7.2 Velocity As a Vector

-the velocity of an object in motion is stated relative to a frame of reference

Air speed/ water speed - is the speed of a plane or boat relative to a person on board (heading without the effects of the wind or current)

Ground speed - is the speed of the plane or boat relative to a person on the ground... it includes the effect of the wind or current.

$$plane: \vec{v}_{ground} = \vec{v}_{plane} + \vec{v}_{wind} \quad or \quad \vec{v}_g = \vec{v}_p + \vec{v}_w$$

$$boat: \vec{v}_{ground} = \vec{v}_{boat} + \vec{v}_{current} \quad or \quad \vec{v}_g = \vec{v}_b + \vec{v}_c$$

Ex1 A streetcar, a bus, and a taxi are travelling along a city street at 35, 42 and 50 km/h respectively. The streetcar and the taxi are travelling north; the bus is travelling south. Determine:

a)   the velocity of the streetcar relative to the taxi

b)   the velocity of the streetcar relative to the bus

c)   the velocity of the taxi relative to the bus

d)   the velocity of the bus relative to the streetcar

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Ex2   An airplane heading northwest at 500 km/h encounters a wind of 120 km/h from N65°E. Determine the resultant ground velocity of the plane.

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Ex3 A canoeist who can paddle at a speed of 5 km/h in still water wishes to cross a river 400 m wide that has a 2km/h current.

a) If he steers the canoe in a direction perpendicular to thecurrent, determine the resultant velocity and the point on the opposite bank where the canoe touches.

b) If he wishes to travel straight across the river, determine thedirection he must head and the time that it will take him to cross theriver.

7.2 Assignment: p.369 #2a 4 5 8 9 10