Question Number	Scheme	Marks
3(a)	$\left(2\sqrt{2}\right)^2 = p^2 + q^2 - 2pq\cos 60°$ oe	M1
	$p^2 + q^2 - pq = 8$ *	A1*
		(2)
(b)	$q = p + 2 \Rightarrow 8 = p^2 + (" p + 2")^2 - p(" p + 2")$	M1
	$p^2 + 2p - 4 = 0$ or $q^2 - 2q - 4 = 0$	A1
	$p = \frac{-2 \pm \sqrt{2^2 - 4\times 1\times(-4)}}{2}$ or $q = \frac{2 \pm \sqrt{(-2)^2 - 4\times 1\times(-4)}}{2}$	M1
	$p = -1 + \sqrt{5}$ or $q = 1 + \sqrt{5}$	B1 (A1 on EPEN)
	$p = -1 + \sqrt{5}$ and $q = 1 + \sqrt{5}$ only	A1cso
		(5)
(c)	$\text{Area} = \frac{1}{2} \times (" -1 + \sqrt{5} ")(" 1 + \sqrt{5} ") \times \sin 60°$	M1
	Area = $\sqrt{3}$ (m^2)	A1
		(2)
Alt(a)	Forming a line BX which is perpendicular to AC where X is on the line AC.	
	$AX = p\cos 60 = \frac{p}{2}$	
	$BX = \sqrt{p^2 - \left(\frac{p}{2}\right)^2} = \frac{\sqrt{3}}{2}p$ or $BX = p\sin 60$	
	$\left(\frac{\sqrt{3}}{2}p\right)^2 + \left(q - \frac{p}{2}\right)^2 = \left(2\sqrt{2}\right)^2$ or $(p\sin 60)^2 + \left(q - \frac{p}{2}\right)^2 = \left(2\sqrt{2}\right)^2$	M1
	$\frac{3p^2}{4} + q^2 - pq + \frac{p^2}{4} = 8$	
	$p^2 + q^2 - pq = 8$ *	A1*
		(9 marks)

(a)

M1 $\left(2\sqrt{2}\right)^2 = p^2 + q^2 - 2pq\cos 60°$ or $\left(2\sqrt{2}\right)^2 = p^2 + q^2 - 2pq \times \frac{1}{2}$ or $8 = p^2 + q^2 - 2pq\cos 60°$

They may carry this out in two stages by forming two right angled triangles with *BX* being perpendicular to *AC* (see Alt(a)). To score this mark they must proceed as far as

$\left(\frac{\sqrt{3}}{2}p\right)^2 + \left(q - \frac{p}{2}\right)^2 = \left(2\sqrt{2}\right)^2$ or $(p\sin 60)^2 + \left(q - \frac{p}{2}\right)^2 = \left(2\sqrt{2}\right)^2$

Condone missing brackets for M1.

A1* Achieves $p^2 + q^2 - pq = 8$ with no errors including omission of brackets. One of the lines above must have been seen for M1A1. If they state = 8 without showing any working then A1 cannot be scored.

(b)

M1 Substitutes $q = p + 2$ (oe) into the given equation

A1 $p^2 + 2p - 4 = 0$ or the equivalent equation in q ($q^2 - 2q - 4 = 0$)

M1 Attempts to solve to find p using the formula or completing the square using their values. Alternatively, they achieve a quadratic equation in q and attempt to solve to find q using their values. Usual rules for solving quadratics apply. If they state the roots or factorise then M0. If they use the quadratic formula then the values must be embedded.

B1 $p = -1 + \sqrt{5}$ **or** $q = 1 + \sqrt{5}$ (ignore any other solutions) Must be exact. This is independent of the previous method mark so if the roots are just stated this mark can be scored.
(Note this is A1 on EPEN)

A1 $p = -1 + \sqrt{5}$ **and** $q = 1 + \sqrt{5}$ only cso (all other marks must have been scored to award A1)

(c)

M1 Attempts to find the area of the triangle using $\frac{1}{2} \times (\text{"}-1+\sqrt{5}\text{"})(\text{"}1+\sqrt{5}\text{"}) \times \sin 60°$. Must see at least one stage of working using their p and their q

A1 $\sqrt{3}$ (m^2) condone lack of units. Do not accept rounded answers.

Question Number	Scheme	Marks
4	$\int \frac{3x^{\frac{3}{2}}-15x^{\frac{1}{2}}+2x-10}{4\sqrt{x}}\,\mathrm{d}x = \int \frac{3}{4}x-\frac{15}{4}+\frac{1}{2}x^{\frac{1}{2}}-\frac{5}{2}x^{-\frac{1}{2}}\,\mathrm{d}x$	M1A1A1
	$x^n \to x^{n+1}$	dM1
	$\frac{3}{8}x^2-\frac{15}{4}x+\frac{1}{3}x^{\frac{3}{2}}-5x^{\frac{1}{2}}+C$	A1A1
		(6 marks)

M1 Attempts to write as a sum of terms using correct index laws at least once.
Award for any term with a correct index.
Score for any one of:

$\frac{"3x^{\frac{3}{2}}"}{4\sqrt{x}} \to ...x$ $\frac{"-15x^{\frac{1}{2}}"}{4\sqrt{x}} \to \text{const}$ $\frac{+"2x"}{4\sqrt{x}} \to ...x^{\frac{1}{2}}$ $\frac{"-10"}{4\sqrt{x}} \to ...x^{-\frac{1}{2}}$

Cannot be scored for a term with a correct index arising from incorrect work

eg $\frac{"-10"}{4\sqrt{x}} \to ...x^{\frac{1}{2}}$

A1 Two correct terms of $\frac{3}{4}x$ $-\frac{15}{4}$ $+\frac{1}{2}x^{\frac{1}{2}}$ $-\frac{5}{2}x^{-\frac{1}{2}}$ (oe). They do not need to be seen on the same line for this mark and they do not need to be simplified. Eg $\frac{3}{4}x^1$, $\frac{-10x^{-\frac{1}{2}}}{4}$ are acceptable.

Indices must be processed though. Eg $\frac{3x^{\frac{3}{2}}}{4\sqrt{x}} \to \frac{3}{4}x^{1.5-0.5}$ is not acceptable.

A1 All four correct terms of $\frac{3}{4}x-\frac{15}{4}+\frac{1}{2}x^{\frac{1}{2}}-\frac{5}{2}x^{-\frac{1}{2}}$ (oe) Terms do not need to be simplified for this mark and do not need to be on one line.

dM1 Increases the power of any of their terms by 1. ($x^n \to x^{n+1}$). It is dependent on the first method mark.

A1 Any two terms correct unsimplified (see below) but the indices must be processed. Condone $-\frac{15}{4}x^1$ as a correct term for this mark only.

A1 $\frac{3}{8}x^2-\frac{15}{4}x+\frac{1}{3}x^{\frac{3}{2}}-5x^{\frac{1}{2}}+C$ o.e. all on one line (including the constant C and all simplified).

Do not accept $-\frac{15}{4}x^1$ as a correct simplified term.

Accept alternative correct simplified forms such as $\frac{3}{8}x^2-\frac{15}{4}x+\frac{1}{3}x^{\frac{3}{2}}-5\sqrt{x}+C$ or $\frac{3}{8}x(x-10)+\frac{1}{3}x^{\frac{1}{2}}(x-15)+C$