Pre-Calculus Name: Key

(5.1) --- Law of Sines & (5.2) --- Law of Cosines

Find the area of each triangle to the nearest tenth

1) a = 5, b = 12, c = 13 ← special Rt. Δ

$S = \frac{5+12+13}{2} = 15$

$A = \sqrt{15(15-5)(15-12)(15-13)}$

$A = 30 \text{ un.}^2$

so, $A = \frac{1}{2}bh$

$A = \frac{1}{2}(12)(5)$

$A = 30 \text{ un.}^2$

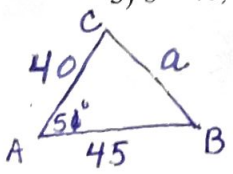
2) c = 3.58, b = 6.8, A = 39° SAS

$A = \frac{1}{2}(3.58)(6.8)\sin 39°$

$A \approx 7.7 \text{ un.}^2$

Solve each triangle (round to the nearest tenth)

3) b = 40, c = 45, A = 51° SAS



Law of Cosines

$a^2 = 40^2 + 45^2 - 2(40)(45)\cos 51°$

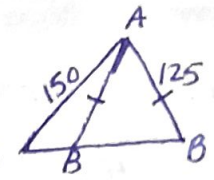
$a \approx 36.87$

$40^2 = 45^2 + a^2 - 2(45)(a)\cos B$

$\angle B \approx 57.5°$

$\angle C \approx 71.5°$

4) c = 125, b = 150, C = 25°



$\frac{\sin 25°}{125} = \frac{\sin B}{150} = \frac{\sin A}{a}$

If ∠B is obtuse

$\angle A \approx 124.5°$ $a \approx 243.7$

$\angle B \approx 30.5°$ $b = 150$

$\angle C \approx 25°$ $c = 125$

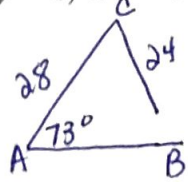
If ∠B is acute

$\angle A \approx 5.5°$ $a \approx 28.2$

$\angle B \approx 149.5°$ $b = 150$

$\angle C = 25°$ $c = 125$

5) $a = 24$, $b = 28$, $A = 73°$

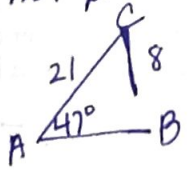


$\frac{\sin 73°}{24} = \frac{\sin B}{28}$

not possible

6) $a = 8$, $b = 21$, $A = 47°$

not possible



$\frac{\sin 47°}{8} = \frac{\sin B}{21}$

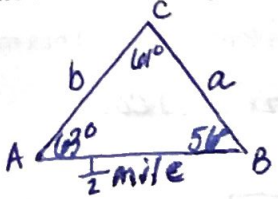
7) $a = 9.8$, $b = 12$, $c = 23$ SSS

Law of Cosines

not possible

$9.8 + 12 < 23$

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



$\frac{\sin 61°}{.5} = \frac{\sin 63°}{a} = \frac{\sin 56°}{b}$

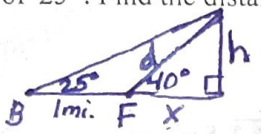
$a \approx .509$ miles Observer B is .509 miles from the sailboat.

$b \approx .474$ miles Observer A is .474 miles from the sailboat

$\cos 40° = \frac{x}{d}$ $\quad d = \frac{x}{\cos 40°}$ $\quad d = 4.6 \text{ miles}$

$\tan 40° = \frac{h}{x}$ $\quad x \tan 40° = h$ $\quad h \approx 1.05 \text{ miles}$

9) Aliens are on their way to earth to abduct Mrs. Foster and Ms. Borchert in order to study brilliant Earthlings. Mrs. Foster looks due East and sees the UFO with an angle of elevation of 40°. At the same time Ms. Borchert is 1 mile due West of Mrs. Foster. When Ms. Borchert looks due East she sees the same UFO at an angle of elevation of 25°. Find the distance between Mrs. Foster and the UFO. How far is the UFO above the ground?



$\tan 40° = \frac{h}{x}$ $\quad x \tan 40° = h$

$\tan 25° = \frac{h}{x+1}$ $\quad (x+1)\tan 25° = h$

$x \tan 40° = (x+1)\tan 25°$

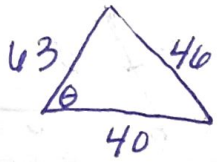
$x \tan 40° = x \tan 25° + \tan 25°$

$x \tan 40° - x \tan 25° = \tan 25°$

$x(\tan 40° - \tan 25°) = \tan 25°$

$x = \frac{\tan 25°}{\tan 40° - \tan 25°}$

10) As Danielle stands on a bridge she notices that it is supported by triangular braces. The sides of each brace have lengths 63 ft, 46 ft, and 40 ft. In order to keep the bridge from collapsing she needs to find the angle measure opposite the 46 ft side. Help Danielle save the bridge!

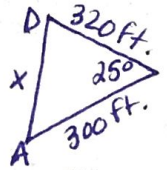


SSS Law of Cosines

$46^2 = 63^2 + 40^2 - 2(63)(40)\cos\theta$

$\frac{46^2 - 63^2 - 40^2}{-2(63)(40)} = \cos\theta$ $\quad \theta \approx 46.76°$

11) Mr. Atkinson and Mr. Dominguez walk from opposite ends of a city block to a point on the other side of the street where they are having a *Star Trek* convention. The angle formed by their paths is 25°. Mr. Atkinson walks 300 ft, while Mr. Dominguez walks 320 ft. How long is the city block?



SAS

$x^2 = 300^2 + 320^2 - 2(300)(320)\cos 25°$

$x \approx 135.6 \text{ ft.}$

12) Eric's mom will be serving *Bagel Bites* to Eric's very productive study group when they arrive. She will be serving them on a new triangular serving platter that Eric gave her for Mother's Day. If one side of the platter is 15 in long and the other two sides both measure 18 inches, find the area of the platter.

$s = \frac{15+18+18}{2} = 25.5$

$A = \sqrt{25.5(25.5-15)(25.5-18)(25.5-18)}$

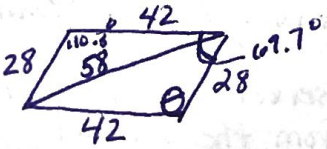
$A = 122.7 \text{ in.}^2$

13) Ms. Borchert's 3rd period class decided to make a poster to hang on the wall of the classroom in order to declare their superiority over 4th period. To honor their Pre-Calculus knowledge they made a triangular shaped poster. Ms. Borchert's 4th period class wants to make an even bigger poster that will cover more wall space. To find the area of the 3rd period's poster they measure and find two of the sides are 8 ft and 9 ft, while the included angle measures 39°. How large will 4th period's poster have to be in order to cover more area than 3rd periods?

$A = \frac{1}{2}(8)(9)\sin(39°)$

$A = 22.66 \text{ ft.}^2$ larger than 22.46 ft.^2

14) The measures of two sides of a parallelogram are 28 in and 42 in. If the longer diagonal has measure 58 in, find the measure of the angles at the vertices.



$58^2 = 28^2 + 42^2 - 2(28)(42)\cos\theta$

$\theta = 110.3°$

$110.3° \text{ \& } 69.7°$