Name _____ Date _____ Class _____

LESSON 8-5

# Practice A

## *Law of Sines and Law of Cosines*

**Use a calculator to find each trigonometric ratio. Round to the nearest hundredth.**

**1.** $\sin 168°$ _____ **2.** $\cos 147°$ _____ **3.** $\tan 107°$ _____

**4.** $\sin 97°$ _____ **5.** $\cos 94°$ _____ **6.** $\tan 140°$ _____

**7.** $\sin 121°$ _____ **8.** $\cos 170°$ _____ **9.** $\tan 135°$ _____

**In Exercises 10 and 11, fill in the blanks to complete the theorems.**

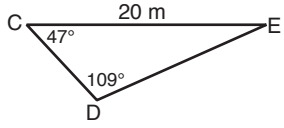
**10.** For any $\triangle ABC$ with side lengths $a$, $b$, and $c$, $\frac{\sin A}{a} = \frac{\square}{b} = \frac{\sin C}{\square}$.

**11.** For any $\triangle ABC$ with side lengths $a$, $b$, and $c$, $a^2 = b^2 + c^2 - 2bc\cos A$,

$b^2 = a^2 + c^2 - 2ac$ _____, and _____ $= a^2 + b^2 - 2ab\cos C$.

**For Exercises 12 and 13, substitute numbers into the given Law of Sines ratio to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

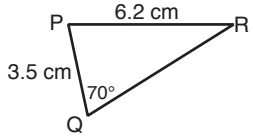
**12.**




$\frac{\sin D}{CE} = \frac{\sin C}{DE}$

$DE$ _____

**13.**

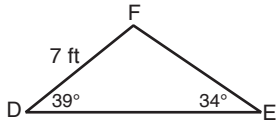



$\frac{\sin Q}{PR} = \frac{\sin R}{PQ}$

$m\angle R$ _____

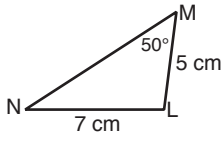
**Use the Law of Sines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

**14.**




$EF$ _____

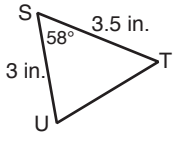
**15.**




$m\angle N$ _____

**For Exercises 16 and 17, substitute numbers into the Law of Cosines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

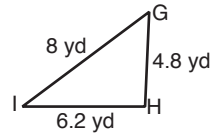
**16.**




$TU$ _____

$TU^2 = ST^2 + SU^2 - 2(ST)(SU)(\cos S)$

**17.**




$m\angle H$ _____

$GI^2 = GH^2 + HI^2 - 2(GH)(HI)(\cos H)$

LESSON 8-5

## Practice A

### Law of Sines and Law of Cosines

**Use a calculator to find each trigonometric ratio. Round to the nearest hundredth.**

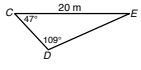
1. $\sin 168°$ **0.21**
2. $\cos 147°$ **−0.84**
3. $\tan 107°$ **−3.27**
4. $\sin 97°$ **0.99**
5. $\cos 94°$ **−0.07**
6. $\tan 140°$ **−0.84**
7. $\sin 121°$ **0.86**
8. $\cos 170°$ **−0.98**
9. $\tan 135°$ **−1.00**

**In Exercises 10 and 11, fill in the blanks to complete the theorems.**

10. For any $\triangle ABC$ with side lengths $a$, $b$, and $c$, $\frac{\sin A}{a} =$ **$\frac{\sin B}{b}$** $= \frac{\sin C}{c}$.

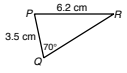
11. For any $\triangle ABC$ with side lengths $a$, $b$, and $c$, $a^2 = b^2 + c^2 - 2bc\cos A$, $b^2 = a^2 + c^2 - 2ac$ **$\cos B$**, and **$c^2$** $= a^2 + b^2 - 2ab\cos C$.

**For Exercises 12 and 13, substitute numbers into the given Law of Sines ratio to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

12. 


$\frac{\sin D}{CE} = \frac{\sin C}{DE}$

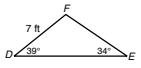
$DE$ **15.5**

13. 


$\frac{\sin Q}{PR} = \frac{\sin R}{PQ}$

$m\angle R$ **32°**

**Use the Law of Sines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

14. 


$EF$ **7.9 ft**

15. 

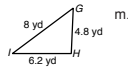

$m\angle N$ **33°**

**For Exercises 16 and 17, substitute numbers into the Law of Cosines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

16. 


$TU$ **3.2 in.**

$TU^2 = ST^2 + SU^2 - 2(ST)(SU)(\cos S)$

17. 


$m\angle H$ **92.4°**

$GI^2 = GH^2 + HI^2 - 2(GH)(HI)(\cos H)$





LESSON 8-5

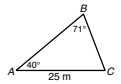
## Practice B

### Law of Sines and Law of Cosines

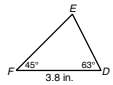
**Use a calculator to find each trigonometric ratio. Round to the nearest hundredth.**

1. $\sin 111°$ **0.93**
2. $\cos 150°$ **−0.87**
3. $\tan 163°$ **−0.31**
4. $\sin 92°$ **1.00**
5. $\cos 129°$ **−0.63**
6. $\tan 99°$ **−6.31**
7. $\sin 170°$ **0.17**
8. $\cos 96°$ **−0.10**
9. $\tan 117°$ **−1.96**

**Use the Law of Sines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

10. 

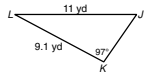

$BC$ **17.0 m**

11. 

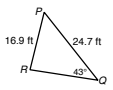

$DE$ **2.8 in.**

12. 

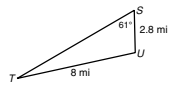

$GH$ **61.1 km**

13. 


$m\angle J$ **55°**

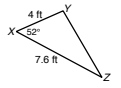
14. 


$m\angle R$ **85°**

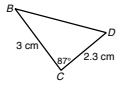
15. 


$m\angle T$ **18°**

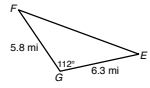
**Use the Law of Cosines to find each measure. Round lengths to the nearest tenth and angle measures to the nearest degree.**

16. 

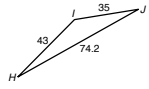

$YZ$ **6.0 ft**

17. 

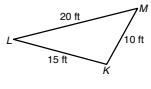

$BD$ **3.7 cm**

18. 

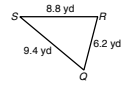

$EF$ **10.0 mi**

19. 


$m\angle I$ **144°**

20. 


$m\angle M$ **47°**

21. 


$m\angle S$ **40°**



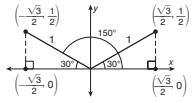


LESSON 8-5

## Practice C

### Law of Sines and Law of Cosines

The figure shows a 30° angle and a 150° angle in a coordinate plane. Notice the special triangles that the angles make with the $x$-axis. The figure also shows the trigonometric ratios for each angle.

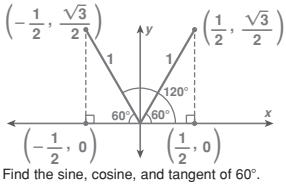



$\sin 150° = \frac{1}{2}$ $\sin 30° = \frac{1}{2}$

$\cos 150° = -\frac{\sqrt{3}}{2}$ $\cos 30° = \frac{\sqrt{3}}{2}$

$\tan 150° = -\frac{\sqrt{3}}{3}$ $\tan 30° = \frac{\sqrt{3}}{3}$

1. Sketch a 60° angle and a 120° angle in a coordinate plane. Give the coordinates of the vertices of the special right triangles that the angles make with the $x$-axis. Give the hypotenuses a length of 1 unit.



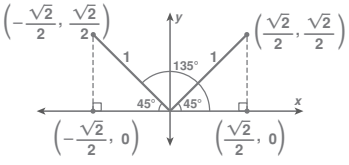

2. Find the sine, cosine, and tangent of 60°.

**$\frac{\sqrt{3}}{2}, \frac{1}{2}, \sqrt{3}$**

3. Find the sine, cosine, and tangent of 120°.

**$\frac{\sqrt{3}}{2}, -\frac{1}{2}, -\sqrt{3}$**

4. Sketch a 45° angle and a 135° angle in a coordinate plane. Give the coordinates of the vertices of the special right triangles that the angles make with the $x$-axis.




**Give the hypotenuses a length of 1 unit.**

5. Find the sine, cosine, and tangent of 45°.

**$\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}, 1$**

6. Find the sine, cosine, and tangent of 135°.

**$\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}, -1$**

7. Make a conjecture about the sine of an angle, $\sin A$, and the cosine of the angle's complement, $\cos(90 - A)$.

**Possible answer: The sine of an angle is equal to the cosine of the angle's complement: $\sin A = \cos(90 - A)$.**





LESSON 8-5

## Review for Mastery

### Law of Sines and Law of Cosines

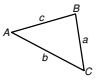
You can use a calculator to find trigonometric ratios for obtuse angles.

$\sin 115° \approx 0.906307787$ $\cos 270° = 0$ $\tan 96° = -9.514364454$

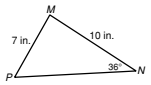
**The Law of Sines**

For any $\triangle ABC$ with side lengths $a$, $b$, and $c$ that are opposite angles $A$, $B$, and $C$, respectively,

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$.




**Find $m\angle P$. Round to the nearest degree.**



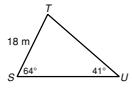

| | |
|---|---|
| $\frac{\sin P}{MN} = \frac{\sin N}{PM}$ | Law of Sines |
| $\frac{\sin P}{10 \text{ in.}} = \frac{\sin 36°}{7 \text{ in.}}$ | $MN = 10$, $m\angle N = 36°$, $PM = 7$ |
| $\sin P = 10 \text{ in.} \cdot \frac{\sin 36°}{7 \text{ in.}}$ | Multiply both sides by 10 in. |
| $\sin P \approx 0.84$ | Simplify. |
| $m\angle P \approx \sin^{-1}(0.84)$ | Use the inverse sine function to find $m\angle P$. |
| $m\angle P \approx 57°$ | Simplify. |

**Use a calculator to find each trigonometric ratio. Round to the nearest hundredth.**

1. $\cos 104°$ **−0.24**
2. $\tan 225°$ **1**
3. $\sin 100°$ **0.98**

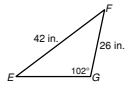
**Find each measure. Round the length to the nearest tenth and the angle measure to the nearest degree.**

4. $TU$




**24.7 m**

5. $m\angle E$




**37°**