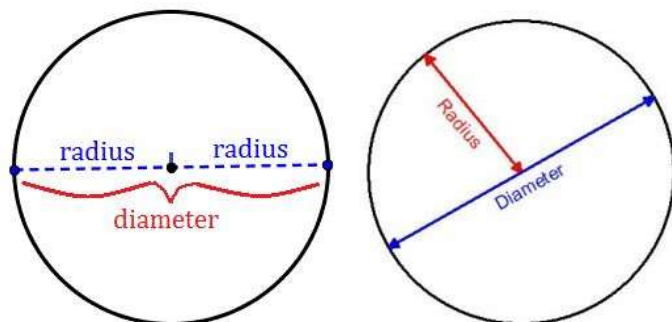


Lesson 6.5 – The Circumference/Diameter Ratio

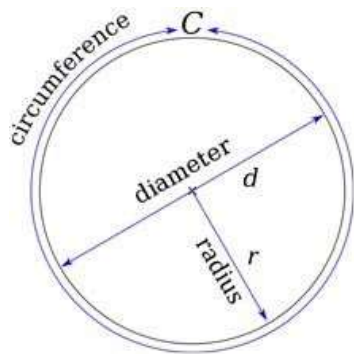
**Remember that a diameter is the chord of the circle that passes through the center, and the radius of the circle is the distance from the center of the circle to the circle.



This means that $d = 2r$ and $r = \frac{d}{2}$.

The distance around a circle is called the **circumference**.

Circumference Conjecture - If C is the circumference and d is the diameter of a circle, then there is a number π such that $C = \pi d$. If $d = 2r$ where r is the radius, then $C = 2\pi r$.



Example 1: Find exact circumference given diameter

What is the circumference of a circle whose diameter is 60 cm?

$$C = \pi d$$

$$d = 60$$

$$C = \pi(60)$$

$$C = 60\pi$$

**We can switch the order of multiplication

$$C = \mathbf{60\pi \text{ cm}}$$

**We are looking for exact circumference so we leave this in terms of π .

Example 2: Find exact circumference given radius

If $r = 10.5$ cm, find C .

We know that the diameter of a circle is twice as long as the radius. So, $d = 2(10.5) = 21$

$$C = \pi d$$

$$d = 21$$

$$C = \pi(21)$$

$$C = \mathbf{21\pi \text{ cm}}$$
 **We are looking for exact circumference so we leave this in terms of π .

Example 3: Find diameter of a circle whose exact circumference is given

What is the diameter of a circle whose circumference is 24π cm?

$$C = \pi d$$

$$C = 24\pi$$

$$24\pi = \pi d$$
 **To get diameter by itself, we need to divide π from each side.

$$\frac{24\pi}{\pi} = \frac{\pi d}{\pi}$$

$$24 = d$$
 **Since there was a π on each side, it cancels out.

$$d = \mathbf{24 \text{ cm}}$$

Example 4: Find radius of a circle whose exact circumference is given

If $C = 25\pi$ cm, find r .

$$C = \pi d$$

$$C = 25\pi$$

$$25\pi = \pi d$$
 **To get diameter by itself, we need to divide π from each side.

$$\frac{25\pi}{\pi} = \frac{\pi d}{\pi}$$

$$25 = d$$
 **Since there was a π on each side, it cancels out.

$$r = \frac{d}{2} = \frac{25}{2} = 12.5$$
 **Radius is half the length of the diameter

$$r = \mathbf{12.5 \text{ cm}}$$

Example 5: Find approximate circumference given diameter

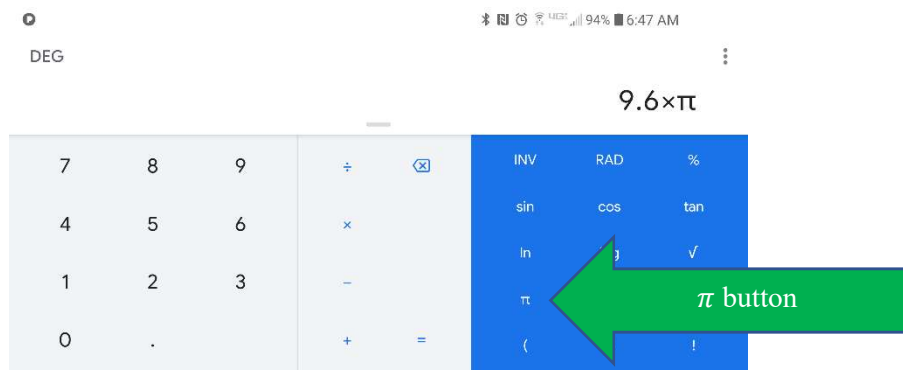
If $d = 9.6$ cm, find C .

$$C = \pi d$$

$$d = 9.6$$

$$C = \pi(9.6)$$

$C \approx 30.159289 \dots$ **We are approximating, so we multiply $9.6 \cdot \pi$ in our calculator.



$C \approx 30.2$ cm **We had to round to find approximate circumference so we use \approx instead of $=$.

Example 6: Find approximate circumference given radius

If $r = 1.2$ cm, find C .

We know that the diameter of a circle is twice as long as the radius. So, $d = 2(1.2) = 2.4$

$$C = \pi d$$

$$d = 2.4$$

$$C = \pi(2.4)$$

$C \approx 7.5398223 \dots$ **We are approximating, so we multiply $2.4 \cdot \pi$ in our calculator.

$C \approx 7.5$ cm **We had to round to find approximate circumference so we use \approx instead of $=$.

Example 7: Find approximate diameter and radius given circumference

If $C = 132$ cm, find d and r .

$$C = \pi d$$

$$C = 132$$

$$132 = \pi d \quad \text{**To get diameter by itself, we need to divide } \pi \text{ from each side.}$$

$$\frac{132}{\pi} = \frac{\pi d}{\pi}$$

$$42.0169049 \dots \approx d \quad \text{**Since there was not a } \pi \text{ with the 132, we must divide } 132/\pi \text{ in our calculator.}$$

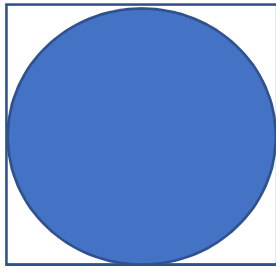
$$d \approx \mathbf{42.0 \text{ cm}} \quad \text{**We had to round to find approximate diameter so we use } \approx \text{ instead of } =.$$

$$r = \frac{d}{2} \approx \frac{42.0}{2} \approx 21.0 \quad \text{**Radius is half the length of the diameter}$$

$$r = \mathbf{21.0 \text{ cm}}$$

Example 8: Circumference of a circle inscribed in a square

A dinner plate fits snugly in a square box with perimeter 48 inches. What is the circumference of the plate?



If we think about the square box, with perimeter of 48 inches, we know that all sides of the square are congruent. So, to find each side, we can take the perimeter of 48 and divide it by the four sides.

$$\frac{48}{4} = 12 \text{ inches}$$

Each side of the square is 12 inches. This means that the diameter of the circle is also 12 inches.

$$C = \pi d$$

$$d = 12$$

$$C = \pi(12)$$

$$C \approx 37.6991118 \dots \quad \text{**We are approximating, so we multiply } 12 \cdot \pi \text{ in our calculator.}$$

$$C \approx \mathbf{37.7 \text{ in}} \quad \text{**We had to round to find approximate circumference so we use } \approx \text{ instead of } =.$$