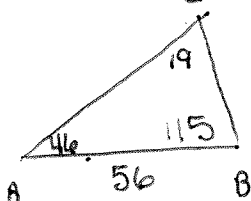


1. The distance between Towns A and B is 56 mi. The angle formed by the road between Towns A and B and the road between Towns A and C measures  $46^\circ$ . The angle formed by AB and BC measures  $115^\circ$ . Find the distance between Town B and Town C. *c*

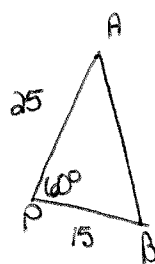


The road between Town B and Town C is about 123.731 miles

$$\frac{\sin 19^\circ}{56} = \frac{\sin 115^\circ}{AC} = \frac{\sin 46^\circ}{BC}$$

$$BC \approx 123.731 \text{ miles}$$

2. Ships A and B leave port at the same time and sail on straight paths making an angle of  $60^\circ$  with each other. How far apart are the ships at the end of 1 hour if the speed of ship A is 25 km/h and that of ship B is 15 km/h.



$$(AB)^2 = 25^2 + 15^2 - 2(25)(15)(\cos 60^\circ)$$

$$AB \approx 21.794 \text{ km}$$

They are about 21.794 km apart

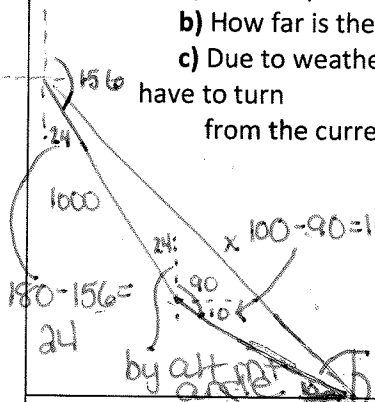
3. A plane leaves Midway Airport at a bearing of  $156^\circ$  and flies at a speed of 400 mph for 2.5 hours. The plane then

turns at a bearing of  $100^\circ$  and continues for another 1.5 hours.

a) Draw a picture of the situation.

b) How far is the plane from the starting point?

c) Due to weather conditions, the plane must go back to Midway. What is the bearing the plane would have to turn from the current location (after the 4 hours of flying) in order to fly back to Midway?



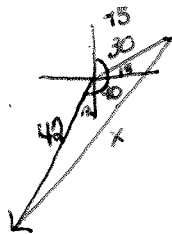
$$x^2 = 600^2 + 1000^2 - 2(600)(1000)\cos 124^\circ$$

$$x = 1425.143 \text{ miles}$$

$$\frac{1000^2 - 600^2 - 1425.143^2}{(-2)(600)(1425.143)} = \cos y \quad y \approx 35.572^\circ$$

$$\text{or a bearing of } 35.572^\circ + 10^\circ = 45.572^\circ$$

4. Two ships leave a harbor at the same time. One ship travels at a bearing of  $192^\circ$  at 14 mph. The other ship travels at a bearing of  $75^\circ$  at 10 mph. How far apart will the ships be after three hours?

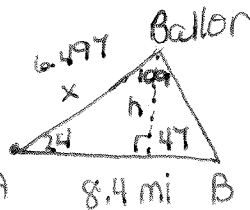


$$x^2 = 30^2 + 42^2 - 2(30)(42)\cos 117^\circ$$

$$x \approx 61.71 \text{ miles}$$

61.71 miles apart

5. The angles of elevation of a balloon from the two points A and B on level ground are  $24^\circ$  and  $47^\circ$  respectively. If points A and B are 8.4 miles apart and the balloon is between the points in the same vertical plane, approximate to the nearest tenth of a mile, the height of a balloon above the ground.



$$\sin 24 = \frac{h}{6.497}$$

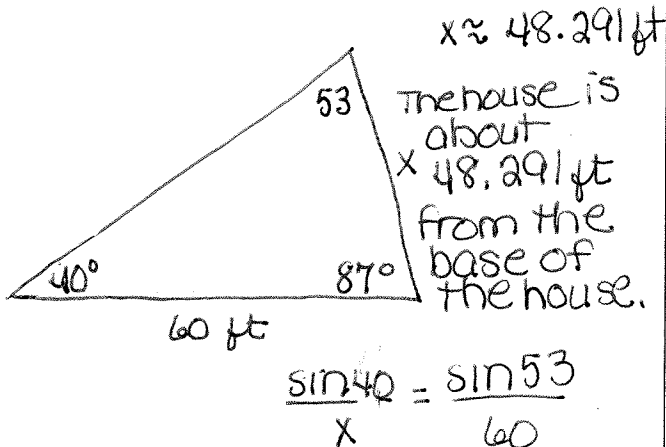
$$h \approx 2.643$$

$$\frac{\sin 47}{x} = \frac{\sin 109}{8.4}$$

The balloon 2.643 miles above the ground.

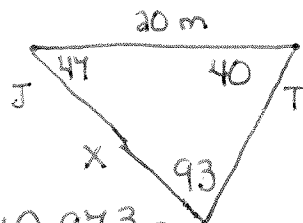
14  
3  
42  
  
12  
90  
15  
117

6. After a storm, a tree is leaning  $3^\circ$  from vertical toward the front of a house. A person standing on the front porch notices that the angle of elevation to the top of the tree is  $40^\circ$ . If the house is 60 feet away from the base of the tree, how tall is the tree.



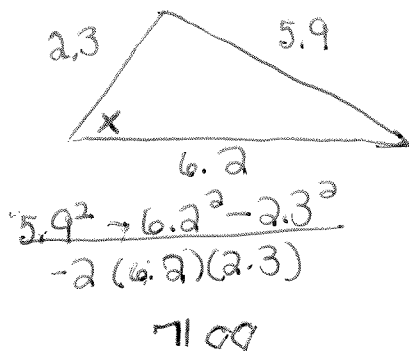
7. Two scuba divers, Jim and Tara, are 20 m apart below the surface of the water. They both spot a shark below them. The angle of depression from Jim to the shark is  $47^\circ$  and the angle of depression from Tara to the shark is  $40^\circ$ . How far is Jim from the shark?

$$\frac{\sin 40}{x} = \frac{\sin 93}{20}$$

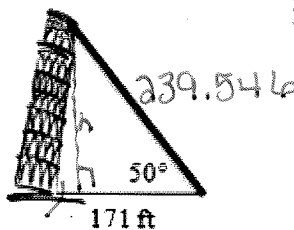


Jim is 12.873 m from the shark.

8. A race follows a triangular course. The 3 legs of the course are, in order, 2.3 km, 5.9 km, and 6.2 km. Find the angle between the starting and finishing legs to the nearest tenth of a degree.



9. Closed to tourists since 1990, the Leaning Tower of Pisa in Italy leans at an angle of about  $84.7^\circ$ . The figure shows that 171 feet from the base of the tower, the angle of elevation to the top is  $50^\circ$ . If a bird is sitting on the very top of the tower, how high up is the bird?

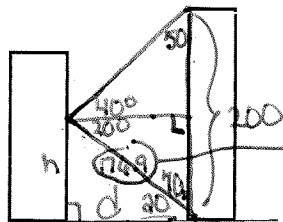


$$\frac{\sin 84.7}{x} = \frac{\sin 45.3}{171}$$

$$\frac{\sin 90}{239.546} = \frac{\sin 50}{h}$$

$84.7^\circ$   
The bird is 183.503 feet above the ground.

10. Ally is in the smaller of two buildings looking out of a window. She sights the top of the taller building at an angle of elevation of  $40^\circ$ . She sights the bottom of the taller building with an angle of depression of  $20^\circ$ .



- a) If the taller building is 200 feet tall, how high up is she in the smaller building? She is 60.507 feet up

$$\frac{\sin 70}{x} = \frac{\sin 60}{200} = \frac{\sin 50}{y}$$

a)  $\sin 20 = \frac{h}{176.910}$

- b) How far apart are the two buildings? 166.241 feet apart

$$\cos 20 = \frac{d}{176.910}$$