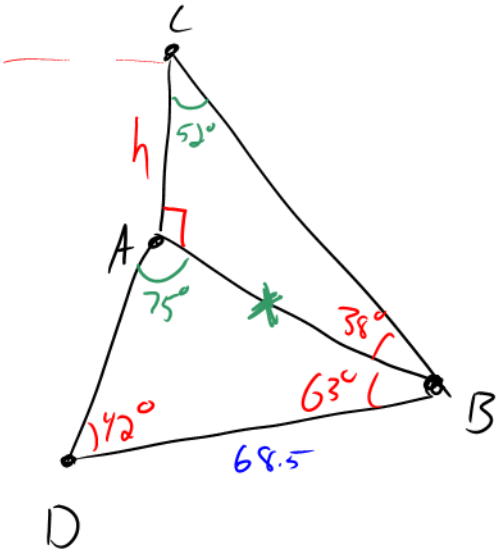
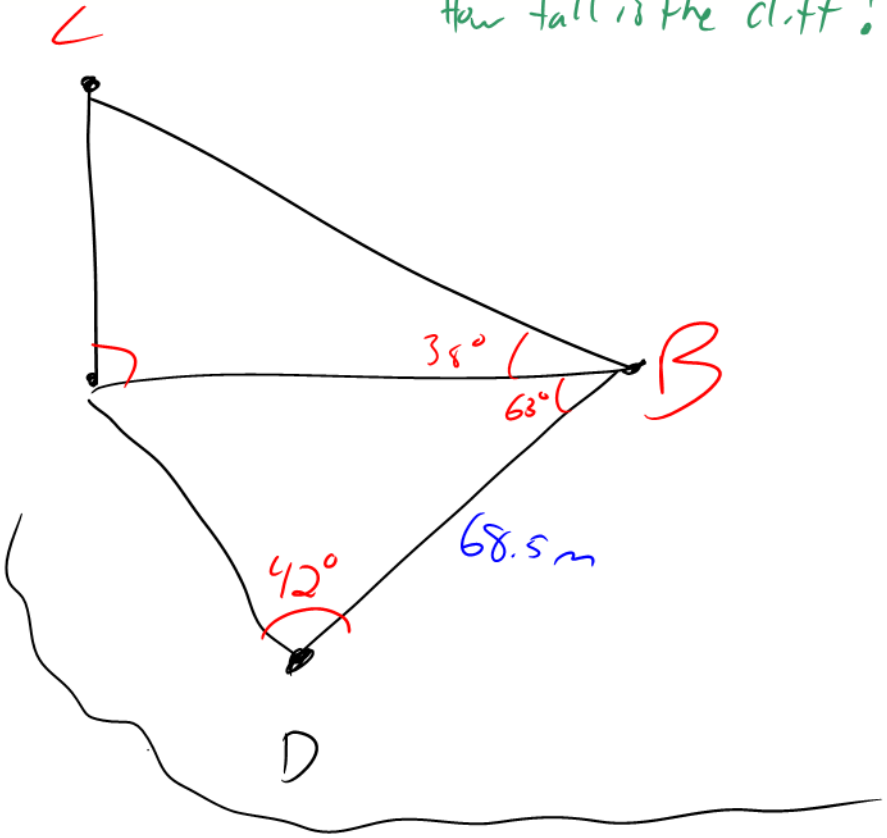
5.8: 3D Trigonometry

From point *B*, Manny uses a clinometer to determine the angle of elevation to the top of a cliff as 38°. From point *D*, 68.5 m away from Manny, Joe estimates the angle between the base of the cliff, himself, and Manny to be 42°, while Manny estimates the angle between the base of the cliff, himself, and his friend Joe to be 63°.

How tall is the cliff?





① $\angle A = 180 - 63 - 42$

$\angle A = 75°$

② $\frac{x}{\sin 42} = \frac{68.5}{\sin 75}$

$x = \frac{68.5(\sin 42)}{\sin 75}$

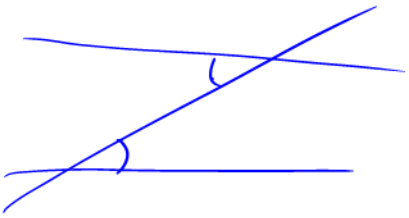
$x \approx 47.5$

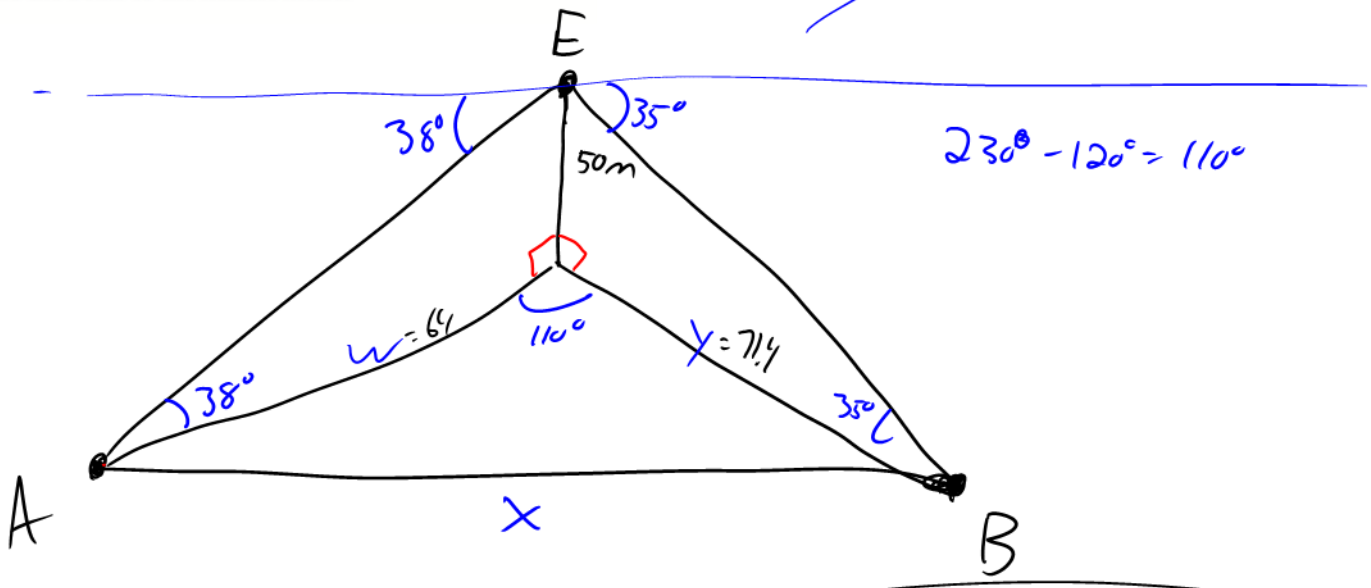
③ $\tan 38 = \frac{h}{47.5}$

$47.5 \tan 38 = h$

$37.1 = h$

Emma is on a 50 m high bridge and sees two boats anchored below. From her position, boat *A* has a bearing of 230° and boat *B* has a bearing of 120°. Emma estimates the angles of depression to be 38° for boat *A* and 35° for boat *B*. How far apart are the boats to the nearest metre?





$230° - 120° = 110°$

$\tan 35 = \frac{50}{y}$

$y = \frac{50}{\tan 35}$

$y = 71.4\text{ m}$

$\tan 38 = \frac{50}{w}$

$w = \frac{50}{\tan 38}$

$w = 64\text{ m}$

$x^2 = 64^2 + 71.4^2 - 2(64)(71.4)\cos 110$

$x^2 = 12319.75$

$x = 111\text{ m}$

HW: pg 332 # 3, 4, 5, 6, 11