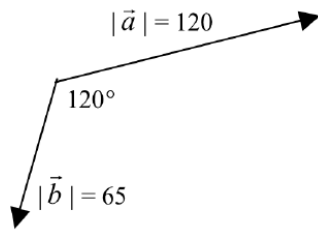
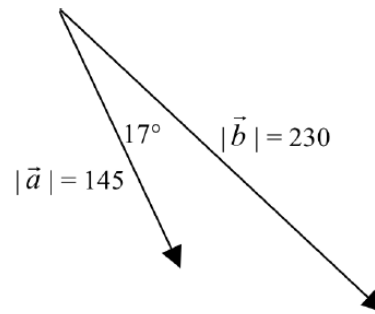


**W2 – Dot Product**

MCV4U

Jensen

Unit 5

**1) Calculate the dot product for each pair.****a)****b)****2) Calculate the dot product for each pair of vectors.  $\theta$  is the angle between the vectors when they are placed tail to tail.**

**a)**  $|\vec{u}| = 7$ ,  $|\vec{v}| = 12$ , and  $\theta = 47^\circ$

**b)**  $|\vec{s}| = 520$ ,  $|\vec{t}| = 745$ , and  $\theta = 135^\circ$

**3) Calculate the dot product of each pair of vectors.**

**a)**  $\vec{a} = [5, 8]$ ,  $\vec{b} = [-2, 1]$

**b)**  $\vec{c} = [-1, 8]$ ,  $\vec{d} = [3, -3]$

**c)**  $\vec{l} = 2\hat{i} - 3\hat{j}$ ,  $\vec{m} = -9\hat{i} + 4\hat{j}$

**d)**  $\vec{u} = -6\hat{i} + 7\hat{j}$ ,  $\vec{v} = 3\hat{i} - 2\hat{j}$

4) Decide whether the following expressions have meaning or not. If not, explain why.

a)  $\vec{u} \cdot (\vec{v} \cdot \vec{w})$

b)  $|\vec{u} \cdot \vec{v}|$

c)  $\vec{u}(\vec{v} \cdot \vec{w})$

d)  $|\vec{u}|^2$

e)  $\vec{v}^2$

f)  $(\vec{u} \cdot \vec{v})^2$

5) Let  $\vec{a} = [1, -2]$ ,  $\vec{b} = [2, 5]$ , and  $\vec{c} = [4, -1]$ . Evaluate the following if possible. If not possible, explain why not.

a)  $\vec{a} \cdot (\vec{b} + \vec{c})$

b)  $(\vec{a} + \vec{b}) \cdot \vec{c}$

c)  $(\vec{a} + \vec{b}) \cdot (\vec{a} + \vec{c})$

d)  $(3\vec{a} + 2\vec{b}) \cdot (4\vec{a} - \vec{b})$

e)  $\vec{a} \cdot \vec{b} \cdot \vec{c}$

f)  $\vec{a} \cdot \vec{b} + \vec{a} \cdot \vec{c}$

g)  $4\vec{b} \cdot (-2\vec{c})$

h)  $(\vec{a} + \vec{b}) \cdot \vec{c}$

6) Determine a value of  $t$  so that  $\vec{u} = [9, t]$  and  $\vec{v} = [-16, t]$  are perpendicular.

7) Find a vector that is perpendicular to  $\vec{a} = [3, -1]$ . Verify that the vectors are perpendicular.

8) Which of the following is a right-angled triangle? Identify the right angle in that triangle.

- $\triangle ABC$  for  $A(3,1)$ ,  $B(-2,3)$ , and  $C(5,6)$
- $\triangle STU$  for  $S(4,6)$ ,  $T(-3,7)$ , and  $U(-5, -4)$

**ANSWER KEY:**

1)a) -3900 b) 31892.76

2)a) 57.29 b) -273 933.17

3)a) -2 b) -27 c) -30 d) -32

4)a) no, you cannot dot a vector with a scalar b) yes c) yes d) yes e) no, you cannot multiply vectors f) yes

5)a) -2 b) 9 c) 6 d) -38 e) not possible- you cannot dot a vector with a scalar f) -2 g) -24 h) 9

6)  $t = 12, -12$

7) Answers may vary:  $[-1, -3]$ ,  $[1, 3]$ , check using the dot product

8)  $\triangle ABC$  is a right triangle; the right angle is  $\angle BAC$