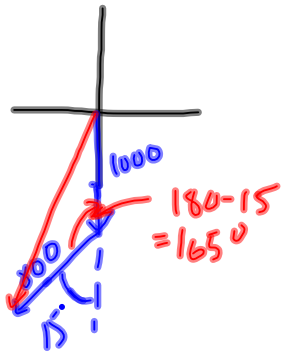
# Applications of Vector Addition

Example 1: A plane taking off from Toronto flies 1000km due south, then adjusts its heading and flies an additional 800km S15°W. How far from Toronto is the plane now?

$c^2 = 800^2 + 1000^2 - 2(800)(1000)\cos 165$

$= \ldots$

$c = 1784.8 \text{ km}$




Example 2: A boat sets a heading of N25°E at a speed of 30 knots. There is a current of 5 knots from a bearing of S45°E. What is the actual bearing of the boat?

$c^2 = 5^2 + 30^2 - 2(5)(30)\cos 110°$

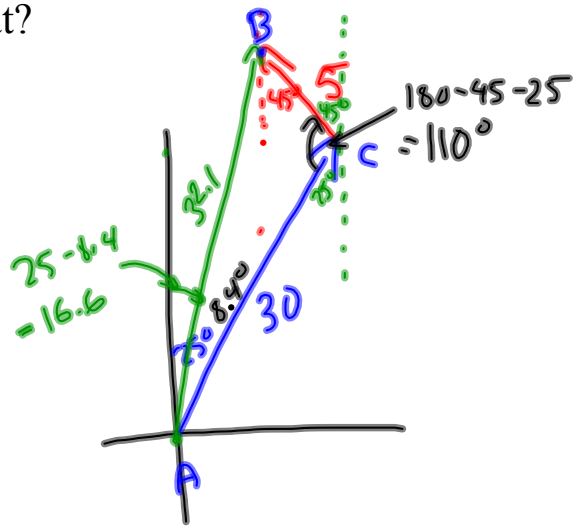
$\ldots$

$C = 32.1$

$\frac{\sin A}{5} = \frac{\sin 110}{32.1}$

$\ldots$

$A = 8.4°$




∴ The actual bearing is 32.1 knots N16.6°E

weight of 50N

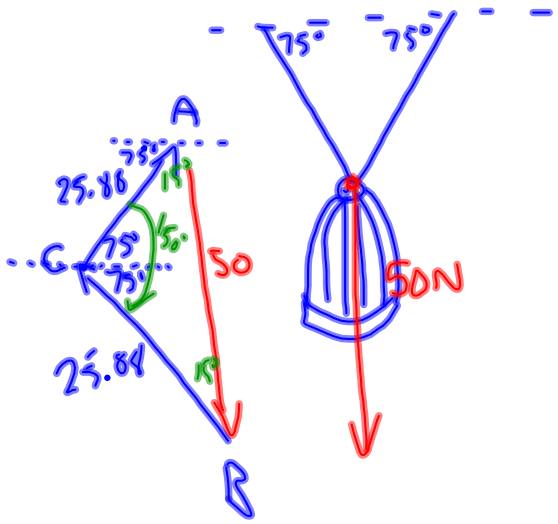
Example 3: A birdcage with a ~~mass of 5kg~~ hangs from the ceiling, suspended from two wires. Each wire makes an angle of 75° with the ceiling. What is the tension in each wire?

$$\frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{b}{\sin 15} = \frac{50}{\sin 150}$$

$$b = \frac{50 \sin 15}{\sin 150}$$

$$b = 25.88\ N$$




∴ Both wires have a tension of 25.88

Example 4: A ferry is crossing a river, which is 1km wide. Its destination is directly across from its starting point. The boat can travel at a speed of 15km/h. The river current is 3km/h. Determine the heading the boat should set to cross the river, and how long it will take to cross.

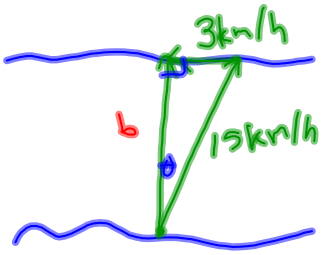
$$\sin\theta = \frac{3}{15}$$

$$\theta = 11.5^\circ$$

$$3^2 + b^2 = 15^2$$

$$b^2 = 15^2 - 3^2$$

$$b = 14.7\ km/h$$




$$t = \frac{d}{v}$$

$$= \frac{1}{14.7}$$

$$= 0.068 \text{ hours} \rightarrow 4.08 \text{ minutes.}$$

Homework:

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