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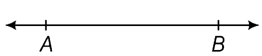
Geometry

Point

A figure of which length, breadth and height cannot be measured is called a point.

Line

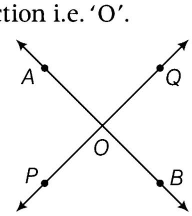
A endless straight path in both directions is said to be a line. It is denoted by $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$.



Note A line has no end points.

(i) Intersecting Lines

Two lines having a common point are called intersecting lines. This common point is called point of intersection i.e. 'O'.

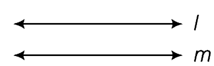


(ii) Concurrent Lines

Three or more lines in a plane which are intersecting at the same point are called concurrent lines.

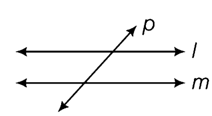
(iii) Parallel Lines

Two lines l and m in a plane are said to be parallel, if they have no common point. It is denoted by symbol $l \parallel m$.



(iv) Transversal Line

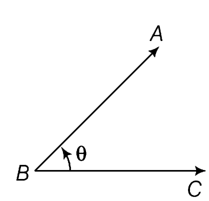
A straight line that cuts two or more straight lines at distinct point is called a transversal line.



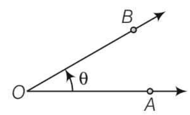
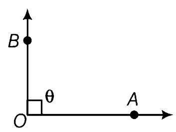
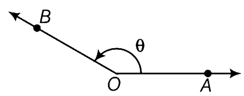
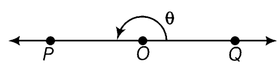
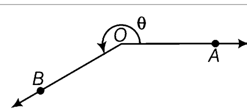
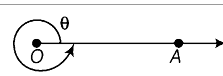
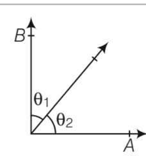
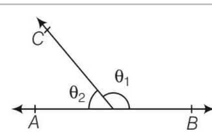
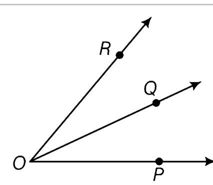
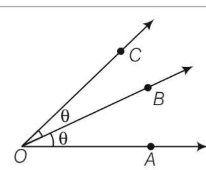
where, p is a transversal line.

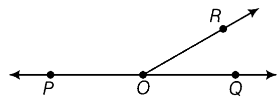
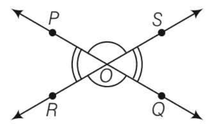
Angle

The figure formed by two rays with the same initial point is called an angle. It is denoted by the symbol θ.



Types of Angles

	Type	Figure	Statement
(i)	Acute Angle		An angle whose measure is more than 0° but less than 90°. $(0° < \theta < 90°)$
(ii)	Right Angle		An angle whose measure is 90°. $(\theta = 90°)$
(iii)	Obtuse Angle		An angle whose measure is more than 90° but less than 180°. $(90° < \theta < 180°)$
(iv)	Straight Angle		An angle whose measure is 180°. $(\theta = 180°)$
(v)	Reflex Angle		An angle whose measure is more than 180° but less than 360°. $(180° < \theta < 360°)$
(vi)	Complete Angle		An angle whose measure is 360°. $(\theta = 360°)$
(vii)	Complementary Angles		The sum of two angles is 90°. $(\theta_1 + \theta_2 = 90°)$
(viii)	Supplementary Angles		The sum of two angles is 180°. $(\theta_1 + \theta_2 = 180°)$
(ix)	Adjacent Angle		Two angles have a common vertex.
(x)	Angle Bisector		A line which cuts an angle in two equal angles is called an angle bisector.

Type	Figure	Statement
(xi) Linear Pair Angles		Two angles are adjacent and they are supplementary.
(xii) Vertically Opposite Angles		∠POS = ∠ROS and ∠POR = ∠SOQ

Example 1 Find the measure of an angle, which is 32° less than its supplement.

(a) 75° (b) 74°
(c) 73° (d) 72°

Sol. (*b*) Let the measure of the required angle be x.

Then, measure of its supplement = $(180° - x)$

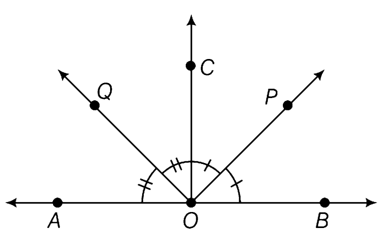
$\therefore \quad (180° - x) - x = 32°$

$\Rightarrow \quad 180° - 32° = 2x$

$\Rightarrow \quad 2x = 148°$

$\Rightarrow \quad x = 74°$

Example 2 In figure, OP bisects $\angle BOC$ and OQ bisects $\angle AOC$, then $\angle POQ$ is



(a) 90° (b) 75°
(c) 105° (d) 80°

Sol. (a) $\angle AOC + \angle BOC = 180°$ [∵ linear pair]

$\Rightarrow \quad \frac{1}{2}\angle AOC + \frac{1}{2}\angle BOC = 90°$

$\Rightarrow \quad \angle QOC + \angle COP = 90°$

$\therefore \quad \angle QOP = 90°$

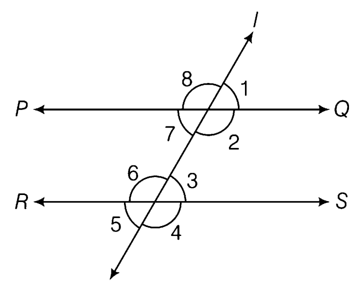
Angles Made by a Transversal on Parallel Lines

Let PQ and RS be two parallel lines, cut by a transversal l.
Then,

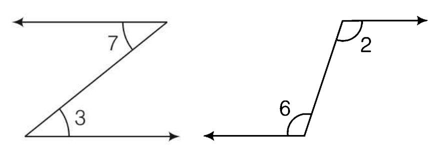
(a) Angles ∠1, ∠4, ∠5 and ∠8 are called exterior angles while angles ∠2 , ∠3, ∠6 and ∠7 are called interior (cointerior) angles.

(b) Pairs of corresponding angles are equal.

i.e. $\angle 1 = \angle 3, \quad \angle 2 = \angle 4,$
$\angle 7 = \angle 5, \quad \angle 8 = \angle 6$



(c) Pairs of alternate interior angles are equal.



i.e. $\angle 7 = \angle 3, \angle 2 = \angle 6$

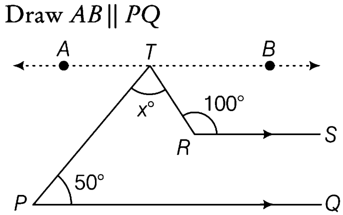
(d) The sum of cointerior angles on the same side of transversal is 180°.

i.e. $\angle 2 + \angle 3 = 180°$
and $\angle 7 + \angle 6 = 180°$

Example 3 In the given figure, $PQ \parallel RS$. Find the value of $x°$.

(a) 40° (b) 50° (c) 60° (d) 70°

Sol. (*b*) Draw $AB \parallel PQ$



$\angle ATP = \angle TPQ = 50°$

[∵ alternate interior angles]

$\angle BTR + \angle TRS = 180°$

[$\because$ sum of interior angles]

$\Rightarrow \quad \angle BTR = 80°$

and $\angle ATP + x + \angle BTR = 180°$

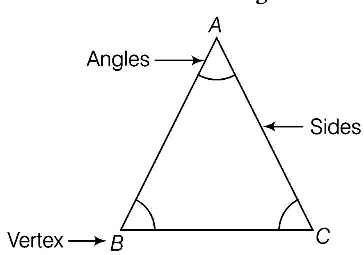
[$\because$ AB is the straight line]

$\Rightarrow \quad 50° + x = 80° = 180°$

$\therefore \quad x = 50°$

Triangle

A closed figure which has three sides, three angles and three vertices is called triangle.



Properties of Triangle

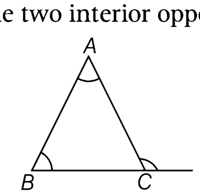
(i) The sum of any two sides of triangle is always greater than the third side.

(ii) Difference of two sides is always less than the third side.

(iii) The sum of three angles of a triangle is equal to $180°$.

(iv) Greater angle has greater side opposite to it and smaller angle has smaller side opposite to it.

(v) In a triangle an exterior angle equals the sum of the two interior opposite angles.



i.e. $\quad$ ext $\angle C = \angle A + \angle B$

Types of Triangle

According to their Sides

(i) **Scalene Triangle** A triangle having all sides are different in length.

(ii) **Isosceles Triangle** A triangle having any two sides are equal in length.

(iii) **Equilateral Triangle** A triangle having all three sides are equal in length and each angle is equal to 60°.

According to their Angles

(i) **Acute Angled Triangle** If each angle of triangle is less than 90°. It is called an acute angled triangle.

(ii) **Right Angled Triangle** If any one angle of a triangle is 90°. It is called a right angled triangle.

(iii) **Obtuse Angled Triangle** If any one angle of triangle is greater than 90°, it is called an obtuse angled triangle.

Example 4 The angles of a triangle are $(3x)°$, $(2x - 7)°$ and $(4x - 11)°$. The value of x is

(a) 18° (b) 20° (c) 22° (d) 23°

Sol. (*c*) Sum of all angles of a triangle is equal to $180°$.

$\therefore \quad 3x + (2x - 7)° + (4x - 11)° = 180°$

$\Rightarrow \quad 3x + 2x - 7° + 4x - 11° = 180°$

$\Rightarrow \quad 9x - 18° = 180°$

$\therefore \quad x = \dfrac{180° + 18°}{9} = 22°$

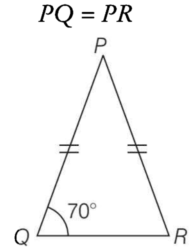
Example 5 ΔPQR is an isosceles triangle with $PQ = PR$. If $\angle Q = 70°$, then find the other angles of a triangle.

(a) 40°, 70° (b) 50°, 30°

(c) 45°, 45° (d) None of the above

Sol. (*a*) In ΔPQR, we have,

$$PQ = PR$$



i.e. $\quad \angle Q = \angle R = 70°$

Since, $\quad \angle P + \angle Q + \angle R = 180°$

[by properties of triangle]

$\therefore \quad \angle P + 140° = 180°$

$\Rightarrow \quad \angle P = 180° - 140° = 40°$

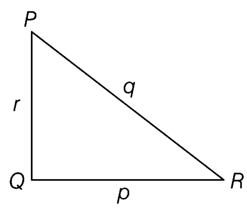
Hence, the required angles of triangle are

$$\angle P = 40° \text{ and } \angle R = 70°$$

Pythagoras Theorem

In a right angle triangle, the square of the hypotenuse equals to the sum of the square of perpendicular and base.

i.e. $$q^2 = p^2 + r^2$$

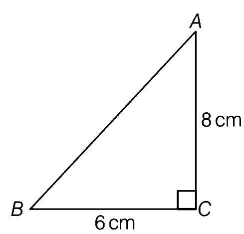


Example 6. The length of the sides of a right angle triangle are 6 cm and 8 cm. What is the length of the hypotenuse?

(a) 10 cm (b) 20 cm (c) 15 cm (d) 18 cm

Sol. (*a*) Using Pythagoras theorem in ΔABC

$\therefore \quad (AB)^2 = (AC)^2 + (BC)^2$



$\Rightarrow \quad (AB)^2 = (8)^2 + (6)^2$

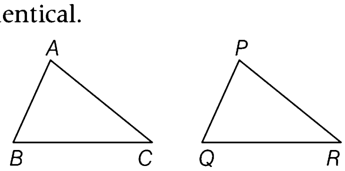
$\Rightarrow \quad (AB)^2 = 64 + 36 = 100$

$\therefore \quad AB = 10$ cm

Hence, the length of the hypotenuse is 10 cm.

Congruent Triangles

Two triangles are congruent if and only if one of them can be made to super impose on the other, so it covers exactly. Thus, congruent triangles are exactly identical.



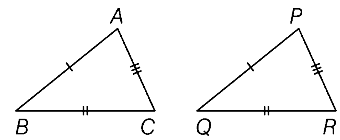
Here, the ΔABC and ΔPQR are congruent. And it is written as

$$\Delta ABC \cong \Delta PQR$$

Criteria for Congruence of Triangles

(i) **SSS Congruence Criterion**

(Side-Side-Side) Two triangles are congruent, if three sides of one triangle are respectively equal to the three sides of the other triangle.



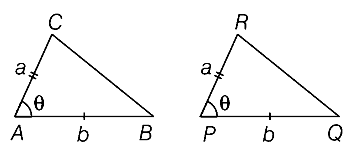
Here, we see that, AB = PQ, BC = QR and CA = RP.

$\therefore \quad \Delta ABC \cong \Delta PQR$

(ii) **SAS Congruence Criterion**

(Side-Angle-Side) Two triangles are congruent, if two sides and the included angle of one triangle are respectively equal to the two sides and the included angle of the other triangle.

Here, we see that, AB = PQ, AC = PR and $\angle A = \angle P$.

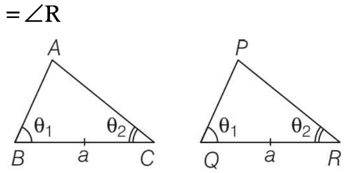


$\therefore \quad \Delta ABC \cong \Delta PQR$

(iii) **ASA Congruence Criterion**

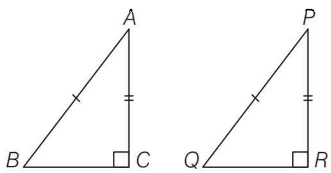
(Angle-Side-Angle) Two triangles are congruent, if two angles and the included side of one triangle are respectively equal to the two angles and the included side of the other triangle.

Here, we see that, $\angle B = \angle Q$, BC = QR and $\angle C = \angle R$



$\therefore \quad \Delta ABC \cong \Delta PQR$

(iv) **RHS Congruence Criterion** (Right angle-Hypotenuse-Side) Two right angled triangles are congruent, if the hypotenuse and one side of the first triangle are respectively equal to the hypotenuse and one side of the second triangle.

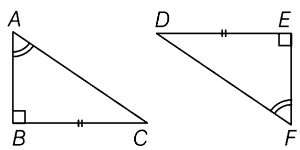


Here, we see that, AB = PQ, AC = PR

and $\angle C = \angle R$

$\therefore$ $\Delta ABC \cong \Delta PQR$

Example 7 In the given figure, the two triangles are congruent. Then, the ΔABC congruent to



(a) ΔEFD (b) ΔFED
(c) ΔDEF (d) None of these

Sol. (*b*) In ΔABC and ΔFED,

$\angle B = \angle E$ [each 90° given]

$\angle A = \angle F$ [given]

$\therefore$ $\angle C = \angle D$

[if two corresponding angles of two triangles are equal than their third corresponding [angles are equal]

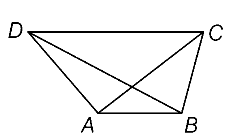
Also, $BC = ED$ [given]

It implies that ΔABC and ΔFED are congruent by ASA congruent criterion.

[$\because \angle B = \angle E$, $\angle C = \angle D$ and $BC = ED$]

Quadrilateral

A plane figure bounded by four line segments AB, BC, CD and DA is called a quadrilateral, written as quadrilateral ABCD or □ ABCD. In a quadrilateral ABCD, we have

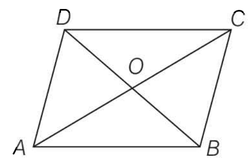


(i) The sum of opposite angle of a quadrilateral is 180°. i.e. $\angle A + \angle C = 180°$ and $\angle B + \angle D = 180°$

(ii) The sum of all angles of a quadrilateral is 360°. i.e. $\angle A + \angle B + \angle C + \angle D = 360°$

Types of Quadrilateral

(i) **Parallelogram** A quadrilateral is a parallelogram, if its both pairs of opposite sides are parallel.



In figure, quadrilateral ABCD is a parallelogram because AB || DC and AD || BC.

(a) The sum of any two adjacent interior angles is equal to 180°.

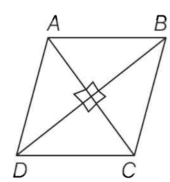
$$\angle A + \angle B = \angle B + \angle C = \angle C + \angle D = \angle D + \angle A = 180°$$

(b) Opposite angles are equal.

(c) Diagonals bisect each other.

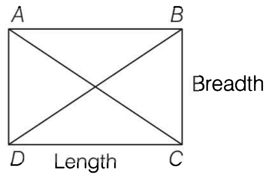
(ii) **Rhombus** A parallelogram in which all the sides are equal, is called a rhombus.

A figure ABCD is rhombus if AB || DC and AD || BC and sides AB = BC = CD = DA.



- In rhombus, diagonal bisects each other but they are not equal.
- The sum of any two adjacent interior angles is equal to 180°.
$$\angle D + \angle C = \angle C + \angle B = \angle B + \angle A = \angle A + \angle D = 180°$$
- The opposite angle are equal in magnitude. i.e. $\angle A = \angle C$ and $\angle B = \angle C$

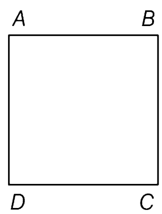
(iii) **Rectangle** A parallelogram in which each angle is a right angle and opposite sides are equal, is called rectangle.



A figure, ABCD is a rectangle if AB = DC and AD = BC, also ∠A = ∠B = ∠C = ∠D = 90°.

In rectangle diagonals bisect each other and they are equal.

(iv) **Square** A parallelogram having all sides equal and each angle equal to a right angle is called a square.



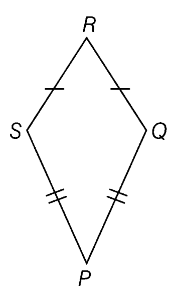
A figure ABCD is a square if

AB = BC = CD = DA

and ∠A = ∠B = ∠C = ∠D = 90°.

In a square diagonals bisect each other and they are equal.

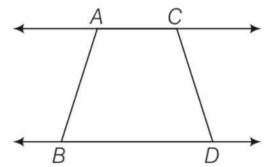
(v) **Kite** A quadrilateral which has two pairs of equal adjacent sides but unequal opposite sides is a kite.



In figure PQRS is a kite in which PQ = PS and RQ = RS but PS ≠ QR and PQ ≠ RS.

(vi) **Trapezium** A quadrilateral in which one pair of opposite sides is parallel, is called a trapezium.

In trapezium ABCD, sides AC and BD are parallel to each other.

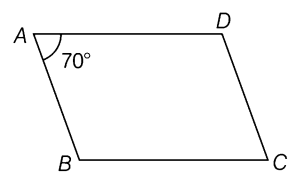


Example 8 $ABCD$ is a parallelogram in which $\angle A = 70°$, find the remaining angles of parallelogram.

(a) 80°, 70°, 70° (b) 79°, 80°, 70°
(c) 110°, 70°, 70° (d) 89°, 90°, 100°

Sol. (*c*) In parallelogram $ABCD$,

$$AD \parallel BC$$



∴ $\angle A + \angle B = 180°$

⇒ $\angle B = 180° - 70° = 110°$

and $\angle C = \angle A$ [opposite angles]

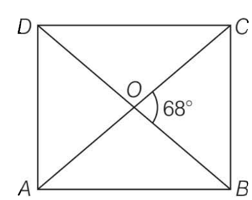
∴ $\angle C = 70°$

Example 9 The diagonals of a rectangle $ABCD$ intersect in O, if $\angle BOC = 68°$, find $\angle ODA$.

(a) 50° (b) 56° (c) 60° (d) 65°

Sol. (*b*) $\angle BOC = 68°$ [given]

∠AOD = 68° [vertically opposite angles]



$OA = OD$

[since, the diagonals bisects each other]

∴ $\angle ODA = \angle OAD$

⇒ $\angle ODA + \angle OAD + \angle AOD = 180°$

[sum of angles of a ΔAOD]

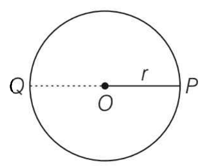
$\Rightarrow \quad 2\angle ODA + 68^\circ = 180^\circ$

$\Rightarrow \quad 2\angle ODA = 180^\circ - 68^\circ = 112^\circ$

$\Rightarrow \quad \angle ODA = 56^\circ$

Circle

A circle is as set of thse points in a plane which are equidistance from a given fixed point in the plane.



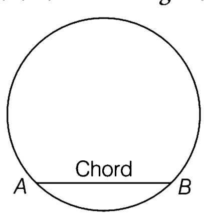
The fixed point O is called the centre. The constant distance r is called the radius of the circle.

A circle can have many radii measure and all the radii of a circle are of equal length.
The line PQ is a diameter of a circle and

$$PQ = 2 \times \text{radius} = 2r$$

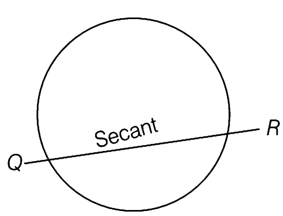
(i) **Chord**

A line segment joining any two points on the circle is called its chord. In a figure, AB is a chord.



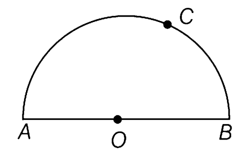
(ii) **Secant**

A line which intersect a circle in two distinct points is called a secant of the circle. In above figure, QR is a secant.



(iii) **Semi-circle**

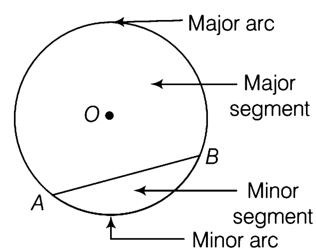
A diameter divides the circle into two equal arcs, each of these two arcs is called a semi-circle.



(iv) **Segment**

If AB be a chord of the circle, then AB divides the circular region into two parts, each part is called a segment of the circle.

The segment containing the minor arc is called the minor segment and the segment containing the major arc is called the major segment.



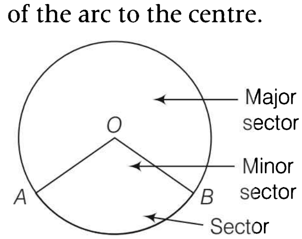
(v) **Central Angle**

If C (O, r) be any circle, then any angle whose vertex is centre of circle is called a central angle.

The degree measure of an arc is the measure of the central angle containing the arc.

(vi) **Sector**

A sector is that region of a circle C (O, r) which lies between an arc and the two radii joining the extremities of the arc to the centre.

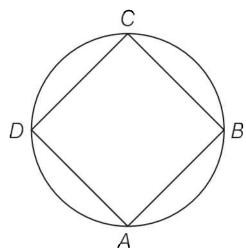


(vii) **Quadrant**

One-fourth of a circular region is called a quadrant.

(viii) **Cyclic Quadrilateral**

If all four vertices of a quadrilateral lie on a circle, then such a quadrilateral is called a cyclic quadrilateral.



The sum of opposite angles of a cyclic quadrilateral are supplementary.

Some Important Results

(i) An infinite number of circles can pass through two points.

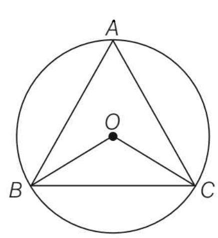
(ii) There is one and only one circle passing through three non-collinear points.

(iii) Angles in the same segment of a circle are equal.

(iv) The perpendicular from the centre to any chord bisects the chord.

(v) The line joining the centre of the mid-point to any chord of a circle is perpendicular to the chord.

(vi) The angle subtended by an arc at the centre of a circle is double the angle subtended by it at any point on the remaining part of the circle.



Angles in the same segment of a circle are equal.

i.e. $\angle AOB = 2\angle ACB$

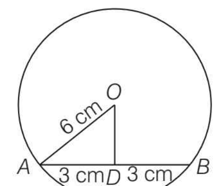
(vii) The angle made in a semicircle is always a right angle.

(viii) If the sum of any pair of opposite angles of a quadrilateral is $180°$, then the quadrilateral is cyclic.

Example 10 The radius of a circle is 6 cm and the length of one of its chords is 6 cm. Find the distance of the chord from the centre.

(a) $3\sqrt{2}$ cm (b) $3\sqrt{3}$ cm
(c) $5\sqrt{3}$ cm (d) None of these

Sol. (*b*) Let AB be a chord of a circle with centre O and radius 6 cm such that $AB = 6$ cm.



From O, draw $OD \perp AB$. Join OA

Clearly, $AD = \frac{1}{2}, AB = 3$ cm

and $OA = 6$ cm.

Now, in right angle ΔODA,

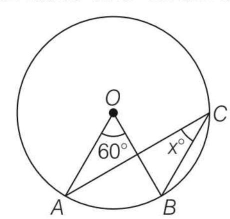
$$OD = \sqrt{OA^2 - AD^2}$$

[using Pythagoras theorem]

$$= \sqrt{6^2 - 3^2} = \sqrt{27} = 3\sqrt{3} \text{ cm}$$

Hence, the distance of the chord from the centre is $3\sqrt{3}$ cm.

Example 11 The value of x° in the figure is



(a) 20° (b) 100° (c) 60° (d) 30°

Sol. (*d*) We know that, the angle subtended by an arc at the centre of a circle is double the angle subtended by it any point of the remaining part of the circle.

$\therefore \quad \angle AOB = 2(\angle ACB)$

$\Rightarrow \quad 60° = 2x \quad \Rightarrow x = 30°$

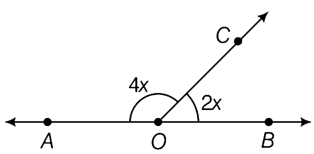
Practice Exercise

1. How many least number of distinct points required to determine a unique line?
(a) One (b) Two
(c) Three (d) Infinite

2. An angle is 14° more than its complement. Then, its measure is
(a) 166° (b) 86° (c) 76° (d) 52°

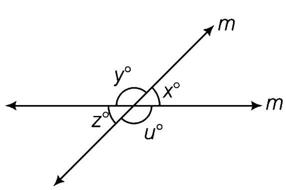
3. The measure of an angle is twice the measure of its supplementary angle. Then, its measure is
(a) 120° (b) 60°
(c) 100° (d) 90°

4. In figure, $\angle AOC$ and $\angle BOC$ form a linear pair. Then, the value of x is



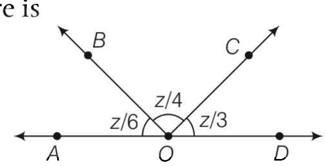
(a) 15° (b) 40°
(c) 25° (d) 30°

5. Lines l and m intersest at O, forming angles as shown in figure.
If $x = 45°$, then values of y, z and u are



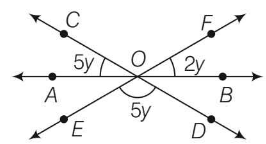
(a) 45°, 135°, 135° (b) 135°, 135°, 45°
(c) 135°, 45°, 135° (d) 115°, 45°, 115°

6. The value of z (in degrees), in the given figure is



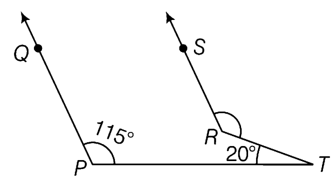
(a) 180° (b) 216° (c) 240° (d) 40°

7. In figure, determine the value of y.



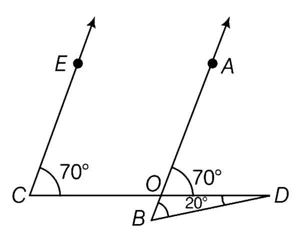
(a) 25° (b) 35°
(c) 15° (d) 40°

8. In the given figure, if $PQ \| RS$, $\angle QPT = 115°$ and $\angle PTR = 20°$, then $\angle SRT$ is



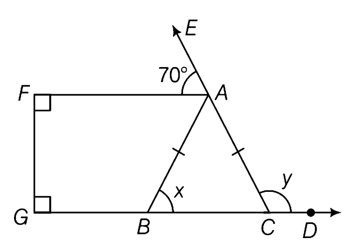
(a) 155° (b) 150°
(c) 135° (d) 95°

9. In the given figure, if $EC \| AB$, $\angle ECD = 70°$, $\angle BDO = 20°$, then $\angle OBD$ is



(a) 70° (b) 60°
(c) 50° (d) 20°

10. In the given figure, the values of x and y are



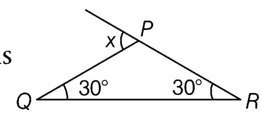
(a) 70°, 110° (b) 80°, 100°
(c) 60°, 120° (d) None of these

11. The total number of triangles formed in a rectangle are
(a) 4 (b) 8 (c) 6 (d) 3

12. If one of the angle of a triangle is greater than each of the two remaining angles by 30°, then the angles of the triangle are
(a) 40°, 40°, 100° (b) 50°, 50°, 80°
(c) 30°, 30°, 120° (d) 35°, 35°, 110°

13. If ΔABC is an isosceles with AB = AC, if $\angle A = 80°$, then $\angle ABC$ will be
(a) 100° (b) 80° (c) 50° (d) 40°

14. The value of x in figure, where ΔPQR is an isosceles with PQ = PR will be



(a) 30° (b) 60° (c) 90° (d) 150°

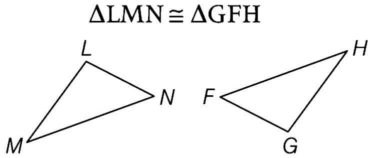
15. In ΔABC all sides are of same length, then each angle will be
(a) 50° (b) 90° (c) 60° (d) 180°

16. ABC is a triangle such that AB = 10 and AC = 3. The side BC is
(a) equal to 7 (b) less than 4
(c) greater than 7 (d) None of these

17. The length of the sides BC and AC of a right angled ΔABC are 3 cm and 4 cm, the length of hypotenuse will be
(a) 5 cm (b) 6 cm (c) 14 cm (d) 100 cm

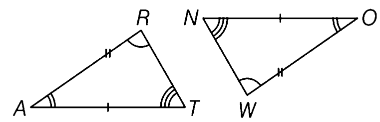
18. A ladder 17 m long when set against the wall of a house just reaches a window at a height of 15 m from the ground. The distance of its lower end from the wall will be
(a) 8 m (b) 9 m (c) 15 m (d) 13 m

19. Which congruence criteria, do you use in the following?
Given, $\angle MLN = \angle FGH$, $\angle NML = \angle GFH$,
ML = FG
So, $\Delta LMN \cong \Delta GFH$



(a) ASA (b) SSS
(c) SAS (d) None of these

20. In the given figure, the two triangles are congruent. Then, the ΔRAT congruent to



(a) ΔOWN (b) ΔWON
(c) ΔNOW (d) None of these

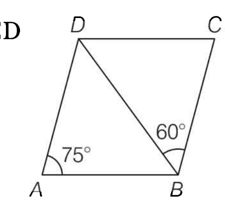
21. A quadrilateral has three acute angles each measuring 75°, what is the measure of fourth angle?
(a) 145° (b) 135° (c) 125° (d) 130°

22. The measures of the four angles of a quadrilateral are in the ratio of 1 : 2 : 3 : 4. What is the measure of fourth angle?
(a) 144° (b) 135° (c) 125° (d) 150°

23. The sum of two opposite angles of a parallelogram is 130°. Find all the angles of parallelogram.
(a) 65°, 65°, 115°, 115° (b) 145°, 135°, 35°, 45°
(c) 90°, 130°, 80°,60° (d) 40°, 140°, 80°, 110°

24. In a quadrilateral ABCD, if AO and BO be the bisectors of $\angle A$ and $\angle B$ respectively, $\angle C = 70°$ and $\angle D = 30°$, then $\angle AOB$ is
(a) 40° (b) 50°
(c) 80° (d) 100°

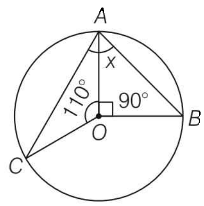
25. In the given figure, ABCD is a parallelogram in which $\angle DAB = 75°$ and $\angle DBC = 60°$.
Then, $\angle BDC$ is equal to
(a) 75° (b) 45°
(c) 60° (d) 55°



26. In a circle with centre O and radius 5 cm, AB is a chord of length 8 cm. If OM ⊥ AB, then the length of OM is
(a) 4 cm (b) 5 cm
(c) 3 cm (d) None of these

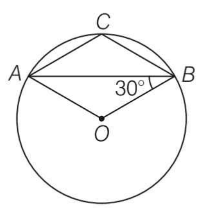
27. In a circle with centre O, AOC is a diameter of the circle, BD is a chord and OB and CD are joined if $\angle AOB = 130°$, then $\angle BDC$ is equal to
(a) 30° (b) 25°
(c) 45° (d) 60°

28. If O is the centre of the circle, the value of x in the adjoining figure, is



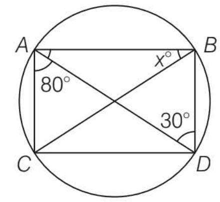
(a) 80° (b) 70°
(c) 60° (d) 50°

29. In the given figure, O is centre, then $\angle ACB$ is



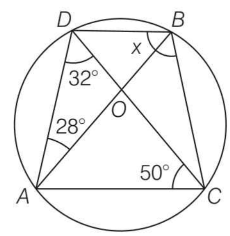
(a) 60°
(b) 120°
(c) 75°
(d) 90°

30. In the following figure, the value of x° is



(a) 60° (b) 90° (c) 70° (d) 40°

31. If O is the centre of the circle, then x is



(a) 72° (b) 62° (c) 82° (d) 52°

32. In a cyclic quadrilateral ABCD, if $\angle B - \angle D = 60°$, then the measure of the smaller of the two is

(a) 60° (b) 40° (c) 38° (d) 30°

Answers

1	(a)	2	(d)	3	(a)	4	(d)	5	(c)	6	(c)	7	(c)	8	(c)	9	(c)	10	(a)
11	(b)	12	(b)	13	(c)	14	(b)	15	(c)	16	(c)	17	(a)	18	(a)	19	(a)	20	(b)
21	(b)	22	(a)	23	(a)	24	(d)	25	(b)	26	(c)	27	(b)	28	(a)	29	(b)	30	(c)
31	(c)	32	(a)																

Hints & Solutions

1. (a) One and only one straight line passes through two distinct points.

2. (d) Let the angle be x, then its complement be $(90° - x)$.

$\therefore \quad x = (90° - x) + 14°$

$\Rightarrow \quad 2x = 104°$

$\therefore \quad x = \dfrac{104°}{2} = 52°$

3. (a) Let the angle be x, then its supplementary be $(180° - x)$.

$\therefore \quad x = 2(180° - x)$

$\Rightarrow \quad 3x = 360°$

$\therefore \quad x = 120°$

4. (d) Since, $\angle AOC + \angle BOC = 180°$ [$\because$ linear pair]

$\Rightarrow \quad 4x + 2x = 180° \Rightarrow 6x = 180°$

$\therefore \quad x = 30°$

5. (c) $x = z$ [$\because$ vertically opposite angle]

$\Rightarrow \quad x = 45° \Rightarrow z = 45°$

$y + x = 180°$ [$\because$ linear pair]

$\Rightarrow \quad y = 180° - 45°$

$\therefore \quad y = 135°$

Also, $y = u$

[$\because$ vertically opposite angles]

$\Rightarrow$ $u = 135°$

6. (c) Let $\frac{z}{6} + \frac{z}{4} + \frac{z}{3} = 180°$ [$\because$ AOD is a line]

$\Rightarrow$ $\frac{2z + 3z + 4z}{12} = 180° \Rightarrow \frac{9z}{12} = 180°$

$\therefore$ $z = \frac{180° \times 12}{9} = 240°$

7. (c) Since, OA, OB are opposite rays.

$\therefore$ $\angle AOC + \angle COF + \angle FOB = 180°$

[$\because$ $\angle COF = \angle EOD$]

$\Rightarrow$ $5y + 5y + 2y = 180° \Rightarrow 12y = 180°$

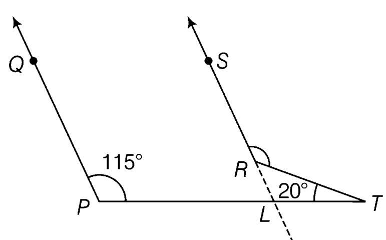
$\Rightarrow$ $y = \frac{180°}{12°} = 15°$

8. (c) Since, $\angle QPL + \angle PLR = 180°$ [$\because$ linear pair]

$\Rightarrow$ $\angle PLR = 180° - 115° = 65°$

and $\angle RLP = \angle LRT + \angle RTL$

$\Rightarrow$ $\angle LRT = \angle RLP - \angle RTL = 65° - 20° = 45°$



Also, $\angle SRT + \angle LRT = 180°$

$\Rightarrow \angle SRT = 180° - \angle LRT = 180° - 45° = 135°$

$\therefore$ $\angle SRT = 135°$

9. (c) $\angle AOD = \angle ECO$

$\Rightarrow$ $\angle AOD = 70°$

So, $\angle BOD = 110°$

In ΔBOD, $\angle OBD + \angle BOD + \angle ODB = 180°$

$\Rightarrow$ $\angle OBD = 180° - (110° + 20°)$

$\therefore$ $\angle OBD = 50°$

10. (a) In ΔABC,

$\angle ABC = \angle ACB = x$

and $x + y = 180°$

Now, $\angle EAF = \angle ACB = 70°$

[$\because$ corresponding angles]

$\therefore$ $x = 70°$

$\Rightarrow$ $y = 180° - 70°$

$\therefore$ $y = 110°$

11. (b) The total number of triangles formed in a rectangle is 8.

12. (b) Since, $(x + 30°) + x + x = 180°$

$\Rightarrow$ $3x = 150° \Rightarrow x = 50°$

$\therefore$ Angles are 50°, 50°, 80°.

13. (c) Given, $\angle A = 80°$ and $AB = AC$

Therefore, $\angle B = \angle C = x$ [isosceles triangle]

Here, $80° + x + x = 180°$ [$\because \angle A + \angle B + \angle C = 180°$]

$\Rightarrow$ $2x = 100° \Rightarrow x = 50°$

14. (b) Since, $PQ = PR$

i.e $\angle Q = \angle R = 30°$

Now, $\angle P = 180° - (30° + 30°) = 120°$

$\therefore$ $x = 180° - 120° = 60°$

15. (c) Since, all the sides of a triangle are of same length, then all angles are of equal.

$\therefore$ $3x = 180°$

$\Rightarrow$ $x = 60°$

16. (c) Since, the sum of any two sides of a triangle is greater than the third side, so BC must be greater than 7.

17. (a) Using Pythagoras theorem,

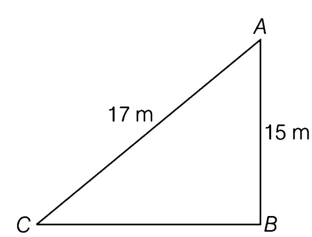
$H^2 = P^2 + B^2$

$\Rightarrow$ $H^2 = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25}$

$\Rightarrow$ $H = 5\text{ cm}$

18. (a) Using Pythagoras theorem,

$AC^2 = AB^2 + BC^2$



$\Rightarrow$ $BC = \sqrt{AC^2 - AB^2}$

$= \sqrt{17^2 - 15^2} = \sqrt{289 - 225} = \sqrt{64} = 8\text{ m}$

19. (a) In ΔLMN and ΔGFH,

$\angle MLN = \angle FGH$, $ML = FG$,

$\angle NML = \angle GFH$ [given]

i.e. two angles and the included side of ΔLMN are equal to two corresponding angles and the included side of ΔGFH.

So, $\Delta LMN \cong \Delta GFH$ [by ASA congruence rule]

20. (b) In ΔRAT and ΔWON, we have

$$RA = WO \quad \text{[from the given figure]}$$
$$\angle RAT = \angle WON \quad \text{[from the given figure]}$$
$$AT = ON \quad \text{[from the given figure]}$$

So, by SAS congruence rule, two triangles are congruent.

The correspondence is $A \leftrightarrow O, R \leftrightarrow W, T \leftrightarrow N$.

In symbolic form, $\Delta RAT \cong \Delta WON$

21. (b) Since, $\angle A + \angle B + \angle C + \angle D = 360^\circ$

$\therefore \quad 225^\circ + \angle D = 360^\circ$

$\Rightarrow \quad \angle D = 360^\circ - 225^\circ = 135^\circ$

22. (a) Let angles are x, 2x, 3x and 4x.

$\because \quad x + 2x + 3x + 4x = 360^\circ$

$\Rightarrow \quad 10x = 360^\circ \quad \Rightarrow \quad x = 36^\circ$

$\therefore \quad$ Fourth angle $= 4 \times 36^\circ = 144^\circ$

23. (a) Since, $\angle A + \angle C = 130^\circ$, then

$\angle B + \angle D = 360^\circ - 130^\circ = 230^\circ$

$\therefore \quad \text{Angles} = \dfrac{130^\circ}{2}, \dfrac{230^\circ}{2} = 65^\circ, 115^\circ$

Hence, all angles are 65°, 65°, 115°, 115°.

24. (d) Since, $\angle A + \angle B + \angle C + \angle D = 360^\circ$

$\therefore \quad \angle A + \angle B = 360^\circ - (130^\circ + 70^\circ)$

$= 360^\circ - 200^\circ = 160^\circ$

$\Rightarrow \quad \dfrac{1}{2}(\angle A + \angle B) = 80^\circ$

So, $\quad \angle OAB + \angle ABO = 80^\circ$

$\therefore \quad \angle AOB = (180^\circ - 80^\circ) = 100^\circ$

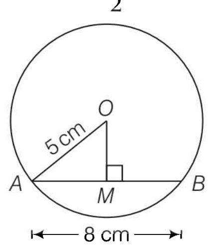
25. (b) $\angle C = \angle A = 75^\circ$

[opposite angles of a parallelogram are equal]

$\therefore \quad \angle BDC = 180^\circ - (60^\circ + 75^\circ)$

$= 180^\circ - 135^\circ = 45^\circ$

26. (c) OA = 5 cm, $AM = \dfrac{1}{2}AB$,

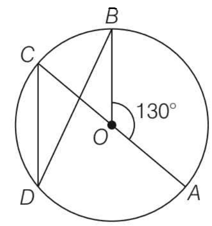


$\Rightarrow \quad AM = 4$ cm

$OM = \sqrt{OA^2 - AM^2} = \sqrt{5^2 - 4^2}$

$\therefore \quad OM = 3$ cm

27. (b) Given, $\angle AOB = 130^\circ$



$\therefore \quad \angle BOC = 180^\circ - \angle AOB = 50^\circ$

[$\because$ linear pair axiom]

Now, $\angle BDC = \dfrac{1}{2}\angle BOC = \dfrac{1}{2} \times 50^\circ = 25^\circ$

28. (a) $\angle COB = 360^\circ - (\angle COA + \angle BOA)$

$= 360^\circ - (110^\circ + 90^\circ)$

$= 160^\circ$

$\therefore \quad x = \dfrac{1}{2}\angle COB$

$= \dfrac{1}{2} \times 160^\circ = 80^\circ$

29. (b) In the given figure, OA = OB (radius of circle)

$\Rightarrow \quad \angle OAB = \angle OBA = 30^\circ$

$\therefore \quad \angle AOB = 180^\circ - 60^\circ = 120^\circ$

$\therefore \quad$ Major $\angle AOB = 360^\circ - 120^\circ = 240^\circ$

$\Rightarrow \quad \angle ACB = \dfrac{1}{2} \times 240^\circ = 120^\circ$

[angle subtended in the arc is half of that subtended at the centre]

30. (c) In a given figure,

$\angle ADB = \angle ACB = 30^\circ$

[angle subtended in the same segment]

In ΔABC, $\angle x^\circ = 180 - (\angle ACB + \angle CAB)$

$= 180^\circ - (30^\circ - 80^\circ) = 70^\circ$

31. (c) In ΔDAC,

$\angle ADC + \angle DCA + \angle CAD = 180^\circ$

$\Rightarrow \quad \angle CAD = 180^\circ - 32^\circ - 50^\circ = 98^\circ$

Now, $\quad \angle CAD + \angle CBD = 180^\circ$

[opposite angles of a quadrilateral]

$\therefore \quad x = 180^\circ - 98^\circ = 82^\circ$

32. (a) Since, $\angle B + \angle D = 180^\circ$

[sum of opposite angles of a cyclic quadrilateral]

$\angle B - \angle D = 60^\circ \quad$ [given]

$\Rightarrow \quad \angle B = 120^\circ$ and $\angle D = 60^\circ$