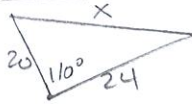


1. Two snowmobilers start from the same point and drive at 10 km/hr and 12 km/hr, respectively, diverging at an angle of 110° . Two hours later they find that their radio transmissions are barely audible. How far apart are they at that time?

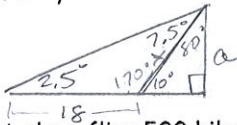
$2(10) = 20$
 $2(12) = 24$



SAS \Rightarrow LOC

$x^2 = 20^2 + 24^2 - 2(20)(24)\cos 110^\circ$
 $x^2 = 1304.339$
 $x = 36.1 \text{ km}$

2. While traveling across flat land, you notice a mountain directly in front of you. The angle of elevation to the peak is 2.5° . After you drive 18 miles closer to the mountain, the angle of elevation is 10° . What is the height of the mountain?



$180 - 90 - 2.5 - 7.5 = 80^\circ$
 $\frac{x}{\sin 2.5} = \frac{18}{\sin 7.5}$
 $x = 6 \text{ mi}$

$\sin 10 = \frac{a}{b}$
 $a = 1 \text{ mile}$

3. A plane flies 500 kilometers with a bearing of $N44^\circ W$ from B to C. The plane then flies southwest 840 kilometers from C to A. Find the bearing of the flight from C to A. Point A is due West of point B as shown in the diagram.

$\frac{\sin A}{500} = \frac{\sin 46}{840}$

$A = \sin^{-1}\left(\frac{500 \sin 46}{840}\right)$

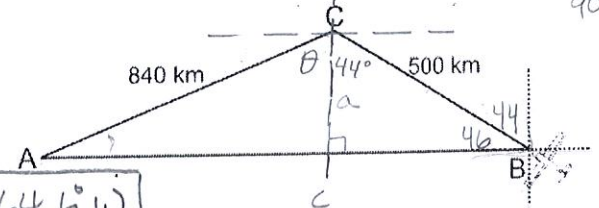
$A = 25.4^\circ$

$C = 180 - 46 - 25.4$
 $C = 108.6^\circ$

$\theta = 108.6 - 44$

$\theta = 64.6^\circ$

$564.6^\circ W$



$90 - 44 = 46$

4. A pilot has just started on the glide path for landing at an airport where the length of the runway is 9000 feet. The angles of depression from the plane to the ends of the runway are 17.5° and 18.8° .

(a) Find the air distance the plane must travel until touching down on the near end of the runway. $\frac{a}{\sin 17.5} = \frac{9000}{\sin 1.3}$

(b) Find the ground distance the plane must travel until touching down.

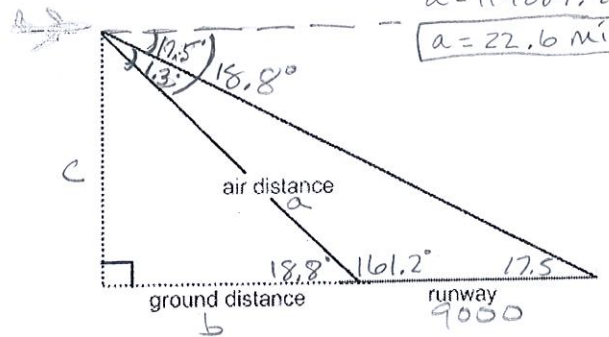
(c) Find the altitude of the plane when the pilot begins his descent.

(b) $\cos 18.8 = \frac{b}{22.6}$

$b = 21.4 \text{ mi}$

(c) $\sin 18.8 = \frac{c}{22.6}$

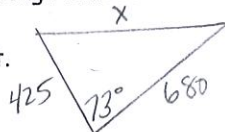
$c = 7.3 \text{ mi}$



5. Andrew works for a fencing company. The company has a contract to fence the entire triangular lot at the corner of Hembree and Post Oak Tritt. The streets intersect at a 73° angle. The lot extends 680 feet from the intersection along Hembree Road and 425 feet from the intersection along Post Oak Tritt.

(a) Find the perimeter of the lot.

SAS \Rightarrow LOC



$x^2 = 425^2 + 680^2 - 2(425)(680)\cos 73^\circ$

$x^2 = 474034.1547$

$x = 688.5'$

Perimeter = 1793.5 ft.

(b) Andrew's company usually sells fencing for \$25 per foot but in September they are offering a 7% discount if the job is booked online. Find the cost of the fencing if an online contract is made online in September.

$1793.5(\$25) = \44837.50

$44,837.50 - .07(44,837.50) = 41,698.88$

6. From the top of a house 10 meters high, the angle of elevation to the top of a flagpole is 11.5° . At the base of the house, the angle of elevation to the top of the flagpole is 39.2° . Find the height of the flagpole.

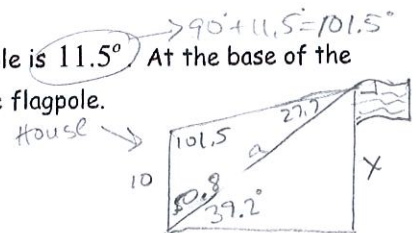
$180 - 101.5 - 50.8 = 27.7^\circ$

$\frac{a}{\sin 101.5} = \frac{10}{\sin 27.7}$

$a = 21.1 \text{ m}$

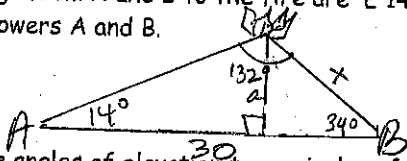
$\sin 39.2 = \frac{x}{21.1}$

$x = 13.3 \text{ m}$



$90 - 39.2 = 50.8$

7. Two fire towers are 30 kilometers apart and tower A is due west of tower B. A fire is spotted from the towers and the bearings from A and B to the fire are $E 14^\circ N$ and $W 34^\circ N$, respectively. Find the distance of the fire from the road that joins towers A and B.



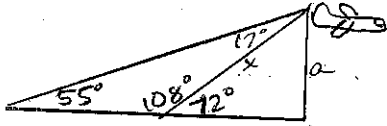
$$\frac{x}{\sin 14} = \frac{30}{\sin 132}$$

$$x = 9.8 \text{ km}$$

$$\sin 34 = \frac{a}{9.8}$$

$$a = 5.5 \text{ km}$$

8. The angles of elevation to an airplane from two points A and B on level ground are 55° and 72° , respectively. The points A and B are 2.2 miles apart and the airplane is east of both points in the same vertical plane. Find the altitude of the plane.



$$\frac{x}{\sin 55} = \frac{2.2}{\sin 17}$$

$$x = 6.2 \text{ miles}$$

$$\sin 72 = \frac{a}{6.2}$$

$$a = 5.9 \text{ mi}$$

9. A bridge is to be built across a small lake from B to C. The bearing from B to C is $S 41^\circ W$. From a point A, 100 meters from B, the bearings to B and C are $S 74^\circ E$ and $S 28^\circ E$, respectively. Find the distance from B to C.

$$\frac{100}{\sin 69} = \frac{x}{\sin 46}$$

$$x = 77.1 \text{ m}$$

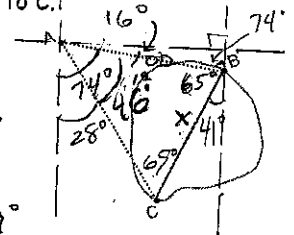
$$74 - 28 = 46^\circ$$

$$90 - 74 = 16^\circ$$

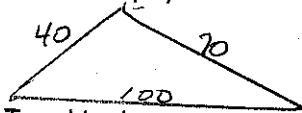
$$180 - 16 - 90 = 74^\circ$$

$$180 - 74 - 41 = 65^\circ$$

$$180 - 65 - 46 = 69^\circ$$



10. Scorpion Gulch Shelter is having a pumpkin sale for Halloween. The pumpkins will be displayed on a triangular region in the parking lot, with sides 40 ft, 70 ft, and 100 ft. Each Pumpkin takes about 3 ft^2 of space. About how many pumpkins can the shelter display?



$$S = \frac{40 + 70 + 100}{2}$$

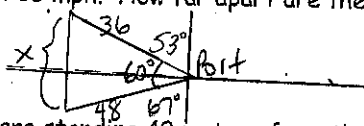
$$S = \frac{210}{2} = 105$$

$$\text{Area} = \sqrt{105(105-40)(105-70)(105-100)}$$

$$\text{Area} = 1092.9$$

$$\frac{1092.9}{3} = 364 \text{ pumpkins}$$

11. Two ships leave a port at 9 am. One travels at a bearing of $N 53^\circ W$ at 12 mph and the other travels at a bearing of $S 67^\circ W$ at 16 mph. How far apart are the ships at noon that day?



$$9 \text{ am} - \text{Noon} = 3 \text{ hours}$$

$$12(3) = 36$$

$$16(3) = 48$$

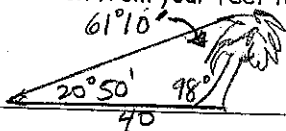
$$180 - 53 - 67 = 60^\circ$$

$$x^2 = 36^2 + 48^2 - 2(36)(48)\cos 60^\circ$$

$$x^2 = 1872$$

$$x = 43.3 \text{ mi}$$

12. You are standing 40 meters from the base of a tree that is leaning 8° from vertical away from you. The angle of elevation from your feet to the top of the tree is $20^\circ 50'$. Find the slant height of the tree.



$$90^\circ + 8^\circ = 98^\circ$$

$$\frac{40}{\sin 61^\circ 10'} = \frac{x}{\sin 20^\circ 50'}$$

$$x = 16.2 \text{ ft.}$$

ANSWERS—APPLICATIONS LOS/LOC WS

- 36.1 km
- 1.0 miles
- $S 64.6^\circ W$
- (a) 22.6 miles (119,289.1 ft) (b) 21.4 miles (112,924.9 ft) (c) 7.2 miles (38,442.8 ft)
- (a) 1793.5 ft (b) \$41,698.88
- 13.3 m
- 5.5 km
- 5.9 miles
- 77.1 m
- about 364 pumpkins
- 43.3 miles
- 16.2 ft