N5 APPLICATIONS 1.2

This resource is to support pupils in passing the appropriate National 5 Assessment Standard. The questions and marking schemes used are from SQA past papers and as such test the topics in their entirety from grade A to C and *may* include other areas from the course.

In addition the questions from **Paper 1 (P1)** should be completed **without** the use of a calculator and questions from **Paper 2 (P2)** permit the use of a calculator.

Each Assessment Standard is used to ensure pupils have the minimum competency on the specified sub-skills for the National 5 course. As such each Assessment Standard will test grade C work on that specific topic.

This resource is divided into two sections:

- Section A has an example on each sub skill for the relevant Assessment Standard and the marking scheme for these questions
- Section B has extra practice questions on this Assessment Standard and the marking scheme for these questions

Unit Assessment Standard	Sub skills	Section A – Question Number
Applications 1.2 Applying geometric skills to vectors	adding or subtracting two-dimensional vectors using directed line segments	Q1 (adding) Q2 (subtracting)
	determining the coordinates of a point from a diagram representing a 3D object	Q3
	adding or subtracting two- or three-dimensional vectors using components	Q4 (adding) Q5 (subtracting)

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \frac{1}{2}ab\sin C$

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

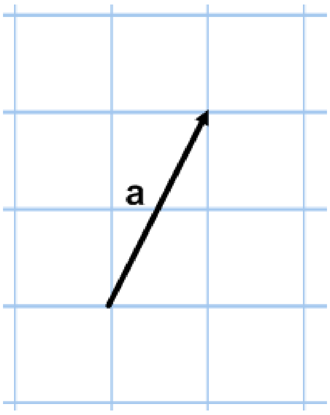
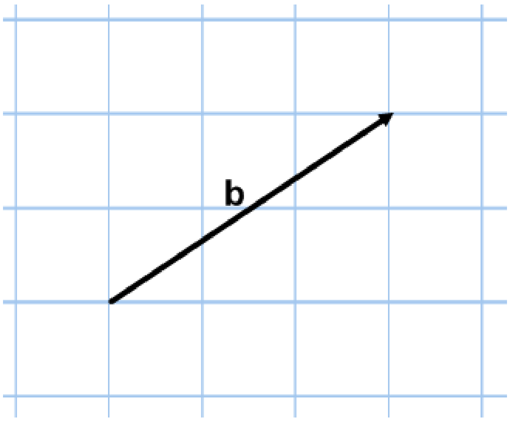
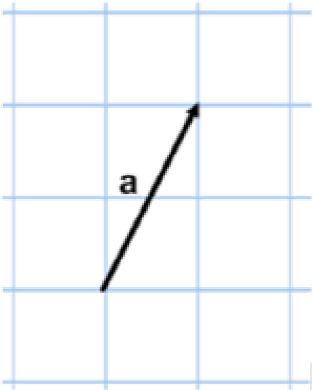
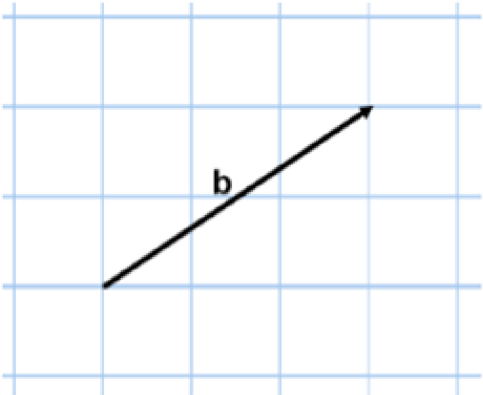
Volume of a cone: $V = \frac{1}{3}\pi r^2 h$

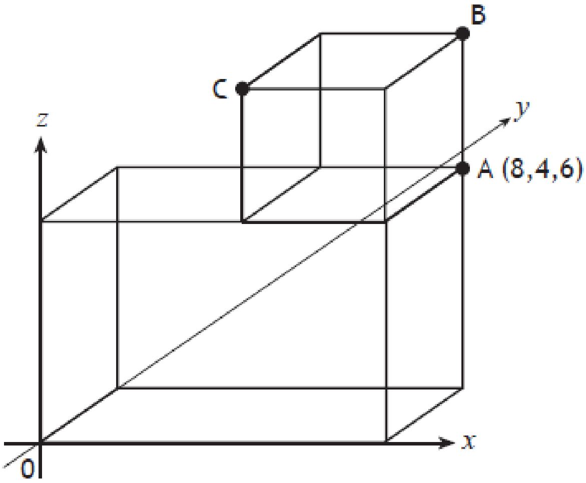
Volume of a pyramid: $V = \frac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x-\overline{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

Section A

Section A

<table>
<tr><th>Q</th><th></th><th>Marks</th></tr>
<tr><td>1
P1</td><td>The diagrams below show 2 directed line segments a and b.

Draw the resultant of a + 2b</td><td>3</td></tr>
<tr><td>2
P1</td><td>The diagrams below show 2 directed line segments a and b.

Draw the resultant of a - 2b</td><td>4</td></tr>
</table>

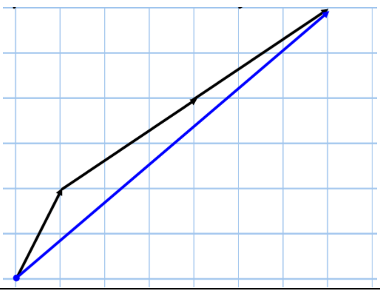
3 **P2**	2. The diagram shows a cube placed on top of a cuboid, relative to the coordinate axes.  A is the point (8,4,6). Write down the coordinates of B and C.	2
4 **P1**	4. Find the resultant vector $2\boldsymbol{u}+\boldsymbol{v}$ when $\boldsymbol{u}=\begin{pmatrix}-2\\3\\5\end{pmatrix}$ and $\boldsymbol{v}=\begin{pmatrix}0\\-4\\7\end{pmatrix}$. Express your answer in component form.	2
5 **P2**	4. Find the resultant vector $2\boldsymbol{u}-\boldsymbol{v}$ when $\boldsymbol{u}=\begin{pmatrix}-2\\3\\5\end{pmatrix}$ and $\boldsymbol{v}=\begin{pmatrix}0\\-4\\7\end{pmatrix}$. Express your answer in component form.	2
6 **P2**	7) Vector $\mathbf{u}=\begin{pmatrix}-1\\2\end{pmatrix}$ and vector $\mathbf{V}=\begin{pmatrix}-2\\4\end{pmatrix}$. Calculate $\lvert 4\mathbf{u}+3\mathbf{v}\rvert$.	

Section A

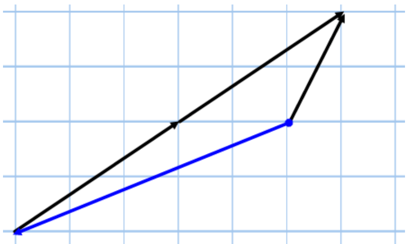
MARKING SCHEME

<table>
<tr><td></td><td><h1><u>Section A - MARKING SCHEME</u></h1></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>1</td><td>

Draws 2b
Applies head to tail when adding
Draws the resultant vector


</td><td>3</td></tr>
<tr><td>2</td><td>

Draws 2b
Changes direction for -2b
Applies head to tail when adding
Draws the resultant vector


</td><td>4</td></tr>
<tr><td>3</td><td>
<table>
<tr><th colspan="3">Question</th><th>Expected Answer(s)
Give one mark for each •</th><th>Max Mark</th><th>Illustrations of evidence for awarding a mark at each •</th></tr>
<tr><td>2.</td><td></td><td></td><td>Ans: B (8, 4, 10), C (4, 0, 10)

•[1] state coordinates of B

•[2] state coordinates of C</td><td>2</td><td>

•[1] (8, 4, 10)

•[2] (4, 0, 10)</td></tr>
<tr><td colspan="6">Notes:
1. For eg B(8, 4, 9) leading to C(4, 0, 9) award 1/2 ×✓
2. The maximum mark available is 1/2 where
(a) brackets are omitted
(b) answers are given in component form</td></tr>
</table>
</td><td></td></tr>
</table>

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Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
4.	Ans: $\begin{pmatrix}-4\\2\\17\end{pmatrix}$	2	
	•[1] calculate 2u		•[1] $\begin{pmatrix}-4\\6\\10\end{pmatrix}$
	•[2] solution		•[2] $\begin{pmatrix}-4\\2\\17\end{pmatrix}$

Notes:
1. Correct answer without working award 2/2.
2. Brackets not required
3. For $(-4, 2, 17)$ award 1/2
4. For subsequent invalid working, the final mark is not available.
   eg $9(-4+2+17)$, $\sqrt{309}$ (magnitude) award 1/2

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Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
4.	Ans: $\begin{pmatrix}-4\\10\\3\end{pmatrix}$	2	
	•[1] calculate 2u		•[1] $\begin{pmatrix}-4\\6\\10\end{pmatrix}$
	•[2] solution		•[2] $\begin{pmatrix}-4\\10\\3\end{pmatrix}$

Notes:
1. Correct answer without working award 2/2.
2. Brackets not required
3. For $(-4, 10, 3)$ award 1/2
4. For subsequent invalid working, the final mark is not available.
   eg $9(-4+10+3)$, $\sqrt{125}$ (magnitude) award 1/2

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7)	• 1 correct scalar multiplication then addition	• 1 $\begin{pmatrix}-4\\8\end{pmatrix} + \begin{pmatrix}-6\\12\end{pmatrix} = \begin{pmatrix}-10\\20\end{pmatrix}$
	• 2 calculate magnitude	• 2 $\sqrt{(-10)^2 + 20^2}$
	• 3 correct answer	• 3 $\sqrt{500}$

Section B

There are no past paper questions involving the topic of Vectors as this is a new topic to the National 5 course.