NCERT Solutions for Maths: Chapter 12 - Areas Related to Circles

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NCERT Solutions for Maths: Chapter 12 – Areas Related to Circles

Class 10: Maths Chapter 12 solutions. Complete Class 10 Maths Chapter 12 Notes.

NCERT Solutions for Maths: Chapter 12 – Areas Related to Circles

NCERT 10th Maths Chapter 12, class 10 Maths Chapter 12 solutions

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Exercise: 12.1

Unless stated otherwise, use π =22/7.

1. The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has a circumference equal to the sum of the circumferences of the two circles.

Let the radius of the third circle be R.

Circumference of the circle with radius R = 2πR

Circumference of the circle with radius 19 cm = 2π × 19 = 38π cm

Circumference of the circle with radius 9 cm = 2π × 9 = 18π cm

Sum of the circumference of two circles = 38π + 18π = 56π cm

Circumference of the third circle = 2πR = 56π

⇒ 2πR = 56π cm

⇒ R = 28 cm

The radius of the circle which has circumference equal to the sum of the circumferences of the two circles is 28 cm.

2. The radii of two circles are 8 cm and 6 cm respectively. Find the radius of the circle having area equal to the sum of the areas of the two circles.

Answer

Let the radius of the third circle be R.

Area of the circle with radius R = πR^2

Area of the circle with radius 8 cm = $\pi \times 8^2 = 64\pi$ cm^2

Area of the circle with radius 6 cm = $\pi \times 6^2 = 36\pi$ cm^2

Sum of the area of two circles = 64π cm^2 + 36π cm^2 = $100\pi cm^2$

Area of the third circle = πR^2 = $100\pi cm^2$

⇒ $\pi R^2 = 100\pi cm^2$

⇒ $R^2 = 100 cm^2$

⇒ R = 10cm

Thus, the radius of the new circle is 10 cm.

3. Fig. 12.3 depicts an archery target marked with its five scoring regions from the centre outwards as Gold, Red, Blue, Black and White. The diameter of the region representing Gold score is 21 cm and each of the other bands is 10.5 cm wide. Find the area of each of the five scoring regions.

Answer

Diameter of Gold circle (first circle) = 21 cm

Radius of first circle, r_1 = 21/2 cm = 10.5 cm

Each of the other bands is 10.5 cm wide,

∴ Radius of second circle, r_2 = 10.5 cm + 10.5 cm = 21 cm

∴ Radius of third circle, r_3 = 21 cm + 10.5 cm = 31.5 cm

∴ Radius of fourth circle, r_4 = 31.5 cm + 10.5 cm = 42 cm

∴ Radius of fifth circle, r_5 = 42 cm + 10.5 cm = 52.5 cm

Area of gold region = $\pi r_1^2 = \pi (10.5)^2 = 346.5$ cm^2

Area of red region = Area of second circle - Area of first circle = πr_2^2 - 346.5 cm^2

$=\pi(21)^2 - 346.5\ cm^2 = 1386 - 346.5\ cm^2 = 1039.5\ cm^2$

Area of blue region = Area of third circle - Area of second circle = πr_3^2 - 1386 cm^2

$=\pi(31.5)^2 - 1386\ cm^2 = 3118.5 - 1386\ cm^2 = 1732.5\ cm^2$

Area of black region = Area of fourth circle - Area of third circle = πr_3^2 - 3118.5 cm^2

$= \pi(42)^2 - 1386\ cm^2 = 5544 - 3118.5\ cm^2 = 2425.5\ cm^2$

Area of white region = Area of fifth circle - Area of fourth circle = πr_4^2 - 5544 cm^2

$= \pi(52.5)^2 - 5544\ cm^2 = 8662.5 - 5544\ cm^2 = 3118.5\ cm^2$

4. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

Answer

Diameter of the wheels of a car = 80 cm

Circumference of wheels = $2\pi r = 2r \times \pi = 80\pi$ cm

Distance travelled by car in 10 minutes = $(66 \times 1000 \times 100 \times 10)/60$ = 1100000 cm/s

No. of revolutions = Distance travelled by car/Circumference of wheels

$= 1100000/80\pi = (1100000 \times 7)/(80 \times 22) = 4375$

4375 complete revolutions does each wheel make in 10 minutes.

5. Tick the correct answer in the following and justify your choice : If the perimeter and the area of a circle are numerically equal, then the radius of the circle is

(A) 2 units (B) π units (C) 4 units (D) 7 units

Answer

Let the radius of the circle be r.

∴ Perimeter of the circle = Circumference of the circle = $2\pi r$

∴ Area of the circle = πr^2

A/q,

$2\pi r = \pi r^2$

$\Rightarrow 2 = r$

Thus, the radius of the circle is 2 units. (A) is correct.

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Exercise: 12.2

Unless stated otherwise, use π =22/7.

1. Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60°.

Answer

Area of the sector making angle θ = $(\theta/360°)\times\pi r^2$

Area of the sector making angle 60° = (60°/360°)×π r^2 cm^2

= (1/6)×6^2π = 36/6 π cm^2 = 6 × 22/7 cm^2 = 132/7 cm^2

2. Find the area of a quadrant of a circle whose circumference is 22 cm.

Answer

Quadrant of a circle means sector is making angle 90°.

Circumference of the circle = 2πr = 22 cm

Radius of the circle = r = 22/2π cm = 7/2 cm

Area of the sector making angle 90° = (90°/360°)×π r^2 cm^2

= (1/4)×$(7/2)^2$π = (49/16) π cm^2 = (49/16) × (22/7) cm^2 = 77/8 cm^2

3. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

Answer

Here, Minute hand of clock acts as radius of the circle.

∴ Radius of the circle (r) = 14 cm

Angle rotated by minute hand in 1 hour = 360°

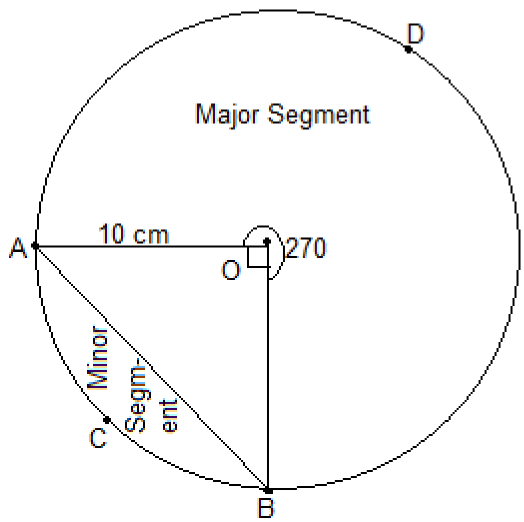
∴ Angle rotated by minute hand in 5 minutes = 360° × 5/60 = 30°

Area of the sector making angle 30° = (30°/360°)×π r^2 cm^2

= (1/12) × 14^2π = 196/12 π cm^2 = (49/3) × (22/7) cm^2 = 154/3 cm^2

Area swept by the minute hand in 5 minutes = 154/3 cm^2

4. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding : (i) minor segment (ii) major sector. (Use π = 3.14)



Radius of the circle = 10 cm

Major segment is making 360° - 90° = 270°

Area of the sector making angle 270°

$= (270°/360°) \times \pi r^2 \text{ cm}^2$

$= (3/4) \times 10^2\pi = 75\pi \text{ cm}^2$

$= 75 \times 3.14 \text{ cm}^2 = 235.5 \text{ cm}^2$

∴ Area of the major segment = 235.5 cm^2

Height of ΔAOB = OA = 10 cm

Base of ΔAOB = OB = 10 cm

Area of ΔAOB = 1/2 × OA × OB

$= 1/2 \times 10 \times 10 = 50\ cm^2$

Major segment is making 90°

Area of the sector making angle 90°
$= (90°/360°) \times \pi\ r^2\ cm^2$

$= (1/4) \times 10^2\pi = 25\ \pi\ cm^2$

$= 25 \times 3.14\ cm^2 = 78.5\ cm^2$

Area of the minor segment = Area of the sector making angle 90° - Area of ΔAOB

$= 78.5\ cm^2 - 50\ cm^2 = 28.5\ cm^2$

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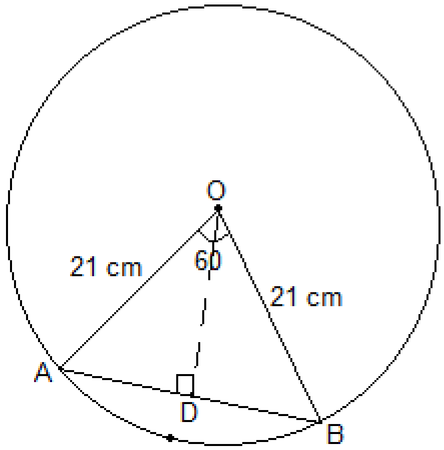
5. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find:

(i) the length of the arc

(ii) area of the sector formed by the arc

(iii) area of the segment formed by the corresponding chord

Answer



Radius of the circle = 21 cm

(i) Length of the arc AB = θ/360° × 2πr

= 60°/360° × 2 × 22/7 × 21

= 1/6 × 2 × 22/7 × 21 = 22

The length of the arc is 22 cm.

(ii) Angle subtend by the arc = 60°

Area of the sector making angle 60° = (60°/360°) × π r^2 cm^2

= (1/6) × 21^2π = 441/6 π cm^2

= 441/6 × 22/7 cm^2 = 231 cm^2

∴ Area of the sector formed by the arc is 231 cm^2

(iii) Area of equilateral ΔAOB = √3/4 × $(OA)^2$ = √3/4 × 21^2 = (441√3)/4 cm^2

Area of the segment formed by the corresponding chord

= Area of the sector formed by the arc - Area of equilateral ΔAOB

$= 231\ cm^2 - (441\sqrt{3})/4\ cm^2$

6. A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. (Use π = 3.14 and √3 = 1.73)

Answer

Radius of the circle = 15 cm

ΔAOB is isosceles as two sides are equal.

∴ ∠A = ∠B

Sum of all angles of triangle = 180°

∠A + ∠B + ∠C = 180°

⇒ 2 ∠A = 180° - 60°

⇒ ∠A = 120°/2

⇒ ∠A = 60°

Triangle is equilateral as ∠A = ∠B = ∠C = 60°

∴ OA = OB = AB = 15 cm

Area of equilateral ΔAOB = $\sqrt{3}/4 \times (OA)^2 = \sqrt{3}/4 \times 15^2$

$= (225\sqrt{3})/4\ cm^2 = 97.3\ cm^2$

Angle subtend at the centre by minor segment = 60°

Area of Minor sector making angle 60° = $(60°/360°) \times \pi r^2\ cm^2$

$= (1/6) \times 15^2\ \pi cm^2 = 225/6\ \pi cm^2$

= (225/6) × 3.14 cm^2 = 117.75 cm^2

Area of the minor segment = Area of Minor sector - Area of equilateral ΔAOB

= 117.75 cm^2 - 97.3 cm^2 = 20.4 cm^2

Angle made by Major sector = 360° - 60° = 300°

Area of the sector making angle 300° = (300°/360°) × π r^2 cm^2

= (5/6) × 15^2 πcm^2 =1125/6 πcm^2

= (1125/6) × 3.14 cm^2 = 588.75 cm^2

Area of major segment = Area of Minor sector + Area of equilateral ΔAOB

= 588.75 cm^2 + 97.3 cm^2 = 686.05 cm^2

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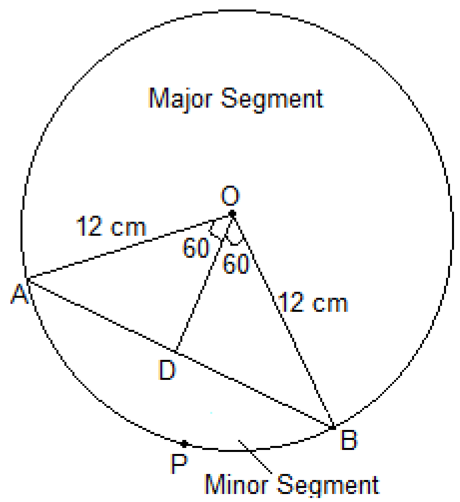
7. A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle. (Use π = 3.14 and √3 = 1.73)

Answer



Radius of the circle, $r = 12$ cm

Draw a perpendicular OD to chord AB. It will bisect AB.

$\angle A = 180° - (90° + 60°) = 30°$

$\cos 30° = AD/OA$

$\Rightarrow \sqrt{3}/2 = AD/12$

$\Rightarrow AD = 6\sqrt{3}$ cm

$\Rightarrow AB = 2 \times AD = 12\sqrt{3}$ cm

$\sin 30° = OD/OA$

$\Rightarrow 1/2 = OD/12$

$\Rightarrow OD = 6$ cm

Area of $\Delta AOB = 1/2 \times \text{base} \times \text{height}$

$= 1/2 \times 12\sqrt{3} \times 6 = 36\sqrt{3}$ cm

$= 36 \times 1.73 = 62.28 \text{ cm}^2$

Angle made by Minor sector = 120°

Area of the sector making angle 120° = (120°/360°) × π r^2 cm^2

= (1/3) × 12^2 πcm^2 =144/3 πcm^2

= 48 × 3.14 cm^2 = 150.72 cm^2

∴ Area of the corresponding Minor segment = Area of the Minor sector - Area of ΔAOB

= 150.72 cm^2 -62.28 cm^2

= 88.44 cm^2

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8. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope (see Fig. 12.11). Find

(i) the area of that part of the field in which the horse can graze.

(ii) the increase in the grazing area if the rope were 10 m long instead of 5 m. (Use π = 3.14)

Answer

Side of square field = 15 m

Length of rope is the radius of the circle, r = 5 m

Since, the horse is tied at one end of square field, it will graze only quarter of the field with radius 5 m.

(i) Area of circle = π r^2 = 3.14 × 5^2 = 78.5 m^2

Area of that part of the field in which the horse can graze = 1/4 of area of the circle = 78.5/4 = 19.625 m^2

(ii) Area of circle if the length of rope is increased to 10 m = πr^2 =3.14 × 10^2 = 314 m^2

Area of that part of the field in which the horse can graze = 1/4 of area of the circle

= 314/4 = 78.5 m^2

Increase in grazing area = 78.5 m^2 - 19.625 m^2 = 58.875 m^2

9. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in Fig. 12.12. Find:

(i) the total length of the silver wire required.

(ii) the area of each sector of the brooch.

Answer

Number of diameters = 5

Length of diameter = 35 mm

∴ Radius = 35/2 mm

(i) Total length of silver wire required = Circumference of the circle + Length of 5 diameter

= $2\pi r$ + (5×35) mm = (2 × 22/7 × 35/2) + 175 mm

= 110 + 175 mm = 185 mm

(ii) Number of sectors = 10

Area of each sector = Total area/Number of sectors

Total Area = π r^2 = 22/7 × $(35/2)^2$ =1925/2 mm^2

∴ Area of each sector = (1925/2) × 1/10 = 385/4 mm^2

10. An umbrella has 8 ribs which are equally spaced (see Fig. 12.13). Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella.

Answer

Number of ribs in umbrella = 8

Radius of umbrella while flat = 45 cm

Area between the two consecutive ribs of the umbrella =

Total area/Number of ribs

Total Area = π r^2 = 22/7 × $(45)^2$ =6364.29 cm^2

∴ Area between the two consecutive ribs = 6364.29/8 cm^2

= 795.5 cm^2

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11. A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of 115°. Find the total area cleaned at each sweep of the blades.

Answer

Angle of the sector of circle made by wiper = 115°

Radius of wiper = 25 cm

Area of the sector made by wiper = (115°/360°) × π r^2 cm^2

$=23/72 \times 22/7 \times 25^2 = 23/72 \times 22/7 \times 625\ cm^2$

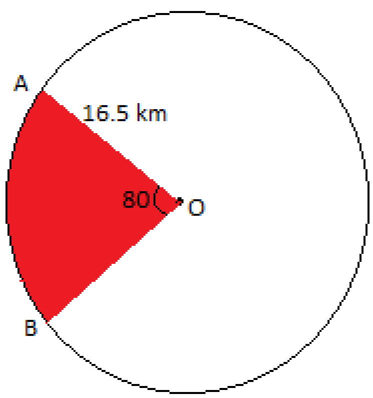
$= 158125/252\ cm^2$

Total area cleaned at each sweep of the blades = $2 \times 158125/252\ cm^2$
$= 158125/126 = 1254.96\ cm^2$

12. To warn ships for underwater rocks, a lighthouse spreads a red coloured light over a sector of angle 80° to a distance of 16.5 km. Find the area of the sea over which the ships are warned.

(Use π = 3.14)

Answer



Let O bet the position of Lighthouse.

Distance over which light spread i.e. radius, r = 16.5 km

Angle made by the sector = 80°

Area of the sea over which the ships are warned = Area made by the sector.

Area of sector = $(80°/360°) \times \pi r^2\ km^2$

$= 2/9 \times 3.14 \times (16.5)^2\ km^2$

= 189.97 km^2

13. A round table cover has six equal designs as shown in Fig. 12.14. If the radius of the cover is 28 cm, find the cost of making the designs at the rate of ₹ 0.35 per cm^2 . (Use √3 = 1.7)

Answer

Number of equal designs = 6

Radius of round table cover = 28 cm

Cost of making design = ₹ 0.35 per cm^2

∠O= 360°/6 = 60°

ΔAOB is isosceles as two sides are equal. (Radius of the circle)

∴ ∠A = ∠B

Sum of all angles of triangle = 180°

∠A + ∠B + ∠O = 180°

⇒ 2 ∠A = 180° - 60°

⇒ ∠A = 120°/2

⇒ ∠A = 60°

Triangle is equilateral as ∠A = ∠B = ∠C = 60°

Area of equilateral ΔAOB = √3/4 × $(OA)^2$ = √3/4 × 28^2 = 333.2 cm^2

Area of sector ACB = (60°/360°) × π r^2 cm^2

= 1/6 × 22/7 × 28 × 28 = 410.66 cm^2

Area of design = Area of sector ACB - Area of equilateral ΔAOB

$= 410.66\ cm^2 - 333.2\ cm^2 = 77.46\ cm^2$

Area of 6 design = $6 \times 77.46\ cm^2 = 464.76\ cm^2$

Total cost of making design = $464.76\ cm^2 \times$ ₹ 0.35 per cm^2 = ₹ 162.66

14. Tick the correct answer in the following : Area of a sector of angle p (in degrees) of a circle with radius R is

(A) $p/180 \times 2\pi R$ (B) $p/180 \times \pi R^2$ (C) $p/360 \times 2\pi R$ (D) $p/720 \times 2\pi R^2$

Answer

Area of a sector of angle p = $p/360 \times \pi R^2$

$= p/360 \times 2/2 \times \pi R^2$

$= 2p/720 \times 2\pi R^2$

Hence, Option (D) is correct.

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Exercise: 12.3

Unless stated otherwise, use $\pi = 22/7$

1. Find the area of the shaded region in Fig. 12.19, if PQ = 24 cm, PR = 7 cm and O is the centre of the circle.

Answer

PQ = 24 cm and PR = 7 cm

∠P = 90° (Angle in the semi-circle)

∴ QR is hypotenuse of the circle = Diameter of the circle.

By Pythagoras theorem,

$QR^2 = PR^2 + PQ^2$

⇒ $QR^2 = 7^2 + 24^2$

⇒ $QR^2 = 49 + 576$

⇒ $QR^2 = 625$

⇒ QR= 25 cm

∴ Radius of the circle = 25/2 cm

Area of the semicircle = $(\pi R^2)/2$

= (22/7 × 25/2 × 25/2)/2 cm^2

= 13750/56 cm^2 = 245.54 cm^2

Area of the ΔPQR = 1/2 × PR × PQ

= 1/2 × 7 × 24 cm^2

= 84 cm^2

Area of the shaded region = 245.54 cm^2 - 84 cm^2 = 161.54 cm^2

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2. Find the area of the shaded region in Fig. 12.20, if radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and ∠AOC = 40°.

Answer

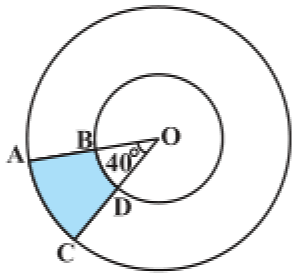

Fig. 12.20

Radius inner circle = 7 cm

Radius of outer circle = 14 cm

Angle made by sector = 40°

Area of the sector OAC = (40°/360°) × π r^2 cm^2

= 1/9 × 22/7 × 14^2= 68.44 cm^2

Area of the sector OBD = (40°/360°) × π r^2 cm^2

= 1/9 × 22/7 × 7^2 = 17.11 cm^2

Area of the shaded region ABDC = Area of the sector OAC - Area of the sector circle OBD

= 68.44 cm^2 - 17.11 cm^2 = 51.33 cm^2

3. Find the area of the shaded region in Fig. 12.21, if ABCD is a square of side 14 cm and APD and BPC are semicircles.

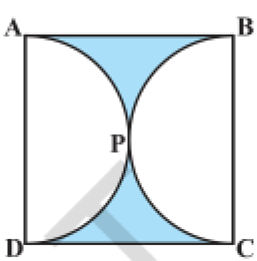

Fig. 12.21

Answer

There are two semicircles in the figure.

Side of the square = 14 cm

Diameter of the semicircle = 14 cm

∴ Radius of the semicircle = 7 cm

Area of the square = 14 × 14 = 196 cm^2

Area of the semicircle = $(\pi R^2)/2$

= (22/7 × 7 × 7)/2 cm^2 = 77 cm^2

Area of two semicircles = 2 × 77 cm^2 = 154 cm^2

Area of the shaded region = 196 cm^2 -154 cm^2 = 42 cm^2

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4. Find the area of the shaded region in Fig. 12.22, 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.

Answer

OAB is an equilateral triangle with each angle equal to 60°.

Area of the sector is common in both.

Radius of the circle = 6 cm.

Side of the triangle = 12 cm.

Area of the equilateral triangle = √3/4 × $(OA)^2$ = √3/4 × 12^2 = 36√3 cm^2

Area of the circle = πR^2 = 22/7 × 6^2 = 792/7 cm^2

Area of the sector making angle 60° = (60°/360°) × πr^2 cm^2

= 1/6 × 22/7 × 6^2 cm^2 = 132/7 cm^2

Area of the shaded region = Area of the equilateral triangle + Area of the circle - Area of the sector

= $36\sqrt{3}$ cm^2 + 792/7 cm^2 - 132/7 cm^2

= ($36\sqrt{3}$ + 660/7) cm^2

5. From each corner of a square of side 4 cm a quadrant of a circle of radius 1 cm is cut and also a circle of diameter 2 cm is cut as shown in Fig. 12.23. Find the area of the remaining portion of the square.

Answers

Side of the square = 4 cm

Radius of the circle = 1 cm

Four quadrant of a circle are cut from corner and one circle of radius are cut from middle.

Area of square = $(side)^2 = 4^2 = 16$ cm^2

Area of the quadrant = $(\pi R^2)/4$ cm^2 = $(22/7 \times 1^2)/4$ = 11/14 cm^2

∴ Total area of the 4 quadrants = 4 × (11/14) cm^2 = 22/7 cm^2

Area of the circle = πR^2 cm^2 = $(22/7 \times 1^2)$ = 22/7 cm^2

Area of the shaded region = Area of square - (Area of the 4 quadrants + Area of the circle)

= 16 cm^2 - (22/7 + 22/7) cm^2

= 68/7 cm^2

6. In a circular table cover of radius 32 cm, a design is formed leaving an equilateral triangle ABC in the middle as shown in Fig. 12.24. Find the area of the design.

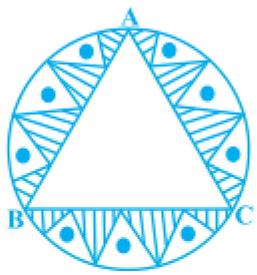


Fig. 12.24

Answer

Radius of the circle = 32 cm

Draw a median AD of the triangle passing through the centre of the circle.

⇒ BD = AB/2

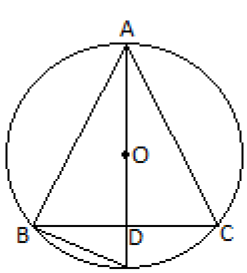
Since, AD is the median of the triangle

∴ AO = Radius of the circle = 2/3 AD

⇒ 2/3 AD = 32 cm

⇒ AD = 48 cm

In ΔADB,



By Pythagoras theorem,

$AB^2 = AD^2 + BD^2$

$\Rightarrow AB^2 = 48^2 + (AB/2)^2$

$\Rightarrow AB^2 = 2304 + AB^2/4$

$\Rightarrow 3/4\ (AB^2) = 2304$

$\Rightarrow AB^2 = 3072$

$\Rightarrow AB = 32\sqrt{3}$ cm

Area of $\Delta ADB = \sqrt{3}/4 \times (32\sqrt{3})^2\ cm^2 = 768\sqrt{3}\ cm^2$

Area of circle = $\pi R^2 = 22/7 \times 32 \times 32 = 22528/7\ cm^2$

Area of the design = Area of circle - Area of ΔADB

$= (22528/7 - 768\sqrt{3})\ cm^2$

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7. In Fig. 12.25, ABCD is a square of side 14 cm. With centres A, B, C and D, four circles are drawn such that each circle touch externally two of the remaining three circles. Find the area of the shaded region.

Answer

Side of square = 14 cm

Four quadrants are included in the four sides of the square.

$\therefore$ Radius of the circles = 14/2 cm = 7 cm

Area of the square ABCD = $14^2 = 196\ cm^2$

Area of the quadrant = $(\pi R^2)/4\ cm^2 = (22/7 \times 7^2)/4\ cm^2$

= 77/2 cm^2

Total area of the quadrant = 4 × 77/2 cm^2 = 154cm^2

Area of the shaded region = Area of the square ABCD - Area of the quadrant

= 196 cm^2 - 154 cm^2

= 42 cm^2

8. Fig. 12.26 depicts a racing track whose left and right ends are semicircular.

The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If

the track is 10 m wide, find :

(i) the distance around the track along its inner edge

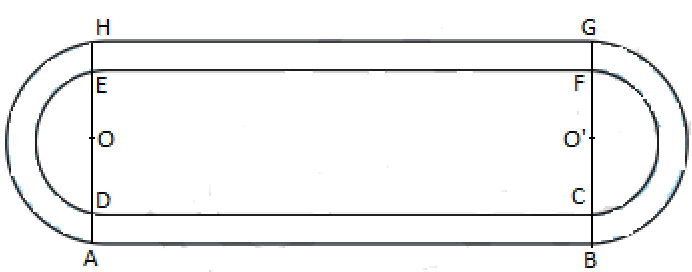
(ii) the area of the track.

Answer

Width of track = 10 m

Distance between two parallel lines = 60 m

Length of parallel tracks = 106 m



DE = CF = 60 m

Radius of inner semicircle, r = OD = O'C

= 60/2 m = 30 m

Radius of outer semicircle, R = OA = O'B

= 30 + 10 m = 40 m

Also, AB = CD = EF = GH = 106 m

Distance around the track along its inner edge = CD + EF + 2 × (Circumference of inner semicircle)

= 106 + 106 + (2 × πr) m = 212 + (2 × 22/7 × 30) m

= 212 + 1320/7 m = 2804/7 m

Area of the track = Area of ABCD + Area EFGH + 2 × (area of outer semicircle) - 2 × (area of inner semicircle)

$= (AB \times CD) + (EF \times GH) + 2 \times (\pi r^2/2) - 2 \times (\pi R^2/2)\ m^2$

$= (106 \times 10) + (106 \times 10) + 2 \times \pi/2\ (r^2 - R^2)\ m^2$

$= 2120 + 22/7 \times 70 \times 10\ m^2$

$= 4320\ m^2$

NCERT 10th Maths Chapter 12, class 10 Maths Chapter 12 solutions

9. In Fig. 12.27, AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of the shaded region.

Answer

Radius of larger circle, R = 7 cm

Radius of smaller circle, r = 7/2 cm

Height of ΔBCA = OC = 7 cm

Base of ΔBCA = AB = 14 cm

Area of ΔBCA = 1/2 × AB × OC = 1/2 × 7 × 14 = 49 cm^2

Area of larger circle = πR^2 = 22/7 × 7^2 = 154 cm^2

Area of larger semicircle = 154/2 cm^2 = 77 cm^2

Area of smaller circle = πr^2 = 22/7 × 7/2 × 7/2 = 77/2 cm^2

Area of the shaded region = Area of larger circle - Area of triangle - Area of larger semicircle + Area of smaller circle

Area of the shaded region = (154 - 49 - 77 + 77/2) cm^2

= 133/2 cm^2 = 66.5 cm^2

10. The area of an equilateral triangle ABC is 17320.5 cm^2. With each vertex of the triangle as centre, a circle is drawn with radius equal to half the length of the side of the triangle (see Fig. 12.28). Find the area of the shaded region. (Use π = 3.14 and √3 = 1.73205)

Answer

ABC is an equilateral triangle.

∴ ∠A = ∠B = ∠C = 60°

There are three sectors each making 60°.

Area of ΔABC = 17320.5 cm^2

⇒ √3/4 × $(side)^2$ =17320.5

⇒ $(side)^2$ =17320.5 × 4/1.73205

⇒ $(side)^2$ = 4 × 10^4

⇒ side = 200 cm

Radius of the circles = 200/2 cm = 100 cm

Area of the sector = (60°/360°) × π r^2 cm^2

= 1/6 × 3.14 × $(100)^2$ cm^2

=15700/3cm^2

Area of 3 sectors = 3 × 15700/3 = 15700 cm^2 =

Area of the shaded region = Area of equilateral triangle ABC - Area of 3 sectors

= 17320.5 - 15700 cm^2 = 1620.5 cm^2

NCERT 10th Maths Chapter 12, class 10 Maths Chapter 12 solutions

11. On a square handkerchief, nine circular designs each of radius 7 cm are made (see Fig. 12.29). Find the area of the remaining portion of the handkerchief.

Answer

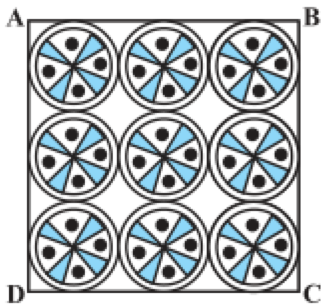


Fig. 12.29

Number of circular design = 9

Radius of the circular design = 7 cm

There are three circles in one side of square handkerchief.

∴ Side of the square = 3 × diameter of circle = 3 × 14 = 42 cm

Area of the square = 42 × 42 cm^2 = 1764 cm^2

Area of the circle = πr^2 = 22/7 × 7 × 7 = 154 cm^2

Total area of the design = 9× 154 = 1386 cm^2

Area of the remaining portion of the handkerchief = Area of the square - Total area of the design

= 1764 - 1386 = 378 cm^2

12. In Fig. 12.30, OACB is a quadrant of a circle with centre O and radius 3.5 cm. If OD = 2 cm, find the area of the

(i) quadrant OACB, (ii) shaded region.

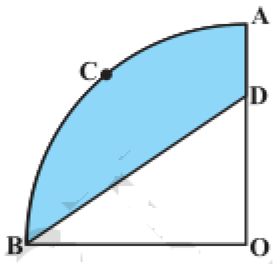


Fig. 12.30

Answer

Radius of the quadrant = 3.5 cm = 7/2 cm

(i) Area of quadrant OACB = $(\pi R^2)/4$ cm^2

= (22/7 × 7/2 × 7/2)/4 cm^2

= 77/8 cm^2

(ii) Area of triangle BOD = 1/2 × 7/2 × 2 cm^2

= 7/2 cm^2

Area of shaded region = Area of quadrant - Area of triangle BOD

= (77/8 - 7/2) cm^2 = 49/8 cm^2

= 6.125 cm^2

13. In Fig. 12.31, a square OABC is inscribed in a quadrant OPBQ. If OA = 20 cm, find the area of the shaded region. (Use π = 3.14)

Answer

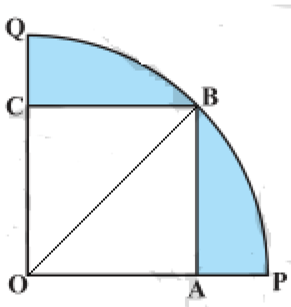


Fig. 12.31

Side of square = OA = AB = 20 cm

Radius of the quadrant = OB

OAB is right angled triangle

By Pythagoras theorem in ΔOAB ,

$OB^2 = AB^2 + OA^2$

⇒ $OB^2 = 20^2 + 20^2$

⇒ $OB^2 = 400 + 400$

⇒ $OB^2 = 800$

⇒ OB= $20\sqrt{2}$ cm

Area of the quadrant = $(\pi R^2)/4$ cm^2 = $3.14/4 \times (20\sqrt{2})^2$ cm^2 = $628 cm^2$

Area of the square = 20 × 20 = 400 cm^2

Area of the shaded region = Area of the quadrant - Area of the square

= 628 - 400 cm^2 = $228 cm^2$

14. AB and CD are respectively arcs of two concentric circles of radii 21 cm and 7 cm and centre O (see Fig. 12.32). If ∠AOB = 30°, find the area of the shaded region.

Answer

Radius of the larger circle, R = 21 cm

Radius of the smaller circle, r = 7 cm

Angle made by sectors of both concentric circles = 30°

Area of the larger sector = (30°/360°) × π R^2 cm^2

= 1/12 × 22/7 × 21^2 cm^2

=231/2cm^2

Area of the smaller circle = (30°/360°) × π r^2 cm^2

= 1/12 × 22/7 × 7^2 cm^2

=77/6cm^2

Area of the shaded region = 231/2 - 77/6 cm^2

= 616/6 cm^2 = 308/3cm^2

15. In Fig. 12.33, ABC is a quadrant of a circle of radius 14 cm and a semicircle is drawn with BC

as diameter. Find the area of the shaded region.

Answer

Radius of the the quadrant ABC of circle = 14 cm

AB = AC = 14 cm

BC is diameter of semicircle.

ABC is right angled triangle.

By Pythagoras theorem in ΔABC,

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

⇒ $BC^2 = 14^2 + 14^2$

⇒ BC = 14√2 cm

Radius of semicircle = 14√2/2 cm = 7√2 cm

Area of ΔABC = 1/2 × 14 × 14 = 98 cm^2

Area of quadrant = 1/4 × 22/7 × 14 × 14 = 154 cm^2

Area of the semicircle = 1/2 × 22/7 × 7√2 × 7√2 = 154 cm^2

Area of the shaded region =Area of the semicircle + Area of ΔABC - Area of quadrant

= 154 + 98 - 154 cm^2 = 98cm^2

16. Calculate the area of the designed region in Fig. 12.34 common between the two quadrants of circles of radius 8 cm each.

Answer

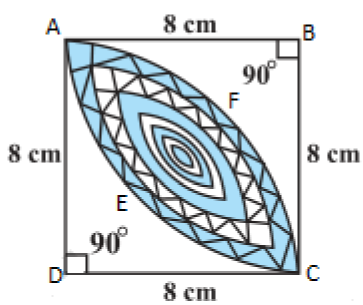


Fig. 12.34

AB = BC = CD = AD = 8 cm

Area of ΔABC = Area of ΔADC = 1/2 × 8 × 8 = 32 cm^2

Area of quadrant AECB = Area of quadrant AFCD = 1/4 × 22/7 × 8^2

$= 352/7\ cm^2$

Area of shaded region = (Area of quadrant AECB - Area of ΔABC) + (Area of quadrant AFCD - Area of ΔADC)

$= (352/7 - 32) + (352/7 - 32)\ cm^2$

$= 2 \times (352/7 - 32)\ cm^2$

NCERT Solutions for Maths Chapter 12

Chapterwise NCERT Solutions for Class 10 Maths:

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