

READY, SET, GO!

Name _____

Period _____

Date _____

READY

Topic: Comparing radius and arc length

Stage coaches and wagons in the 1800s had wheels that were smaller in the front than in the back. The front wheels had 12 spokes. The top of the front wheel measured 44 inches from the ground.
 The rear wheels 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. **Leave π in your answers.**)

1. Find the area and the circumference of each wheel.

Front Wheel: Area = $\pi(22)^2 = 484\pi \text{ in}^2$ Back Wheel: Area = $\pi(29.5)^2 = 870.25\pi$
 Circum = $2\pi(22) = 44\pi \text{ in}$ Circum = $2\pi(29.5) = 59\pi$

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

Front Wheel: $\frac{360^\circ}{12} = 30^\circ$ Back Wheel: $\frac{360^\circ}{16} = 22.5^\circ$

3. Find the distance on the circumference between two consecutive spokes for each wheel. (arc length)

Front Wheel: Arc length = $\frac{30^\circ}{360^\circ} \cdot 2\pi(22) = \frac{11\pi}{3} \text{ in}$ Back wheel: Arc length = $\frac{22.5^\circ}{360^\circ} \cdot 2\pi(29.5) = \frac{59\pi}{16} \text{ in}$

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?

1 mile = 5280 ft = 5280(12) in = 63,360 in $\therefore 15 \text{ miles} = 950,400 \text{ in}$
 Front Wheel: turns $\frac{950,400}{44\pi} = 6875.49$ times Back wheel: turns $\frac{950,400}{59\pi} = 5127.49$ times

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

$\frac{r \text{ rotations}}{1 \text{ minute}} = \frac{360 \cdot r \text{ degrees}}{60 \text{ sec}} = 6r \text{ degrees/sec}$
 \therefore In t seconds it will rotate $6rt$ degrees.

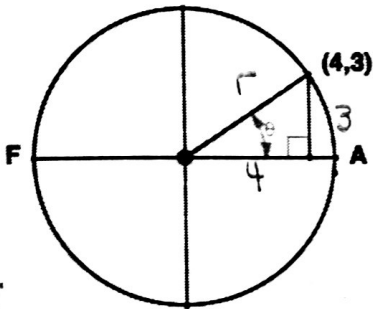
SET

Topic: Determining values of cosine in a circle

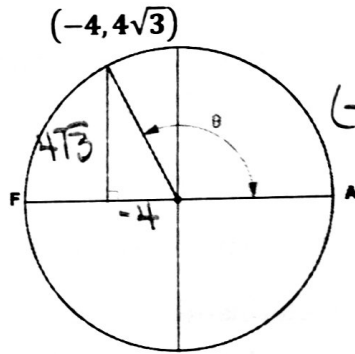
Use the given point on the circle to find the value of cosine.

Recall $r = \sqrt{x^2 + y^2}$ and $\cos \theta = \frac{x}{r}$.

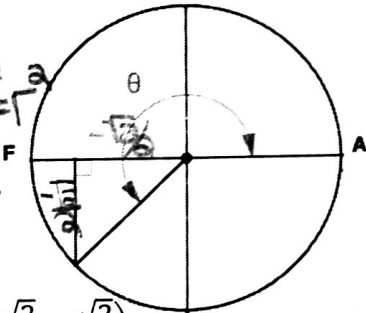
6.
 $4^2 + 3^2 = r^2$
 $25 = r^2$
 $5 = r$
 $\cos \theta = \frac{4}{5}$



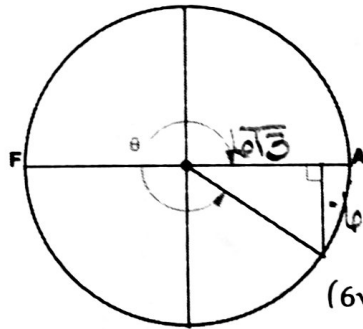
7.
 $(-4)^2 + (4\sqrt{3})^2 = r^2$
 $16 + 48 = r^2$
 $64 = r^2$
 $8 = r$
 $\cos \theta = \frac{-4}{8} = -\frac{1}{2}$



8.
 $(-\frac{\sqrt{2}}{2})^2 + (-\frac{\sqrt{2}}{2})^2 = r^2$
 $\frac{1}{2} + \frac{1}{2} = r^2$
 $1 = r^2$
 $1 = r$
 $\cos \theta = \frac{-\frac{\sqrt{2}}{2}}{1} = -\frac{\sqrt{2}}{2}$



9.
 $(6\sqrt{3})^2 + (-6)^2 = r^2$
 $108 + 36 = r^2$
 $144 = r^2$
 $12 = r$
 $\cos \theta = \frac{6\sqrt{3}}{12} = \frac{\sqrt{3}}{2}$



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 positive and the angles of rotation that make the x-values negative.

Angles that make x-values positive:
 $0^\circ < \theta < 90^\circ, 270^\circ < \theta < 360^\circ$

Angles that make x-values negative:
 $90^\circ < \theta < 270^\circ$

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

They have the same sign (i.e. when x is positive cos is positive, when x is negative cosine is negative)

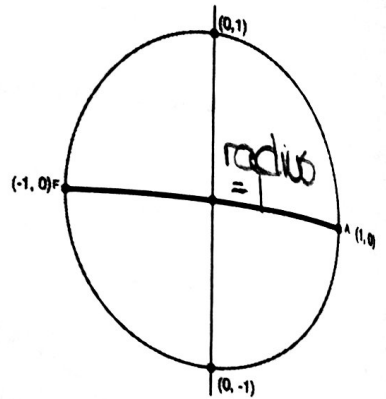
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12. In the graph at the right, the radius of the circle is 1.

The intersections of the circle and the axes are labeled.

$\cos \theta = \frac{x}{r}$

Based on your observation in #11, what do you think the value of cosine might be for the following values of θ :



90°? 180°? 270°? 360°?
 $\frac{0}{1} = 0$ $\frac{-1}{1} = -1$ $\frac{0}{1} = 0$ $\frac{1}{1} = 1$

GO

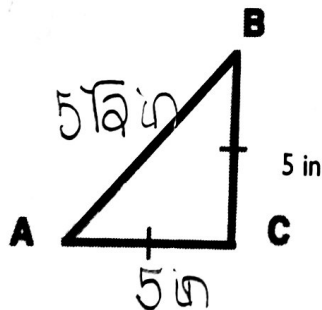
Topic: Reviewing the measurements in special triangles.

Use the given information to find the missing sides and the missing angles.

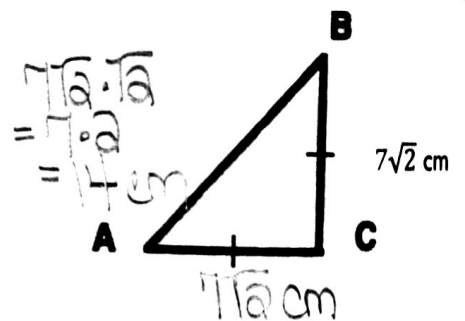
Triangle ABC is a right triangle. Angle C is the right angle. Write the exact values for the sides.

$45^\circ - 45^\circ - 90^\circ$
 hypotenuse = $\sqrt{2}$ • leg
 13.

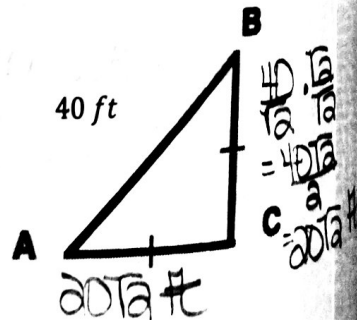
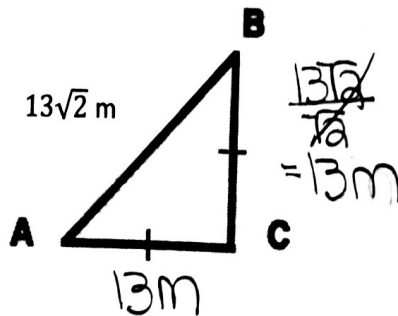
$30^\circ - 60^\circ - 90^\circ$
 hypotenuse = 2 • short leg long leg = $\sqrt{3}$ • short leg
 14. (opp. of 30°) (opp. of 60°)



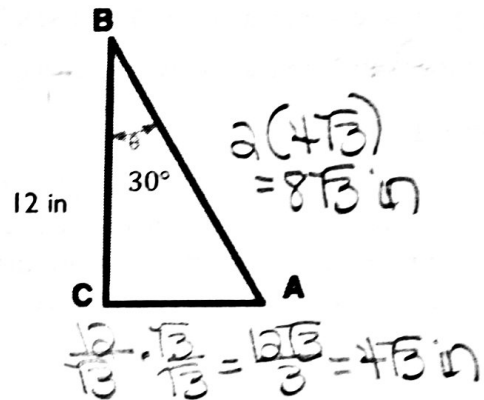
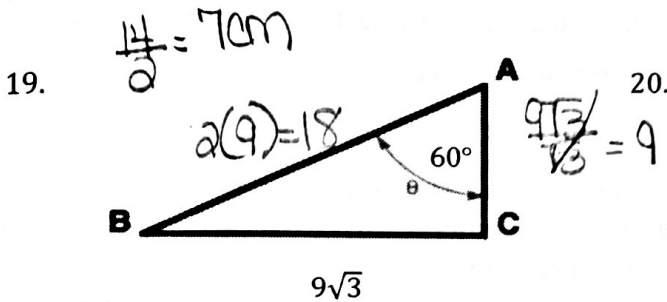
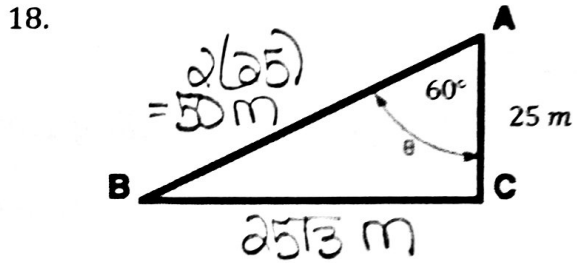
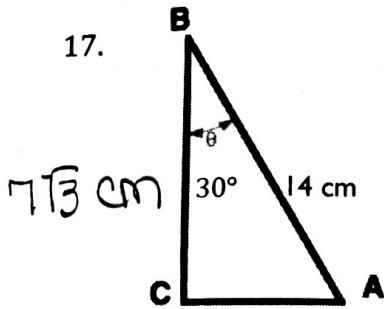
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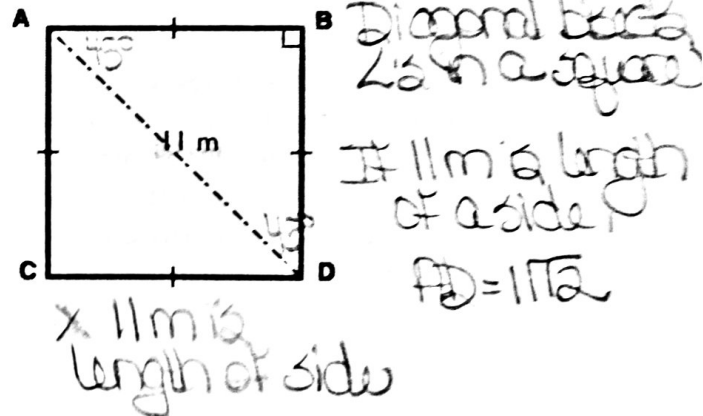
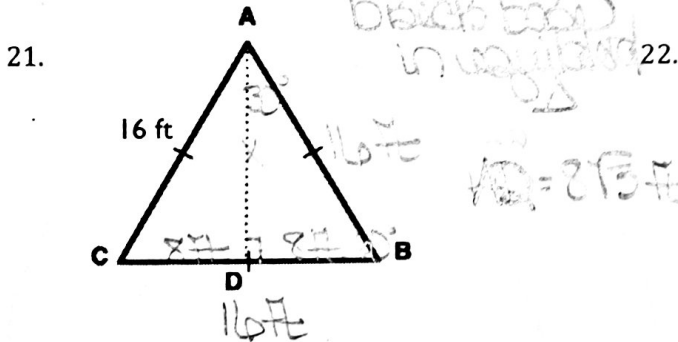
16.



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Find AD in the figures below.



Remember that π is simply a number.

23. If you purchased π gallons of gasoline, about how many gallons of gas did you buy?
 ~ 3.14 gallons
24. If you were paid 5π dollars per hour, about how many dollars would you make in 8 hours?
 $5\pi(8) \approx 125.66$
25. If you slept 2π hours each night, about how many hours of sleep would you get per night?
 ~ 6.28 hours

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