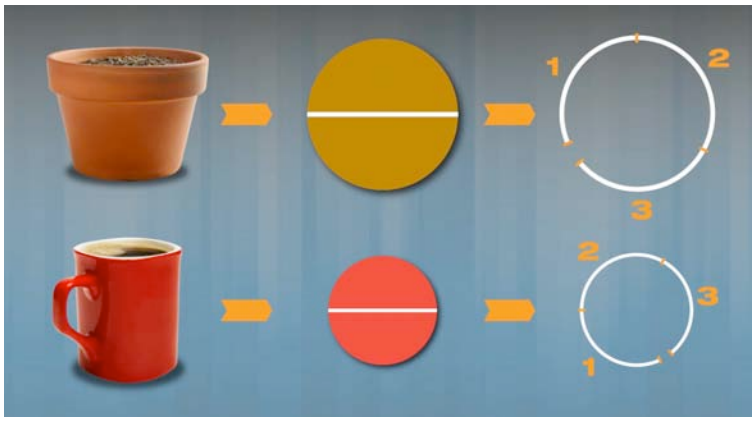
PROBLEM SOLVED
MAKING SENSE OF MATHEMATICS

What is π?
A Closer Look at the Video

After watching the *What is π?* video, make sense of the mathematics by taking a closer look at the problem situation and solutions. Use the questions and comments in bold to help you make sense of π.

There is a relationship between the diameter and circumference of any circle. Study the following diagrams and describe what you notice about the circumference and diameter of each circle.



No matter how large or small the circle it always takes a little more than three diameters to equal the circumference. This is true of the top of a circular flowerpot and the top of the mug. It is also true of very small circles like a coin and very large circles like the center circle of a soccer field.

The following chart shows the measurements of several round objects. For each item, divide the circumference by the diameter. Round your answers to the nearest one tenth of a unit. What do you notice about the results?

OBJECT	CIRCUMFERENCE C	DIAMETER d	$\frac{C}{d}$ RATIO OF C TO d
flower pot	12.5 in.	4.0 in.	
penny	6.0 cm	1.9 cm	
trash can lid	75.5 in.	23.5 in.	
patio table	150.5 in.	48.0 in.	
coffee mug	26.2 cm	8.6 cm	

When circumference is divided by diameter, the ratios are always a little more than three. If we could be exact in the measurements, we would get the same number every time and that number is pi (π).

MakingSense

OBJECT	CIRCUMFERENCE C	DIAMETER d	$\frac{C}{d}$ RATIO OF C TO d
flower pot	12.5 in.	4.0 in.	3.1
penny	6.0 cm	1.9 cm	3.2
trash can lid	75.5 in.	23.5 in.	3.2
patio table	150.5 in.	48.0 in.	3.1
coffee mug	26.2 cm	8.6 cm	3.0

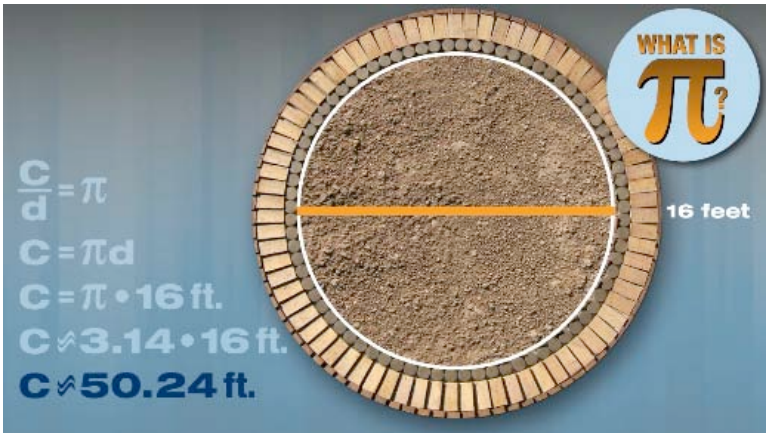
Pi (π) is a Greek symbol for an irrational number. An irrational number goes on forever without ever repeating. Mathematicians have calculated π to over a million decimal places.

How does this relationship relate to the formula, C= πd? If the circumference of any circle divided by the diameter of that circle equals π, then the circumference is equal to π times diameter.

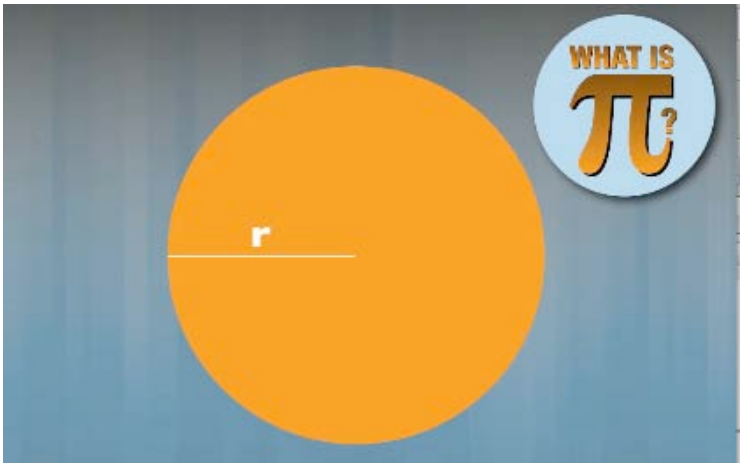
If $\frac{C}{d} = \pi$, then $C = \pi d$.

Carlos has a friend who is stumped trying to find the size of a circular garden and how much edging it will take. The diameter of the garden is 16 ft. Knowing the circumference will allow the friend to find the amount of edging necessary for the garden. What is the circumference of the garden?

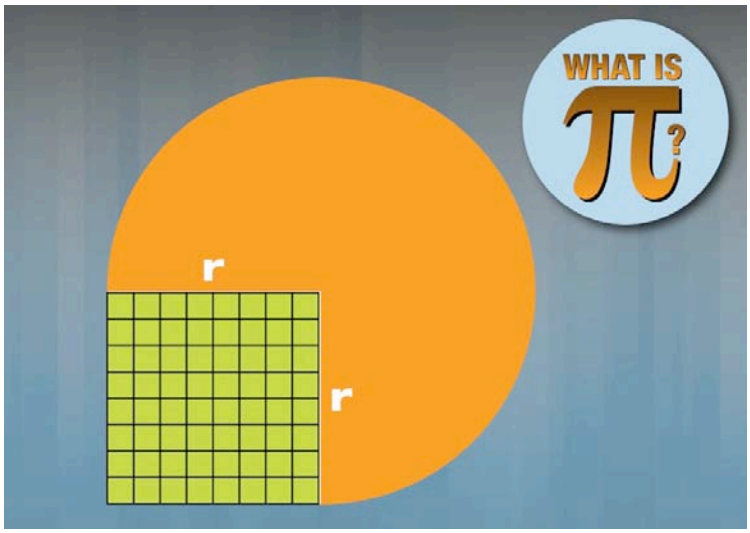
The diameter of the garden is 16 ft., so the circumference is π · 16. To find the approximate circumference, substitute 3.14 for π. Since the diameter of the circle was measured to the nearest foot, it is more accurate to report the circumference of the circle to the nearest foot. Therefore, the circumference of the garden is about 50 ft.



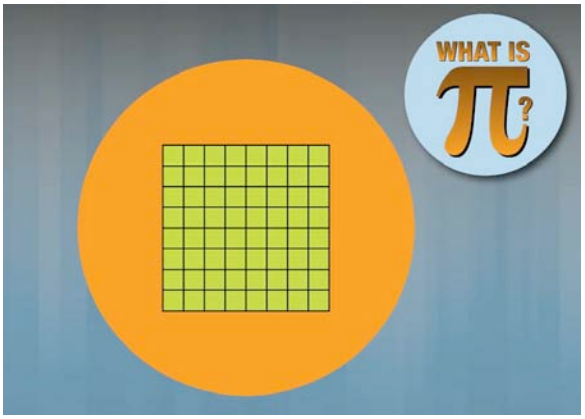
There is also a relationship between the area and radius of any circle. What is the radius of a circle? The radius of a circle is the distance from a point on the circle to the center of the circle.



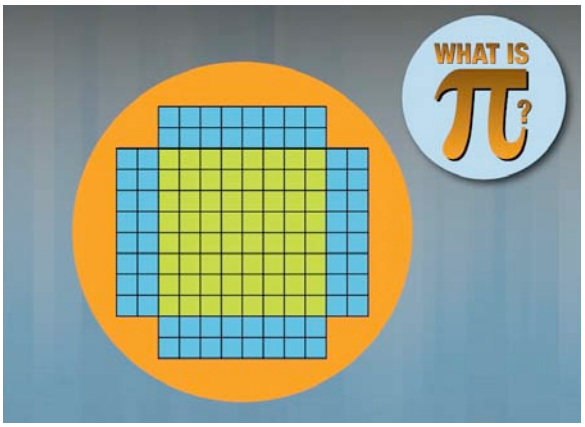
What is the radius square? The radius square is a square whose side is the length of the radius.



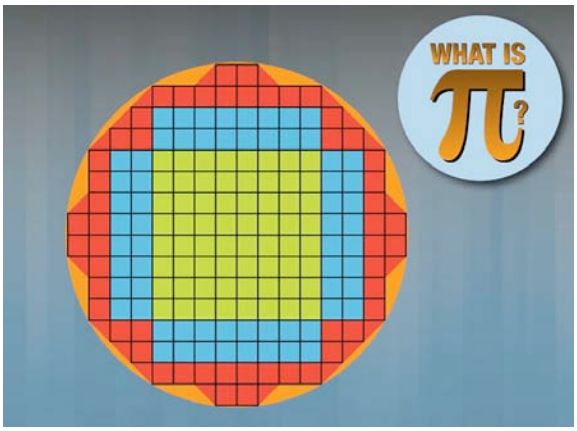
How many radius squares will it take to cover the circle?



One radius square fits easily.



You can cut up a second radius square and make it fit.



If you cut up a third radius square even more, it also fits.

Just a little bit of the circle is not covered, so it takes a little more than three radius squares to cover the circle. The area of any circle is approximately three times its radius squared or exactly π times the radius squared (Area of a circle = πr^2).

You already found the circumference of the circular garden. Now find the area. The radius of the garden is 8 ft.

The area is $\pi \cdot 8^2$ or about 3.14 x 64 which is approximately 200.96 sq. ft. Since the radius was measured to the nearest foot, it would be more accurate to report the area as approximately 201 sq. ft.

There is a relationship between the diameter and the circumference of any circle and there is a relationship between the radius and area of any circle.

- No matter how large or small the circle, it always takes a little more than three diameters, or exactly π diameters, to equal the circumference.
- No matter how large or small the circle, it always takes a little more than three radius squares, or exactly π radius squares, to equal the area.