



National 5 Mathematics

Vectors - Solutions

Marks are indicated in brackets after each question number

2014 Paper 1 Question 4, (2)

$$\begin{aligned}2\underline{u} - \underline{v} &= 2\begin{pmatrix} -2 \\ 3 \\ 5 \end{pmatrix} - \begin{pmatrix} 0 \\ -4 \\ 7 \end{pmatrix} \\ &= \begin{pmatrix} -4 \\ 6 \\ 10 \end{pmatrix} - \begin{pmatrix} 0 \\ -4 \\ 7 \end{pmatrix} \\ &= \begin{pmatrix} -4 \\ 10 \\ 3 \end{pmatrix}\end{aligned}$$

2014 Paper 2 Question 2, (2)

$$B = (8, 4, 10)$$

$$C = (4, 0, 10)$$

2015 Paper 2 Question 4, (2)

$$\begin{aligned}|\underline{u}| &= \sqrt{6^2 + (-13)^2 + 18^2} \\ &= \sqrt{529} \\ &= 23\end{aligned}$$

2015 Paper 2 Question 5, (2)

$$\begin{aligned}\underline{p} &= \begin{pmatrix} -5 \\ 3 \end{pmatrix}, \underline{q} = \begin{pmatrix} 4 \\ -5 \end{pmatrix} \\ \underline{p} + \underline{q} &= \begin{pmatrix} -5 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ -5 \end{pmatrix} = \begin{pmatrix} -1 \\ -2 \end{pmatrix}\end{aligned}$$

2016 Paper 1 Question 1, (2)

$$\begin{aligned}\frac{1}{2}\underline{p} + \underline{q} &= \frac{1}{2}\begin{pmatrix} 4 \\ -6 \end{pmatrix} + \begin{pmatrix} -5 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} 2 \\ -3 \end{pmatrix} + \begin{pmatrix} -5 \\ -1 \end{pmatrix} \\ &= \begin{pmatrix} -3 \\ -4 \end{pmatrix}\end{aligned}$$



2016 Paper 2 Question 3, (1)

$$\overrightarrow{BD} = \underline{v} - \underline{u}$$

2017 Paper 2 Question 8, (1) (2)

a) $\overrightarrow{PR} = -\underline{d} - \underline{c}$

b)
$$\begin{aligned}\overrightarrow{TV} &= \overrightarrow{TP} + \frac{1}{2}\overrightarrow{PR} \\ &= -\underline{d} + \frac{1}{2}(-\underline{d} - \underline{c}) \\ &= -\frac{3}{2}\underline{d} - \frac{1}{2}\underline{c}\end{aligned}$$

2018 Paper 1 Question 13, (2)

$$B = (4, 8, 5)$$

$$C = (6, 8, 0)$$

2018 Paper 2 Question 3, (2)

$$\begin{aligned}|r| &= \sqrt{24^2 + (-12)^2 + 8^2} \\ &= \sqrt{784} \\ &= 28\end{aligned}$$

2018 Paper 2 Question 10, (2)

$$\begin{aligned}\overrightarrow{BC} &= \overrightarrow{BA} + \overrightarrow{AE} + \overrightarrow{ED} + \overrightarrow{DC} \\ &= -\underline{u} - \underline{w} + 2\underline{u} + \frac{1}{2}\underline{w} \\ &= \underline{u} - \frac{1}{2}\underline{w}\end{aligned}$$

2019 Paper 1 Question 10, (1) (2)

a)
$$\begin{aligned}\overrightarrow{PQ} &= \overrightarrow{PR} + \overrightarrow{RQ} \\ &= \begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} -1 \\ 8 \end{pmatrix} \\ &= \begin{pmatrix} 5 \\ 4 \end{pmatrix}\end{aligned}$$



$$\begin{aligned}\text{b) } \overrightarrow{MQ} &= \overrightarrow{MP} + \overrightarrow{PQ} \\ &= \frac{1}{2}\overrightarrow{RP} + \overrightarrow{PQ} \\ &= -\frac{1}{2}\overrightarrow{PR} + \overrightarrow{PQ} \\ &= -\frac{1}{2}\begin{pmatrix} 6 \\ -4 \end{pmatrix} + \begin{pmatrix} 5 \\ 4 \end{pmatrix} \\ &= \begin{pmatrix} -3 \\ 2 \end{pmatrix} + \begin{pmatrix} 5 \\ 4 \end{pmatrix} \\ &= \begin{pmatrix} 2 \\ 6 \end{pmatrix}\end{aligned}$$

2019 Paper 2 Question 2, (2)

$$\begin{aligned}|p| &= \sqrt{6^2 + 27^2 + (-18)^2} \\ &= \sqrt{1089} \\ &= 33\end{aligned}$$