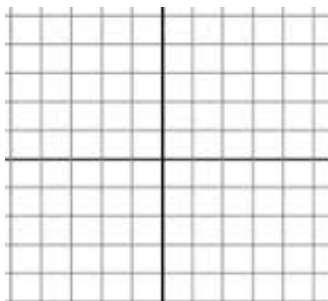


### 6.2 Dot Product of Vectors

Target 8C: Calculate and use properties of the Dot Product

Review of Prior Concepts

1. Let  $\mathbf{u} = \langle 2, -1 \rangle$ . Sketch  $\mathbf{u}$  and  $2\mathbf{u}$ .

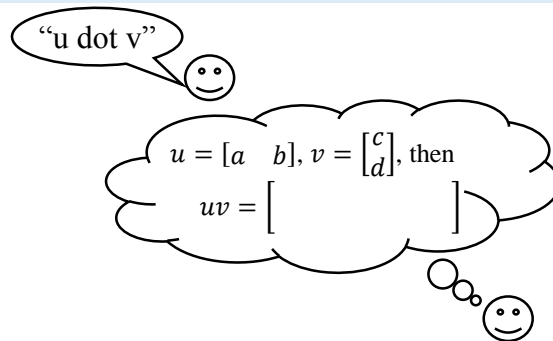


2. Find  $AB$ , if  $A = [1 \quad -3]$  and  $B = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$

### Dot Product

If  $\vec{u} = \langle a, b \rangle$  and  $\vec{v} = \langle c, d \rangle$ , then

$$\vec{u} \cdot \vec{v} =$$



**Example**

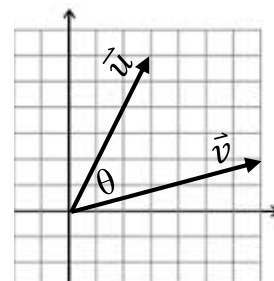
Given  $\vec{u} = \langle 1, 3 \rangle$  and  $\vec{v} = \langle 4, 5 \rangle$ , find  $\vec{u} \cdot \vec{v}$ .

### Angle Between Two Vectors

See how this formula comes about at:

<https://youtu.be/eLMLJkcllBs>

$$\cos \theta = \frac{\vec{u} \cdot \vec{v}}{|\mathbf{u}| |\mathbf{v}|}$$



**Example**

Given  $\vec{u} = \langle 1, 3 \rangle$  and  $\vec{v} = \langle 4, 5 \rangle$ , find the angle between  $\vec{u}$  and  $\vec{v}$ .

Now you try,

1. Given  $\vec{u} = \langle 2, -4 \rangle$ , and  $\vec{v} = \langle -8, 7 \rangle$ ,  
find  $\vec{u} \cdot \vec{v}$ .

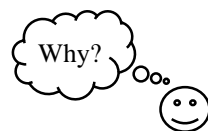
2. Given  $\vec{u} = 4i - 11j$  and  $\vec{v} = -3j$ ,  
find  $\vec{u} \cdot \vec{v}$ .

3. Given  $\vec{u} = \langle -3, 8 \rangle$  and  $\vec{v} = \langle -1, -9 \rangle$ , find the angle between  $\vec{u}$  and  $\vec{v}$ .

4. Given  $\vec{u} = \langle -2, 0 \rangle$  and  $\vec{v} = \langle 0, 5 \rangle$ , find the angle between  $\vec{u}$  and  $\vec{v}$ .

### Orthogonal Vectors

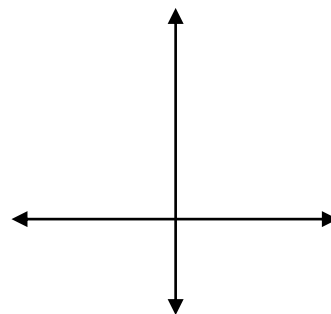
If  $\vec{u} \cdot \vec{v} = 0$ , then the vectors are \_\_\_\_\_.



*Example:*

**(Non-calculator)**

Given  $\vec{u} = \langle \cos \frac{\pi}{3}, \sin \frac{\pi}{3} \rangle$  and  $\vec{v} = \langle 3 \cos \frac{5\pi}{6}, 3 \sin \frac{5\pi}{6} \rangle$ , find the angle between  $\vec{u}$  and  $\vec{v}$ .



**More Practice**

**Dot Product**

<https://www.mathsisfun.com/algebra/vectors-dot-product.html>

<https://betterexplained.com/articles/vector-calculus-understanding-the-dot-product/>

<https://youtu.be/KDHuWxy53uM>

<https://youtu.be/98C7iv8OcnI>

**Angle Between Vectors**

<http://onlinemschool.com/math/library/vector/angl/>

<https://youtu.be/WDdR5s0C4cY>

<https://youtu.be/4WxniMJYySc>

**Homework Assignment**

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