

## Unit 3 Summary

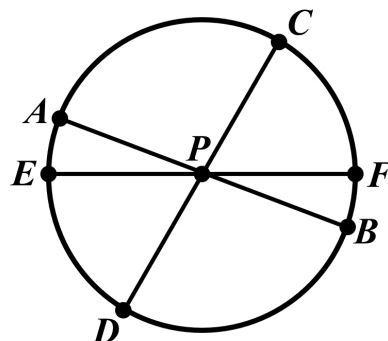
Prior Learning	Grade 7, Unit 3	Later in Grade 7	Grade 8
Grade 6 <ul style="list-style-type: none"> <li>Area of triangles and quadrilaterals</li> <li>Evaluating formulas</li> </ul> Grade 7 <ul style="list-style-type: none"> <li>Proportional relationships</li> </ul>	<ul style="list-style-type: none"> <li>Circumference of a circle</li> <li>Area of a circle</li> </ul>	Unit 6 <ul style="list-style-type: none"> <li>Solve equations</li> </ul>	<ul style="list-style-type: none"> <li>Volume of cylinders, cones, and spheres</li> </ul>

### Circumference of a Circle

Circles are shapes made up of all the points that are the same distance away from a center.

Here are some common measurements of a circle.

- The **radius** goes from the center to the edge of a circle.
- The **diameter** goes from one edge of a circle to the other and passes through the center.
- The **circumference** is the distance around the circle.



There is a proportional relationship between the diameter and circumference of a circle.

The constant of proportionality of this relationship is  $\pi$  (pronounced "pie").

Common approximations for  $\pi$  are 3.14,  $\frac{22}{7}$ , and 3.14159, but none of these are exactly  $\pi$ .

The relationship between the diameter and circumference of a circle is exactly  $C = \pi d$ .

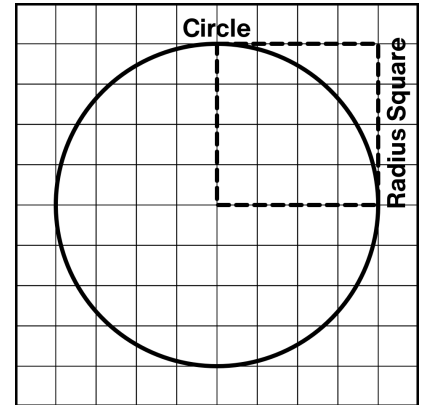
If  $AP$  is 5 inches, then  $AB$  is  $2 \cdot 5 = 10$  inches.

The circumference is  $C = \pi(10) = 10\pi$  inches, or about 31.4 inches.

### Area of a Circle

We can estimate the area of a circle using radius squares.

A little more than 3 radius squares cover any circle, so this circle's area would be a little more than  $3 \cdot 4^2 = 48$  square units.



The relationship between the radius and area of a circle is exactly  $A = \pi r^2$ .

The area of the circle above is  $\pi(4)^2 = 16\pi \approx 50.27$  square units.

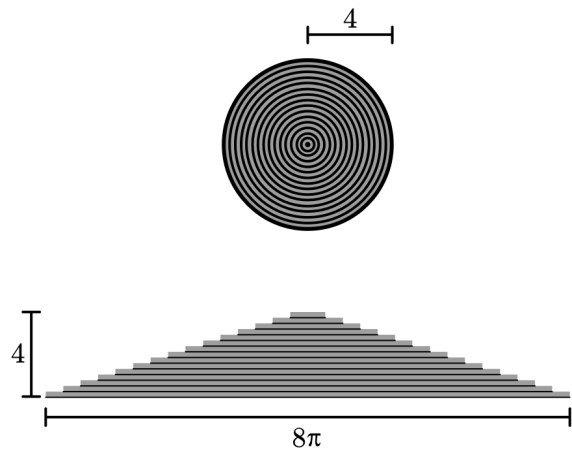
We can prove that this formula is correct by cutting a circle into rings and rearranging the rings into a triangle.

The height of the triangle is the radius of the circle.

The base of the triangle is its circumference.

The area of the triangle is:

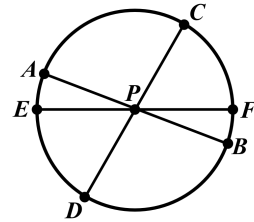
$$\begin{aligned}
 A &= \frac{1}{2} \cdot b \cdot h \\
 &= \frac{1}{2} \cdot 8\pi \cdot 4 \\
 &= 16\pi \text{ square units.}
 \end{aligned}$$



## Try This at Home

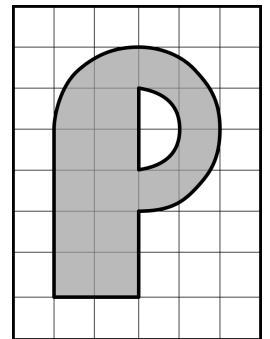
### Circumference of a Circle

- 1.1  $AP$  is a radius of this circle. List every other radius.
- 1.2  $EF$  is a diameter of this circle. List every other diameter.



A candle has a diameter of 12 centimeters.

- 2.1 What is the distance from the edge of the candle to the wick (at the center)?
- 2.2 Would a ribbon 40 centimeters long wrap around the candle? Explain your thinking.
3. Determine the total perimeter of this figure.

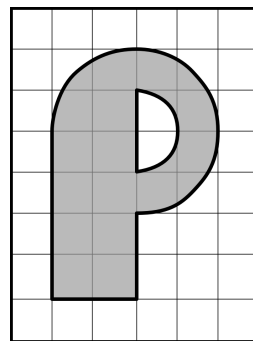


### Area of a Circle

A rectangular wooden board, 20 inches wide and 40 inches long, has a circular hole cut out of it.

- 4.1 If the diameter of the circle is 6 inches, what is the area of the circular hole?
- 4.2 What is the area of the board after the circle is removed?

5. Determine the total shaded area of this figure.



### Solutions:

1.1  $BP, CP, DP, EP, FP$

1.2  $AB, CD$

2.1 6 centimeters. This would be the radius of the circle, which is half of the diameter.

2.2 Yes.

*Explanations vary.* The distance around the candle is its circumference, which would be  $C = \pi(12) = 12\pi \approx 37.7$  centimeters. This means a 40-centimeter ribbon would wrap around.

3.  $4\pi + 10$  units

The perimeter of the outside of the shape is  $\frac{3}{4} \cdot \pi \cdot 4 = 3\pi$  units plus 8 units for the straight edges. The perimeter of the inside of the shape is 2 units plus  $\frac{1}{2} \cdot \pi \cdot 2 = \pi$  units.  
 $(3\pi + 8) + (\pi + 2) = 4\pi + 10$  units.

4.1  $\pi(3^2) = 9\pi \approx 28.3$  square inches

4.2  $800 - 36\pi \approx 686.9$  square inches

5.  $2.5\pi + 8$  square units

The area of the large shape is  $\frac{3}{4} \cdot \pi \cdot (2^2) = 3\pi$  square units for the part of a circle plus  $2 \cdot 4 = 8$  square units for the area of the rectangle. The area of the hole is  $\frac{1}{2} \cdot \pi \cdot (1^2) = 0.5\pi$  square units.  $(3\pi + 8) - (0.5\pi) = 2.5\pi + 8$  square units.