Laws of Sines and Cosines

Name_____Solution_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) An airplane is sighted at the same time by two ground observers who are 5 miles apart and both directly west of the airplane. They report the angles of elevation as 15° and 25°. How high is the airplane?

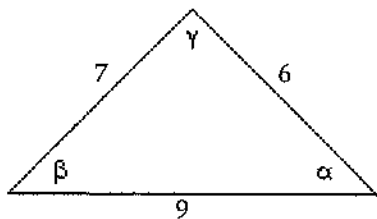   A) 5.14 mi   B) 1.29 mi   C) 3.15 mi   D) 2.11 mi

1) __C__

2) A ladder leans against a building that has a wall slanting away from the ladder at an angle of 96° with the ground. If the bottom of the ladder is 23 feet from the base of the wall and it reaches a point 52 feet up the wall, how tall is the ladder to the nearest foot?

    A) 60 ft   B) 61 ft   C) 59 ft   D) 58 ft

2) __C__

Solve the triangle. Find the angles α and β first.

3)

A) $\alpha = 51°$, $\beta = 87.2°$, $\gamma = 41.8°$ B) $\alpha = 51°$, $\beta = 41.8°$, $\gamma = 87.2°$
C) $\alpha = 41.8°$, $\beta = 87.2°$, $\gamma = 51°$ D) $\alpha = 41.8°$, $\beta = 51°$, $\gamma = 87.2°$

3) __B__

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the area of the triangle. If necessary, round the answer to two decimal places.

4)
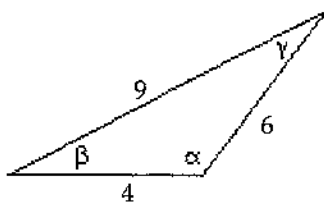
4) __9.56__

Laws of Sines and Cosines

Name_____ Solution

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) A ladder leans against a building that has a wall slanting away from the ladder at an angle of 96° with the ground. If the bottom of the ladder is 23 feet from the base of the wall and it reaches a point 52 feet up the wall, how tall is the ladder to the nearest foot?

    A) 61 ft   B) 60 ft   C) 59 ft   D) 58 ft

1)   **C**

2) An airplane is sighted at the same time by two ground observers who are 3 miles apart and both directly west of the airplane. They report the angles of elevation as 11° and 21°. How high is the airplane?
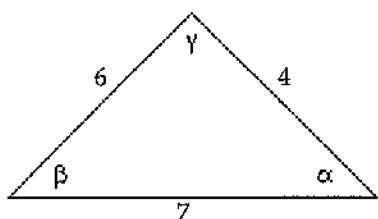
    A) 0.57 mi   B) 1.18 mi   C) 2.22 mi   D) 1.08 mi

2)   **B**

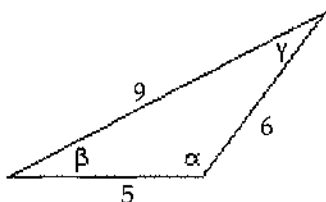**Solve the triangle. Find the angles α and β first.**

3)

$$4^2 = 6^2 + 7^2 - 2(6)(7)\cos\beta$$

$$\cos\beta = \frac{6^2 + 7^2 - 4^2}{2(6)(7)} \rightarrow \beta = \cos^{-1}\left[\frac{6^2 + 7^2 - 4^2}{2(6)(7)}\right]$$

$$\boxed{34.8°}$$

3)   **C**

A) $\alpha = 34.8°$, $\beta = 86.4°$, $\gamma = 58.8°$ B) $\alpha = 34.8°$, $\beta = 58.8°$, $\gamma = 86.4°$

C) $\alpha = 58.8°$, $\beta = 34.8°$, $\gamma = 86.4°$ D) $\alpha = 58.8°$, $\beta = 86.4°$, $\gamma = 34.8°$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

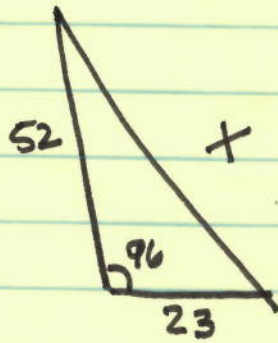**Find the area of the triangle. If necessary, round the answer to two decimal places.**

4)

4)   **14.14**

$$S = \frac{1}{2}(9 + 6 + 5) = \boxed{10}$$

$$\text{Area} = \sqrt{10(10-9)(10-6)(10-5)}$$

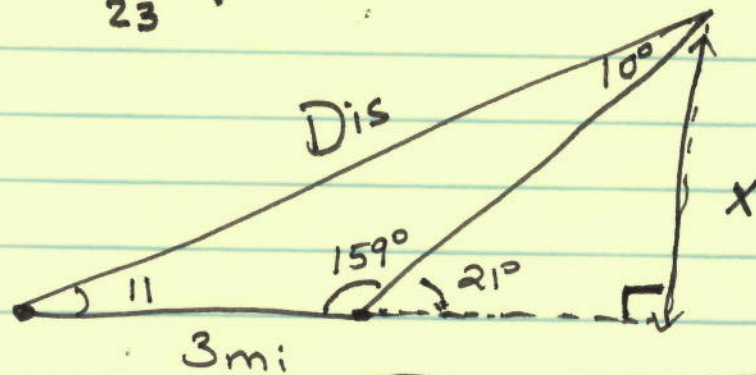$$\text{Area} = \sqrt{10(1)(4)(5)} = \sqrt{200}$$

$$= \boxed{10\sqrt{2}} \quad \boxed{14.14}$$

law of cosine

$$x^2 = 52^2 + 23^2 - 2(52)(23)\cos 96$$

Diagram with triangle: sides 52 and x, angle 96°, base 23.

Plane.

Second diagram: Dis, 10°, x, 159°, 21°, 11, 3mi

$$\frac{\sin 159}{Dis} = \frac{\sin 10}{3} \longrightarrow \boxed{Dis = 3\frac{\sin 159}{\sin 10}}$$

$$\sin 11 = \frac{x}{Dis} \longrightarrow x = Dis \cdot \sin 11$$

$$\boxed{x = 3\frac{\sin 159}{\sin 10} \cdot \sin 11}$$