Push Tasks — Answers

1. Find the circumference of a circle with radius 4.5 cm. Give your answer in terms of π.

Solution

$C = 2\pi r = 2\pi(4.5)$

$= 9\pi$ cm

2. Find the area of a circle with diameter 18 m. Give your answer in terms of π.

Solution

$r = 9$; $A = \pi r^2 = \pi(9)^2$

$= 81\pi$ m^2

3. A bicycle wheel has radius 35 cm. Using $\pi \approx 22/7$, how many complete revolutions does it make over 1 km?

Solution

$C = 2 \times \frac{22}{7} \times 35 = 220$ cm

$100\,000 \div 220 = 454.5\ldots$

454 complete revolutions

4. A circle's area is 36π cm^2. Find its circumference in terms of π.

Solution

$r^2 = 36,\ r = 6$

$C = 2\pi(6) = 12\pi$ cm

Push Tasks — Answers

5. Two circles have radii in the ratio 3:4. What is the ratio of their circumferences?

Solution

$C = 2\pi r$ is linear in r,
so the ratio is unchanged:
$3 : 4$

6. Two circles have radii in the ratio 2:5. What is the ratio of their areas?

Solution

$A = \pi r^2$ scales with r^2:
$2^2 : 5^2$
$= 4 : 25$

7. The ratio of the areas of two circles is 9:16. The smaller circle has circumference 18π cm. Find the radius of the larger circle.

Solution

Radius ratio $= \sqrt{9} : \sqrt{16} = 3 : 4$
Small: $2\pi r = 18\pi \Rightarrow r = 9$
Large $= 9 \times \frac{4}{3} = 12$ cm

8. The circumference of a circle is tripled. By what factor does its area increase?

Solution

Circumference $\times 3 \Rightarrow$ radius $\times 3$
Area $\propto r^2 \Rightarrow \times 3^2$
Area increases by a factor of 9

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9. Two concentric circles have radii 7 cm and 10 cm. Find the area of the annulus (ring) between them.

Solution

$A = \pi(10^2 - 7^2) = \pi(100 - 49)$
$= 51\pi \approx 51 \times 3.14$
$= 160.14$ cm^2

10. Find the arc length and area.

Solution

Arc $= \frac{72}{360} \times 2\pi(15) = 18.84$ cm
Area $= \frac{72}{360} \times \pi(15)^2$
$= 0.2 \times 3.14 \times 225 = 141.3$ cm^2

11. A circular pond has diameter 8 m. A concrete path 2 m wide is built around it. Find the cost of concreting the path at \$45 per m^2.

Solution

Outer $r = 4+2 = 6$; inner $r = 4$
Path $= \pi(6^2 - 4^2) = 20\pi \approx 62.8$ m^2
Cost $= 62.8 \times 45 = \$2826$

12. A running track has two straight sections 100 m long and two semicircular ends of radius 30 m. Find the total perimeter.

Solution

Straights $= 2 \times 100 = 200$
Curves $= 2\pi(30) = 60\pi \approx 188.4$
Perimeter $= 200 + 188.4 = 388.4$ m

Push Tasks — Answers

13. A square of side length 14 cm has a circle inscribed touching all four sides. Find the area inside the square but outside the circle.

Solution

Square $= 14^2 = 196$
Circle: $r = 7$, $A = 3.14 \times 49 = 153.86$
Difference $= 196 - 153.86 = 42.14$ cm^2

14. Circles have radii 5 cm and 13 cm. Is a circle of radius 9 cm (their average) exactly halfway in area too? Justify your answer.

Solution

A_5=78.5, A_{13}=530.66; avg=304.58
$A_9 = 3.14 \times 81 = 254.34$
No: area $\propto r^2$, not r, so
averaging radii under-averages area.

15. A goat is tied to the corner of a square shed of side length 10 m, with a rope 12 m long. Find the area the goat can graze outside the shed.

Solution

$\frac{3}{4}$ circle rad. 12: $0.75\pi(12)^2$=108π
$2 \times \frac{1}{4}$ circle rad. 2 (12-10) at
each corner: $2 \times 0.25\pi(2)^2$=2π
Total $= 110\pi \approx 345.4$ m^2

16. A large circle's area equals the sum of the areas of two smaller circles of radii 6 cm and 8 cm. Find the radius of the large circle.

Solution

$\pi R^2 = \pi(6^2)+\pi(8^2) = \pi(36+64)$
$R^2 = 100$
$R = 10$ cm