PRACTICE & PROBLEM SOLVING

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UNDERSTAND

- 12. Construct Arguments Lourdes said that you can use the Law of Sines if you have any two angles and any side, or any two sides and any angle. Is Lourdes correct? Explain your reasoning.
- **13. Generalize** Knowing a particular combination of the sides and/or angles in a triangle leads to the ambiguous case. What is that combination?
- **14. Error Analysis** Describe and correct the error a student made in using the Law of Cosines to find *a*.

 $a^{2} = 14^{2} + 9^{2} - 2(14)(9)(\cos 140)$ $a^{2} = 196 + 81 - 252(-.766)$ $a^{2} = 277 - 193.03$ $a^{2} = 83.97$ $a \approx 9.16$

15. Communicate Precisely Two students are solving for *d* in the triangle shown, using the Law of Cosines. One says the answer is 20 in., and the other says the answer is 20.3 in. Is either student incorrect? Explain your reasoning.



16. Look for Relationships Show that the Law of Cosines is equivalent to the Pythagorean Theorem when the given angle is 90°.



17. Higher Order Thinking The ambiguous case only causes a problem when the given angle is acute, not when an obtuse angle is given. Explain why.

PRACTICE

How can you derive the Law of Sines for the given angles? SEE EXAMPLE 1



Use the Law of Sines to solve. SEE EXAMPLE 2

20. In $\triangle HJK$, $m \angle J = 122^\circ$, j = 17, and k = 8. What is $m \angle K$?

21. In $\triangle RST$, $m \angle R = 45^\circ$, $m \angle S = 19^\circ$, and r = 15. What is *s*?

Find the number of possible triangles for each set of measures. Then find the angle measure(s). SEE EXAMPLE 3

- **22.** In $\triangle WXY$, $m \angle X = 104^\circ$, x = 7, and y = 2. Find $m \angle Y$.
- **23.** In $\triangle DEF$, $m \angle D = 28^\circ$, d = 8, and e = 15. Find $m \angle E$.
- **24.** In $\triangle RST$, $m \angle R = 30^\circ$, r = 14, and t = 32. Find $m \angle T$.

How can you derive the Law of Cosines for obtuse angle *K*? SEE EXAMPLE 4



In $\triangle PQR$, find $m \angle P$. SEE EXAMPLE 5 26. p = 5, q = 8, r = 9

27. *p* = 14, *q* = 6, *r* = 12

What is the measure of angle *Z*? SEE EXAMPLE 6



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APPLY

30. Model with Mathematics The head sail for Melissa's sailboat is a triangle with the three sides having lengths of 24 ft, 23 ft, and 12 ft. What is the measure of the sail's greatest angle?

31. Use Structure

An art sculpture is made of rotated scalene triangles, as shown. The triangles are all congruent. What is the length of the longest side of each triangle?



32. Make Sense and Persevere The course for a race follows three roads as shown. How far do the runners travel along Jappa Road?



- 33. Model With Mathematics Noemi throws a ball to Parker, who is 6 m away. When Parker catches the ball, he turns 50°, and then throws the ball 7 m to Shandra. What angle does Shandra turn to throw back to Noemi?
- 34. Make Sense and Persevere Tamika parked her car and walked 300 yd down a path. She then made a 135° turn onto a new path. She walked another 40 yd along a river to her fishing spot. If Tamika turns to face the direction of her car, what angle does she need to turn?

ASSESSMENT PRACTICE

35. In $\triangle EFG$, $m \angle E = 35^{\circ}$, e = 5.8, and f = 10. Choose Yes or No to tell whether each is a possible value for $m \angle F$.

	Yes	No
There are no possible values.		
6.2°		
60.3°		
81.5°		
98.5°		
119.7°		

36. SAT/ACT In $\triangle ABC$, a = 29.7, b = 48.5, and $B = 92^{\circ}$. What is $m \angle A$?

A There is no possible value.

- **B** 37.7°
- © 56.3°
- D 123.7°
- E 142.3°
- 37. Performance Task Teo is standing 80 yd from the base of a Mayan pyramid. The side of the pyramid is 100 ft from base to peak.



Part A How many feet from the base of the pyramid is Teo?

Part B What is the measure of angle P formed by the side of the pyramid and Teo's line of sight?

Part C What is the distance in a straight line from Teo to the peak x?

