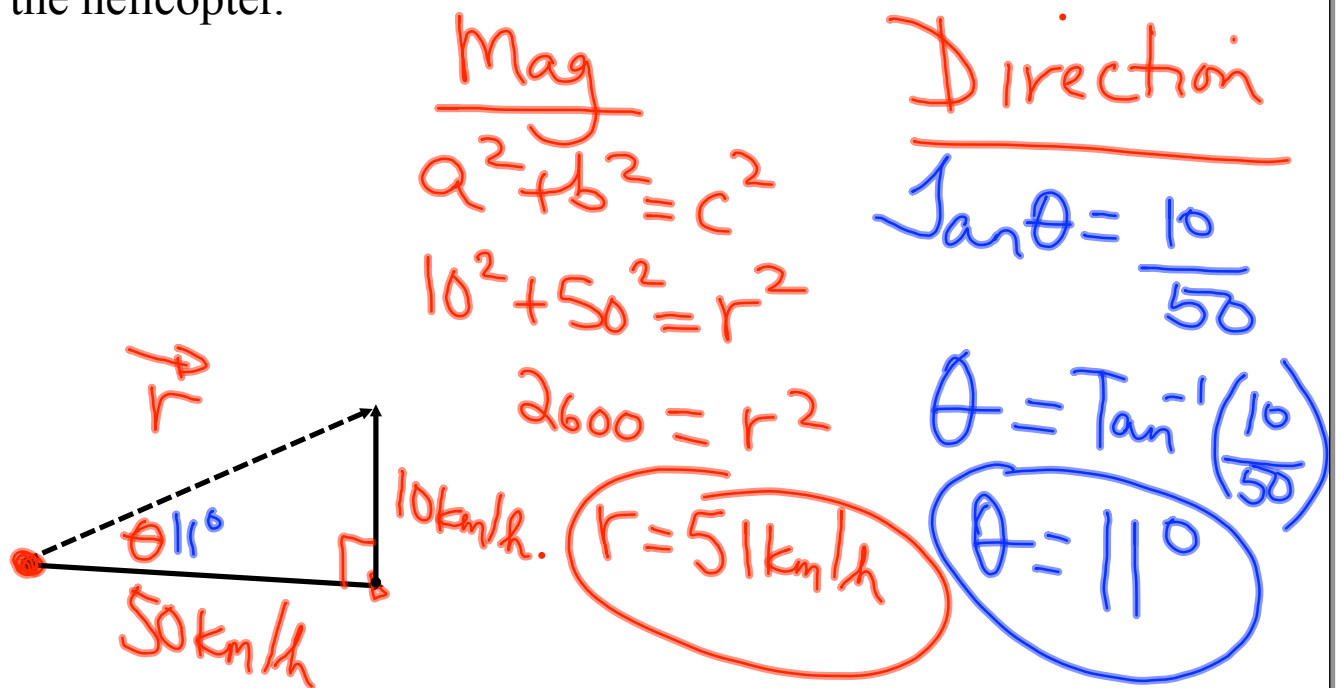


7.4 Solving Vector Problems by Computation

A helicopter flies at 50 km/h [E]. The wind is blowing toward the north at 10 km/h. Determine the resultant magnitude and direction of the helicopter.



Mag

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

$$10^2 + 50^2 = r^2$$

$$2600 = r^2$$

$$r = 51 \text{ km/h}$$

Direction

$$\tan \theta = \frac{10}{50}$$

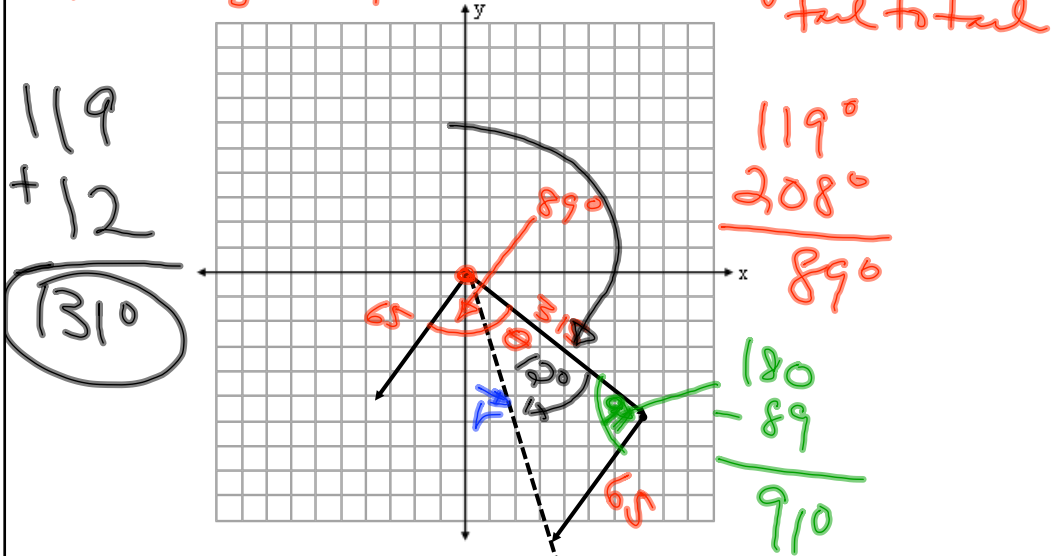
$$\theta = \tan^{-1}\left(\frac{10}{50}\right)$$

$$\theta = 11^\circ$$

Ans: 51 km/h 11° N of E
51 km/h $[79^\circ]$

An airplane travels at 315 mph [119°]. The wind blows at 65 mph [208°]. Determine the resultant magnitude and direction.

* Non-right Δ problems are always drawn tail to tail



Magnitude

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

$$a^2 = 65^2 + 315^2 - 2(65)(315) \cos 91^\circ$$

a = 322.7 mph

Direction

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{322.7}{\sin 91^\circ} = \frac{65}{\sin B}$$

$$65(\sin 91) = 322.7 \sin B$$

Ans:
322.7 mph
[131°].

$$\frac{65(\sin 91)}{322.7} = \sin B$$

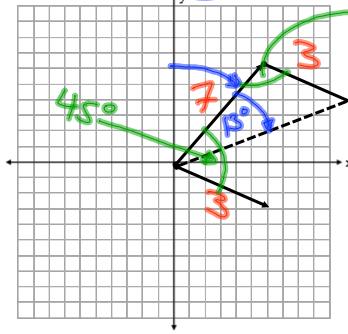
$$\sin^{-1}(0.201) = \sin B$$

(0.201...)

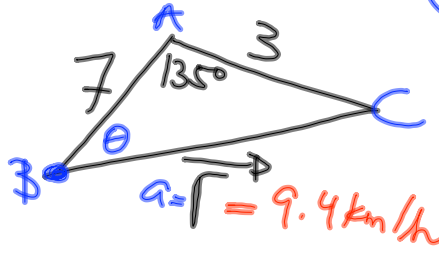
B = 12°

A kayaker paddles at 7 km/h [52°]. The river flows at 3 km/h [97°].

$$\begin{array}{r} 97 \\ -52 \\ \hline 45 \end{array}$$



$$\begin{array}{r} 52 \\ 13 \\ \hline 65^\circ \end{array}$$



Mag

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

$$a^2 = 7^2 + 3^2 - 2(7)(3) \cos 135$$

$$a = 9.4 \text{ km/h}$$

Direction

$$\frac{a}{\sin A} = \frac{b}{\sin B}$$

$$\frac{9.4}{\sin 135} = \frac{3}{\sin B}$$

$$9.4(\sin B) = 3(\sin 135)$$

$$\sin B = \frac{3(\sin 135)}{9.4}$$

$$\angle B = \sin^{-1}(0.2257)$$

$$\angle B = 130$$

Ans:
9.4 km/h [65°]

Assignment

Pg.328 1 - 8