1.5 Moving Shadows

Practice

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I. Comparing radius and arc length

The wheels on the wagons that the pioneers used to cross the plains were smaller in the front than in the back. The front wheel had 12 spokes. The top of the front wheel measured 44 inches from the ground. The rear wheel had 16 spokes. The top of the rear wheel measured 59 inches from the ground. (For these problems disregard the hub at the center of the wheel. Assume the spokes meet in the center at a point.)
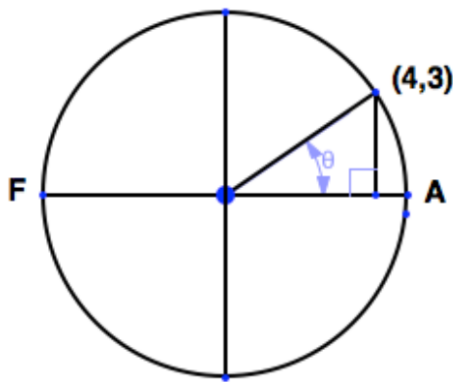
1. Find the area and the circumference of each wheel.

2. Determine the central angle between the spokes on each wheel.

3. Find the distance on the circumference between two consecutive spokes for each wheel.

4. The wagons could cover a distance of 15 miles per day. How many more times would the front wheel turn than the back wheel on an average day?

5, A wheel rotates r times per minute. Write a formula for how many degrees it rotates in t seconds.

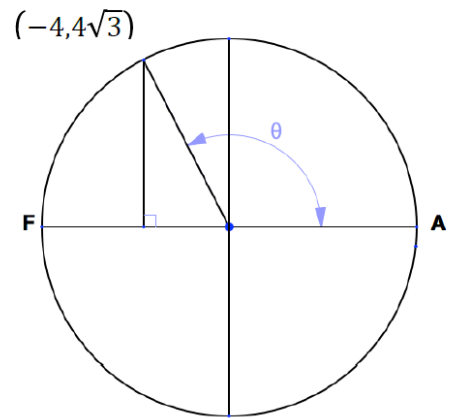## II. Values of Cosine in the Coordinate Plane

Use the given point on the circle to find the value of cosine. Recall that
$r = \sqrt{x^2 + y^2}$ and $\cos\theta = \frac{x}{r}$.

6.

(4,3)
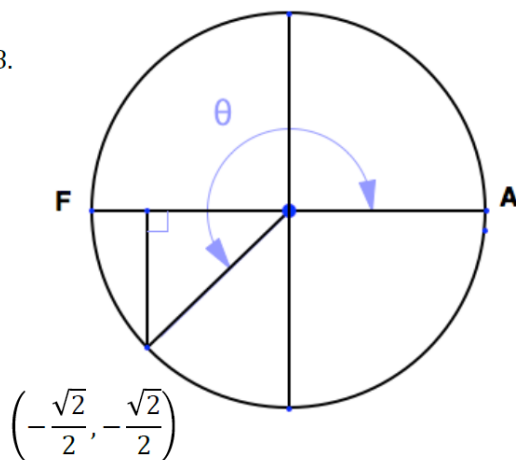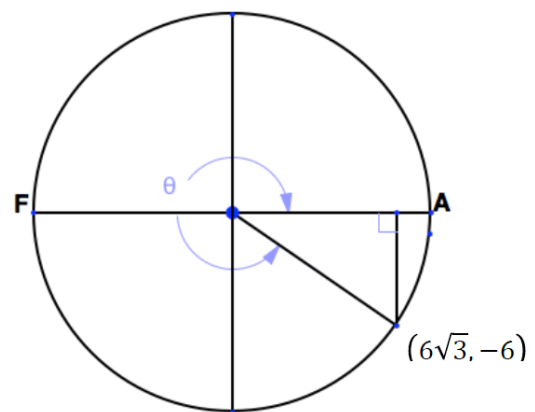
F

θ

A

7.

$\left(-4, 4\sqrt{3}\right)$

F

θ

A

8.

θ

F

A

$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

9.

θ

F

A

$\left(6\sqrt{3}, -6\right)$

10. In each graph, the angle of rotation is indicated by an arc and θ. Describe the angles of rotation that make the x-values of the points be positive and the angles of rotation that make the x-values be negative.

11. What do you notice about the x-values and the value of cosine in the graphs?

12. In the graph at the right, the radius of the circle is 1. The intersections of the circle and the axes are labeled.

Based on your observation in #6, what do you think the value of cosine might be for
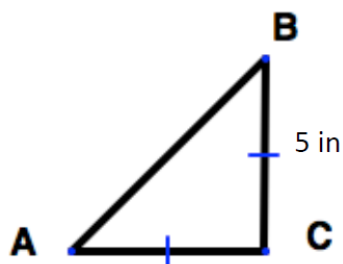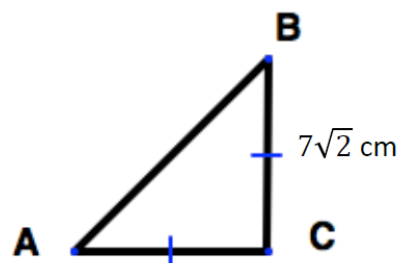
   a) 90°?

   b) 180°?

   c) 270°?

   d) 360°?
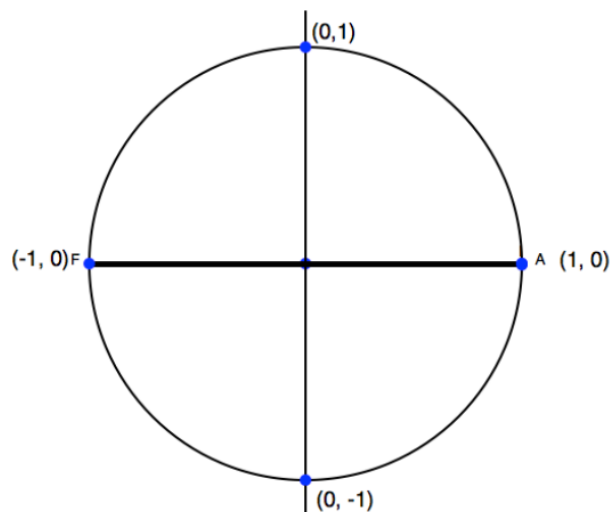
III. Measures in Special Triangles

Triangle ABC is a right triangle. Angle C is the right angle. Use the given information to find the missing sides and the missing angles.
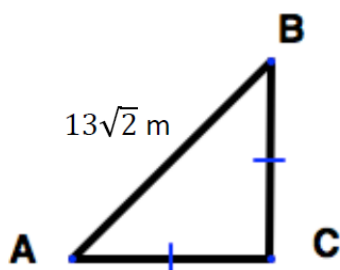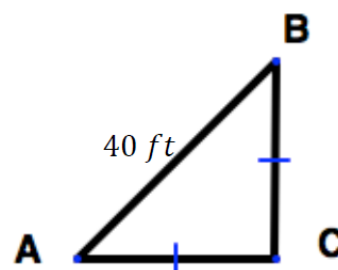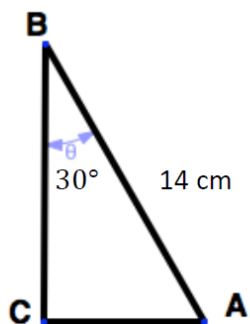
13.

5 in
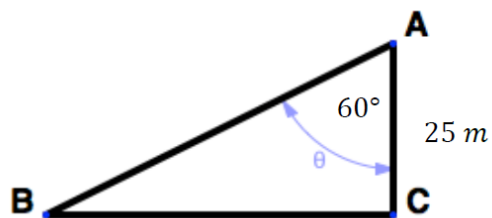
14.

$7\sqrt{2}$ cm

15.

$13\sqrt{2}$ m

16.

40 ft

17.

B

θ
30°   14 cm

C   A

18.

A

60°
25 m

B   C

19.

A

60°
θ

B   C

9√3 ft

20.

B

θ
30°

12 in

C   A
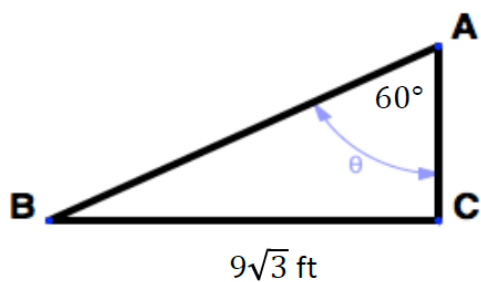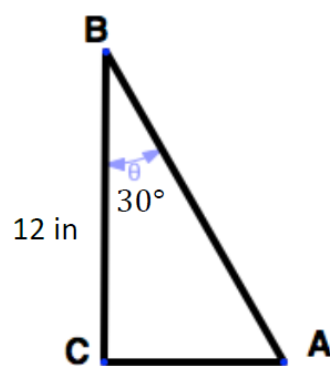
Find AD in the figures below.

21.

A

16 ft

C   D   B

22.
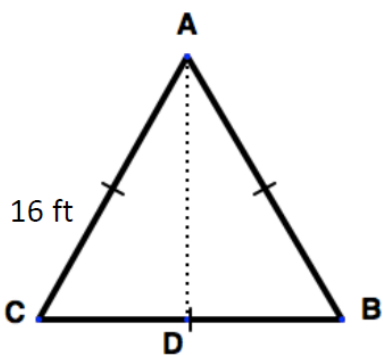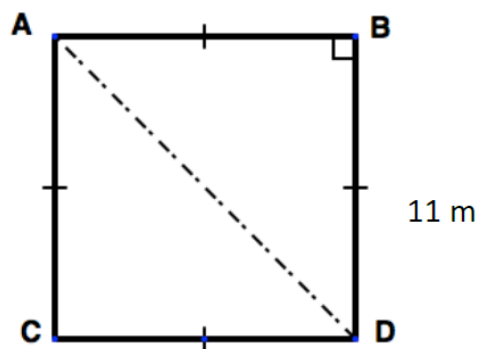
A   B

11 m

C   D

Remember that π is simply a number.

23. If you purchased π gallons of gasoline, about how many gallons of gas did you buy?

24. If you were paid 5π dollars per hour, about how many dollars would you make in 8 hours?

25. If you slept 2π hours each night, about how many hours of sleep would you get per night?