Circumference of Circles

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7.7 Circumference of Circles

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[Figure 1]

Thomas is practicing throwing an old discus ring he found in the attic. After an exhausting afternoon, Thomas sits with the discus ring and starts to examine it. He uses a ruler to measure the radius, which is 11 cm. He also finds a way to measure the diameter of the circle he marked out to throw the discus into – it's 2.5 m across. Now that he has this information about both circles, how can Thomas figure out the circumference of each?

In this concept, you will learn to find the diameter, radius and circumference of circles.

Circumference

Circles are unique geometric figures. A **circle** is the set of points that are equidistant from a center point. The **radius** of a circle is the distance from the center to any point on the circle. The **diameter** is the distance across the circle through the center. The diameter is always twice as long as the radius.

You also use the special number pi (π) when dealing with circle calculations. Pi is a decimal that is infinitely long $(3.14159265\ldots)$, but in your calculations you round it to 3.14. Pi is

the ratio of the circumference, or distance around a circle, to the diameter.

Circles are special in geometry because this ratio of the circumference and the diameter always stays the same. In other words, these two measurements are related. If you change the diameter, the circumference changes proportionally. For example, if you double the length of the diameter, the circumference doubles also.

Look at the circles below. Find the ratio of the circumference to the diameter for both circles. What do you notice?
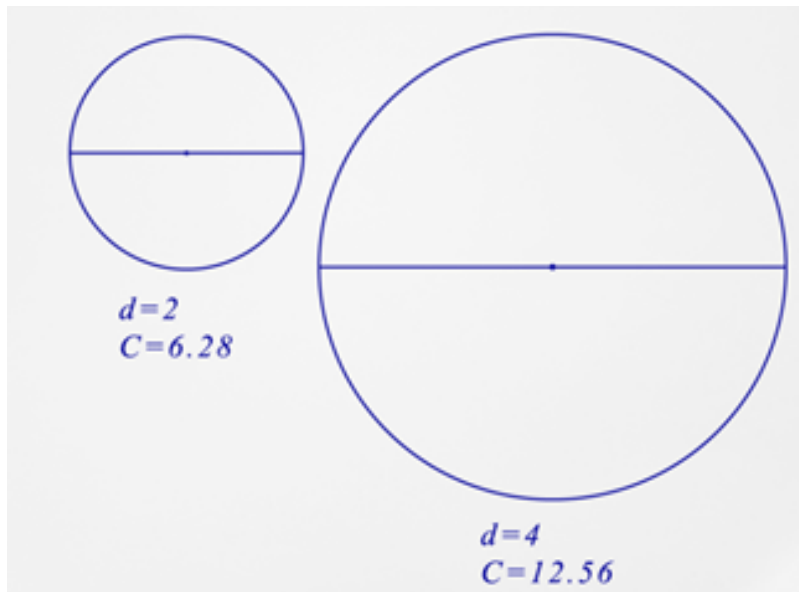
[Figure 2]

Large Circle

$$\frac{\text{circumference}}{\text{diameter}} = \frac{12.56}{4}$$
$$\frac{\text{circumference}}{\text{diameter}} = 3.14$$

Small Circle

$$\frac{\text{circumference}}{\text{diameter}} = \frac{6.28}{2}$$
$$\frac{\text{circumference}}{\text{diameter}} = 3.14$$

Notice, when you divide the circumference of a circle by its diameter, no matter how big or small the circle is, you will always get the same number. Whenever you divide the circumference by the diameter, you will always get 3.14, pi .

The circumference of a circle can be found using the formula: $C = \pi d$. Since the diameter (d) is twice the radius (r), you can also use the formula: $C = 2\pi r$

Let's look at an example.

What is the circumference of a circle that has a diameter of 3 inches?

First, substitute what you know into the formula for circumference.

$$
\begin{aligned}
C &= \pi d \\
C &= \pi \times 3
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= \pi \times 3 \\
C &= 9.42
\end{aligned}
$$

The answer is 9.42.

The circumference is 9.42 inches.

Examples

Example 1

Earlier, you were given a problem about Thomas and his discus.

The discus ring has a radius of 11 cm. The throwing area has a diameter of 2.5 m.

First, substitute what you know into the formula for circumference to find the circumference of the discus.

$$
\begin{aligned}
C &= 2\pi r \\
C &= 2\pi \times 11
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= 2\pi \times 11 \\
C &= 69.12
\end{aligned}
$$

The answer is 69.12.

The circumference of the discus is 69.1 cm.

Then, substitute what you know into the formula for circumference to find the circumference of the discus throwing area.

$$
\begin{aligned}
C &= \pi d \\
C &= \pi \times 2.5
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= \pi \times 2.5 \\
C &= 7.85
\end{aligned}
$$

The answer is 7.85.

The circumference of the throwing circle for the discus is 7.85 meters.

Example 2

What is the circumference of a circle if the radius is 2.5 feet?

First, substitute what you know into the formula for circumference.

$$
\begin{aligned}
C &= 2\pi r \\
C &= 2\pi \times 2.5
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= 2\pi \times 2.5 \\
C &= 15.71
\end{aligned}
$$

The answer is 15.71.

The circumference is 15.7 feet.

Example 3

Find the circumference of each circle given the diameter is 6 inches.

First, substitute what you know into the formula for circumference.

$$
\begin{aligned}
C &= \pi d \\
C &= \pi \times 6
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= \pi \times 6 \\
C &= 18.85
\end{aligned}
$$

The answer is 18.85.

The circumference is 18.85 inches.

Example 4

Find the circumference of each circle given the radius is 4.5 feet.

First, substitute what you know into the formula for circumference.

$$
\begin{aligned}
C &= 2\pi r \\
C &= 2\pi \times 4.5
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= 2\pi \times 4.5 \\
C &= 28.27
\end{aligned}
$$

The answer is 28.27.

The circumference is 28.27 feet.

Example 5

Find the circumference of each circle given the diameter is 3.5 meters.

First, substitute what you know into the formula for circumference.

$$
\begin{aligned}
C &= \pi d \\
C &= \pi \times 3.5
\end{aligned}
$$

Next, solve for the circumference.

$$
\begin{aligned}
C &= \pi \times 3.5 \\
C &= 11.0
\end{aligned}
$$

The answer is 11.0.

The circumference is 11.0 meters.

Review

Find the circumference of each circle given the radius or diameter. Use 3.14 to approximate π.

1. $d = 10 \ in$

2. $d = 5 \ in$

3. $d = 7 \ ft$

4. $d = 12 \ mm$

5. $d = 14 \ cm$

6. $r = 4 \ in$

7. $r = 6 \ \text{meters}$

8. $r = 8 \ ft.$

9. $r = 11 \ in$

10. $r = 15 \ cm$

Find the diameter given each circumference. Use 3.14 to approximate π.

11. $53.38 \ \text{inches}$

12. $43.96 \ \text{feet}$

13. $56.52 \ \text{inches}$

14. 65.94 meters

15. 48.67 meters

16. 37.68 feet

17. 78.5 meters

18. $100.48\ cm$

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

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