

MATHEMATICS
WORKSHEET_220726
CHAPTER-05 I'M UP AND DOWN AND ROUND AND ROUND
(ANSWERS)

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : IX

DURATION : 1½ hrs

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

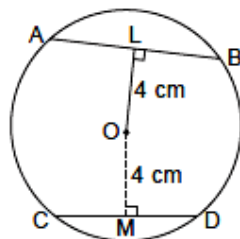
1. Given a chord AB of length 5 cm, of a circle with centre O. OL is perpendicular to chord AB and OL = 4 cm. OM is perpendicular to chord CD such that OM = 4 cm. Then CM is equal to
- (a) 4 cm (b) 5 cm (c) 2.5 cm (d) 3 cm

Ans: (c) 2.5 cm

Since OL = OM = 4 cm, so

AB = CD ($\because$ Chords equidistant from the centre of a circle are equal in length)

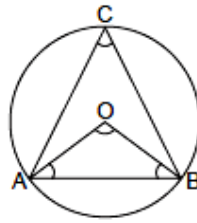
$\Rightarrow$ CD = 5 cm



Since the perpendicular drawn from the centre of a circle to a chord bisects the chord, so

$$CM = MD = \frac{1}{2} CD \Rightarrow CM = 2.5 \text{ cm}$$

2. In a circle with centre O, chords AB and CD are of lengths 5 cm and 6 cm respectively and subtend angles x° and y° at the centre of the circle respectively. Then
- (a) $x = y$ (b) $x < y$ (c) $x > y$ (d) cannot say
- Ans: (b) $x < y$
3. Given a circle of radius r and with centre O. A point P lies in a plane such that $OP > r$, then point P lies
- (a) in the interior of the circle (b) on the circle
- (c) in the exterior of the circle (d) cannot say
- Ans: (c) in the exterior of the circle
4. A chord of a circle is equal to the radius of the circle. Then the angle subtended by the chord at the point of major arc is
- (a) 90° (b) 30° (c) 150° (d) 60°
- Ans: (b) 30°
- Given, a chord of a circle is equal to the radius of the circle.



$$\Rightarrow OA = AB = OB$$

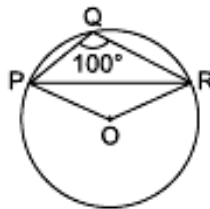
So, $\triangle OAB$ is an equilateral triangle.

$$\Rightarrow \angle AOB = 60^\circ$$

$$\text{Thus, } \angle ACB = \frac{1}{2} \times \angle AOB = \frac{1}{2} \times 60^\circ = 30^\circ$$

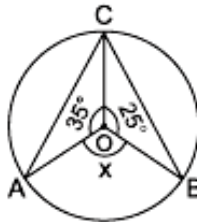
5. Diagonals of a cyclic quadrilateral are the diameters of that circle, then quadrilateral is a
 (a) parallelogram (b) square (c) rectangle (d) trapezium
 Ans: (c) rectangle

6. In the given figure, the value of $\angle OPR$ is



- (a) 65° (b) 10° (c) 20° (d) 50°
 Ans: (b) 10°

7. In figure, O is the centre of the circle. The value of x is



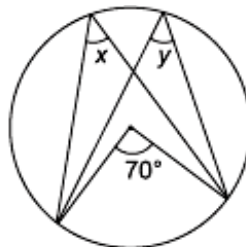
- (a) 140° (b) 60° (c) 120° (d) 300°
 Ans: (d) 300°

$$\text{We have } \angle AOC + \angle BOC + \angle AOB = 360^\circ$$

($\because$ Angle at the centre of a circle)

$$\Rightarrow 35^\circ + 25^\circ + x = 360^\circ \Rightarrow x = 300^\circ$$

8. In the given figure, value of y is



- (a) 35° (b) 140° (c) $70^\circ + x$ (d) 70°
 Ans: (a) 35°

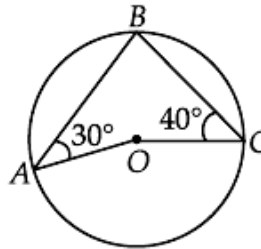
The angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle. So,

$$y = \frac{1}{2} \times 70^\circ = 35^\circ$$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

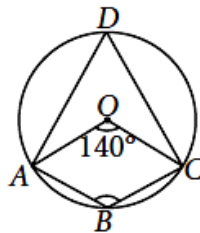
9. **Assertion (A):** In the given figure, $\angle BAO = 30^\circ$ and $\angle BCO = 40^\circ$. Then the measure of $\angle AOC = 70^\circ$.



Reason (R): Angle subtended by an arc of a circle at the centre of the circle is twice the angle subtended by that arc on the remaining part of the circle.

Ans: (d) A is false but R is true.

10. **Assertion (A):** In the given figure, O is the centre of circle. If $\angle AOC = 140^\circ$, then $\angle ABC = 110^\circ$.



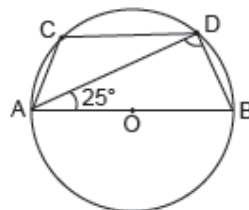
Reason (R): In cyclic quadrilateral, opposite angles are supplementary.

Ans: (a) Both A and R are true and R is the correct explanation of A.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. In the given figure, AB is diameter of the circle with centre O and $CD \parallel AB$. If $\angle DAB = 25^\circ$, then find the measure of $\angle CAD$.



Ans: $\angle ADB = 90^\circ$

$\angle BAD = \angle ADC = 25^\circ$

$\therefore \angle BDC = 90^\circ + 25^\circ = 115^\circ$

Now, $\angle BDC + \angle BAC = 180^\circ$

$\Rightarrow 115^\circ + \angle BAC = 180^\circ$

$\Rightarrow \angle BAC = 180^\circ - 115^\circ = 65^\circ$

Now, $\angle BAC = \angle BAD + \angle CAD$

$\Rightarrow 65^\circ = 25^\circ + \angle CAD$

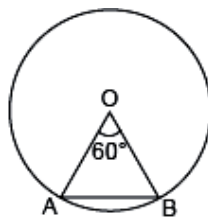
$\therefore \angle CAD = 65^\circ - 25^\circ = 40^\circ$

[Angle in a semicircle]

[Alternate interior angles]

[opp. $\angle$ s of cyclic quadrilateral]

12. In the given figure, chord AB subtends $\angle AOB$ equal to 60° at the centre O of the circle. If $OA = 5$ cm. then find the length of AB.



Ans: In $\triangle AOB$

$$\angle AOB = 60^\circ$$

(Given)

$$OA = OB$$

(Equal radii)

$$\therefore \angle OAB = \angle OBA$$

(Angles opposite to equal sides OA and OB) ... (i)

$$\text{In } \triangle AOB \angle OAB + \angle AOB + \angle OBA = 180^\circ \quad (\text{Angle sum property of triangle})$$

$$60^\circ + \angle OAB + \angle OAB = 180^\circ$$

($\because \angle OAB = \angle OBA$, using (i))

$$\Rightarrow 2\angle OAB = 180^\circ - 60^\circ$$

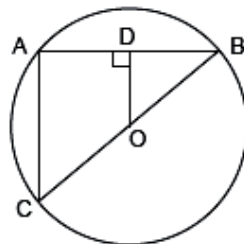
$$\Rightarrow \angle OAB = 60^\circ \Rightarrow \angle OBA = 60^\circ$$

$\therefore \triangle AOB$ is an equilateral triangle

$$\text{Hence } OA = OB = AB \Rightarrow AB = 5 \text{ cm} \quad (\text{as } OA = 5 \text{ cm})$$

13. If BC is a diameter of a circle of centre O and OD is perpendicular to the chord AB of a circle, show that $CA = 2OD$.

Ans: Since $OD \perp AB$



$\therefore$ D is the mid-point of AB (perpendicular drawn from the centre to a chord bisects the chord)

O is centre $\Rightarrow$ O is the mid-point of BC.

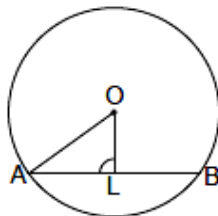
In $\triangle ABC$, O and D are the mid-points of BC and AB, respectively.

$$\therefore OD \parallel AC \text{ and } OD = \frac{1}{2} AC \quad (\text{mid-point theorem})$$

$$\therefore CA = 2OD$$

14. In a circle of radius 5 cm having centre O, OL is drawn perpendicular to the chord AB. If $OL = 3$ cm, find the length of AB.

Ans: Let AB be a chord of circle having centre O.



$OL \perp AB$ and OA is the radius of the circle. So, $OA = 5$ cm

In $\triangle OAL$, Applying Pythagoras theorem, we have

$$OA^2 = AL^2 + OL^2$$

$$\Rightarrow (5)^2 = AL^2 + (3)^2 \Rightarrow 25 = AL^2 + 9 \Rightarrow AL^2 = 25 - 9 = 16 \Rightarrow AL = \sqrt{16} \text{ cm} = 4 \text{ cm}$$

As we know that perpendicular drawn from the centre to the chord bisects the chord.

$$\therefore AB = 2(AL) = 2(4) = 8 \text{ cm}$$

SECTION – C

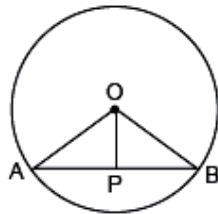
Questions 15 to 17 carry 3 marks each.

15. Prove that the line drawn through the centre of a circle to the mid point of a chord is perpendicular to the chord.

Ans:

In circle, O is the centre and OP bisects the chord AB.

Join OA and OB (radius of circle)



In $\triangle APO$ and $\triangle BPO$

$OA = OB$ (radius of circle)

$OP = OP$ (common)

$AP = BP$ (given)

$\therefore \triangle APO \cong \triangle BPO$ (by SSS)

$\therefore \angle OPA = \angle OPB$... (i) (by CPCT)

Also $\angle OPA + \angle OPB = 180^\circ$ (Linear pair angles)

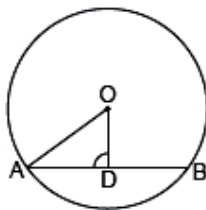
$\Rightarrow \angle OPA + \angle OPA = 180^\circ$ [Using (i)]

$2\angle OPA = 180^\circ$

$\Rightarrow \angle OPA = 90^\circ \Rightarrow OP \perp AB.$

16. Distance of a chord AB of a circle from the centre is 12 cm and length of the chord AB is 10 cm. Find the diameter of the circle.

Ans: Let in a circle having centre O, AB be the chord of length 10 cm.



Distance of chord AB from centre is OD

$\therefore OD = 12$ cm

OA = radius of circle

In $\triangle AOD$, $OD \perp AB$

As we know perpendicular drawn from the centre to the chord bisects the chord.

$\therefore AD = \frac{1}{2} AB = \frac{1}{2} \times 10 = 5$ cm

Now, in $\triangle AOD$

$OA^2 = AD^2 + OD^2$ (Applying Pythagoras theorem)

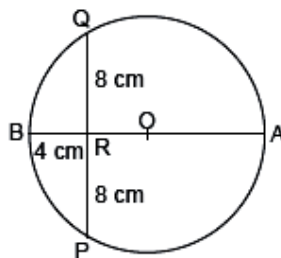
$\Rightarrow OA^2 = (5)^2 + (12)^2 = 25 + 144$

$\Rightarrow OA^2 = 169$

$\therefore OA = \sqrt{169} = 13$ cm

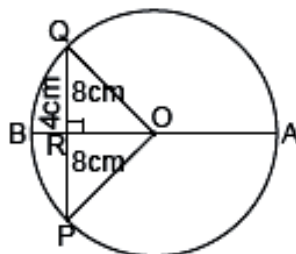
$\therefore \text{diameter} = 2(OA) = 2 \times 13 \text{ cm} = 26 \text{ cm}$

17. In the given figure, diameter AB of circle with centre O bisects the chord PQ. If $PR = QR = 8$ cm and $RB = 4$ cm, find the radius of the circle.



Ans:

Here AB is the diameter of the circle and AB bisects PQ.



Also, $PR = RQ = 8$ cm

OB, OP and OQ are radii of the circle.

$\Rightarrow OB = OQ = OP = r$ (say)

Consider $OR = x$ cm

$OB = OR + BR = (x + 4)$ cm

$\Rightarrow x = (OB - 4) = (r - 4)$ cm

As R is the mid point of PQ.

Also, RO is a line segment passing through centre O.

$\therefore OR \perp PQ$ (line segment joining mid pt. of chord to the centre of circle is perpendicular to the chord)

In right-angled $\triangle OQR$

$OQ^2 = OR^2 + QR^2$ (by Pythagoras theorem)

$= x^2 + (8)^2$

$\Rightarrow OQ^2 = x^2 + 64$

$r^2 = (r - 4)^2 + 64$ [Put $x = (r - 4)$]

$\Rightarrow r^2 = r^2 + 16 - 8r + 64$

$\Rightarrow 8r = 80$

$\Rightarrow r = 10$ cm

SECTION – D

Questions 18 carry 5 marks.

- 18.** Prove that the quadrilateral formed (if possible) by the internal angle bisectors of any quadrilateral is cyclic.

Ans: Given: ABCD is a quadrilateral, AH, BF, CF and DH are the angle bisectors of internal angles A, B, C and D.

These bisectors form a quadrilateral EFGH.

To Prove: EFGH is cyclic

Proof: In $\triangle AEB$.

$\angle EAB + \angle ABE + \angle AEB = 180^\circ$ (Sum of angles of $\triangle ABC$)

$\Rightarrow \angle AEB = 180^\circ - (\angle EAB + \angle ABE)$... (i)

Also $\angle AEB = \angle FEH$... (ii) (Vertically opposite angles)

By equating (i) and (ii) $\angle FEH = 180^\circ - (\angle EAB + \angle ABE)$... (iii)

Similarly, in $\triangle GDC$ $\angle FGH = 180^\circ - (\angle GDC + \angle GCD)$... (iv)

Adding (iii) and (iv)

$\angle FEH + \angle FGH = 360^\circ - (\angle EAB + \angle ABE + \angle GDC + \angle GCD)$

$= 360^\circ - \frac{1}{2} (\angle BAD + \angle ABC + \angle ADC + \angle BCD)$ (As AH, BF, CF and HD are bisectors of $\angle$

A, $\angle B$, $\angle C$, $\angle D$)

$$= 360^\circ - \frac{1}{2} \times 360^\circ$$

(Sum of angles of quadrilateral, ABCD)

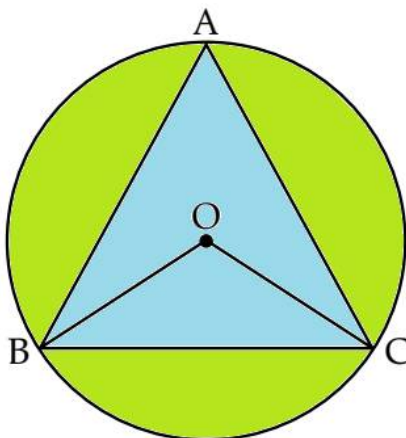
$$\angle FEH + \angle FGH = 360^\circ - 180^\circ = 180^\circ$$

$\Rightarrow$ FEHG is a cyclic quadrilateral. (If the sum of opposite angles of quadrilateral is 180° , then it is cyclic)

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. One triangular shaped pond is there in a park marked by ABC. Three friends are sitting positions at A, B and C. They are studying in Class IX in an International. A, B and C are equidistant from each other as shown in figure given below.



- (i) What is the value of $\angle BAC$? (1)
(ii) What will be the value of $\angle BOC$? (2)

OR

- (ii) What will be the value of $\angle OBC$? (2)
(iii) Which angle will be equal to $\angle OBC$?

Ans: (i) $AB = BC = AC$ as per the given statement

$\therefore \triangle ABC$ is an equilateral triangle

$\therefore \angle BAC = 60^\circ$ (Angles of a equilateral triangle)

(ii) $\angle BOC = 2\angle BAC$ ($\because$ Angle subtended by an arc at the centre is double the angle subtended by it in the remaining part of the circle.)

$$\therefore \angle BOC = 2 \times 60^\circ = 120^\circ$$

OR

(ii) In $\triangle BOC$, $OB = OC$ (radii)

$\Rightarrow \angle OBC = \angle OCB$ ($\angle$ s opposite to equal sides are equal)

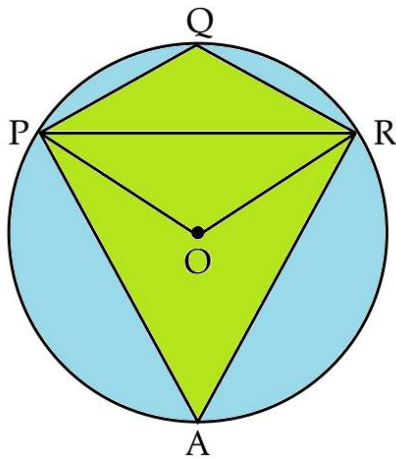
$\Rightarrow \angle OBC + \angle OCB + \angle BOC = 180^\circ$ (Angle sum property of triangle)

$$\Rightarrow \angle OBC + \angle OBC + 120^\circ = 180^\circ$$

$$\Rightarrow 2\angle OBC = 60^\circ \Rightarrow \angle OBC = 30^\circ$$

20. Four Friends Rima, Mohan, Sohan and Sita are sitting on the circumference of a circular park full of water. Their locations are marked by points A, P, Q and R such that the APQR is a quadrilateral with greenery.

Rohit joins them and sits at the centre of the circular park, so he is equidistant from all the other friends. His position is marked as O. They are sitting in such a way that $\angle PQR = 110^\circ$.



(i) What is measure of reflex $\angle POR$? (1)

(ii) What is the measure of $\angle PAR$? (2)

OR

(ii) Find $\angle OPR$? (2)

(iii) What is measure of $\angle POR$? (1)

Ans:

(i) Reflex $\angle POR = 2\angle PQR$ ($\because$ Angle subtended by an arc at the centre is double the angle subtended by it in the remaining part of the circle.)

$$\therefore \text{Reflex } \angle POR = 2 \times 110^\circ = 220^\circ$$

(ii) $\angle PAR + \angle PQR = 180^\circ$ ($\because$ Sum of opposite angles of cyclic quadrilateral is 180°)

$$\therefore \angle PAR = 180^\circ - 110^\circ = 70^\circ$$

OR

In $\triangle OPR$, $OP = OR$ (equal radii)

$\therefore \angle OPR = \angle ORP = x^\circ$ (Angle opposite to equal sides are equal.) [1]

$$\angle OPR + \angle ORP + \angle POR = 180^\circ$$

$$\Rightarrow x + x + 140^\circ = 180^\circ \quad (\because \angle POR = 2\angle PAR)$$

$$\Rightarrow 2x = 40^\circ \Rightarrow x = 20^\circ$$

Hence, $\angle OPR = 20^\circ$

(iii) $\angle POR = 2\angle PAR$ ($\because$ Angle subtended by an arc at the centre is double the angle subtended by it in the remaining part of the circle.)

$$\therefore \angle POR = 2 \times 70^\circ = 140^\circ$$

.....