

Circles: Circumference and Area Made Clear

Grade 7 math · Worksheet Answer Key · Standards: 7.G.B.4

Each solution shows the substitution, the arithmetic and a final answer in bold with units. Compare your own steps, not only the final numbers, and check whether you used the radius or the diameter in each area problem.

Standards: 7.G.B.4 · **Level:** Grade 7

Problem 1 Radius from diameter

$$\text{Radius} = \text{diameter} \div 2 = 26 \div 2.$$

$$\mathbf{r = 13 \text{ ft}}$$

Problem 2 Diameter from radius

$$\text{Diameter} = 2 \times \text{radius} = 2 \times 2.5.$$

$$\mathbf{d = 5 \text{ yd}}$$

Problem 3 Circumference from diameter

$$C = \pi d = 3.14 \times 25 = 78.5.$$

$$\mathbf{C = 78.5 \text{ in}}$$

Problem 4 Circumference in terms of π

$$C = 2\pi r = 2 \times \pi \times 6 = 12\pi.$$

$$\mathbf{C = 12\pi \text{ m}}$$

Problem 5 Area from radius

$$A = \pi r^2 = 3.14 \times 9^2 = 3.14 \times 81 = 254.34.$$

$$\mathbf{A = 254.34 \text{ cm}^2}$$

Problem 6 Area in terms of π

$$A = \pi r^2 = \pi \times 11^2 = 121\pi.$$

$$\mathbf{A = 121\pi \text{ in}^2}$$

Problem 7 Area from the diameter

$$\text{Radius} = 30 \div 2 = 15 \text{ in. } A = \pi \times 15^2 = 225\pi.$$

$$\mathbf{A = 225\pi \text{ in}^2}$$

Problem 8 Work backward from circumference

$$d = C \div \pi = 75.36 \div 3.14 = 24 \text{ ft.}$$

$$r = 24 \div 2 = 12 \text{ ft.}$$

$$\mathbf{d = 24 \text{ ft and } r = 12 \text{ ft}}$$

Problem 9 Bicycle wheel

$$\text{One turn covers the circumference: } C = 3.14 \times 26 = 81.64.$$

$$\mathbf{81.64 \text{ in}}$$

Problem 10 Garden from the fence

$$d = 37.68 \div 3.14 = 12 \text{ ft, so } r = 6 \text{ ft.}$$

$$A = 3.14 \times 6^2 = 3.14 \times 36 = 113.04.$$

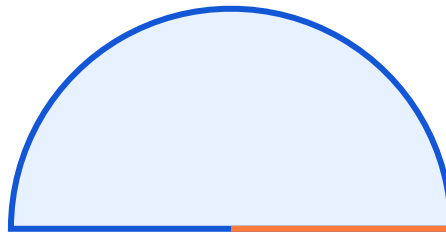
$$\mathbf{A = 113.04 \text{ ft}^2}$$

Problem 11 Area of a semicircle

$$r = 16 \div 2 = 8 \text{ cm. Full circle: } 3.14 \times 8^2 = 3.14 \times 64 = 200.96.$$

$$\text{Half: } 200.96 \div 2 = 100.48.$$

$$\mathbf{A = 100.48 \text{ cm}^2}$$



$r = 8 \text{ cm}$

Radius 8 cm, half of the diameter.

Problem 12 Area of a quarter circle

Full circle: $\pi \times 12^2 = 144\pi$. One fourth: $144\pi \div 4 = 36\pi$.

$36 \times 3.14 = 113.04$.

$A = 36\pi \text{ ft}^2 \approx 113.04 \text{ ft}^2$

Problem 13 Rearranging a circle

Base = half the circumference = $(2\pi \times 5) \div 2 = 5\pi$ in. Height = radius = 5 in.

Area = $5\pi \times 5 = 25\pi$.

base 5π in, height 5 in, area $25\pi \text{ in}^2$

Problem 14 Effect of doubling

Circumferences: $2\pi \times 4 = 8\pi$ and $2\pi \times 8 = 16\pi$, so the larger one is 2 times as long.

Areas: $\pi \times 4^2 = 16\pi$ and $\pi \times 8^2 = 64\pi$, so the larger one is 4 times as big.

Circumference doubles (8π to 16π); area quadruples (16π to 64π).

Problem 15 Pizza value

12-in: $r = 6$, $A = 3.14 \times 36 = 113.04 \text{ in}^2$. $\$9 \div 113.04 \approx \$0.080$.

16-in: $r = 8$, $A = 3.14 \times 64 = 200.96 \text{ in}^2$. $\$14 \div 200.96 \approx \$0.070$.

The 16-inch pizza costs less per square inch (about \$0.070 compared with \$0.080).

Problem 16 Field with rounded ends

The two semicircles make one circle with $d = 24 \text{ ft}$, $r = 12 \text{ ft}$.

Perimeter: $2 \times 40 + 3.14 \times 24 = 80 + 75.36 = 155.36$ ft.

Area: $40 \times 24 + 3.14 \times 12^2 = 960 + 452.16 = 1,412.16$ ft².

Perimeter 155.36 ft; area 1,412.16 ft²

Problem 17 Sprinkler coverage

Lawn: $30 \times 30 = 900$ ft². Watered: $3.14 \times 15^2 = 3.14 \times 225 = 706.5$ ft².

$900 - 706.5 = 193.5$.

193.5 ft² are not watered

Problem 18 Arched window

Semicircle: $r = 18$ in. Area = $3.14 \times 18^2 \div 2 = 3.14 \times 324 \div 2 = 508.68$ in².

Rectangle: $36 \times 48 = 1,728$ in². Glass: $1,728 + 508.68 = 2,236.68$ in².

Trim: $48 + 48 + 36 + (3.14 \times 36 \div 2) = 132 + 56.52 = 188.52$ in.

Area 2,236.68 in²; trim 188.52 in

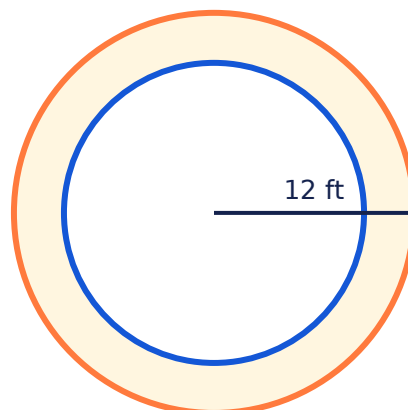
Problem 19 Path around a pond

Outer radius: $9 + 3 = 12$ ft. Outer area: $\pi \times 144 = 144\pi$.

Pond: $\pi \times 81 = 81\pi$. Path: $144\pi - 81\pi = 63\pi$.

$63 \times 3.14 = 197.82$.

63π ft² $\approx$ 197.82 ft²



Path area = outer circle minus pond.

Problem 20 Odometer wheel

One turn: $3.14 \times 28 = 87.92$ in. 500 turns: $87.92 \times 500 = 43,960$ in.

$43,960 \div 12 \approx 3,663.3$ ft.

About 3,663 ft