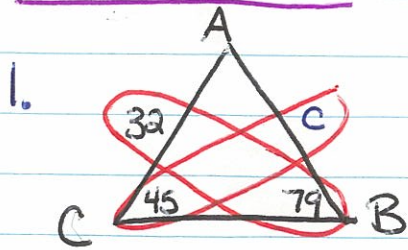


Laws of Sine & Cosine Worksheet Chapter 3

Sine Law:

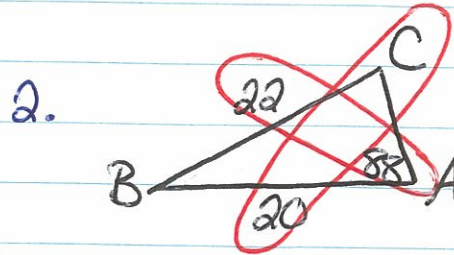


$$\frac{c}{\sin 45} = \frac{32}{\sin 79}$$

$$c = \frac{32 \times \sin 45}{\sin 79}$$

$$c = 23.0509$$

$c = 23.1 \text{ cm}$



$$\frac{\sin C}{20} = \frac{\sin 88}{22}$$

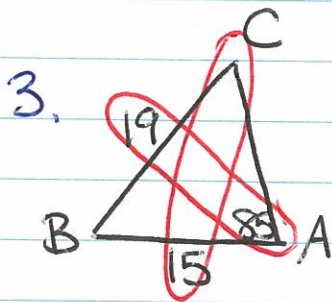
$$\sin C = \frac{20 \times \sin 88}{22}$$

$$\sin C = 0.9085371155..$$

$$C = \sin^{-1}(0.9085...)$$

$$C = 65.30397$$

$C = 66^\circ$



$$\frac{\sin C}{15} = \frac{\sin 85}{19}$$

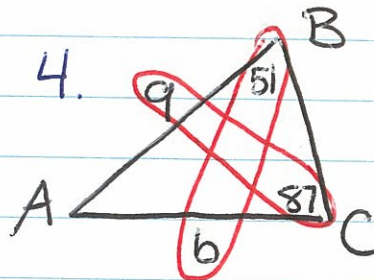
$$\sin C = \frac{15 \times \sin 85}{19}$$

$$\sin C = 0.786469...$$

$$C = \sin^{-1}(0.786469...)$$

$$C = 51.8568$$

$C = 52^\circ$

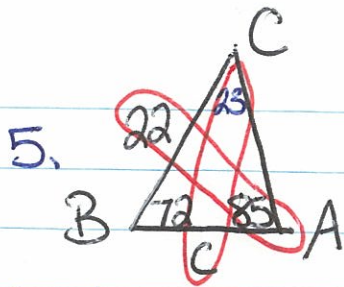


$$\frac{b}{\sin 51} = \frac{9}{\sin 87}$$

$$b = \frac{9 \times \sin 51}{\sin 87}$$

$$b = 7.00391...$$

$b = 7.0 \text{ in}$



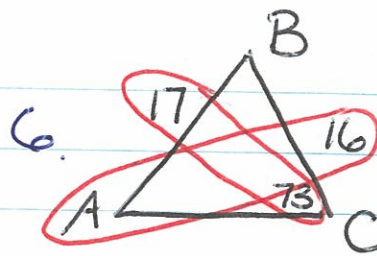
$$C = 180 - 72 - 85 = 23$$

$$\frac{c}{\sin 23} = \frac{22}{\sin 85}$$

$$c = \frac{22 \times \sin 23}{\sin 85}$$

$$c = 8.62892$$

$$c = 8.2 \text{ mi}$$



$$\frac{\sin A}{16} = \frac{\sin 73}{17}$$

$$\sin A = \frac{16 \times \sin 73}{17}$$

$$\sin A = 0.900051535$$

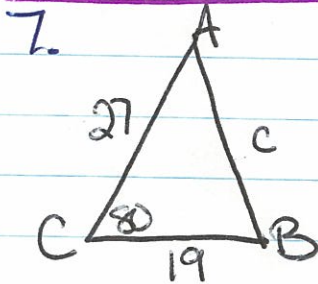
$$A = \sin^{-1}(0.90005\dots)$$

$$A = 64.1648 = 64^\circ$$

$$B = 180 - 73 - 64 = 43^\circ$$

$$B = 43^\circ$$

Cosine Law:



$$c^2 = 27^2 + 19^2 - 2(27)(19)\cos 80$$

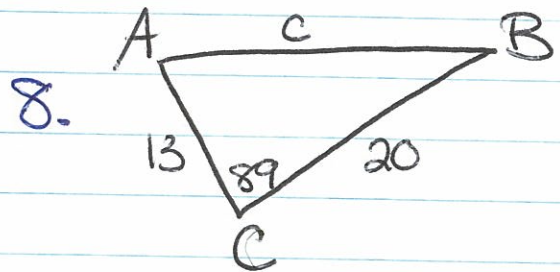
$$c^2 = 1090 - 1026\cos 80$$

$$c^2 = 911.8369697$$

$$c = \sqrt{911.8369697}$$

$$c = 30.196638$$

$$c = 30.2 \text{ m}$$



$$c^2 = 13^2 + 20^2 - 2(13)(20)\cos 89$$

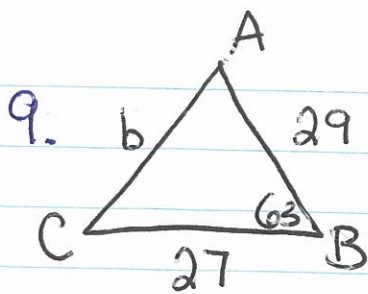
$$c^2 = 569 - 520\cos 89$$

$$c^2 = 559.9247487$$

$$c = \sqrt{559.9247487}$$

$$c = 23.6627$$

$$c = 23.7 \text{ in}$$



$$b^2 = 27^2 + 29^2 - 2(27)(29)\cos 63$$

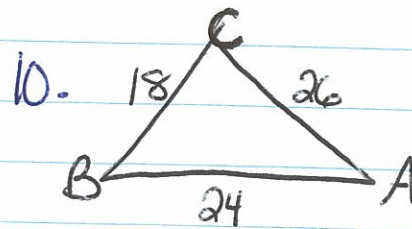
$$b^2 = 1570 - 1566\cos 63$$

$$b^2 = 859.0508774$$

$$b = \sqrt{859.0508774}$$

$$b = 29.30956972$$

$$b = 29.3 \text{ mi}$$



$$24^2 = 18^2 + 26^2 - 2(18)(26)\cos C$$

$$576 = 1000 - 936\cos C$$

$$-1000 \quad -1000$$

$$\underline{-424} = \underline{-936\cos C}$$

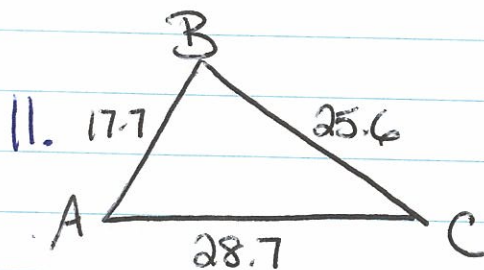
$$\underline{-936} \quad \underline{-936}$$

$$0.452991453 = \cos C$$

$$C = \cos^{-1}(0.452991453)$$

$$C = 63.0642$$

$$C = 63^\circ$$



$$25.6^2 = 17.7^2 + 28.7^2 - 2(17.7)(28.7)\cos A$$

$$655.36 = 1136.98 - 1015.98\cos A$$

$$\underline{-1136.98} \quad \underline{-1136.98}$$

$$\underline{-481.62} = \underline{-1015.98\cos A}$$

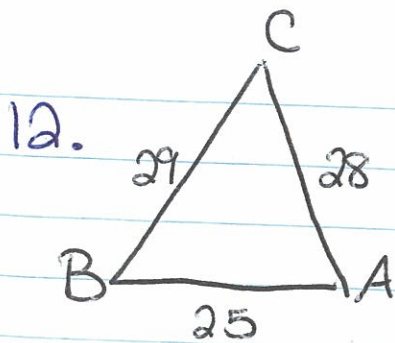
$$\underline{-1015.98} \quad \underline{-1015.98}$$

$$0.4740447647 = \cos A$$

$$A = \cos^{-1}(0.4740447647)$$

$$A = 61.7028$$

$$A = 62^\circ$$



$$28^2 = 29^2 + 25^2 - 2(29)(25)\cos B$$

$$784 = 1466 - 1450\cos B$$

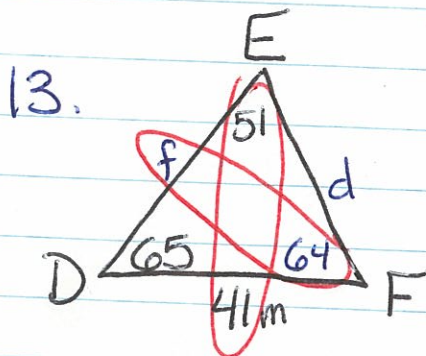
$$\begin{array}{r} -1466 \quad -1466 \\ -682 = -1450\cos B \\ \hline -1450 \quad -1450 \end{array}$$

$$0.4703448276 = \cos B$$

$$B = \cos^{-1}(0.4703448276)$$

$$B = 61.9433$$

$$B = 62^\circ$$



$$F = 180 - 65 - 51 = 64^\circ$$

$$\frac{f}{\sin 64} = \frac{41}{\sin 51}$$

$$f = \frac{41 \times \sin 64}{\sin 51}$$

$$f = 47.4178$$

$$d^2 = 41^2 + 47.4178^2 - 2(41)(47.4178)\cos 65$$

$$d^2 = 3929.447757 - 388.2596\cos 65$$

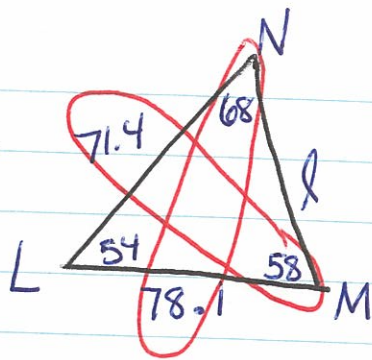
$$d^2 = 2286.198243$$

$$d = \sqrt{2286.198243}$$

$$d = 47.8142$$

$D = 65^\circ$	$d = 47.8 \text{ m}$
$E = 51^\circ$	$e = 41 \text{ m}$
$F = 64^\circ$	$f = 47.4 \text{ m}$

14.



$$\frac{\sin N}{78.1} \Rightarrow \frac{\sin 58}{71.4}$$

$$\sin N = \frac{78.1 \times \sin 58}{71.4}$$

$$\sin N = 0.9276268391$$

$$N = \sin^{-1}(0.9276268391)$$

$$N = 68.068$$

$$N = 68^\circ$$

$$L = 180 - 58 - 68 = 54^\circ$$

$$\frac{78.1}{\sin 68} = \frac{l}{\sin 54}$$

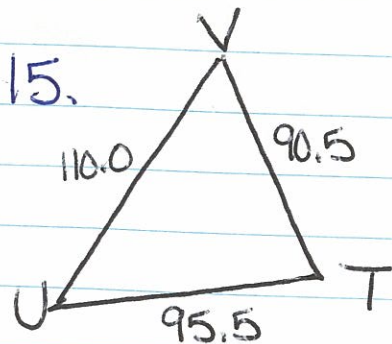
$$\frac{78.1 \times \sin 54}{\sin 68} = l$$

$$68.1464 = l$$

$$L = 54^\circ \quad l = 68.1 \text{ cm}$$

$$M = 58^\circ \quad m = 71.4 \text{ cm}$$

$$N = 68^\circ \quad n = 78.1 \text{ cm}$$



$$110^2 = 90.5^2 + 95.5^2 - 2(90.5)(95.5)\cos T$$

$$12100 = 17310.5 - 17285.5\cos T$$

$$-17310.5 \quad -17310.5$$

$$\frac{-5210.5}{-17285.5} = \frac{-17285.5\cos T}{-17285.5}$$

$$0.3014376211 = \cos T$$

$$T = \cos^{-1}(0.3014376211)$$

$$T = 72.456$$

$$T = 72^\circ$$

$$U = 180 - 72 - 56 = 52^\circ$$

$$\frac{\sin 72}{110} = \frac{\sin V}{95.5}$$

$$\frac{95.5 \times \sin 72}{110} = \sin V$$

$$0.8256899755 = \sin V$$

$$V = \sin^{-1}(0.8256899755)$$

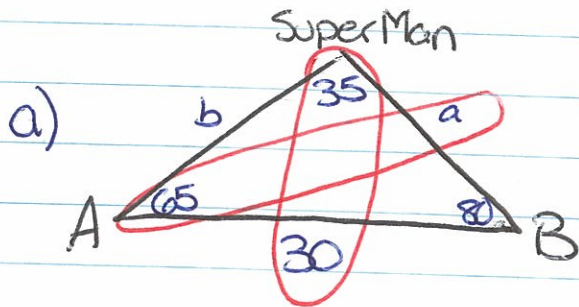
$$V = 55.6585 = 56^\circ$$

$$T = 72^\circ \quad t = 110.0 \text{ mm}$$

$$U = 52^\circ \quad u = 90.5 \text{ mm}$$

$$V = 56^\circ \quad v = 95.5 \text{ mm}$$

16.



$$\angle S = 180 - 65 - 80 = 35^\circ$$

$$\frac{a}{\sin 65} = \frac{30}{\sin 35}$$

$$a = \frac{30 \times \sin 65}{\sin 35}$$

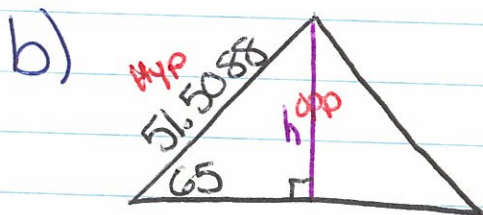
$$a = 47.40298$$

$$\frac{b}{\sin 80} = \frac{30}{\sin 35}$$

$$b = \frac{30 \times \sin 80}{\sin 35}$$

$$b = 51.5087976$$

Person A is 51.5 ft from Superman
 Person B is 47.4 ft from Superman



$$\sin 65 = \frac{\text{opp}}{\text{hyp}}$$

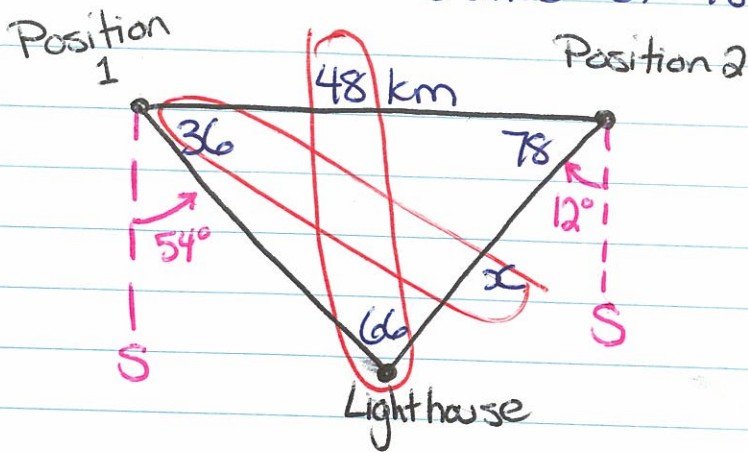
$$\sin 65 = \frac{h}{51.5088}$$

$$51.5088 \times \sin 65 = 1 \times h$$

$$46.68282654 = h$$

Superman is 46.7 ft
 off the ground.

17. If the boat is going 24 km/h it will travel a distance of 48 km in 2 hours.



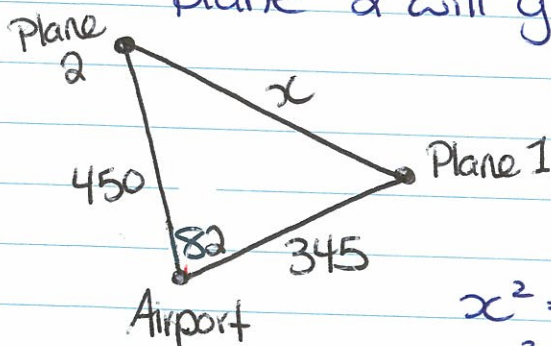
Find Angle at lighthouse:

$$L = 180 - 36 - 78 \\ = 66^\circ$$

$$\frac{x}{\sin 36} = \frac{48}{\sin 66} \\ x = \frac{48 \times \sin 36}{\sin 66} \\ x = 30.8837$$

The boat is 30.9 km from the lighthouse

18. In 1.5 hours plane 1 will go 345 km and plane 2 will go 450 km.



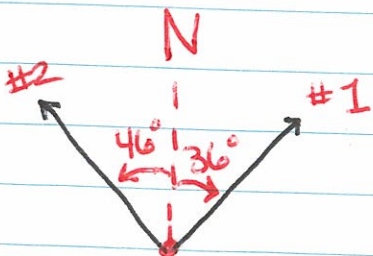
$$x^2 = 450^2 + 345^2 - 2(450)(345)\cos 82$$

$$x^2 = 321525 - 310500\cos 82$$

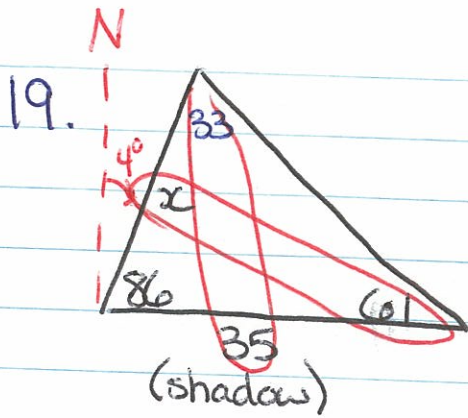
$$x^2 = 278311.7522$$

$$x = \sqrt{278311.7522}$$

$$x = 527.5526061$$



The planes are 527.6 km apart



Find 3rd Angle: $180 - 86 - 61 = 33^\circ$

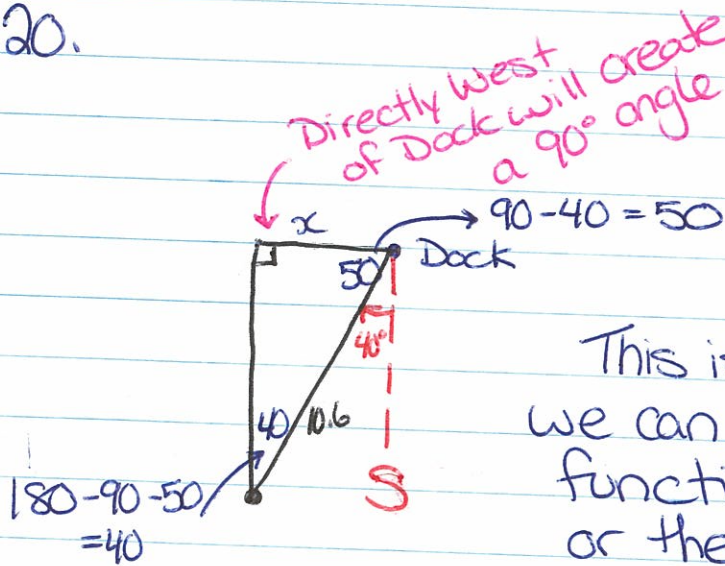
$$\frac{x}{\sin 61} = \frac{35}{\sin 33}$$

$$x = \frac{35 \times \sin 61}{\sin 33}$$

$$x = 56.20546414$$

The height of the tower is 56.2m

20.



This is a Right-Angle Triangle. We can use primary Trig functions (Sin, Cos, Tan) or the Sine Law

$$\cos 50 = \frac{\text{adj}}{\text{hyp}}$$

$$\frac{\cos 50}{1} = \frac{x}{10.6}$$

$$10.6 \times \cos 50 = 1 \times x$$

$$6.8135 = x$$

OR

$$\frac{x}{\sin 40} = \frac{10.6}{\sin 90}$$

$$x = \frac{10.6 \times \sin 40}{\sin 90}$$

$$x = 6.8135$$

The sailboat is 6.8 km from the dock