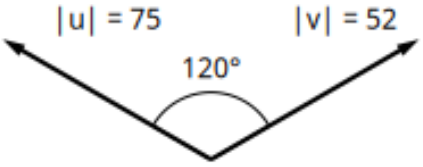
5.5 Cross Product of Vectors Worksheet

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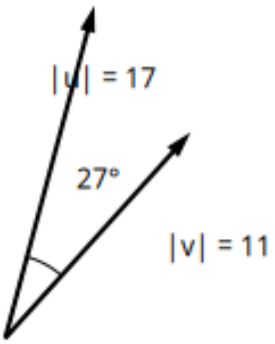
The course material originated from www.jensenmath.ca

1) Determine $\vec{u} \times \vec{v}$.

a)



b)



c) $\vec{u} = [2, -1, 7]$, $\vec{v} = [2, 1, 3]$

d) $\vec{u} = [-3, 4, 7]$, $\vec{v} = [4, 3, -5]$

e) $\vec{u} = 3\vec{i} + 4\vec{j} - \vec{k}$, $\vec{v} = 5\vec{i} + \vec{j} - 2\vec{k}$

f) $\vec{u} = 2\vec{i} - 3\vec{j} + 7\vec{k}$, $\vec{v} = -\vec{i} + \vec{j}$

2) Find a vector perpendicular to each of the following pairs of vectors. Use the dot product to check your answer.

a) $[5, 0, 1]$ and $[-2, 5, 8]$

b) $[1, 4, -2]$ and $[-4, 9, 0]$

3) Find a unit vector perpendicular to $\vec{a} = [6, -2, -3]$ and $\vec{b} = [5, 1, -4]$.

4) Given $\vec{a} = [1, -2, -1]$, $\vec{b} = [2, 2, -1]$ and $\vec{c} = [2, -3, -4]$, evaluate each of the following:

a) $\vec{a} \times (\vec{b} \times \vec{c})$

b) $(\vec{a} \times \vec{b}) \times \vec{c}$

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c) $\vec{a}\times\vec{c}-\vec{a}\times\vec{b}$	d) $\vec{b}\times 3\vec{c}$
e) $(\vec{a}\times\vec{c})\cdot\vec{b}$	f) $(\vec{a}\times\vec{b})\cdot\vec{c}$
g) $\lvert\vec{a}\times\vec{b}\rvert$	h) $\lvert\vec{a}\times(\vec{b}-\vec{c})\rvert$

5) Use the cross product to determine the angles between the vectors $\vec{a}=[2,\ 1,\ -3]$ and $\vec{b}=[5,\ -4,\ 3]$. Consider ambiguous case. Use dot product to confirm or use graphing software to inspect.

6) Determine the area of $\triangle PQR$ with vertices of $P(3,\ -2,\ 7)$, $Q(2,\ 2,\ -3)$, and $R(1,\ 1,\ 2)$.

7) Determine the area of the parallelogram ABCD defined by the vertices $A(2,\ -1,\ -1)$, $B(-4,\ -2,\ 3)$, $C(2,\ 3,\ 2)$, and $D(8,\ 4,\ -2)$.

Answer Key

1. a) $-3377.5\hat{n}$ or 3377.5 in to the page b) $-84.9\hat{n}$ or 84.9 in to the page c) $[-10,\ 8,\ 4]$ d) $[-41,\ 13,\ -25]$ e) $[-7,\ 1,\ -17]$ f) $[-7,\ -7,\ -1]$

2. a) $[-5,\ -42,\ 25]$ b) $[18,\ 8,\ 25]$

3. $\frac{1}{\sqrt{458}}[11,\ 9,\ 16]$

4. a) $[26,\ 21,\ -16]$ b) $[22,\ 28,\ -10]$ c) $[1,\ 3,\ -5]$ d) $[-33,\ 18,\ -30]$ e) 13 f) -13 g) $\sqrt{53}$ h) $\sqrt{35}$

5) $96.5°$

6) $2.5\sqrt{14}$ units^2

7) $\sqrt{1261}$ units^2

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