FOUNDATION & HIGHER

SAME AT BOTH TIERS

Name ..... Class .....

G24: Translation vectors

Solve problems using column vectors for translations

20 marks · 25 minutes · Non-calculator

1) A translation maps $A(2, 3)$ to $(7, -1)$. The same translation maps B to $(0, 4)$. Find B.

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[Question 1: 2 marks]

2) A shape is translated by $\begin{pmatrix} a \\ b \end{pmatrix}$ and then by $\begin{pmatrix} 2a \\ 3b \end{pmatrix}$. The total translation is $\begin{pmatrix} 9 \\ 8 \end{pmatrix}$. Find a and b.

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[Question 2: 3 marks]

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3) A robot moves $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$, then $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$, then $\begin{pmatrix} 2 \\ -2 \end{pmatrix}$. How far is it from where it started?

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[Question 3: 3 marks]

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4) A is $(1, 1)$. B is the image of A under $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$ and C is the image of B under $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$. $ABCD$ is a square. Find its perimeter and area.

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[Question 4: 2 marks]

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5) A ship moves $\begin{pmatrix} 6 \\ 8 \end{pmatrix}$ km every hour. Find its position relative to the start after 2.5 hours and its distance from the start.

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[Question 5: 3 marks]

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6) P is $(-2, 5)$ and $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -7 \end{pmatrix}$. Find Q and the exact length of PQ.

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[Question 6: 3 marks]

7) The point $(1, 4)$ is translated by $k \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ onto the x-axis. Find k and the image.

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[Question 7: 4 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	$(-5, 8)$	Vector $(5, -4)$ (P1); A1.
2	$a = 3, b = 2$	$3a = 9$, $4b = 8$ (P1, P1); A1.
3	5	Total $(4, 3)$ (P1, P1); A1.
4	16; 16	Side 4 (P1); A1.
5	$(15, 20)$; 25 km	$2.5 \times (6, 8)$ (P1); A1; $\sqrt{225 + 400}$ (A1).
6	$(1, -2)$; $\sqrt{58}$	Q (A1); $\sqrt{9 + 49}$ (P1, A1).
7	4; $(9, 0)$	$4 - k = 0$ (P1, P1); $k = 4$ (A1); $(9, 0)$ (A1).