



Grade 6 Math Circles

Week of 16th October

Newton's Second Law - Problem Set

Vectors

1. Which of the following quantities would it make most sense to describe with vectors? Explain.

- The cost of a theater ticket
- The current in a river
- The initial flight path from Toronto to Vancouver
- The population of the world

2. Complete the following vector operations

$$(2, 2) + (2, 2) \quad ((1, 1) + (2, 2)) - (1, 1) \quad (3, 7) + (7, 3) \quad (2, 2) - (5, -1)$$

3. Find the magnitude of the following vectors

$$(3, 4) \quad (5, 12) \quad (2, 2) \quad (1, 1) \quad (\sqrt{2}, \sqrt{2})$$

4. You are on a jet plane that takes off from Toronto Pearson Airport. Its velocity is 550 kilometers per hour due east.

- a) There is a wind blowing with a velocity of 100 kilometers per hour from the West. Use vector addition to diagram the two vectors and calculate the resultant vector.
- b) There is a wind blowing with a velocity of 150 kilometers per hour from the south. Use vector addition to diagram the two vectors and calculate the resultant vector.

Physics

1. You are told that there are 2 forces acting on a 10kg box, 50N to the right, and 35N to the left. Draw a diagram of the box with vectors representing the force (not to scale).

- a) Determine the net force acting on the box.
- b) Determine the acceleration of the box, and in which direction it's moving.



- An object with mass of 6.0kg accelerates 4.0m/s^2 when an unknown force is applied to it. What is the magnitude of force applied to the object?
- An object accelerates 3.0m/s^2 when a force of 6.0 Newtons is applied to it. What is the mass of the object?
- Using the fact that the acceleration due to gravity is 9.81m/s^2 , what is the mass of a rock if it requires a force of 147N to hold it at rest in your hand.
- Assume that the red dot symbolizes $(0,0)$. Determine the net force acting on the box.

