6.2 EXERCISES

See www.CalcChat.com for worked-out solutions to odd-numbered exercises.

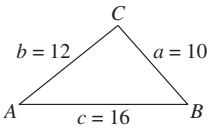
VOCABULARY: Fill in the blanks.

1. If you are given three sides of a triangle, you would use the Law of _____ to find the three angles of the triangle.
2. If you are given two angles and any side of a triangle, you would use the Law of _____ to solve the triangle.
3. The standard form of the Law of Cosines for $\cos B = \dfrac{a^2 + c^2 - b^2}{2ac}$ is _____ .
4. The Law of Cosines can be used to establish a formula for finding the area of a triangle called _____ _____ Formula.

SKILLS AND APPLICATIONS

In Exercises 5–20, use the Law of Cosines to solve the triangle. Round your answers to two decimal places.

5.



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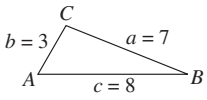

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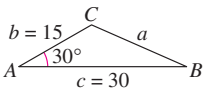

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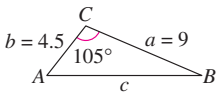


9. $a = 11, \quad b = 15, \quad c = 21$

10. $a = 55, \quad b = 25, \quad c = 72$

11. $a = 75.4, \quad b = 52, \quad c = 52$

12. $a = 1.42, \quad b = 0.75, \quad c = 1.25$

13. $A = 120°, \quad b = 6, \quad c = 7$

14. $A = 48°, \quad b = 3, \quad c = 14$

15. $B = 10° \, 35', \quad a = 40, \quad c = 30$

16. $B = 75° \, 20', \quad a = 6.2, \quad c = 9.5$

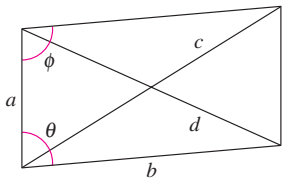
17. $B = 125° \, 40', \quad a = 37, \quad c = 37$

18. $C = 15° \, 15', \quad a = 7.45, \quad b = 2.15$

19. $C = 43°, \quad a = \frac{4}{9}, \quad b = \frac{7}{9}$

20. $C = 101°, \quad a = \frac{3}{8}, \quad b = \frac{3}{4}$

In Exercises 21–26, complete the table by solving the parallelogram shown in the figure. (The lengths of the diagonals are given by c and d.)



	a	b	c	d	θ	ϕ
21.	5	8			45°	
22.	25	35				120°
23.	10	14	20			
24.	40	60		80		
25.	15		25	20		
26.		25	50	35		

In Exercises 27–32, determine whether the Law of Sines or the Law of Cosines is needed to solve the triangle. Then solve the triangle.

27. $a = 8, \quad c = 5, \quad B = 40°$

28. $a = 10, \quad b = 12, \quad C = 70°$

29. $A = 24°, \quad a = 4, \quad b = 18$

30. $a = 11, \quad b = 13, \quad c = 7$

31. $A = 42°, \quad B = 35°, \quad c = 1.2$

32. $a = 160, \quad B = 12°, \quad C = 7°$

In Exercises 33–40, use Heron's Area Formula to find the area of the triangle.

33. $a = 8, \quad b = 12, \quad c = 17$

34. $a = 33, \quad b = 36, \quad c = 25$

35. $a = 2.5, \quad b = 10.2, \quad c = 9$

36. $a = 75.4, \quad b = 52, \quad c = 52$

37. $a = 12.32, \quad b = 8.46, \quad c = 15.05$

38. $a = 3.05, \quad b = 0.75, \quad c = 2.45$

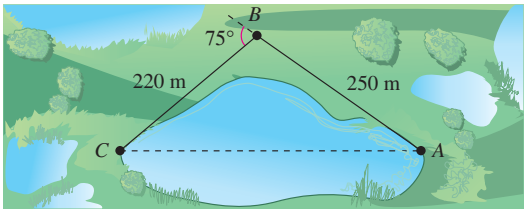
39. $a = 1, \quad b = \frac{1}{2}, \quad c = \frac{3}{4}$

40. $a = \frac{3}{5}, \quad b = \frac{5}{8}, \quad c = \frac{3}{8}$

41. NAVIGATION A boat race runs along a triangular course marked by buoys A, B, and C. The race starts with the boats headed west for 3700 meters. The other two sides of the course lie to the north of the first side, and their lengths are 1700 meters and 3000 meters. Draw a figure that gives a visual representation of the situation, and find the bearings for the last two legs of the race.

42. NAVIGATION A plane flies 810 miles from Franklin to Centerville with a bearing of 75°. Then it flies 648 miles from Centerville to Rosemount with a bearing of 32°. Draw a figure that visually represents the situation, and find the straight-line distance and bearing from Franklin to Rosemount.

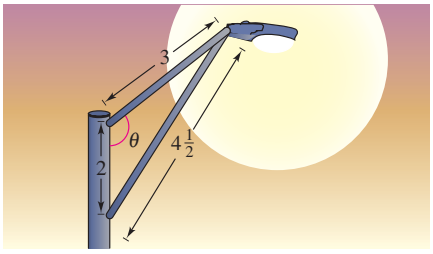
43. SURVEYING To approximate the length of a marsh, a surveyor walks 250 meters from point A to point B, then turns 75° and walks 220 meters to point C (see figure). Approximate the length AC of the marsh.



44. SURVEYING A triangular parcel of land has 115 meters of frontage, and the other boundaries have lengths of 76 meters and 92 meters. What angles does the frontage make with the two other boundaries?

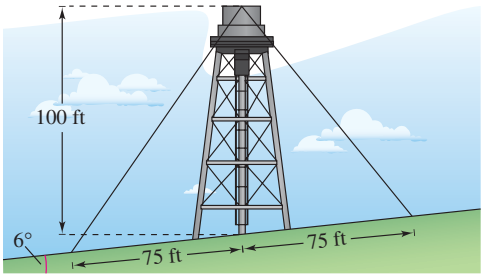
45. SURVEYING A triangular parcel of ground has sides of lengths 725 feet, 650 feet, and 575 feet. Find the measure of the largest angle.

46. STREETLIGHT DESIGN Determine the angle θ in the design of the streetlight shown in the figure.



47. DISTANCE Two ships leave a port at 9 A.M. One travels at a bearing of N 53° W at 12 miles per hour, and the other travels at a bearing of S 67° W at 16 miles per hour. Approximate how far apart they are at noon that day.

48. LENGTH A 100-foot vertical tower is to be erected on the side of a hill that makes a 6° angle with the horizontal (see figure). Find the length of each of the two guy wires that will be anchored 75 feet uphill and downhill from the base of the tower.



49. NAVIGATION On a map, Orlando is 178 millimeters due south of Niagara Falls, Denver is 273 millimeters from Orlando, and Denver is 235 millimeters from Niagara Falls (see figure).

(a) Find the bearing of Denver from Orlando.

(b) Find the bearing of Denver from Niagara Falls.

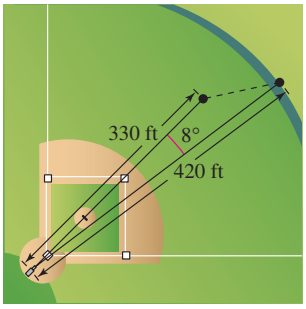
50. NAVIGATION On a map, Minneapolis is 165 millimeters due west of Albany, Phoenix is 216 millimeters from Minneapolis, and Phoenix is 368 millimeters from Albany (see figure).

(a) Find the bearing of Minneapolis from Phoenix.

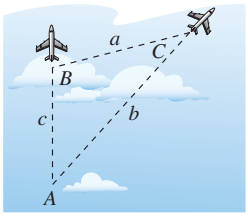
(b) Find the bearing of Albany from Phoenix.

51. BASEBALL On a baseball diamond with 90-foot sides, the pitcher's mound is 60.5 feet from home plate. How far is it from the pitcher's mound to third base?

52. BASEBALL The baseball player in center field is playing approximately 330 feet from the television camera that is behind home plate. A batter hits a fly ball that goes to the wall 420 feet from the camera (see figure). The camera turns 8° to follow the play. Approximately how far does the center fielder have to run to make the catch?

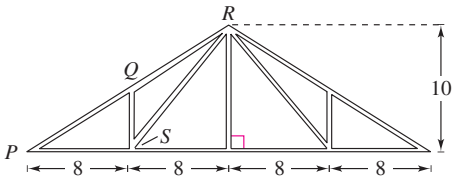


53. AIRCRAFT TRACKING To determine the distance between two aircraft, a tracking station continuously determines the distance to each aircraft and the angle A between them (see figure). Determine the distance a between the planes when $A = 42°$, $b = 35$ miles, and $c = 20$ miles.



54. AIRCRAFT TRACKING Use the figure for Exercise 53 to determine the distance a between the planes when $A = 11°$, $b = 20$ miles, and $c = 20$ miles.

55. TRUSSES Q is the midpoint of the line segment $\overline{PR}$ in the truss rafter shown in the figure. What are the lengths of the line segments $\overline{PQ}$, $\overline{QS}$, and $\overline{RS}$?



56. ENGINE DESIGN An engine has a seven-inch connecting rod fastened to a crank (see figure).

(a) Use the Law of Cosines to write an equation giving the relationship between x and θ.

(b) Write x as a function of θ. (Select the sign that yields positive values of x.)

(c) Use a graphing utility to graph the function in part (b).

(d) Use the graph in part (c) to determine the maximum distance the piston moves in one cycle.

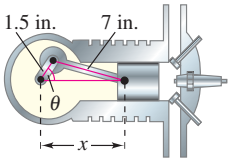


FIGURE FOR 56

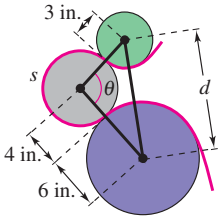
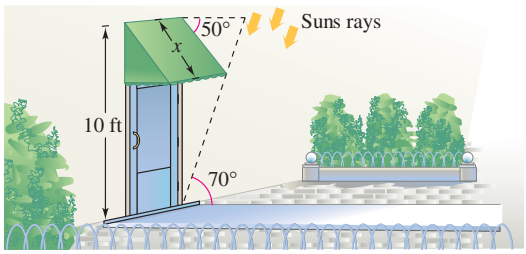


FIGURE FOR 57

57. PAPER MANUFACTURING In a process with continuous paper, the paper passes across three rollers of radii 3 inches, 4 inches, and 6 inches (see figure). The centers of the three-inch and six-inch rollers are d inches apart, and the length of the arc in contact with the paper on the four-inch roller is s inches. Complete the table.

d (inches)	9	10	12	13	14	15	16
θ (degrees)							
s (inches)							

58. AWNING DESIGN A retractable awning above a patio door lowers at an angle of 50° from the exterior wall at a height of 10 feet above the ground (see figure). No direct sunlight is to enter the door when the angle of elevation of the sun is greater than 70°. What is the length x of the awning?



59. GEOMETRY The lengths of the sides of a triangular parcel of land are approximately 200 feet, 500 feet, and 600 feet. Approximate the area of the parcel.