| Question number | Scheme | Marks | |
|---|---|---|---|
| 4. | (a) $m = \frac{4-(-3)}{-6-8}$ or $\frac{-3-4}{8-(-6)}$, $= \frac{7}{-14}$ or $\frac{-7}{14}$ $\left(=-\frac{1}{2}\right)$ | M1, A1 | |
| | Equation: $y-4=-\frac{1}{2}(x-(-6))$ or $y-(-3)=-\frac{1}{2}(x-8)$ | M1 | |
| | $x+2y-2=0$ (or equiv. with <u>integer</u> coefficients… must have '= 0') | A1 | (4) |
| | (e.g. $14y+7x-14=0$ and $14-7x-14y=0$ are acceptable) | | |
| | (b) $(-6-8)^2+(4-(-3))^2$ | M1 | |
| | $14^2+7^2$ or $(-14)^2+7^2$ or $14^2+(-7)^2$ (M1 A1 may be implied by 245) | A1 | |
| | $AB=\sqrt{14^2+7^2}$ or $\sqrt{7^2(2^2+1^2)}$ or $\sqrt{245}$ | | |
| | $7\sqrt{5}$ | A1cso | (3) |
| | | | **7** |
| | (a) 1st M: Attempt to use $m=\frac{y_2-y_1}{x_2-x_1}$ (may be implicit in an equation of $L$).<br>2nd M: Attempting straight line equation in any form, e.g $y-y_1=m(x-x_1)$, $\frac{y-y_1}{x-x_1}=m$, with any value of $m$ (except 0 or $\infty$) and either (–6, 4) or (8, –3).<br>N.B. It is also possible to use a different point which lies on the line, such as the midpoint of $AB$ (1, 0.5).<br>Alternatively, the 2nd M may be scored by using $y=mx+c$ with a numerical gradient and substituting (–6, 4) or (8, –3) to find the value of $c$.<br>Having coords the <u>wrong way round</u>, e.g. $y-(-6)=-\frac{1}{2}(x-4)$, loses the 2nd M mark <u>unless</u> a correct general formula is seen, e.g. $y-y_1=m(x-x_1)$.<br>(b) M: Attempting to use $(x_2-x_1)^2+(y_2-y_1)^2$.<br><u>Missing bracket</u>, e.g. $-14^2+7^2$ implies M1 if no earlier version is seen.<br>$-14^2+7^2$ with no further work would be M1 A0.<br>$-14^2+7^2$ followed by 'recovery' can score full marks. | | |

| Question number | Scheme | Marks |
|---|---|---|
| 10. (a) | $QR = \sqrt{(7-1)^2 + (0-3)^2}$ | M1 |
| | $= \sqrt{36+9}$ or $\sqrt{45}$ (condone $\pm$ ) | A1 |
| | $= 3\sqrt{5}$ or $a = 3$ ($\pm 3\sqrt{5}$ etc is A0) | A1 (3) |
| (b) | Gradient of $QR$ (or $l_1$) = $\frac{3-0}{1-7}$ or $\frac{3}{-6}$, $= -\frac{1}{2}$ | M1, A1 |
| | Gradient of $l_2$ is $-\frac{1}{-\frac{1}{2}}$ or 2 | M1 |
| | Equation for $l_2$ is: $y - 3 = 2(x-1)$ or $\frac{y-3}{x-1} = 2$ [or $y = 2x + 1$] | M1 A1ft (5) |
| (c) | $P$ is (0, 1) (allow "$x = 0, y = 1$" but it must be clearly identifiable as $P$) | B1 (1) |
| (d) | $PQ = \sqrt{(1-x_P)^2 + (3-y_P)^2}$ | M1 |
| | $PQ = \sqrt{1^2 + 2^2} = \sqrt{5}$ | A1 |
| | Area of triangle is $\frac{1}{2}QR \times PQ = \frac{1}{2}3\sqrt{5} \times \sqrt{5}, = \frac{15}{2}$ or 7.5 | dM1, A1 (4) |
| | **Determinant Method**<br>e.g.(0+0+7) - (1+21+0)<br>= - 15 (o.e.)<br>Area = $\frac{1}{2}\lvert -15 \rvert$, = 7.5 | |
| | | **13** |

Rules for quoting formula: For an M mark, if a correct formula is quoted and some correct substitutions seen then M1 can be awarded, if no values are correct then M0. If no correct formula is seen then M1 can only be scored for a fully correct expression.

**(a)**
M1 for attempting $QR$ or $QR^2$. May be implied by $6^2 + 3^2$
1st A1 for as printed or better. Must have square root. Condone $\pm$

**(b)**
1st M1 for attempting gradient of $QR$
1st A1 for - 0.5 or $-\frac{1}{2}$, can be implied by gradient of $l_2 = 2$
2nd M1 for an attempt to use the perpendicular rule on their gradient of $QR$.
3rd M1 for attempting equation of a line using $Q$ with their changed gradient.
2nd A1ft requires all 3 Ms but can ft their gradient of $QR$.

> $y = 2x + 1$ with no working. Send to review.

**(d)**
1st M1 for attempting $PQ$ or $PQ^2$ follow through their coordinates of $P$
1st A1 for $PQ$ as one of the given forms.
2nd dM1 for correct attempt at area of the triangle. Follow through their value of $a$ and their $PQ$. This M mark is dependent upon the first M mark
2nd A1 for 7.5 or some exact equivalent. Depends on both Ms. Some working must be seen.

**ALT**
Use $QS$ where $S$ is (1, 0)
1st M1 for attempting area of $OPQS$ and $QSR$ and $OPR$. Need all 3.
1st A1 for $OPQS = \frac{1}{2}(1+3) \times 1 = 2$, $QSR = 9$, $OPR = \frac{7}{2}$
2nd dM1 for $OPQS + QSR - OPR = \ldots$ Follow through their values.
2nd A1 for 7.5

> **Determinant Method**
> M1 for attempt -at least one value in each bracket correct .
> A1 if correct ($\pm$ 15)
> M1 for correct area formula
> A1 for 7.5

**MR**
Misreading $x$-axis for $y$-axis for $P$. Do NOT use MR rule as this oversimplifies the question. They can only get M marks in (d) if they use $PQ$ and $QR$.

| Question Number | Scheme | Marks |
|---|---|---|
| **10** (a) | $y-5=-\frac{1}{2}(x-2)$ or equivalent, e.g. $\frac{y-5}{x-2}=-\frac{1}{2}$, $y=-\frac{1}{2}x+6$ | M1A1, A1cao (3) |
| (b) | $x=-2 \Rightarrow y=-\frac{1}{2}(-2)+6 = 7$ (therefore $B$ lies on the line)<br>(or equivalent verification methods) | B1 (1) |
| (c) | $(AB^2 =)\ (2--2)^2+(7-5)^2$, $=16+4=20$, $AB=\sqrt{20}=2\sqrt{5}$ | M1, A1, A1 (3) |
| (d) | $C$ is $(p,\ -\frac{1}{2}p+6)$, so $AC^2=(p-2)^2+\left(-\frac{1}{2}p+6-5\right)^2$<br>Therefore $25=p^2-4p+4+\frac{1}{4}p^2-p+1$<br>$25=1.25p^2-5p+5$ or $100=5p^2-20p+20$ (or better, RHS simplified to 3 terms)<br>Leading to: $0=p^2-4p-16$ (*) | M1<br>M1<br>A1<br>A1cso (4)<br>**[11]** |
| (a)<br><br><br><br><br><br>(b)<br><br><br><br>(c)<br><br><br><br>(d) | M1 A1 The version in the scheme above can be written down directly (for 2 marks), and M1 A0 can be allowed if there is just one slip (sign or number).<br>If the 5 and 2 are the wrong way round the M mark can still be given if a correct formula (e.g. $y-y_1=m(x-x_1)$) is seen, otherwise M0.<br>If (2, 5) is substituted into $y=mx+c$ to find $c$, the M mark is for attempting this and the 1st A mark is for $c=6$.<br>Correct answer without working or from a sketch scores full marks.<br>A conclusion/comment is not required, except when the method used is to establish that the line through $(-2,7)$ with gradient $-\frac{1}{2}$ has the same eqn. as found in part (a), or to establish that the line through $(-2,7)$ and $(2,5)$ has gradient $-\frac{1}{2}$. In these cases a comment 'same equation' or 'same gradient' or 'therefore on same line' is sufficient.<br>M1 for attempting $AB^2$ or $AB$. Allow one slip (sign or number) <u>inside</u> a bracket, i.e. do <u>not</u> allow $(2--2)^2-(7-5)^2$.<br>1st A1 for 20 (condone bracketing slips such as $-2^2=4$)<br>2nd A1 for $2\sqrt{5}$ or $k=2$ (Ignore ± here).<br>1st M1 for $(p-2)^2+(\text{linear function of } p)^2$. The linear function may be unsimplified but must be equivalent to $ap+b,\ a\neq 0,\ b\neq 0$.<br>2nd M1 (dependent on 1st M) for forming an equation in $p$ (using 25 or 5) and attempting (perhaps not very well) to multiply out both brackets.<br>1st A1 for collecting like $p$ terms and having a correct expression.<br>2nd A1 for correct work leading to printed answer.<br><u>Alternative, using the result</u>:<br>Solve the quadratic $(p=2\pm 2\sqrt{5})$ and use one or both of the two solutions to find the length of $AC^2$ or $C_1C_2{}^2$: e.g. $AC^2=(2+2\sqrt{5}-2)^2+(5-\sqrt{5}-5)^2$ scores 1st M1, and 1st A1 if fully correct.<br>Finding the length of $AC$ or $AC^2$ for both values of $p$, or finding $C_1C_2$ with some evidence of halving (or intending to halve) scores the 2nd M1.<br>Getting $AC=5$ for both values of $p$, or showing $\frac{1}{2}C_1C_2=5$ scores the 2nd A1 (cso). | |

| Question Number | Scheme | Marks |
|---|---|---|
| Q8 (a) | $AB$: $m = \frac{2-7}{8-6}$, $\left(= -\frac{5}{2}\right)$ | B1 |
| | Using $m_1 m_2 = -1$: $m_2 = \frac{2}{5}$ | M1 |
| | $y - 7 = \frac{2}{5}(x-6)$, $2x - 5y + 23 = 0$ (o.e. with integer coefficients) | M1, A1 (4) |
| (b) | Using $x = 0$ in the answer to (a), $y = \frac{23}{5}$ or 4.6 | M1, A1ft (2) |
| (c) | Area of triangle = $\frac{1}{2} \times 8 \times \frac{23}{5} = \frac{92}{5}$ (o.e) e.g. $\left(18\frac{2}{5},\ 18.4,\ \frac{184}{10}\right)$ | M1 A1 (2) |
| | | **[8]** |
| (a)<br><br><br><br><br><br><br><br><br>(b)<br><br><br><br><br><br><br><br><br>(c) | B1 for an expression for the gradient of $AB$. Does not need the $= -2.5$<br>1st M1 for use of the perpendicular gradient rule. Follow through their $m$<br>2nd M1 for the use of (6, 7) and their changed gradient to form an equation for $l$.<br>Can be awarded for $\frac{y-7}{x-6} = \frac{2}{5}$ o.e.<br>Alternative is to use (6, 7) in $y = mx + c$ to <u>find a value</u> for $c$. Score when $c = \ldots$ is reached.<br>A1 for a correct equation in the required form and must have "= 0" and integer coefficients<br>M1 for using $x = 0$ in their answer to part (a) e.g. $-5y + 23 = 0$<br>A1ft for $y = \frac{23}{5}$ provided that $x = 0$ clearly seen <u>or</u> $C$ (0, 4.6). Follow through their equation in (a)<br>If $x = 0$, $y = 4.6$ are clearly seen but $C$ is given as (4.6,0) apply ISW and award the mark.<br>This A mark requires a simplified fraction or an exact decimal<br>Accept their 4.6 marked on diagram next to $C$ for M1A1ft<br>M1 for $\frac{1}{2} \times 8 \times y_C$ so can follow through their $y$ coordinate of $C$.<br>A1 for 18.4 (o.e.) but their $y$ coordinate of $C$ must be positive<br><br><u>Use of 2 triangles or trapezium and triangle</u><br>Award M1 when an expression for area of $OCB$ only is seen<br><br><u>Determinant approach</u><br>Award M1 when an expression containing $\frac{1}{2} \times 8 \times y_C$ is seen | |

| Question number | Scheme | Marks |
| --- | --- | --- |
| Q3 | (a) Putting the equation in the form $y = mx\ (+c)$ <u>and</u> attempting to extract the $m$ or $mx$ (<u>not</u> the $c$),<br>or finding 2 points on the line and using the correct gradient formula.<br>Gradient = $-\frac{3}{5}$ (or equivalent) | M1<br><br>A1<br>(2) |
| | (b) Gradient of perp. line = $\frac{-1}{"\left(-\frac{3}{5}\right)"}$ (Using $-\frac{1}{m}$ with the $m$ from part (a))<br>$y-1="\left(\frac{5}{3}\right)"(x-3)$<br>$y=\frac{5}{3}x-4$ (Must be in this form... allow $y=\frac{5}{3}x-\frac{12}{3}$ but not $y=\frac{5x-12}{3}$)<br>This A mark is dependent upon <u>both</u> M marks. | M1<br>M1<br>A1<br>(3)<br>**[5]** |
| | (a) Condone sign errors and ignore the $c$ for the M mark, so...<br>both marks can be scored even if $c$ is wrong (e.g. $c=-\frac{2}{5}$) or omitted.<br><u>Answer only</u>: $-\frac{3}{5}$ scores M1 A1. Any other <u>answer only</u> scores M0 A0.<br>$y=-\frac{3}{5}x+\frac{2}{5}$ with no further progress scores M0 A0 ($m$ or $mx$ not extracted).<br>(b) 2nd M: For the equation, in any form, of a straight line through (3, 1) with <u>any</u> numerical gradient (except 0 or ∞).<br>(Alternative is to use (3, 1) in $y = mx + c$ to <u>find a value</u> for $c$, in which case $y=\frac{5}{3}x+c$ leading to $c=-4$ is sufficient for the A1).<br>(See general principles for straight line equations at the end of the scheme). | |

| Question Number | Scheme | Marks | |
|---|---|---|---|
| **8.** | | | |
| **(a)** | $m_{AB} = \frac{4-0}{7-2} \quad \left(= \frac{4}{5}\right)$ | M1 | |
| | Equation of $AB$ is: $y - 0 = \frac{4}{5}(x-2)$ or $y - 4 = \frac{4}{5}(x-7)$ (o.e.) | M1 | |
| | $\underline{4x - 5y - 8 = 0}$ (o.e.) | A1 | (3) |
| **(b)** | $(AB =)\sqrt{(7-2)^2 + (4-0)^2}$ | M1 | |
| | $= \sqrt{41}$ | A1 | (2) |
| **(c)** | Using isos triangle with $AB = AC$ then $t = 2 \times y_A = 2 \times 4 = 8$ | B1 | (1) |
| **(d)** | Area of triangle = $\frac{1}{2} t \times (7-2)$ | M1 | |
| | $= \underline{20}$ | A1 | (2) |
| | | | **8** |
| | **Notes** | | |
| **(a)** | **Apply the usual rules for quoting formulae here.**<br>For a correctly quoted formula with some correct substitution award M1<br>If no formula is quoted then a fully correct expression is needed for the M mark<br>1st M1 for attempt at gradient of $AB$. Some correct substitution in correct formula.<br>2nd M1 for an attempt at equation of $AB$. Follow through their gradient, not e.g. $-\frac{1}{m}$<br>Using $y = mx + c$ scores this mark when $c$ is found.<br>Use of $\frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$ scores 1st M1 for denominator, 2nd M1 for use of a correct point<br>A1 requires integer form but allow $5y + 8 = 4x$ etc. Must have an "=" or A0 | | |
| **(b)** | M1 for an expression for $AB$ or $AB^2$. Ignore what is "left" of the equals sign | | |
| **(c)** | B1 for $t = 8$. May be implied by correct coordinates (2, 8) or the value appearing in (d) | | |
| **(d)** | M1 for an expression for the area of the triangle, follow through their $t$ ($\neq 0$) but must have the $(7-2)$ or 5 and the $\frac{1}{2}$. | | |
| **DET** | e.g. $\begin{matrix} 2 & 7 & 2 & 2 \\ 0 & 4 & t & 0 \end{matrix}$ Area $= \frac{1}{2}\left[8 + 7t + 0 - (0 + 8 + 2t)\right]$ Must have the $\frac{1}{2}$ for M1 | | |