Objective: Students will be able to:
- Identify the formulas for finding circumference and area of a circle.
- Calculate the circumference and area of given circles.

Time Requirement: 1 class period, longer for activity

Materials Needed:
- Pencils
- Paper (regular and graph paper)
- Calculators
- Compasses
- Students’ baseball field scale drawings started in Lesson 1
- Copies of the “Baseball Circles” worksheet – 1 for each student

Vocabulary:
Center – The point inside a circle that is the same distance from all the points on a circle
Circle – The set of all points in a plane that are the same distance from a point called the center
Circumference – The distance around a circle
Diameter – The distance across the circle measured through its center
Pi – The ratio of the circumference of a circle to its diameter – 3.14
Radius – The distance from the center of a circle to any point on the circle
Applicable Common Core State Standards:

CCSS.Math.Content.7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

CCSS.Math.Content.7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

CCSS.Math.Content.7.G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

CCSS.Math.Content.6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.
  • CCSS.Math.Content.6.EE.A.2a Write expressions that record operations with numbers and with letters standing for numbers.

CCSS.Math.Content.7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
1. To begin, review the following elements of a circle:
   • **Radius**: The distance from the center of a circle to any point on the circle. (Equal to half of the diameter)
   • **Diameter**: The distance across a circle, measured through its center. (Diameter = 2 x Radius)

2. Review that **circumference** is the distance around a circle. Ask students, "How do you find the circumference of a circle?"

3. Review the formula for circumference: \( C = \pi d \). \( C \) means circumference, \( \pi \) is roughly equal to 3.14, and \( d \) means diameter.

4. Give students the following practice problem:
   • What is the circumference of a circle with a diameter of 3 inches?

5. Go over the practice problem with students. Ensure that all understand how to calculate circumference.
   • \( \pi \times 3" = 9.42" \)

6. Ask, students, "How do you find the area of a circle?"

7. Review the formula for area of a circle: \( A = \pi r^2 \). \( A \) means area, \( \pi = 3.14 \), and \( r^2 \) means radius x radius (or radius squared).

8. Review that the answer to an area problem will *always* be in square units.

9. You may also choose to review that the radius is squared before multiplying by \( \pi \) (order of operations).

10. Give students the following practice problem:
    • What is the area of a circle with a radius of 2 feet?
11. Go over the practice problem with students.
   - Area = $\pi \times 2 \text{ft}^2$
   - Area = $\pi \times 4 \text{ft}$
   - Area = 12.56 ft$^2$

12. Next give the students another practice problem:
   - What is the area of a circle with a radius of 8’?

13. Go over the practice problem with students.
   - Area = $\pi \times 8 \text{ft}^2$
   - Area = $\pi \times 64 \text{ft}$
   - Area = 200.96 ft$^2$

1. Provide students with the Little League ballpark scale drawings they created in Lesson 1 of this unit.

2. Before proceeding, ensure that each student has a pencil, a calculator, scrap paper, extra graph paper, a ruler, and a compass.

3. Today, students will add new elements to their scale drawings. Provide students with the following measurements:

<table>
<thead>
<tr>
<th>A circle surrounding home plate</th>
<th>Radius = 9 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitcher’s mound</td>
<td>Radius = 6 feet</td>
</tr>
</tbody>
</table>

4. Have students use the given measurements to add the two circles to their scale drawings. Depending on students’ familiarity with compasses, instruction or review may be necessary.

5. Ask students, “What is the circumference and area of the pitcher’s mound and the home plate circle?”
   - Pitcher’s mound: Circumference = 37.68 feet, Area = 113.04 feet$^2$
   - Home plate circle: Circumference = 56.52 feet, Area = 254.34 feet$^2$

6. On a standard baseball infield, the pitcher’s mound and the home plate circle are covered with dirt. Have students determine the combined area of dirt-covered infield. (Answer: 367.38 feet$^2$)

7. Collect students’ scale drawings for use in Lesson 3 of this unit.

**Conclusion:**
To conclude this lesson and check for understanding, provide students with “Baseball Circles” worksheet (included), and have students work independently to find the circumference and area of the circles given.
Instructions: It is the year 2065. Major League Baseball has allowed the teams to change the sizes of their on-deck circles. Below are on-deck circles from the different Major League teams. Compute the area and circumference of each circle by using the diameter or radius given. Please show your work.

<table>
<thead>
<tr>
<th></th>
<th>XY = 7 feet</th>
<th></th>
<th>NB = 125 centimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1" alt="Circle" /></td>
<td>5.</td>
<td><img src="image5" alt="Circle" /></td>
</tr>
<tr>
<td>2</td>
<td>MU = 30 inches</td>
<td>6.</td>
<td>FW = 2 yards</td>
</tr>
<tr>
<td>3</td>
<td>VP = 3 meters</td>
<td>7.</td>
<td>KD = 210 centimeters</td>
</tr>
<tr>
<td>4</td>
<td>JH = 48 inches</td>
<td>8.</td>
<td>CE = 4.5 feet</td>
</tr>
</tbody>
</table>

Baseball Circles
Baseball Circles Answer Key

1) Area __153.86ft$^2$___ Circumference __43.96ft___
2) Area __2826in$^2$___ Circumference __188.4in___
3) Area __7.07m$^2$___ Circumference __9.42m___
4) Area __7234.56 in$^2$___ Circumference __301.44in___
5) Area __12265.63cm$^2$___ Circumference __392.5cm___
6) Area __12.56 yds$^2$___ Circumference __12.56yds___
7) Area __34618.5 cm$^2$___ Circumference __659.4cm___
8) Area __63.59ft$^2$___ Circumference __28.26ft___