Question	Scheme	Marks	AOs
6(a)	$x = 2$ **or** $y = 5$	B1	1.1b
	$P(2, 5)$	B1	2.2a
		(2)	
(b)	$16 - 4x = 3(x-2) + 5 \Rightarrow x = ...$	M1	1.1b
	$x = \frac{17}{7}$	A1	2.1
		(2)	
(c)	$k_{\max} = 3$ or $k_{\min} = \frac{"5" - 4}{"2"}$	M1	3.1a
	$\frac{1}{2} < k < 3$	A1	2.5
		(2)	
			(6 marks)

Notes

(a)

B1: One correct coordinate. Either $x = 2$ or $y = 5$ or $(2, \ldots)$ or $(\ldots, 5)$ seen.

B1: Deduces $(2, 5)$ Accept written separately e.g. $x = 2$, $y = 5$ isw after a correct answer. Condone 2, 5 without the brackets.

(b)

M1: Attempts to solve the correct equation without modulus signs $16 - 4x = 3(x-2) + 5 \Rightarrow x = ...$ Must reach a value for x. Ignore attempts at e.g. $16 - 4x = 3(2 - x) + 5$

A1: $x = \frac{17}{7}$ o.e. exact answer and no other values. If other values have been found they must be rejected or the $x = \frac{17}{7}$ clearly selected. Answer only implies both marks.

Note: $x =$ "2.75" coming from $5 = 16 - 4x$ may be found as part of their working to establish which branch of the modulus graph the line $y = 16 - 4x$ intersects. If this is the case it need not be "rejected" provided it is not clearly stated as one of their solutions.

Those that achieve $|x| = \frac{17}{7}$ can score BOD M1A0.

Alternative by squaring:

$$16 - 4x = 3|x-2| + 5 \Rightarrow 11 - 4x = 3|x-2|$$

$$\Rightarrow 16x^2 - 88x + 121 = 9\left(x^2 - 4x + 4\right)$$

$$\Rightarrow 7x^2 - 52x + 85 = 0 \Rightarrow x = 5, \frac{17}{7}$$

M1: Isolates the $|x-2|$ (or $3|x-2|$), squares both sides and solves the resulting 3TQ using the usual rules and may be by calculator, leading to a value for x.

A1: Selects the $\frac{17}{7}$ or rejects any other values as in main scheme.

(c)

M1: Correct method to find either critical value (following through on their *P*).

Either k {=} 3 or k {=} $\frac{"5"-4}{"2"}$ scores M1 without evidence of an incorrect method.

Note that $k = 3$ occasionally appears from use of the discriminant on $x(k-3)+5=0,$ and scores M0 unless there is an alternative valid reason given.

Allow the use of e.g. m = in place of k = here but do not allow x = or y =

A1: Correct range in terms of k in acceptable notation with no incorrect method seen.

Use of e.g. x is A0. Allow "and" or "$\cap$" to join the regions but not "or" or "," or "$\cup$"

Accept e.g. $(0.5,3)$; $k \in \left(\frac{1}{2},3\right)$; $k<3$ and $k>\frac{1}{2}$; $k>\frac{1}{2} \cap k<3$

but not $\frac{1}{2}<x<3$; $\frac{1}{2}$,, k ,, 3 ; $\left[\frac{1}{2},3\right]$; $k>\frac{1}{2} \cup k<3$; $k>\frac{1}{2}, k<3$; $k>\frac{1}{2}$ or $k<3$

Alt 1 via solving simultaneous equations:

$$\text{e.g. } kx+4=3(x-2)+5 \Rightarrow kx+4=3x-1 \Rightarrow x=-\frac{5}{k-3}$$

$$kx+4=3(2-x)+5 \Rightarrow kx+4=11-3x \Rightarrow (k+3)x=7$$

$$\Rightarrow (k+3)\left(\frac{-5}{k-3}\right)=7 \Rightarrow k=\frac{1}{2}$$

M1: Sets $kx+4=3(x-2)+5$ and $kx+4=3(2-x)+5$, eliminates x, and solves for k

A1: As main scheme.

Alt 2 via squaring and the discriminant:

$$kx+4=3|x-2|+5 \Rightarrow kx-1=3|x-2|$$

$$\Rightarrow k^2x^2-2kx+1=9\left(x^2-4x+4\right)$$

$$\Rightarrow \left(k^2-9\right)x^2+(36-2k)x-35=0$$

$$\Rightarrow (36-2k)^2-4\left(k^2-9\right)(-35)=0$$

$$\Rightarrow 144k^2-144k+36=0 \Rightarrow k=\frac{1}{2}$$

M1: Sets $kx+4=3|x-2|+5$, isolates $|x-2|$ (or $3|x-2|$), squares both sides, uses $b^2-4ac\ldots 0$ where … is any equality or inequality, and solves the resulting 3TQ using the usual rules and may be by calculator, leading to a value for k.

Condone slips in expanding the brackets.

A1: As main scheme.

Alt 3 via Domain for the right hand branch of the modulus graph:

$$kx+4=3x-1 \Rightarrow x=\frac{-5}{k-3}>2 \quad \left\{\text{or } x=\frac{5}{3-k}>2\right\}$$

$$\Rightarrow k-3<0 \quad \{\text{and} \quad \Rightarrow -5<2(k-3)\}$$

$$\Rightarrow k<3 \quad \{\text{and} \quad \Rightarrow 0.5<k\}$$

M1: Sets $kx+4=3(x-2)+5$, makes x the subject, sets > 2 and deduces a critical value.

A1: As main scheme.