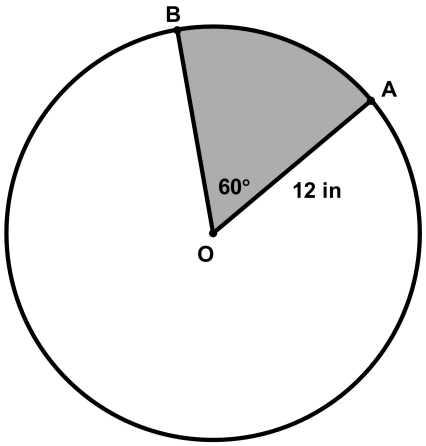
Name: _____ Date: _____

SECTORS OF CIRCLES
COMMON CORE GEOMETRY

A portion of a circle that is bounded (surrounded) by two radii and an arc is known as a **sector** of a circle. Sectors are amazingly important in design, engineering, mathematics, and pizza (since a slice of a circular pizza is almost always a sector). In today's lesson we will work with how to find the **area** and **arc length** of a **sector**.

***Exercise* #1:** In Circle O shown below, with a radius of 12 inches, a sector has been defined by two radii $\overline{OB}$ and $\overline{OA}$ with a central angle of 60° as shown.



(a) This is known in geometry as the **minor sector** created by these two radii. Why do think it includes the word **minor**?

(b) Determine the circumference and area of Circle O. Express your answers in terms of pi and to the nearest hundredth.

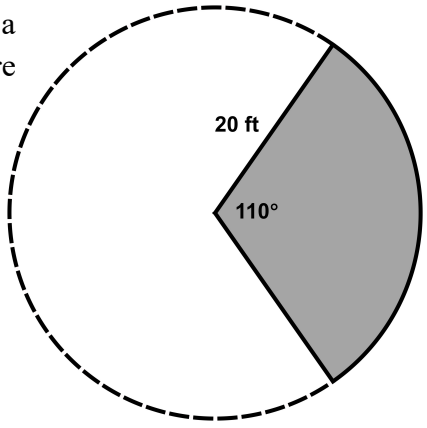
Circumference of $\odot O$ Area of $\odot O$

(c) What portion (fraction) of the circle's area and circumference are contained in the shaded sector? Explain how you know this answer.

(d) Determine the length of $\overset{\frown}{AB}$ and the area of the sector AOB in terms of pi and to the nearest hundredth.

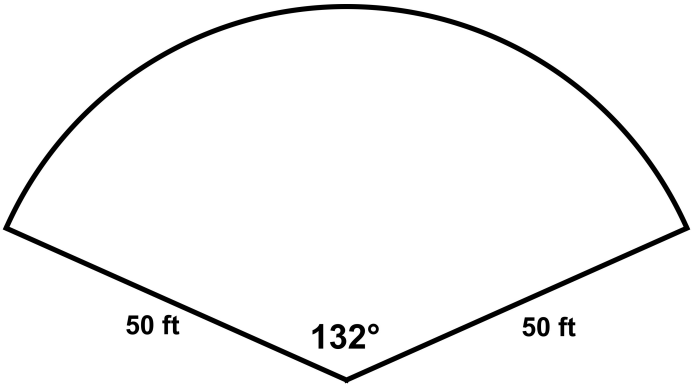
The key to all sector work is the fraction of the circle that has been taken up by the sector. This can always be determined by the **central angle** created by the two radii. Let's now look at a problem with a more difficult central angle.

***Exercise* #2:** A patio in the shape of a circular sector has a radius of 20 feet and a central angle of 110° as shown. Find the area of the sector to the nearest square foot. Show the work that leads to your answer.



As long as you can **solve** a **proportion**, you can determine any arc length or area involving a sector because the arc length and area of a sector are all **directly proportional** to the size of the **central angle**.

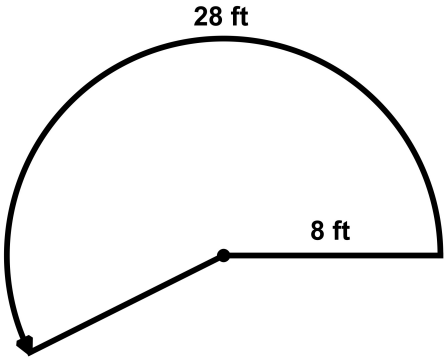
***Exercise* #3:** A garden has the shape of a circular sector such that its straight sides measure 50 feet in length and the central angle is 132°. If the garden needs to be surrounded by fencing, how many feet of it are needed? Round to the nearest foot.



This proportional relationship can also be used to solve for the central angle if information is already known about the area or arc length of the sector.

***Exercise* #4:** A sector of a circle, whose radius is 5 centimeters, has an area of 20 square centimeters. Is the central angle of this sector acute or obtuse? Justify your response.

***Exercise* #5:** A horse attached to an 8-foot-long rope can rotate through a distance of 28 feet. What angle can the horse walk about? Round to the nearest degree.



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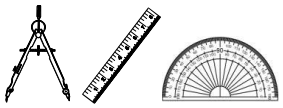


SECTORS OF CIRCLES
COMMON CORE GEOMETRY HOMEWORK

MEASUREMENT AND CONSTRUCTION

1. Using a ruler, compass, and protractor, draw a sector of a circle whose radius is 7 centimeters and whose central angle is 40°. Use point A shown below as its center.

A •

PROBLEM SOLVING

2. Which of the following is closest to the area of the sector you drew in #1?

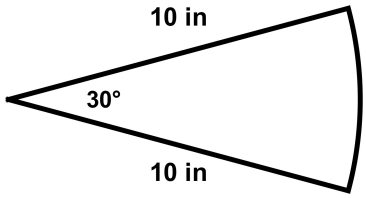
(1) 5 cm^2 (3) 14 cm^2

(2) 9 cm^2 (4) 17 cm^2 _____

3. The following sector has a radius of 10 inches and a central angle of 30°. Which of the following is its arc length, in inches?

(1) $\frac{5\pi}{3}$ (3) $\frac{7\pi}{4}$

(2) $\frac{10\pi}{7}$ (4) $\frac{7\pi}{6}$



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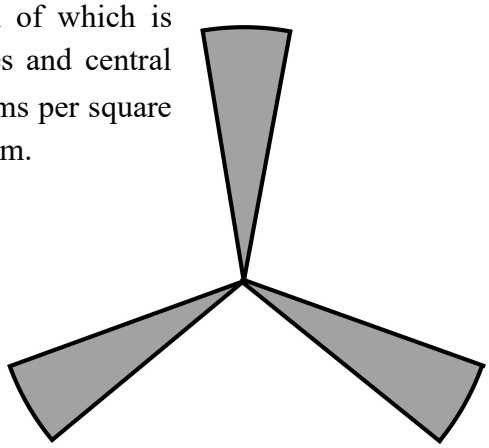
4. The area of a circle is 18π square inches. If the area of a sector of this circle is 6π square inches, then which of the following must be the sector's central angle?

(1) 60° (3) 120°

(2) 90° (4) 240° _____

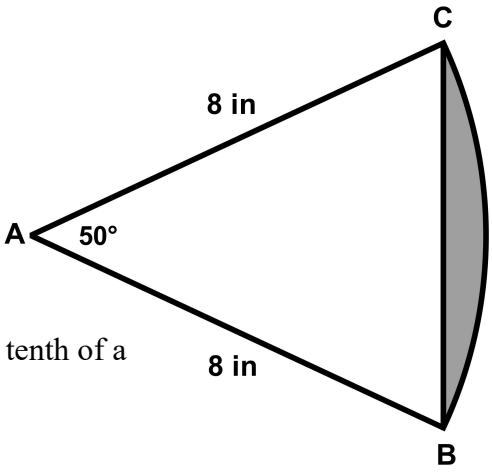
5. Luca is designing a propeller system that consists of 3 blades, each of which is identical. The blades are sectors of a circle that have radii of 4 inches and central angles of 20°. The blades are to be made from steel that weighs 16 grams per square inch. Determine the weight of the three blades together to the nearest gram.



6. An ant crawls around the perimeter of a circle whose radius is 2 feet through a central angle of 72°. What distance, to the nearest inch, has the ant crawled?

7. Isosceles triangle ABC is shown below with legs that measure 8 inches and a vertex angle of 50°.

   (a) Determine the area of ΔABC. Note that you will need to use right triangle trigonometry. Round to the nearest tenth of a square inch.



   (b) Determine the area of the circular sector. Again, round to the nearest tenth of a square inch.

   (c) Using your answers from (a) and (b), determine the area of the shaded region.