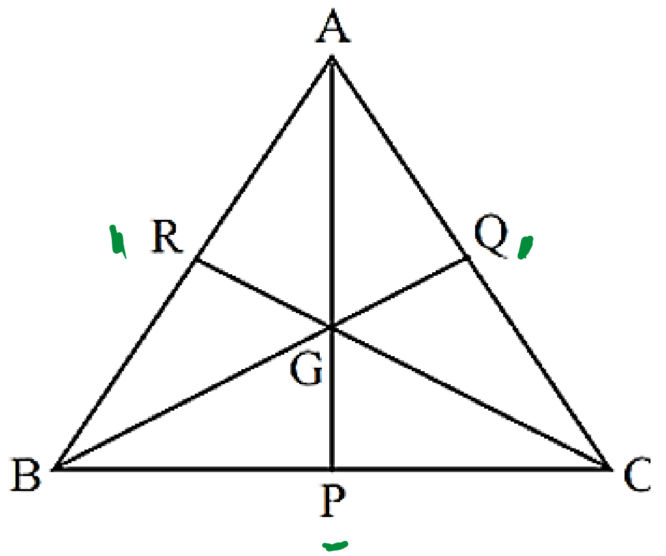
Converse of this theorem is also true.



$\left\{ \dfrac{AE}{EB} = \dfrac{AF}{FC} \right\}$

MEDIAN & CENTROID

We know that a line segment joining the mid point of a side of a triangle to its opposite vertex is called a median.

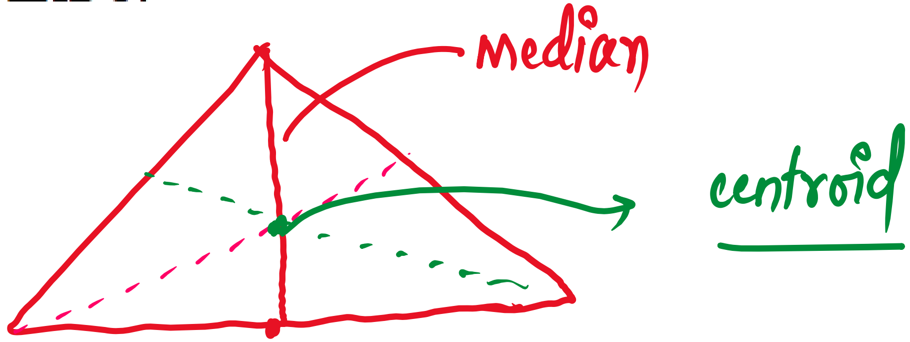


AP, BQ and CR are medians of ΔABC where P, Q and R are mid points of sides BC, CA and AB respectively.

(i) Three medians of a triangle on concurrent. The point of concurrent of three medians is called Centroid of the triangle denoted by G.

(ii) Centroid of the triangle divides each median in the ratio 2 : 1

i.e. $AG : GP = BG : GQ = CG : GR = 2 : 1$, where G is the centroid of ΔABC.

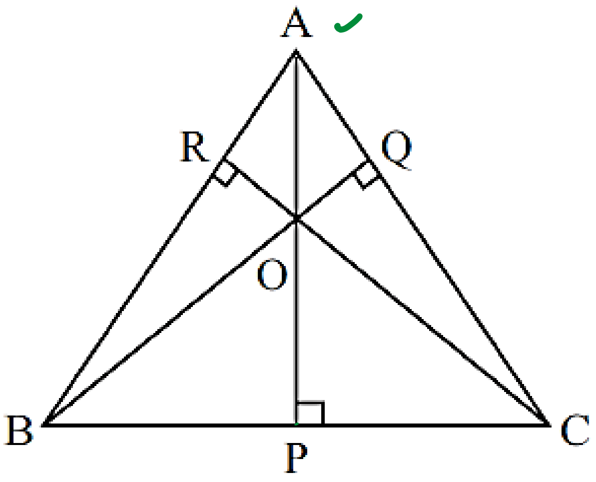


ALTITUDE & ORTHOCENTRE

A perpendicular drawn from any vertex of a triangle to its opposite side is called altitude of the triangle. There are three altitudes of a triangle.

In the figure, AP, BQ and CR are altitudes of ΔABC.

The altitudes of a triangle are concurrent (meet at a point) and the point of concurrency of altitudes is called Ortho-centre of the triangle, denoted by O.



In figure, AP, BQ and CR meet at O, hence O is the orthocentre of the triangle ABC.

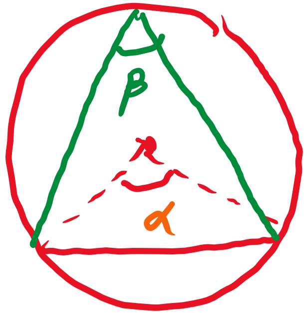
PERPENDICULAR BISECTOR & CIRCUMCENTRE

A line which is perpendicular to a side of a triangle and also bisects the side is called a perpendicular bisector of the side.

(i) Perpendicular bisectors of sides of a triangle are concurrent and the point of concurrency is called circumcentre of the triangle, denoted by 'C'.

(ii) The circumcentre of a triangle is centre of the circle that circumscribes the triangle.

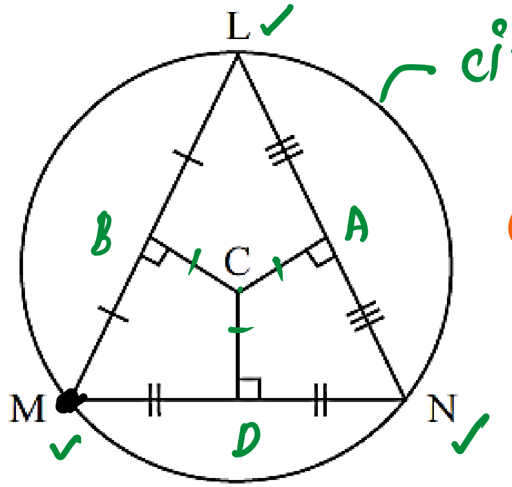
(iii) Angle formed by any side of the triangle at the circumcentre is twice the vertical angle opposite to the side.



$(\alpha = 2\beta)$

In figure, perpendicular bisectors of sides LM, MN and NL of ΔLMN meets at C. Hence C is the circumcentre of the triangle LMN.

$\angle MCN = 2\,\angle MLN.$



circumcircle

CA, CB & CD are perpendicular bisectors.

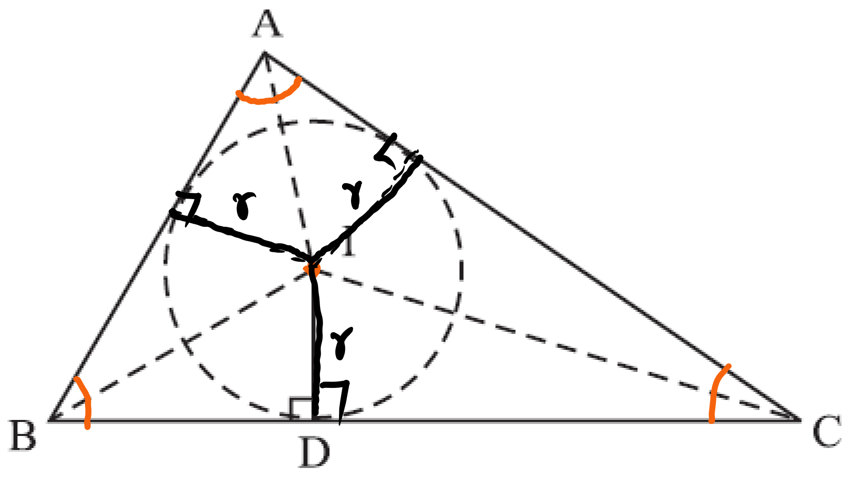
ANGE BISECTOR & INCENTRE

Lines bisecting the interior angles of a triangle are called angle bisectors of triangle.

(i) Angle bisectors of a triangle are concurrent and the point of concurrency is called Incentre of the triangle, denoted by I.

(ii) With I as centre and radius equal to length of the perpendicular drawn from I to any side, a circle can be drawn touching the three sides of the triangle. So this is called incircle of the triangle. Incentre is equidistant from all the sides of the triangle.

(iii) Angle formed by any side at the incentre is always 90° more than half the vertex angle opposite to the side.

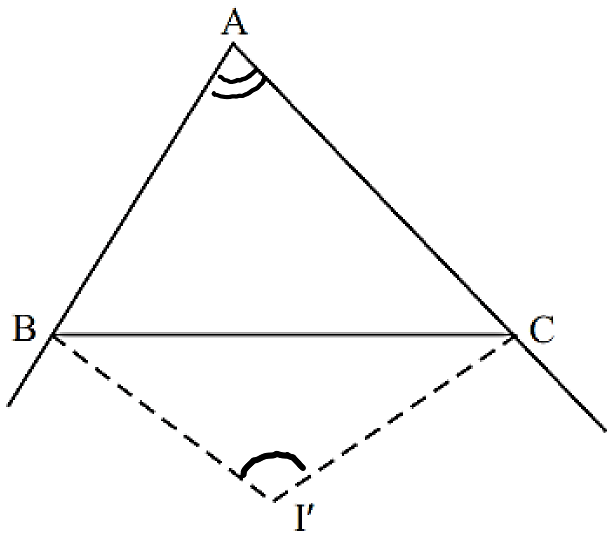


IMPORTANT RESULT

In figure AI, BI, CI are angle bisectors of ΔABC.
Hence I is the incentre of the ΔABC and

$$\angle BIC = 90° + \frac{1}{2}\angle A,\ \angle AIC = 90° + \frac{1}{2}\angle B$$

and $$\angle AIB = 90° + \frac{1}{2}\angle C$$

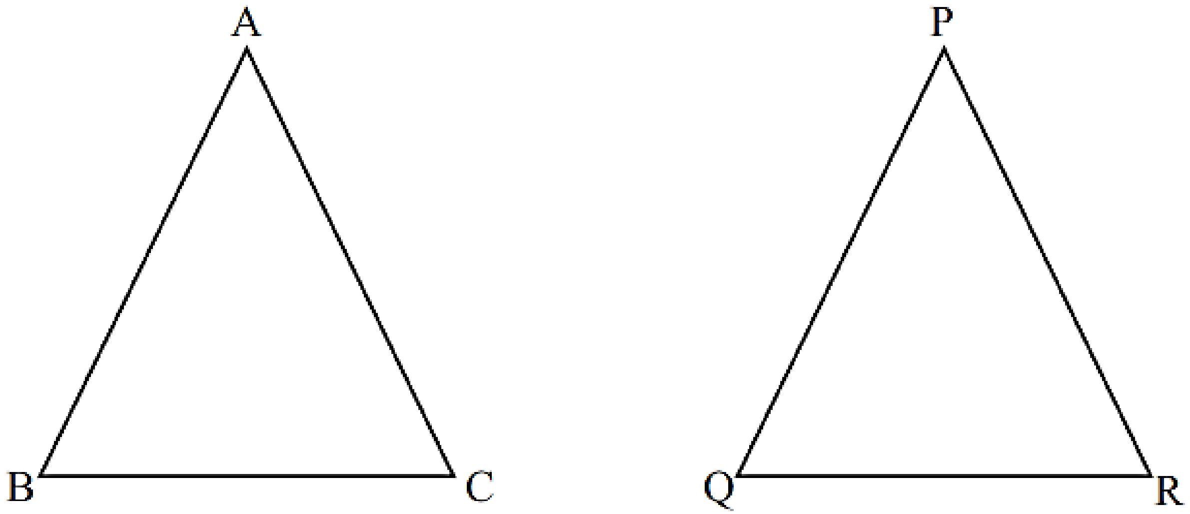


If BI' and CI' be the angle bisectors of exterior angles at B and C, then

$$\angle BI'C = 90° - \frac{1}{2}\angle A.$$

CONGRUENCY OF TRIANGLE

Two triangles are congruent if they are of the same shape and size i.e .if any one of them can be made to superpose on the other it will cover exactly.



If two triangles ABC and PQR are congruent then 6 elements (i.e. three sides and three angles) of one triangle are equal to corresponding 6 elements of other triangle.

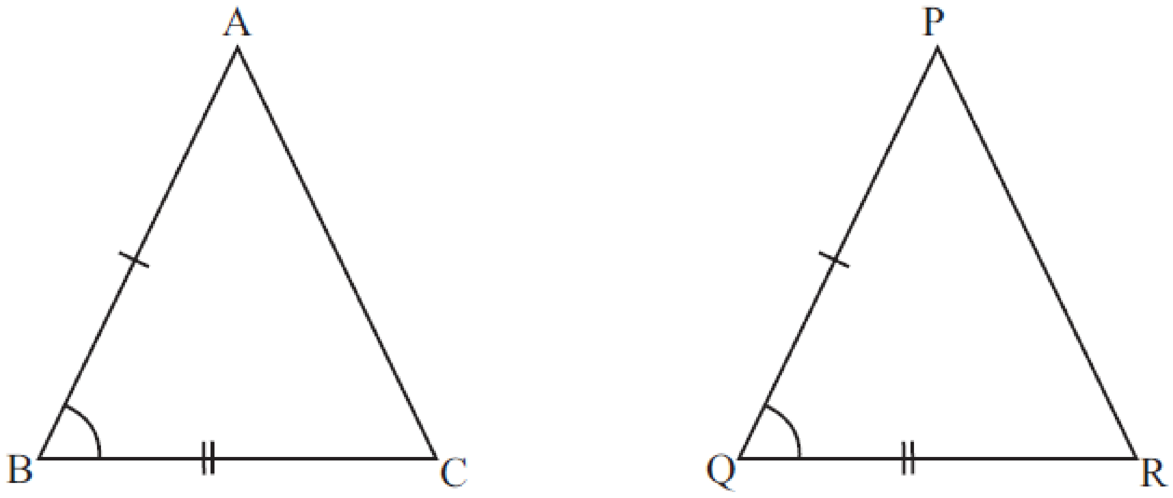
(i) $\angle A = \angle P, \angle B = \angle Q, \angle C = \angle R$

(ii) $AB = PQ, BC = QR, AC = PR$

This is symbolically written as $\Delta ABC \cong \Delta PQR$

CONDITIONS OF CONGRUENCY

1. **SAS (Side-Angle-Side) Congruency:** If two sides and the included angle between these two sides of one triangle is equal to corresponding two sides and included angle between these two sides of another triangle, then the two triangles are congruent.



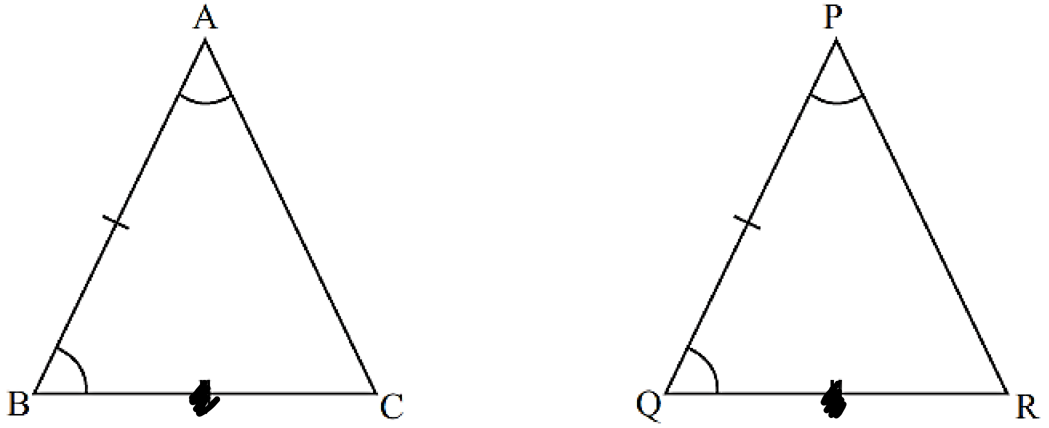
$AB = PQ$

$BC = QR$

$\angle B = \angle Q$

CONDITIONS OF CONGRUENCY

2. **ASA (Angle-Side-Angle) Congruency:** If two angles and included side between these two angles of one triangle are equal to corresponding angles and included side between these two angles of another triangle, then two triangles are congruent.



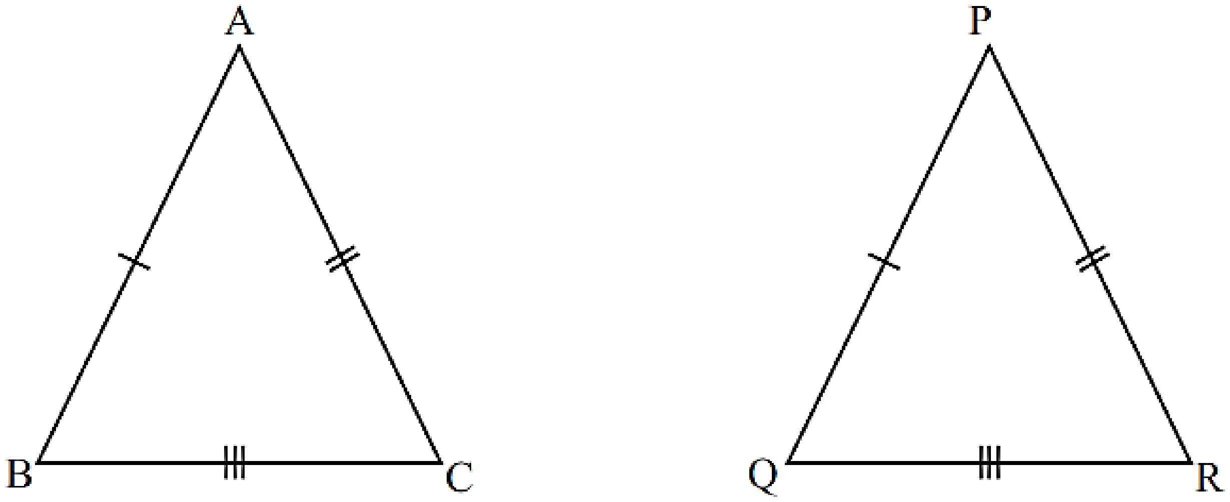
$\angle A = \angle P$

$\angle B = \angle Q$

$AB = PQ$

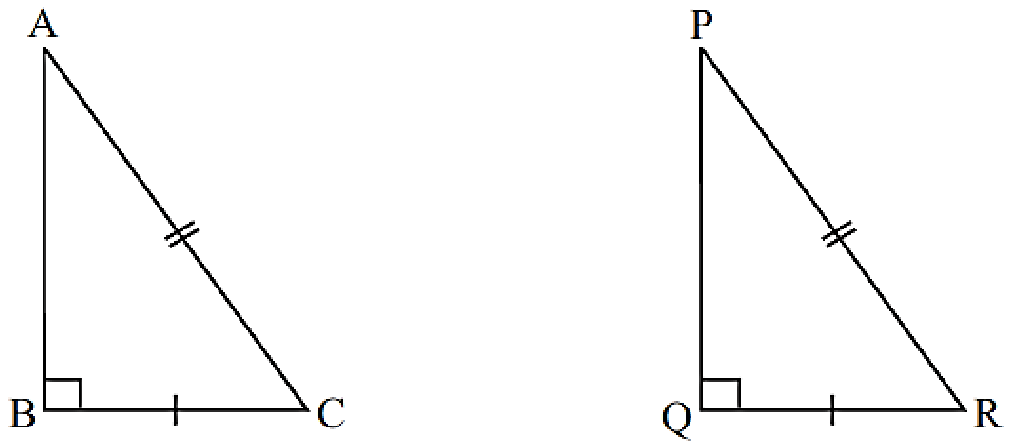
CONDITIONS OF CONGRUENCY

3. **SSS (Side-Side-Side) Congruency:** If three sides of one triangle are equal to corresponding three sides of another triangle, the two triangles are congruent.



CONDITIONS OF CONGRUENCY

4. **RHS (Rightangle-Hypotenuse-Side) Congruency:** Two right angled triangles are congruent to each other if hypotenuse and one side of one triangle are equal to hypotenuse and corresponding side of another triangle.



$AC = PR$

$\angle B = \angle Q = 90^0$

$AB = PQ$, or $BC = QR$ (any one of the legs)

SIMILARITY

Two triangles are said to be similar, if their shapes are the same but their size may or may not be equal.

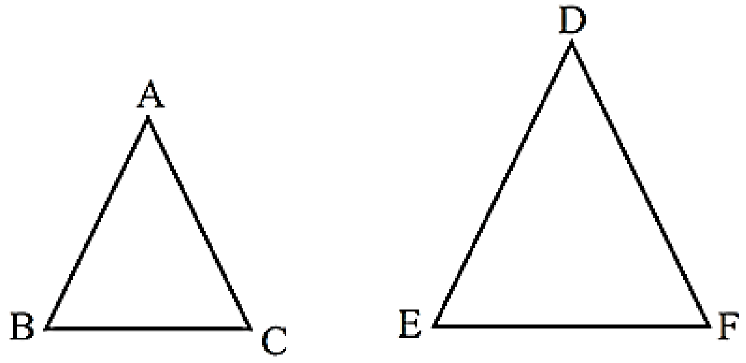
When two triangles are similar, then

(i) all the corresponding angles are equal and

(ii) all the corresponding sides are in the same ratio (or proportion)

SIMILARITY

In two similar triangles, sides opposite to equal angles are called corresponding sides. And angles opposite to side proportional to each other are called corresponding angles.



If ΔABC and ΔDEF are similar, then

$$\angle A = \angle D$$
$$\angle B = \angle E$$
$$\angle C = \angle F$$

and $\dfrac{AB}{DE} = \dfrac{BC}{EF} = \dfrac{CA}{FD}$

sides are proportional.

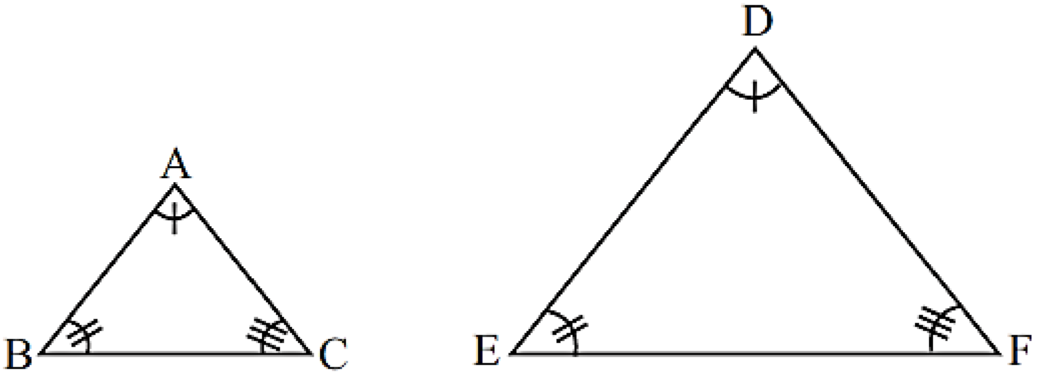
$\Delta ABC \sim \Delta DEF$, read as triangle ABC is similar to triangle DEF.

Here ~ is the sign of similarity.

CONDITIONS OF SIMILARITY

1. **AAA (Angle–Angle–Angle) Similarity:** Two triangles are said to be similar, if their all corresponding angles are equal.

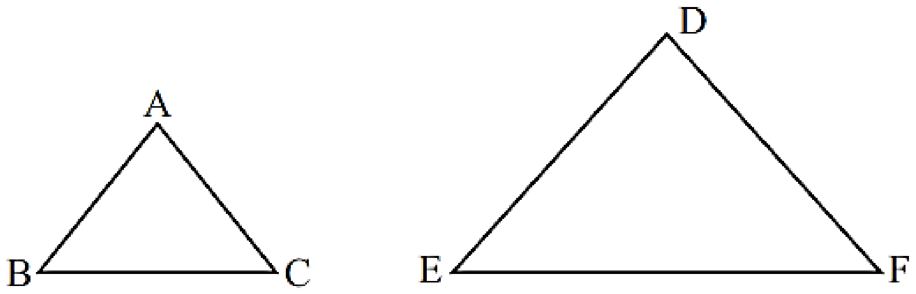
For example:



CONDITIONS OF SIMILARITY

2. **SSS (Side–Side–Side) Similarity:** Two triangles are said to be similar, if sides of one triangle are proportional (or in the same ratio of) to the sides of the other triangle:

For example:



In ΔABC and ΔDEF, if

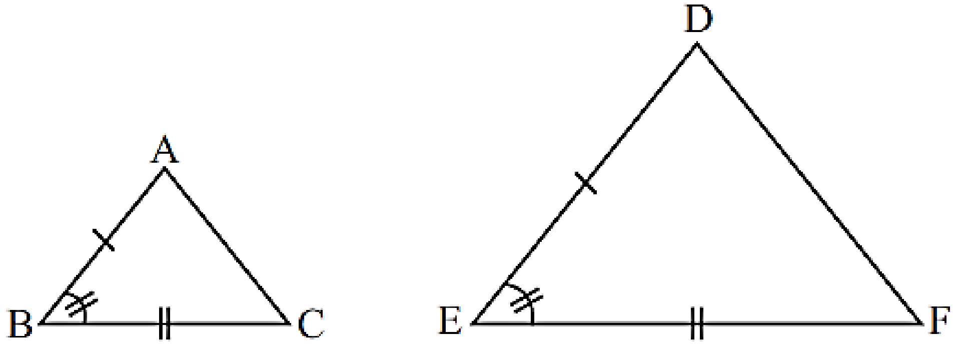
$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

Then $\Delta ABC \sim \Delta DEF$ [By SSS Similarity]

CONDITIONS OF SIMILARITY

3. **SAS (Side–Angle–Side) Similarity:** Two triangles are said to be similar if two sides of a triangle are proportional to the two sides of the other triangle and the angles included between these sides of two triangles are equal.

For example:



In ΔABC and ΔDEF, if

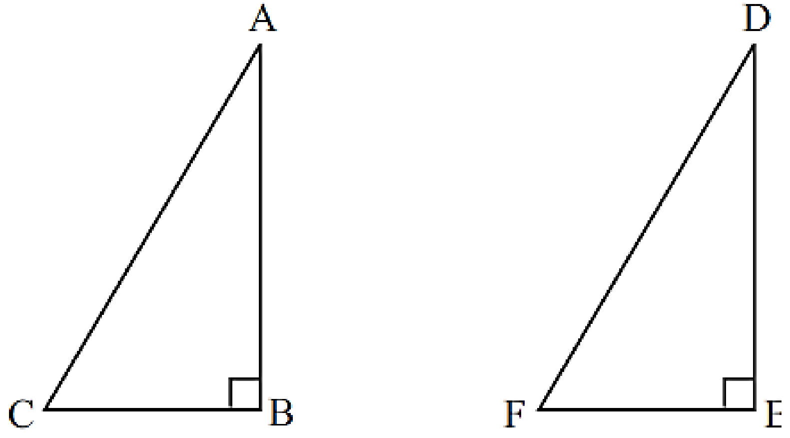
$$\frac{AB}{DE} = \frac{BC}{EF}$$

and $\angle B = \angle E$

Then, $\Delta ABC \sim \Delta DEF$ [By SAS Similarity]

CONDITIONS OF SIMILARITY

4. **RHS (Rightangle-Hypotenuse-Side) Similarity:** Two triangles are said to be similar if one angle of both triangle is right angle and hypotenuse of both triangles are proportional to any one other side of both triangles respectively.



In ΔABC and ΔDEF, if

$\angle B = \angle E$ [= 90°]

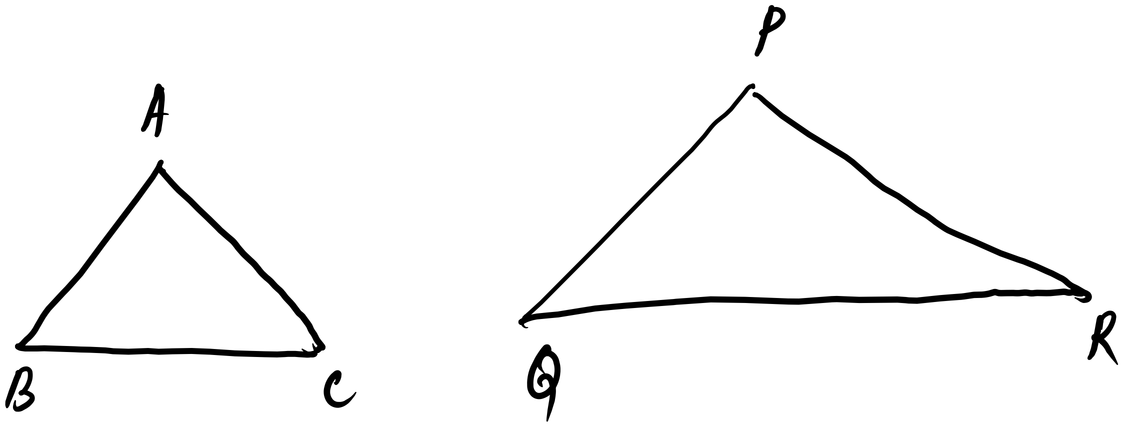
$$\frac{AC}{DF} = \frac{AB}{DE}$$

Then $\Delta ABC \sim \Delta DEF$ [By RHS similarity]

PROPERTIES

Ratio of medians = Ratio of corresponding heights
= Ratio of circumradii
= Ratio of inradii

If two triangles are similar, then ratio of areas of two similar triangle is equal to the ratio of square of corresponding sides.



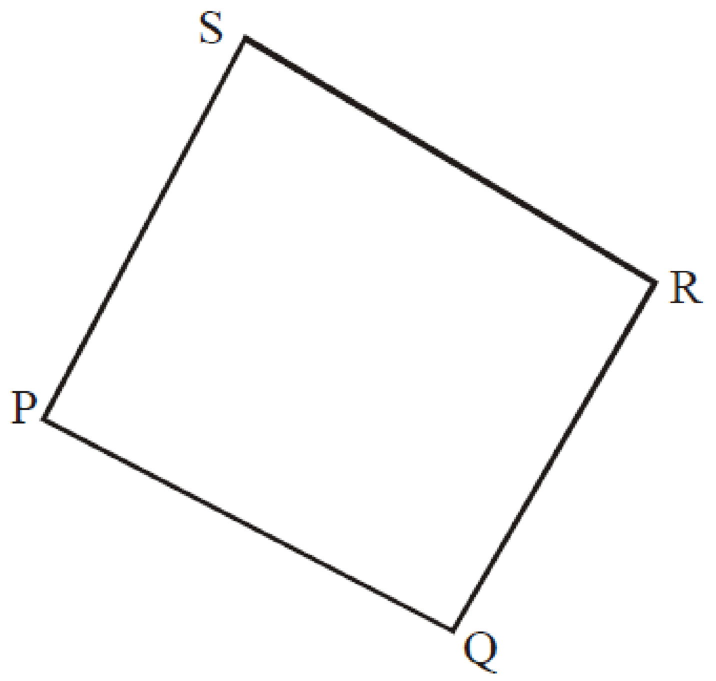
$\triangle ABC \sim \triangle PQR$

$$\frac{ar(\triangle ABC)}{ar(\triangle PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2$$

$$= \left(\frac{AC}{PR}\right)^2$$

QUADRILATERAL

A figure formed by joining four points is called a quadrilateral.
A quadrilateral has four sides, four angles and four vertices.

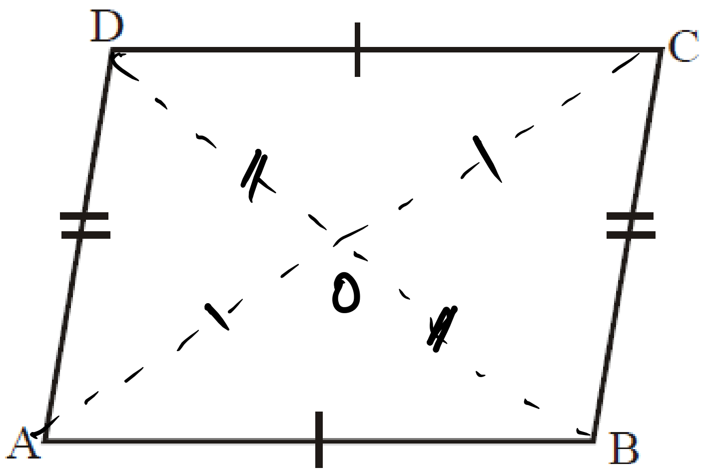


In quadrilateral PQRS, PQ, QR, RS and SP are the four sides; P, Q, R and S are four vertices and $\angle P$, $\angle Q$, $\angle R$ and $\angle S$ are the four angles.

- The sum of the angles of a qudrilateral is 360°.
  $\angle P + \angle Q + \angle R + \angle S = 360°$

TYPES OF QUADRILATERAL

Parallelogram : A quadrilateral whose opposite sides are parallel is called parallelogram.



$AO = CO$

$DO = BO$

Properties :

(i) Opposite sides are parallel and equal.

(ii) Opposite angles are equal.

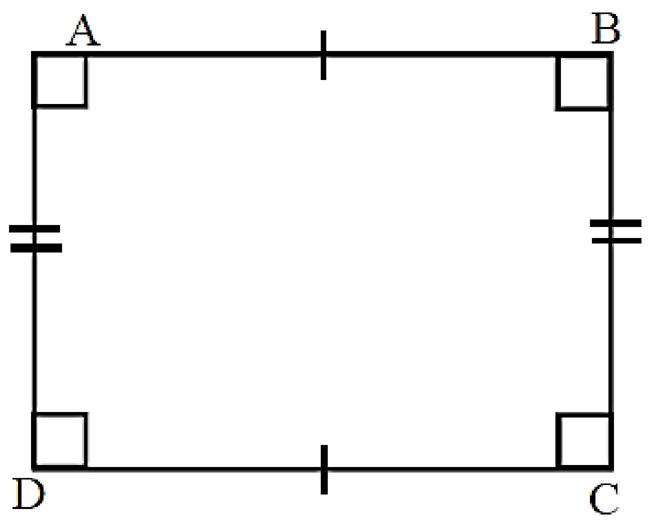
(iii) Diagonals bisect each other.

(iv) Sum of any two adjacent angles is 180°.

(v) Each diagonal divides the parallelogram into two triangles of equal area.

TYPES OF QUADRILATERAL

Rectangle : A parallelogram, in which each angle is a right angle, i.e., 90° is called a rectangle.



Properties :

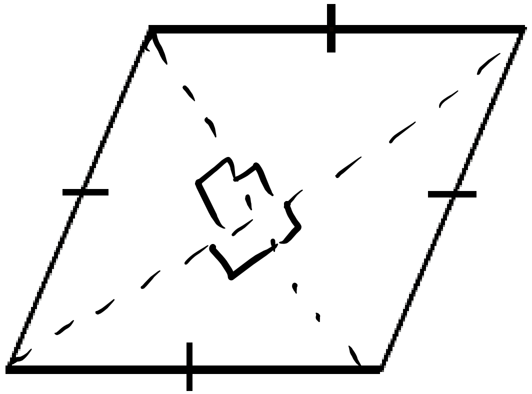
(i) Opposite sides are parallel and equal.

(ii) Each angle is equal to 90°.

(iii) Diagonals are equal and bisect each other.

TYPES OF QUADRILATERAL

Rhombus : A parallelogram in which all sides are congruent (or equal) is called a rhombus.



Properties :

(i) Opposite sides are parallel.

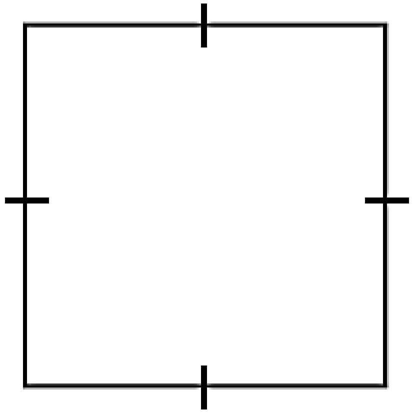
(ii) All sides are equal.

(iii) Opposite angles are equal.

(iv) Diagonals bisect each other at right angle.

TYPES OF QUADRILATERAL

Square : A rectangle in which all sides are equal is called a square.



Properties :

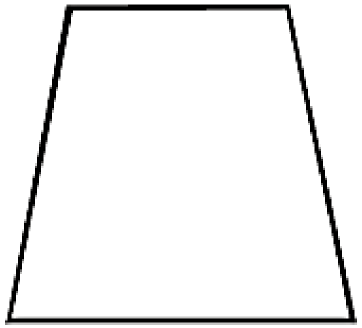
(i) All sides are equal and opposite sides are parallel.

(ii) All angles are 90°.

(iii) The diagonals are equal and bisect each other at right angle.

TYPES OF QUADRILATERAL

Trapezium : A quadrilateral is called a trapezium if two of the opposite sides are parallel but the other two sides are not parallel.



Properties :

(i) The segment joining the mid-points of the non-parallel sides is called the median of the trapezium.

$$\textbf{Median} = \frac{1}{2} \times \textbf{ sum of the parallel sides}$$

POLYGON

A plane figure formed by three or more non-collinear points joined by line segments is called a polygon.

A polygon with 3 sides is called a triangle.
A polygon with 4 sides is called a quadrilateral.
A polygon with 5 sides is called a pentagon.
A polygon with 6 sides is called a hexagon.
A polygon with 7 sides is called a heptagon.
A polygon with 8 sides is called an octagon.
A polygon with 9 sides is called a nonagon.
A polygon with 10 sides is called a decagon.

angle sum = $(n-2) \times 180^\circ$

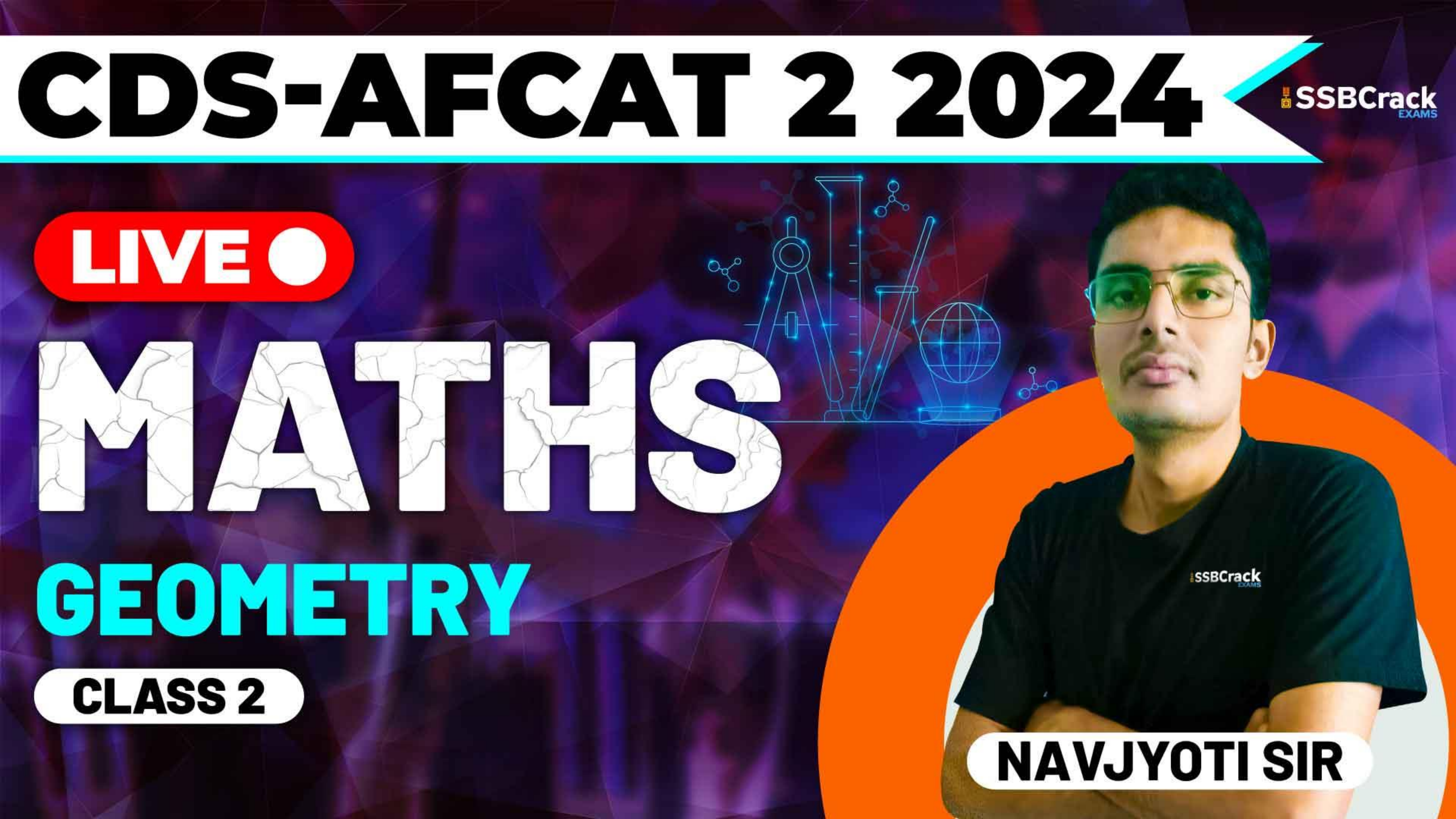
n → no. of sides

exterior - angles

sum = 360° (for any polygon)

no. of sides $= \dfrac{360^\circ}{\text{exterior angle}}$

for regular polygon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