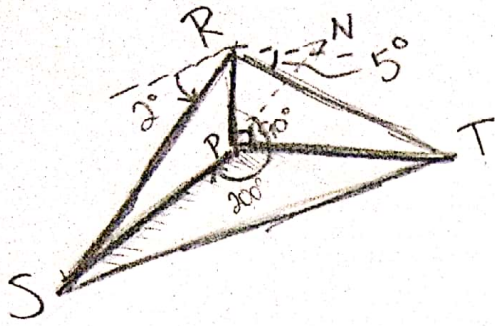
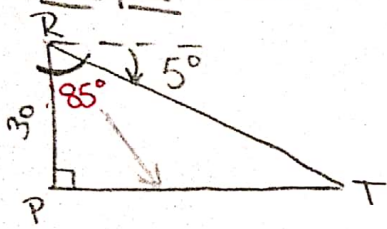


## Example 4:



Step 1: Find PT → use the right triangle

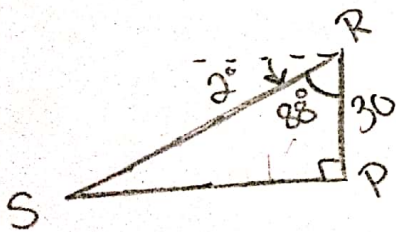


$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 85 = \frac{PT}{30} \Rightarrow PT = 30 \tan 85$$

$$PT = 342.9$$

Step 2: Find PS → use the left triangle

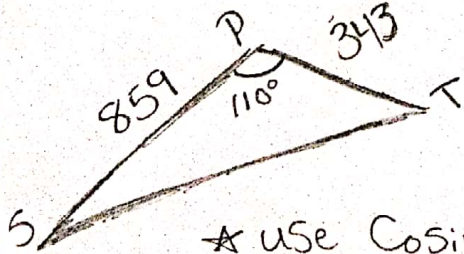


$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 88 = \frac{PS}{30} \Rightarrow PS = 30 \tan 88$$

$$= 859.1$$

Step 3: Find ST → use the bottom triangle



$$\angle P = 200^\circ - 90^\circ$$

$$\angle P = 110^\circ$$

★ use Cosine Law

$$P^2 = S^2 + T^2 - 2ST \cos P$$

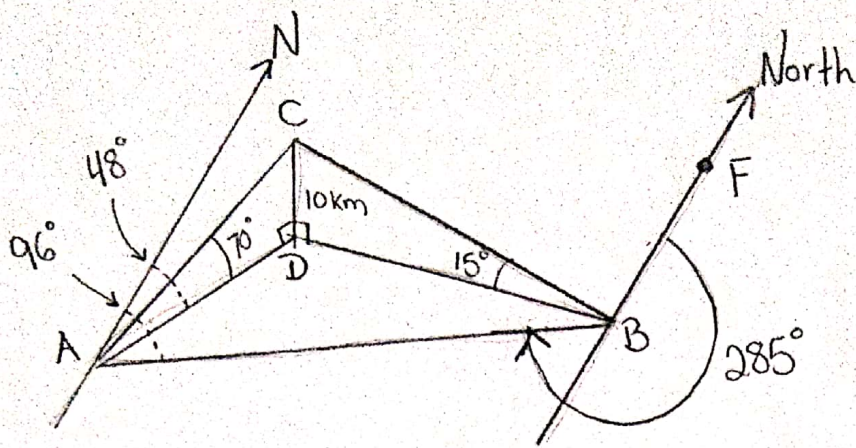
$$P^2 = (859)^2 + (343)^2 - 2(859)(343) \cos 110^\circ$$

$$P^2 = 1,057,073.6$$

$$P = 1028 \text{ m}$$

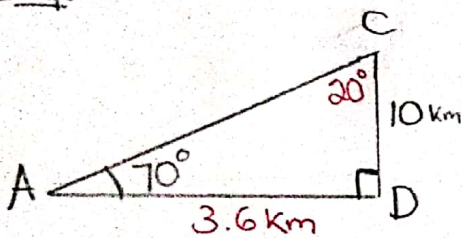


# Practice 4:



Question: Find the distance of Side AB

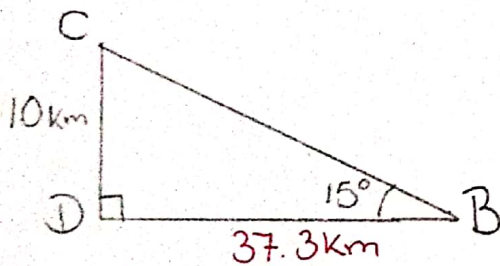
Step 1: Find Side AD



$$\begin{aligned} \angle C &= 180 - 90 - 70 \\ \angle C &= 20^\circ \end{aligned}$$

$$\begin{aligned} \tan 20^\circ &= \frac{AD}{10} \\ AD &= 10 \tan 20^\circ \\ AD &= 3.6 \text{ km} \end{aligned}$$

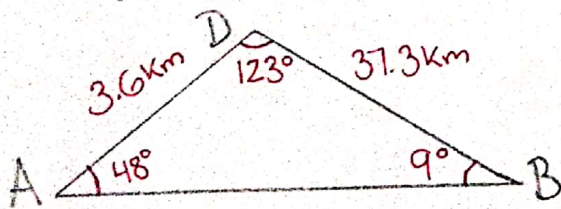
Step 2: Find Side BD



$$\begin{aligned} \angle C &= 180 - 90 - 15 \\ \angle C &= 75^\circ \end{aligned}$$

$$\begin{aligned} \tan 75^\circ &= \frac{BD}{10} \\ BD &= 10 \tan 75^\circ \\ BD &= 37.3 \end{aligned}$$

Step 3: Find AB



$$\angle A = 96^\circ - 48^\circ$$

$$\angle B = 9^\circ$$

$$\angle A = 48^\circ$$

$$\therefore \angle D = 180 - 48 - 9$$

$$\angle D = 123^\circ$$

Note: using the original picture:

$$\angle FBA = 180^\circ - 96^\circ = 84^\circ$$

$$\angle FBD = 360^\circ - 285^\circ = 75^\circ$$

$$\therefore \angle ABD = 84^\circ - 75^\circ = 9^\circ$$

$$\therefore d^2 = a^2 + b^2 - 2ab \cos D$$

$$d^2 = (3.6)^2 + (37.3)^2 - 2(37.3)(3.6) \cos(123^\circ)$$

$$d^2 = 1550.5$$

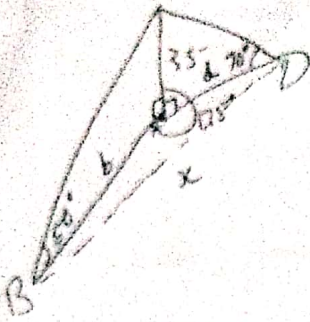
$$d = 39.4 \text{ km}$$

$\therefore$  The Ships are 39.4 km apart



### Practice 5:

A communication tower is 35m tall. David is due north of the tower and measures the angle of elevation of the top of the tower as  $70^\circ$ . Brenda is on a bearing of  $175^\circ$  from the tower and measures the angle of elevation of the top of the tower as  $50^\circ$ . To the nearest metre, determine the distance between Brenda and David.



$$b = \frac{35}{\tan 50^\circ}$$
$$d = \frac{35}{\tan 70^\circ}$$

$$x^2 = b^2 + d^2 - 2bd \cos X$$

$$x^2 = \left(\frac{35}{\tan 50^\circ}\right)^2 + \left(\frac{35}{\tan 70^\circ}\right)^2 - 2 \cdot \frac{35}{\tan 50^\circ} \cdot \frac{35}{\tan 70^\circ} \cdot \cos 175^\circ$$

$$x = \sqrt{1770.2}$$

$$x = 42 \text{ m}$$

$\therefore$  Brenda and David are 42 m apart.