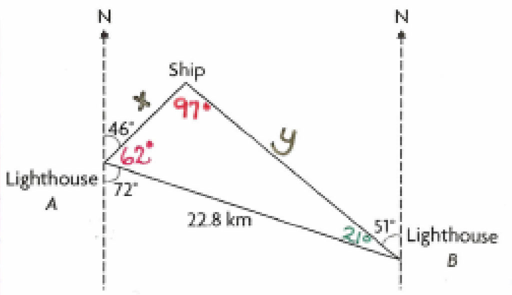
SOLUTIONS => 4.4 Solving Problems Using Obtuse Triangles (WORKBOOK)

1. Two lighthouses, A and B, are 22.8 Km apart. From lighthouse A, the compass heading for lighthouse B is S72°E. The Keeper in each lighthouse sees the same ship. The heading of the ship from lighthouse A is N46°E. The heading of the ship from lighthouse B is N51°W. How far, to the nearest tenth of a Kilometer, is the ship from each lighthouse?



$180° - 72° - 46° = \boxed{62°}$

$72° - 51° = \boxed{21°}$

$180° - 62° - 21° = \boxed{97°}$

Distance from Ship to Lighthouse A => "x"

$$\frac{x}{\sin 21°} = \frac{22.8}{\sin 97°}$$

$$\frac{x \cancel{\sin 97°}}{\cancel{\sin 97°}} = \frac{22.8 \sin 21°}{\sin 97°}$$

$$x = 8.2 \text{ Km}$$

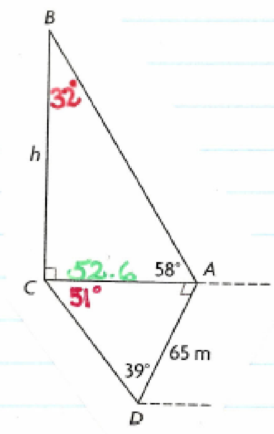
Distance from Ship to Lighthouse B => "y"

$$\frac{y}{\sin 62°} = \frac{22.8}{\sin 97°}$$

$$\frac{y \cancel{\sin 97°}}{\cancel{\sin 97°}} = \frac{22.8 \sin 62°}{\sin 97°}$$

$$y = 20.3 \text{ Km}$$

2. Calculate the height, h, to the nearest tenth of a meter.



$\angle ACD = 180° - 90° - 39°$

$= \boxed{51°}$

To find "h", we need to find the length of AC first:

$$\frac{x}{\sin 39°} = \frac{65}{\sin 51°}$$

$$\frac{x \cancel{\sin 51°}}{\cancel{\sin 51°}} = \frac{65 \sin 39°}{\sin 51°}$$

$$\boxed{x = 52.6 \text{ m}}$$

$\angle CBA = 180° - 90° - 58°$

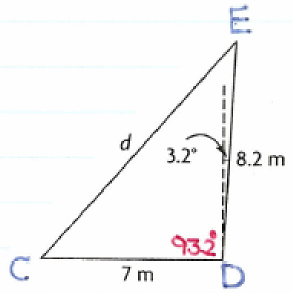
$= \boxed{32°}$

$$\frac{h}{\sin 58°} = \frac{52.6}{\sin 32°}$$

$$\frac{h \cancel{\sin 32°}}{\cancel{\sin 32°}} = \frac{52.6 \sin 58°}{\sin 32°}$$

$$h = 84.2 \text{ m}$$

3. An 8.2m tall telephone pole stands on level ground and leans 3.2° from the vertical. When the pole's shadow is 7m long, what is the distance, d, from the top of the pole to the tip of the shadow, to the nearest tenth of a meter?

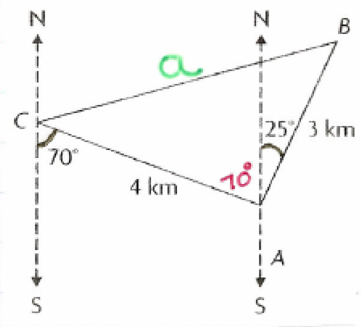


$\angle CDE = 90° + 3.2°$
$= 93.2°$

$d^2 = c^2 + e^2 - 2ce \cos D$
$d^2 = (8.2)^2 + (7)^2 - 2(8.2)(7) \cos 93.2°$
$d^2 = 67.24 + 49 - 114.8(-0.0558)$
$d^2 = 116.24 + 6.4058$
$d^2 = 122.6458$
$d = \sqrt{122.6458}$
$d = 11.1\text{ m}$

It is 11.1m from the top of the pole to the tip of the shadow.

4. Jasleen leaves her campsite at C and hikes 4 Km in a S70°E direction to A. She then turns and hikes 3 Km in a N25°E direction to B. How far is Jasleen from the campsite? Round your answer to the nearest tenth of a Kilometer.



$\angle CAN = 70°$ (alternate interior)

$a^2 = b^2 + c^2 - 2bc\cos A$

$a^2 = (4)^2 + (3)^2 - 2(4)(3)\cos 95°$

$a^2 = 16 + 9 - 24(-0.0872)$

$a^2 = 25 + 2.0928$

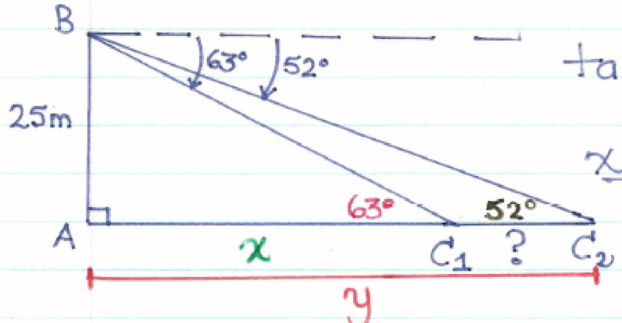
$a^2 = \underline{27.0928}$

$a = \sqrt{27.0928}$

$a = 5.2\,Km$

5. From the top of a 25 m building, the angle of depression to one parked car is 63° and the angle of depression to another parked car is 52°. The cars are parked in the same line of sight.

The distance between the two cars, to the nearest tenth of a meter is?



$$\tan 63° = \frac{25}{x} \qquad \tan 52° = \frac{25}{y}$$

$$\frac{x\cancel{\tan 63°}}{\cancel{\tan 63°}} = \frac{25}{\tan 63°} \qquad \frac{y\cancel{\tan 52°}}{\cancel{\tan 52°}} = \frac{25}{\tan 52°}$$

$$x = 12.7\text{m} \qquad y = 19.5\text{ m}$$

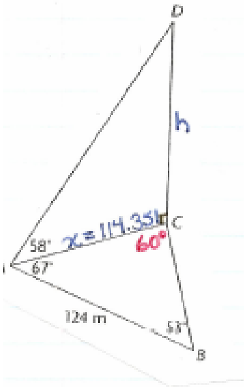
$< BC_1A = 63°$

$< BC_2A = 52°$

The distance between the cars is: $19.5\text{m} - 12.7\text{m}$

$= 6.8\text{m}$

6. The diagram shows the measurements Roberta made to determine the height, CD, of a skyscraper, using a baseline AB.



a) The first thing Roberta needed to Know, based on her measurements, was the measure of <ACB.

$$\angle ACB = 180° - 67° - 53°$$
$$= 60°$$

b) Roberta then used this angle measure to determine the length of AC from one end of her baseline to the foot of the building.

$$\frac{x}{\sin 53°} = \frac{124}{\sin 60°}$$

$$\frac{x \cancel{\sin 60°}}{\cancel{\sin 60°}} = \frac{124 \sin 53°}{\sin 60°}$$

$$x = 114.351 \text{ m}$$

c) Finally, Roberta was able to determine the height of the skyscraper, using the angle of elevation she had measured.

$$\tan 58° = \frac{h}{114.351}$$

$$114.351 \tan 58° = h$$

$$183 \text{m} = h$$