

Instructions for students:

Name: _____

- **Show full solutions** for each question using your handwriting. **Do not type out the answers.**
- If you can not print this sheet, ensure the questions are included with your answer so the teacher understands which question you are answering.
- When completed, **submit as a pdf file** to your teacher.
- Plagiarism will result in a mark of zero.

1. **True/False: Clearly circle your choice. If the statement is false, give an explanation why and/or a correction to the statement in the space provided.**

i) Collinear vectors are parallel to one another and may be in opposite directions.	TRUE / FALSE
ii) The sum of vectors \vec{u} and \vec{v} can be found by translating the tail of \vec{v} to the head of \vec{u} .	TRUE / FALSE
iii) Two nonzero vectors \vec{u} and \vec{v} are called perpendicular (or orthogonal) if the angle between them is 90° .	TRUE / FALSE
iv) The dot product $\vec{u} \cdot \vec{v}$ is negative if \vec{u} and \vec{v} point in the same general direction.	TRUE / FALSE
v) Two non zero vectors \vec{u} and \vec{v} are parallel if and only if $\vec{u} \times \vec{v} = 0$.	TRUE / FALSE

2. Vectors \vec{AB} and \vec{AC} have a magnitude of 5 m and 7 m, respectively, with an angle of 63° between them. Determine $|\vec{AB} + \vec{AC}|$ to one decimal place.

3. If $\vec{a} = (3, 0, -2)$ and $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$, determine the following. Show all steps.

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

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

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

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

4. If $\vec{u} = (-1, 3, 2)$ and $\vec{v} = (4, -5, 1)$, determine $proj_{\vec{v}} \vec{u}$ in component form.

5. Find a vector that has the same direction as $(-2, 4, 2)$ but has length 5. Fully simplify your answer.

6. Given triangle ABC with vertices $A(0, 0, 1)$, $B(2, 3, -2)$, $C(1, 1, 4)$

a) Determine the area of the triangle. Round your answer to one decimal place.

b) Determine the measure of $\angle A$. Round your answer to one decimal place.

7. Show that $\vec{a} \cdot \vec{b} = \frac{1}{4}|\vec{a} + \vec{b}|^2 - \frac{1}{4}|\vec{a} - \vec{b}|^2$.

8. A pilot needs to fly to an airfield $N16^\circ E$ of his present position. The average airspeed of the plane is 480km/h and the wind is coming from $S60^\circ E$ at 70km/h . Determine the plane's ground speed **and** the direction the pilot should steer. Round your answers to the nearest tenth and include appropriate diagram(s)