

## Sec. 13.4- 13.6- Trigonometric Functions

### New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

### Solve.

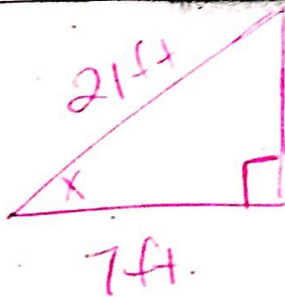
19. A 21-foot ladder is leaning against a building. The base of the ladder is 7 feet from the base of a building. To the nearest degree, what is the measure of the angle that the ladder makes with the ground?

71°

Original content Copyright © by Holt McDougal. Additions and changes to the original content are the responsibility of the instructor.

13-28

Holt Algebra 2



$$\cos(x) = \frac{7}{21}$$

$$\cos^{-1}\left(\frac{7}{21}\right) = 70.5^\circ$$

71°

ec. 13.4- 13.6- Trigonometric Functions

New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

Solve each equation to the nearest tenth. Use the given restrictions.

13.  $\sin \theta = 0.45$ , for  $0^\circ < \theta < 90^\circ$

26.7°

14.  $\sin \theta = 0.801$ , for  $90^\circ < \theta < 270^\circ$

126.8°

15. ~~\_\_\_\_\_~~

16.  $\cos \theta = -0.334$ , for  $0^\circ < \theta < 180^\circ$

109.5°

17.  $\cos \theta = -0.181$ , for  $180^\circ < \theta < 360^\circ$

259.6°

18. ~~\_\_\_\_\_~~

③  $\sin^{-1}(.45) = 26.7^\circ$

④  $\sin^{-1}(.801) = 53.2^\circ$ 

★	★
-	-

  
 $180 - 53.2^\circ = 126.8^\circ$

⑥  $\cos^{-1}(-.334) = 109.5^\circ$

⑦  $\cos^{-1}(-.181) = 100.4^\circ$ 

-	★
-	★

  
 $360 - 100.4 = 259.6^\circ$

c. 13.4- 13.6- Trigonometric Functions

New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

Evaluate each inverse trigonometric function. Give your answer in both radians and degrees.

7.  $\sin^{-1}(-1)$

$270^\circ; 3\pi/2$

8.  $\tan^{-1}(-\sqrt{3})$  *\* Don't worry about*

11.  $\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)$  *\* Don't worry about.*

10.  $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

~~$60^\circ, 120^\circ$~~   $60^\circ, 120^\circ$

$120^\circ, 300^\circ$

$\pi/3, 2\pi/3$

$\frac{2\pi}{3}, \frac{5\pi}{3}$

9.  $\cos^{-1}1$

$0^\circ/360^\circ; 0\pi/2\pi$

12.  $\cos^{-1}\left(\frac{\sqrt{2}}{2}\right)$

$45^\circ, 315^\circ$

$\pi/4, 7\pi/4$

13.4- 13.6- Trigonometric Functions

Learning Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

Name \_\_\_\_\_ Date \_\_\_\_\_ Class \_\_\_\_\_

**LESSON** **Practice B**  
**13-4** **Inverses of Trigonometric Functions**

Find all possible values of each expression. *n, an integer.*

1.  $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$

2.  $\cos^{-1}\left(-\frac{1}{2}\right)$

3.  $\tan^{-1}0$

*4π/3 + 2πn & 5π/3 + 2πn* } *2π/3 + 2πn*  
*4π/3 + 2πn* } *0 + 2πn,*  
*π + 2πn*

4.  $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

5.  $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

6. 

*5π/4 + 2πn*  
*7π/4 + 2πn*

*3π/4 + 2πn*  
*5π/4 + 2πn*

*degrees*

① *240° + 360n*  
*300° + 360n*

② *120 + 360n*  
*240 + 360n*

③ *0 + 360n*  
*180 + 360n*

④ *235° + 360n*  
*315° + 360n*

⑤ *135° + 360n*  
*235° + 360n*



## Sec. 13.4- 13.6- Trigonometric Functions

### New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

# READY TO GO ON?

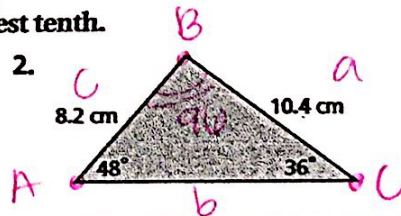
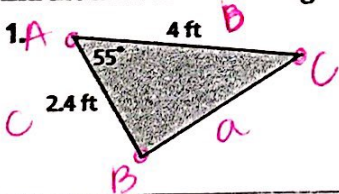


SECTION 13B

## Quiz for Lessons 13-5 Through 13-6

### The Law of Sines

Find the area of each triangle. Round to the nearest tenth.



$$A = \frac{1}{2} bc \sin A$$

$$A = \frac{1}{2} 4(2.4)(\sin 55^\circ) = \boxed{3.98 \text{ ft}^2}$$

$$A = \frac{1}{2} ac \sin B$$

$$A = \frac{1}{2} (10.4)(8.2)(\sin 96^\circ) = \boxed{A = 42.4 \text{ cm}^2}$$

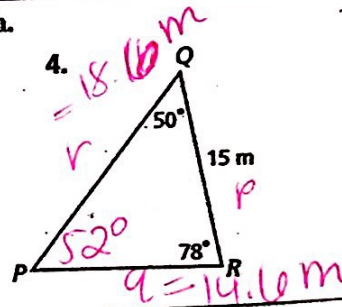
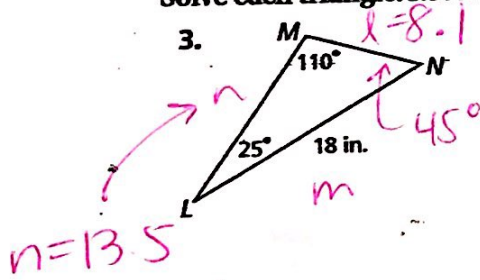
*Handwritten mark*

# ec. 13.4- 13.6- Trigonometric Functions

## New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

Solve each triangle. Round to the nearest tenth.



$$\textcircled{3} \frac{\sin 25^\circ}{l} = \frac{\sin 110^\circ}{18}$$

$$18 \frac{\sin 110^\circ}{\sin(110)} = \frac{(\sin 25^\circ)(18)}{\sin(110)}$$

$$l = 8.09$$

$$l = 8.1$$

$$\frac{\sin 110}{18} = \frac{\sin 45^\circ}{n}$$

$$n \frac{\sin 110}{\sin(110)} = \frac{18 \sin 45^\circ}{\sin 110}$$

$$n = 13.5$$

$$\textcircled{4} \frac{\sin 52^\circ}{15} = \frac{\sin 78^\circ}{r}$$

$$r \frac{\sin 52^\circ}{\sin 52} = \frac{15 \sin 78^\circ}{\sin 52}$$

$$r = 18.6$$

$$\frac{\sin 52^\circ}{15} = \frac{\sin 50^\circ}{q}$$

$$\frac{(\sin 50^\circ)(15)}{\sin(52)} = \frac{\sin(52^\circ)q}{\sin(52)}$$

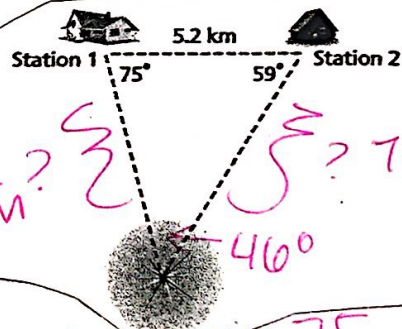
$$14.6 = q$$

## Sec. 13.4- 13.6- Trigonometric Functions

### New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

7. The rangers at two park stations spot a signal flare at the same time. Based on the measurements shown in the diagram, what is the distance between each park station and the point where the flare was set off? Round to the nearest tenth.



$$\frac{\sin 46}{5.2} = \frac{\sin 59}{x}$$

$$5.2 \sin 59 = x \frac{\sin 46}{\sin 46}$$

$$x = 6.2 \text{ km}$$

$$\frac{\sin 46}{5.2} = \frac{\sin 75}{x}$$

$$\frac{\sin 75 \times 5.2}{\sin 46} = x \frac{\sin 46}{\sin 46}$$

$$x = 7 \text{ km}$$

# Sec. 13.4- 13.6- Trigonometric Functions

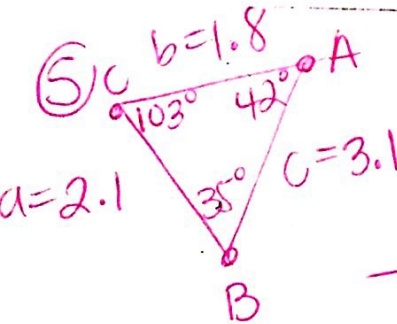
## New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

Derrick is designing triangular panes for a stained glass window. Determine the number of different triangles that he can form using the given measurements. Then solve the triangles. Round to the nearest tenth.

5.  $a = 2.1$  cm,  $b = 1.8$  cm,  $m\angle A = 42^\circ$

6.  $a = 3$  cm,  $b = 4.6$  cm,  $m\angle A = 95^\circ$



$$\frac{\sin 42}{2.1} = \frac{\sin B}{1.8}$$

$$\sin B = .574$$

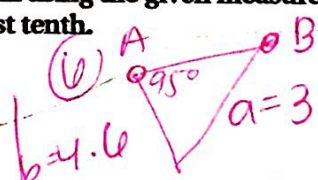
$$m\angle B = 35^\circ$$

$$\frac{\sin 42}{2.1} = \frac{\sin 103}{x}$$

$$\sin 42 x = \sin 103 (2.1)$$

$$x = 3.1$$

check for 2nd  $\Delta$   
 $180 - 35 = 145^\circ$   
 $145^\circ + 42^\circ = 187^\circ$   
 over  $180^\circ$   
**[NO SECOND  $\Delta$ !]**



$$\frac{\sin 95}{3} = \frac{\sin B}{4.6}$$

$$1.53 = \sin B$$

$$\sin^{-1}(1.53) = \text{undef.}$$

**[NO  $\Delta$ ]**



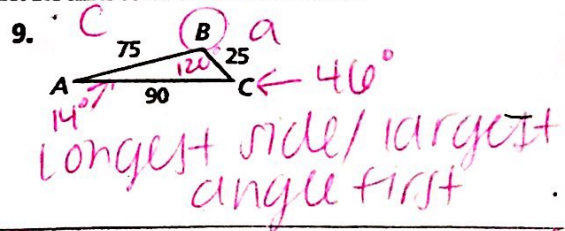
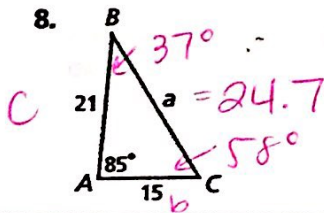
## Sec. 13.4- 13.6- Trigonometric Functions

### New Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

### The Law of Cosines

Use the given measurements to solve each triangle. Round to the nearest tenth.



$$\begin{aligned} (8) a^2 &= 15^2 + 21^2 - 2(15)(21)\cos 85 \\ a^2 &= 666 - 630\cos 85 \\ a^2 &= 666 - 54.9 \\ \sqrt{a^2} &= \sqrt{611.1} \\ a &= 24.7 \\ \frac{\sin 85}{24.7} &= \frac{\sin B}{15} \\ 15 \sin 85 &= \frac{24.7 \sin B}{24.7} \\ \sin B &= .6 \quad m\angle B = 37^\circ \end{aligned}$$

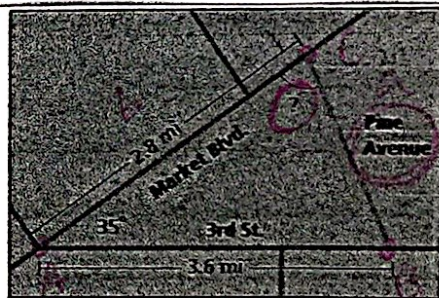
$$\begin{aligned} (9) 90^2 &= 25^2 + 75^2 - 2(25)(75)\cos B \\ 8100 &= 6250 - 3750\cos B \\ -6250 - 6250 & \\ \underline{1850} &= \underline{-3750\cos B} \\ -3750 - 3750 & \\ \cos B &= -.49 \quad m\angle B = 120^\circ \\ \frac{\sin A}{25} &= \frac{\sin 120}{90} \\ \times 25 \quad \times 25 & \\ \sin A &= .24 \quad m\angle A = 14^\circ \\ 180 - 120 - 14 &= 46^\circ \\ m\angle C &= 46^\circ \end{aligned}$$

# ec. 13.4- 13.6- Trigonometric Functions

## ew Objectives from Test:

- Evaluate inverse trigonometric functions. (13.4)
- Use trigonometric equations and inverse trigonometric functions to solve problems. (13.4)
- Determine the area of a triangle given side-angle-side information. (13.5)
- Use the Law of Sines to find the side lengths and angle measures of a triangle. (13.5)
- Be able to determine how many triangles can be made with the given information. (13.5)
- Use the Law of Cosines to find the side lengths and angle measures of a triangle. (13.6)
- Use Heron's Formula to find the area of a triangle. (13.6)

10. A civil engineer is working on plans for a new road called Pine Avenue. This road will intersect Market Boulevard and 3rd Street as shown. To the nearest degree, what is the measure of the angle that Pine Avenue will make with Market Boulevard?



11. A school courtyard is shaped like a triangle. Its sides measure 25 yards, 27.5 yards, and 32 yards. What is the area of the courtyard to the nearest square yard?

Ready to Go On? 975

$$\textcircled{10} a^2 = 2.8^2 + 3.6^2 - 2(2.8)(3.6)\cos(35)$$

$$a^2 = 20.8 - 20.16\cos(35)$$

$$\sqrt{a^2} = 4.3$$

$$a = 2.1 \text{ miles}$$

$$\frac{\sin 35}{2.1} = \frac{\sin C}{3.6}$$

$$\times 3.6 \quad \times 3.6$$

$$.983 = \sin C$$

$$\sin^{-1}(.983) = 79.5^\circ \quad \textcircled{80^\circ}$$

$$\textcircled{11} s = \frac{25 + 27.5 + 32}{2} = 42.25$$

$$\sqrt{s(s-a)(s-b)(s-c)}$$

~~\_\_\_\_\_~~ 75-

~~\_\_\_\_\_~~

$$\sqrt{42.25(17.25)(14.75)(10.25)}$$