ACTIVITY 1
MATHia CONNECTION
• Investigating Circles

Circles and Ratio

TOPIC 1   LESSON 1

Getting Started   Activity 1 2 3   Talk the Talk
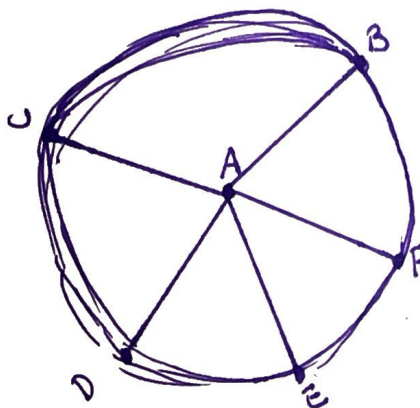
Analyzing the Parts of a Circle

Everyone can identify a circle when they see it, but defining a circle is a bit harder. Can you define a circle without using the word *round*? Investigating the formation of a circle will help you define it mathematically.

1 Follow the given steps to investigate the formation of a circle.

STEP 1 In the space provided, draw a point and label the point *A*.

STEP 2 Use a centimeter ruler to locate and draw a second point that is exactly 2.5 cm from point *A*. Label this point *B*.

STEP 3 Locate a third point that is exactly 2.5 cm from point *A*. Label this point *C*.

STEP 4 Repeat this process until you have drawn at least ~~ten~~ **5** distinct points that are each exactly 2.5 cm from point *A*.   **B-F**

2 How many other points could have a location exactly 2.5 cm from point *A*?

There is an infinite number of points that are 2.5 cm from Point A

3 Set a compass to 2.5 centimeters and use it to complete circle *A*.

Sketch
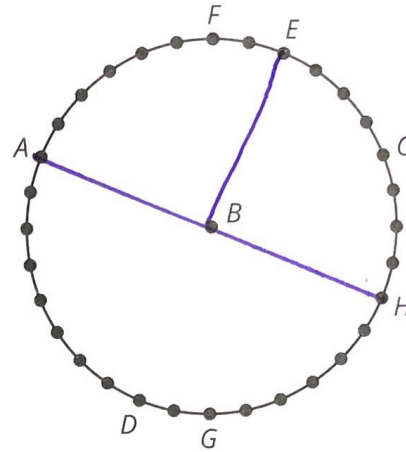
4 Define the term *circle* without using the word *round*.

A circle is a collection of points on the same plane equidistant from the same point.

A **circle** is a collection of points on the same plane equidistant from the same point.

- The center of a circle is the point from which all points on the circle are equidistant. You name circles by their center point.

- The **radius** of a circle is a line segment formed by connecting a point on the circle and the center of the circle.

- The distance across a circle through the center is the *diameter* of the circle. The **diameter** of a circle is a line segment formed by connecting two points on the circle such that the line segment passes through the center point.

- You call the distance around a circle the **circumference** of the circle.

5 Use the circle shown to answer each question.

    (a) Name the circle.

        Circle B

    (b) Draw and identify a radius of the circle.

        $\overline{BE}$

    (c) Draw and identify a diameter of the circle.

        $\overline{AH}$

    (d) Are all radii of this circle the same length? **Explain your reasoning.**

        Yes. All points on the edge are equidistant from the center point.

TAKE NOTE...
The plural of *radius* is *radii*.

6 What is the relationship between the length of a radius and the length of a diameter?

    The radius is ½ the lenght of the diameter

Measuring the Distance Around a Circle

HABITS OF MIND
- Model with mathematics.
- Use appropriate tools strategically.

> For this activity, use circles *A, B, D, E,* and *O* provided on page 11. Circle *O* is the same as the circle from the Getting Started.

1 Use string and a centimeter ruler to measure the distance from a point on the circle to its center. Then, measure the distance around each circle. Record your measurements in the table. In the last column, write the ratio of *Circumference : Diameter* in fractional form and as a decimal rounded to the nearest hundredth.

Circle	Circumference	Radius	Diameter	$\dfrac{\text{Circumference}}{\text{Diameter}}$
Circle A	7.5 cm	1.2 cm		
Circle B	12.1 cm	1.9 cm		
Circle O	15.2 cm	2.4 cm		
Circle D	20.3 cm	3.2 cm		
Circle E	24.3 cm	3.9 cm		

2 Average the ratios recorded for $\frac{\text{circumference}}{\text{diameter}}$. What is the approximate ratio for the circumference to the diameter for the set of circles? Write the approximate ratio in fractional form and as a decimal.

3 How does your answer to Question 2 compare to your classmates' answers?

4 Average all of your classmates' answers to Question 2. Write the approximate ratio of circumference to the diameter as a fraction and as a decimal rounded to the nearest hundredth.

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				Circumference / Diameter
Circle *A*			2.4 cm	$\frac{7.5}{2.4} \approx 3.13$
Circle *B*			3.8 cm	$\frac{12.1}{3.8} \approx 3.18$
Circle *O*			4.8 cm	$\frac{15.2}{4.8} \approx 3.17$
Circle *D*			6.4 cm	$\frac{20.3}{6.4} \approx 3.17$
Circle *E*			7.8 cm	$\frac{24.3}{7.8} \approx 3.12$

2 Average the ratios recorded for $\frac{\text{circumference}}{\text{diameter}}$. What is the approximate ratio for the circumference to the diameter for the set of circles? Write the approximate ratio in fractional form and as a decimal.

$$\frac{79.4 \div 5}{25.2 \div 5} = \frac{15.88}{5.04} \approx 3.15$$

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TOPIC 1

The Circumference Formula

The number **pi** (π) is the ratio of the circumference of a circle to its diameter.

circumference of the circle

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

diameter of the circle

HABIT OF MIND
- Attend to precision.

The number π has an infinite number of decimal digits that never repeat.

1 Use this information to write a formula for the circumference of a circle, where *d* represents the diameter of a circle and *C* represents the circumference of a circle.

$$d \cdot \pi = \frac{C}{d} \cdot \frac{d}{1} \qquad\qquad C = \pi d$$

2 Rewrite the formula for the circumference of a circle, where *r* represents the radius of a circle and *C* represents the circumference of a circle.

$$C = \pi \cdot 2r \quad \Rightarrow \quad C = 2\pi r$$

3 Use different representations for π to calculate the circumference of a circle.

  (a) Calculate the circumference of a circle with a diameter of 4.5 centimeters and a circle with a radius of 6 inches. Round your answer to the nearest ten-thousandths, if necessary.

Value for π	d = 4.5 centimeters	r = 6 inches
π	4.5 π cm	12 π in
Use the π Key on a Calculator	14.1372 cm	37.6991 in
Use 3.14 for π	14.13 cm	37.68 in
Use $\frac{22}{7}$ for π	14.1429 cm	37.7143 in

(b) Compare your circumference calculations. How do the different values of π affect your calculations?

TOPIC 1

4 Use the circumference of a circle formula to determine each unknown. Use 3.14 for π.

(a) Compute the length of the diameter of the circle with a circumference of 65.94 feet.

$$\frac{65.94}{3.14} = \frac{3.14d}{3.14}$$

$$\boxed{21\text{ ft} = d}$$

(b) Compute the length of the radius of the circle with a circumference of 109.9 millimeters.

$$\frac{109.9}{3.14} = \frac{3.14d}{3.14}$$

$$35 = d$$

$$35 \div 2 = \boxed{17.5\text{ mm} = r}$$

5 What is the minimum amount of information needed to compute the circumference of a circle?

You need to know either the diameter or radius