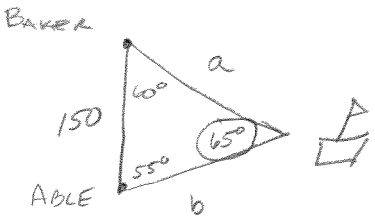
Law of Sines
Word Problems

p. 503 #37



a) How far is each station from the ship?

$$\frac{150}{\sin 65} = \frac{a}{\sin 55} \qquad \frac{b}{\sin 60} = \frac{150}{\sin 65}$$

$$a = \frac{150 \sin 55}{\sin 65} \qquad b = \frac{150 \sin 60}{\sin 65}$$

$$a \approx 135.6 \qquad b \approx 143.3$$

Baker is about 135.6 miles away from the ship.
Able is about 143.3 miles away from the ship

b) If a helicopter capable of flying 200 mph is dispatched from the nearest station, how long will it take to reach the ship?

The nearest station is Baker, which is about 135.6 miles away.

$$D = r \cdot t$$

$$135.6 = \frac{200 \text{ miles}}{1 \text{ hour}} \cdot t$$

$$135.6 \text{ miles} \cdot \left(\frac{1 \text{ hour}}{200 \text{ miles}}\right) = t$$

$$0.7 \text{ hour} = t$$

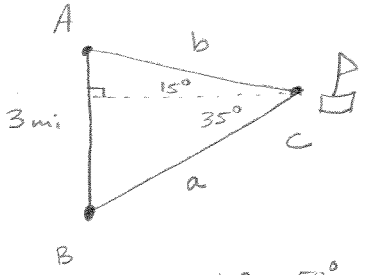
$$0.7 \text{ hour} \left(\frac{60 \text{ min}}{1 \text{ hour}}\right) = t$$

$$40.7 \text{ min} = t$$

The helicopter will take about 40.7 minutes to reach the ship.

p. 505 #48

Law of Sines Word Problems



$m\angle C = 50°$

$m\angle A = 75°$

$m\angle B = 55°$

a) Ship to A

$$\frac{b}{\sin 55} = \frac{3}{\sin 50}$$

$$b = \frac{3 \sin 55}{\sin 50}$$

$$b \approx 3.2$$

The ship is about 3.2 miles from lighthouse A.

b) Ship to B

$$\frac{3}{\sin 50} = \frac{a}{\sin 75}$$

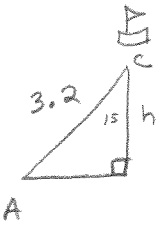
$$a = \frac{3 \sin 75}{\sin 50}$$

$$a \approx 3.8$$

The ship is about 3.8 miles from Lighthouse B.

c) How far is the ship from the shore?

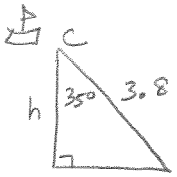
USE TRIG!



$\cos 15° = \frac{h}{3.2}$ OR $\sin 75 \quad \frac{h}{3.2}$

$3.2 \cos 15 = h$ OR $3.2 \sin 75 = h$

$3.1 = h$ $\quad$ $3.1 \approx h$



$\cos 35 = \frac{h}{3.8}$ $\quad$ $\sin 55 = \frac{h}{3.8}$

$3.8 \cos 35 = h$ OR $3.8 \sin 55 = h$

$3.1 = h$ $\quad$ $3.1 = h$

THE SHIP IS ABOUT 3.1 MILES FROM SHORE.

LAW OF SINES

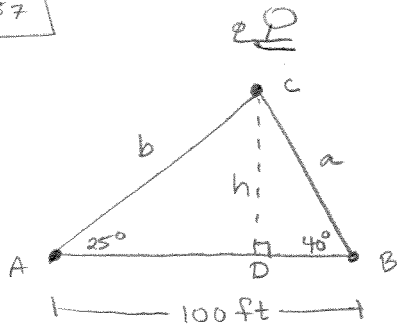
$h = b \sin A$ $\quad$ OR $\quad$ $h = a \sin B$

$h = 3.2 \sin 75$ $\quad$ $h = 3.8 \sin 55$

$h = 3.1$ $\quad$ $h = 3.1$

Law of Sines Word Problems

p. 506 #57



$m\angle C = 115°$

$\frac{a}{\sin 25} = \frac{100}{\sin 115}$

$a = \frac{100 \sin 25}{\sin 115}$

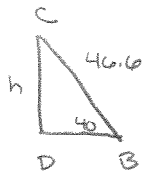
$a \approx 46.6$

$\frac{b}{\sin 40} = \frac{100}{\sin 115}$

$b = \frac{100 \sin 40}{\sin 115}$

$b \approx 70.9$

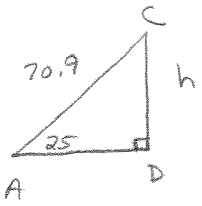
USE TRIG



$\sin 40 = \frac{h}{46.6}$

$46.6 \sin 40 = h$

$30 \approx h$



$\sin 25 = \frac{h}{70.9}$

$70.9 \sin 25 = h$

$30 = h$

The helicopter is about 30 feet above the observers.

LAW OF SINES

$h = b \sin A$

$h = 70.9 \sin 25$

$h = 30$

$h = a \sin B$

$h = 46.6 \sin 40$

$h = 30$

Law of Cosines Word Problems

p. 511

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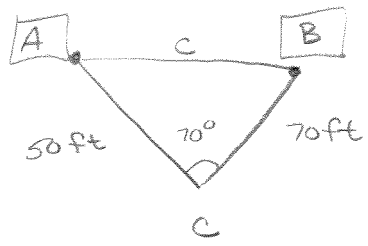

CASE: SAS

$c = \sqrt{a^2 + b^2 - 2ab\cos C}$

$c = \sqrt{(70)^2 + (50)^2 - 2(70)(50)\cos 70^\circ}$

$c \approx 70.8$

The houses are about 70.8 feet apart.

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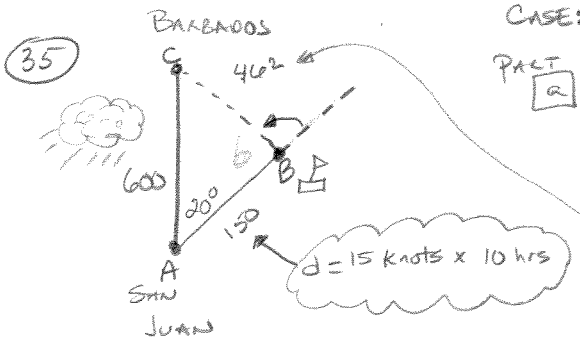


CASE: SAS

PART [a]

$a = \sqrt{150^2 + 600^2 - 2(150)(600)\cos 20^\circ}$

$a \approx 461.9$

$a \approx 462$ nautical miles

Next, Find $m\angle B$

$600^2 = 150^2 + 462^2 - 2(150)(462)\cos\beta$

$360000 = 235944 - 138600\cos\beta$

$124056 = -138600\cos\beta$

$\cos\beta = \frac{124056}{-138600}$

$m\angle B \approx \cos^{-1}\left(\frac{124056}{-138600}\right)$

$m\angle B \approx 153.5^\circ$

The Course Correction will be the supplement to $m\angle B$: 26.5°

The captain should turn 26.5° to head to Barbados.

PART [b] $D = r \cdot t$

$462 \text{ miles} = \frac{15 \text{ knots}}{1 \text{ hour}} \cdot t$

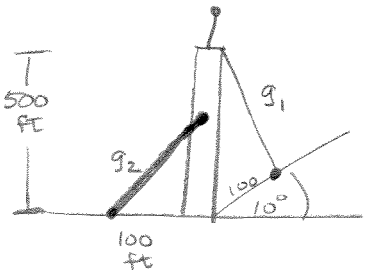
$30.8 \text{ hr} = t$

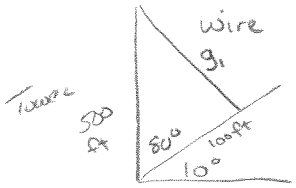
It will take about 30.8 hours before the ship reaches Barbados.

Be sure to write sentences & include units!

p. 512, #39 THE HEIGHT OF A radio tower is 500 feet, AND THE GROUND ON ONE SIDE OF THE TOWER SLOPES UP AT AN angle of 10°.

a) How long should the guy wire be if it is to connect to the top of the tower & be secured at a point 100 feet from the base of the tower, on the sloped SIDE



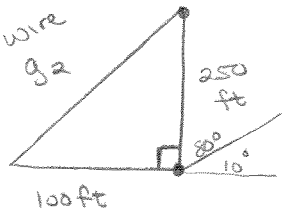


$$g_1 = \sqrt{(500)^2 + 100^2 - 2(500)(100)\cos 80°}$$

$$g_1 \approx 492.6$$

The guy wire should be about 492.6 ft long.

b) How long should the second guy wire be if it to connect the midde of the tower and be secured at a point 100 feet from the base on the flat side?



* The Angle from the tower To the ground is 90° on the flat side

∴ We can Use TRIG!

$$g_2 = \sqrt{100^2 + 250^2}$$

$$g_2 \approx 269.3$$

This guy wire should be about 269.3 feet long.

Solving using Laws of Cosines Yields Same Result:

$$g_2 = \sqrt{100^2 + 250^2 - 2(100)(250)\cos 90}$$

$$g_2 \approx 269.3$$

Do you know why?