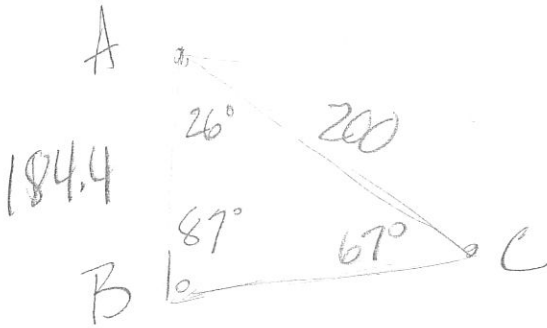


Chapter 13 Word Problems  
Laws of Sines and Cosines

Name: KEY Per: \_\_\_\_\_

Directions: Draw a picture and solve each problem below. Work must be shown to earn full points.

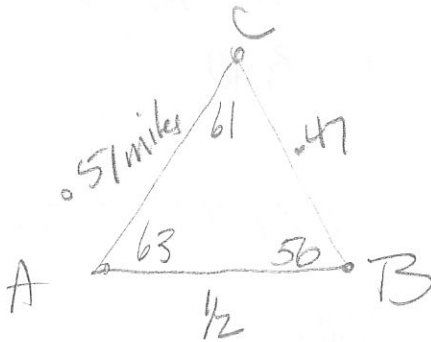
1. Points A and B are on opposite sides of the Grand Canyon. Point C is 200 yards from A. Angle B measures  $87^\circ$  and angle C measures  $67^\circ$ . What is the distance between A and B?



$$\frac{\sin 87}{200} = \frac{\sin 67}{C}$$

$$C = 184.4 \text{ yards}$$

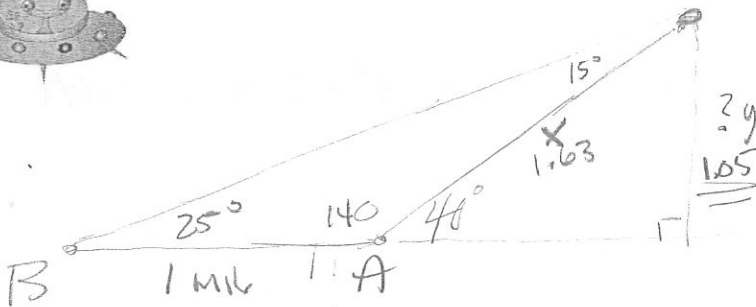
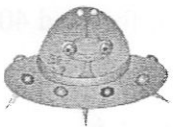
2. Two observers are standing on shore  $\frac{1}{2}$  mile apart at points A and B and measure the angle to a sailboat at a point C at the same time. Angle A is  $63^\circ$  and angle B is  $56^\circ$ . Find the distance from each observer to the sailboat.



$$\frac{\sin 61}{.5} = \frac{\sin 56}{b} \quad 0.47 \text{ miles}$$

$$\frac{\sin 61}{.5} = \frac{\sin 63}{a} \quad 0.51 \text{ miles}$$

3. A person at point A looks due east and sees a UFO with an angle of elevation of  $40^\circ$ . At the same instant, another person, 1.0 miles due west of point A looks due east and sights the same UFO with an angle of elevation of  $25^\circ$ . Find the distance between A and the UFO. How far is the UFO above the ground?



$$\frac{\sin 15}{1} = \frac{\sin 25}{x} \quad x = 1.63$$

$$\frac{\sin 90}{1.63} = \frac{\sin 40}{y}$$

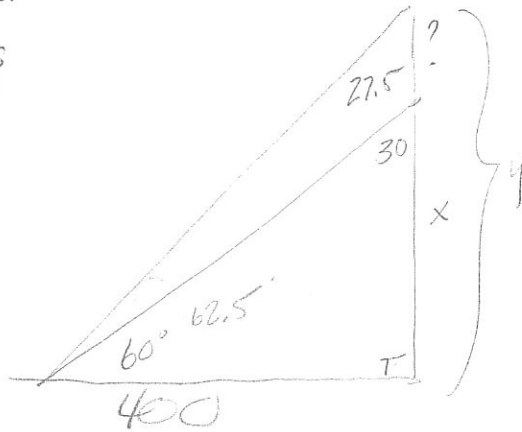
$$y = 1.05 \text{ miles}$$

4. A vertical flagpole is attached to the top edge of a building. A man stands 400 feet from the base of the building. From his viewpoint, the angle of elevation to the bottom of the flagpole is  $60^\circ$ ; to the top is  $62.5^\circ$ . Determine the height of the flagpole.

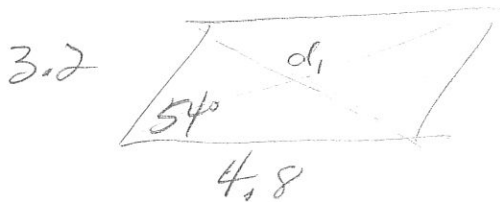
$$\tan 60^\circ = \frac{x}{400} \quad 692.8$$

$$\tan 62.5^\circ = \frac{y}{400} \quad 768.4$$

$$? = \underline{75.6 \text{ ft}}$$

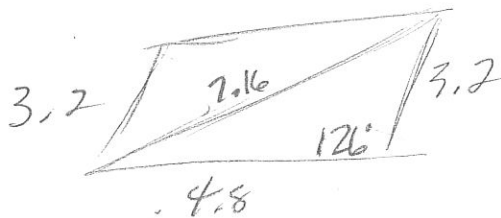


5. Two sides and the included angle of a parallelogram have measures 3.2, 4.8, and  $54^\circ$  respectively. Find the lengths of the diagonals.



$$d_1^2 = 3.2^2 + 4.8^2 - 2 \cdot 3.2 \cdot 4.8 \cdot \cos 54^\circ$$

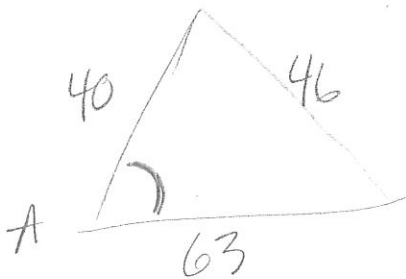
$$d_1 = 3.90$$



$$d_2^2 = 3.2^2 + 4.8^2 - 2 \cdot 3.2 \cdot 4.8 \cdot \cos 126^\circ$$

$$d_2 = 7.16$$

6. A bridge is supported by triangular braces. If the sides of each brace have lengths 63 feet, 46 feet and 40 feet, find the measure of the angle opposite the 46 ft side.



$$46^2 = 40^2 + 63^2 - 2 \cdot 40 \cdot 63 \cos A$$

$$-40^2$$

$$-63^2$$

$$\frac{-3453}{-5040} = \cos A$$

$$A = \underline{46.8^\circ}$$

7. On a map, Orlando is 178 mm due south of Niagara Falls, Denver is 273 mm from Orlando, and Denver is 235 mm from Niagara Falls. Find the bearing of Denver from Orlando. Find the bearing of Denver from Niagara Falls.

$$273^2 = 235^2 + 178^2 - 2 \cdot 235 \cdot 178 \cos A$$

$$-235^2$$

$$-178^2$$


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$$-12380$$

$$-83660 \quad A = 81.5^\circ$$

8. Nancy shines a light from a window of a light house on a cliff 250 feet above the water level. Nick Danger 10 feet above the water level in a ship off shore, finds that the angle of elevation of the light is  $3^\circ$ . Find the length of the line of sight (light beam) from the ship to Nancy. Round to the nearest tenth.



$$\sin 3^\circ = \frac{240}{X}$$

$$X = \frac{240}{\sin 3^\circ}$$

$$X = \underline{\underline{4585.8 \text{ ft}}}$$

9. Yogi bear is out walking with Boo Boo looking for a pic-i-nic basket and Boo Boo sights a bee hive up in a tree at an angle of elevation of  $36^\circ$ . They walk 120 meters closer to get a better look and then look up at an angle of elevation of  $51^\circ$ . How far are Yogi and Boo Boo from the bottom of the tree from their current spot?



$$\frac{\sin 15^\circ}{120} = \frac{\sin 36^\circ}{X}$$

$$X = 272.5 \text{ m}$$

$$\cos 51^\circ = \frac{X}{272.5}$$

$$X = \underline{\underline{171.5 \text{ m}}}$$