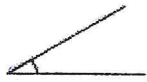


April 8 (Wed)

MPM2D
Ms. Kueh

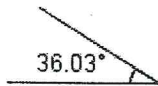
Angle of Elevation and Angle of Depression

Definition: Elevation usually means up.
This is an angle of elevation:



In an angle of elevation, a line rises or goes up from the horizontal.

The angle of elevation shown here is 36.02°.

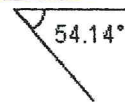


Definition: Depression usually means down.
This is an angle of depression:



In an angle of depression, a line goes down from the horizontal

The angle of depression shown here is 54.14°



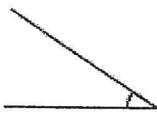
Practice: State whether this is an angle of depression, angle of elevation, or neither.

1)



D

2)



E

3)



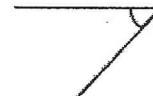
N

4)



N

5)



D

6)



E

7) Draw an example an angle of elevation



and

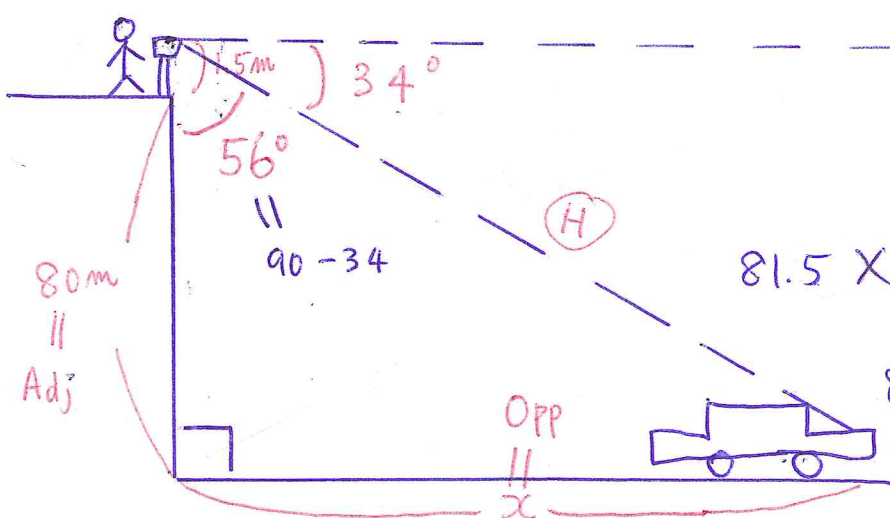
8) Draw an example of an angle of depression



and

In the real world, trigonometry is used to solve for the height of very tall buildings or mountains, or the distance of a faraway object. Surveyors use a measuring instrument called a transit to help them find angles of depression or elevation.

Example 1 A surveyor is standing on a cliff that is 80 m high. He is using a transit that is 1.5 m high. The surveyor sees a car parked at the bottom of the cliff. The angle of depression to the car is 34°. How far away is the car from the base of the cliff? Hint: Always draw a picture!



S O C H T A
H H H A

// tool

$$\tan 56^\circ = \frac{O}{A} = \frac{x}{81.5}$$

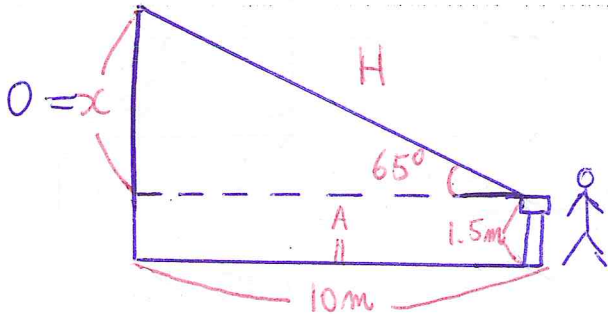
$$81.5 \times \tan 56^\circ = \frac{x}{81.5} \times 81.5$$

$$81.5 \times \tan 56^\circ = x$$

$$\therefore x = 120.8 \text{ m}$$

Example 2

From a point 10 m from a building, a surveyor measures the angle of elevation to the top of the building to be 65° . She is using a 1.5 m tall transit. How tall is the building?



$$\tan 65^\circ = \frac{O}{A} = \frac{x}{10}$$

$$10 \times \tan 65^\circ = \frac{x}{10} \times 10$$

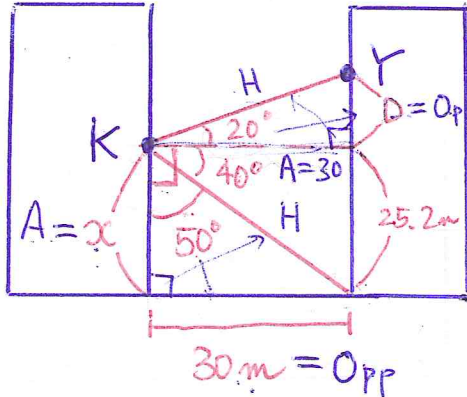
$$21.4 \text{ m} = x \rightarrow \text{Building} = 21.4 + 1.5 = 22.9$$

\therefore The building is 22.9 m.

Example 3

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

a) How high is Kim's balcony above the ground, to the nearest metre?



$$\text{T.O.A} \quad \tan 50^\circ = \frac{O}{A} = \frac{30}{x}$$

$$\tan 50^\circ = \frac{30}{x}$$

$$\frac{\tan 50^\circ \times x = 30}{\tan 50^\circ}$$

$$x = \frac{30}{\tan 50^\circ} = 25.2 \text{ m}$$

b) How high is Yuri's balcony to the ground to the nearest metre?

$$\text{T.O.A} \quad \tan 20^\circ = \frac{O}{A} = \frac{D}{30}$$

$$30 \times \tan 20^\circ = \frac{D}{30} \times 30$$

$$10.9 \text{ m} = D$$

\therefore Height of Yuri is

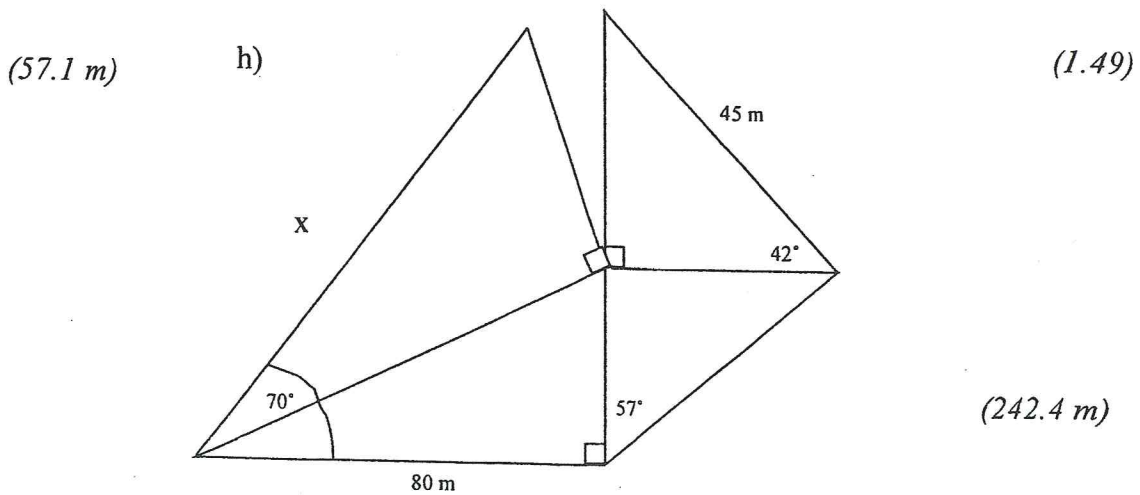
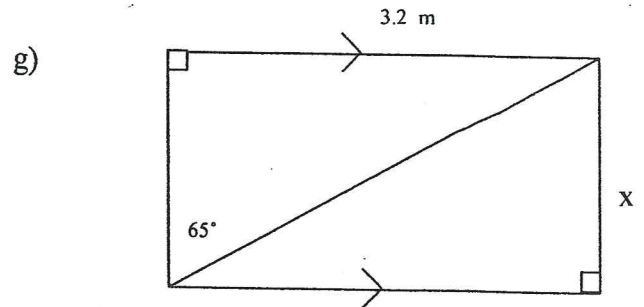
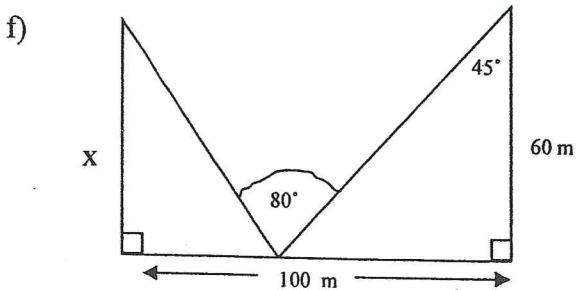
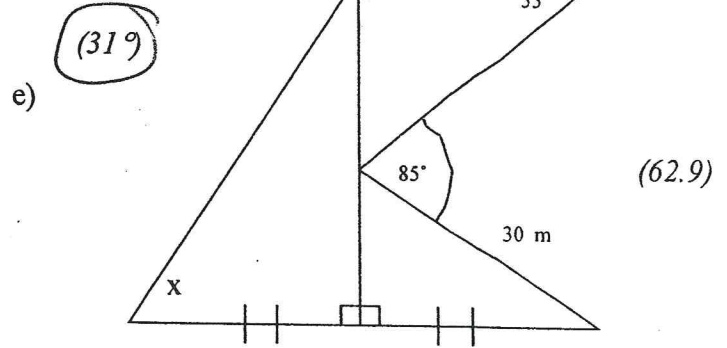
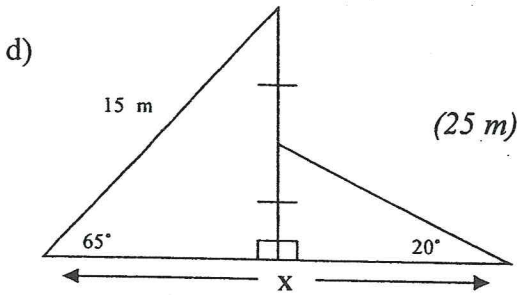
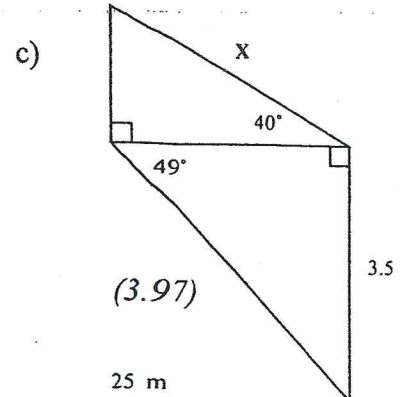
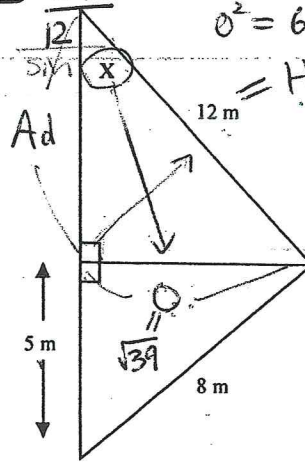
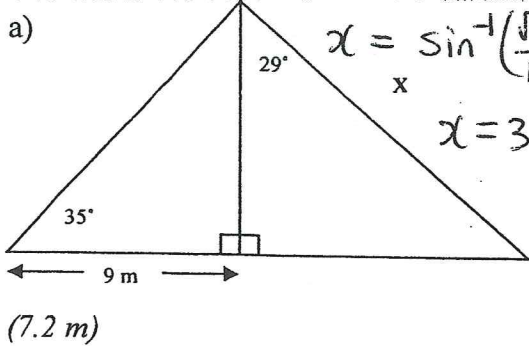
$$10.9 \text{ m} + 25.2 \text{ m} = 36.1 \text{ m}$$

\therefore Height of Yuri is 36.1 m

$O^2 = 39$
 $O = \sqrt{39}$

1. Solve for the labeled values in the following diagrams:

$a^2 + b^2 = c^2$
 $5^2 + O^2 = 8^2$
 $O^2 = 64 - 25$
 $SOH: \sin \alpha = \frac{O}{H} = \frac{\sqrt{39}}{12}$
 $\alpha = \sin^{-1}\left(\frac{\sqrt{39}}{12}\right)$
 $\alpha = 31.4^\circ$



April 8 Worksheet Solution

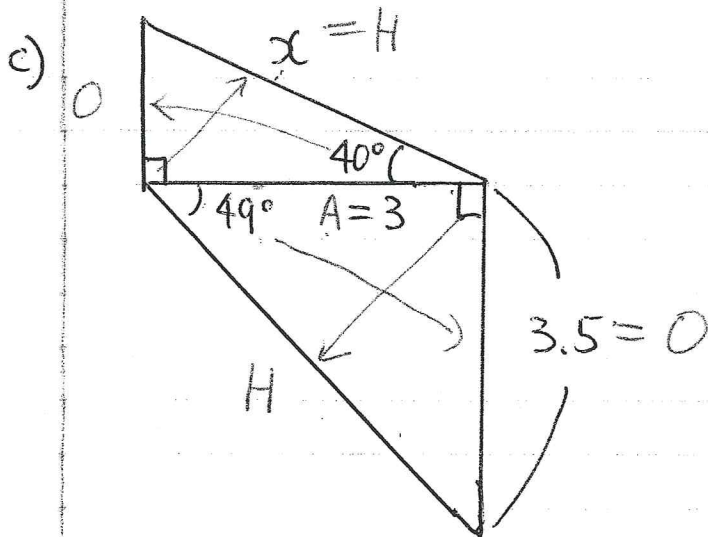
$$\tan 49^\circ = \frac{O}{A} = \frac{3.5}{A}$$

~~$$\tan 49 = \frac{3.5}{A}$$~~

$$\frac{A \times \tan 49^\circ}{\tan 49} = \frac{3.5}{\tan 49}$$

$$A = \frac{3.5}{\tan 49^\circ} = \frac{3.5}{1.15}$$

$$A = 3.0$$



CAH

$$\cos 40^\circ = \frac{A}{H} = \frac{3}{x}$$

$$x \times \cos 40^\circ = \frac{3}{x} \times x$$

$$\frac{\cos 40^\circ \times x}{\cos 40^\circ} = \frac{3}{\cos 40^\circ}$$

$$x = \frac{3}{\cos 40^\circ} = 3.9$$

$$\therefore x = 3.9$$