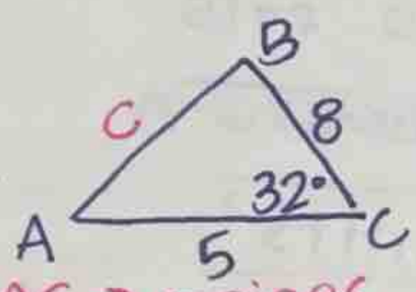
Unit 6 Review
Law of Sines and Cosines

Name _____

Round side lengths and area to the nearest tenth and angle measures to the nearest degree for all questions. Find **all** possible solutions

1. Given: $a = 8$, $b = 5$, $m\angle C = 32^\circ$



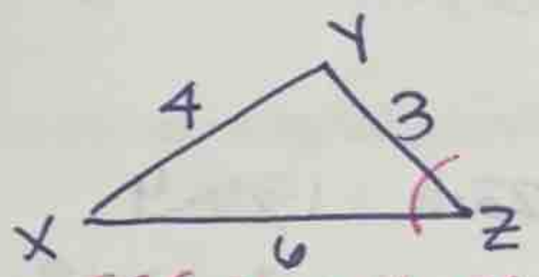
Find: *length of side c* SAS → cosines

$c^2 = 5^2 + 8^2 - 2(5)(8)\cos 32^\circ$

$\sqrt{c^2} = \sqrt{21.16}$

$\boxed{c = 4.6}$

2. Given: $x = 3$, $y = 6$, $z = 4$



Find: $m\angle Z$ SSS → cosines

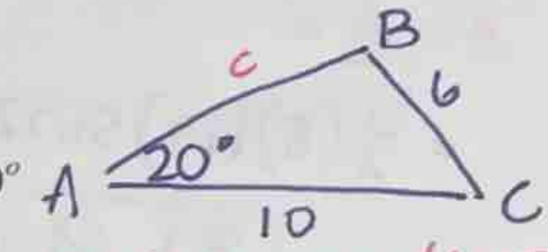
$4^2 = 3^2 + 6^2 - 2(3)(6)\cos Z$

$\frac{-29}{-36} = \frac{-36\cos Z}{-36}$

$\frac{29}{36} = \cos Z$

$\boxed{36.3^\circ}$

3. Given: $a = 6$, $b = 10$, $m\angle A = 20^\circ$



Find: *length of side c* SSA → sines (AMBIG)

$\frac{\sin 20}{6} = \frac{\sin B}{10}$

$B = 34.8^\circ$ OR 145.2° (180 − 34.8)

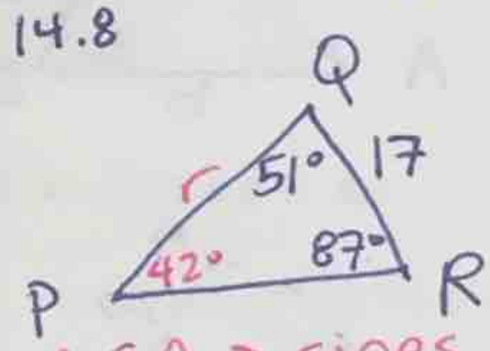
$m\angle C$: 180 − 20 − 34.8 OR 180 − 20 − 145.2
125.2° 14.8

$\frac{\sin 20}{6} = \frac{\sin 125.2}{c}$

$\boxed{14.3 \text{ OR } 4.5}$

$\frac{\sin 20}{6} = \frac{\sin 14.8}{c}$

4. Given: $p = 17$, $m\angle Q = 51^\circ$, $m\angle R = 87^\circ$



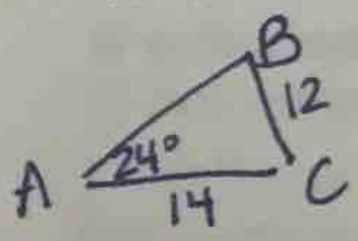
Find: *length of side r* ASA → sines

$\frac{\sin 42}{17} = \frac{\sin 87}{r}$

$\boxed{r = 25.4}$

Solve ΔABC. Find ALL solutions

5. Given: $a = 12$, $b = 14$, $m\angle A = 24^\circ$



SSA → sines (AMBIG)

$\frac{\sin 24}{12} = \frac{\sin B}{14}$

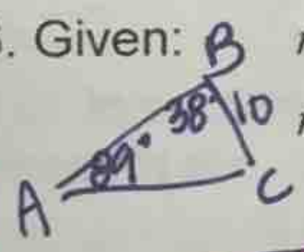
$B = 28.3^\circ$ OR 151.7°

$m\angle C = 127.7^\circ$ OR 4.3°

$c = 23.3$ OR 2.6

$\frac{\sin 24}{12} = \frac{\sin 127.7}{c}$ $\frac{\sin 24}{12} = \frac{\sin 4.3}{c}$

6. Given: $a = 10$, $m\angle A = 89^\circ$, $m\angle B = 38^\circ$



AAS → sines

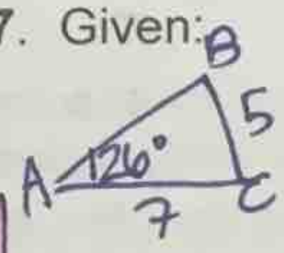
$m\angle C = 53^\circ$
$b = 6.2$
$c = 8$

$\frac{\sin 89}{10} = \frac{\sin 38}{b}$

$b = 6.2$

$\frac{\sin 89}{10} = \frac{\sin 53}{c}$

7. Given: $a = 5$, $b = 7$, $m\angle A = 126^\circ$



SSA → sines (AMBIG)

$\frac{\sin 126}{5} = \frac{\sin B}{7}$

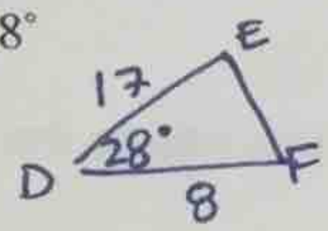
$\sin B = 1.1$

DNE

$\boxed{\text{NO SOLUTION}}$

Find the area. Round your answer to the nearest tenth.

8. $m\angle D = 28°$
e = 8 cm
f = 17 cm

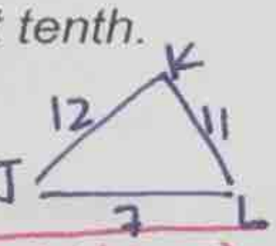


$A = \frac{1}{2} ef \sin D$

$= \frac{1}{2}(8)(17)\sin 28$

$\boxed{31.9 \text{ cm}^2}$

9. j = 11 in
k = 7 in
l = 12 in



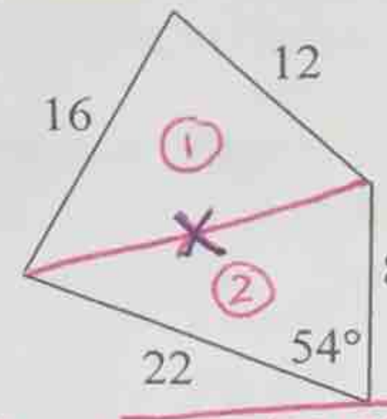
$A = \sqrt{s(s-a)(s-b)(s-c)}$

Perimeter = 30 s = 15

$A = \sqrt{15(15-12)(15-11)(15-7)}$

$\boxed{37.9 \text{ in}^2}$

10.



$A_1 + A_2 = A_{TOTAL}$

$95.2 + 71.2 = \boxed{166.4}$

$x^2 = 22^2 + 8^2 - 2(22)(8)\cos 54$

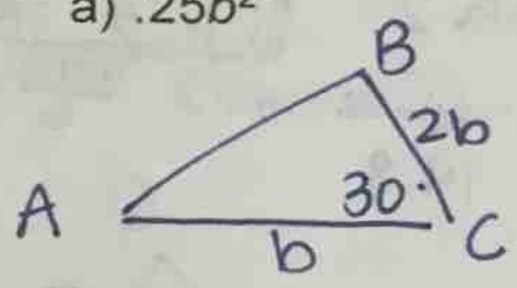
$x = 18.469$

$A_1 = \sqrt{23.25(23.25-16)(23.25-12)(23.25-18.469)}$

$A_2 = \frac{1}{2}(22)(8)\sin 54$

11. In ΔABC, side *a* is twice as long as *b* and m<C = 30. In terms of b, the area of ΔABC is:

a) $.25b^2$ $\boxed{\text{b) } .5b^2}$ c) $.866b^2$ d) b^2

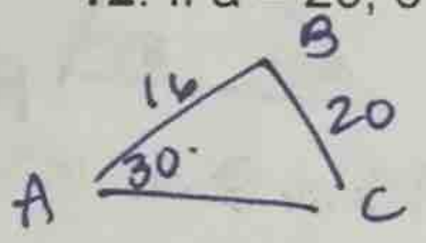


$a = 2b$

$A = \frac{1}{2} ab \sin C$

$= \frac{1}{2}(2b)(b)\sin 30 = b^2\left(\frac{1}{2}\right)$

12. If a = 20, c = 16, and m<A = 30, how many distinct triangles can be constructed?



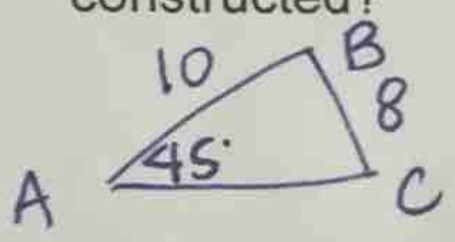
$\frac{\sin 30}{20} = \frac{\sin C}{16}$

$m\angle C = 23.6$ OR $180 - 23.6 = 156.4$

$156.4 + 30 > 180$

$\boxed{\text{ONE}}$

13. In ΔABC, if AB = 10, BC = 8, and m<A = 45, how many distinct triangles can be constructed?



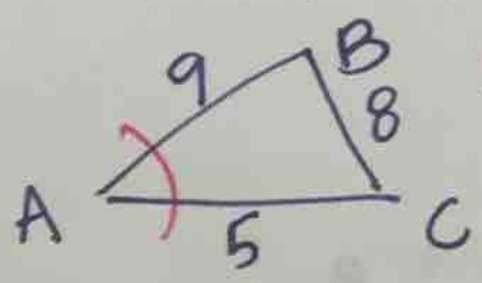
$\frac{\sin 45}{8} = \frac{\sin C}{10}$

$m\angle C = 62.1$ OR $180 - 62.1 = 117.9$

$117.9 + 45 < 180$

$\boxed{\text{TWO}}$

14. In ΔABC, if a = 8, b= 5 and c = 9, what is the value of cos*A*?



SSS → cosines

$8^2 = 9^2 + 5^2 - 2(9)(5)\cos A$

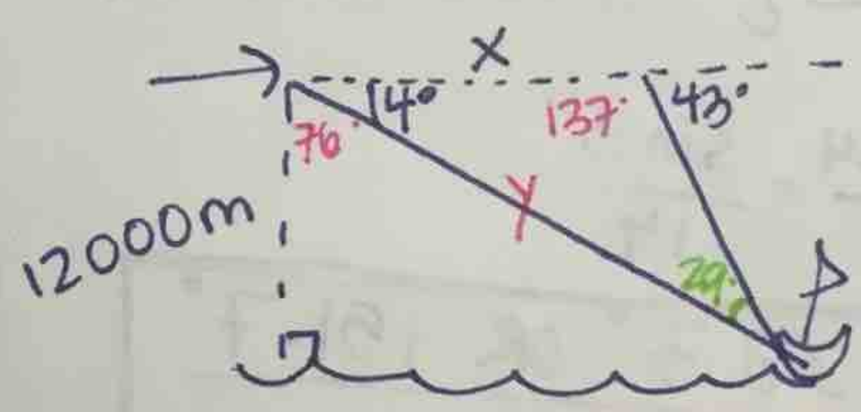
$\frac{-42}{-90} = \frac{-90\cos A}{-90}$

$\boxed{\cos A = \frac{42}{90} = \frac{7}{15}}$

15. A pilot of a transoceanic jet flying at an altitude of 12,000 m finds that a stationary ship is in the same vertical plane as the jet's course. He measures the ship's angle of depression to be 14°. Two minutes later he finds it to be 43°.

A. How far did the jet fly in those 2 minutes?

B. At what speed was the jet traveling?



A. $\cos 76 = \frac{12000}{y}$

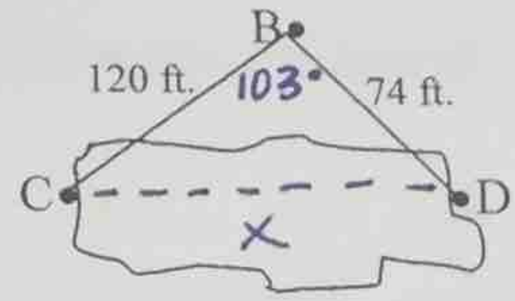
$y = 49602.8\text{m}$

$\frac{\sin 137}{49602.8} = \frac{\sin 29}{x}$

$\boxed{x = 35260.96\text{m}}$

B. $\frac{35260.96 \text{ m}}{2 \text{ min}} = \boxed{17630.5 \text{ m/min}}$

16. An engineer wants to measure the width of a sinkhole. He places a stake at B as shown and measures from the stake to C and D as shown. If the angle at B is 103°, how wide is the sinkhole?

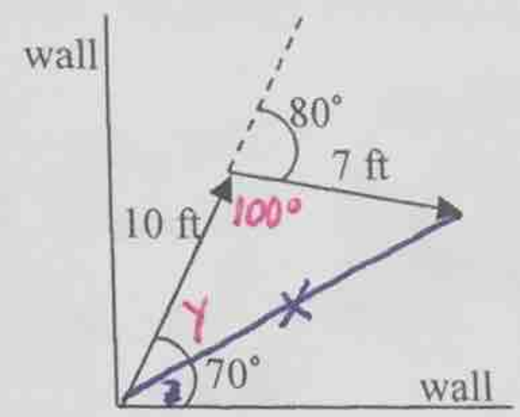


$x^2 = 120^2 + 74^2 - 2(120)(74)\cos 103°$

$x^2 = 23871.13$

$x = 154.5$ ft

17. Suppose you start at the corner of a room and walk 10 feet at an angle of 70° to the right hand wall. Then you turn 80° clockwise and walk another 7 ft. If you had walked straight from the corner of the room to your stopping point, how far and in what direction would you have walked?



$x^2 = 10^2 + 7^2 - 2(10)(7)\cos 100$

$x = 13.2$ ft

$\frac{\sin Y}{7} = \frac{\sin 100}{13.2}$

$m\angle Y = 31.5°$

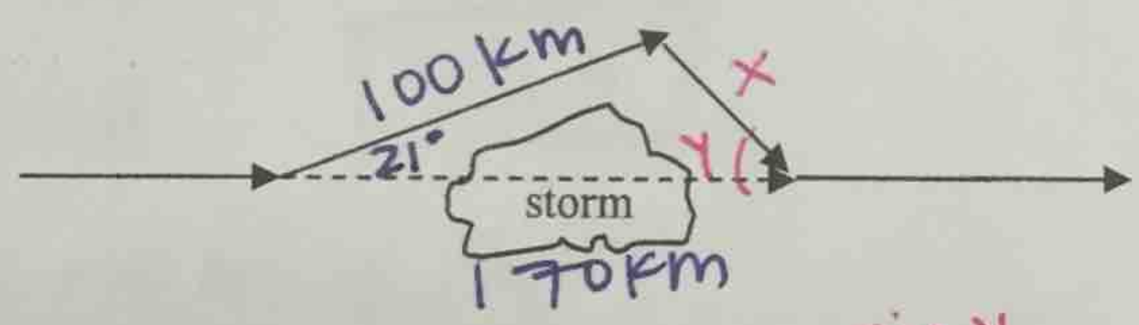
$m\angle Z = 70 - 31.5$

38.5° from wall

18. The pilot of a commercial airplane finds it necessary to detour around a group of thunderstorms, as shown. He turns the plane at an angle of 21° to his original path, flies 100 km, turns, and then rejoins his original path 170 km from where he left it.

a) How much further did he have to fly because of the detour?

b) At what angle did he rejoin his original course?



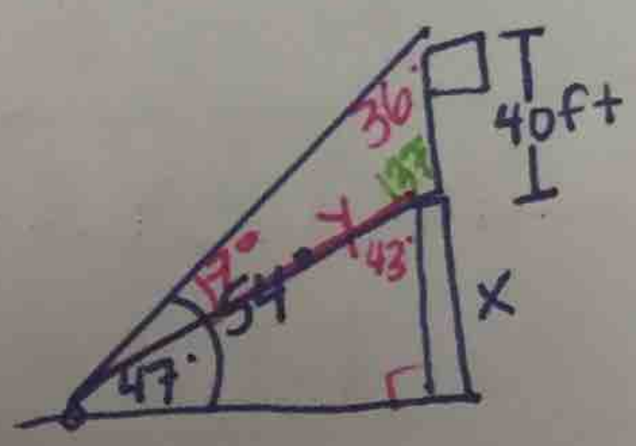
$x^2 = 100^2 + 170^2 - 2(100)(170)\cos 21$

$x = 84.6$ km a.

$\frac{\sin Y}{100} = \frac{\sin 21}{84.6}$

$Y = 25.1°$ b.

19. A flagpole 40 feet tall stands on top of the Wentworth Building. From a point in front of the building, the angle of elevation to the top of the pole is 54°, and the angle of elevation to the bottom of the pole is 47°. How high is the building?



$\frac{\sin 36}{Y} = \frac{\sin 7}{40}$

$Y = 192.9$

$\sin 47 = \frac{x}{192.9}$

$x = 141.1$ ft