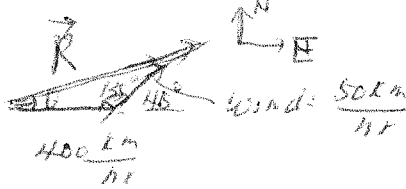


IB Math 2: More Vector Application Problems

Name: Key period:

1. An airplane is directly heading east at 400 km/hr. And a wind velocity of 50 km/hr blows toward the northeast. a) If the airplane encounters the wind, illustrate the resultant velocity diagram. b) Calculate the resultant speed and direction of the airplane influenced by the wind.



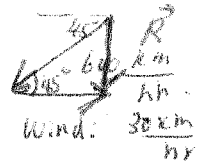
$$R^2 = (400)^2 + (50)^2 - 2 \cdot 400 \cdot 50 \cdot (\cos 135^\circ)$$

$$\approx 437 \frac{\text{km}}{\text{hr}}$$

$$\frac{\sin \theta}{50} = \frac{\sin 135^\circ}{R}$$

$$\theta \approx 4.64^\circ$$

2. Illustrate the vector diagram showing an airplane heading southwest at 600 km/hr and encountering a wind blowing 30 km/hr from the west. Show the resultant velocity vector and calculate the resultant speed.



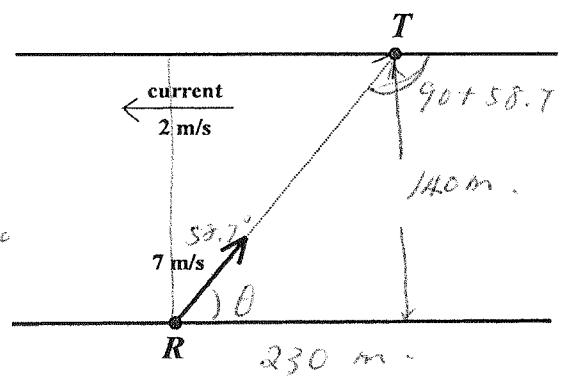
$$R^2 = (600)^2 + (30)^2 - 2 \cdot (600)(30) \cos 45^\circ$$

$$\approx 579 \frac{\text{km}}{\text{hr}}$$

3.

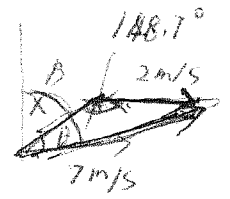


Beth paddles her stand up paddle board 7 meters per second in still water. She starts at point R and want to travel directly to point T. The river has a current of 2 meter per second from right as shown.



$$\theta = \tan^{-1} \left(\frac{140}{230} \right) \approx 58.7^\circ$$

- In order to paddle directly towards T, a) in what direction should Beth aim to compensate for the current? b) And what will Beth's actual speed be?

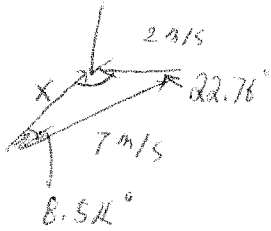


$$\frac{\sin 148.7^\circ}{7} = \frac{\sin \theta}{2}$$

$$\theta \approx 8.54^\circ$$

$$90 + 58.7^\circ \approx 148.7^\circ$$

$$\beta = 58.7^\circ + 8.54^\circ \approx 67.2^\circ$$



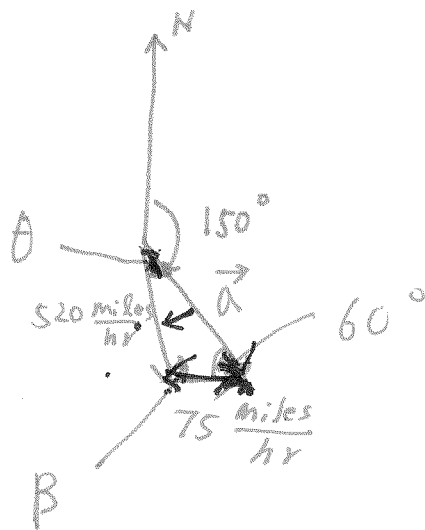
$$\frac{\sin 22.76^\circ}{x} = \frac{\sin 148.7^\circ}{7}$$

$$x \approx 5.22 \frac{\text{m}}{\text{s}}$$

$$\text{OR } x^2 = (7)^2 + (2)^2 - 2 \cdot (7)(2) \cdot (\cos 22.76^\circ)$$

4. Jenny wants to fly from Chicago to Atlanta as quickly as possible. If there were no wind, her course would be bearing of 150° and she would fly at her plane's top speed of 520 miles/hr. a) What course, direction, should she plan if there is a 75 miles/hr wind blowing toward the east? b) What will the actual speed influenced by the wind be? Illustrate the vector diagram and show your work.

(compensate the wind.)



direction

$$\frac{\sin \theta}{75} = \frac{\sin 60^\circ}{520}$$

$$\theta \approx 7.18^\circ$$

① Direction : $150 + 7.18 = 157.18$

$$\approx 157^\circ$$

Bearing Angle

② $\beta = 180 - 60 - 7.18 \approx 112.82^\circ$

$$\frac{\sin(112.82^\circ)}{a} = \frac{\sin 60^\circ}{520}$$

$$a \approx 553 \frac{\text{miles}}{\text{hr}}$$

OR $(\vec{a})^2 = (520)^2 + (75)^2 - (2)(520)(75)\cos(112.82^\circ)$

$$a \approx 553 \frac{\text{miles}}{\text{hr}}$$