A pizzeria plans to sell three sizes of its new pizza with cheese in the crust. A small pizza will be 9 inches in diameter, a medium will be 12 inches in diameter, and a large will be 15 inches in diameter.

The owner surveyed her lunch customers to find out what they would be willing to pay for a small pizza.

What do you think is a fair price for a 9-inch, cheese-filled crust pizza with one topping?

(Please check one price.)

○ $4.00   ○ $8.00

○ $6.00   ○ $10.00

Thanks!
Pizzeria Management

She found that $6 was a fair price for a 9-inch pizza with one topping. Based on this price, the owner wants to find fair prices for 12- and 15-inch pizzas with one topping.

- What prices would you suggest for the larger pizzas?

One of the cooks suggests making the difference in prices match the difference in pizza diameters, but the owner disagrees. She says that area is the best measurement to use to set the prices. She also says that comparing areas would suggest different prices from comparing diameters. Together, the cook and the owner wonder about the following question:

- What is the relationship, if any, between the diameter or radius of a circle and its area?

3.3 Squaring a Circle to Find Its Area

In earlier study of polygons, you developed formulas for the areas of triangles and parallelograms by comparing them to rectangles. You can discover more about the areas of circles by comparing them to squares.

- How is the area of a circle related to the area of a square?

In the drawing at the right, a shaded square covers a portion of each circle. The length of a side of the shaded square is the same length as the radius of the circle. You call such a square a "radius square."

After discussing, share Student Models of Radius Squares

Circle 1

Circle 2   Circle 3
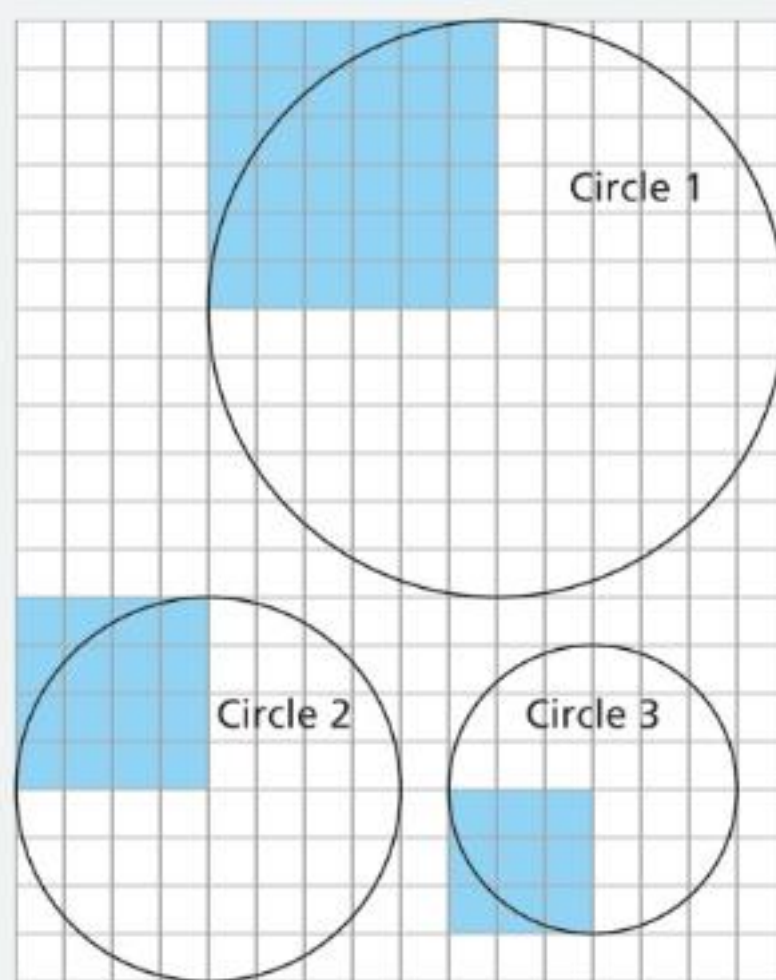
Circle	Radius of Circle (units)	Area of Radius Square (square units)	Area of Circle (square units)	Number of Radius Squares Needed
1	▪	▪	▪	▪
2	▪	▪	▪	▪
3	▪	▪	▪	▪

2. Describe any patterns and relationships you see in the table that will allow you to predict the area of the circle from its radius square. Test your ideas on some other circular objects.

The area of a circle will be about 3 times the area of the radius square.

Formula… $A = \pi r^2$

B **1.** How can you find the area of a circle if you know the radius?

2. How can you find the radius of a circle if you know the area?

$$r^2 = \frac{A}{\pi}$$

Did You Know?

You have discovered that the circumference of a circle is a little more than three times the diameter. The area of a circle is a little more than three times the square of the radius. The number "a little more than 3" is the same in both circumference and area calculations. It is given exactly by a decimal with infinitely many decimal digits beginning 3.14159265 …

In 1706, William Jones used the Greek letter π (also written as pi and pronounced "pie") to stand for the distance around a circle with a diameter of 1 unit.

William Jones

As early as 2000 B.C., the Babylonians knew that π was more than 3. Their estimate for π was $3\frac{1}{8}$. By the fifth century A.D., Chinese mathematician Tsu Chung-Chi wrote that π was somewhere between 3.1415926 and 3.1415927. From 1436 to 1874, the known value of π went from 14 places past the decimal point to 707 places.

In the past 50 years, mathematicians have used computers to calculate millions more digits in the decimal for π. They have shown that π cannot be expressed as a fraction with whole numbers in the numerator and denominator. Such numbers expressed as unending decimals that have no repeating pattern are called *irrational numbers*.

Tsu Chung-Chi

A fun way to remember formulas for circumference and area of a circle…

Fiddle dee dum
Fiddle dee dee
A ring around the moon is pi (π) times D (diameter)
If a hole you want repaired the formula is πr^2

Begin HW – WS Circles: Area & Circumference