

MCV4U Unit Test #2 3-space /32 + /4 = /35 Name: _____

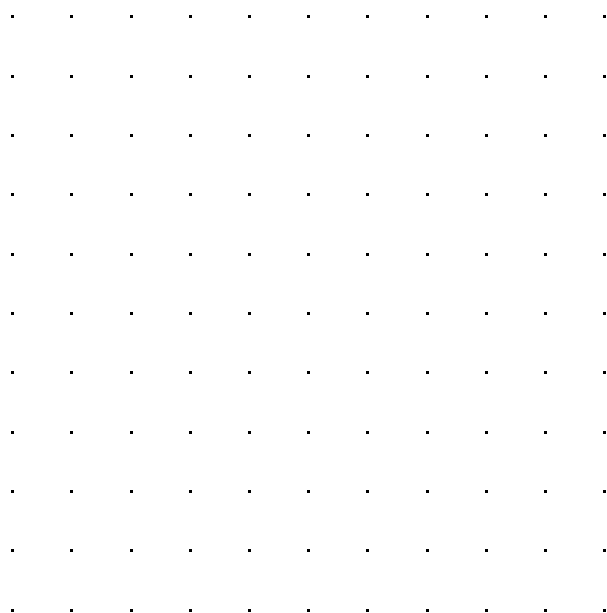
Useful formulae: $|\vec{u} \times \vec{v}| = |\vec{u}||\vec{v}|\sin\theta$ $|\vec{u} \cdot \vec{v}| = |\vec{u}||\vec{v}|\cos\theta$ $\tau = |\vec{r} \times \vec{F}|$ $|\vec{t}| = |\vec{r}||\vec{F}|\sin\theta$

1. demonstrate an understanding of vectors in two-space and three-space by representing them algebraically and geometrically and by recognizing their applications;
2. perform operations on vectors in two-space and three-space, and use the properties of these operations to solve problems, including those arising from real-world applications;

1. a) Locate the points A(3, -1, 2), B(-2, -1, 3) and C(0, -1 -3) on the x, y and z axes below.
- b) What is the equation of the plane containing the points A, B and C?

[3]

[1]



2. Given the points A (-2, 3, -7) and B (4, 8, -5), determine the vector \vec{AB} and its magnitude.

[2]

3. Determine the value of a and b such that the vector pair are collinear
 $\vec{r} = [-9, a, 15]$ and $\vec{s} = [b, 2, -5]$

[2]

4. Determine the value of k so that $\vec{u} = [-5, k, 3]$ and $\vec{v} = [1, 2, -7]$ are orthogonal.

[3]

5. a) Use the cross product to determine the angle between $\vec{u} = [5, -4, 1]$ and $\vec{v} = [-3, 2, 7]$.
 [3]

- b) Use the dot product to verify your answer in part a).

[3]

6. A force of 75 N is applied to a wrench in a counterclockwise direction at 60° to the handle, 12 cm from the center of the bolt.
- Calculate the magnitude of the torque.
 - In what direction does the bolt move?

[3]

7. Given $\vec{u} = [3, -1, 4]$, $\vec{v} = [-5, 2, -1]$ and $\vec{w} = [8, 1, -2]$, evaluate $u \cdot (v \times w) + |v|^2$

[4]

8. If $\vec{p} = [1, 2, -3]$ and $\vec{q} = [2, -1, 4]$, find a unit vector perpendicular to both \vec{p} and \vec{q} .

[3]

- 9 a) Show that vector $\vec{a} = [1, 12, -29]$ can be written as a linear combination of $\vec{b} = [1, 2, -3]$ and $\vec{c} = [3, 1, 4]$.

[4]

- b) What does it mean if you can write two vectors as a linear combination of another?

[1]