4.4 Applications of Vector Addition Worksheet

This document was composed and formatted by Annie Bernatchez.

The course material originated from www.jensenmath.ca

1) The velocity of an airplane is 800 km/h north. A wind is blowing due east at 100 km/h. Determine the velocity of the airplane relative to the ground.

2) A particle is displaced 5 units to the east and then displaced 12 units in a direction $N45°E$. Find the magnitude and direction of the resultant displacement.

3) A mass of 5 kg is suspended by two strings, 24 cm and 32 cm long, from two points that are 40 cm apart and at the same level. Determine the tension in each of the strings.

4) A mass of 20 kg is suspended from a ceiling by two lengths of rope that make angles of 30° and 45° with the ceiling. Determine the tension in each rope.

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5) A river is 2 km wide and flows at 6 km/h. Anna is driving a motorboat, which has a speed of 20 km/h in still water and she heads out from one bank in a direction perpendicular to the current. A marina lies directly across the river from the starting point on the opposite bank.

a) How far downstream from the marina will the current push the boat?

b) How long will it take for the boat to cross the river?

c) If Anna decides that she wants to end up directly across the river at the marina, in what direction should she head? What is the resultant velocity of the boat?

6) Adam can swim at the rate of 2 km/h in still water. At what angle to the bank of a river must he head if he wants to swim directly across the river and the current in the river moves at the rate of 1 km/h.

7) An airplane is travelling $N60°E$ with a resultant ground speed of 205 km/h. The nose of the plane is actually pointing east with an airspeed of 212 km/h. Find the wind speed and direction.

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Answer Key

1) 806.2 km/h $N7.1°E$ **2)** 15.93 units $N57.8°E$ **3)** 24 cm string: 39.2 N, 32 cm string: 29.4 N

4) 45° rope: 175.73 N 30° rope: 143.48 N

5) a) 0.6 km downstream from the marina b) 6 minutes (0.1 hours) c) upstream 17.5°, resultant velocity: 19.1 km/h

6) 60° **7)** 108.1 km/h $N18.6°W$

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