ALBERT

Name _____ Date _____

# Inscribed and Circumscribed Circles Worksheet

Geometry · Common Core HSG-C.A.3

> Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

## Practice

Builds the skill step by step.

1. Quadrilateral ABCD is inscribed in a circle. m∠A = 70°. What is m∠C?

2. Quadrilateral PQRS is inscribed in a circle. m∠Q = 95°. What is m∠S?

3. The circumcenter of a triangle (the center of its circumscribed circle) is where which lines meet?

   A. the medians
   B. the angle bisectors
   C. the perpendicular bisectors of the sides
   D. the altitudes

4. The incenter of a triangle (the center of its inscribed circle) is where which lines meet?

   A. the medians
   B. the altitudes
   C. the perpendicular bisectors of the sides
   D. the angle bisectors

5. Which quadrilateral can ALWAYS be inscribed in a circle?

   A. a kite

   B. a rectangle

   C. a rhombus

   D. a parallelogram

6. Quadrilateral ABCD is inscribed in a circle. $m\angle B = (2x)°$ and $m\angle D = (3x + 30)°$. What is x?

7. Where is the circumcenter of a right triangle?

   A. at the midpoint of the hypotenuse

   B. at the right-angle vertex

   C. outside the triangle

   D. at the midpoint of the shortest side

8. A right triangle has legs 6 and 8. What is the radius of its circumscribed circle?

9. An inscribed circle touches each side of a triangle. How does each side relate to the circle?

   A. Each side is a chord.

   B. Each side passes through the center.

   C. Each side is tangent to the circle.

   D. Each side is a diameter.

10. Quadrilateral ABCD is inscribed in a circle. $m\angle A = 82°$ and $m\angle B = 105°$. What is $m\angle D$?

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## On Level

Grade-level practice.

1. Quadrilateral ABCD is inscribed in a circle. m∠A = (x + 20)° and m∠C = (2x + 10)°. What is m∠C?

2. Prove that opposite angles of a quadrilateral inscribed in a circle are supplementary.

3. Which quadrilateral can NOT always be inscribed in a circle?

   A. a parallelogram that is not a rectangle

   B. a square

   C. a rectangle

   D. an isosceles trapezoid

4. A triangle has vertices A(0, 0), B(8, 0) and C(0, 6). What are the coordinates of its circumcenter?

5. For the same triangle (A(0, 0), B(8, 0), C(0, 6)), what is the radius of the circumscribed circle?

6. To construct the inscribed circle of a triangle, after finding the incenter, how do you find the radius?

   A. Use the distance between two vertices.

   B. Construct a perpendicular from the incenter to one side.

   C. Use half of the longest side.

   D. Measure from the incenter to a vertex.

7. Isosceles trapezoid ABCD is inscribed in a circle with AB ∥ CD. m∠A = 65°. What is m∠C?

8. In which kind of triangle is the circumcenter outside the triangle?

   A. a right triangle

   B. an acute triangle

   C. an equilateral triangle

   D. an obtuse triangle

9. Inscribed quadrilateral ABCD has arc AB = 80°, arc BC = 90° and arc CD = 110°. What is m∠A?

10. An equilateral triangle has a circumscribed circle of radius 4. What is the radius of its inscribed circle?

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## Challenge

Multi-step and word problems that stretch it.

1. Inscribed quadrilateral ABCD has m∠A = (4x + 6)°, m∠B = (3x + 1)° and m∠C = (2x + 12)°. What is m∠D?

2. A right triangle has legs 5 and 12. What is the radius of its inscribed circle? (For a right triangle, r = (a + b − c) ÷ 2.)

3. Explain why the circumcenter of a triangle is the same distance from all three vertices.

4. Kite ABCD has m∠B = m∠D = 90° and is inscribed in a circle. m∠A = 70°. What is m∠C?

5. A triangle with vertices (0, 0), (10, 0) and (0, 10) is inscribed in a circle. What is the radius? Give the exact value.

6. A quadrilateral has angles 80°, 100°, 95° and 85°, in order. Can it be inscribed in a circle?

   A. No, because 80° + 95° ≠ 180°.

   B. Yes, because the angles add to 360°.

   C. Yes, because 80° + 100° = 180°.

   D. No, because no angle is 90°.

7. Inscribed quadrilateral PQRS has $m\angle P = 3y°$ and $m\angle R = 6y°$. What is $m\angle P$?

8. The circumcenter of $\triangle ABC$ is O. OA = 7. What is OC?

9. An equilateral triangle has side 6. What is the radius of its inscribed circle? Give the exact value.

10. A rectangle with sides 9 and 12 is inscribed in a circle. What is the circle's diameter?