GEOMETRY

Name: _____*Key*_____   Date:_____   Period:_____

SECTION 11.5 CIRCLES

VOCABULARY

| DEFINITION	EXAMPLE
Radius: distance from the center to the circle edge	⊙
Diameter: straight line through the center of the circle touching the edge twice	⊙ $d = 2r$
Circumference: distance around the circle. (Like the perimeter of a polygon.)	⊙ C
Pi: ratio of the circumference to the diameter. $\pi \approx 3.14159 \approx \frac{22}{7}$	$\pi = \frac{C}{d}$
Area of a circle: $A = \pi r^2$	⊙ $A = \pi r^2$ $A = \pi 4^2$ $A = 16\pi$

Big Idea: How do we find the area and circumference of a circle?

EXPLORATION 1

Using a piece of string, carefully measure the radius and circumference in inches of each of the circles below. Place the circles on grid paper and estimate their area, then complete the table below.

A

C

E

B

D
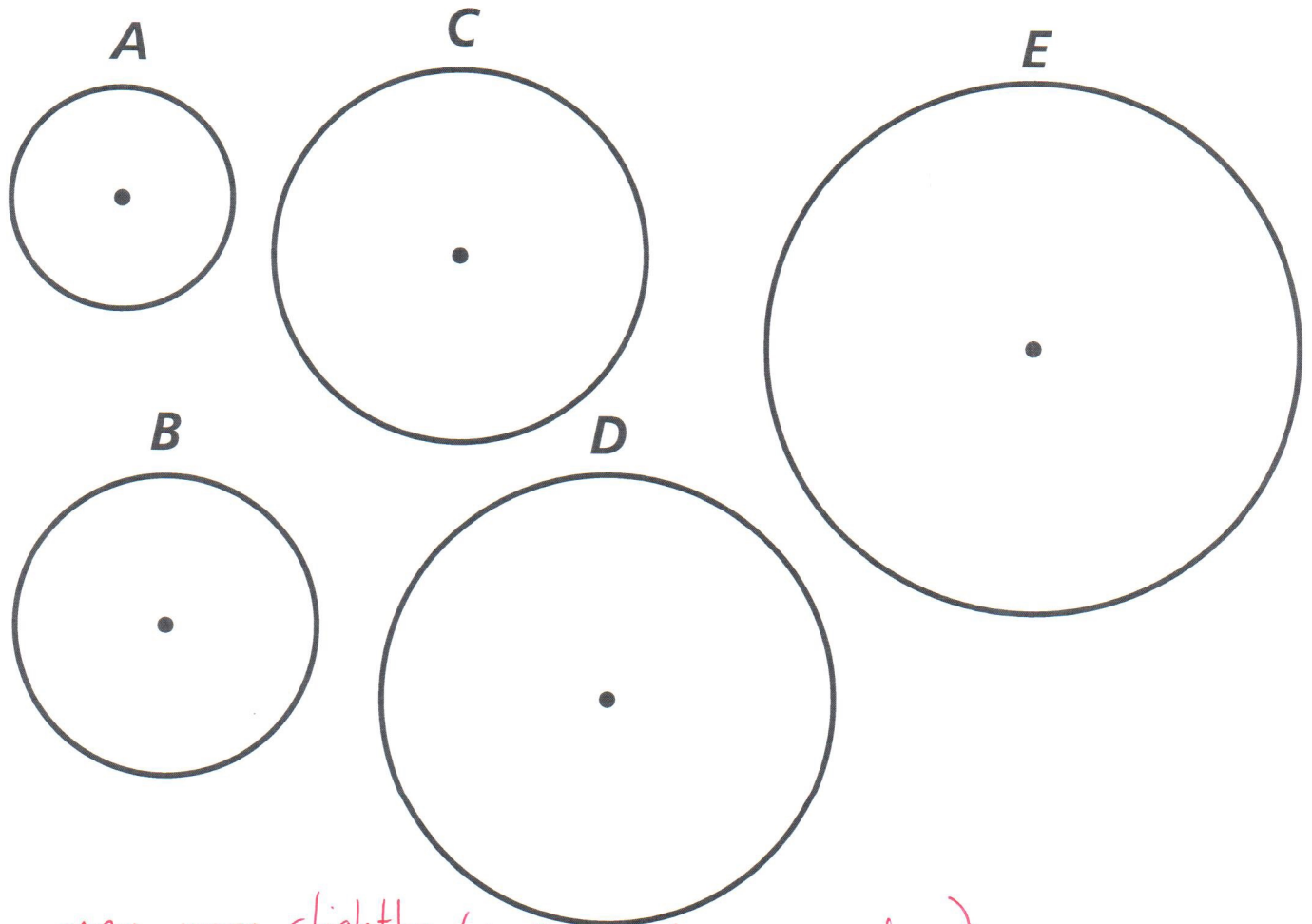
may vary slightly (inches and square inches)

Circle	Radius r	Diameter $d=2r$	Circumference $C=d\pi$	Area $A=\pi r^2$
A	0.5 in	1 in	$\pi \approx 3.14$ in	0.25π in² ≈ 0.79 in²
B	0.75 in	1.5 in	$1.5\pi \approx 4.71$ in	0.56π in² ≈ 1.77 in²
C	1 in	2 in	$2\pi \approx 6.28$ in	π in² ≈ 3.14 in²
D	1.125 in	2.25 in	$2.25\pi \approx 7.07$ in	1.27π in² ≈ 3.97 in²
E	1.375 in	2.75 in	$2.75\pi \approx 8.64$ in	1.89π in² ≈ 5.94 in²

Looking at the table, what patterns do you notice?

diameter is radius doubled

Do you notice a relationship between the radius and the diameter? Using the variable D to denote the length of the diameter, express the diameter in terms of the radius *r*.
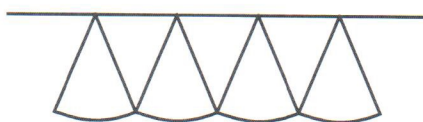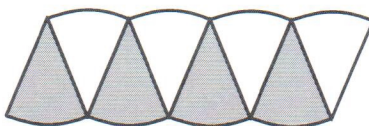
$D = 2r$

EXPLORATION 2

What is the area A of a circle whose radius is 1? Draw a circle with radius 1 and circumference 2π and cut it in half. Then cut each half into many small pie slices:
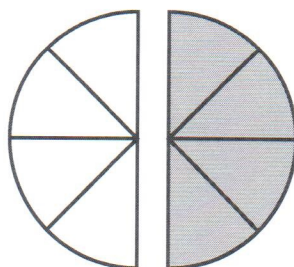
Take the slices from one half of the circle and lay the points of the slices along a line:

Do the same with the bottom half of the circle, filling in the spaces:

The shape looks a little like a rectangle. The more slices, the closer the shape is to a rectangle. If this cutting process continued infinitely, the area of the circle with radius 1 would approximate the area of the rectangle with length π and width 1.

The area $A = \pi \cdot 1 = \pi$ units^2.

EXAMPLE 1

A circle has radius 4 inches.

    a. Find the exact circumference of the circle keeping your answer in terms of π.

$$C = d\pi = (2r)\pi$$
$$C = 2(4)\pi = \boxed{8\pi \text{ inches}}$$

    b. Approximate the circumference to the nearest tenth of an inch.

$$8\pi \approx (8)(3.14) = \boxed{25.12 \text{ inches}}$$

    c. Find the exact area of the circle keeping your answer in terms of π.

$$A = \pi r^2$$
$$A = \pi (4)^2$$
$$A = \boxed{16\pi \text{ inches}^2}$$

    d. Approximate the area to the nearest hundredth of an inch.

$$A = 16(\pi) \approx 16(3.14) = \boxed{50.24 \text{ inches}^2}$$

EXAMPLE 2

A circle has the circumference of 37.68 ft. What is the circle's diameter? Find the radius and its area. Use 3.14 for π.

$$C = 37.68$$
$$C = \pi d$$
$$\frac{37.68}{3.14} = \frac{3.14 d}{3.14}$$
$$\boxed{12 \text{ ft} = d}$$

$$d = 2r$$
$$12 = 2r$$
$$\boxed{r = 6 \text{ ft}}$$

$$A = \pi r^2$$
$$A = \pi (6)^2$$
$$A = 3.14 \cdot 36$$
$$\boxed{A = 113.04 \text{ ft}^2}$$

PRACTICE EXERCISES

1. The diameter of a circle is 8 centimeters. What is the circumference of the circle? What is the area of the circle?

$d = 8 \text{ cm}$

$2r = d$

$2r = 8$

$r = 4 \text{ cm}$

$C = \pi d$

$C = \pi(8)$

$C = \boxed{8\pi \text{ cm}}$

$A = \pi r^2$

$= \pi(4)^2$

$= \boxed{16\pi \text{ cm}^2}$

2. A circle has a radius of 12 miles. Find its circumference. Find its area.

$C = d\pi$

$C = 2\pi r$

$C = \pi(2 \cdot 12)$

$C = \boxed{24\pi \text{ miles}}$

$A = \pi r^2$

$= \pi(12^2)$

$= \boxed{144\pi \text{ miles}^2}$

3. The circumference of a circle is 99 inches. To the nearest tenth of an inch, what is the circle's diameter? Its radius? Use *Pi* as approximately **3.14.**

$C = 99 \text{ in} = \pi d$

$\dfrac{99}{3.14} = \dfrac{(3.14)d}{3.14}$

$\boxed{31.5 \text{ in} = d}$

$d = 2r = \dfrac{31.5 \text{ in}}{2}$

$\boxed{r = 15.8 \text{ in}}$

SUMMARY (What I learned today)