Question Number	Scheme	Marks
6	Assumption: e.g. (Assume) "n^2-4n+5 is even and n is even"	B1
	Sets e.g. $n=2k$ and attempts $(2k)^2-4(2k)+5$	M1
	$4k^2-8k+5$ (oe for their n)	A1
	Completes proof with: (i) Statement "which is odd" (ii) Reason odd E.g. $4(k^2-2k)+5$ or e.g. $4(k^2-2k+1)+1$ or e.g. $2(2k^2-4k+2)+1$ or e.g. $(2k-2)^2+1$ Condone $4k^2-8k+5=even-even+odd=odd$ (iii) A (minimal) conclusion e.g. "Hence contradiction", "so proven", "the statement is true" etc.	A1*
		(4 marks)

Notes:

Note that B0M1A1A1 is not possible.

If the same variable is used e.g. $n = 2n$ allow all but the final mark for otherwise correct work. But allow $n = 2N$ as a different variable.

B1: Sets up a suitable assumption. Must be in words.
Look for e.g. n^2-4n+5 is even and n is even or e.g. if n even then n^2-4n+5 is even.
The word "assume" is not required but there must be a statement referring to n^2-4n+5 is even and n is even.
Condone e.g. "if n^2-4n+5 is even then n is even".

M1: Uses algebra with $n = 2k$ or equivalent e.g. $n=2k+2$ or e.g. $n=4k$ and attempts n^2-4n+5

A1: $4k^2-8k+5$ or equivalent <u>for their n</u> such as $4(k^2-2k)+5$ or e.g. $4k^2+1$ for $n=2k+2$

A1*: Completes proof with

- a correct expression that is clearly odd
- an acceptable statement with reason
- minimal conclusion.

Note that attempts that consider a contradiction such as e.g.
(Assume) "n^2-4n+5 is odd and n is odd"
score no marks.

There will be valid approaches to the proof.
See below for some alternatives:

"n^2-4n+5 is even and n is even"

$n^2-4n+5=(n-2)^2+1$ is even so $(n-2)^2$ must be odd

If $(n-2)^2$ is odd then $(2k-2)^2$ is odd (as n is even) hence contradiction

So if n^2-4n+5 is even then n is odd

"n^2-4n+5 is even and n is even"

$n^2-4n+5=(n-2)^2+1=2k \Rightarrow (n-2)^2=2k-1$ so $(n-2)^2$ must be odd

If $(n-2)^2$ is odd then $(2a-2)^2$ is odd (as n is even) hence contradiction

So if n^2-4n+5 is even then n is odd

Mark such attempts as follows:

B1: As main scheme

M1: Completes the square on n^2-4n+5 to obtain $(n-2)^2+...$ or uses $n^2-4n+5=n(n-4)+...$

A1: $n^2-4n+5=(n-2)^2+1$ or e.g. $n^2-4n+5=n(n-4)+5$

A1: Fully reasoned and convincing argument with a (minimal) conclusion

If you are unsure if a particular response deserves merit then use review.

Question Number	Scheme	Marks
7	$x = 4\sin\theta \Rightarrow \dfrac{\mathrm{d}x}{\mathrm{d}\theta} = 4\cos\theta$	B1
	$\displaystyle\int \frac{1}{\left(16-x^2\right)^{\frac{3}{2}}}\,\mathrm{d}x = \int \frac{4\cos\theta}{\left(16-16\sin^2\theta\right)^{\frac{3}{2}}}\,\mathrm{d}\theta = \int \frac{4\cos\theta}{64\cos^3\theta}\,\mathrm{d}\theta$	M1 A1
	$= \dfrac{1}{16}\tan\theta$	dM1
	Uses limits of $\frac{\pi}{6}$ and $\frac{\pi}{3}$ or 30° and 60° within their attempted integration and subtracts the right way round e.g. $\mathrm{f}\left(\frac{\pi}{3}\right)-\mathrm{f}\left(\frac{\pi}{6}\right)$ or $\mathrm{f}(60°)-\mathrm{f}(30°)$	M1
	$= \dfrac{1}{16}\tan\dfrac{\pi}{3} - \dfrac{1}{16}\tan\dfrac{\pi}{6} = \dfrac{\sqrt{3}}{24}$	A1
		(6 marks)

Notes:

B1: States or uses $\dfrac{\mathrm{d}x}{\mathrm{d}\theta} = 4\cos\theta$ o.e. e.g. $\mathrm{d}x = 4\cos\theta\mathrm{d}\theta$. This may be seen within the integrand.

M1: Simplifies $\left(16-x^2\right)^{\frac{3}{2}}$ using the given substitution to $k\cos^3\theta$ using the Pythagorean identity

This may be implied if the work is correct and they proceed correctly to e.g. $\dfrac{1}{16}\displaystyle\int \cos^{-2}\theta\ \mathrm{d}\theta$

A1: $\displaystyle\int \frac{1}{\left(16-x^2\right)^{\frac{3}{2}}}\,\mathrm{d}x = \int \frac{4\cos\theta}{64\cos^3\theta}\,\mathrm{d}\theta$ or exact equivalent e.g. $\dfrac{1}{16}\displaystyle\int \cos^{-2}\theta\ \mathrm{d}\theta$ or $\displaystyle\int \frac{1}{\left(4\cos\theta\right)^2}\mathrm{d}\theta$

or e.g. $\displaystyle\int \frac{4\cos\theta}{\left(4\cos\theta\right)\left(4\cos\theta\right)\left(4\cos\theta\right)}\,\mathrm{d}\theta$

Condone if the "dθ" is missing but is otherwise correct.

dM1: For $\displaystyle\int k\frac{\cos\theta}{\cos^3\theta}\mathrm{d}\theta = \ldots\tan\theta$

M1: Uses limits of $\frac{\pi}{6}(30°)$ and $\frac{\pi}{3}(60°)$ correctly with their attempted integration.

Condone poor integration here.

A1: $\dfrac{\sqrt{3}}{24}$ or exact equivalent e.g. $\dfrac{1}{8\sqrt{3}}$