Areas Related to Circles

1 Mark:

1. A chord of a circle of radius 10 cm subtends a right angle at its centre. The length of the chord (in cm) is
   A) $5\sqrt{2}$  
   B) $10\sqrt{2}$  
   C) $\frac{5}{2}$  
   D) $10\sqrt{3}$  
   CBSE 2014, Outside Delhi (30/1), (30/2), (30/3)

2. If the difference between the circumference and the radius of a circle is 37 cm, then using $\pi = \frac{22}{7}$ the circumference (in cm) of the circle is:
   A) 154  
   B) 44  
   C) 14  
   D) 7  
   CBSE 2013, Delhi (30/1/1)

3. Two circular pieces of equal radii and maximum area, touching each other are cut out from a rectangular card board of dimensions $14 \, \text{cm} \times 7 \, \text{cm}$. Find the area of the remaining card board.
   [Use $\pi = \frac{22}{7}$]  
   CBSE 2013, Delhi (30/1/1)

4. If the area of a circle is equal to sum of the areas of two circles of diameters 10 cm and 24 cm, then the diameter of the larger circle (in cm) is:
   A) 34  
   B) 26  
   C) 17  
   D) 14  
   CBSE 2012, Delhi (30/1/1)

5. In figure, three sectors of a circle of radius 7 cm, making angles of $60^\circ$, $80^\circ$, $40^\circ$ at the centre are shaded. The area of the shaded region (in $\text{cm}^2$) is [Using $\pi = \frac{22}{7}$]
   A) 77  
   B) 154  
   C) 44  
   D) 22  
   CBSE 2012, Foreign (30/2/1)

6. In figure, the shape of the top of a table is that of a sector of a circle with centre $O$ and $\angle AOB = 90^\circ$. If $AO = OB = 42 \, \text{cm}$, then find the perimeter of the top of the table. [Use $\pi = \frac{22}{7}$]  
   CBSE 2012, Foreign (30/2/1)

7. Find the area of the shaded region in figure, if $ABCD$ is a square of side 28 cm and $APD$ and $BPC$ are semicircles.
   CBSE 2012, Foreign (30/2/1)

8. The circumference of a circle is 22 cm. The area of its quadrant (in $\text{cm}^2$) is
   A) $\frac{77}{2}$  
   B) $\frac{77}{4}$  
   C) $\frac{77}{8}$  
   D) $\frac{77}{16}$  
   CBSE 2012, Outside (30/1)

9. The perimeter (in cm) of a square circumscribing a circle of radius $a$ cm, is
   A) $8 \, a$  
   B) $4 \, a$  
   C) $2 \, a$  
   D) $16 \, a$  
   CBSE 2011, Outside Delhi (30/1)
10. If the area of a circle is numerically equal to twice its circumference, then the diameter of the circle is
   
   A) 4 units  
   B) $\pi$ units  
   C) 8 units  
   D) 2 units

   CBSE 2011, Foreign (30/2/1)

11. If the diameter of semi-circular protractor is 14 cm, then find its perimeter.
   CBSE 2009, Outside Delhi (30/1)

12. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side are respectively equal?
   CBSE Sample Paper II 2008

13. If the adjoining figure is a sector of a circle of radius 10.5 cm, find the perimeter of the sector. (Take $\pi = \frac{22}{7}$)

   CBSE Sample Paper II 2008

2 Marks:

1. Find the perimeter of the shaded region if $ABCD$ is a square of side 21 cm and $APB$ & $CPD$ are semicircles. (Use $\pi = \frac{22}{7}$)

   CBSE Sample Paper 2016

2. In figure, $ABCD$ is a square of side 4 cm. A quadrant of a circle of radius 1 cm is drawn at each vertex of the square and a circle of diameter 2 cm is also drawn. Find the area of the shaded region. (Use $\pi = 3.14$

   CBSE 2012, Outside Delhi (30/1)

3. From a rectangular sheet of paper $ABCD$ with $AB = 40$ cm and $AD = 28$ cm, a semi-circular portion with $BC$ as diameter is cut off. Find the area of the remaining paper. (Use $\pi = \frac{22}{7}$)

   CBSE 2012, Outside Delhi (30/1)

4. Find the perimeter of the shaded region in figure, if $ABCD$ is a square of side 14 cm and $APB$ and $CPD$ are semicircles. [Use $\pi = \frac{22}{7}$]

   CBSE 2011, Outside Delhi (30/1)

5. The radii of two circles are 4 cm and 3 cm respectively. The diameter of the circle having area equal to the sum of the areas of the two circles (in cm) is
   
   A) 5  
   B) 7  
   C) 10  
   D) 14

   CBSE 2011, Delhi (30/1/1)

6. In figure, $APB$ and $CQD$ are semi-circles of diameter 7 cm each, while $ARC$ and $BSD$ are semi-circles of diameter 14 cm each. Find the perimeter of the shaded region. [Use $\pi = \frac{22}{7}$]

   CBSE 2011, Delhi (30/1/1)
7. Find the area of a quadrant of a circle, where the circumference of circle is 44 cm. \( \text{Use } \pi = \frac{22}{7} \) 

CBSE 2011, Delhi (30/1/1)

8. In figure, \( OABC \) is a quadrant of a circle with centre \( O \) and radius 3.5 cm. If \( OD = 2 \text{ cm} \), find the area of the shaded region. \( \text{Use } \pi = \frac{22}{7} \)

CBSE 2011, Foreign (30/2/1)

3 Marks:

1. Three semicircles each of diameter 3 cm, a circle of diameter 4.5 cm and a semicircle of radius 4.5 cm are drawn in the given figure. Find the area of the shaded region.

CBSE 2017, Outside Delhi (30/1)

2. In the given figure, two concentric circles with centre \( O \) have radii 21 cm and 42 cm. If \( \angle AOB = 60^\circ \), find the area of the shaded region. \( \text{Use } \pi = \frac{22}{7} \)

CBSE 2017, Outside Delhi (30/1)

3. In the given figure, \( OACB \) is a quadrant of a circle with centre \( O \) and radius 3.5 cm. If \( OD = 2 \text{ cm} \), find the area of the shaded region.

CBSE 2017, Delhi (30/1/1)

4. In the given figure, \( ABCD \) is a trapezium with \( AB \parallel DC \), \( AB = 18 \text{ cm} \), \( DC = 32 \text{ cm} \) and the distance between \( AB \) and \( AC \) is 14 cm. If arcs of equal radii 7 cm taking \( A, B, C \) and \( D \) as centres, have been drawn, then find the area of the shaded region.

CBSE 2017, Foreign (30/2/1)

5. Find the area of the minor segment of a circle of radius 42 cm, if the length of the corresponding arc is 44 cm.

CBSE Sample Paper 2017

6. In given figure, \( PS \) is the diameter of a circle of radius 6 cm. The points \( Q \) and \( R \) trisects the diameter \( PS \). Semi circles are drawn on \( PQ \) and \( QS \) as diameters. Find the area of the shaded region.

CBSE Sample Paper 2017
7. In figure, $O$ is the centre of a circle such that diameter $AB = 13 \text{ cm}$ and $AC = 12 \text{ cm}$. $BC$ is joined. Find the area of the shaded region. (Take $\pi = 3.14$)

![Image](CBSE 2016, Outside Delhi (30/1))

8. In figure, find the area of the shaded region, enclosed between two concentric circles of radii 7 cm and 14 cm where $\angle AOC = 40^\circ$. (Use $\pi = \frac{22}{7}$)

![Image](CBSE 2016, Outside Delhi (30/1))

9. In figure, $ABCD$ is a square of side 14 cm. Semi-circles are drawn with each side of square as diameter. Find the area of the shaded region. (use $\pi = \frac{22}{7}$)

![Image](CBSE 2016, Delhi (30/1/1))

10. In figure, are shown two arcs $PAQ$ and $PBQ$. Arc $PAQ$ is a part of circle with centre $O$ and radius $OP$ while arc $PBQ$ is a semi-circle drawn on $PQ$ as diameter with centre $M$. If $OP = PQ = 10 \text{ cm}$, show that area of shaded region is $25\left(\sqrt{3} - \frac{\pi}{6}\right) \text{ cm}^2$.

![Image](CBSE 2016, Delhi (30/1/1))

11. Find the area of shaded region in figure, where a circle of radius 6 cm has been drawn with vertex $O$ of an equilateral triangle $OAB$ of side 12 cm. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$)

![Image](CBSE 2016, Delhi (30/1/1))

12. In figure, is a chord $AB$ of circle, with centre $O$ and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment $AQBP$. Hence find the area of major segment $ALBQA$. (Use $\pi = 3.14$)

![Image](CBSE 2016, Foreign (30/2/1))

13. Find the area of shaded region shown in the given figure where a circular arc of radius 6 cm has been drawn with vertex $O$ of an equilateral triangle $OAB$ of side 12 cm as centre.

![Image](CBSE Sample Paper 2016)
14. Find the area of the minor segment of a circle of radius 14 cm, when its central angle is 60°. Also find the area of the corresponding major segment. [Use \( \pi = \frac{22}{7} \)]

15. In figure, PQRS is a square lawn with side PQ = 42 metres. Two circular flower beds are there on the sides PS and QR with centre at O, the intersection of its diagonals. Find the total area of the two flower beds (shaded parts).

16. In figure, APB and AQO are semicircles, and AO = OB. If the perimeter of the figure is 40 cm, find the area of the shaded region. [Use \( \pi = \frac{22}{7} \)]

17. In figure, find the area of the shaded region [Use \( \pi = 3.14 \)]

18. In figure, ABCD is a trapezium with \( AB \parallel DC, AB = 18 \text{ cm}, DC = 32 \text{ cm} \) and the distance between \( AB \) and \( DC \) is 14 cm. If arcs of equal radii 7 cm have been drawn, with centres A, B, C and D, then find the area of the shaded region.

19. The long and short hands of a clock are 6 cm and 4 cm long respectively. Find the sum of the distances travelled by their tips in 24 hours. (Use \( \pi = 3.14 \))

20. In Figure two concentric circles with centre \( O \), have radii 21 cm and 42 cm. If \( \angle AOB = 60^\circ \), find the area of the shaded region. [Use \( \pi = \frac{22}{7} \)]

21. In Figure ABCD is a trapezium of area 24.5 sq. cm. In it, \( AD \parallel BC, \angle DAB = 90^\circ, AD = 10 \text{ cm} \) and \( BC = 4 \text{ cm} \). If ABE is a quadrant of a circle, find the area of the shaded region. [Take \( \pi = \frac{22}{7} \)]
22. If figure, \(AB\) and \(CD\) are two diameters of a circle with centre \(O\), which are perpendicular to each other. \(OB\) is the diameter of the smaller circle. If \(OA = 7\) cm, find the area of the shaded region.

\[
\text{Use } \pi = \frac{22}{7}
\]

CBSE 2013, Delhi (30/1/1)

23. In a circle of radius 21 cm, an arc subtends an angle of \(60^\circ\) at the centre.
Find:
(i) the length of the arc
(ii) area of the sector formed by the arc.

\[
\text{Use } \pi = \frac{22}{7}
\]

CBSE 2013, Delhi (30/1/1)

24. In figure, \(O\) is the centre of the circle with \(AC = 24\) cm, \(AB = 7\) cm and \(\angle BOD = 90^\circ\). Find the area of the shaded region.

CBSE 2012, Outside Delhi (30/1)

25. In figure, find the area of the shaded region, if \(ABCD\) is a square of side 14 cm and \(APD\) and \(BPC\) are semicircles.

CBSE 2012, Outside Delhi (30/1)

26. In figure, \(OABC\) is a square of side 7 cm. If \(OAPC\) is a quadrant of a circle with centre \(O\), then find the area of the shaded region.

\[
\text{Use } \pi = \frac{22}{7}
\]

CBSE 2012, Delhi (30/1/1)

27. In figure, \(PQ\) and \(AB\) are respectively the arcs of two concentric circles of radii 7 cm and centre \(O\). If \(\angle POQ = 30^\circ\), then find the area of the shaded region.

\[
\text{Use } \pi = \frac{22}{7}
\]

CBSE 2012, Delhi (30/1/1)
28. In figure, $ABCD$ is a square of side 7 cm. $DPBA$ and $DQBC$ are quadrants of circles, each of radius 7 cm. Find the area of the shaded region. [Use $\pi = \frac{22}{7}$]

29. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 10 minutes.

30. A chord of a circle of radius 14 cm subtends an angle of 120° at the centre. Find the area of the corresponding minor segment of the circle. [Use $\pi = \frac{22}{7}$ and $\sqrt{3} = 1.73$]

31. Find the area of the major segment $APB$, in figure, of a circle of radius 35 cm and $\angle AOB = 90°$. [Use $\pi = \frac{22}{7}$]

32. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding minor segment and hence find the area of the major segment. [Use $\pi = 3.14$]

33. In Fig. the boundary of shaded region consists of four semi-circular arcs, two smallest being equal. If diameter of the largest is 14 cm and that of the smallest is 3.5 cm, calculate the area of the shaded region. [Use $\pi = \frac{22}{7}$]

34. Find the area of the shaded region in Fig. if $AC = 24$ cm, $BC = 10$ cm and $O$ is the centre of the circle. [Use $\pi = 3.14$]

35. Find the area of the shaded region in Figure 3, where a circular arc of radius 7 cm has been drawn with vertex $O$ of an equilateral triangle $OAB$, of side 12 cm, as centre.

36. In Figure, $PQ = 24$ cm, $PR = 7$ cm and $O$ is the centre of the circle. Find the area of shaded region (take $\pi = 3.14$)
37. In Figure, the shape of the top of a table in a restaurant is that of a sector of a circle with centre \( O \) and \( \angle BOD = 90^\circ \). If \( BO = OD = 60 \text{ cm} \), find

I. the area of the top of the table.
II. The perimeter of the table top.

(Take \( \pi = 3.14 \))

38. In Figure, \( ABCD \) is a square of side 14 cm and \( APD \) and \( BPC \) are semicircles. Find the area of shaded region.

(Take \( \pi = \frac{22}{7} \))

39. In Fig., \( ABC \) is a quadrant of a circle of radius 14 cm and a semi-circle is drawn with \( BC \) as diameter. Find the area of the shaded region.

40. \( PQRS \) is a square land of side 28 m. Two semicircular grass covered portions are to be made on two of its opposite sides as shown in the figure. How much area will be left uncovered? (Take \( \pi = \frac{22}{7} \))

4 Marks:

1. In the given figure, \( ABCD \) is a rectangle of dimensions 21 cm \( \times \) 14 cm. A semicircle is drawn with \( BC \) as diameter. Find the area and the perimeter of the shaded region in the figure.

2. A chord \( PQ \) of a circle of radius 10 cm subtends an angle of 60° at the centre of circle. Find the area of major and minor segments of the circle.

3. In the given figure, the side of square is 28 cm and radius of each circle is half of the length of the side of the square where \( O \) and \( O' \) are centres of the circles. Find the area of shaded region.
4. Two circles touch internally. The sum of their areas is $116 \pi \text{ cm}^2$ and the distance between their centres is 6 cm. Find the radii of the circles. \text{CBSE 2017, Foreign (30/2/1)}

5. A park is of the shape of a circle of diameter 7 m. It is surrounded by a path of width of 0.7 m. Find the expenditure of cementing the path, if its cost ₹ 110 per sq. m. \text{CBSE 2017, Foreign (30/2/1)}

6. In figure, is shown a sector $OAP$ of a circle with centre $O$, containing $\angle \theta$. $AB$ is perpendicular to the radius $OA$ and meets $OP$ produced at $B$. Prove that the perimeter of shaded region is $r \left( \tan \theta + \sec \theta + \frac{\pi \theta}{180} - 1 \right)$ \text{CBSE 2016, Outside Delhi (30/1)}

7. An elastic belt is placed around the rim of a pulley of radius 5 cm. From one point $C$ on the belt, the elastic belt is pulled directly away from the centre $O$ of the pulley until it is at $P$, 10 cm from the point $O$. Find the length of the belt that is still in contact with the pulley. Also find the shaded area. \(\text{Use } \pi = 3.14 \text{ and } \sqrt{3} = 1.73\) \text{CBSE 2016, Delhi (30/1/1)}

8. Find the area of the shaded region in figure, where $APD, AQB, BRC$ and $CSD$ are semi-circles of diameter 14 cm, 3.5 cm, 7 cm and 3.5 cm respectively. \(\text{Use } \pi = \frac{22}{7}\) \text{CBSE 2016, Foreign (30/2/1)}

9. Four equal circles are described at the four corners of a square so that each touches two of the others. The shaded area enclosed between the circles is $\frac{24}{7} \text{ cm}^2$. Find the radius of each circle. \text{CBSE Sample Paper 2016}

10. From a thin metallic piece, in the shape of a trapezium $ABCD$ in which $AB \parallel CD$ and $\angle BCD = 90^\circ$, a quarter circle $BFEC$ is removed. Given $AB = BC = 3.5 \text{ cm}$ and $DE = 2 \text{ cm}$, calculate the area of the remaining (shaded) part of the metal sheet. \(\text{Use } \pi = \frac{22}{7}\) \text{CBSE 2011, Foreign (30/2/1)}

11. In figure, three circles each of radius 3.5 cm are drawn in such a way that each of them touches the other two. Find the area enclosed between these three circles (shaded region). \(\text{Use } \pi = \frac{22}{7}\) \text{CBSE 2011, Outside Delhi (30/1)}
6 Marks:

1. In Figure, \(ABC\) is a right triangle right angled at \(A\). Find the area of shaded region, if \(AB = 6 \, cm\), \(BC = 10 \, cm\) and \(O\) is the centre of the incircle of \(\Delta ABC\). [Take \(\pi = 3.14\)]