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| KNOW / 12 | APP / 12 | INQ / 12 | COMM / 6 |
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# MCV4UP - UNIT 10 – INTRODUCTION TO VECTORS

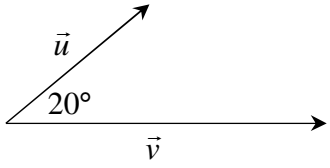
## TEST

**ROUND ALL FINAL ANSWERS TO THE NEAREST TENTH, UNLESS STATED OTHERWISE.**

1) Given the points $A(2,-3,17)$ and $B(-5,22,-11)$, find $\overrightarrow{AB}$ in algebraic (component) form. (*K – 2 marks*)

2) If $\vec{u}=(2,-5)$ and $\vec{v}=(-1,4,10)$, calculate the exact value of $|\vec{u}|$ and $|\vec{v}|$. (*K – 2 marks*)

3) For vectors $\vec{u}$ and $\vec{v}$ shown below, $|\vec{u}|=5$ and $|\vec{v}|=8$. Draw the vector $\vec{u}-\vec{v}$ and calculate $|\vec{u}-\vec{v}|$. (*K – 2 marks*)




4) If $|\vec{u}|=5$, $|\vec{v}|=12$ and $|\vec{u}+\vec{v}|=13$, show that $\vec{u}$ and $\vec{v}$ must be perpendicular. (*K – 2 marks*)

5) Let $\vec{u} = (2,3,-5)$ and $\vec{v} = (-4,-6,5)$. (*K – 4 marks*)

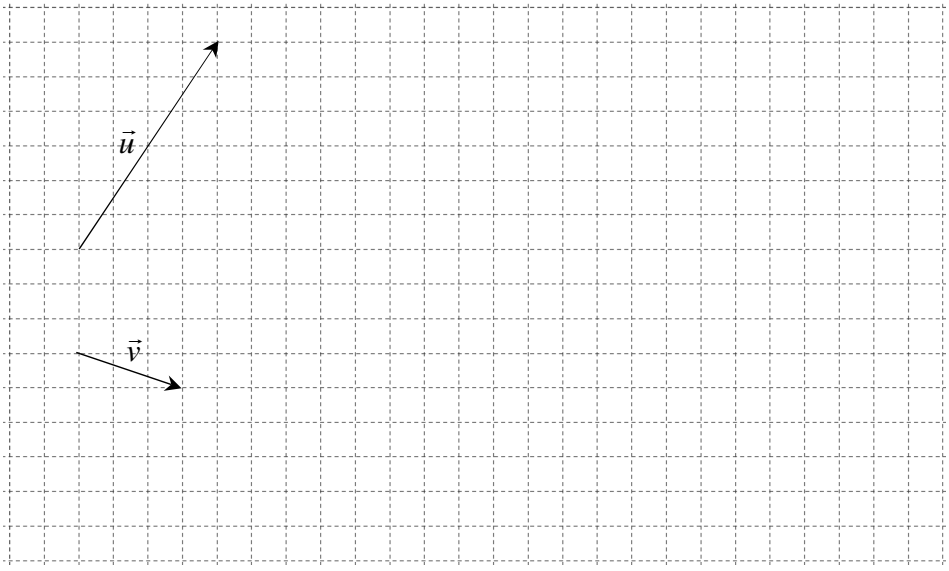
a) Determine a vector equivalent to $2\vec{u} - 3\vec{v}$.

b) Express $\vec{u} - \vec{v}$ in terms of the unit vectors $\vec{i}$, $\vec{j}$, and $\vec{k}$.

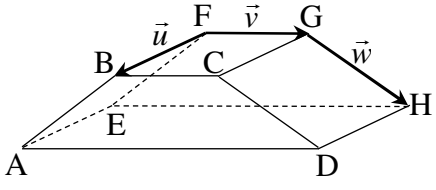
c) State whether or not $\vec{u}$ and $\vec{v}$ are collinear.

d) Determine the exact value of $|\vec{u} + \vec{v}|$.

6) Two vectors $\vec{u}$ and $\vec{v}$ are shown on the grid below. Accurately draw the vector $\frac{1}{2}\vec{u} - 3\vec{v}$. (*A – 2 marks*)




7) In the trapezoidal prism shown below, $BC = \frac{1}{3}AD$. Express each of the following in terms of $\vec{u}$, $\vec{v}$ and $\vec{w}$. (*A – 4 marks*)




a) $\overrightarrow{AG}$

b) $\overrightarrow{BA}$

8) Determine a vector that has the same direction as $(2,-6,-9)$ and a magnitude of 5. Leave your answer in exact form. (*A – 3 marks*)

9) Express the vector $\vec{p}=(44,-26)$ as a linear combination of $\vec{q}=(3,-2)=$ and $\vec{r}=(-7,4)$. (*A – 3 marks*)

10) Consider the vectors $\vec{u}=(8,1,6)$, $\vec{v}=(-1,3,4)$ and $\vec{w}=(5,1,-1)$. Determine if the three vectors are coplanar and whether or not they span $R^3$. (*I – 6 marks*)

Are the three vectors coplanar? ☐ Yes ☐ No (*check one*)

Does the set of vectors span $R^3$? ☐ Yes ☐ No (*check one*)

11) Circle all of the following vectors that are perpendicular to $(6,-4)$. (*I – 2 marks*)

$(-6,4)$ $(12,18)$ $(-4,6)$ $(4,6)$ $(-4,-6)$ $(24,-16)$ $(-8,12)$ $(-2,-3)$

12) Consider the points $A(2,3,7)$, $B(1,7,15)$, $C(-4,3,17)$ and $D(-3,-1,9)$. Use vectors to prove that quadrilateral *ABCD* is a parallelogram, but **not** a rhombus. (Note: a rhombus is a parallelogram in which all sides have equal length.) (*I – 4 marks*)

13) How many vectors are needed to span $R^2$? What condition(s) must these vectors meet in order to span $R^2$? (*C – 2 marks*)

Number of vectors needed: _____ Condition(s): _____

14) How many vectors are needed to span $R^3$? What condition(s) must these vectors meet in order to span $R^3$? (*C – 2 marks*)

Number of vectors needed: _____ Condition(s): _____

15) During a deep discussion about 3-space, Katerina and Alberto were considering the vectors $\vec{u} = (4,0,5)$, $\vec{v} = (8,0,3)$ and $\vec{w} = (9,1,1)$. Without writing anything down, Katerina quickly claimed that the three vectors are coplanar and Alberto immediately responded that the three vectors are not coplanar. Who is correct? Explain. (*C – 2 marks*)