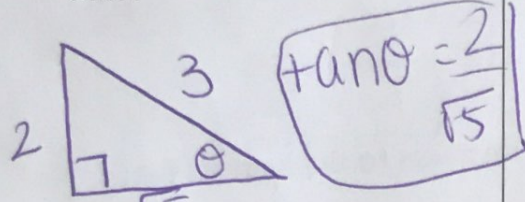


LESSON #12: LAW OF SINES (DAY 1)

Do Now:

1. Given an acute angle  $\theta$ ,  $\sin\theta = \frac{2}{3}$   
 Find the values of  $\cos\theta$  and  $\tan\theta$ .



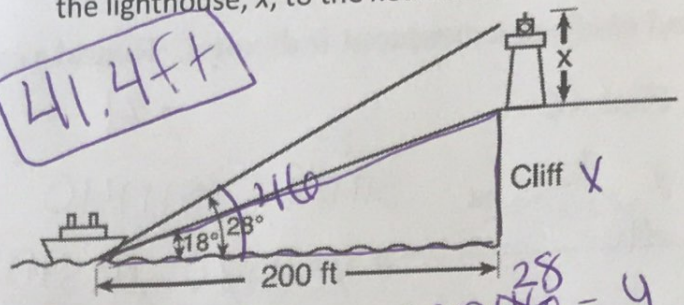
$2^2 + x^2 = 3^2$   
 $\sqrt{x^2} = \sqrt{5}$   
 $x = \sqrt{5}$

$\cos\theta = \frac{\sqrt{5}}{3}$

$\tan\theta = \frac{2}{\sqrt{5}}$

2. A lighthouse is built on the edge of a cliff near the ocean, as shown in the accompanying diagram. From a boat located 200 feet from the base of the cliff, the angle of elevation to the top of the cliff is 18 degrees and the angle of elevation to the top of the lighthouse is 28 degrees. What is the height of the lighthouse,  $x$ , to the nearest tenth of a foot?

$41.4\text{ft}$



$\tan 18 = \frac{x}{200}$

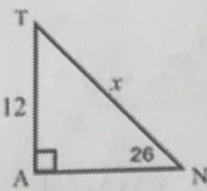
$x = 200 \tan 18$   
 $x = 64.9839$

$\tan 28 = \frac{y}{200}$

$y = 200 \tan 28$   
 $y = 207.1060$   
 $106.34$

~~$142.1\text{ft}$~~

3. Find TN to the nearest tenth.



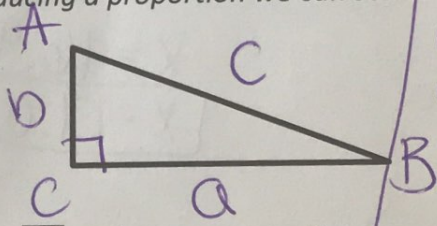
$\sin 26 = \frac{12}{x}$

$x \sin 26 = 12$   
 $\frac{x \sin 26}{\sin 26} = \frac{12}{\sin 26}$

$x = 27.4$

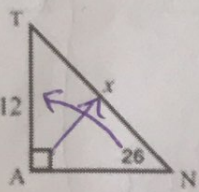
The Law of Sines states that the sine of an angle is proportional to the side opposite the angle. We only use two of the possible ratios, thus producing a proportion we can solve.

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



lower = sides  
 upper = x's

1. Using the Law of Sines, find the length of hypotenuse  $\overline{TN}$  to the nearest tenth.



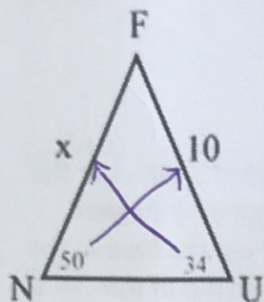
$\frac{12}{\sin 26} = \frac{x}{\sin 90}$

$\frac{x \sin 26}{\sin 26} = \frac{12 \sin 90}{\sin 26}$

$x = 27.4$

OMG SAME!

2. Solve for x to the nearest tenth.



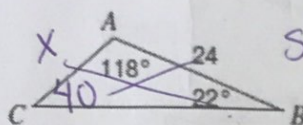
$$\frac{10}{\sin 50} = \frac{x}{\sin 34}$$

$$\frac{x \sin 50}{\sin 50} = \frac{10 \sin 34}{\sin 50}$$

$$x = 7.3$$

Find each measurement indicated. Round your answers to the nearest tenth.

1) Find AC



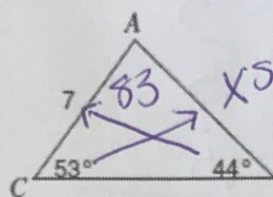
$$\frac{x}{\sin 22} = \frac{24}{\sin 40}$$

$$\frac{x \sin 40}{\sin 40} = \frac{24 \sin 22}{\sin 40}$$

$$x = 13.9868$$

$$x = 14$$

2) Find AB

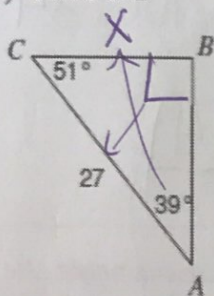


$$\frac{7}{\sin 44} = \frac{x}{\sin 53}$$

$$\frac{x \sin 44}{\sin 44} = \frac{7 \sin 53}{\sin 44}$$

$$x = 8.0$$

3) Find BC



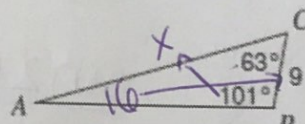
$$\frac{x}{\sin 39} = \frac{27}{\sin 90}$$

$$\frac{x \sin 90}{\sin 90} = \frac{27 \sin 39}{\sin 90}$$

$$x = 16.9916$$

$$x = 17.0$$

4) Find AC

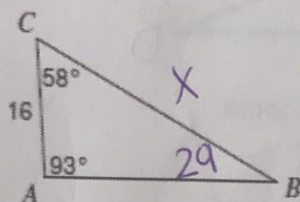


$$\frac{9}{\sin 10} = \frac{x}{\sin 101}$$

$$\frac{x \sin 10}{\sin 10} = \frac{9 \sin 101}{\sin 10}$$

$$x = 32.1$$

5) Find BC

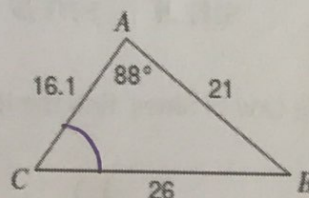


$$\frac{x}{\sin 93} = \frac{16}{\sin 29}$$

$$\frac{x \sin 29}{\sin 29} = \frac{16 \sin 93}{\sin 29}$$

$$x = 33$$

6) Find  $m\angle C$



$$\frac{21}{\sin C} = \frac{26}{\sin 88}$$

$$\frac{21 \sin 88}{26} = \frac{26 \sin C}{26}$$

$$.8072 = \sin C$$

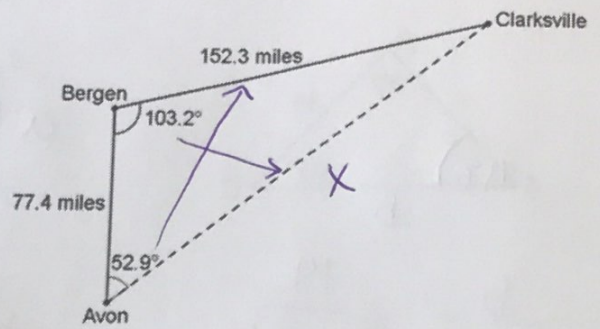
$$C = 53.8^\circ$$

9. As shown in the map below, it is possible to get from Avon to Clarksville by traveling first to Bergen and then to Clarksville. The state department wants to build a straight highway to connect Avon directly to Clarksville. To the nearest tenth of a mile, the length of the new highway from Avon to Clarksville will be

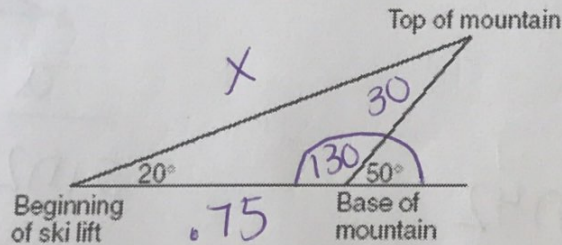
$$\frac{x}{\sin 103.2} = \frac{152.3}{\sin 52.9}$$

$$\frac{x \sin 52.9}{\sin 52.9} = \frac{152.3 \sin 103.2}{\sin 52.9}$$

$$x = 185.9 \text{ mi}$$



10. A ski lift begins at ground level 0.75 mile from the base of a mountain whose face has a  $50^\circ$  angle of elevation, as shown in the accompanying diagram. The ski lift ascends in a straight line at an angle of  $20^\circ$ . Find the length of the ski lift from the beginning of the ski lift to the top of the mountain, to the nearest hundredth of a mile.

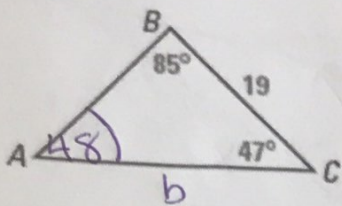


$$\frac{x}{\sin 130} = \frac{0.75}{\sin 30}$$

$$\frac{x \sin 130}{\sin 130} = \frac{0.75 \sin 130}{\sin 30}$$

$$x = 1.15 \text{ miles}$$

Use the Law of Sines to solve the following non-right triangles and round your answers to the nearest hundredth.

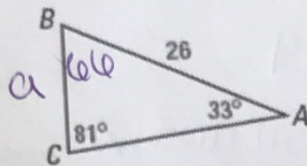


$$\frac{b}{\sin 85} = \frac{19}{\sin 48}$$

$$\frac{b \sin 48}{\sin 48} = \frac{19 \sin 85}{\sin 48}$$

$$b = 25.47$$

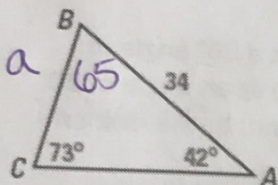
$$\angle A = \boxed{48^\circ} \quad b = \boxed{25.47}$$



$$\frac{a}{\sin 33} = \frac{26}{\sin 81}$$

$$\frac{a \sin 81}{\sin 81} = \frac{26 \sin 33}{\sin 81}$$

$$\angle B = \boxed{66^\circ} \quad a = \boxed{14.34}$$

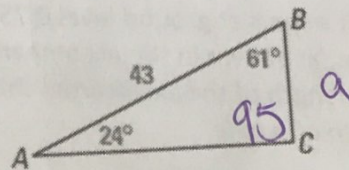


$$\frac{a}{\sin 42} = \frac{34}{\sin 73}$$

$$\frac{a \sin 73}{\sin 73} = \frac{34 \sin 42}{\sin 73}$$

$$a = 23.79$$

$$\angle B = \boxed{65^\circ} \quad a = \boxed{23.79}$$



$$\frac{a}{\sin 24} = \frac{43}{\sin 95}$$

$$\frac{a \sin 95}{\sin 95} = \frac{43 \sin 24}{\sin 95}$$

$$a = 17.56$$

$$\angle C = \boxed{95^\circ} \quad a = \boxed{17.56}$$