Circumference of a circle

Remember that the radius of a circle is the length of any line segment from the center of the circle to a point on the circle, and that the diameter is the length of any chord that passes through the center of the circle.

A diameter of a circle is always made of two radii, so $d = 2r$, where d is the diameter and r is the radius. And π is a special number, $\pi \approx 3.14$, that describes the relationship between a circle's circumference and the its diameter.

Circumference of a circle

The circumference of a circle, which we'll call C, is the distance around the circle (its perimeter). We can also think of the circumference as the length of the circle. The circumference can be expressed in terms of the radius or in terms of the diameter:

$$C = 2\pi r$$

$$C = \pi d$$

Let's start by working through an example.

Example

What is the circumference of a circle with a diameter of 10 in?

The formula for the circumference of a circle when we know the circle's diameter is $C = \pi d$. We know the diameter of this circle is 10 inches, so when we plug this into the formula we get

$$C = \pi(10 \text{ in})$$

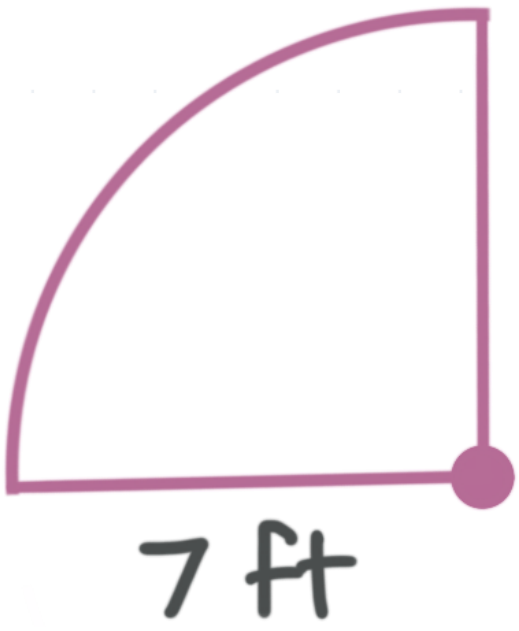
$$C \approx 3.14(10 \text{ in})$$

$$C \approx 31.4 \text{ in}$$

Sometimes you could be asked to find the length of part of a circle.

Example

To the nearest hundredth, what is the length of this quarter-circle (one-fourth of a circle)?



The formula for circumference when you know the radius is $C = 2\pi r$, and we know the radius is 7 feet, so the circumference is

$$C = 2\pi(7 \text{ ft})$$

$$C = 14\pi \text{ ft}$$

We need to divide the circumference by 4 to find the length of the quarter-circle.

$$\text{length of quarter-circle} = \frac{C}{4} = \frac{14\pi \text{ ft}}{4} = 3.5\pi \text{ ft}$$

Notice that if we had been asked to find the perimeter of the figure, we would have needed to add the lengths of the two radii shown in the figure to the length of the quarter-circle. The perimeter would be

$$P = (3.5\pi \text{ ft}) + (7 \text{ ft}) + (7 \text{ ft})$$

$$P \approx 3.5(3.14) \text{ ft} + 14 \text{ ft}$$

$$P \approx 10.99 \text{ ft} + 14 \text{ ft}$$

$$P \approx 24.99 \text{ ft}$$