Warm Up

Simplify.

1. 8^2 64

2. 12^2 144

3. 6.2^2 38.44

4. 7.5^2 56.25

Perimeter, Circumference, and Area

7th Grade Book

12-1 and 12-2

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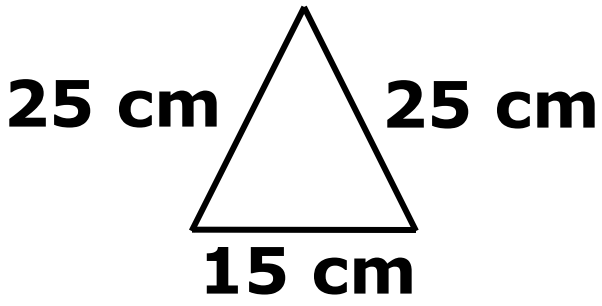
Perimeter is the distance around a geometric figure. To find the perimeter *P* of a polygon, you can add the lengths of its sides.

Additional Example 1: Finding the Perimeter of a Polygon

Find the perimeter.



$P = 25 + 25 + 15$ *Use the side lengths.*

$P = 65$ *Add.*

The perimeter of the triangle is 65 cm.

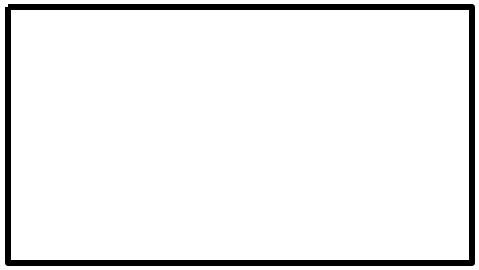
PERIMETER OF A RECTANGLE

The perimeter P of a rectangle is the sum of twice its length ℓ and twice its width w.

$$P = 2\ell + 2w$$

Additional Example 2: Using Properties of a Rectangle to Find Perimeter

Find the perimeter of a rectangle.



$P = 2l + 2w$	*Use the formula.*
$P = (2 \cdot 18) + (2 \cdot 14)$	*Substitute for l and w.*
$P = 36 + 28$	*Multiply.*
$P = 64$	*Add.*

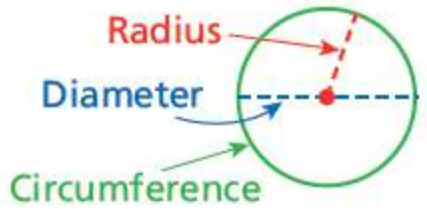
The perimeter of the rectangle is 64 ft.

The distance around a circle is called **circumference**. For every circle, the ratio of circumference *C* to diameter *d* is the same. This ratio, $\frac{C}{d}$, is represented by the Greek letter π, called ***pi***. *Pi* is approximately equal to 3.14 or $\frac{22}{7}$. By solving the equation $\frac{C}{d} = \pi$ for *C*, you get the formula for circumference.

CIRCUMFERENCE OF A CIRCLE

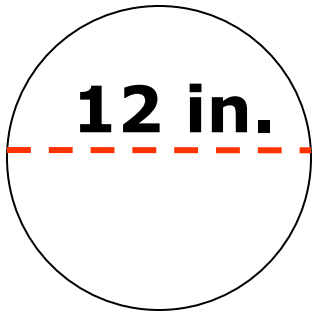
The circumference C of a circle is π times the diameter d, or 2π times the radius r.

$$C = \pi d$$
or
$$C = 2\pi r$$



Additional Example 3A: Finding the Circumference of a Circle

Find the circumference of the circle to the nearest tenth. Use 3.14 for π.



$C = \pi d$ *You know the diameter.*

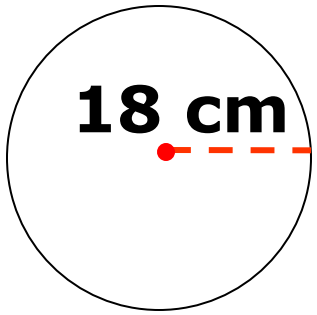
$C \approx 3.14 \cdot 12$ *Substitute for π and d.*

$C \approx 37.68$ *Multiply.*

The circumference of the circle is about 37.7 in.

Additional Example 3B: Finding the Circumference of a Circle

Find the circumference of the circle to the nearest tenth. Use 3.14 for π.



$C = 2\pi r$ *You know the radius.*

$C \approx 2 \cdot 3.14 \cdot 18$ *Substitute for π and r.*

$C \approx 113.04$ *Multiply.*

The circumference of the circle is about 113.0 cm.

Helpful Hint

If the diameter or radius of a circle is a multiple of 7, use $\frac{22}{7}$ for π.

Additional Example 4: *Application*

The diameter of a circular pond is 42 m. What is its circumference? Use $\frac{22}{7}$ for π.

$C = \pi d$ — *You know the diameter.*

$C \approx \frac{22}{7} \cdot 42$ — *Substitute $\frac{22}{7}$ for π and 42 for d.*

$C \approx \frac{22}{7} \cdot \frac{42}{1}$ — *Write 42 as a fraction.*

$C \approx \frac{22}{\cancel{7}_{1}} \cdot \frac{\cancel{42}^{6}}{1}$ — *Simplify.*

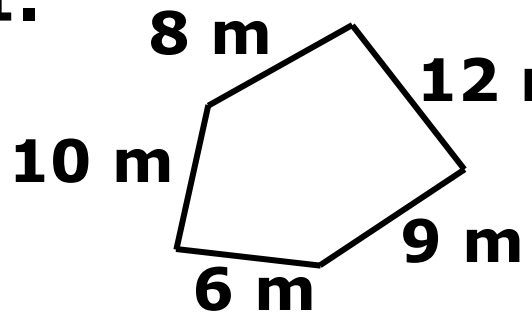
$C \approx 132$ — *Multiply.*

The circumference of the pond is about 132 m.

Lesson Quiz

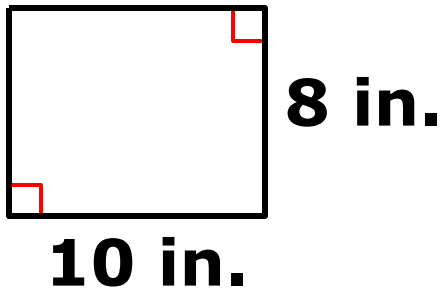
Find the perimeter.

1.



45 m

2.

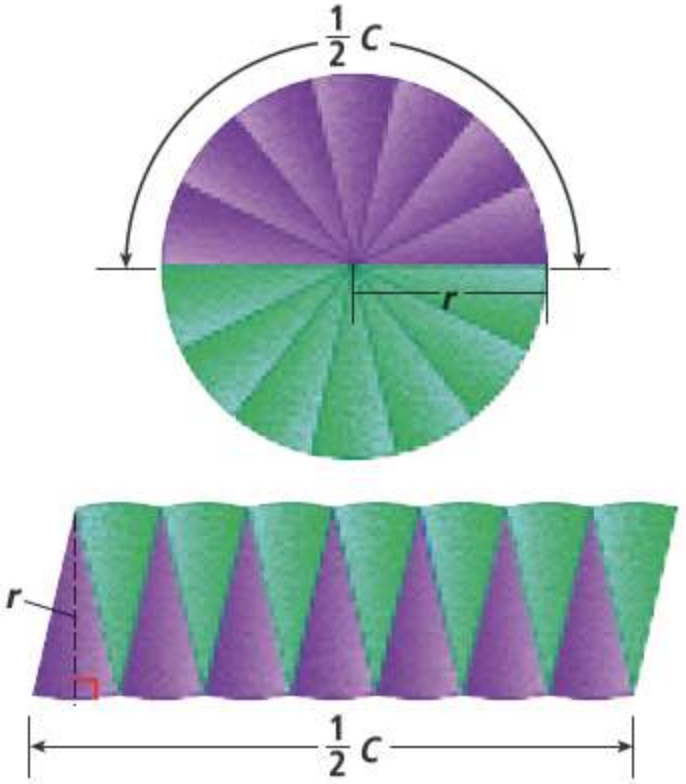


36 in.

3. What is the circumference of a circle with a a radius of 8 inches? Use 3.14 for π. 50.24 in.

4. If a guardrail is to be placed around the edge of a circular swimming pool with a diameter of 21 ft, how many feet of railing will be needed? Use $\frac{22}{7}$ for π. 66 ft

A circle can be cut into equal-sized sectors and arranged to resemble a parallelogram. The height h of the parallelogram is equal to the radius r of the circle, and the base b of the parallelogram is equal to one-half the circumference C of the circle.

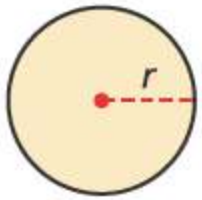


So the area of the parallelogram can be written as

$$A = bh, \text{ or } A = \frac{1}{2}Cr.$$

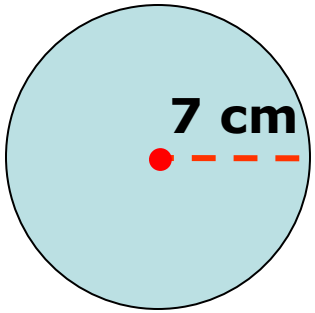
$$\text{Since } C = 2\pi r,\ A = \frac{1}{2}(2\pi r)r = \pi r^2.$$

AREA OF A CIRCLE

The area A of a circle is the product of π and the square of the circle's radius r.	$A = \pi r^2$	

Additional Example 1A: Finding the Area of a Circle

Find the area of the circle to the nearest tenth. Use 3.14 for π.



$A = \pi r^2$ *Use the formula.*

$A \approx 3.14 \cdot 7^2$ *Substitute 7 for r.*

$A \approx 3.14 \cdot 49$ *Evaluate the power.*

$A \approx 153.86$ *Multiply.*

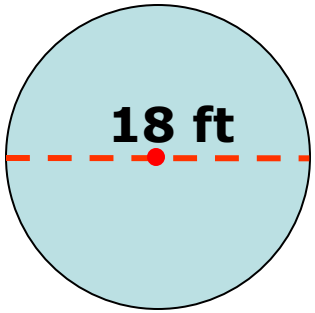
The area of the circle is about 153.9 cm^2.

Remember!

The order of operations calls for evaluating the exponents before multiplying.

Additional Example 1B: Finding the Area of a Circle

Find the area of the circle to the nearest tenth. Use 3.14 for π.



$A = \pi r^2$ *Use the formula.*

$A \approx 3.14 \cdot 9^2$ *Substitute 9 for r.*

$A \approx 3.14 \cdot 81$ *Evaluate the power.*

$A \approx 254.34$ *Multiply.*

The area of the circle is about 254.3 ft^2.

Additional Example 2: *Application*

Park employees are fitting a top over a circular drain in the park. If the radius of the drain is 14 inches, what is the area of the top that will cover the drain? Use $\frac{22}{7}$ for π.

$A = \pi r^2$ *Use the formula for the area of a circle.*

$A \approx \frac{22}{7} \cdot 14^2$ *Substitute. Use 14 for r.*

$A \approx \frac{22}{\cancel{7}_{1}} \cdot \cancel{196}^{28}$ *Evaluate the power.*

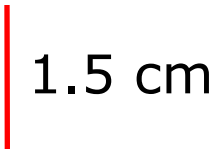
$A \approx 22 \cdot 28$

$A \approx 616$ *Multiply.*

The area of the top that will cover the drain is about 616 in^2.

Additional Example 3: Application

Find the area of the shaded region of the circle. Use 3.14 for π. Round your answer to the nearest tenth.



The measurement of the radius of the circle is 1.5 cm.

Now find the area of the entire circle.

$A = \pi r^2$	*Use the formula for the area of a circle.*
$A = 3.14 \cdot 1.5^2$	*Substitute. Use 1.5 for r.*
$A \approx 3.14 \cdot 2.25$	*Evaluate the power.*
$A \approx 7.07$	*Multiply.*

Additional Example 3 Continued

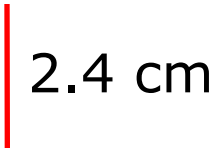
Find the area of the shaded region of the circle. Use 3.14 for π. Round your answer to the nearest tenth.

Since $\frac{1}{2}$ of the circle is shaded, divide the area of the circle by 2. 7.07 ÷ 2 = 3.535.

The area of the shaded region of the circle is about 3.5 cm^2.

Check It Out: Example 3

Find the area of the shaded region of the circle. Use 3.14 for π. Round your answer to the nearest tenth.



The measurement of the radius of the circle is 2.4 cm.

Now find the area of the entire circle.

$A = \pi r^2$	*Use the formula for the area of a circle.*
$A = 3.14 \cdot 2.4^2$	*Substitute. Use 2.4 for r.*
$A \approx 3.14 \cdot 5.76$	*Evaluate the power.*
$A \approx 18.09$	*Multiply.*

Check It Out: Example 3 Continued

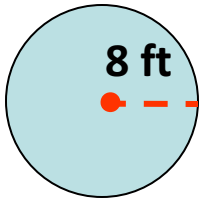
Find the area of the shaded region of the circle. Use 3.14 for π. Round your answer to the nearest tenth.

Since $\frac{3}{4}$ of the circle is shaded, divide the area of the circle by 4 and subtract the answer from the entire area.
18.0864 ÷ 4 = 4.52. 18.0864 – 4.52 = 13.56.

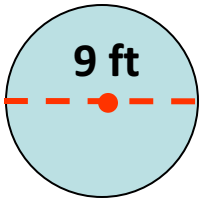
The area of the shaded region of the circle is about 13.56 cm^2.

Lesson Quiz

Find the area of each circle, to the nearest tenth. Use 3.14 for π.

1. 

201.0 ft^2

2. 

63.6 ft^2

3. The bull's-eye on a target has a diameter of 2 in. What is the area of the bull's-eye to the nearest tenth? Use 3.14 for π. 3.1 in^2

4. A round table cloth has a radius of 36 in. What is the area of the table cloth? Use 3.14 for π. Round your answer to the nearest tenth.

4,069.4 in^2