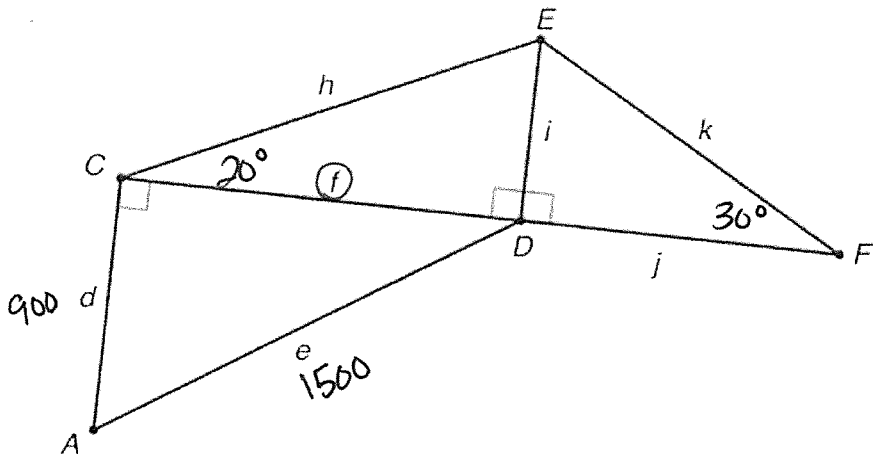
Section 6.2 Further Right-Angled Trigonometry

Example 1: Using the diagram below, find the following sides and angle.



Label the diagram for a. Then relabel for b.

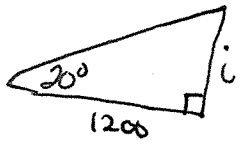
This is labeled for a!

a) If $e = 1500$, $d = 900$, $E\hat{C}D = 20°$, and $E\hat{F}D = 30°$, find the length of k.

First use Pythagorean Thm to find f:

$$f^2 + 900^2 = 1500^2$$
$$f^2 = 1500^2 - 900^2$$
$$f = \sqrt{1{,}440{,}000} = 1200$$

Now find i using trig:

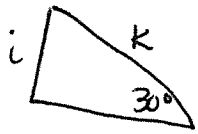


$$\tan 20° = \frac{i}{1200}$$

$$i = 1200 \cdot \tan 20° \approx 436.76 \ldots$$

Carry the value of i over using the ANS key (hit 2nd and the negative button)

Now find k using trig:



$$\sin 30° = \frac{i}{k}$$

$$\sin 30° = \frac{ANS}{k}$$

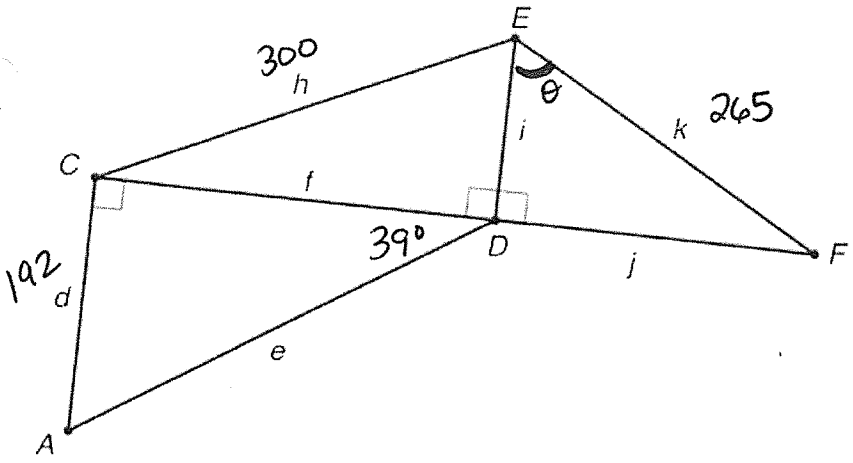
$$k \cdot \sin 30° = ANS$$

$$k = \frac{ANS}{\sin 30°}$$

$$k \approx 873.52 \ldots = 874$$

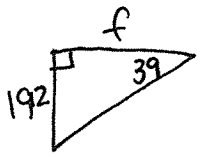
See next page for example b

Example 1 CONTINUED: Using the diagram below, find the following sides and angle.



b) If $C\hat{D}A = 39°$, $d = 192$, $h = 300$, and $k = 265$, find the size of $D\hat{E}F$.

First find f using trig:

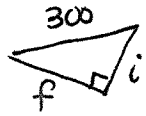


$$\tan 39° = \frac{192}{f}$$

$$f \cdot \tan 39° = 192$$

$$f = \frac{192}{\tan 39°} \approx 237.10 \ldots$$

Now use the Pythag Thm to find i:



$$(ANS)^2 + i^2 = 300^2$$

$$i = \sqrt{300^2 - (ANS)^2} \approx 183.80 \ldots$$

Now find $D\hat{E}F$ using trig:

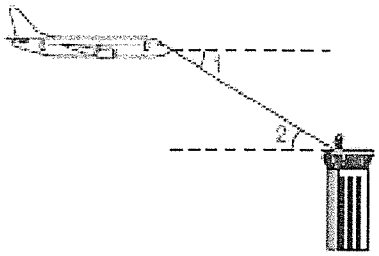
$$\cos(D\hat{E}F) = \frac{ANS}{265}$$

$$\cos^{-1}\left(\frac{ANS}{265}\right) = D\hat{E}F \rightarrow D\hat{E}F \approx 46.1°$$

Angles of Elevation & Depression are made by a horizontal line and a diagonal line of sight.

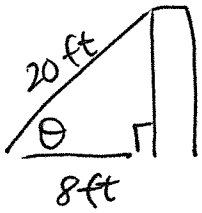
$\angle 1$ is the angle of depression from the airplane to the building. **(always goes down)**

$\angle 2$ is the angle of elevation from the building to the airplane. **(always goes up)**

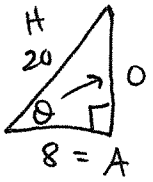


* Notice **both** angles touch the line of sight. These angles are always congruent because they're alternate interior $\angle$'s

Example 2: A 20-foot ladder leans against a wall so that the base of the ladder is 8 feet from the base of the building. What angle does the ladder make with the ground?



So

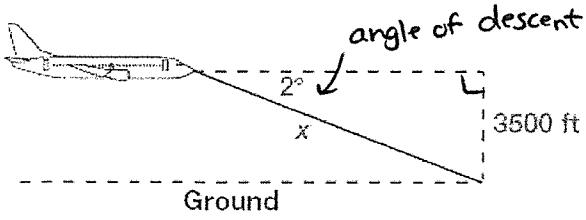


$\cos\theta = \frac{8}{20}$

$\cos^{-1}\left(\frac{8}{20}\right) = \theta$

$\theta \approx 66.4°$

Example 3: An airplane flying 3500 ft above ground begins a 2°descent to land at an airport. How many miles from the airport is the airplane when it starts its descent?



Since the airplane travels diagonal to get to the airport, find the hypotenuse.

$\sin 2° = \frac{3500}{x}$

$x \sin 2° = 3500$

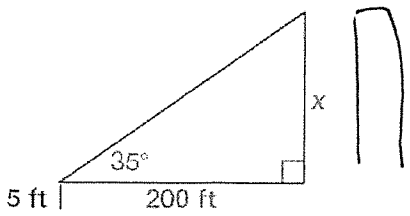
$x \approx 3849.12\ldots$ feet

But... how many miles?

1 mile = 5280 ft.

So ANS ÷ 5280 = .729 miles

Example 4: A surveyor stands 200 ft from a building to measure its height. The angle of elevation to the top of the building is 35°. How tall is the building if his instrument is 5 feet off the ground?



This triangle is 5ft off the ground. So when I find x I must add 5 to it.

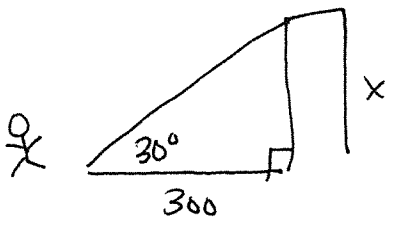
$$\tan 35° = \frac{x}{200}$$

$$x = 200 \tan 35 \approx 94.8$$

$$+5$$

99.8 ft

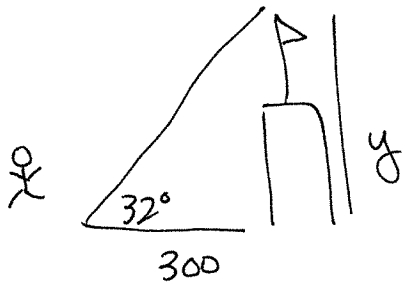
Example 5: Zach is standing in front of an office building. He is standing 300 feet from the building. The angle of elevation to the top of the building is 30°. Zach notices a flag pole on top of the building. The angle of elevation to the top of the flag pole is 32°. How tall is the building? How tall is the flag pole?



$$\tan 30 = \frac{x}{300}$$

$x \approx 173$ ft

height of building



$$\tan 32 = \frac{y}{300}$$

$y \approx 187$ ft

height from ground to top of pole

Flag pole = $y - x$

$187 - 173$

14 ft