**Basic Properties of a Circle: Radius Diameter, and Circumference**

**Radius:** A line segment joining the center of a circle and a point on the circle.

**Diameter:** A straight line passing through the center of the circle and terminating at two points on the circumference. It measures the distance across a circle, and its measure is equal to twice the measure of the radius.

**Circumference:** The distance around a circle. It replaces the word perimeter in circles.

NOTE: No matter how large or small a circle is, the length of the diameter will always divide into the circumference the same number of times.

Approximate values for are 3.14 and .

The formula for find the circumference is , where is the diameter.

**Concentric circles:** Circles that lie in the same plane and have the same center and radii of different length.

**EXAMPLE:**

1. Approximate the circumference of a circle with a diameter of 14 inches. Use as an approximation for .
2. Approximate the circumference of a circle with radius of 21 inches. Use as an approximation for .
3. The circumference of a circle measures 66 feet. Approximate the radius of the circle. Use as an approximation for .

**Secant:** A line drawn from a point outside a circle that intersects a circle in two points. See below.

**Chord:** A line segment joining any two points on the circle. (A diameter is a chord that passes through the center of the circle.) See below.

**Tangent:** A line that intersects a circle at **on and only one** point on the circumference. See below.

* If a line is tangent to a circle, it is perpendicular to the radius drawn to the point of tangency.
* is a radius
* Line is perpendicular to at point .

**Circumference and Arc Length**

**Circumference of a Circle:** The circumference of a circle is the entire length of the arc of a circle or the distance around the circle. In all circle, regardless of the size, the ratio is constant. This constant value is .

**EXAMPLE:**

1. Find the circumference of a circle if the length of its radius is 5’’. (Use ).

Sometimes it is necessary to find the length of an arc, which is equivalent to finding a fractional part of the circumference.

**Arc Length** , where is the number of degrees in the arc.

**EXAMPLE:**

1. In the figure, what is the length of and ?
2. is the center of the circle with a radius of 4’’. Find the length of intercepted by a central angle of 40°. Leave your answer in terms of .
3. A wheel is rolled and makes five revolutions. If the diameter of the wheel is 3 feet, how far does the wheel travel? Leave your answer in terms of .

**Measurement of Arcs**

**Central angle:** An angle whose vertex is at the center of the circle.

**IMPORTANT:**

* The measure of a minor arc equals the measure of its central angle.
* The measure of a semicircle is 180°.
* The measure of a major arc is 360° minus the measure of the central angle’s intercepted arc.

**EXAMPLE:**

1. Find:
2. **** is the center; a central angle intercepts a minor arc of and a major arc of . Find .
3. Given the three central angles, find the measure of minor arc .
4. What is the measure of the obtuse angle formed by the two hands of a clock at 5 P.M.?



1. is the center. The measure of is 62°. Find .
2.  is the center; is a regular hexagon inscribed in the circle whose sides are eight units long. Find .

**Inscribed angle:** An angle whose vertex is on the circle and whose sides are chords of the circle.

* The measure of an inscribed angle is equal to **one-half the measure of its intercepted arc.**
* The measures of two inscribed angles are equal if they intercept the same arc.
* Any angle inscribed in a semi-circle is a right angle.

**Chord:** A line drawn within a circle touching two points on the circumference of the circle.

**EXAMPLE:**

1. What is the measure of ?
2. If three arcs of the circle measure , , and , find inscribed .



1. is the center. Find
2. is the center. Find .
3.  is the center. Chords and form an inscribed angle of 30°. Find the central angle whose measure is .
4. Inscribed measures 50°. Find the inscribed angle whose measure is .

**Areas of Circles, Triangles, Rectangles, Parallelograms, Trapezoids, and Other Figures with Formulas**

**Circle**

**Rectangle**

**Parallelogram**

**Rhombus**

**Square**

**Trapezoid**

**Triangle**

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**Sector of a Circle:** The region bounded by an arc of the circle and two radii drawn to the endpoints of the arc.

**Area of sector**  where is the degree measure of the arc of the sector.

**EXAMPLE:**

1. Find the area of sector OAB.

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1. What is the area of the shaded portion?