CIRCLES
SYNOPSIS

Circle: If d is the diameter of the circle and 'r' is its radius then

$$d = 2r \text{ units} \qquad \text{or} \qquad r = \frac{d}{2} \text{ units}$$

Circumference of the circle: The length of the circle is called circumference of the circle.

$$\pi = \frac{\text{The circumference of a circle}}{\text{The diameter of a circle}}$$

$$\frac{C}{d} = \pi \qquad \boxed{C = \pi d} \quad \text{or} \quad \boxed{C = 2\pi r}$$

Note: π is not a rational number

$$\text{Perimeter of a semi circle} = \pi r + d \text{ or } \pi r + 2r \text{ or } \frac{36}{7} \times \text{radius}$$

$$\text{Area of a circle } A = \pi r^2 \text{ sq.units} \qquad \text{or} \qquad \frac{\pi d^2}{4} \text{ sq.units}$$

WORK SHEET

SINGLE ANSWER TYPE

1. A _____ is a set of points in a plane, which are at the same distance from a given point in the same plane.
   A) line   B) line segment   C) circle   D) parabola

2. A line segment joining the centre of the circle to any point on it is called a _____ of the circle.
   A) diameter   B) radius   C) chord   D) secant

3. A circle has _____ number of Radii.
   A) limited   B) only one   C) unlimited   D) two

4. Two circles having the same radii are called __ circles.
   A) congruent   B) similar   C) equal   D) unequal

5. A chord passing through the centre of a circle is called a _____ of the circle.
   A) diameter   B) radius   C) chord   D) secant

6. A line intersecting a circle in two points is called a _____ of the circle.
   A) diameter   B) radius   C) chord   D) secant

7. The diameter of a circle is _____ its radius.
   A) twice   B) thrice   C) four times   D) five times

8. A chord which is not passing through the centre of a circle is _____ its diameter.
   A) shorter than   B) greater than
   C) equals to   D) none

9. In a circle, longest chord is called the _____ of the circle.
   A) diameter   B) radius   C) tangent   D) secant

10. A part of a circle is called _____ of the circle.
    A) radius   B) an arc   C) diameter   D) secant

11. An arc which is exactly half of the circle is called a
    A) chord   B) diameter   C) semi circle   D) circle
12. The diameter of a circle divides the circle into _____ semi circle.
    A) two   B) three   C) four   D) five
13. A chord divides the circle into_____segments.
    A) two   B) three   C) four   D) five
14. The circumference of a circle is   times its radius.
    A) π B) $\pi/2$ C) 2π D) 4π
15. The circumference of a circle is _____ units.
    A) πr^2 B) $2\pi r$ C) πr D) $2\pi d$
16. The area of a circle is _____ sq. units
    A) πr^2 B) $2\pi r$ C) πr D) $2\pi d$
17. If ABCD is a parallelogram then $\angle A - \angle C$ is
    A) 180^0 B) 0^0 C) 360^0 D) 90^0

MULTI ANSWER TYPE

18. If the radius of circle is 56 cm, then
    1) it's circumfrence is 352 cm   2) it's circumfrence is 354 cm^2
    3) it's area is 9856 cm^2 4) it's area is 9394 cm^2
19. In a circle of radius 28 cm, an arc subtends an angle of 108° at the centre
    1) area of the sector is 852 cm   2) area of the sector is 739.2 cm
    3) length of the arc is 52 cm   4) length of the arc is 52.8 cm

REASONING ANSWER TYPE

20. *Statement-II:*   If the radius of the circle is doubled, then its area is four
                       times of its original area.

    Statement-II: Circumference of a circle is C = πd units.

    1) Both Statements are true, Statement II is the correct explanation of
    Statement I.
    2) Both Statements are true, Statement II is not correct explanation of Statement
    I.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

21. *Statement-I:*   The side of the square is 14 cm
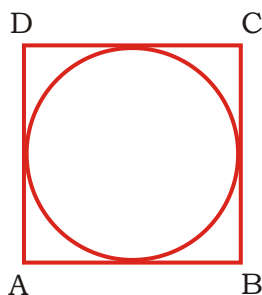
    Statement-II: The ratio of the square and circle perimeter is 14 : 11
    1) Both Statements are true, Statement II is the correct explanation of
    Statement I.
    2) Both Statements are true, Statement II is not correct explanation of Statement
    I.
    3) Statement I is true, Statement II is false.
    4) Statement I is false, Statement II is true.

COMPREHENSION TYPE
Writeup:1
In an equilateral triangle of side 12cm, a circle is inscribed touching its sides.

Take = $\pi = 3.14$ and $\sqrt{3} = 1.73$.

Based on the above data answer the following questions.

22. Radius of circle is

1) $\sqrt{3}$ cm   2) $2\sqrt{3}$ cm   3) $3\sqrt{3}$ cm   4) $4\sqrt{3}$ cm

23. Area of the incircle is
1) 9.42 cm²   2) 24.6 cm²   3) 37.68 cm²   4) 48. 24 cm²

24. The area of the portion of the triangle not included in the circle is
1) 24.6 cm²   2) 37.68 cm²   3) 62.28 cm²   4) None of these

Writeup:2
A wire of length 88 m is first bent in the from a circle. It is bent in the form of a square. Read the above passage and answer the questions below.

25. Side of a square is
1) 22 m   2) 20 m   3) 24m   4) 26m

26. Area of circle is
1) 584m²   2) 616m²   3) 640m²   4) 480m²

27. The ratio of area of a circle and area of square is
1) 14 : 11   2) 14 : 12   3) 11 : 14   4) 14 : 10

MATRIX MATCHING TYPE

28. | Column - I | Column - II |
|---|---|
| a) Circumference of a circle | 1) πr^2 sq.units |
| b) If radius of the circle is half of its original radius, then its new area is | 2) $\dfrac{\pi d^2}{4}$ sq.units |
| c) Area of circle | 3) $2\pi r$ units |
| d) Perimeter of a semicircle is original | 4) One fourth times of its |
| | 5) $\pi r + d$ units |

29. **Column - I**

a) The perimeter of a sheet of paper in the shape of a quadrant of a circle is 75 cm. Then its area = (in cm²)

hexagon is inscribed in a circle of radius 14 cm. Then the area of the circle falling outside the hexagon is (in cm²)

c) The cross section of a tunnel is in the shape of a semicircle surmounted on the longer side of a rectangle whose shorter side measures 6m. If the perimeter of the cross section is 66cm, then breadth of the tunnel is (in cm²)

of a circle inscribed in a square of area 147 sq.cm is (in cm²)

Column - II

1) 21

b) A regular
2) 42

3) 106.79

d) The area
4) 346.5

5) $115\dfrac{1}{2}$

INTEGER ANSWER TYPE

30. A play field is in the form of a circle whose radius is 42m. If fencing costs 2 rupees per meter, then the cost of fencing is Rs. _____.

WORK SHEET (KEY)				
1) 3	2) 2	3) 3	4) 1	5) 1
6) 4	7) 1	8) 1	9) 1	10) 2
11) 3	12) 1	13) 1	14) 3	15) 2
16) 1	17) 2	18) 1,3	19) 2,4	20) 2
21) 2	22) 2	23) 3	24) 1	25) 1
26) 2	27) 1	28) 3,4,(1,2),3	29) 4,3,1,5	30) 528

18.   Area = $\dfrac{22}{7} \times 56 \times 56$ = 9856 cm²

    Circumference = $2\pi r = 2 \times \dfrac{22}{7} \times 56 = 352$ cm

19. a)   Area   of   the   sector $= \pi r^2 \left(\dfrac{\theta}{360°} \right)$ $= \dfrac{22}{7} \times 28 \times 28 \times \dfrac{108°}{360°}$

    $= 22 \times 4 \times 28 \times \dfrac{3}{10} = 739.2 \text{cm}$

    b) Length of the arc $= 2\pi r \left(\dfrac{\theta}{360°} \right)$ $= 2 \times \dfrac{22}{7} \times 28 \times \dfrac{108}{360°} = 52.8 \text{cm}$

20.   R = 2r; New area = $\pi R^2 = \pi (2r)^2 = 4\pi r^2$ = 4 (original area)

21.   Side of the square = diametre of the circle $\Rightarrow$ s = d $\Rightarrow$ d = 14 cm $\Rightarrow$ 2r = 14 $\Rightarrow$ r = 7 cm

    $\therefore$ ratio of perimetres = 4 × side : $2\pi r$ = $4 \times 14 : 2 \times \dfrac{22}{7} \times 7$ = 56 : 44 = 14 : 11

22 – 24 Paragraph.

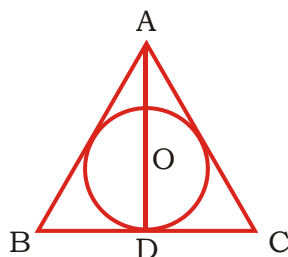   Let ABC be an equilateral triangle of side 12 cm.

    Let $AD \perp BC$. Then, D is the midpoint of BC.

    $\therefore$ BD = DC = 6 cm and AB = 12 cm. $\therefore$ AD = $\sqrt{AB^2 - BD^2}$

$\sqrt{12^2 - 6^2} = 6\sqrt{3}$ cm .

Let O be the centre of the inscribed circle.

Then, O is the centroid of $\triangle ABC$.

$\therefore$ AO : OD = 2 : 1 and OD = $\dfrac{1}{3}$AD = $\dfrac{1}{3} \times 6\sqrt{3}$ cm = $2\sqrt{3}$ cm.

$\therefore$ r = OD = $2\sqrt{3}$ cm.

Required area = (area of $\triangle ABC$) − (area of the in circle)

$= \left[\dfrac{\sqrt{3}}{4} \times (12)^2 - 3.14 \times (2\sqrt{3})^2 \right] cm^2 = \left(36\sqrt{3} - 3.14 \times 12 \right) cm^2 =$

$(36 \times 1.73 - 3.14 \times 12)\ cm^2$

= (62.28 − 37.68) cm² = 24.6 cm².

25–27 Paragraph.

$2\pi r = 88 \quad \Rightarrow \quad r = \dfrac{88}{2\pi} = \dfrac{88}{2 \times 22} \times 7 \quad \Rightarrow \quad r = 14$ m

$4 \times$ side = 88 $\Rightarrow$ $4 \times$ side = 88 $\Rightarrow$ side = 22

$\therefore$ Ratio Area = $\pi r^2 : (side)^2 = \dfrac{22}{7} \times 14^2 : 22 \times 22 = \dfrac{22}{7} \times 196 : 484 = 14 : 11$
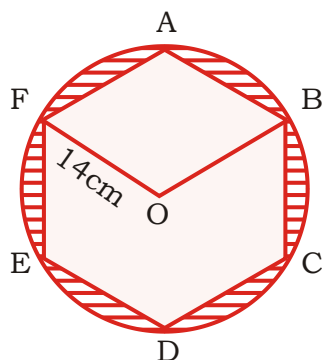
29. a)   Let the radius be r. Then,
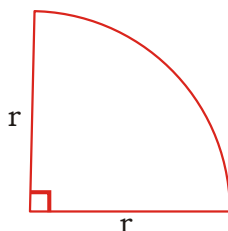
perimeter $= \left(\dfrac{\pi}{2} + 2 \right) r \Rightarrow 75$ cm $= \left(\dfrac{1}{2} \cdot \dfrac{22}{7} + 2 \right) r = 75$ cm $= \dfrac{25}{7} r \Rightarrow r = 21$ cm.

$\therefore$ area $= \dfrac{1}{4} \cdot \pi r^2 = \dfrac{1}{4} \times \dfrac{22}{7} \times 21 = \dfrac{693}{2} = 346.5$ cm².

b)   Required area = area of the circle − area of the regular hexagon.

Area of the circle $= \pi r^2 = \dfrac{22}{7} \times 14^2 = 616$ cm².

Area of the regular hexagon $= 6 \times$ area of the equilateral $\triangle OAB$

$= 6 \times \dfrac{\sqrt{3}}{4} \times OA^2 = \dfrac{3\sqrt{3}}{2} \times 14^2$ cm² $= 294\sqrt{3}$ cm² $= 509.\ 21$ cm².

$= 616$ cm² $-$ 509.21 cm² $= 106.79$ cm².

c) Let the radius of the semicircle be r meters.
Then, the perimeter of the cross section
$= AB + BC + AD +$ Semi circle DEC.
$= (2r + 6 + 6 + \pi r)$m.
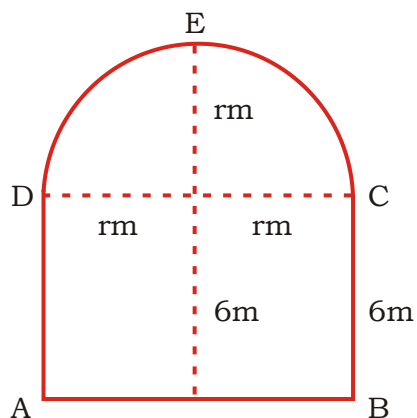
$= \left(12 + 2r + \dfrac{22}{7}r\right)$ m $= \left(12 + \dfrac{36}{7}r\right)$ m $\qquad \therefore 66$ m $= \left(12 + \dfrac{36}{7}r\right)$ m .

$\Rightarrow 66 = \left(12 + \dfrac{36}{7}\right) \Rightarrow r = \dfrac{54 \times 7}{36} = \dfrac{21}{2}$

$\therefore$ AB $=$ breadth of the tunnel $= 2$rm $= 2 \times \dfrac{21}{2}$ m $= 21$ m.

d) Diameter of a circle = side of a square.

Side of a square $= \sqrt{\text{area}} = \sqrt{147} = 7\sqrt{3}$ cm .

$\Rightarrow$ Radius of circle $= \dfrac{7\sqrt{3}}{2}$ cm.

Area of circle $= \pi \left(\dfrac{7\sqrt{3}}{2} \right)^2 = 115\dfrac{1}{2}$ sq. cm.

30.   r = 42m

Circumfernce $= \dfrac{2 \times 22}{7} \times 42 = 264$m.

Cost of pencing the play field $= 264 \times 2 = 528$ rupees.