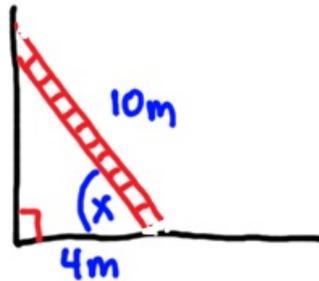1. A ladder is leaning against a building. The ladder is 10m long and it is sitting on the ground 4m out from the building. What is the angle that the ladder makes with the ground?
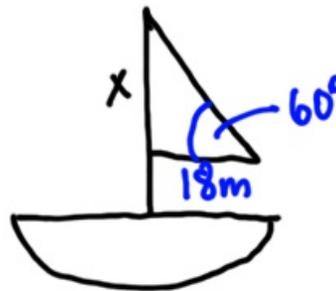
$$\cos(x) = \frac{4}{10}$$

$$x = \cos^{-1}\left(\frac{2}{5}\right)$$

$$x \approx 66.42°$$

(diagram: right triangle with hypotenuse 10m, base 4m, angle x at the bottom)

2. A sailboat's main sail is shaped like a right triangle and the base is 18m long. If it makes an angle of 60, as marked, how tall is the sail?
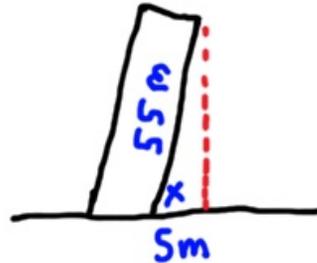
(diagram: sailboat with sail height x, base 18m, angle 60°)

$$18 \cdot \tan(60°) = \frac{x}{18} \cdot 18$$

$$x = 18 \tan(60°)$$

$$x \approx 31.18m$$

3. The Leaning Tower of Pisa is 55m tall. The top edge of the tower is 5m out from the bottom edge. What is the angle created between the ground and the tower?
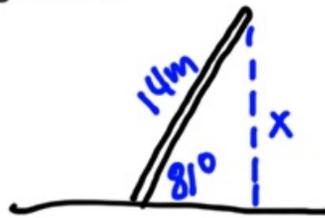
$$\cos(x) = \frac{5}{55}$$

$$x = \cos^{-1}\left(\frac{1}{11}\right)$$

$$x \approx 84.78°$$

4. After a windstorm, one of the telephone poles had a lean to it. The poles are 14m tall and the angle between the pole and the ground is 81. How high is the top of the pole above the ground?
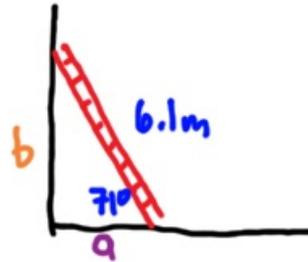
$$\sin(81°) = \frac{x}{14}$$

$$x = 14\sin(81°)$$

$$x \approx 13.83m$$

5. A 6.1 meter ladder leans against a wall. The angle formed by the ladder and the ground is 71 degrees.
   a. How far is the foot of the ladder from the wall?
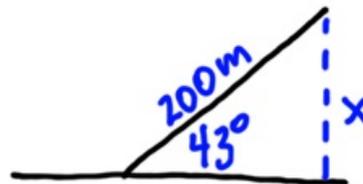   b. How high up the wall does the ladder reach?

$$\cos(71°) = \frac{a}{6.1} \rightarrow a = 6.1\cos(71°)$$

$$a \approx 1.99m$$

$$\sin(71°) = \frac{b}{6.1} \rightarrow b = 6.1\sin(71°)$$

$$b \approx 5.77m$$

(diagram: ladder 6.1m, angle 71°, sides a and b)

6. A kite has a string 200m long. The string makes an angle of 43 with the ground. Determine the height of the kite.

$$\sin(43°) = \frac{x}{200}$$
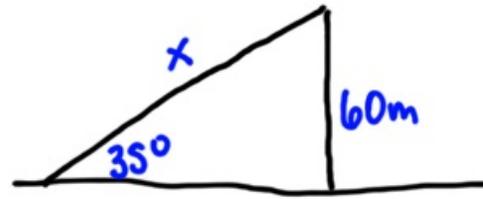
$$x = 200\sin(43°)$$

$$x \approx 136.40 m$$

(diagram: 200m string, 43°, height x)

7. A roller coaster climbs vertically 60meters at an angle of 35 from the lowest to the highest point of the track. It then plunges over the high point to begin the 'fun part'. Calculate the length of the track from the bottom of the hill to the very top.

x

$60m$

$35°$

$\sin(35°) = \dfrac{60}{x}$

$x = \dfrac{60}{\sin(35°)}$

$x \approx 104.61m$

8. A tree casts a 23m shadow when the angle of elevation of the sun is 52.
   a.   Find the height of the tree.
   b.   Find the length of the shadow when the angle of elevation of the sun is 38 degrees.

a)

$\tan(52°) = \dfrac{x}{25}$

$x = 25\tan(52°)$ b)

$x \approx 32m$

$52°$

$23m$

$32m$

$38°$

x

$\tan(38°) = \dfrac{32}{x}$

$x = \dfrac{32}{\tan(38°)}$

$x \approx 40.96m$