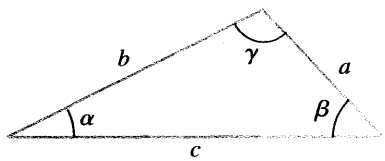
EXERCISE 6.2

All triangles in this exercise are labeled as in the figure unless stated to the contrary. Your answers may differ slightly from those in the book, depending on the order in which you solve for the sides and angles.



1. Referring to the figure above, if $\beta = 38.7°$, $a = 25.3$ ft, and $c = 19.6$ ft, which of the two angles, α or γ, can you say for certain is acute? Why?
2. Referring to the figure above, if $\alpha = 92.6°$, $b = 33.8$ cm, and $c = 49.1$ cm, which of the two angles, β or γ, can you say for certain is acute? Why?

Solve each triangle in Problems 3–6.

3. $\alpha = 50°40'$, $b = 7.03$ mm, $c = 7.00$ mm
4. $\alpha = 71°0'$, $b = 5.32$ cm, $c = 5.00$ cm
5. $\gamma = 134.0°$, $a = 20.0$ m, $b = 8.00$ m
6. $\alpha = 120.0°$, $b = 5.00$ km, $c = 10.0$ km
7. Referring to the figure at the beginning of the exercise, if $a = 36.5$ mm, $b = 22.7$ mm, and $c = 19.1$ mm, then, if the triangle has an obtuse angle, which angle must it be? Why?
8. You are told that a triangle has sides $a = 29.4$ ft, $b = 12.3$ ft, and $c = 16.7$ ft. Explain why the triangle has no solution.

Solve each triangle in Problems 9–12.

9. $a = 9.00$ yd, $b = 6.00$ yd, $c = 10.0$ yd (Decimal degrees)
10. $a = 5.00$ km, $b = 5.50$ km, $c = 6.00$ km (Decimal degrees)
11. $a = 420.0$ km, $b = 770.0$ km, $c = 860.0$ km (Degrees and minutes)
12. $a = 15.0$ cm, $b = 12.0$ cm, $c = 10.0$ cm (Degrees and minutes)

Problems 13–30 represent a variety of problems involving the first two sections of this chapter. Solve each triangle using the law of sines or the law of cosines (or both). If a problem does not have a solution, say so.

13. $\beta = 132.4°$, $\gamma = 17.3°$, $b = 67.6$ ft
14. $\alpha = 57.2°$, $\gamma = 112.0°$, $c = 24.8$ ft
15. $\beta = 66.5°$, $a = 13.7$ m, $c = 20.1$ m
16. $\gamma = 54.2°$, $a = 112$ ft, $b = 87.2$ ft
17. $\beta = 84.4°$, $\gamma = 97.8°$, $a = 12.3$ cm
18. $\alpha = 95.6°$, $\gamma = 86.3°$, $b = 43.5$ cm
19. $a = 10.5$ in., $b = 5.23$ in., $c = 9.66$ in. (Decimal degrees)
20. $a = 15.0$ ft, $b = 18.0$ ft, $c = 22.0$ ft (Decimal degrees)
21. $\gamma = 80.3°$, $a = 14.5$ mm, $c = 10.0$ mm
22. $\beta = 63.4°$, $b = 50.5$ in., $c = 64.4$ in.
23. $\alpha = 46.3°$, $\gamma = 105.5°$, $b = 643$ m
24. $\beta = 123.6°$, $\gamma = 21.9°$, $a = 108$ cm
25. $a = 12.2$ m, $b = 16.7$ m, $c = 30.0$ m
26. $a = 28.2$ yd, $b = 52.3$ yd, $c = 22.0$ yd
27. $\alpha = 46.7°$, $a = 18.1$ yd, $b = 22.6$ yd
28. $\gamma = 58.4°$, $b = 7.23$ cm, $c = 6.54$ cm
29. $\alpha = 36.5°$, $\beta = 72.4°$, $\gamma = 71.1°$
30. $\alpha = 29°20'$, $\beta = 32°50'$, $\gamma = 117°50'$
31. Using the law of cosines, show that if $\beta = 90°$, then $b^2 = c^2 + a^2$ (the Pythagorean theorem).
32. Using the law of cosines, show that if $b^2 = c^2 + a^2$, then $\beta = 90°$.

Exercise 6.2

1. A triangle can have at most one obtuse angle. Since β is acute, then, if the triangle has an obtuse angle, it must be the angle opposite the longer of the two sides, a and c. Thus, γ, the angle opposite the shorter of the two sides, c, must be acute.

3. $a = 6.00$ mm, $\beta = 65°0'$, $\gamma = 64°20'$

5. $c = 26.2$ m, $\alpha = 33.3°$, $\beta = 12.7°$

7. If the triangle has an obtuse angle, then it must be the angle opposite the longest side—in this case, α.

9. $\alpha = 62.8°$, $\beta = 36.3°$, $\gamma = 80.9°$

11. $\alpha = 29°12'$, $\beta = 63°26'$, $\gamma = 87°22'$

13. $\alpha = 30.3°$, $a = 46.2$ ft, $c = 27.2$ ft

15. $b = 19.3$ m, $\alpha = 40.6°$, $\gamma = 72.9°$ **17.** No solution

19. $\alpha = 84.1°$, $\beta = 29.7°$, $\gamma = 66.2°$ **21.** No solution

23. $\beta = 28.2°$, $a = 984$ m, $c = 1{,}310$ m

25. No solution

27. Triangle 1: $\beta = 65.3°$, $\gamma = 68.0°$, $c = 23.1$ yd;
Triangle 2: $\beta' = 114.7°$, $\gamma' = 18.6°$, $c' = 7.93$ yd

29. An infinite number of similar triangles have those angles.

31. $b^2 = a^2 + c^2 - 2ac \cos 90° = a^2 + c^2 - 0 = a^2 + c^2$

33. $-0.872 \approx -0.873$ **37.** $CB = 613$ m

39. 113.3° **41.** 180 km **43.** 121 cm

45. $\alpha = 65°20'$, $\beta = 27°0'$, $\gamma = 87°40'$

47. $AC = 23.0$ ft; $AB = 17.0$ ft **49.** 638 mi

51. 74° **53.** $DC = 166$ m