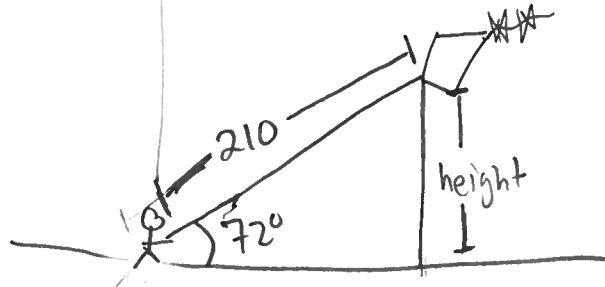EX: Flying a kite on a line 210 ft long.
It makes an angle of $72°$ w/ horiz. direction.
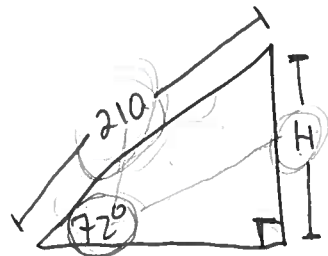[What height is the kite flying at?]

Soln:

DEF

$$\sin(\theta) = \frac{\text{opp of } \theta}{\text{hyp}}$$

↓ extract the △

Goal: find H
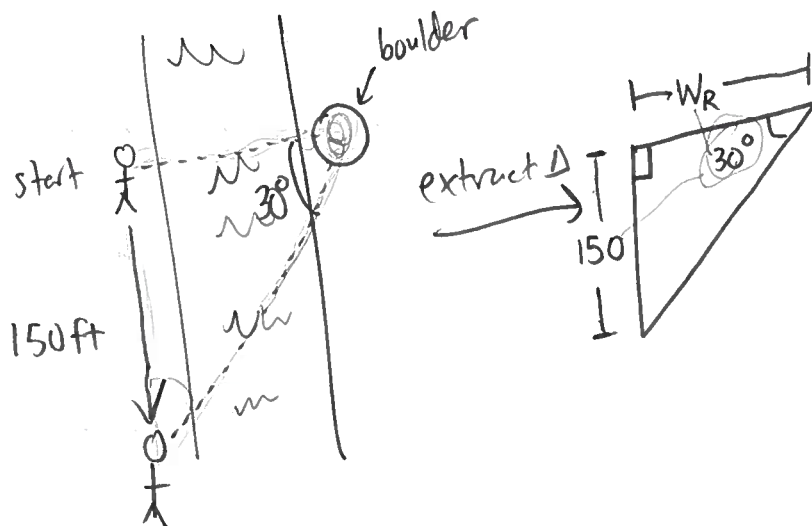
$$\underbrace{\sin(72°)}_{\text{number}} = \frac{H}{210}$$

Mult by 210:

$$H = 210 \sin(72°) \approx 199.722 \text{ ft}$$

Ex: At riverbank. Straight across river thre is a boulder. You walk 150ft along river and now the boulder makes 30° w/ edge of the river.

What is the width of the river?

$$\tan\theta = \frac{opp\ \theta}{adj\ \theta}$$

boulder

start

150ft

extract Δ

150

$\vdash W_R \dashv$

30°

150

$$\tan(30°) = \frac{150}{W_R}$$ ← variable is in denom

number

↓ take reciprocal of both sides

$$\frac{1}{\tan(30°)} = \frac{W_R}{150}$$

↓ mult by 150

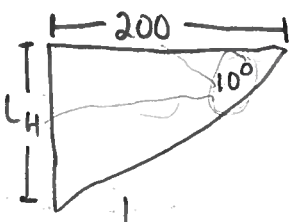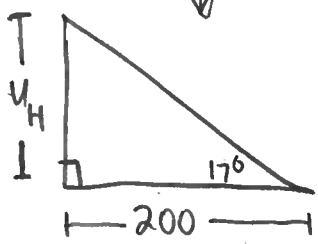$$W_R = \frac{150}{\tan(30°)} \approx 259.81\ ft$$

Ex: Spz you are in a building (not on 1st floor) and from your window, the top of a neighboring building has an angle of elevation of $17°$.

The bottom of that bldg has an angle of depression to its ground floor of $10°$.

If the other bldg is 200ft away, then how tall is it?

not a right △

$H = U_H + L_H$

← you are here
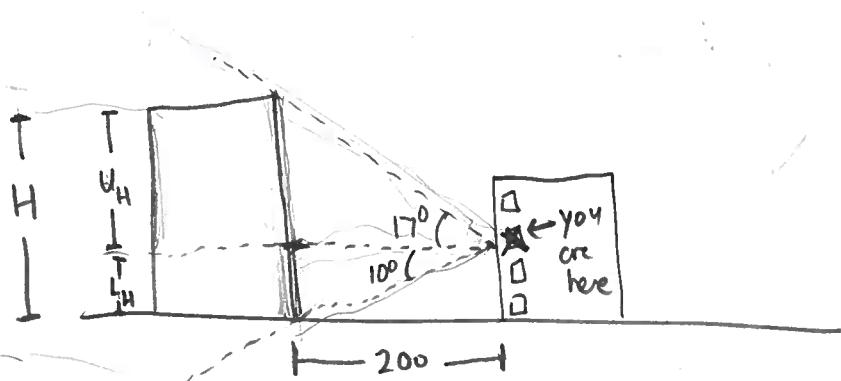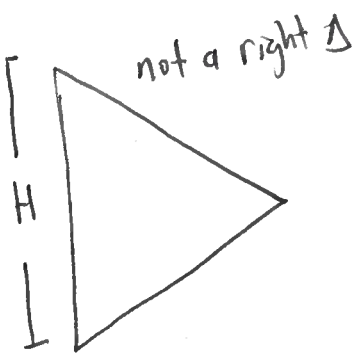
$\downarrow$ extract 2 △'s

find U_H

$$\tan(17°) = \frac{U_H}{200}$$

$\downarrow$ mult by 200

$$U_H = 200\tan(17°)$$

find L_H

$$\tan(10°) = \frac{L_H}{200}$$

$$L_H = 200\tan(10°)$$

Finally, the total height is

$$H = U_H + L_H$$

$$= 200\tan(17°) + 200\tan(10°)$$

$$\approx 96.41 \text{ ft}$$

Ex: A guy wire needs to support a pole.
End of wire will be 18ft from ground.
Angle formed by wire & ground is 35°.
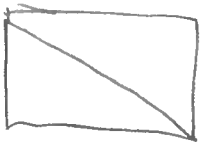On ground, how far away is wire from pole?
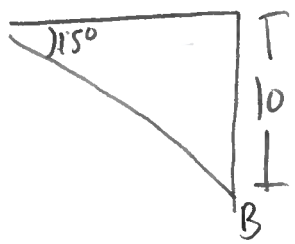

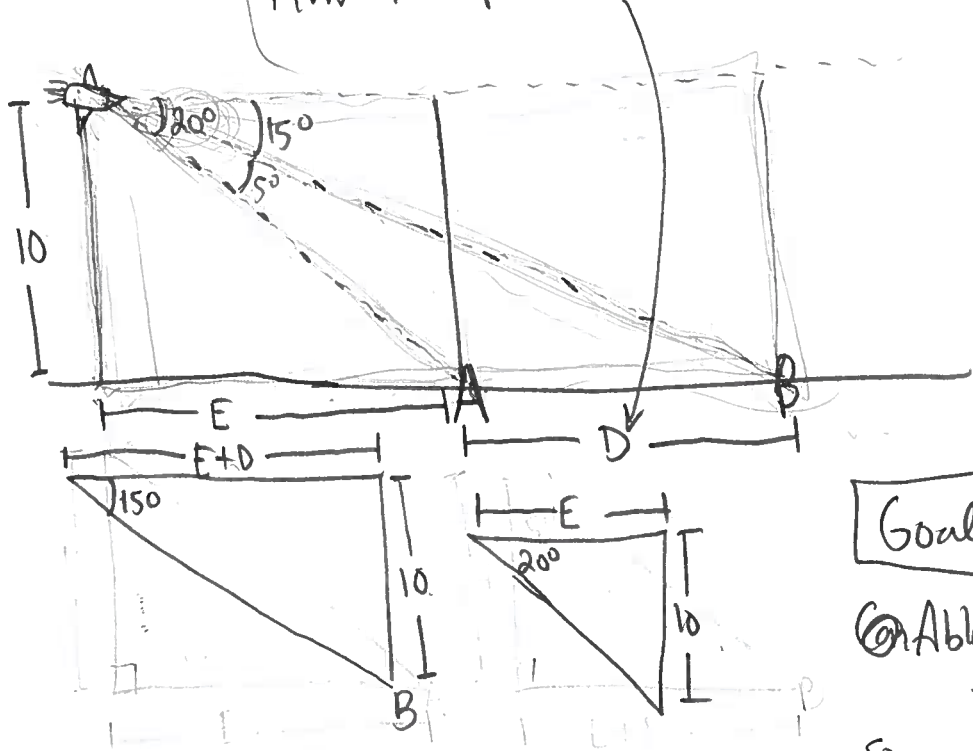extract Δ →
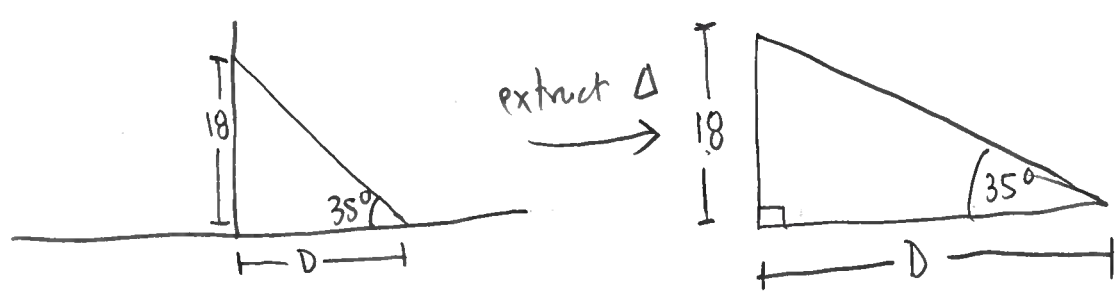
$$\tan(35°) = \frac{18}{D}$$

$$\frac{1}{\tan(35°)} = \frac{D}{18}$$

$$25.71 \text{ is } \frac{18}{\tan(35°)} = D$$

Ex: Airplane at 10 km in air.

   Can see City A and City B straight ahead.

   Angle of depression to city A is $20°$ and

   angle of dep to City B is $15°$.

   [How far apart are the cities?]

Goal: find D

① Able to find:
   E and D+E

So,
$$D = (D+E) - E$$

Find E+D

$$\tan(15°) = \frac{10}{E+D}$$

$$E+D = \frac{10}{\tan(15°)}$$

Find E

$$\tan(20°) = \frac{10}{E}$$

$$E = \frac{10}{\tan(20°)}$$

So, $D = (E+D) - D = \dfrac{10}{\tan(15°)} - \dfrac{10}{\tan(20°)}$

$$= 9.85 \text{ km}$$