CATHOLIC EDUCATION WESTERN AUSTRALIA | ViSN Virtual School Network

2020 Year 11 ViSN Mathematics Specialist Unit 1 & 2
Test 2 – Vectors
Section One – Calculator Free

Mr Daniel Comtesse
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Calculator Free:_____/14
Calculator Assumed:_____/26

Result: _____/40 _____%

Student Name: _____

School: _____

Time allowed: Section One - 15 minutes
Section Two – 30 minutes

Assessment Date: Thursday Week 7, Term 1 – 19/02

Material required/recommended

To be provided by the supervisor
This Question/Answer Paper
SCSA Formula Sheet

To be provided by the candidate
Standard items: pens, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters

Submission Details
Timed Assessments are to be returned to the ViSN teacher by the ViSN mentor (scan completed assessment and email to teacher above) within 24 hours of assessment date (above).

Instructions to Students

1. **ALL** questions should be attempted.

2. Write your answers in the spaces provided in this Question/Answer Booklet.

3. **SHOW ALL YOUR WORKING CLEARLY**. Your working should be sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Correct answers given without supporting reasoning may not be allocated full marks. Incorrect answers given without supporting reasoning cannot be allocated any marks.

4. If you repeat an answer to any question, ensure that you cancel the answers you do not wish to have marked.

5. It is recommended that you **do not use pencil**, except in diagrams.

Question 1 **[2, 1, 1, 1, 2 = 7 marks]**

Given the vectors $\boldsymbol{a} = 4\boldsymbol{i} + 3\boldsymbol{j}$, $\boldsymbol{b} = 6\boldsymbol{i} + 2\boldsymbol{j}$ and $\boldsymbol{c} = 8\boldsymbol{i} + k\boldsymbol{j}$,

(a) Evaluate $|\boldsymbol{a} - \boldsymbol{b}|$ giving your answer in exact form.

(b) Find the magnitude of $\boldsymbol{b}$ giving your answer as an exact simplified surd.

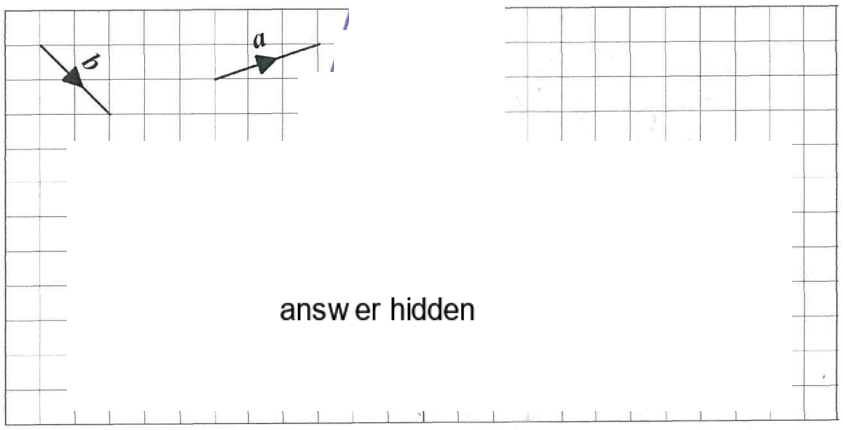
(c) Find k if $\boldsymbol{a}$ and $\boldsymbol{c}$ are parallel.

(d) Find an expression for $\boldsymbol{p}$, given that it has the same direction to $\boldsymbol{b}$, and has a magnitude of 1. You do not need to simplify your answer.

(e) Find a vector parallel to $\boldsymbol{a}$ with a magnitude of $\boldsymbol{b}$. You do not need to simplify your answer.

Question 2 **[3 marks]**

Two vectors, **a** and **b**, are shown on the grid below.



Draw and label the vectors **c**, **d** and **e** on the grid, where $\mathbf{c}=\mathbf{a}+\mathbf{b}$, $\mathbf{d}=2\mathbf{a}-2\mathbf{b}$ and $\mathbf{e}=\mathbf{b}-3\mathbf{a}$.

Question 3 **[4 marks]**

The point P divides the line segment from A(-2, 6) to B(4, 15) in the ratio 1:2. Determine the position vector of point P.

End of Section One

Extra working space

Question number _____.

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Calculator Assumed:_____/26

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Special items: CAS and/or scientific calculator, 1 A4 (one sided) page of notes.

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Question 6 **[2, 1 = 3 marks]**

Two forces are acting on a single point. One force is 21 N and the other force is 15 N. It is known that the angle between the forces is 34°.

(a) Find the magnitude of the resulting force.

(b) Find the angle at which this resultant force makes with the 21 N force.

Question 7 **[2, 2, = 4 marks]**

A helicopter is 35 km due West of its destination and can fly at 23 m/s in still air. A wind comes from the south at 6 m/s.

(a) At what bearing should the helicopter fly at so that the flight heads directly towards the destination.

(b) How long will it take to complete its journey?

Question 4 **[4 marks]**

Express the vector $12\boldsymbol{i} - 5\boldsymbol{j}$ in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$ if $\boldsymbol{a} = 2\boldsymbol{i} - 3\boldsymbol{j}$ and $\boldsymbol{b} = 5\boldsymbol{i} + 2\boldsymbol{j}$.

Question 5 **[2, 1, 1, 1, 2, 1 = 8 marks]**

OABC is a parallelogram with $\overrightarrow{OA} = \boldsymbol{a}$ and $\overrightarrow{OC} = \boldsymbol{c}$.

M is the midpoint of $\overrightarrow{AB}$.

N is a point on $\overrightarrow{OM}$ such that $\overrightarrow{ON} = 2\,\overrightarrow{NM}$

(a) Sketch a diagram to represent this information.

(b) Express the following vectors in terms of the vectors $\boldsymbol{a}$ and $\boldsymbol{c}$.

(i) $\overrightarrow{AO}$

(ii) $\overrightarrow{CA}$

(iii) $\overrightarrow{AM}$

(iv) $\overrightarrow{ON}$

(v) $\overrightarrow{CM}$

Question 8 **[4, 3 = 7 marks]**

Vector **a** has magnitude 6 units and acts on a bearing of 310°. Vector **b** has magnitude 12 units and acts on a bearing of 070°.

(a) Determine the magnitude and direction of $3\mathbf{a} + 2\mathbf{b}$.

(b) Determine the value of the constant k if the direction of $5\mathbf{a} + k\mathbf{b}$ is due north.

End of Assessment

Extra working space

Question number _____.