MODULE 12-AREA,SURFACE AREA,AND VOLUME.

LESSON -2-AREA OF CIRCLES

What is the plan?

Monday ,18th

Learning Objective

Students will find the area of circles

I'm finished when...

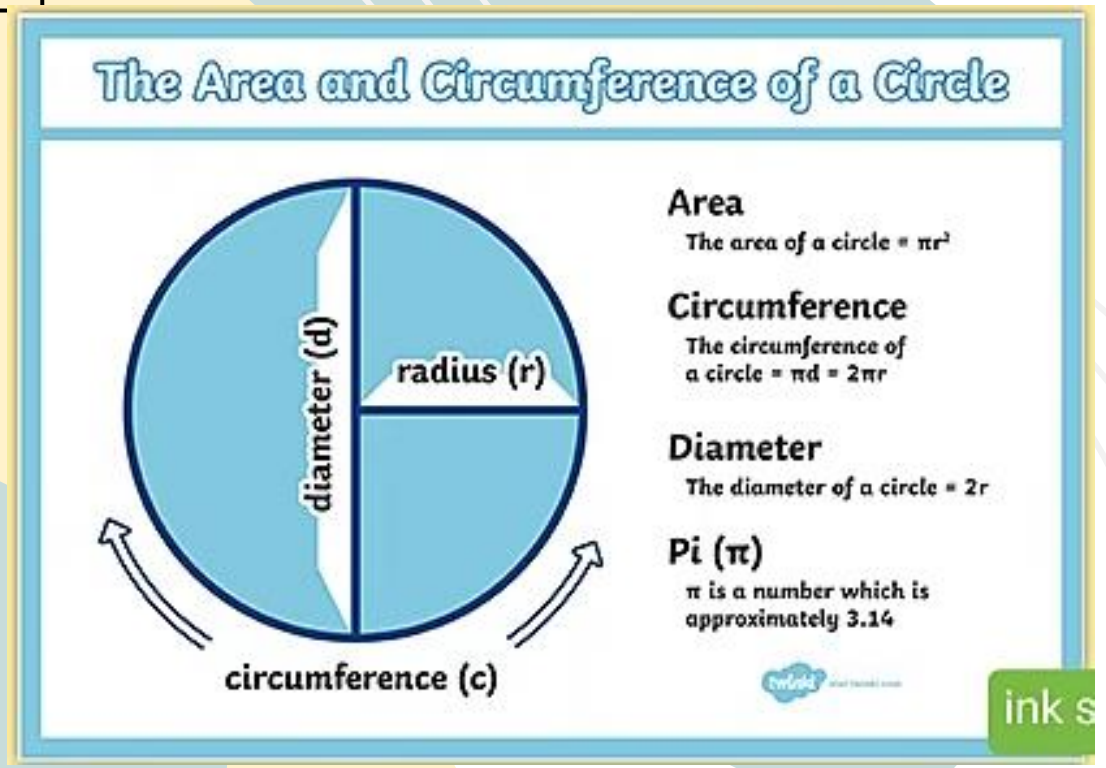
Success Criteria

I can identify relation between radius,diameter,area,and circumference of circle
I can use formula to find area of circles

Vocabulary

Area

Semicircle



Diameter - A chord that pass through the center.

Starter Activity.

Warm Up

Solve each problem.

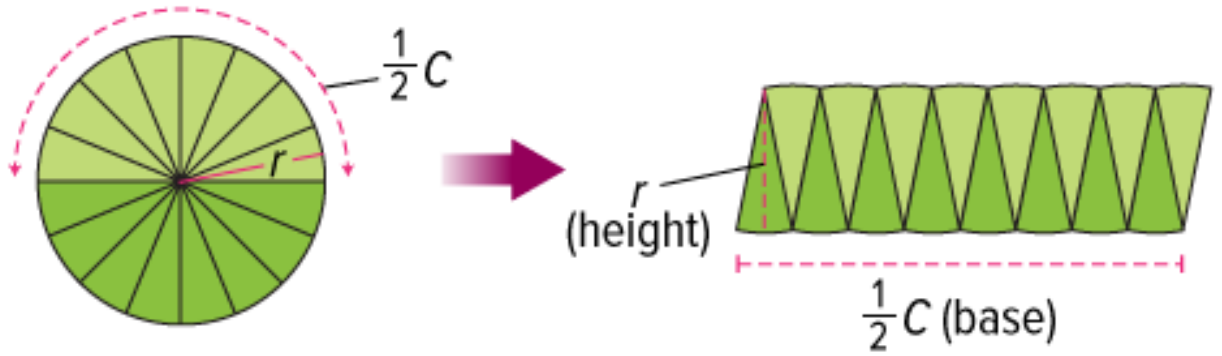
1. For a picnic, George bought 8 packs of 8 hot dog buns. Evaluate 8^2 to find how many buns George bought.

2. The floor of Mrs. Key's classroom has 20 rows of 20 tiles each. Evaluate 20^2 to find the number of tiles in the classroom.

3. The formula for the area of a square is s^2, where s is the length of a side of the square. What is the area of a square with a side length of 9 centimeters?

Learn –Derive the formula for the Area of Circle

When a circle is divided into sections, the sections can be rearranged to form a figure resembling a parallelogram.



Move through the steps to write the formula for the area of a circle based on the formula for the area of a parallelogram

$A = bh$	Area of a parallelogram
$A = br$	Because $h \approx r$, replace h with r.
$A = \left(\frac{1}{2}C\right)r$	Because $b \approx \frac{1}{2}C$, replace b with $\frac{1}{2}C$.
$A = \frac{1}{2}(2\pi r)r$	Because $C = 2\pi r$, replace b with $\frac{1}{2}C$.

Learn-Area of a Circle

- Area is the measure of the interior surface of a two dimensional figure.As with the area of polygons, area of a circle is expressed in square units

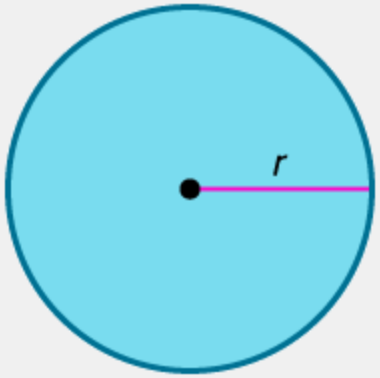
Words

The area A of a circle equals the product of π and the square of its radius, r.

Symbols

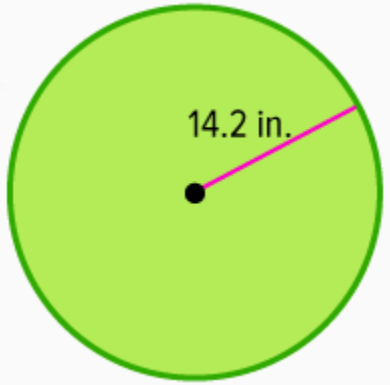
$$A = \pi r^2$$

Model



Example 1 · Find the Area Given the Radius

Find the Area of the circle.Use 3.14 for pi .Round to the nearest hundredth if necessary



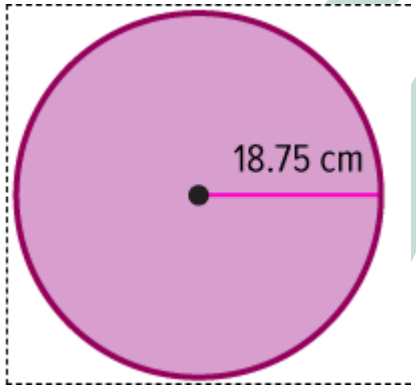
Make an Estimate

A	$=$	πr^2	Area of a circle
A	$=$	$\pi(14.2)^2$	Replace r with 14.2.
A	$=$	201.64π	Simplify. This is the *exact* area.
A	$\approx$	$201.64\,(3.14)$	Replace π with 3.14.
A	$\approx$	633.1496	Simplify. This is the *approximate* area.

So, the approximate area of the circle is ☐ square inches.

Example 1 · Find the Area Given the Radius

Find the area of the circle. Use 3.14 for π. Write your answer as a decimal rounded to the nearest hundredth.



Example 2 · Find the Area Given the Diameter

The city of Wellington is commissioning a statue to honor their former mayor. The circular base of the statue will be 26 feet in diameter.

What is the area of the space needed to fit the base of the statue? Use 3.14 for π. Round to the nearest hundredth if necessary.

Step 1 Find the radius of the circle.

Because the diameter of the base of the statue is 26 feet, the radius of the base is 26 ÷ 2 or ☐ feet.

Step 2 Calculate the area of the circle.

A	$=$	πr^2	Area of a circle
A	$=$	$\pi(13)^2$	Replace r with 13.
A	$=$	169π	Simplify. This is the *exact* area.
A	$\approx$	$169\,(3.14)$	Replace π with 3.14.
A	$\approx$	530.66	Simplify. This is the *approximate* area.

So, the area of the space needed to fit the base of the statue is about ☐ square feet.

Check -Example 2 · Find the Area Given the Diameter

The circular area covered by a lawn sprinkler has a 24.25-foot diameter. What is the area of the space covered by the sprinkler? Use 3.14 for π. Round to the nearest hundredth if necessary

Learn ·Area of Semicircles

A semicircle is half of a circle

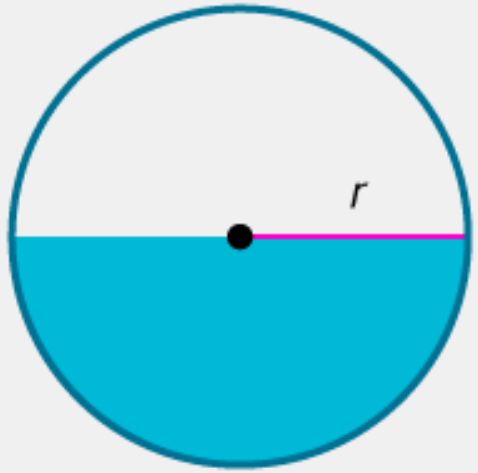
Words

The area A of a semicircle equals half of the product of π and the square of its radius r.

Symbols

$$A = \frac{1}{2}\pi r^2$$

Model



Example 3 ·Find Area of Semicircles

A wireless fence transmitter at the back door of a house allows a dog to roam freely within a semicircle that has a radius of 30 feet.

What is the area of the space the dog has to roam? Use 3.14 for π. Round to the nearest hundredth if necessary.

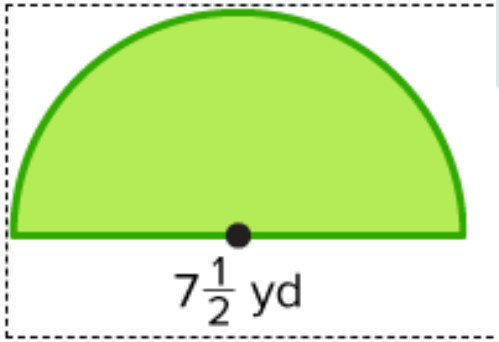
Make an Estimate

A	$=$	$\frac{1}{2}\pi r^2$	Area of a semicircle
A	$=$	$\frac{1}{2}\pi(30)^2$	Replace r with 30.
A	$=$	450π	Simplify. This is the *exact* area.
A	$\approx$	$450\,(3.14)$	Replace π with 3.14.
A	$\approx$	$1{,}413$	Simplify. This is the *approximate* area.

So, the dog has an approximate roaming area of ☐ square feet.

Check-Example 3 ·Find Area of Semicircles

What is the area of the semicircle? Use 3.14 for π. Write your estimate as a decimal rounded to the nearest hundredth.



Learn ·Use Circumference to find Area

Find the Area of a Circle Given Its Circumference

Example 4 ·Use Circumference to find the Area

The exact circumference of a circle is 32 pi inches.What is the approximate area of the circle.Round to the nearest hundredth if necessary?

Step 1 Find the radius.

Use the circumference formula to find the radius of the circle.

C	$=$	$2\pi r$	Circumference of a circle
32π	$=$	$2\pi r$	Replace C with 32π.
$\frac{32\pi}{2\pi}$	$=$	$\frac{2\pi r}{2\pi}$	Division Property of Equality; Divide each side by 2π.
16	$=$	r	Simplify.

The radius of the circle is [ ] inches.

Step 2 Find the area.

The radius of the circle is 16 inches.

A	$=$	πr^2	Area of a circle
A	$\approx$	$3.14 \cdot 16^2$	Replace π with 3.14 and r with 16.
A	$\approx$	803.84	Simplify.

So, the approximate area of the circle is [ ] square inches.

Check Example 4 ·Use Circumference to find the Area

The exact circumference of a circle is 13π feet. What is the approximate area of the circle? Use 3.14 for π. Round to the nearest hundredth.

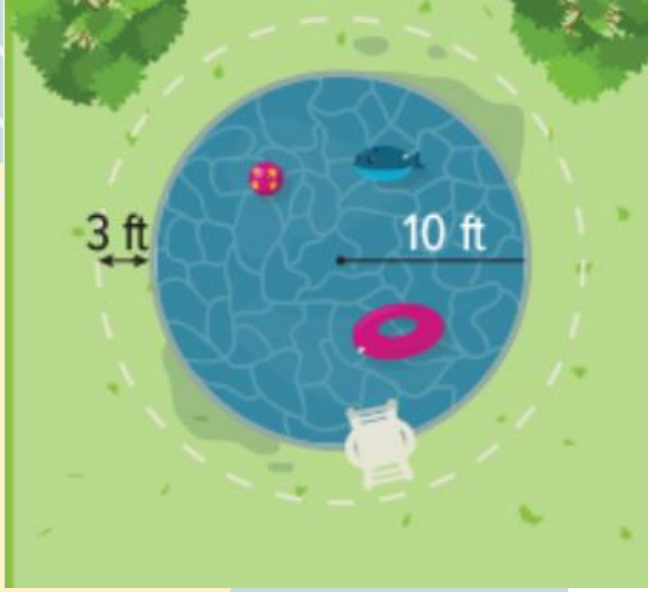
Apply ·Crafting

A square scrapbook page has an area of 144 square inches. Jillian wants to cut the largest circle possible from the page to create a layered background for a new page. What is the approximate area of the paper circle? Use 3.14 for π. Round to the nearest hundredth if necessary.

Check -Apply.

The blackwells have a circular pool with a radius of 10feet.They want to install a 3 foot wide sidewalk around the pool.

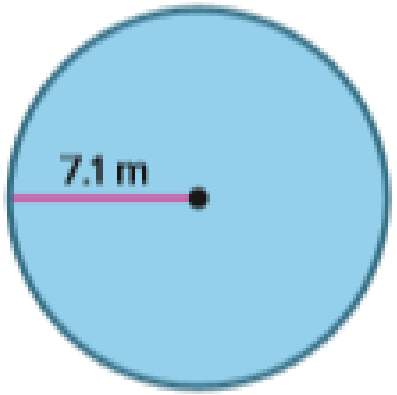
What will be the area of the sidewalk? Use 3.14 for π. Round to the nearest hundredth if necessary.



Thank you!

Exercise 1

Find the area of the circle. Use 3.14 for π. Round to the nearest hundredth if necessary.



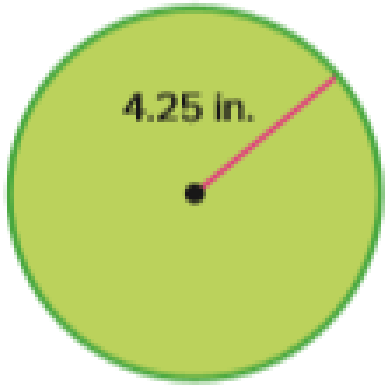
SOLUTION:

$A = \pi r^2$	Area of a circle
$A = \pi(7.1)^2$	Replace r with 7.1.
$A = 50.41\pi$	Simplify. This is the exact area.
$A \approx 50.41(3.14)$	Replace π with 3.14.
$A \approx 158.29$	Simplify. This is the approximate area.

So, the approximate area of the circle is 158.29 square meters.

Exercise 2

Find the area of the circle. Use 3.14 for π. Round to the nearest hundredth if necessary.



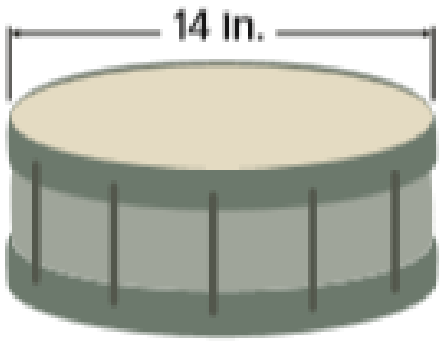
SOLUTION:

$A = \pi r^2$	Area of a circle
$A = \pi(4.25)^2$	Replace r with 4.25.
$A = 18.0625\pi$	Simplify. This is the exact area.
$A \approx 18.0625(3.14)$	Replace π with 3.14.
$A \approx 56.72$	Simplify. This is the approximate area.

So, the approximate area of the circle is 56.72 square inches.

Exercise 3

What is the area of the drumhead on the drum? Use 3.14 for π. Round to the nearest hundredth if necessary.



SOLUTION:

$A = \pi r^2$	Area of a circle
$A = \pi(7)^2$	Replace r with 7.
$A = 49\pi$	Simplify. This is the exact area.
$A \approx 49(3.14)$	Replace π with 3.14.
$A \approx 153.86$	Simplify. This is the approximate area.

So, the approximate area of the drumhead is 153.86 square inches.

Exercise 4

What is the area of one side of the penny? Use 3.14 for π. Round to the nearest hundredth if necessary.

SOLUTION:

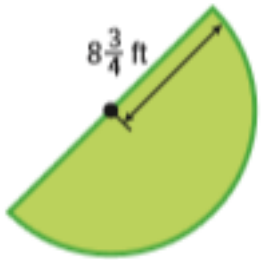
The radius is 19 ÷ 2 or 9.5 millimeters.

$A = \pi r^2$	Area of a circle
$A = \pi(9.5)^2$	Replace r with 9.5.
$A = 90.25\pi$	Simplify. This is the exact area.
$A \approx 90.25(3.14)$	Replace π with 3.14.
$A \approx 283.39$	Simplify. This is the approximate area.

So, the approximate area of the penny is about 283.39 square millimeters.

Exercise 5

Mr. Ling is adding a pond in the shape of a semicircle in his backyard. What is the area of the pond? Use 3.14 for π. Round to the nearest hundredth if necessary.



SOLUTION:

The radius is 19 ÷ 2 or 9.5 millimeters.

$A = \frac{1}{2}\pi r^2$ Area of a semicircle

$A = \frac{1}{2}\pi(8.75)^2$ Replace r with $8\frac{3}{4}$ or 8.75.

$A = 38.28125\pi$ Simplify. This is the exact area.

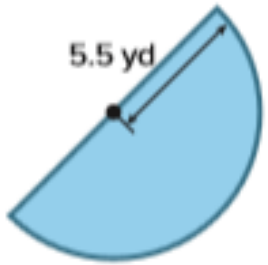
$A \approx 38.28125(3.14)$ Replace π with 3.14.

$A \approx 120.20$ Simplify. This is the approximate area.

So, the approximate area of the semicircle is 120.20 square feet.

Exercise 6

Vidur needs to buy mulch for his garden. What is the area of his garden? Use 3.14 for π. Round to the nearest hundredth if necessary.



SOLUTION:

$A = \frac{1}{2}\pi r^2$ Area of a semicircle

$A = \frac{1}{2}\pi(5.5)^2$ Replace r with 5.5.

$A = 15.125\pi$ Simplify. This is the exact area.

$A \approx 15.125(3.14)$ Replace π with 3.14.

$A \approx 47.49$ Simplify. This is the approximate area.

So, the approximate area of the semicircle is 47.49 square yards.

Exercise 7

The exact circumference of a circle is 18π inches. What is the approximate area of the circle? Use 3.14 for π. Round to the nearest hundredth if necessary.

SOLUTION:

Step 1: Use the circumference formula to find the radius of the circle.

$C = 2\pi r$ Circumference of a circle

$18\pi = 2\pi r$ Replace C with 18π.

$\frac{18\pi}{2\pi} = \frac{2\pi r}{2\pi}$ Division Property of Equality

$9 = r$ Simplify.

Step 2: Find the area.

$A = \pi r^2$ Area of a circle

$A = \pi(9)^2$ Replace r with 9.

$A = 81\pi$ Simplify. This is the exact area.

$A \approx 81(3.14)$ Replace π with 3.14.

$A \approx 254.34$ Simplify. This is the approximate area.

So, the approximate area of the circle is 254.34 square inches.

Exercise 8

Open Response The exact circumference of a circle is 34π meters. What is the approximate area of the circle? Use 3.14 for π. Round to the nearest hundredth if necessary.

SOLUTION:

Step 1: Use the circumference formula to find the radius of the circle.

$C = 2\pi r$	Circumference of a circle
$34\pi = 2\pi r$	Replace C with 34π.
$\frac{34\pi}{2\pi} = \frac{2\pi r}{2\pi}$	Division Property of Equality
$17 = r$	Simplify.

Step 2: Find the area.

$A = \pi r^2$	Area of a circle
$A = \pi(17)^2$	Replace r with 17.
$A = 289\pi$	Simplify. This is the exact area.
$A \approx 289(3.14)$	Replace π with 3.14.
$A \approx 907.46$	Simplify. This is the approximate area.

So, the approximate area of the circle is 907.46 square meters.

Exercise 9

Tye has a square piece of yellow felt that has an area of 81 square inches. She wants to cut the largest circle possible from the material to create a sun for her art project. What is the area of the felt circle? Use 3.14 for π. Round to the nearest hundredth if necessary.

SOLUTION:

The side length of the square is equal to the diameter of the circle. Find the side length of the square.

$A = s^2$	Area of square
$81 = s^2$	Replace A with 81.
$9 = s$	Positive square root

The diameter is 9 inches, so the radius is 9 ÷ 2 or 4.5 inches.

Find the area.

$A = \pi r^2$	Area of a circle
$A = \pi(4.5)^2$	Replace r with 4.5.
$A = 20.25\pi$	Simplify. This is the exact area.
$A \approx 20.25(3.14)$	Replace π with 3.14.
$A \approx 63.59$	Simplify. This is the approximate area.

So, the approximate area of the sun is 63.59 square inches.

Exercise 10

Tarek has 72 feet of plastic fencing to make a flower garden in his backyard. The garden shape can either be circular or square. If he uses all of the fencing, what is the difference between the area of the circular garden and the square garden? Use 3.14 for π. Round to the nearest hundredth if necessary.

SOLUTION:

If the garden is a square, the side length is 72 feet ÷ 4 or 18 feet. Find the area of the square garden.

$A = s^2$ Area of square

$A = (18)^2$ Replace s with 18.

$A = 324$ Simplify.

The area of the square garden is 324 square feet.

Use the circumference formula to find the radius of the circular garden.

$C = 2\pi r$ Circumference of a circle

$72 = 2(3.14)r$ Replace C with 72 and π with 3.14.

$\frac{72}{2(3.14)} = \frac{2(3.14)r}{2(3.14}$ Division Property of Equality

$11.464968... = r$ Simplify.

Find the area.

$A = \pi r^2$ Area of a circle

$A = \pi(11.464968)^2$ Replace r with 11.464968.

$A = 131.445...\pi$ Simplify. This is the exact area.

$A \approx 131.445...(3.14)$ Replace π with 3.14.

$A \approx 412.74$ Simplify. This is the approximate area.

So, the approximate area of the circular garden is 412.74 square feet.

The difference between the area of the circular garden and the square garden is 412.74 – 324 or 88.74 square feet.

Exercise 11

Reason Inductively Explain how you could find the area of the three-quarter circle shown. Then write a formula that could be used to find the area of the three-quarter circle and use the formula to find the area of the figure. Use 3.14 for π.

SOLUTION:

Sample answer: To find the area, multiply the area of the entire circle by $\frac{3}{4}$.

$$A = \frac{3}{4}\pi r^2$$

$$= \frac{3}{4}\pi(6)^2 \qquad \text{Replace } r \text{ with 6.}$$

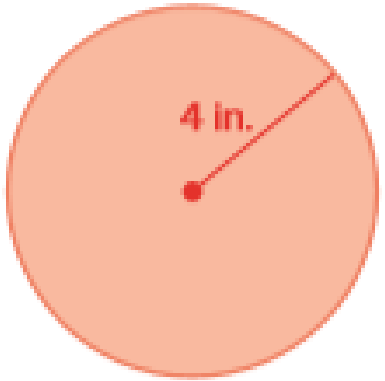
$$= 84.78 \text{ cm}^2 \qquad \text{Multiply.}$$

Exercise 12

Draw and label a circle with an area between 50 and 60 square inches.

SOLUTION:

Sample answer:

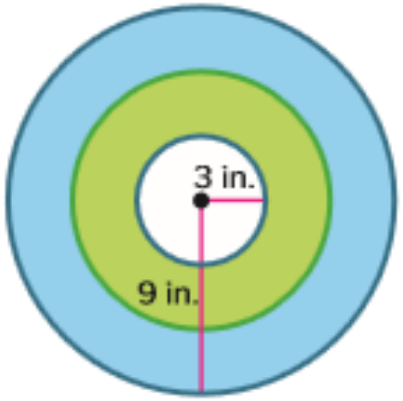


$A = \pi r^2$	Area of a circle
$A = \pi(4)^2$	Replace r with 4.
$A = 3.14(4)^2$	Replace π with 3.14.
$A \approx 50.24$	Multiply.

50.24 in^2 is greater than 50 in^2 and less than 60 in^2.

Exercise 13

Persevere with Problems The bullseye on an archery target has a radius of 3 inches. The entire target has a radius of 9 inches. To the nearest hundredth, find the area of the target outside of the bullseye. Use 3.14 for π.



SOLUTION:

Sample method: To find the area of the green circle, subtract the area of the white circle from the area of the blue circle.

Area of white circle = $\pi(3)^2$ or 28.26 in^2

Area of blue circle = $\pi(9)^2$ or 254.34 in^2

So, the area of the green circle is 254.34 − 28.26 or 226.08 in^2

Exercise 14

Justify Conclusions Determine if the following statement is *true* or *false*. Support your answer with an example or counterexample.

If the length of a radius is doubled, the area of the circle is also doubled.

SOLUTION:

The area is not doubled, but it is 4 times as great. For example, if the radius is 2 units, then the area is $2 \times 2 \times 3$ or about 12 square units. If the radius is doubled to 4, then the area is $4 \times 4 \times 3$ or about 48 square units.$12 \times 4 = 48$. So, the statement is false.