Ch.9 Applications of Vectors

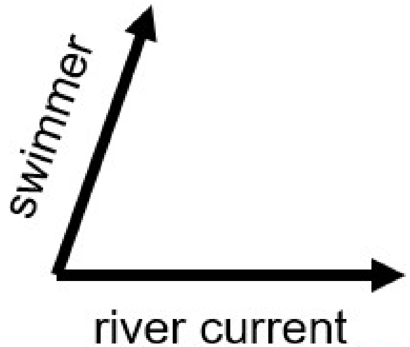
→Force has ***magnitude*** and ***direction***

(the length and angle of a vector)

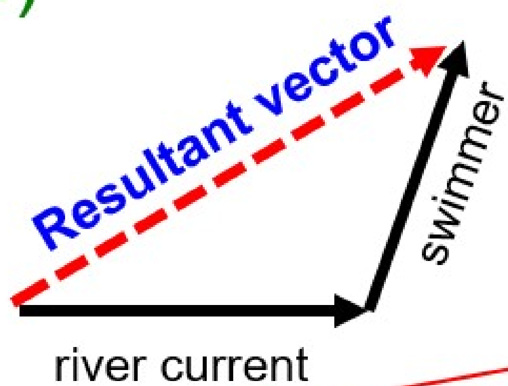
→Force is often measured in Newtons

(1 pound ≈ 4.45 N)

This tip-to-tail drawing is useful for solving magnitude and direction.



General diagram

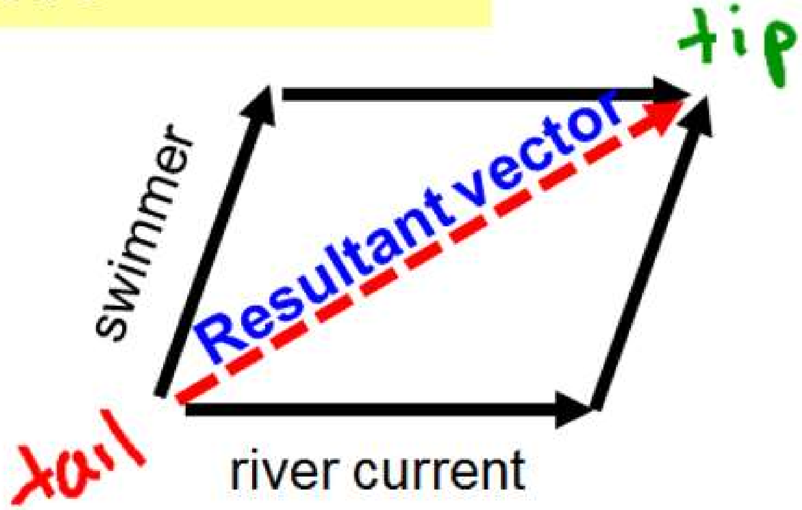


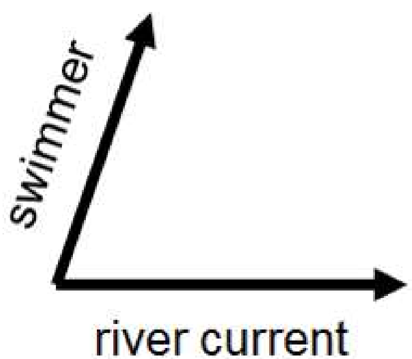
User friendly diagram that shows the forces acting upon each other (like a chain of events.)

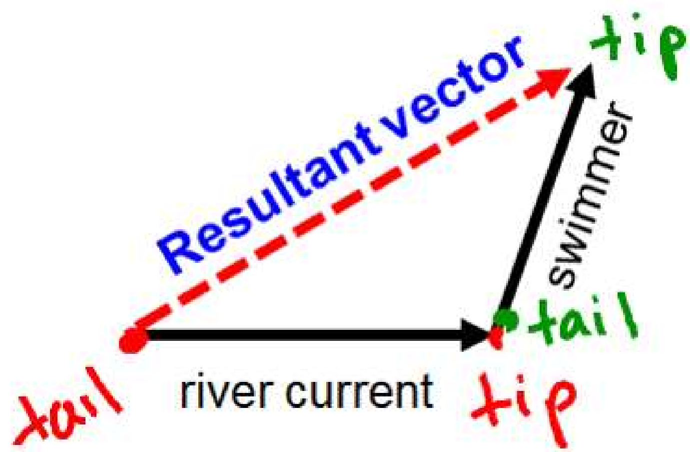
Ch.9 Applications of Vectors

A **parallelogram** will help find the resultant vector.

(similar to a tip-to-tail drawing)







Law of Cosines:

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

↑ side a is across from angle A ↑

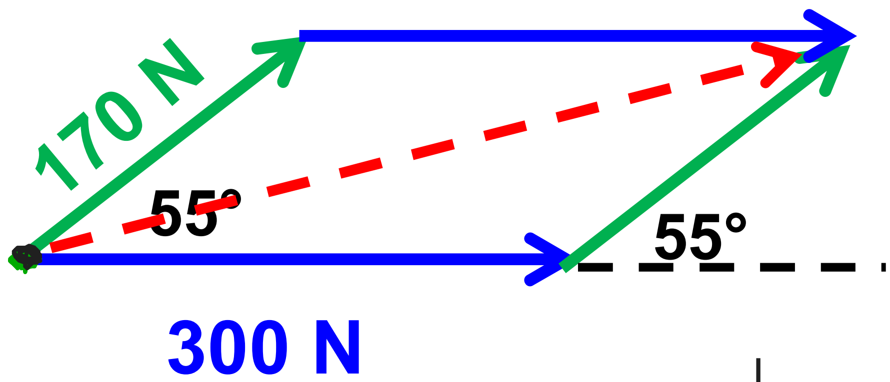
Law of Sines:

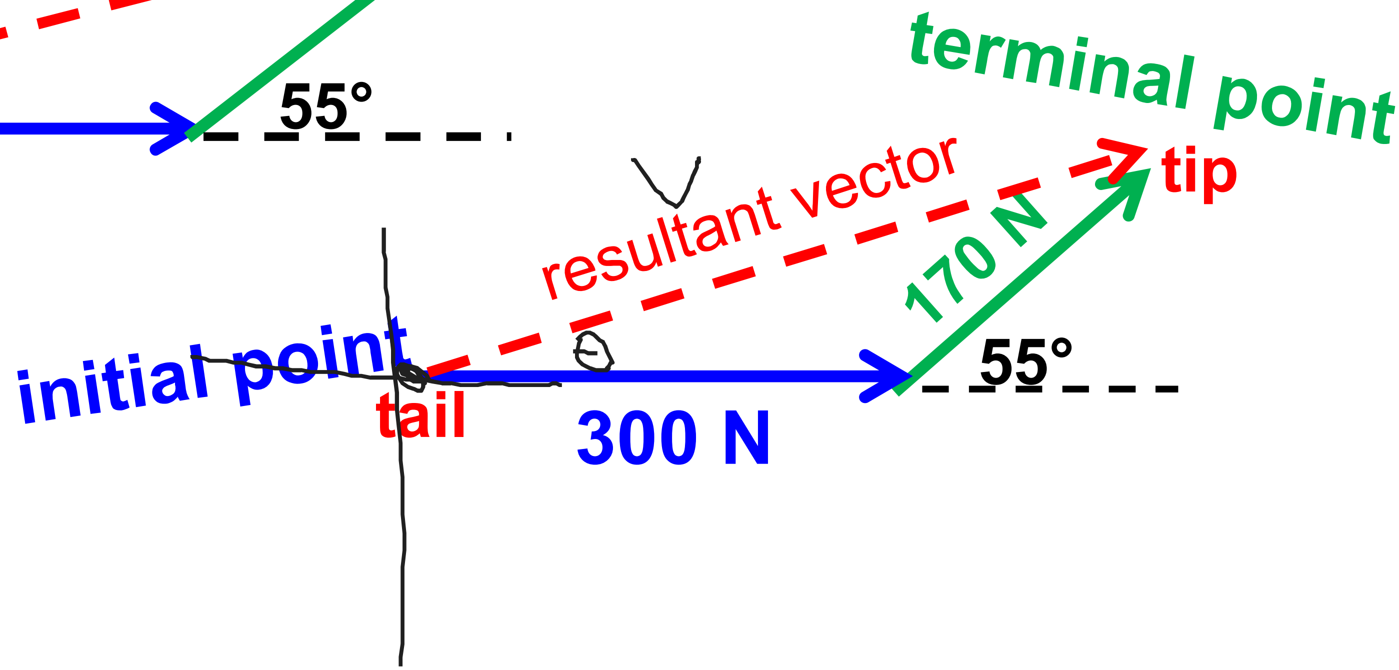
$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

A. Find the magnitude and direction of the resultant vector.

Be sure to form a parallelogram to find the resultant vector.
Use arrows!!

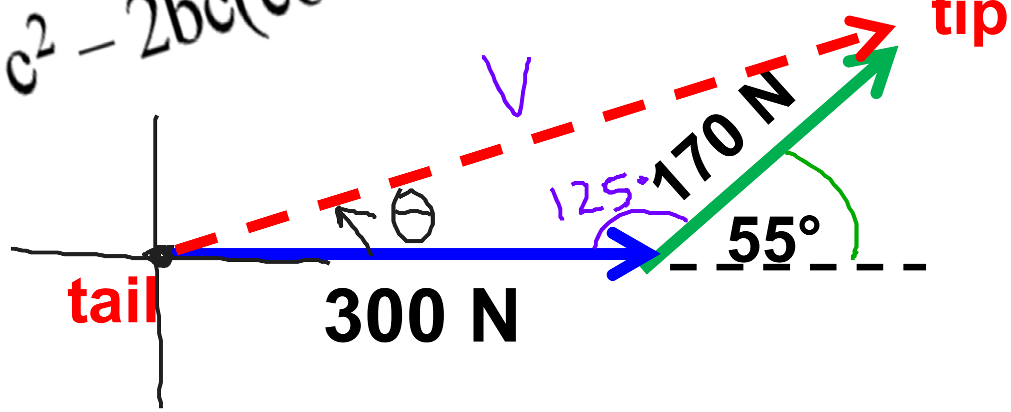
Given:





A. continued…

Law of Cosines: $a^2 = b^2 + c^2 - 2bc(\cos A)$



$$V^2 = \underline{300^2 + 170^2} \; \underline{-2(300)(170)(\cos 125°)}$$

$$V^2 = 118{,}900 - 102{,}000 \cos 125°$$

$$\sqrt{V^2} = \sqrt{177{,}404.797}$$

$$\boxed{V \approx 421\,19\,N}$$

magnitude

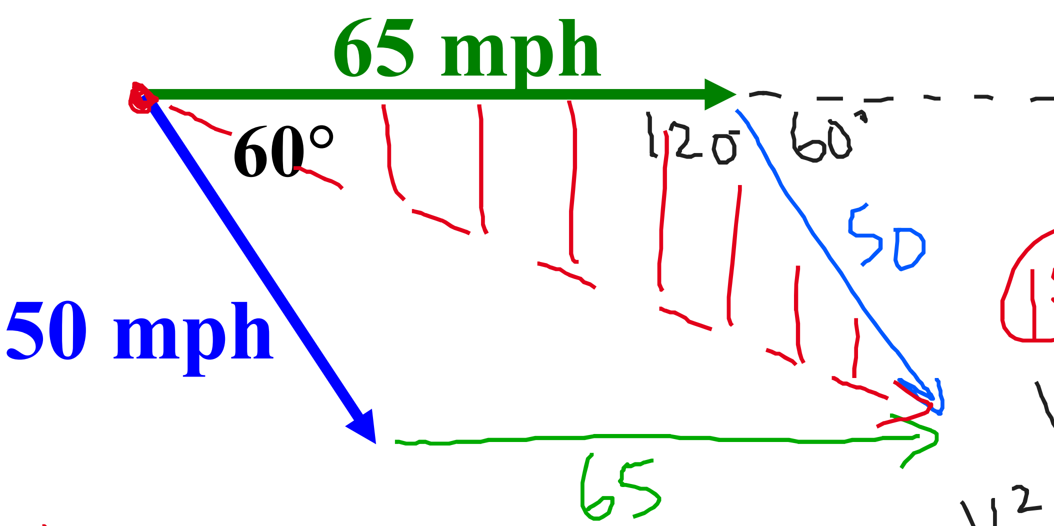
$$\frac{\sin\theta}{170} = \frac{\sin 125°}{421\,19}$$

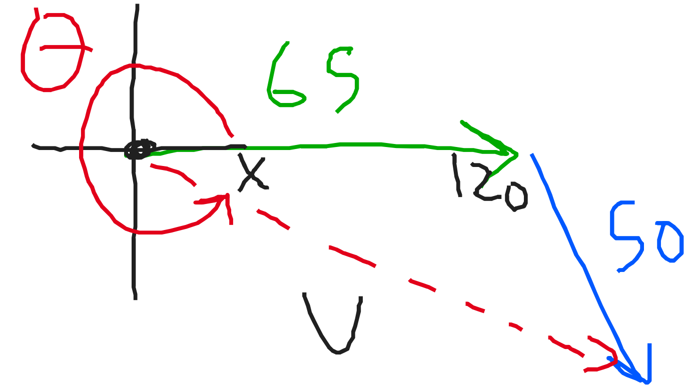
$$\sin\theta = \frac{170 \sin 125}{421.19}$$

$$\theta = \sin^{-1}(.3306)$$

$$\boxed{\theta \approx 19\,3°}$$ direction

B.





1st

$$V^2 = 65^2 + 50^2 - 2(65)(50)\cos 120°$$

$$V^2 = 6725 - 6500\cos 120°$$

$$V^2 = 9975$$

$$\boxed{V \approx 99.87 \text{ mph}}$$

magnitude

2nd

$$\frac{\sin x}{50} = \frac{\sin 120}{99.87}$$

$$\sin x = \frac{50\sin 120}{99.87}$$

$$x = \sin^{-1}(.4336)$$

θ is in Quad IV

$$x \approx 25.69° \rightarrow \theta = 360 - 25.69$$

direction $\boxed{\theta \approx 334.31}$