

1. Compute and interpret dot products of vectors.
 2. Understand when vector operations are possible based on dimensions.
 3. Use vectors to solve modeling problems.
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Trig Review:

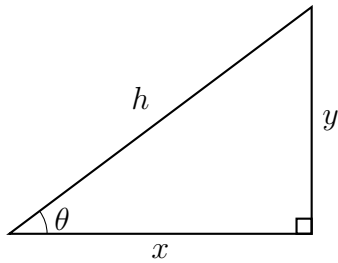


Figure 1: Right Triangle

$$\sin \theta = \frac{y}{h}$$

$$\cos \theta = \frac{x}{h}$$

$$\tan \theta = \frac{y}{x}$$

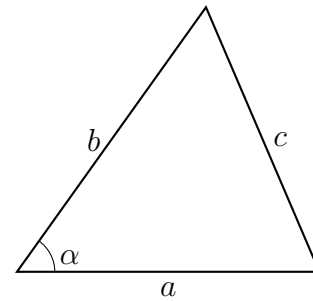


Figure 2: Scalene Triangle

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab \cos \alpha$$

Warm Up:

Given $\vec{u} = \langle 2, 4 \rangle$ and $\vec{v} = \langle -1, 1 \rangle$ determine the magnitude and direction (in degrees counterclockwise from the x-axis) of both vectors.

Dot Product:

1. Calculate the following, given $\vec{u} = \langle -2, 4, 0 \rangle$, $\vec{v} = \langle \frac{1}{2}, 5, -2 \rangle$, $\vec{w} = \langle 1, -1, 2 \rangle$, $\vec{x} = \langle -4, 6 \rangle$.
If you cannot compute one explain why.

1. $\vec{u} \cdot \vec{v}$

2. $\vec{v} \cdot \vec{u}$

3. $\vec{u} \cdot \vec{v} + \vec{u} \cdot \vec{w}$

4. $\vec{u} \cdot (\vec{v} + \vec{w})$

5. $\vec{w} \cdot \vec{x}$

6. $\vec{u} \cdot \vec{u}$

7. $|\vec{u}|^2$

2. Prove $\vec{a} \cdot \vec{b} = |\vec{a}||\vec{b}| \cos \theta$.

3. Suppose $|\vec{a}| = 2\sqrt{6}$, $|\vec{b}| = 2\sqrt{3}$, and the angle between the two vectors is 45° . Compute $\vec{a} \cdot \vec{b}$.

4. If $\vec{r} = \langle -2, 4 \rangle$ and $\vec{s} = \langle 1, 3 \rangle$, calculate the angle between the two vectors using the dot product.

5. Which of the following vectors are perpendicular (orthogonal) to each other?

$$\vec{u} = \langle -2, 4, 0 \rangle, \quad \vec{c} = \langle 3, \frac{3}{2}, -2 \rangle, \quad \vec{d} = \langle -1, 6, 3 \rangle$$

6. A constant force of 30lb is applied at an angle of 60° to pull a handcart 10ft across the ground. How much work is done by the force? *Hint: $W = \vec{F} \cdot \vec{d}$.*

7. AAA Party Supply Store sells invitations, party favors, decorations, and food service items such as paper plates and napkins. When AAA buys its inventory, it pays 25¢ per package for invitations and party favors. Decorations cost AAA 50¢ each, and food service items cost 20¢ per package. AAA sells invitations for \$2.50 per package and party favors for \$1.50 per package. Decorations sell for \$4.50 each and food service items for \$1.25 per package.

During the month of May, AAA Party Supply Store sells 1258 invitations, 342 party favors, 2426 decorations, and 1354 food service items. Use vectors and dot products to calculate how much money AAA made in sales during the month of May. How much did the store make in profit?