I'm in the Mood for some   **Double-Trig**   **Fun!**
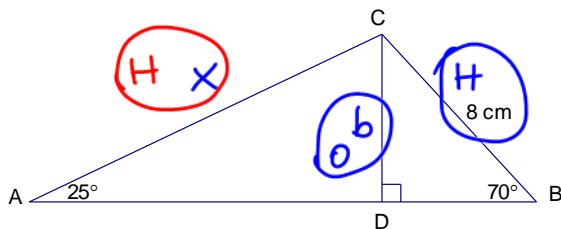

Warm-Up: What Do I Do?   *A SOHCAHTOA Dilemma*
Solve for x.
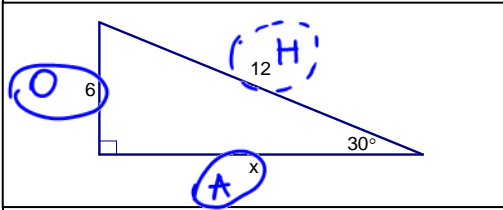
TOA
$$\tan 30° = \frac{6}{x}$$ OR

$$x = \frac{6}{\tan 30°}$$

$$x \doteq 10.4$$

CAH
$$\cos 30° = \frac{x}{12}$$

$$x = 12 \cdot \cos 30°$$

$$x \doteq 10.4$$

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1. Find the length of AC.

C
H x
o b
H
8 cm

A 25°   70° B
         D

Step 1: Use **ΔBCD** to find **CD**

SOH
$$\sin 70° = \frac{b}{8}$$

$$b = 8 \cdot \sin 70°$$

$$b \doteq 7.5$$

Step 2: Use **ΔACD** to find **AC**

$$\sin 25 = \frac{7.5}{x}$$

$$x = \frac{7.5}{\sin 25}$$

$$x \doteq 17.8$$

2. Find the measure of $\angle G$.

F
H
o
e
6 cm

E 75°   θ   G
       H   12 cm A
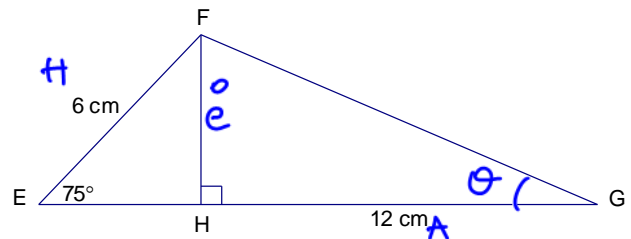
Step 1: Use Δ __EFX__ to find __FH__

$$\sin 75 = \frac{e}{6}$$

$$e = 6 \cdot \sin 75°$$

$$e \doteq 5.8$$

Step 2: Use Δ __FGH__ to find __θ__

TOA
$$\tan θ = \frac{5.8}{12}$$

$$\tan^{-1}\left(\frac{5.8}{12}\right) = θ$$
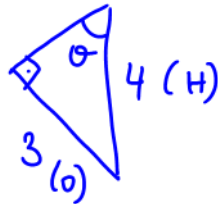
$$θ \doteq 26°$$

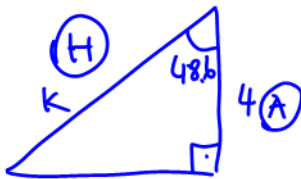3. Find the length of JL.
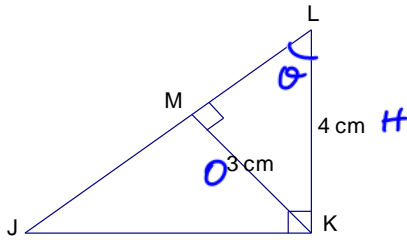
Step 1: Use Δ __KLM__ to find __∠L (θ)__

$$\sin\theta = \frac{3}{4}$$

$$\sin^{-1}\left(\frac{3}{4}\right) = \theta$$

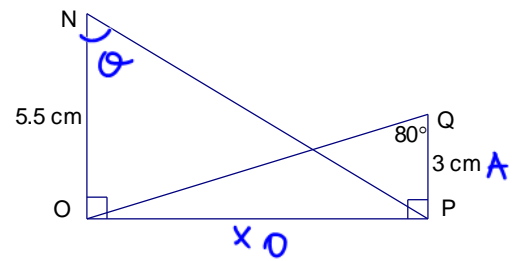$$\boxed{\theta = 48.6°}$$

Step 2: Use Δ __JLK__ to find __JL__

$$\cos 48.6° = \frac{4}{k}$$

$$k = \frac{4}{\cos 48.6°}$$

$$\boxed{k = 6}$$

4. Find the measure of ∠N.

Step 1: Use Δ __OPQ__ to find __OP (x)__

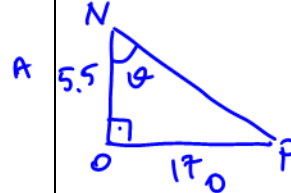$$\tan 80° = \frac{x}{3}$$

$$x = 3 \cdot \tan 80°$$

$$\boxed{x \doteq 17}$$
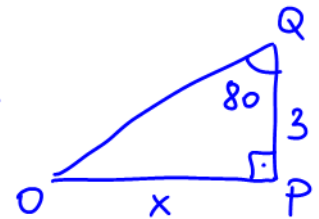
Step 2: Use Δ __NOP__ to find __∠N (θ)__

$$\tan\theta = \frac{17}{5.5}$$

$$\tan^{-1}\left(\frac{17}{5.5}\right) = \theta$$

$$\boxed{\theta \doteq 72°}$$

DAY 2

5. A 3-dimensional problem:

Some measurements were taken by a surveyor, as shown on the diagram, to find the measurement of an inaccessible height. Find the height of the cliff.

① XY is perpendicular to WX

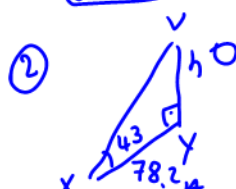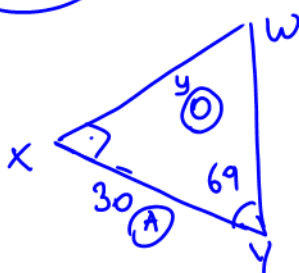What do you need to assume to do this question?

② The cliff rises with a 90 angle.

Step 1

① $$\tan 69° = \frac{y}{30}$$
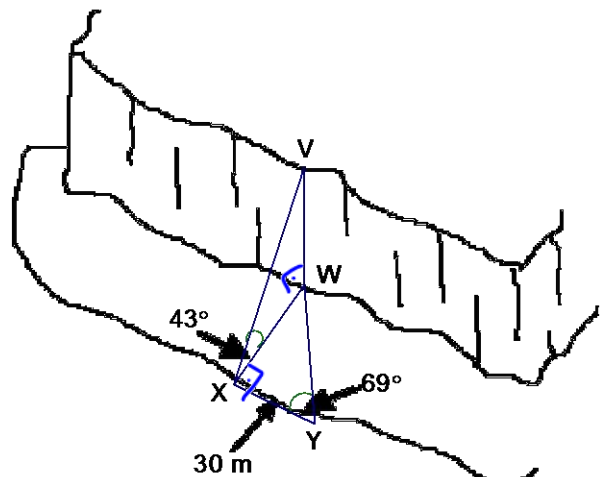
$$y = 30 \cdot \tan 69$$

$$\boxed{y \doteq 78.2}$$

② $$\tan 43° = \frac{h}{78.2}$$

$$h = 78.2 (\tan 43)$$

$$\boxed{h \doteq 73m}$$

6. A 53 m high transmission tower has a supporting guy wire that makes an angle of 68° with the ground. The company that maintains the tower wishes to move the base of the guy wire 4 m farther from the base of the tower.
   a. How much additional wire is needed? (2 m)
   b. What angle will the wire make with the ground at its new position? (64°)

Step1 find KL & ML or ML

$$\tan 68° = \frac{53}{k}$$

$$b = \frac{53}{\tan 68°}$$

$$\boxed{b \doteq 21.4}$$

SOH

$$\sin 68° = \frac{53}{k}$$

$$k = \frac{53}{\sin 68°}$$

$$\boxed{h = 57.2}$$

Step2. find MN

$$\tan \theta = \frac{53}{25.4}$$

$$\tan^{-1}\left(\frac{53}{25.4}\right) = \theta$$

(b) $\boxed{\theta \doteq 64°}$

$K \quad 21.4+4 = \boxed{25.4} N$

$$\sin 64 = \frac{53}{x}$$
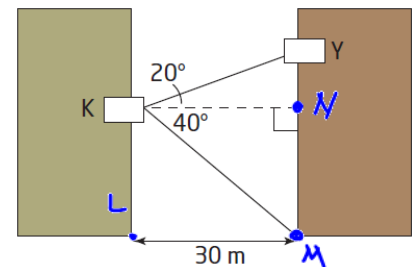
$$x = \frac{53}{\sin 64}$$

$$\boxed{x \doteq 59}$$

(a) $59 - 57.2 \doteq 2m$
additional approximately
∴ 2m needed

7. Kim and Yuri live in apartment buildings that are 30m apart, as shown.
The angle of depression from Kim's balcony to where Yuri's building meets the ground is 40^0.
The angle of elevation from Kim's balcony to Yuri's balcony is 20^0

a. How high is Kim's balcony about the ground, to the nearest metre?

$$\tan 40° = \frac{m}{30}$$

$$m = 30 \cdot \tan 40°$$

$$\boxed{m = 25m}$$

b. How high is Yuri's balcony above the ground, to the nearest metre?

find h + k

$$\tan 20° = \frac{h}{30}$$

$$h = 30 \cdot \tan 20°$$

$$\boxed{h = 11m}$$

∴ 25 + 11 = 36m