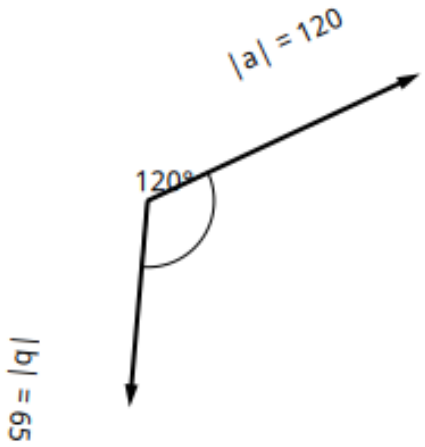
5.2 Dot Product Worksheet

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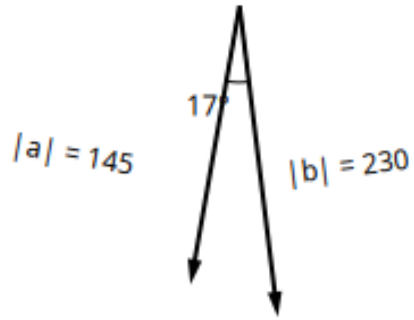
The course material originated from www.jensenmath.ca

1) Calculate the dot product for each pair.

a)



b)



2) Calculate the dot product for each pair of vectors. θ is the angle between the vectors when they are placed tail to tail.

a) $\lvert\vec{u}\rvert = 7$, $\lvert\vec{v}\rvert = 12$, and $\theta = 47°$	b) $\lvert\vec{s}\rvert = 520$, $\lvert\vec{t}\rvert = 745$, and $\theta = 135°$

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) $\vec{l} = 2\vec{i} - 3\vec{j}$, $\vec{m} = -9\vec{i} + 4\vec{j}$	d) $\vec{u} = -6\vec{i} + 7\vec{j}$, $\vec{v} = 3\vec{i} - 2\vec{j}$

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

a) $\vec{u} \cdot (\vec{v} \cdot \vec{w})$	b) $\lvert\vec{u} \cdot \vec{v}\rvert$	c) $\vec{u}(\vec{v} \cdot \vec{w})$	d) $\lvert\vec{u}\rvert^2$	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) $(3\vec{a} + 2\vec{b}) \cdot (4\vec{a} - \vec{b})$

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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 $\angle BAC$

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