Question	Scheme	Marks	AOs
11(a)	Midpoint $=(8,0)$ or $m=\frac{-1-1}{11-5}\left\{=-\frac{1}{3}\right\}$	B1	1.1b
	$y-"0"="3"(x-"8")$	M1	1.1b
	$y=3x-24$	A1	1.1b
		(3)	
(b)	$3x-24=-\frac{1}{2}x+\frac{1}{2}\Rightarrow x=\{7\}$	M1	3.1a
	$y=3\times"7"-24=\{-3\}$	dM1	1.1b
	$(7,-3)$*	A1*	2.1
		(3)	
(c)	e.g. $(5-7)^2+(1+3)^2=r^2$ leading to $r^2=\{20\}$	M1	1.1b
	$(x-7)^2+(y+3)^2=20$	A1	1.1b
		(2)	
(d)	PR: $y=2x-9$	B1	2.2a
	$(x-7)^2+("2x-9"+3)^2=20$	M1	3.1a
	$5x^2-38x+65=0$ $(5x-13)(x-5)=0$ $\Rightarrow x=...$	dM1	1.1b
	$x=\frac{13}{5}$	A1	2.2a
	$\left(\frac{13}{5},-\frac{19}{5}\right)$	A1	1.1b
		(5)	
			(13 marks)

Notes:

(a)

B1: Finds either the midpoint or a correct expression for the gradient of PQ

B1: $y-y_1=-\frac{1}{m_{PQ}}(x-x_1)$ with an attempt at the midpoint (must not be P or Q) and the negative reciprocal of their $m="-\frac{1}{3}"$

If $y=mx+c$ is used they must proceed as far as $c=\ldots$

B1: $y=3x-24$ only

(b) **M1:** Substitutes their answer to (a) into the given equation: $"3x-24"=-\frac{1}{2}x+\frac{1}{2}$ and solves to find a value for x **dM1:** Attempts to find a value for y using this value for x in either equation. **A1*:** $(7,-3)$ cso
(c) **M1:** Attempts to find the radius of the circle or r^2 by substituting either $(5,1)$ or $(11,-1)$ into $(x-7)^2+(y+3)^2=r^2$ leading to $r^2=\ldots$ or $r=\ldots$ $\left\{=\sqrt{20}\text{ or }2\sqrt{5}\right\}$ **A1:** $(x-7)^2+(y+3)^2=20$ o.e.
(d) **B1:** Correct equation for *PR* using $y-1=2(x-5)$ If $y=mx+c$ is used they must get to $y=2x-9$ o.e. **M1:** Substitutes their $y=2x-9$ into their circle equation, i.e., $(x-"7")^2+("2x-9"+"3")^2="20"$ and attempts to expand. **dM1:** Attempts to form a 3TQ, set $=0$ and solve for x . **A1:** Deduces $x=\frac{13}{5}$ (or rejects $x=5$, which may be rejected later on as coordinates) **A1:** Fully correct work leading to $\left(\frac{13}{5},-\frac{19}{5}\right)$ o.e. e.g. $(2.6,-3.8)$ (and $(5,1)$ rejected if seen)