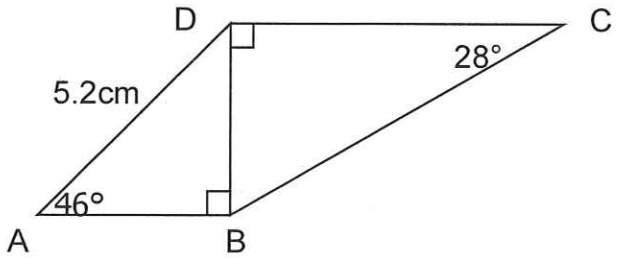
2.7 Solving Problems Involving More than One Right Triangle

Example: Calculate the length of CD to the nearest tenth of a centimetre.



Find BD (shared side) first.

$\sin 46° = \frac{BD}{5.2}$

$BD = 5.2 \sin 46°$

$= 3.740566962$ cm

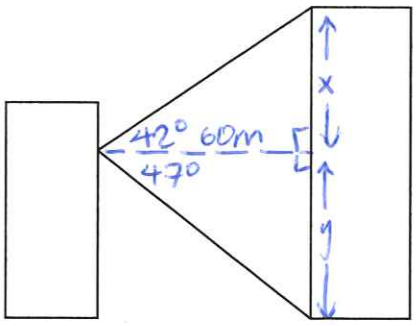
Use BD to find CD: (unrounded)

$\tan 28° = \frac{BD}{CD}$

$CD = \frac{BD}{\tan 28°}$

$\boxed{CD = 7.0 \text{ cm}}$

Example: Two office towers are 60 m apart. From the 12th floor of the shorter tower, the angle of elevation to the top of the taller tower is 42°. The angle of depression to the base of the taller tower is 47°. Determine the height of the taller tower to the nearest tenth of a metre.



$\tan 42° = \frac{x}{60}$

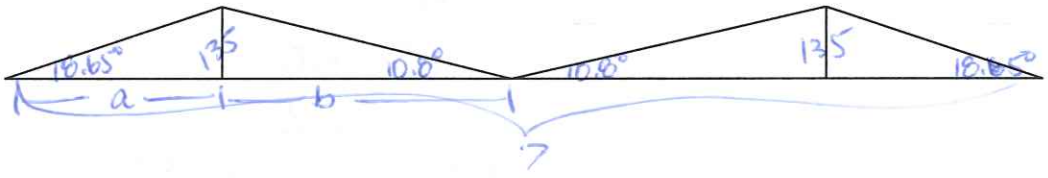
$x = 60 \tan 42°$

$\tan 47° = \frac{y}{60}$

$y = 60 \tan 47°$

$x + y = 118.4 \text{m}$

Example: The world's longest suspension bridge is across the Humber Estuary in England. The towers of this bridge reach about 135m above the level of the bridge. The angles of elevations of the towers measured from the centre of the bridge and at either end are 10.80° and 18.65°, respectively. How long is the bridge? (to 2 decimal places)

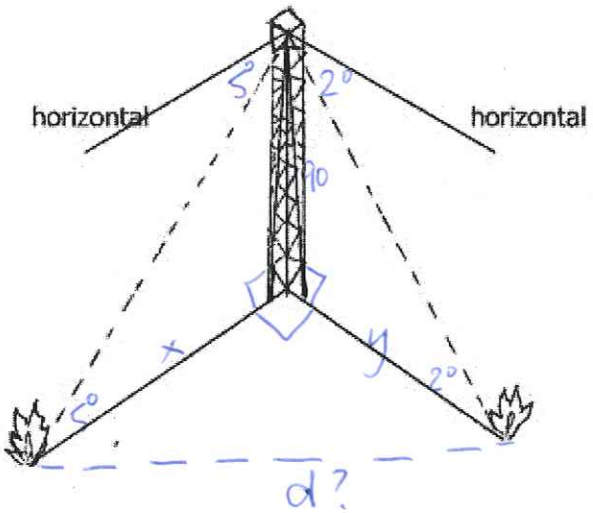


$\tan 18.65° = \frac{135}{a}$ $\tan 10.8° = \frac{135}{b}$

$a = \frac{135}{\tan 18.65°}$ $b = \frac{135}{\tan 10.8°}$

$2(a+b) = 2215.37\text{m}$

Example: From the top of a 90-ft observation tower, a fire manager observes one fire due west of the tower at an angle of depression of 5°, and another fire due south of the tower at an angle of depression of 2°. How far apart are the fires to the nearest foot?



$\tan 5° = \frac{90}{x}$ $\tan 2° = \frac{90}{y}$

$x = \frac{90}{\tan 5°}$ $y = \frac{90}{\tan 2°}$

$d^2 = x^2 + y^2$

$d = \sqrt{\left(\frac{90}{\tan 5°}\right)^2 + \left(\frac{90}{\tan 2°}\right)^2}$

$d = 2774.98$

$= 2775\text{ ft}$

Practice Work: Page 118 # 3bd, 4c, 5bc, 6, 7, 10, 12, 13, 17, 19