Name: Mrs. Jarvis

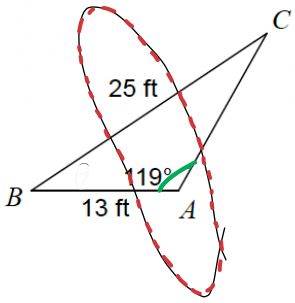
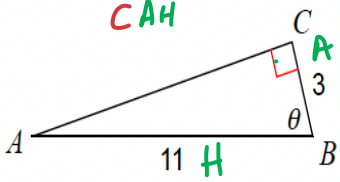
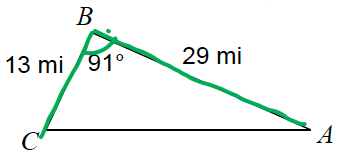
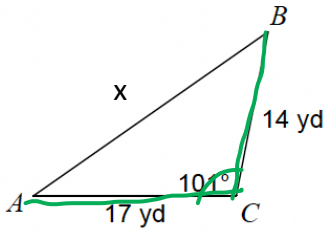
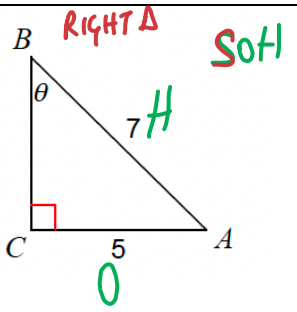
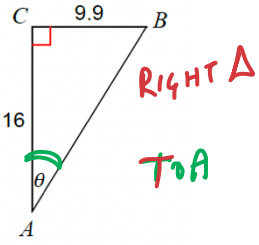
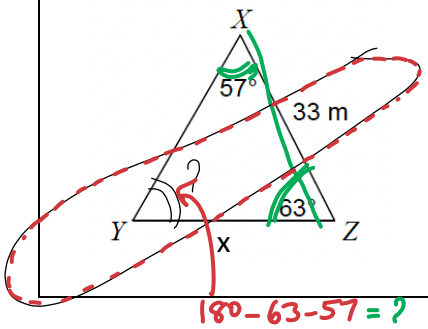
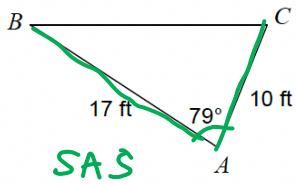
Trigonometry

SOH CAH TOA

Law of Sines and Cosines

Review Work Package

WHO CAN HELP?

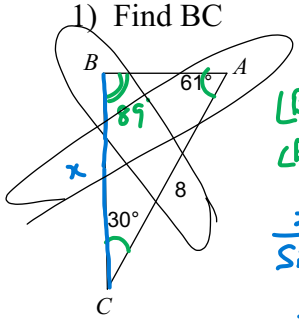
1. 	◯ SOH ◯ CAH ◯ TOA ✓ Sine Law ◯ Cosine Law
2. RIGHT Δ CAH 	◯ SOH ✓ CAH ◯ TOA ◯ Sine Law ◯ Cosine Law
3. Find $m\angle C$ SAS 	◯ SOH ◯ CAH ◯ TOA ◯ Sine Law ✓ Cosine Law
4.  SAS	◯ SOH ◯ CAH ◯ TOA ◯ Sine Law ✓ Cosine Law
5.  RIGHT Δ SOH O	✓ SOH ◯ CAH ◯ TOA ◯ Sine Law ◯ Cosine Law
6. O  A RIGHT Δ TOA	◯ SOH ◯ CAH ✓ TOA ◯ Sine Law ◯ Cosine Law
7.  180−63−57 = ?	◯ SOH ◯ CAH ◯ TOA ✓ Sine Law ◯ Cosine Law
8. Find BC  SAS	◯ SOH ◯ CAH ◯ TOA ◯ Sine Law ✓ Cosine Law

Name_____

Date_____

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

1) Find BC



$\angle B = 180 - 30 - 61$

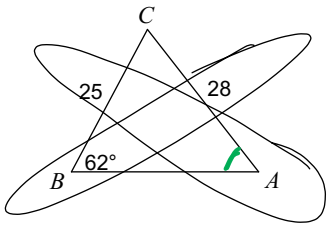
$\angle B = 89°$

$\frac{x}{\sin 61} = \frac{8}{\sin 89}$

$x = \frac{8\sin(61)}{\sin(89)}$

$x = 7$ (approx)

2) Find $m\angle A$

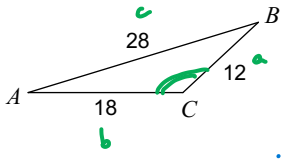


$\frac{\sin A}{25} = \frac{\sin 62}{28}$

$\sin A = \frac{25\sin(62)}{28} = 0.788\ldots$

$A = \sin^{-1}(0.788\ldots) = 52°$

3) Find $m\angle C$



SSS

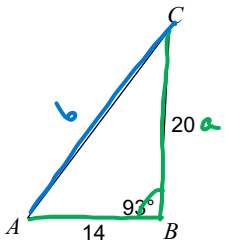
∴ Cosine law

$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$

$\cos C = \frac{28^2 - 12^2 - 18^2}{-2(12)(18)} = \frac{784 - 144 - 324}{-432}$

$C = \cos^{-1}\left(\frac{316}{-432}\right) = 137°$ (approx)

4) Find AC



SAS

∴ Cosine law

$b^2 = a^2 + c^2 - 2ac\cos B$

$b^2 = 20^2 + 14^2 - 2(20)(14)\cos 93$

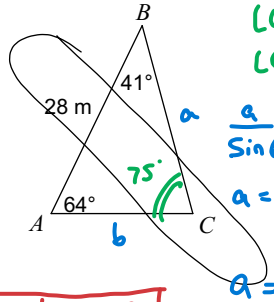
$b^2 = 400 + 196 - 560\cos 93$

$b = \sqrt{625.308\ldots}$

$b = 25$ (approx)

Solve each triangle. Round your answers to the nearest tenth.

5)



$\angle C = 180 - 41 - 64$

$\angle C = 75°$

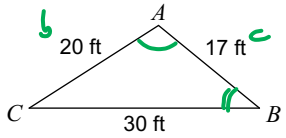
$\frac{a}{\sin 64} = \frac{28}{\sin 75}$ | $\frac{b}{\sin 41} = \frac{28}{\sin 75}$

$a = \frac{28\sin 64}{\sin 75}$ | $b = \frac{28\sin 41}{\sin 75}$

$a = 26$ | $b = 19$

$\angle C$	$75°$
a	26m
b	19m

6)



SSS

∴ Cosine

$\cos A = \frac{a^2 - b^2 - c^2}{-2bc}$ | $\cos B = \frac{b^2 - a^2 - c^2}{-2ac}$

$\cos A = \frac{30^2 - 20^2 - 17^2}{-2(20)(17)}$ | $\cos B = \frac{20^2 - 30^2 - 17^2}{-2(30)(17)}$

$A = \cos^{-1}(\quad)$ | $B = \cos^{-1}(\quad)$

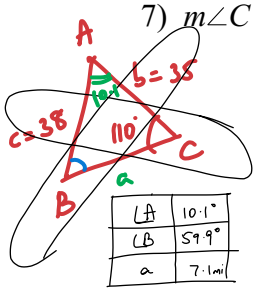
$A = 108.1°$ | $B = 39.3°$

$\therefore C = 180 - 108.1 - 39.3 = 32.6°$

$\angle A$	$108.1°$
$\angle B$	$39.3°$
$\angle C$	$32.6°$

∠A	38°
∠B	108°
∠C	34°

7) $m\angle C = 110°$, $b = 35$ mi, $c = 38$ mi



∠A	10.1°
∠B	59.9°
a	7.1 mi

$\frac{\sin B}{35} = \frac{\sin 110}{38}$

$\sin B = \frac{35 \sin 110}{38}$

$B = \sin^{-1}(0.8655\ldots)$

$B = 59.9°$

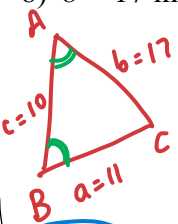
$\therefore \angle A = 180 - 110 - 59.9 = 10.1°$

$\therefore \frac{a}{\sin(10.1)} = \frac{38}{\sin 110}$

$a = \frac{38 \sin(10.1)}{\sin(110)}$

$a = 7.1$

8) $b = 17$ in, $a = 11$ in, $c = 10$ in



SSS

∴ Cosine law

$\cos A = \frac{a^2 - b^2 - c^2}{-2bc}$

$\cos A = \frac{11^2 - 17^2 - 10^2}{-2(17)(10)}$

$A = \cos^{-1}\left(\frac{121 - 289 - 100}{-340}\right)$

$A = \cos^{-1}\left(\frac{-268}{-340}\right)$

$A = 38°$ (approx)

$\cos B = \frac{b^2 - a^2 - c^2}{-2ac}$

$\cos B = \frac{17^2 - 11^2 - 10^2}{-2(11)(10)}$

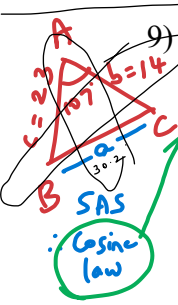
$B = \cos^{-1}\left(\frac{289 - 121 - 100}{-220}\right)$

$B = \cos^{-1}\left(\frac{68}{-220}\right)$

$B = 108°$ (approx)

$\therefore C = 180 - 38 - 108 = 34°$

9) $b = 14$ cm, $m\angle A = 107°$, $c = 23$ cm



SAS

∴ Cosine law

$a^2 = b^2 + c^2 - 2bc \cos A$

$a^2 = 14^2 + 23^2 - 2(14)(23)\cos 107$

$a^2 = 196 + 529 - 644 \cos 107$

$a = \sqrt{913.28737\ldots} \approx 30.2$

Using Sine law and $a = 30.2$

$\frac{\sin B}{14} = \frac{\sin 107}{30.2}$

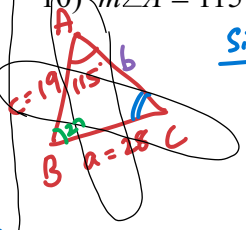
$\sin B = \frac{14 \sin 107}{30.2}$

$B = \sin^{-1}(0.44332\ldots) = 26.3°$ (approx)

a	30.2 cm
∠B	26.3°
∠C	46.7°

$\therefore \angle C = 180 - 107 - 26.3 = 46.7°$

10) $m\angle A = 115°$, $c = 19$ mi, $a = 28$ mi



$\frac{\sin C}{19} = \frac{\sin 115}{28}$

$\sin C = \frac{19 \cdot \sin 115}{28}$

$C = \sin^{-1}(0.61499\ldots)$

$C = 38°$ (approx)

$\therefore B = 180 - 115 - 38 = 27°$

$\frac{b}{\sin 27} = \frac{28}{\sin 115}$

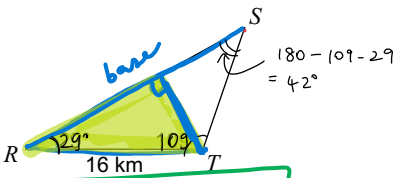
$b = \frac{28 \sin 27}{\sin 115}$

$\therefore b = 14$ mi

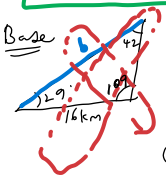
b	14 mi
∠C	38°
∠B	27°

Find the area of each triangle to the nearest tenth.

11)



Area (Δ) = $\frac{\text{base} \cdot \text{height}}{2}$



$\frac{b}{\sin 109} = \frac{16}{\sin 42}$

$b = \frac{16 \sin 109}{\sin 42}$

$b = 22.6$ km

SOH

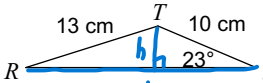
$\sin 29 = \frac{h}{16}$

$16 \sin 29 = h$

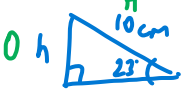
$7.8 \text{ km} = h$

$\therefore \text{Area}(\Delta) = \frac{(22.6)(7.8)}{2} = 88.1 \text{ km}^2$

12)



Area (Δ) = $\frac{bh}{2}$

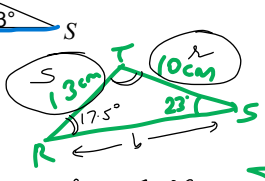


SOH

$\sin 23 = \frac{h}{10}$

$10 \sin 23 = h$

$3.9 = h$



$\frac{\sin R}{10} = \frac{\sin 23}{13}$

$\sin R = \frac{10 \sin 23}{13}$

$R = \sin^{-1}(0.30056\ldots)$

$R = 17.5°$

$\therefore \angle T = 180 - 23 - 17.5$

$T = 139.5°$

$\frac{b}{\sin 139.5} = \frac{13}{\sin 23}$

$b = \frac{13 \sin(139.5)}{\sin(23)}$

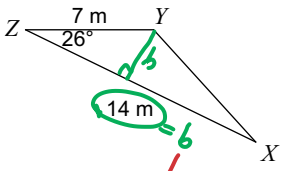
$b = 21.6$ (approx)

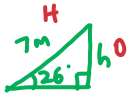
$\therefore \text{Ar}(\Delta) = \frac{bh}{2}$

$= \frac{(21.6)(3.9)}{2}$

$= 42.1 \text{ cm}^2$

13)





SOH

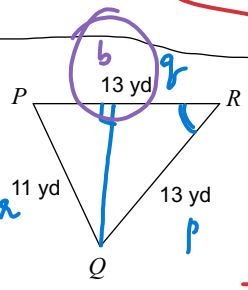
$\sin 26 = \frac{h}{7}$

$7 \cdot \sin 26 = h$

$3.1 = h$

$\therefore \text{area}(\Delta) = \frac{(14)(3.1)}{2} = 21.7 \text{ m}^2$

14)



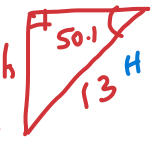
SSS

∴ Cosine

$\cos R = \frac{r^2 - p^2 - q^2}{-2pq}$

$\cos R = \frac{11^2 - 13^2 - 13^2}{-2(13)(13)} = \frac{121 - 169 - 169}{-338} = \frac{-217}{-338}$

$R = \cos^{-1}\left(\frac{217}{338}\right) = 50.1°$



SOH

$\sin 50.1 = \frac{h}{13}$

$13 \sin 50.1 = h$

$10 = h$

$b = 13$

$\therefore \text{Area} = \frac{bh}{2}$

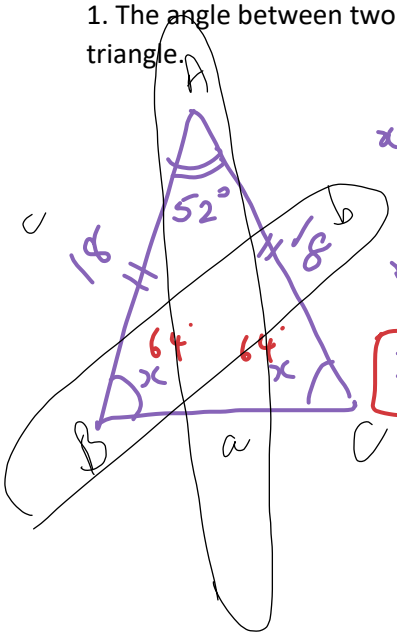
$A = \frac{(13)(10)}{2}$

$= 65 \text{ yd}^2$

Trigonometry Word Problems **Name:**_____

Drawing a triangle, label the corners, fill in the information, and then find what you need!

1. The angle between two equal sides of an isosceles triangle is 52°. Each of the equal sides is 18cm long. Solve the triangle.



$x = \frac{180 - 52}{2}$

$x = \frac{128}{2}$

$x = 64°$

$\frac{a}{\sin 52} = \frac{18}{\sin 64}$

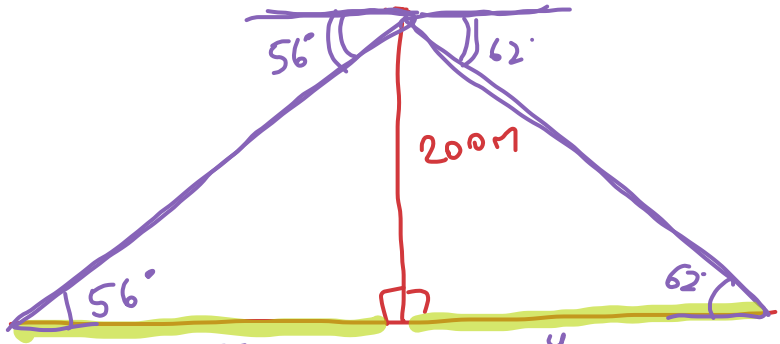
$a = \frac{18 \sin 52}{\sin 64}$

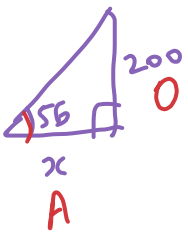
$a = 15.8\text{cm (approx)}$

$\angle B$	64°
$\angle C$	64°
a	15.8cm

2. A radar operator on a ship discovers a large sunken vessel lying flat on the ocean floor, 200m directly below the ship. The radar operator measures the angles of depression to the front and back of the sunken ship to be 56° and 62°. How long is the sunken ship?

$\rightarrow x + y$



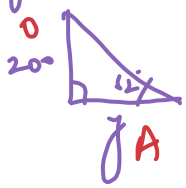


TOA

$\tan 56 = \frac{200}{x}$

$x \tan 56 = 200$

$x = \frac{200}{\tan 56} = 134.9\text{m}.$



TOA

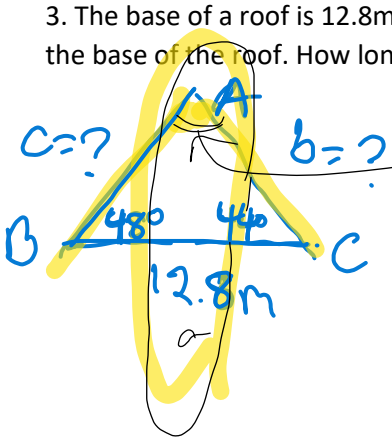
$\tan 62 = \frac{200}{y}$

$y \tan 62 = 200$

$y = \frac{200}{\tan 62} = 106.3\text{m}.$

$\therefore$ length of sunken ship $= 134.9 + 106.3 = 241.2\text{m}.$

3. The base of a roof is 12.8m wide. The rafters (meaning the slants of the roof) form angles of 48° and 44° with the base of the roof. How long, to the nearest tenth of a metre, is each rafter?



$\angle A = 180 - 48 - 44 = 88^\circ$

$$\frac{b}{\sin 48} = \frac{12.8}{\sin 88}$$

$$b = \frac{12.8 \sin 48}{\sin 88}$$

$b = ?$

$$\frac{c}{\sin 44} = \frac{12.8}{\sin 88}$$

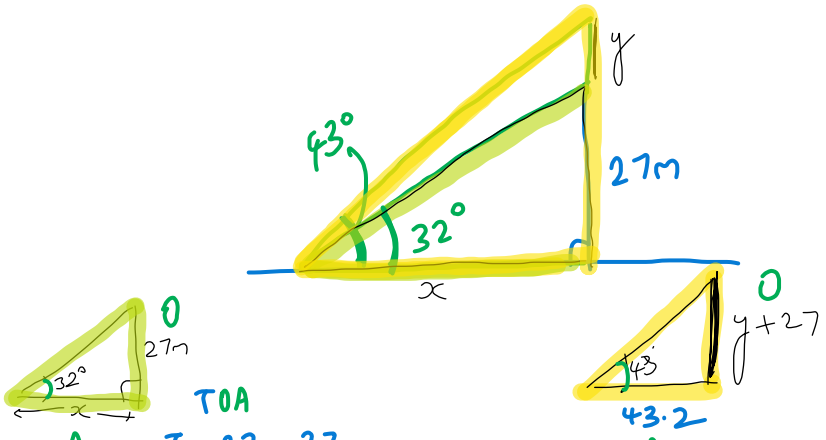
$$c = \frac{12.8 \sin 44}{\sin 88}$$

$c = ?$

4. A flagpole stands on top of a building that is 27m high. From a point on the ground some distance away, the angle of elevation to the top of the flagpole is 43°. The angle of elevation to the bottom of the flagpole is 32°.

a) How far is the point on the ground from the base of the building? x

b) How tall is the flagpole?



TOA

$\tan 32 = \frac{27}{x}$

$x \tan 32 = 27$

$x = \frac{27}{\tan 32}$

$x = 43.2$

TOA

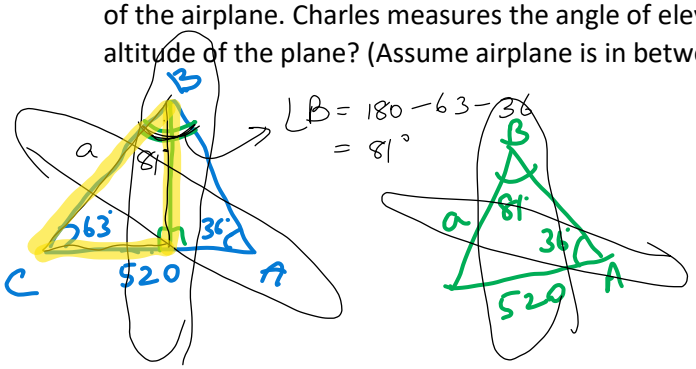
$\tan 43 = \frac{y+27}{43.2}$

$43.2 \tan 43 = y + 27$

$(43.2 \tan 43) - 27 = y$

$13.3\text{m} = y$

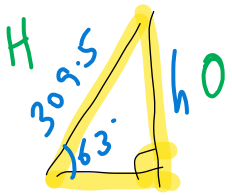
5. Charles and Agnes are 520m apart. As Brenda flies overhead in an airplane, they measure the angle of elevation of the airplane. Charles measures the angle of elevation to be 63° and Agnes measures it to be 36°. What is the altitude of the plane? (Assume airplane is in between Charles and Agnes.)



$$\frac{a}{\sin 36} = \frac{520}{\sin 81}$$

$$a = \frac{520 \sin 36}{\sin 81}$$

$$a = 309.5\text{m}$$

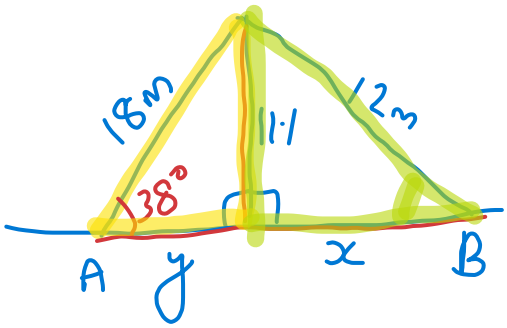


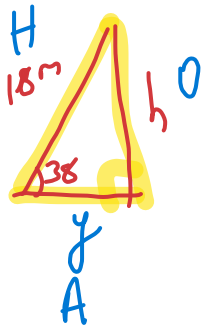
SOH

$$\sin 63 = \frac{h}{309.5} \Rightarrow 309.5 \sin 63 = h$$

$$\Rightarrow h = 275.8\text{m}.$$

6. Two support wires are fastened to the top of a satellite dish tower from points A and B on the ground, on either side of the tower. One wire is 18m long and the other is 12m long. The angle of elevation of the longer wire to the top of the tower is 38°. How tall is the satellite dish and how far apart are points A and B?



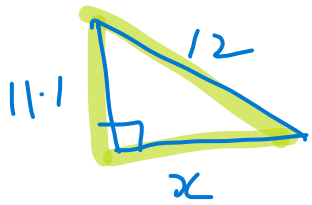


SOH

$$\sin 38 = \frac{h}{18}$$

$$18 \sin 38 = h$$

$$11.1\text{m} = h$$



$$x = \sqrt{12^2 - 11.1^2}$$

$$x = \sqrt{144 - 123.21}$$

$$x \approx 4.6\text{m}.$$

CAH

$$\cos 38 = \frac{y}{18}$$

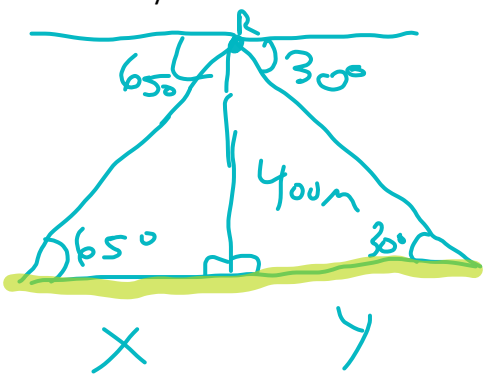
$$18 \cos 38 = y$$

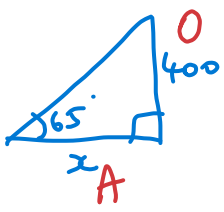
$$14.2 \approx y$$

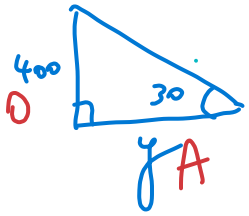
$$\therefore x + y = 4.6 + 14.2 = 18.8\text{m}.$$

The satellite dish is 11.1m tall & the wires are 18.8m apart.

7. Ryan is in a police helicopter 400m directly above a highway. When he looks west, the angle of depression to a car accident is 65°. When he looks east, the angle of depression to the approaching ambulance is 30°. How are far away is the ambulance from the scene of the accident?







Dist. b/w accident scene and ambulance

$\therefore x + y = 186.5 + 692.8$

879.3

ToA

$\tan 65 = \frac{400}{x}$

$x = \frac{400}{\tan 65}$

$x = 186.5\text{m}$

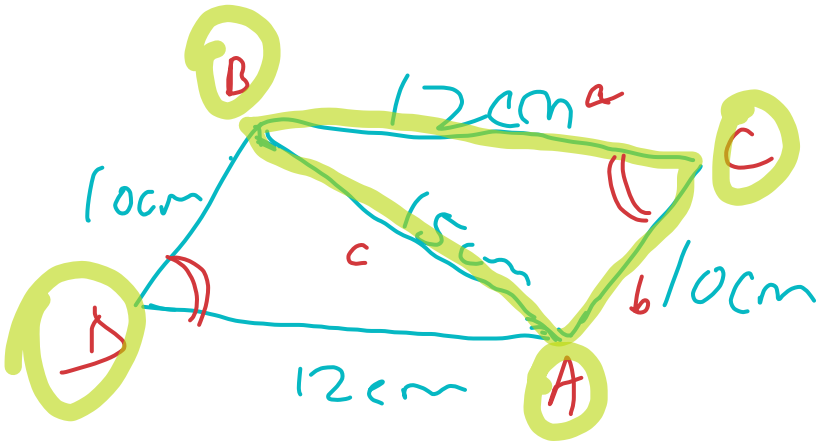
ToA

$\tan 30 = \frac{400}{y}$

$y = \frac{400}{\tan 30}$

$y = 692.8\text{m}$

8. In a parallelogram, two adjacent sides measure 10cm and 12cm. The shorter diagonal is 15cm. Determine, to the nearest degree, the measures of all four angles in the parallelogram.



Parallelogram ACBD

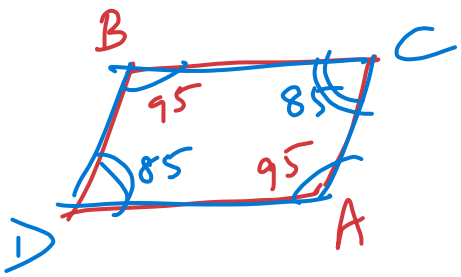
$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$

$\cos C = \frac{15^2 - 12^2 - 10^2}{-2(12)(10)}$

$C = \cos^{-1}\left(\frac{225 - 144 - 100}{-240}\right)$

$C = \cos^{-1}\left(\frac{+19}{-240}\right)$

$C \approx 85°$



$\angle C = \angle D = 85°$

$\therefore \angle A = \angle B = \frac{360 - 2(85)}{2} = \frac{360 - 170}{2}$

$= 95°$