SQA Past paper questions

2024 - Paper 1 - Question 4

Given $\mathbf{a} = \begin{pmatrix} 3 \\ 4 \\ -1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 5 \\ 3 \\ 2 \end{pmatrix}$, find the resultant vector $3\mathbf{a} + \mathbf{b}$.

Express your answer in component form. 2

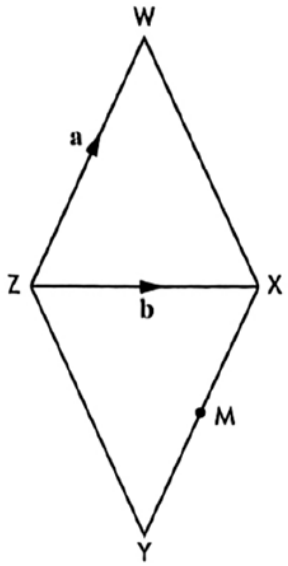
Click here for video solution.

2024 - Paper 2 - Question 14

The diagram shows a rhombus WXYZ with a diagonal ZX drawn.

$\overrightarrow{ZW}$ represents vector **a** and

$\overrightarrow{ZX}$ represents vector **b**.



(a) Express $\overrightarrow{WX}$ in terms of **a** and **b**. 1

M is the mid-point of XY.

(b) Express $\overrightarrow{WM}$ in terms of **a** and **b**.
Give your answer in its simplest form. 2

Click here for video solution.

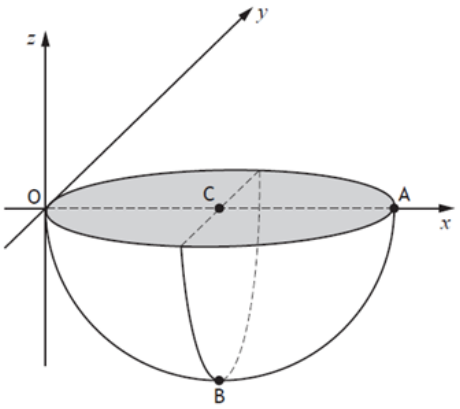
2021 - Paper 1 - Question 1

Calculate $|\mathbf{d}|$, the magnitude of vector $\mathbf{d} = \begin{pmatrix} 1 \\ -4 \\ 8 \end{pmatrix}$. 2

Click here for video solution.

2021 - Paper 1 - Question 14

The diagram shows a hemisphere relative to the coordinate axes.



- A is the point (6, 0, 0)
- C is the midpoint of diameter OA
- B is vertically below C

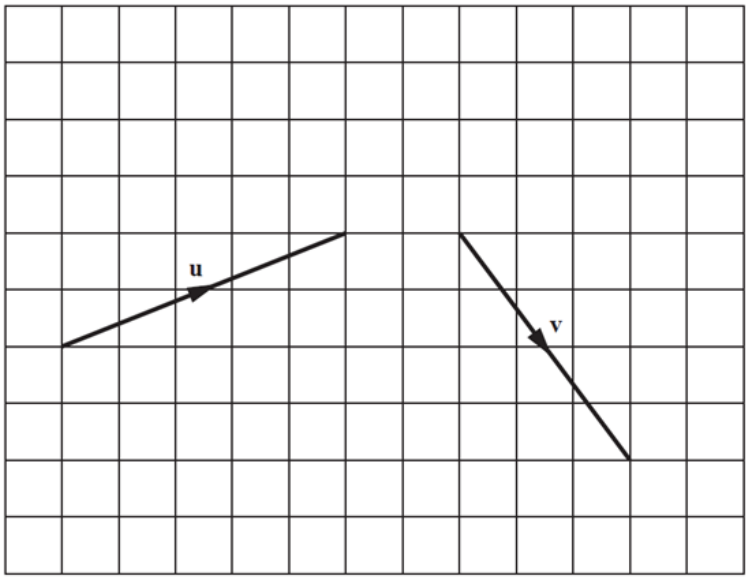
(a) State the coordinates of B. 1

(b) Calculate the volume of the hemisphere.
Give your answer in its simplest form in terms of π. 2

Click here for video solution.

2021 - Paper 2 - Question 5

The vectors $\mathbf{u}$ and $\mathbf{v}$ are shown in the diagram below.



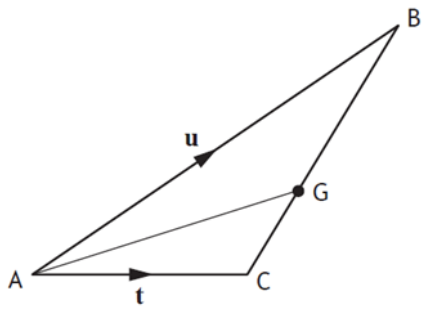
Find the resultant vector $\mathbf{u} - \mathbf{v}$.

Express your answer in component form. 2

Click here for video solution.

2021 - Paper 2 - Question 17

The triangle ABC is shown below



$\overrightarrow{AB} = \mathbf{u}$ and $\overrightarrow{AC} = \mathbf{t}$.

G is the point such that $CG = \frac{1}{3}CB$.

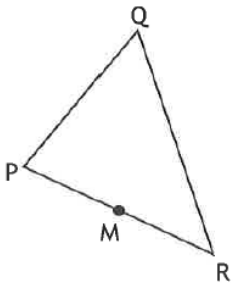
Express $\overrightarrow{AG}$ in terms of $\mathbf{u}$ and $\mathbf{t}$.

Give your answer in simplest form. **3**

Click here for video solution.

2019 - Paper 1 - Question 10

In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}$.



(a) Express $\overrightarrow{PQ}$ in component form. **1**

M is the midpoint of PR.

(b) Express $\overrightarrow{MQ}$ in component form. **2**

Click here for video solution.

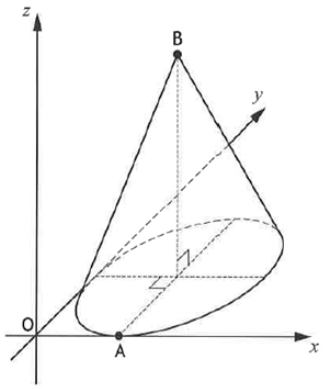
2019 - Paper 2 - Question 2

Find $|\mathbf{p}|$, the magnitude of vector $\mathbf{p} = \begin{pmatrix} 6 \\ 27 \\ -18 \end{pmatrix}$. **2**

Click here for video solution.

2019 - Paper 2 - Question 5

The diagram shows a cone with diameter 6 units and height 8 units.



- The x-axis and the y-axis are tangents to the base
- A is the point of contact between the base and the x-axis
- B is directly above the centre of the base

Write down the coordinates of A and B. **2**

Click here for video solution.

2018 - Paper 1 - Question 4

Two vectors are given by $\mathbf{u} = \begin{pmatrix} 1 \\ 5 \\ 1 \end{pmatrix}$ and $\mathbf{u} + \mathbf{v} = \begin{pmatrix} 6 \\ -4 \\ 3 \end{pmatrix}$.

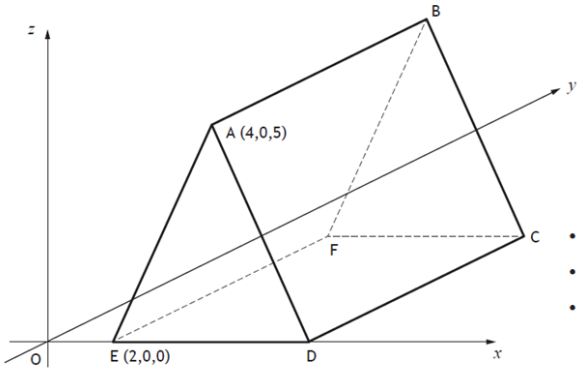
Find vector $\mathbf{v}$.

Express your answer in component form. **2**

Click here for video solution.

2018 - Paper 1 - Question 13

The diagram shows a triangular prism, ABCDEF, relative to the coordinate axes.



- AD = AE.
- DC = 8 units.
- Edges EF, DC and AB are parallel to the y-axis.

Write down the coordinates of B and C. **2**

Click here for video solution.

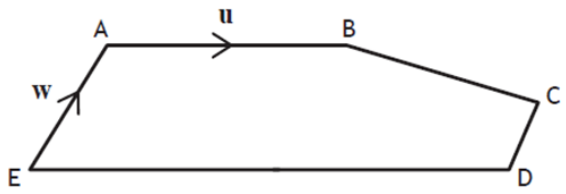
2018 - Paper 2 - Question 3

Find $|\mathbf{r}|$, the magnitude of vector $\mathbf{r} = \begin{pmatrix} 24 \\ -12 \\ 8 \end{pmatrix}$. 2

Click here for video solution.

2018 - Paper 2 - Question 10

In the diagram below, $\overrightarrow{AB}$ and $\overrightarrow{EA}$ represent the vectors $\mathbf{u}$ and $\mathbf{w}$ respectively.



- $\overrightarrow{ED} = 2\overrightarrow{AB}$
- $\overrightarrow{EA} = 2\overrightarrow{DC}$

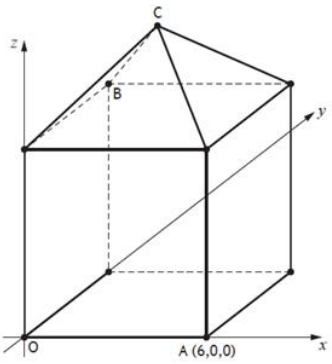
Express $\overrightarrow{BC}$ in terms of $\mathbf{u}$ and $\mathbf{w}$.

Give your answer in its simplest form. 2

Click here for video solution.

2017 - Paper 1 - Question 5

The diagram shows a square-based pyramid placed on top of a cube, relative to the coordinate axes.



The height of the pyramid is half of the height of the cube.

A is the point (6,0,0).

The point C is directly above the centre of the base.

Write down the coordinates of B and C. 2

Click here for video solution.

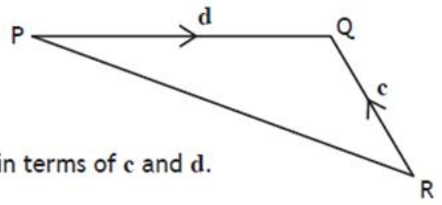
2017 - Paper 2 - Question 1

Find $|\mathbf{v}|$, the magnitude of vector $\mathbf{v} = \begin{pmatrix} 18 \\ -14 \\ 3 \end{pmatrix}$. 2

Click here for video solution.

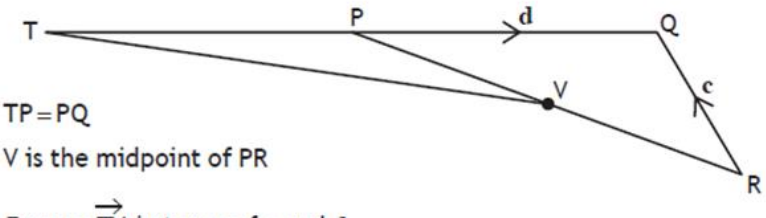
2017 - Paper 2 - Question 8

In the diagram below, $\overrightarrow{RQ}$ and $\overrightarrow{PQ}$ represent the vectors $\mathbf{c}$ and $\mathbf{d}$ respectively.



(a) Express $\overrightarrow{PR}$ in terms of $\mathbf{c}$ and $\mathbf{d}$.

The line QP is extended to T.



- TP = PQ
- V is the midpoint of PR

(b) Express $\overrightarrow{TV}$ in terms of $\mathbf{c}$ and $\mathbf{d}$.
Give your answer in simplest form.

Click here for video solution.

2016 - Paper 1 - Question 1

Given $\mathbf{p} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} -5 \\ -1 \end{pmatrix}$.

Find the resultant vector $\frac{1}{2}\mathbf{p} + \mathbf{q}$.

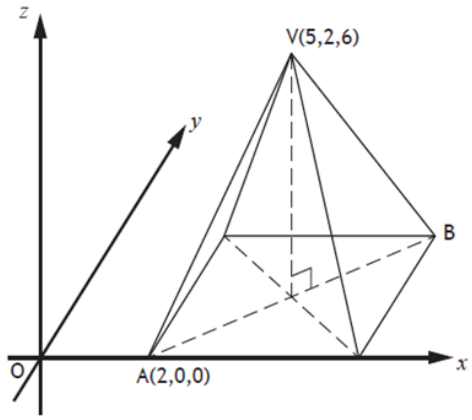
Express your answer in component form. 2

Click here for video solution

2016 - Paper 1 - Question 7

The diagram shows a rectangular based pyramid, relative to the coordinate axes.

- A is the point (2,0,0).
- V is the point (5,2,6).



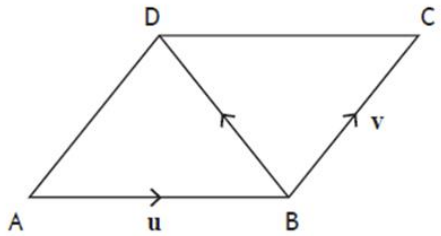
(a) Write down the coordinates of B. 1

(b) Calculate the length of edge AV of the pyramid. 3

Click here for video solution.

2016 - Paper 2 - Question 3

The diagram below shows parallelogram ABCD.



$\overrightarrow{AB}$ represents vector $\mathbf{u}$ and $\overrightarrow{BC}$ represents vector $\mathbf{v}$.

Express $\overrightarrow{BD}$ in terms of $\mathbf{u}$ and $\mathbf{v}$. 1

Click here for video solution.

2015 - Paper 2 - Question 4

Find $|\mathbf{u}|$, the magnitude of vector $\mathbf{u} = \begin{pmatrix} 6 \\ -13 \\ 18 \end{pmatrix}$. 2

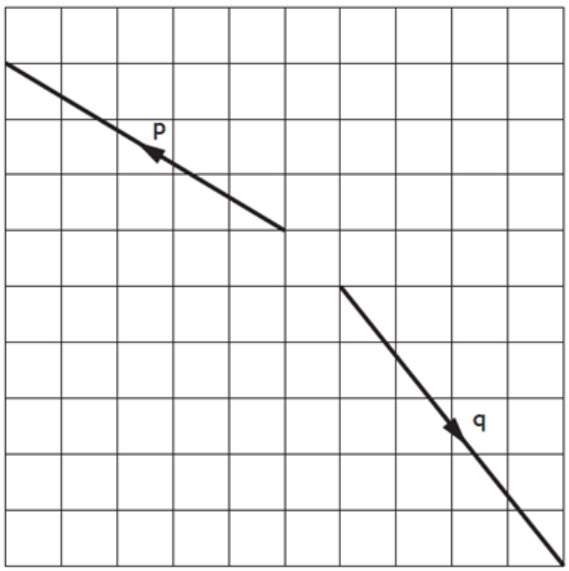
Click here for video solution.

2015 - Paper 2 - Question 5

The vectors p and q are shown in the diagram below.

Find the resultant vector p + q.

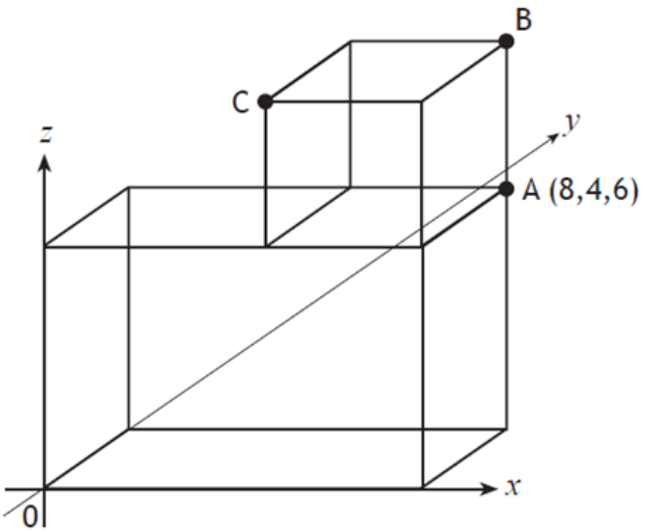
Express your answer in component form. 2



Click here for video solution.

2014 - Paper 2 - Question 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

Click here for video solution.

Specimen - Paper 1 - Question 3

Two forces acting on a rocket are represented by vectors $\mathbf{u}$ and $\mathbf{v}$.

$$\mathbf{u} = \begin{pmatrix} 2 \\ -5 \\ -3 \end{pmatrix} \text{ and } \mathbf{v} = \begin{pmatrix} 7 \\ 4 \\ -1 \end{pmatrix}.$$

Calculate $|\mathbf{u} + \mathbf{v}|$, the magnitude of the resultant force.

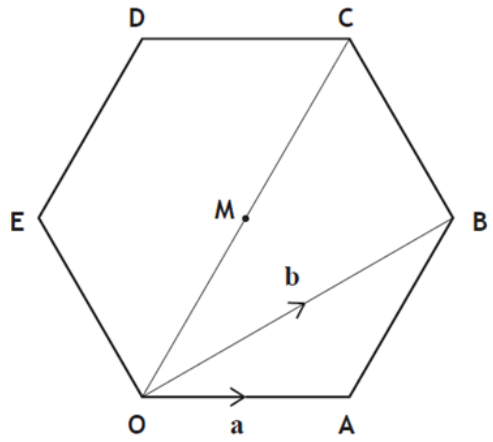
Express your answer as a surd in its simplest form. **3**

Click here for video solution.

Specimen - Paper 2 - Question 3

In the diagram, OABCDE is a regular hexagon with centre M.

Vectors $\mathbf{a}$ and $\mathbf{b}$ are represented by $\overrightarrow{OA}$ and $\overrightarrow{OB}$ respectively.



(a) Express $\overrightarrow{AB}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. **1**

(b) Express $\overrightarrow{OC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. **1**

Click here for video solution.