# Mark scheme

## Column vectors and magnitude

Mathematics 0580 · Questions from Paper 1, Paper 2 and Paper 4

Total marks

**45**

**MARKS FOR EACH QUESTION**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 2 | 3 | 4 | 4 | 4 | 5 | 5 | 14 | **45** |

### Question 1 [2]

| | | | | |
|---|---|---|---|---|
| **1** | **(a)** | $\begin{pmatrix}-1\\5\end{pmatrix}$ | **1** | |
| | **(b)** | $H$ marked at (–3,–3) | **1** | |

### Question 2 [2]

| | | | |
|---|---|---|---|
| **2**(a) | $\begin{pmatrix}-3\\-2\end{pmatrix}$ | **1** | |
| **2**(b) | $\begin{pmatrix}-2\\6\end{pmatrix}$ | **1** | |

### Question 3 [2]

| | | | |
|---|---|---|---|
| **3** | 5.83 or 5.830 to 5.831 | **2** | **M1** for $\sqrt{(-3)^2+5^2}$ |

### Question 4 [3]

| | | | |
|---|---|---|---|
| **4**(a) | (9, −4) | **1** | |
| **4**(b) | −5 | **2** | **M1** for $t^2 + 12^2 = 13^2$ oe<br>or **SC1** for answer 5 or ± 5 |

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**Question 5** **[4]**

| | | | | |
|---|---|---|---|---|
| **5** | **(a)** | $\begin{pmatrix}-7\\3\end{pmatrix}$ | **2** | **M1** for $\overrightarrow{CB}=\begin{pmatrix}-2\\-3\end{pmatrix}$<br>or<br>for correct route allow e.g. $BA - BC$, $CB + BA$ |
| | **(b)** | 7.81 or 7.810…. | **2** | **M1** for $\sqrt{(-5)^2+6^2}$ |

**Question 6** **[4]**

| | | | | |
|---|---|---|---|---|
| **6** | **(a)** | Point at (3, 5) | **1** | |
| | **(b)** | $\begin{pmatrix}1\\-3\end{pmatrix}$ | **1FT** | **FT** their $\overrightarrow{AC}$ |
| | **(c)** | $\begin{pmatrix}0\\4\end{pmatrix}$ or $\begin{pmatrix}0\\-4\end{pmatrix}$ | **2** | **M1** for a vector of magnitude 4 or of form $\begin{pmatrix}0\\\pm k\end{pmatrix}$ |

**Question 7** **[4]**

| | | | |
|---|---|---|---|
| **7**(a) | $\begin{pmatrix}14\\13\end{pmatrix}$ | **2** | **B1** for $\begin{pmatrix}14\\k\end{pmatrix}$ or for $\begin{pmatrix}k\\13\end{pmatrix}$ or for $\begin{pmatrix}22\\10\end{pmatrix}$ |
| **7**(b) | 24 | **2** | **M1** for $y + 5^2 = 7^2$ or better |

**Question 8** **[5]**

| | | | |
|---|---|---|---|
| **8**(a) | $\begin{pmatrix}24\\-9\end{pmatrix}$ | **1** | |
| **8**(b) | $\begin{pmatrix}-4\\32\end{pmatrix}$ | **1** | |
| **8**(c) | (9, –7) | **1** | |
| **8**(d) | 37 | **2** | **M1** for $(-12)^2 + 35^2$ oe |

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**Question 9** **[5]**

| | | | |
|---|---|---|---|
| **9**(a) | $\begin{pmatrix} 10 \\ -15 \end{pmatrix}$ | **1** | |
| **9**(b) | 10 | **4** | **B3** for answer ±10<br>OR<br>**M3** for $(-4-4)^2 + (0-6)^2$ oe or better<br>OR<br>**M2** for $\begin{pmatrix} -4 \\ 0 \end{pmatrix} - \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ oe<br>or **B1** for [$J$ =] (4, 6) soi or $\begin{pmatrix} -1 \\ -8 \end{pmatrix}$<br>**M1** for (*their* $-8)^2$ + (*their* $-6)^2$ oe or better |

**Question 10** **[14]**

| | | | |
|---|---|---|---|
| **10** | **(a) (i)** $\begin{pmatrix} -2 \\ -1 \end{pmatrix}$ | **1** | |
| | **(ii)** 7.28 [0] or $\pm\sqrt{53}$ as final answer | **2** | **M1** for $\sqrt{2^2 + (-7^2)}$ oe |
| | **(iii)** [$m$ = ] 3.5 oe and [$n$ = ] –1.5 oe | **6** | **B1** for $-2m + 2n = -10$ oe<br>and **B1** for $3m - 7n = 21$ oe<br>and **M1** for correct attempt to equate one set of coefficients and **M1dep** for elimination allow 1 arithmetic error overall<br>ft their sim eqns for both m's<br>or **M1** for correct rearrangement (allow 1 slip)<br>and **M1dep** for correct substitution<br>ft their sim eqns for both m's<br>and **A1** for 3.5 or –1.5 |
| | **(b) (i)** **–p** + **q** | **1** | Condone column vector used |
| | **(ii)** $-\frac{3}{5}$ **p** + $\frac{3}{5}$ **q** oe | **1 FT** | Correct or ft $\frac{3}{5}$ (their **(b)(i)**) dep on $ap + bq$, [$a \neq 0$, $b \neq 0$]<br>Condone column vector used |
| | **(iii)** Parallel<br>similar<br>9 : 25 oe | **1**<br>**1**<br>**1** | <br>Accept enlargement<br>e.g 1 : 2.77 [7] or 0.36 : 1 |

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