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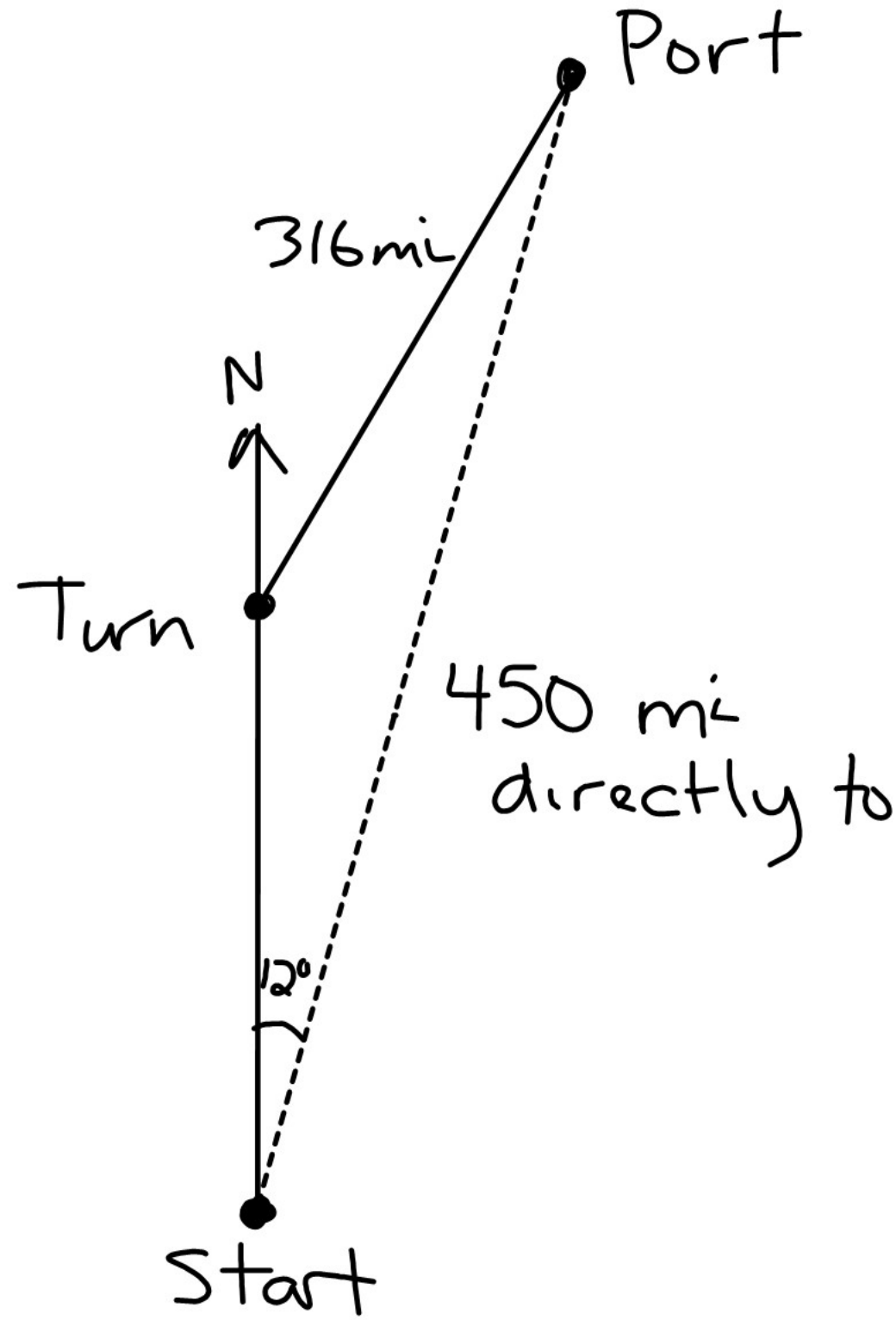
Navigation The captain of the Coast Guard Cutter Pendant plans to sail to a port that is 450 miles away and 12° east of north. The captain first sails the ship due north to check a buoy. He then turns the ship and sails 316 miles to the port.

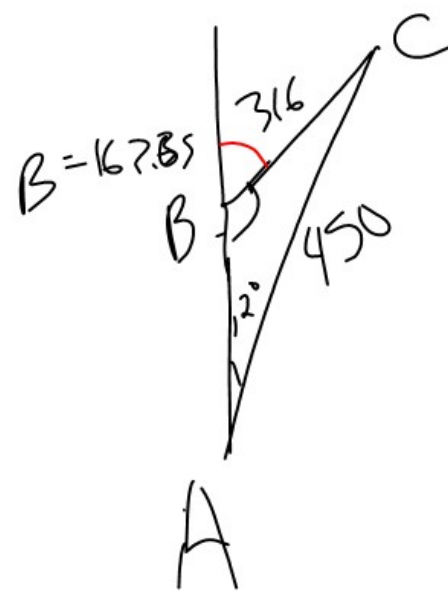
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Problem 36
from 5.7





$$\frac{\sin 12^\circ}{316} = \frac{\sin B}{450}$$

$$\frac{450 \sin 12^\circ}{316} = \sin B$$

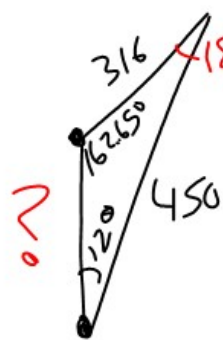
$$B = \sin^{-1}\left(\frac{450 \sin 12^\circ}{316}\right)$$

$$B = \sin^{-1}(.296\dots) \quad B = 17.35^\circ$$

$$B' = 180 - 17.35$$

a) he should turn $17.35^\circ = 162.65^\circ$
 & 1st of north

b) how many hours to turning
 point if he is going 23 mph



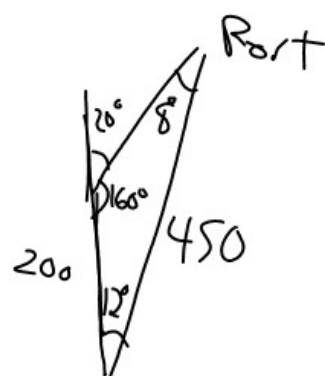
$$\frac{X}{\sin 5.35^\circ} = \frac{316}{\sin 12^\circ}$$

$$X = \frac{316 \sin 5.35^\circ}{\sin 12^\circ}$$

$$X = 141.7 \text{ mi}$$

$$t = \frac{141.7 \text{ mi}}{23 \text{ mi/hr}} = 5.99 \text{ hrs}$$

c)



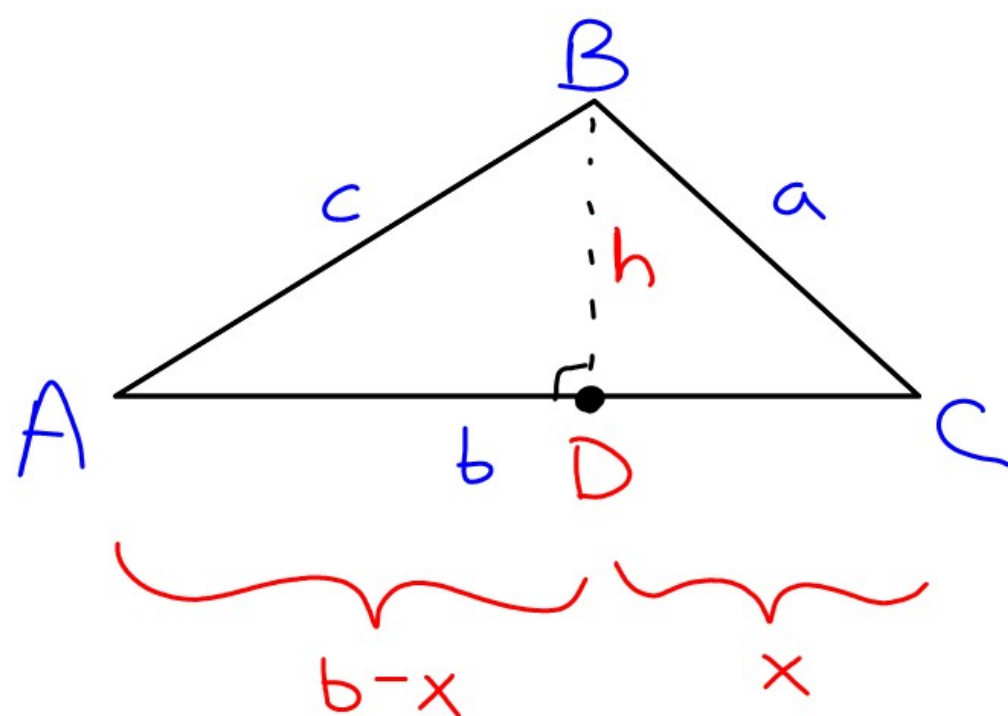
Is this a
 legal triangle?

$$\frac{\sin 160^\circ}{450} \stackrel{?}{=} \frac{\sin 8^\circ}{200}$$

$$.00676 \stackrel{?}{=} .00696$$

No

5.8] Law of Cosines



1) $\triangle ABD$ pyth. theorem $c^2 = (b-x)^2 + h^2$
 $c^2 = b^2 - 2bx + x^2 + h^2$

2) $\triangle BCD$ pyth theorem $a^2 = x^2 + h^2$

3) Substitute $c^2 = b^2 - 2bx + a^2$
 $c^2 = a^2 + b^2 - 2bx$

4) Trig ratio to find x $\cos C = \frac{x}{a}$

$$x = a \cos C$$

5) Substitute

6) Similarly

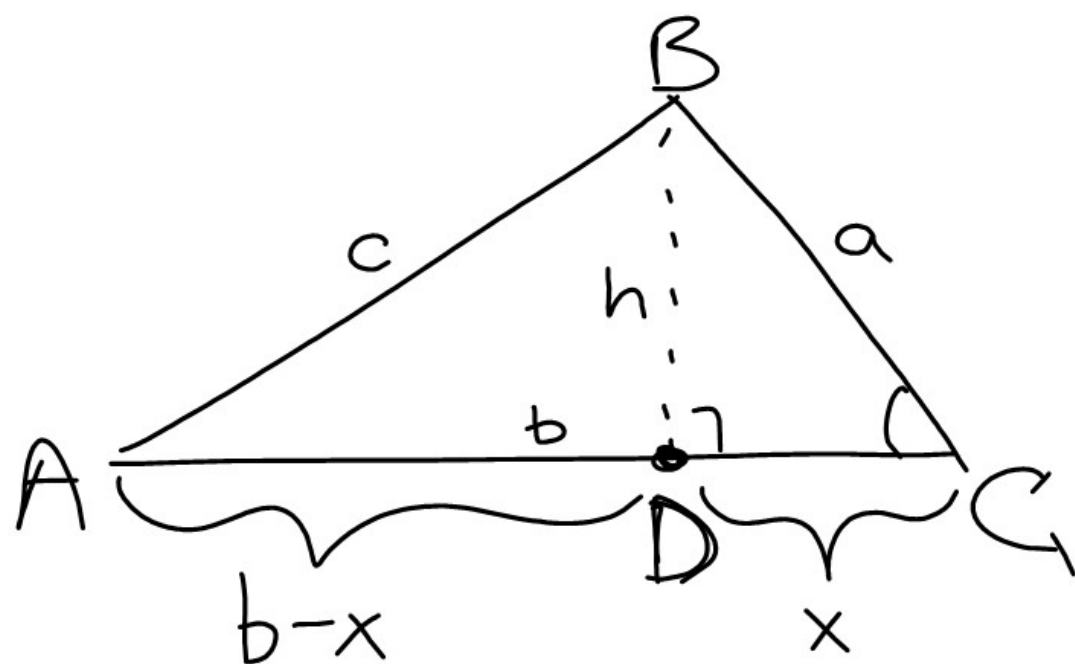
$$c^2 = a^2 + b^2 - 2ab \cos C$$

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

$$b^2 = a^2 + c^2 - 2ac \cos B$$

The law of cosines

5.8) Law of cosines



$$\cos C = \frac{x}{a}$$

$$\underline{\underline{x = a \cos C}}$$

$\triangle ABD$ pyth. theorem

$$c^2 = (b-x)^2 + h^2$$

$$c^2 = b^2 - 2bx + x^2 + h^2$$

$\triangle BCD$ pyth theorem

$$a^2 = h^2 + x^2$$

Substitute

$$c^2 = b^2 - 2bx + a^2$$

$$c^2 = a^2 + b^2 - 2bx$$

Trig ratio to find x

$$\underline{x = a \cos C} \quad \cancel{\neq}$$

$$c^2 = a^2 + b^2 - 2b(a \cos C)$$

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

$$b^2 = c^2 + a^2 - 2ac \cos B$$

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

Law of cosines

Yeahhh

, that's cool