Oxford Revise | Edexcel A Level Maths | Answers

- Method (**M**) marks are awarded for showing you know a method and have attempted to apply it.
- Accuracy (**A**) marks should only be awarded if the relevant M marks have been awarded.
- Unconditional accuracy (**B**) marks are awarded independently of M marks. They do not rely on method.
- The abbreviation **o.e.** means 'or equivalent (and appropriate)'.

Please note that:

- efficient use of advanced calculators is expected
- inexact numerical answers should be given to three significant figures unless the question states otherwise; values from statistical tables should be quoted in full
- when a value of g is required, it is taken as $g = 9.8\ \text{m s}^{-2}$ unless stated otherwise in the question.

Chapter 26 Vectors

Question	Answer	Extra information	Marks
26.1	$\mathbf{q} = \mathbf{p} + \frac{1}{4}\overrightarrow{PR}$	Writing expression for **q**	M1
	$= \mathbf{p} + \frac{1}{4}(\mathbf{r} - \mathbf{p})$	Finding $\overrightarrow{PR}$	M1
	$= \frac{1}{4}(\mathbf{r} + 3\mathbf{p})$	Correct answer	A1
	Total		**3 marks**

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Question	Answer	Extra information	Marks
26.2 (a)	$\begin{pmatrix} 7 \\ 1 \\ -4 \end{pmatrix} - \begin{pmatrix} -5 \\ 2 \\ 6 \end{pmatrix} = \begin{pmatrix} 12 \\ -1 \\ -10 \end{pmatrix}$	**a** – **b**	M1
	$\mathbf{c} = \frac{1}{2}\begin{pmatrix} 12 \\ -1 \\ -10 \end{pmatrix}$	Dividing	M1
	$= \begin{pmatrix} 6 \\ -0.5 \\ -5 \end{pmatrix}$	Correct answer	A1
26.2 (b)	$\overrightarrow{AB} = \begin{pmatrix} -5 \\ 2 \\ 6 \end{pmatrix} - \begin{pmatrix} 7 \\ 1 \\ -4 \end{pmatrix} = \begin{pmatrix} -12 \\ 1 \\ 10 \end{pmatrix}$	Finding $\overrightarrow{AB}$	M1
	$\left\lvert\overrightarrow{AB}\right\rvert = \sqrt{(-12)^2 + 1^2 + 10^2}$	Use of Pythagoras' theorem	M1
	$= 7\sqrt{5}$	Correct answer	A1
	Total		**6 marks**
26.3 (a)	$\sqrt{12^2 + 4^2} = \sqrt{160}$	Use of Pythagoras' theorem	M1
	$= 4\sqrt{10}$	Correct answer. Must be exact.	A1

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Question	Answer	Extra information	Marks
26.3 (b)	$\tan^{-1}\left(\frac{6}{7}\right) = 40.6...°$ $180° - 40.6°\ldots = 139.4°$ (1 d.p.)	Use of inverse tan Correct answer	M1 A1
26.3 (c)	$\begin{pmatrix}12\\4\end{pmatrix}+\begin{pmatrix}-7\\6\end{pmatrix}+\begin{pmatrix}a\\b\end{pmatrix}=\begin{pmatrix}0\\0\end{pmatrix}$ $a = -5$, $b = -10$	Equilibrium equation Correct answers	M1 A1A1
	Total		**7 marks**
26.4 (a)	$3\mathbf{i} - 2\mathbf{j} - (4\mathbf{i} + 2\mathbf{j})$ $= -\mathbf{i} - 4\mathbf{j}$	Subtracting Correct answer	M1 A1
26.4 (b)	$\lvert\overrightarrow{AB}\rvert = \sqrt{20};\ \lvert\overrightarrow{AC}\rvert = \sqrt{13};\ \lvert\overrightarrow{BC}\rvert = \sqrt{17}$ $\cos BAC = \frac{\sqrt{20}+\sqrt{13}-\sqrt{17}}{2\sqrt{20}\sqrt{13}}$ $= 0.1226\ldots$ Hence $BAC = 82.956\ldots°$ Area $= \frac{1}{2}\sqrt{20}\sqrt{13}\sin 82.956...$ $= 8.00$ units^2 (3 s.f.)	Valid strategy for finding area Correct area	M1 A1
	Total		**4 marks**

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Question	Answer	Extra information	Marks
26.5 (a)	$\sqrt{7^2+(-8)^2}$ $=\sqrt{113}$	Use of Pythagoras' theorem Correct answer	M1 A1
26.5 (b)	$\tan^{-1}\left(\frac{8}{7}\right)=48.8°$ $90° - 48.8° = 41.2°$ Or $\tan^{-1}\left(\frac{7}{8}\right)=41.2°$	Use of inverse tan Correct answer	M1 A1
26.5 (c)	$\frac{7}{\sqrt{113}}\mathbf{a}-\frac{8}{\sqrt{113}}\mathbf{b}$	Dividing by their (a)	M1A1
	Total		**6 marks**
26.6	$\sqrt{4^2+q^2}=7$ $q^2 = 49 - 16 = 33$ $q = \sqrt{33}$	Use of Pythagoras' theorem Attempting to rearrange Correct answer	M1 M1 A1
	Total		**3 marks**
26.7 (a)	$\sqrt{30^2+12^2}$ $=6\sqrt{29}$ (m s^{-1})	Use of Pythagoras' theorem Correct answer	M1 A1

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Question	Answer	Extra information	Marks
26.7 (b)	$\tan^{-1}\left(\frac{12}{30}\right)$ $= 21.8°$ (1 d.p.)	Use of inverse tan Correct answer	M1 A1
	Total		**4 marks**
26.8	Ratio **b** : **a** = 9 : 7 $p = 9 \times 6 \div 7$ $= \frac{54}{7}$	Use of ratio. Can be assumed from correct scaling. Scaling to find p Correct answer	M1 M1 A1
	Total		**3 marks**
26.9 (a)	$\sqrt{12^2 + (-7)^2 + 8^2}$ $= \sqrt{257}$	Use of Pythagoras' theorem Correct answer	M1 A1
26.9 (b)	$\cos\theta_x = \frac{12}{\sqrt{257}}$ Hence $\theta_x = \cos^{-1}\left(\frac{12}{\sqrt{257}}\right)$ $= 41.5°$ (1 d.p.)	Vector cosine for x Use of inverse cosine Correct answer	M1 M1 A1
	Total		**5 marks**

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Question	Answer	Extra information	Marks
26.10 (a)	$\overrightarrow{AB} = \begin{pmatrix} -3 \\ 2 \\ 1 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ 6 \end{pmatrix}$	Use of resultant vector	M1
	$= \begin{pmatrix} -4 \\ 0 \\ -5 \end{pmatrix}$	Correct answer	A1
26.10 (b)	$\overrightarrow{BC} = \begin{pmatrix} 4 \\ 0 \\ 2 \end{pmatrix} - \begin{pmatrix} -3 \\ 2 \\ 1 \end{pmatrix} = \begin{pmatrix} 7 \\ -2 \\ 1 \end{pmatrix}$	Finding the other two sides	M1
	$\overrightarrow{AC} = \begin{pmatrix} 4 \\ 0 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \\ 6 \end{pmatrix} = \begin{pmatrix} 3 \\ -2 \\ -4 \end{pmatrix}$		
	$\left\lvert\overrightarrow{AB}\right\rvert = \sqrt{41}$	Use of Pythagoras' theorem	M1
	$\left\lvert\overrightarrow{BC}\right\rvert = \sqrt{54}$	Any one length correct	A1
	$\left\lvert\overrightarrow{AC}\right\rvert = \sqrt{29}$		
	All the sides are different lengths; hence the triangle is scalene.	All lengths correct and correct conclusion	A1
	Total		**6 marks**
26.11 (a)	$-\mathbf{a}$	Correct answer	B1
26.11 (b)	$\mathbf{a} + \mathbf{d}$	Adding	M1A1

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Question	Answer	Extra information	Marks
26.11 (c)	$\overrightarrow{PB} = \frac{1}{3}\mathbf{a}$	Either *PB* or *BQ* correct	B1
	$\overrightarrow{BQ} = \frac{3}{4}\mathbf{d}$	Both *PB* and *BQ* correct	B1
	Hence $\overrightarrow{PQ} = \frac{1}{3}\mathbf{a} + \frac{3}{4}\mathbf{b}$	Adding	M1A1
	Total		**7 marks**
26.12 (a)	$\sqrt{13^2 + (-11)^2}$	Use of Pythagoras' theorem	M1
	$= \sqrt{290}$ (km) [= 17.0 (3 s.f.)]	Correct answer	A1
26.12 (b)	$\tan^{-1}\left(\frac{11}{13}\right) = 40.23...°$	Use of inverse tan	M1
	Hence bearing = 90° + 40.23°…	Converting to bearing	M1
	= 130.2° (1 d.p.)	Correct answer	A1
26.12 (c)	$\frac{\sqrt{290}}{3}$	Use of distance ÷ time	M1
	= 5.68 (km h^{-1}) (3 s.f.)	Correct answer	A1
	Total		**7 marks**

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Question	Answer	Extra information	Marks
26.13 (a)	$\overrightarrow{PQ} = \begin{pmatrix} -1 \\ 5 \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ -2 \\ 7 \end{pmatrix}$	Finding resultant vector	M1
	$= \begin{pmatrix} -5 \\ 7 \\ -4 \end{pmatrix}$	Correct resultant	A1
26.13 (b)	$\left\|\overrightarrow{OP}\right\| = \sqrt{69}$; $\left\|\overrightarrow{OQ}\right\| = \sqrt{35}$; $\left\|\overrightarrow{PQ}\right\| = 3\sqrt{10}$	Finding lengths	M1
	$\cos POQ = \dfrac{\sqrt{69} + \sqrt{35} - 3\sqrt{10}}{2\sqrt{69}\sqrt{35}}$ $= 0.04818...$	Use of cosine rule	M1
	Hence $POQ = 87.2°$ (1 d.p.)	Correct answer	A1
	Total		**5 marks**

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Question	Answer	Extra information	Marks
26.14	$\overrightarrow{BC} = \begin{pmatrix} 8 \\ 4 \\ 9 \end{pmatrix} - \begin{pmatrix} 2 \\ 7 \\ 2 \end{pmatrix} = \begin{pmatrix} 6 \\ -3 \\ 7 \end{pmatrix}$	Finding resultant vector	M1
	$\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AD}$ $= \overrightarrow{OA} + \overrightarrow{BC}$	Use of a suitable vector equation	M1
	$= \begin{pmatrix} 7 \\ 3 \\ 1 \end{pmatrix} + \begin{pmatrix} 6 \\ -3 \\ 7 \end{pmatrix} = \begin{pmatrix} 13 \\ 0 \\ 8 \end{pmatrix}$	Adding	M1
	Hence $D(13, 0, 8)$	Correct answer. Must be given as coordinates.	A1
	Total		**4 marks**

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Question	Answer	Extra information	Marks
26.15	$\overrightarrow{AB} = \begin{pmatrix} -1 \\ -7 \\ 3 \end{pmatrix} - \begin{pmatrix} 2 \\ 3 \\ 5 \end{pmatrix} = \begin{pmatrix} -3 \\ -10 \\ -2 \end{pmatrix}$	Finding the resultant vector	M1
	Hence $\overrightarrow{AC} = 3\begin{pmatrix} -3 \\ -10 \\ -2 \end{pmatrix}$	Multiplying by 3	M1
	$= \begin{pmatrix} -9 \\ -30 \\ -6 \end{pmatrix}$	Correct $\overrightarrow{AC}$	A1
	$\overrightarrow{OC} = \overrightarrow{OA} + \overrightarrow{AC}$ Hence $\overrightarrow{OC} = \begin{pmatrix} 2 \\ 3 \\ 5 \end{pmatrix} + \begin{pmatrix} -9 \\ -30 \\ -6 \end{pmatrix} = \begin{pmatrix} -7 \\ -27 \\ -1 \end{pmatrix}$		
	Hence $C(-7, -27, -1)$	Correct answer. Must be given as a coordinates.	A1
	Total		**4 marks**

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Question	Answer	Extra information	Marks
26.16	$\int \frac{y}{1+y^2}\,\mathrm{d}y = \int \frac{x}{1-x^2}\,\mathrm{d}x$	Separating the variables	M1A1
	$\frac{1}{2}\ln\left\|1+y^2\right\| = -\frac{1}{2}\ln\left\|1-x^2\right\| + c$	Attempting to integrate	M1A1
	$\frac{1}{2}\ln 10 = -\frac{1}{2}\ln 1 + c \Rightarrow c = \frac{1}{2}\ln 10$	Attempting to find c	M1A1
	$\ln\left\|1+y^2\right\| = \ln 10 - \ln\left\|1-x^2\right\|$ $= \ln\left\|\frac{10}{1-x^2}\right\|$		
	$1 + y^2 = \frac{10}{1-x^2}$	Attempting to rearrange	M1
	Hence $y = \sqrt{\frac{10}{1-x^2} - 1}$	Correct answer	A1
	Total		**8 marks**
26.17 (a)	f(0.8) = –0.0717… f(0.9) = 0.1541…	Evaluating	M1
	Since there is a change of sign and f is continuous on the given interval, there is at least one root in the interval.	Correct conclusion	A1

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Question	Answer	Extra information	Marks
26.17 (b)	$f'(x) = 1 + 3x^2 \sin(x^3)$ Hence $x_1 = 0.8 - \frac{0.8 - \cos(0.8^3)}{1 + 3(0.8^2)\sin(0.8^3)}$ $= 0.8369\ldots$ $= 0.84$ (2 d.p.)	Attempting to find f′ Use of iteration formula with their f″ Correct answer	M1 M1 A1
26.17 (c)	$f(0.835) = -0.00026\ldots$ $f(0.845) = 0.02156\ldots$ There is a change of sign in the given interval, so $\alpha = 0.84$ correct to 2 decimal places.	Choosing interval and attempting to evaluate Correct conclusion	M1 A1
	Total		**7 marks**

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