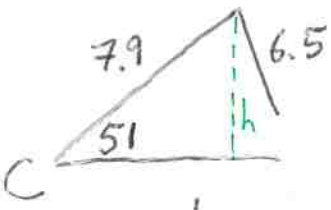
Key

Ch. 3 Law of Sines, Cosines, Area of Triangle Test Review (WS #3) Help Session

For each of the below problems: **A)** Solve the triangle **B)** Find the Area of triangle

1) Given $C = 51°$, $b = 7.9ft$, and $c = 6.5ft$

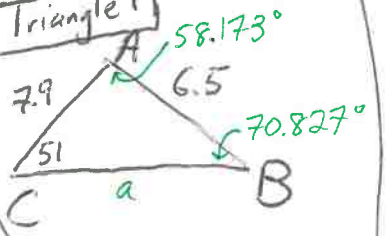


$\sin 51 = \frac{h}{7.9}$

$h = 7.9\sin 51 = 6.139$

* SSA, 2 triangles since $6.139 < 6.5 < 7.9$

Triangle 1



$\frac{\sin B}{7.9} = \frac{\sin 51}{6.5}$

$\sin B = \frac{7.9\sin 51}{6.5}$

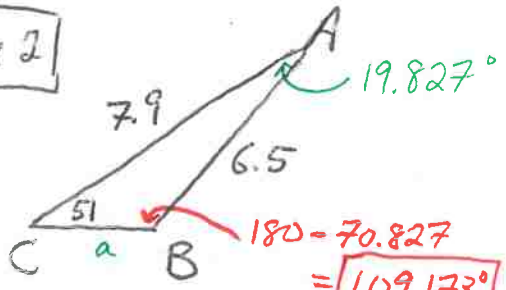
$B = \sin^{-1}(0.9445)$

$B = 70.827°$

$\frac{a}{\sin 58.173} = \frac{6.5}{\sin 51}$

$a = \frac{6.5\sin 58.173}{\sin 51} = 7.106$

Triangle 2

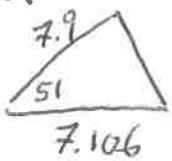


$\frac{a}{\sin 19.827} = \frac{6.5}{\sin 51}$

$a = \frac{6.5\sin 19.827}{\sin 51} = 2.837$

b) * Find Area of just the large triangle!

Triangle 1:

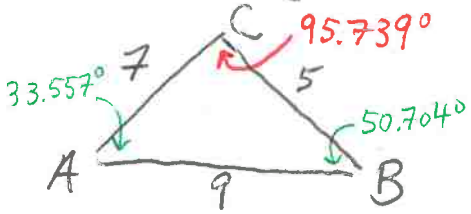


$\text{Area} = \frac{1}{2}(7.9)(7.106)\sin 51$

$\text{Area} = 21.813\ ft^2$

2) Given $a = 5km$, $b = 7km$, and $c = 9km$.

* SSS, start with Law of Cosine, start with longest side (largest angle)



$c^2 = a^2 + b^2 - 2ab\cos C$

$9^2 = 7^2 + 5^2 - 2(5)(7)\cos C$

$81 = 49 + 25 - 70\cos C$

$-49 \quad -25$

$7 = -70\cos C$

$-0.1 = \cos C$

$C = \cos^{-1}(-0.1)$

$C = 95.739°$

$\frac{\sin A}{5} = \frac{\sin 95.739}{9}$

$\sin A = \frac{5\sin 95.739}{9}$

$A = \sin^{-1}(0.5527)$

$A = 33.557°$

$\angle B = 50.704°$

b) Area using SSS

$s = \frac{1}{2}(a+b+c) \rightarrow \frac{1}{2}(7+9+5) = 10.5$

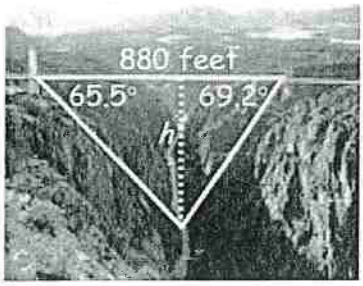
$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$

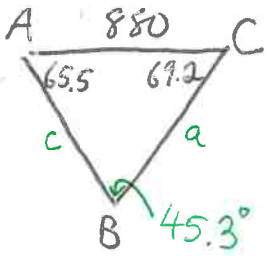
$\text{Area} = \sqrt{10.5(10.5-5)(10.5-7)(10.5-9)}$

$\text{Area} = 17.412\ km^2$

3) a) Find the Height b) Solve the triangle

. **Finding the Height of the Bridge over the Royal Gorge** The highest bridge in the world is the bridge over the Royal Gorge of the Arkansas River in Colorado. Sightings to the same point at the water level directly under the bridge are taken from each side of the 880-foot-long bridge, as indicated in the figure. How high is the bridge?

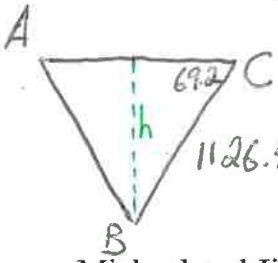




$$\frac{a}{\sin 65.5} = \frac{880}{\sin 45.3} \qquad \frac{c}{\sin 69.2} = \frac{880}{\sin 45.3}$$

$$a = \frac{880 \sin 65.5}{\sin 45.3} \qquad c = \frac{880 \sin 69.2}{\sin 45.3}$$

$a = 1126.571$ $\quad$ $c = 1157.354$



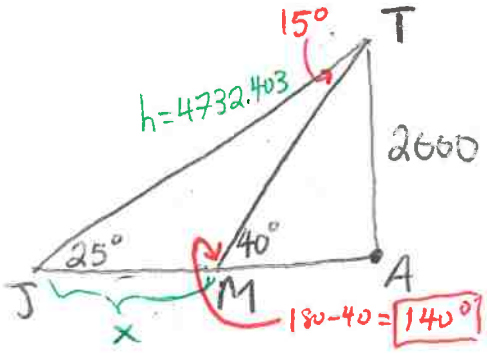
$\sin\theta = \frac{opp}{hyp}$

$\sin 69.2 = \frac{h}{1126.571}$

$h = 1126.571 \sin 69.2$

$h = 1053.147$ ft.

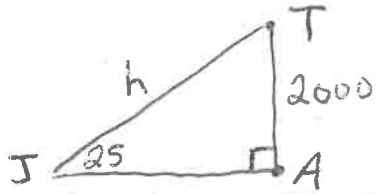
4) Michael and Jim are standing in a line and are both looking at the Sears Tower. The angle of elevation from Michael to the top of the tower is 40° and Jim's is 25°. The tower is 2000 feet tall. What is the distance between Michael and Jim?



$$\frac{x}{\sin(15)} = \frac{4732.403}{\sin 140}$$

$$x = \frac{4732.403 \sin 15}{\sin 140}$$

$x = 1905.507$ ft



$\sin 25 = \frac{2000}{h} \rightarrow h = \frac{2000}{\sin 25}$

$h = 4732.403$

5) A piece of commercial real estate is priced at $3.50 per square foot. Find the cost, to the nearest dollar, of a triangular lot measuring 320 feet by 510 feet by 410 feet.

$s = \frac{1}{2}(320 + 510 + 410) = 620$

$Area = \sqrt{620(620-320)(620-510)(620-410)}$

$Area = 65,548.455\ ft^2$

$Cost = 65,548.455\ ft^2 \cdot \frac{\$3.50}{ft^2}$

$Cost = \$229,419$