RLP-GEOB · RLP Geometry B — Solids, Coordinates, Circles and Probability

Unit 3: Circles

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 3.1 — All Circles Are Similar: Chords, Radii and Tangents

FLUENCY

1. A right triangle has hypotenuse 17 and one leg 3. Find the other leg exactly.

2. A right triangle has hypotenuse 7 and one leg 3. Find the other leg exactly.

3. A right triangle has hypotenuse 9 and one leg 5. Find the other leg exactly.

4. A circle has radius 8 and P is 17 from the center. Find the length of each tangent segment from P.

5. A chord is 5 units from the center of a circle of radius 13. How long is the chord?

6. A chord of length 16 lies in a circle of radius 10. How far is it from the center?

7. From an outside point P, tangent segments $PA = 3x + 4$ and $PB = 10 - x$. Find PA.

8. Describe a similarity transformation that carries the circle with center $(2, -1)$ and radius 3 onto the circle with center $(-4, 5)$ and radius 12.

9. A tangent line touches a circle at T. What angle does it make with radius OT?

APPLICATION

10. Only a piece of a broken circular plate survives. Describe how to find the center using chords, and justify it.

11. Taking the Earth as a sphere of radius 6,371 km, how far away is the horizon for a person whose eyes are 2 m above a calm sea? (The line of sight to the horizon is tangent to the Earth.)

12. A belt runs around a pulley of radius 5 cm. The two straight parts of the belt meet (if extended) at a point 13 cm from the pulley's center. How long is each straight part from that point to the pulley?

CHALLENGE

13. Prove that the perpendicular from the center of a circle to a chord bisects the chord.

REVIEW

14. Find the center and radius of the circle $x^2 - 4x + y^2 + 10y - 20 = 0$.

15. Find the volume of a square pyramid with base edge 9 cm and height 8 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

16. Find the point 2/3 of the way from $(-3, 2)$ to $(6, -4)$.

Lesson 3.2 — Inscribed, Central and Circumscribed Angles

FLUENCY

1. An inscribed angle intercepts an arc of 130°. Find the angle.

2. An inscribed angle measures 38°. Find the central angle on the same arc.

3. Tangents at A and B meet at P, and arc AB (the minor arc) measures 110°. Find $\angle APB$.

4. A circumscribed angle measures 50°. Find the minor arc between the points of tangency.

5. Triangle ABC is inscribed in a circle with AB a diameter. $\angle A = 32°$. Find $\angle C$ and $\angle B$.

6. Two inscribed angles intercept the same arc. One is $(2x + 10)°$ and the other $(4x - 20)°$. Find the angle.

7. Points A, B, C divide a circle into arcs of 100°, 120° and 140°. Find the angles of triangle ABC.

APPLICATION

8. A carpenter places the corner of a set square on a circular tabletop edge and marks where the two sides cross the edge. What has she found, and why? How can she find the center?

9. *(Illustrative.)* A soccer goal occupies an arc of 40° of a circle drawn through both posts. Every point on the rest of that circle sees the goal at the same angle. What is it?

10. A regular pentagon is inscribed in a circle. Find the angle between two adjacent sides by using inscribed angles.

CHALLENGE

11. Prove the inscribed angle theorem in the case where the center lies *outside* the inscribed angle ACB.

REVIEW

12. Find the center and radius of the circle $x^2 - 4x + y^2 - 4y - 73 = 0$.

13. Find the volume of a square pyramid with base edge 7 cm and height 8 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

14. Write the line through (2, 5) perpendicular to $y = 4x - 1$.

Lesson 3.3 — Triangle Centers, Inscribed Quadrilaterals and Tangent Constructions

FLUENCY

1. Quadrilateral $ABCD$ is inscribed in a circle, with $\angle A = 82°$ and $\angle B = 97°$. Find $\angle C$ and $\angle D$.

2. Which lines meet at the circumcenter of a triangle, and what is it equidistant from?

3. Which lines meet at the incenter, and what is it equidistant from?

4. A right triangle has legs 10 and 24. Find the radius of its circumscribed circle.

5. Where does the circumcenter of an obtuse triangle lie?

6. Put in order the steps to construct a tangent from an outside point P to a circle with center O: (a) draw lines PT_1 and PT_2; (b) construct the midpoint M of OP; (c) draw the circle centered at M through O, meeting the given circle at T_1 and T_2.

APPLICATION

7. *(Illustrative.)* Three trees stand at (0, 0), (8, 0) and (0, 6) on a park grid in meters. A sprinkler must be equidistant from all three. Where should it go, and what radius reaches them?

8. A triangular plaza has sides 6 m, 8 m and 10 m. The largest circular fountain that fits is its inscribed circle. Its radius is $(a + b - c)/2$ for a right triangle with legs a, b and hypotenuse c. Find the radius and the fountain's area.

9. Can a rhombus that is not a square be inscribed in a circle? Explain.

CHALLENGE

10. **Complete the proof.** Prove that opposite angles of inscribed quadrilateral *ABCD* are supplementary.

11. **Identify the flaw.** "*PT* is tangent because $OT \perp PT$, and $OT \perp PT$ because *PT* is tangent."

REVIEW

12. Find the center and radius of the circle $x^2 - 6x + y^2 - 10y - 30 = 0$.

13. Find the volume of a sphere with radius 5 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

14. A triangle has vertices (0, 0), (6, 0) and (2, 5). Find its area.

Lesson 3.4 — Arc Length, Radians and Sector Area

FLUENCY

1. A circle has radius 10. For a central angle of 72°, find the arc length and the sector area in terms of π.
2. A circle has radius 12. For a central angle of 60°, find the arc length and the sector area in terms of π.
3. A circle has radius 8. For a central angle of 72°, find the arc length and the sector area in terms of π.
4. A circle has radius 4. For a central angle of 45°, find the arc length and the sector area in terms of π.
5. A circle has radius 12. For a central angle of 72°, find the arc length and the sector area in terms of π.
6. A circle has radius 3. For a central angle of 150°, find the arc length and the sector area in terms of π.

7. Convert 15° to radians.

8. Convert π/12 radians to degrees.

9. Convert 36° to radians.

10. Convert 300° to radians.

APPLICATION

11. A bicycle wheel has a diameter of 66 cm. How far does the bike travel in one revolution, and in 100 revolutions (to the nearest meter)?

12. A minute hand is 15 cm long. How far does its tip travel in 20 minutes?

13. A sprinkler with a 12 m throw sweeps 110°. Find the watered area to the nearest square meter.

14. A 16-inch pizza is cut into 8 equal slices. Find the crust length and the area of one slice.

CHALLENGE

15. Taking the Earth's radius as 6,371 km, how far north must you travel along a meridian to change your latitude by 1°? Use radians.

REVIEW

16. Find the center and radius of the circle $x^2 + 16x + y^2 + 15 = 0$.

17. Find the volume of a cylinder with radius 5 cm and height 20 cm. Give an exact answer and, if it involves π, a decimal to the nearest tenth.

18. An inscribed angle intercepts a 96° arc. Find it.

Unit 3 checkpoint

1. Which sequence shows a circle of radius 2 centered at A is similar to a circle of radius 5 centered at B?
   A. Translate A to B, then dilate from B by 5/2
   B. Rotate 90°
   C. Reflect across AB
   D. Dilate by 3
2. A tangent segment from a point 10 units from the center of a circle of radius 6 has length _____.
3. True or false: A radius drawn to a point of tangency is perpendicular to the tangent.
4. An inscribed angle on a 150° arc measures _____°.
5. An angle inscribed in a semicircle measures:
   A. 45°
   B. 90°
   C. 180°
   D. It depends
6. Tangents at A and B meet at P. If the minor arc AB is 124°, then angle APB is _____°.
7. An inscribed quadrilateral has one angle of 71°. Its opposite angle is:
   A. 71°
   B. 109°
   C. 19°
   D. 142°
8. The incenter of a triangle is the intersection of its:
   A. Perpendicular bisectors
   B. Angle bisectors
   C. Medians
   D. Altitudes
9. True or false: In the tangent construction from an outside point P, the auxiliary circle is centered at P.

10. 225° equals _____ $\pi/4$ radians.

11. Arc length for radius 9 and central angle $2\pi/3$ is:
    A. 6π
    B. 3π
    C. 27π
    D. 18π

12. A sector of radius 6 with a 60° angle has area _____ π.