

Warm Up: Unit analysis and vectors

Prof. Jordan C. Hanson

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1 Memory Bank

1. $\vec{v} = v_x \hat{i} + v_y \hat{j}$... Definition of a vector in terms of \hat{i} and \hat{j} components (representing the x-direction and y-direction).
2. $\vec{v} + \vec{w} = (v_x + w_x)\hat{i} + (v_y + w_y)\hat{j}$... Vector addition: the \hat{i} -components add with each other, and the \hat{j} -components add with each other.

2 Chapter 1 - Unit Analysis and Estimation

1. There are 2.2 lbs per kilogram. Convert 160 lbs. to kilograms:
2. A unit of *acceleration* is m s^{-2} , spoken like “meters per second squared.” Which of the following is true?
 - A: $1 \text{ m s}^{-2} = 3.6 \times 10^{-1} \text{ cm min}^{-2}$
 - B: $1 \text{ m s}^{-2} = 3.6 \times 10^{-1} \text{ cm min}^{-3}$
 - C: $1 \text{ m s}^{-2} = 3.6 \times 10^{-1} \text{ cm min}^{-4}$
 - D: $1 \text{ m s}^{-2} = 3.6 \times 10^{-1} \text{ cm min}^{-5}$

3 Chapter 2 - Algebra of Vectors

1. A *vector* is a quantity with a *magnitude* and a *direction*. If we travel 4 km in the x-direction, and we travel 4 km in the y-direction, our displacement from the origin is $\vec{x} = 4\hat{i} + 4\hat{j}$ km. Evaluate the following:
 - A: $\vec{a} = -2\hat{i} + 2\hat{j}$, $\vec{b} = -1\hat{i} + 1\hat{j}$. $\vec{a} + \vec{b} =$
 - B: $\vec{a} = -2\hat{i} + 2\hat{j}$, $\vec{b} = -1\hat{i} + 1\hat{j}$. $\vec{a} - \vec{b} =$
2. Consider the vector \vec{a} above. Suppose it has units of kilometers, and it represents the displacement of an aircraft after 1 minute. (a) Draw the vector below in a 2D coordinate system. That is, make a vector go “2 left,” and “2 up.” (b) Using the Pythagorean theorem, calculate the magnitude of the vector $|\vec{a}|$.