Question Number	Scheme	Marks
5	$4x^{-\frac{1}{2}} \to \ldots x^{\frac{1}{2}}$ **or** $k \to \ldots x$	M1
	$\left\{\int \left(\frac{4}{\sqrt{x}}+k\right)\mathrm{d}x =\right\} \int \left(4x^{-\frac{1}{2}}+k\right)\mathrm{d}x = \frac{4x^{\frac{1}{2}}}{\left(\frac{1}{2}\right)}+kx \ \{+c\}$	A1
	$\left[\frac{4x^{\frac{1}{2}}}{\left(\frac{1}{2}\right)}+kx\right]_2^4 = 30 \Rightarrow \left(8\sqrt{4}+4k\right)-\left(8\sqrt{2}+2k\right)=30$	dM1
	$\Rightarrow 2k+16-8\sqrt{2}=30$	
	$\Rightarrow k = 7+4\sqrt{2}$	ddM1A1
		(5)
		(5 marks)

Note: Condone spurious inclusion of $\int$ throughout.

M1: Increases the power by one on a correct term. Score for either $4x^{-\frac{1}{2}} \to \ldots x^{\frac{1}{2}}$ or $k \to \ldots x$ where … is a constant and may be unsimplified.

The indices must be evaluated, so do not score for $4x^{-\frac{1}{2}} \to \ldots x^{-\frac{1}{2}+1}$

Candidates that write e.g. $\frac{4}{\sqrt{x}} = 4x^{\frac{1}{2}} \to \frac{4}{\left(\frac{3}{2}\right)}x^{\frac{3}{2}}$ or e.g. $\frac{4}{\sqrt{x}} = 4x^{-2} \to \frac{4}{(-1)}x^{-1}$ will not score this mark (unless they integrate k to … x).

A1: Correct integration (may be unsimplified) $\frac{4x^{\frac{1}{2}}}{\left(\frac{1}{2}\right)}+kx \ \{+c\}$ ignoring limits.

The indices must be evaluated, so do not score for $4x^{-\frac{1}{2}} \to \ldots x^{-\frac{1}{2}+1}$

There is no need for $+c$ in the whole question.

dM1: Substitutes both $x=4$ and $x=2$ into an integrated expression (at least one term must have been integrated), subtracts the correct way round and sets equal to 30.
Condone missing brackets which lead to a sign error, e.g., $8\sqrt{4}+4k-8\sqrt{2}+2k=30$
It is dependent upon the previous method mark i.e. there must be some clear algebraic integration.
If there is no algebraic integration but you think it may be implied then send to review.

ddM1: Dependent upon both previous method marks **and** having correctly integrated k to kx
It is for an attempt to solve the resulting equation in k leading to a value which may be inexact.
Condone slips when solving their equation: do not be concerned about their processing provided they proceed from a linear equation in k to a value for k.

A1: $k = 7 + 4\sqrt{2}$ or any unsimplified exact equivalent, e.g., $k = \frac{14 + 8\sqrt{2}}{2}$ or $k = \frac{30 + 8\sqrt{2} - 16}{2}$

or e.g. $k = 7 + 2^{\frac{5}{2}}$ o.e. and no other solutions.

ISW if they go on to provide a decimal approximation e.g. 12.66.

Question Number	Scheme	Marks
6.(a)	{Mid-point of XY =} (3, 7)	B1
	gradient $XY = \frac{11-3}{6-0}$ $\left\{=\frac{4}{3}\right\}$	M1
	$y - "7" = "-\frac{3}{4}"(x - "3")$	dM1
	$3x + 4y - 37 = 0$	A1
		(4)
(b)	Substitute $y = 10$ into their line equation to give $x = \ldots$	M1
	$x = -1$	A1
		(2)
(c)	e.g. $r^2 = ("-1" - 0)^2 + (10-3)^2$ or $r = \sqrt{("-1"-6)^2 + (10-11)^2}$	M1
	$(x+1)^2 + (y-10)^2 = 50$	dM1, A1
		(3)
(d)	Full method to find W or e.g. $(..., 9)$ **or** $("-8", ...)$	M1 (B1 on EPEN)
	$(-8, 9)$	A1 (B1 on EPEN)
		(2)
		(11 marks)

Note: Throughout the question be generous with parts that are mislabelled or not labelled at all, provided it is clear what their intention is.

(a)

B1: Correct coordinates for {M =} (3, 7)

M1: Correct method for gradient of $XY = \frac{11-3}{6-0}$ $\left\{=\frac{4}{3}\right\}$

An alternative is to set up and solve an equation e.g. $11 = 6m + 3$ leading to $m = \ldots$

dM1: Correct method for the equation of the line through Z and their M (which must not be X or Y).

Look for use of the negative reciprocal of their $\frac{4}{3}$ with their (3, 7), e.g., $y - "7" = "-\frac{3}{4}"(x - "3")$

If using $y = mx + c$ they must proceed as far as $c = \ldots$ Dependent on the previous method mark.

A1: $3x + 4y - 37 = 0$ but allow any integer multiple of this and any order of terms.

The = 0 must be present. $3x + 4y = 37$ is A0 without also giving an alternative in the required form.

(b)

M1: Substitutes $y = 10$ into their $3x + 4y - 37 = 0$ (or earlier form of this equation) and solves to find a value for x

or Alt uses the fact that $XZ = YZ$ to give $x^2 + 7^2 = (x-6)^2 + 1^2$ and solves by expanding and then cancelling the x^2 terms to find a value for x

A1: cao $x = -1$ Note: if they use an equation from part (a) it must be correct.

If using **Alt** then you do not need to check their equation in part (a).

(c)

M1: Valid method to find the radius or radius^2, usually using Pythagoras with $("-1", 10)$ and either X or Y. Alternatively, uses $MZ^2 + MY^2 = r^2$ or $MZ^2 + MX^2 = r^2$