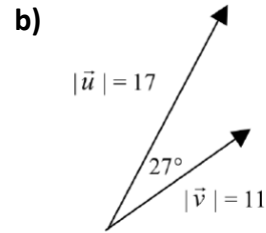
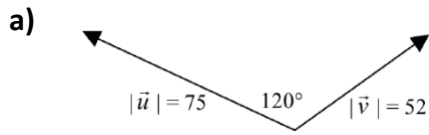


W5 – Cross Product of Vectors

Unit 5

MCV4U

Jensen

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

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

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

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

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

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

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) $|\vec{a} \times \vec{b}|$

h) $|\vec{a} \times (\vec{b} - \vec{c})|$

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 ΔPQR 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) $2.5\sqrt{14}$ units²

7) $\sqrt{1261}$ units²