ALBERT

Name _____ Date _____

Arc Length and Sector Area Worksheet

Geometry · Common Core HSG-C.B.5

> Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Practice

Builds the skill step by step.

1. A circle has radius 6. What is the length of an arc with a central angle of 60°? Use 3.14 for π and round to the nearest tenth.

2. A circle has radius 10. What is the area of a sector with a central angle of 90°? Use 3.14 for π and round to the nearest tenth.

3. A circle has radius 9. What is the length of an arc with a central angle of 120°? Use 3.14 for π and round to the nearest tenth.

4. An angle measures 180°. Its radian measure is kπ. What is k?

5. An angle measures 90°. Its radian measure is kπ. What is k?

6. An arc has length 5 in a circle of radius 5. What is the central angle in radians?

7. A circle has radius 4. What is the area of a sector with a central angle of 45°? Use 3.14 for π and round to the nearest tenth.

8. Which describes one radian?

   A. the angle of a full turn

   B. a quarter of a circle

   C. the central angle whose arc is as long as the radius

   D. an angle of 1°

9. A sector is $\frac{1}{4}$ of a circle with area 64 square units. What is the area of the sector?

10. An angle of 60° is kπ radians. What is k?

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On Level

Grade-level practice.

1. A central angle of 2 radians intercepts an arc in a circle of radius 7. How long is the arc?

2. A circle has radius 12. What is the area of a sector with a central angle of 150°? Use 3.14 for π and round to the nearest tenth.

3. An angle measures $\frac{3}{4}\pi$ radians. How many degrees is that?

4. A circle has radius 15. What is the length of an arc with a central angle of 40°? Use 3.14 for π and round to the nearest tenth.

5. Using similar circles, explain why the length of an arc is proportional to the radius for a fixed central angle.

6. An arc of length 12 has a central angle of 3 radians. What is the radius?

7. A sector has a central angle of 72° in a circle with area 50 square units. What is the area of the sector?

8. A sector of a circle with radius 6 has a central angle of 2 radians. What is its area? (Area = $\frac{1}{2}r^2\theta$.)

9. A 300° angle is $k\pi$ radians. What is k?

10. A circle has radius 20. What is the length of an arc with a central angle of 135°? Use 3.14 for π and round to the nearest tenth.

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Challenge

Multi-step and word problems that stretch it.

1. A pizza with a 14-inch diameter is cut into 8 equal slices. What is the area of one slice? Use 3.14 for π and round to the nearest tenth.

2. A pendulum 30 cm long swings through an angle of 50°. How far does its tip travel along the arc? Use 3.14 for π and round to the nearest tenth.

3. An arc length is 4π and the radius is 6. What is the central angle in degrees?

4. A sector has area 15π and radius 6. What is the central angle in degrees?

5. Derive the formula for the area of a sector with central angle θ° in a circle of radius r.

6. Two circles have radii 3 and 9. In each, a 40° central angle cuts an arc. How many times as long is the larger arc?

7. A sprinkler sprays water 12 m in a 210° arc. What area does it water? Use 3.14 for π and round to the nearest tenth.

8. The minute hand of a clock is 10 cm long. How far does its tip travel in 20 minutes? Use 3.14 for π and round to the nearest tenth.

9. A circle has circumference 36 units. What is the length of an arc with a central angle of 2.5 radians, to the nearest tenth? (Use $r = 36 \div (2\pi)$ and $\pi \approx 3.14$.)

10. Arc length divided by radius gives the angle in which unit?

    A. radians
    B. degrees
    C. square units
    D. percent