GRADE 7 · UNIT 4 · LESSON 8

Exploring the Area of a Circle

MA.7.GR.1.4

I can explain where $A = \pi r^2$ comes from, and use it to find the area of a circle.

Warm-Up

1. A rectangle: 12 cm by 4 cm. Find its area.
2. A circle: radius 4 cm. Circumference? Use 3.14.
3. What is half of your answer to question 2?
4. Work out 3.14×4^2. Square first, then multiply.

Warm-Up

1. A rectangle: 12 cm by 4 cm. Find its area. **48 cm^2**
2. A circle: radius 4 cm. Circumference? Use 3.14. **25.12 cm**
3. What is half of your answer to question 2? **12.56 cm**
4. Work out 3.14×4^2. Square first, then multiply. **50.24**

Vocabulary

area of a circle

the space inside it: $A = \pi r^2$, the radius squared, times π

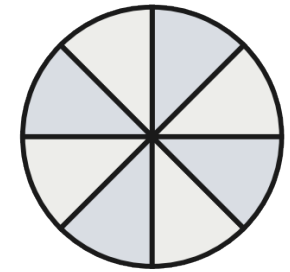
radius squared

$r \times r$ — the radius times itself, never $2 \times r$

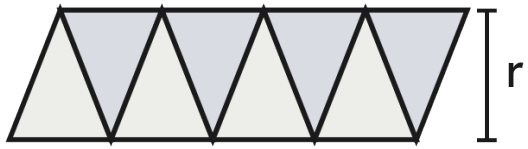
Notes

I. Where the formula comes from

Cut a circle into eight equal wedges. Lay them point-up, point-down.



cut into eight



about π r

Notes

The rectangle it becomes

The long side is half the circumference: πr. The short side is the radius: r.

Area of a rectangle = long × short.

So the area of a circle = $\pi r \times r = \pi r^2$.

Notes

II. The formula, and the order

1. Given a diameter? Halve it first: $d \div 2 = r$.

2. Square the radius: $r \times r = r^2$.

3. Multiply by π last: $\pi \times r^2 = A$.

$3.14 \times 20^2 = 3.14 \times 400 = 1{,}256$. But $(3.14 \times 20)^2 = 3{,}943.84$.

Notes

III. Which π, and what the units are

Use 3.14 unless the question tells you otherwise.

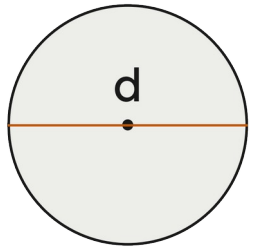
Use 22/7 when the radius or diameter is a multiple of 7: $22/7 \times 7^2 = 22 \times 7 = 154$.

In terms of π, a radius of 20 gives 400π. Stop there.

An area is in square units: cm^2, in^2, m^2.

Example 1

A large pizza is 12 inches across.



12 in across

How much pizza is that? Use 3.14.

Example 1

$r = 12 \div 2 = 6$

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

$A = 113.04 \text{ in}^2$

Answer: 113.04 in²

Your Turn

A circle has a diameter of 18 ft.

Find its area. Use 3.14.

Your Turn

A circle has a diameter of 18 ft.

Find its area. Use 3.14.

Radius: $18 \div 2 = 9$

$A = 3.14 \times 9^2 = 3.14 \times 81 = 254.34$

Answer: 254.34 ft²

Example 2

A circular pool has a radius of 7 m.

A cover costs $8 per square meter.

What does the cover cost?

Example 2

$$A = \frac{22}{7} \times 7^2 = \frac{22}{7} \times 49 = 154 \text{ m}^2$$

$$154 \times 8 = 1{,}232$$

Answer: $1,232

Your Turn

A circle has a diameter of 28 cm.

Find its area in terms of π. Then find it with 22/7.

Your Turn

A circle has a diameter of 28 cm.

Find its area in terms of π. Then find it with 22/7.

Radius: $28 \div 2 = 14$

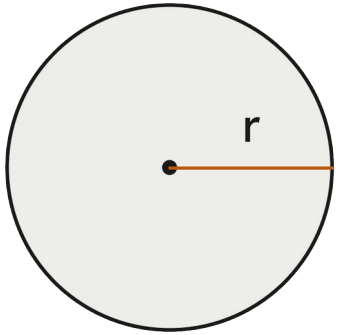
$A = \pi \times 14^2 = 196\pi$

With 22/7: $\frac{22}{7} \times 196 = 616$

Answer: 196π cm², and 616 cm²

Whiteboards · Question 1 of 9

Find the area. Use 3.14.

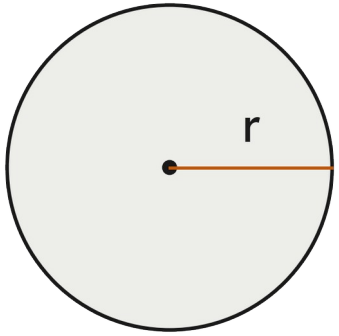


r = 5 cm

Answer it.

Whiteboards · Question 1 of 9

Find the area. Use 3.14.



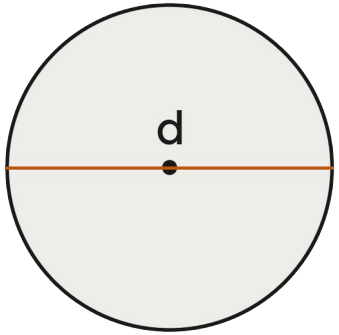
r = 5 cm

$$A = 3.14 \times 5^2 = 3.14 \times 25 = 78.5$$

Answer: 78.5 cm²

Whiteboards · Question 2 of 9

Find the area. Use 3.14.

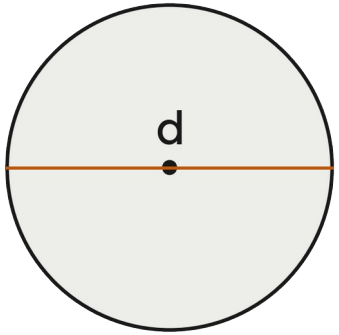


d = 10 cm

Answer it.

Whiteboards · Question 2 of 9

Find the area. Use 3.14.



d = 10 cm

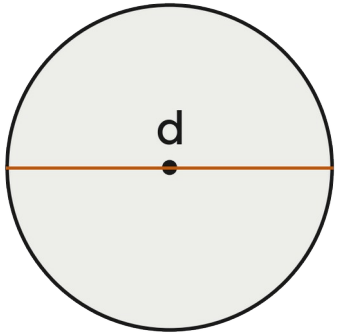
Radius: $10 \div 2 = 5$

$A = 3.14 \times 5^2 = 3.14 \times 25 = 78.5$

Answer: 78.5 cm²

Whiteboards · Question 3 of 9

Find the area. Use 3.14.

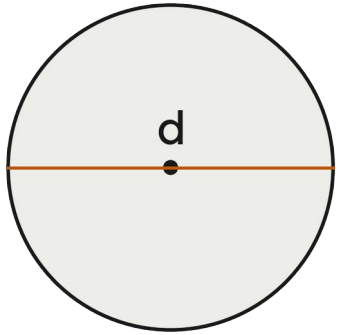


d = 6 cm

Answer it.

Whiteboards · Question 3 of 9

Find the area. Use 3.14.



d = 6 cm

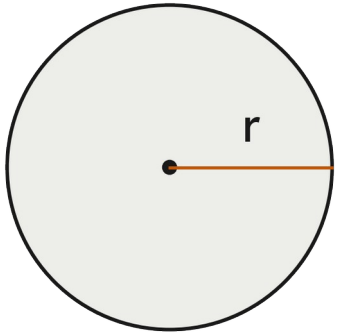
Radius: $6 \div 2 = 3$

$A = 3.14 \times 3^2 = 3.14 \times 9 = 28.26$

Answer: 28.26 cm²

Whiteboards · Question 4 of 9

Find the area. Use 3.14.

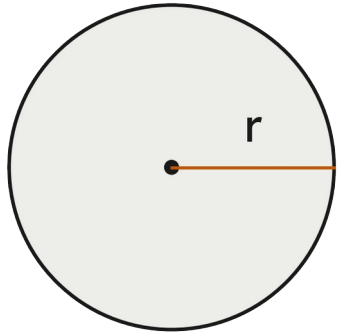


r = 10 cm

Answer it.

Whiteboards · Question 4 of 9

Find the area. Use 3.14.



r = 10 cm

$A = 3.14 \times 10^2 = 3.14 \times 100 = 314$

Board 1 was 78.5: $314 \div 78.5 = 4$

Answer: 314 cm², four times board 1

Whiteboards · Question 5 of 9

A clock face is 20 cm across. It hangs 150 cm above the floor.

Find the area of the clock face. Use 3.14.

Answer it.

Whiteboards · Question 5 of 9

A clock face is 20 cm across. It hangs 150 cm above the floor.

Find the area of the clock face. Use 3.14.

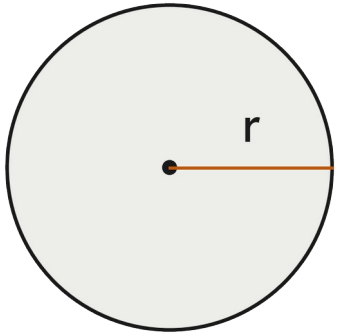
Radius: $20 \div 2 = 10$

$A = 3.14 \times 10^2 = 3.14 \times 100 = 314$

Answer: 314 cm²

Whiteboards · Question 6 of 9

Find the area in terms of π.

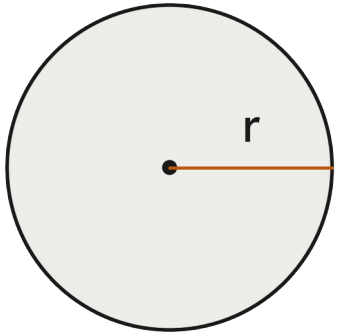


r = 5 cm

Answer it.

Whiteboards · Question 6 of 9

Find the area in terms of π.



r = 5 cm

$5^2 = 25$

$A = \pi \times 5^2 = 25\pi$

Answer: 25π cm²

Whiteboards · Question 7 of 9

A circular pin badge has a radius of 21 mm.

Find the area of the badge. Use 22/7 for π.

A. 1,384.74 mm^2

B. 9,702 mm^2

C. 132 mm

D. 1,386 mm^2

Answer it.

Whiteboards · Question 7 of 9

A circular pin badge has a radius of 21 mm.

Find the area of the badge. Use 22/7 for π.

$$A = \frac{22}{7} \times 21^2 = \frac{22}{7} \times 441 = 1{,}386$$

Answer: D — 1,386 mm²

Whiteboards · Question 8 of 9

A table top 6 ft across needs a cover at $6 per square foot.

What does the cover cost? Use 3.14.

A. $678.24

B. $169.56

C. $216.00

D. $28.26

Answer it.

Whiteboards · Question 8 of 9

A table top 6 ft across needs a cover at $6 per square foot.

What does the cover cost? Use 3.14.

Radius: $6 \div 2 = 3$

Area: $3.14 \times 3^2 = 28.26$

Cost: $28.26 \times 6 = 169.56$

Answer: B — $169.56

Whiteboards · Question 9 of 9

A large pizza is 32 cm across; a small one is 16 cm across. The large costs twice as much.

Is that a fair price?

Write your answer in sentences.

Whiteboards · Question 9 of 9

A large pizza is 32 cm across; a small one is 16 cm across. The large costs twice as much.

Is that a fair price?

Large: $3.14 \times 16^2 = 803.84$

Small: $3.14 \times 8^2 = 200.96$

$803.84 \div 200.96 = 4$

Answer: 803.84 cm² against 200.96 cm²: four times the pizza for twice the price.

Before You Go

A circle is a rectangle π r long and r tall.

Square the radius, then multiply by π.

Given a diameter? Halve it first.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. These skills continue tomorrow: one assignment, due at the start of the class after 4.09.

Today's skills — all required

Area of circles (YA8)