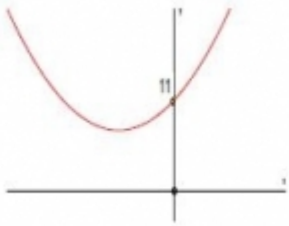
Pure Mathematics 1 Practice Paper M10 MARK SCHEME

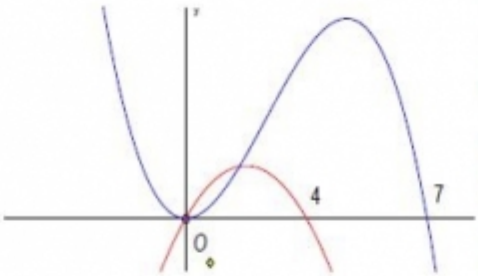
Q1.

Question Number	Scheme	Marks
(a)	$(x+3)^2+2$ or $p=3$ or $\frac{6}{2}$ $q=2$	B1 B1 (2)
(b)	 U shape with min in 2^{nd} quad (Must be above x-axis and not on y=axis) U shape crossing y-axis at (0, 11) only (Condone (11,0) marked on y-axis)	B1 B1 (2)
(c)	$b^2-4ac=6^2-4\times11$ $=\underline{-8}$	M1 A1 (2) 6
	Notes	
(a)	Ignore an "= 0" so $(x+3)^2+2=0$ can score both marks	
(b)	The U shape can be interpreted fairly generously. Penalise an obvious V on 1st B1 only. The U needn't have equal "arms" as long as there is a clear min that "holds water" 1st B1 for U shape with minimum in 2^{nd} quad. Curve need not cross the y-axis but minimum should NOT touch x-axis and should be left of (not on) y-axis 2nd B1 for U shaped curve crossing at (0, 11). Just 11 marked on y-axis is fine. The point must be marked on the sketch (do not allow from a table of values) Condone stopping at (0, 11)	
(c)	M1 for some correct substitution into b^2-4ac. This may be as part of the quadratic formula but must be in part (c) and must be only numbers (no x terms present). Substitution into $b^2<4ac$ or $b^2=4ac$ or $b^2>4ac$ is M0 A1 for -8 only. If they write $-8<0$ treat the <0 as ISW and award A1 If they write $-8\geq0$ then score A0 A substitution in the quadratic formula leading to -8 inside the square root is A0. So substituting into $b^2-4ac<0$ leading to $-8<0$ can score M1A1. Only award marks for use of the discriminant in part (c)	

Q2.

Question Number	Scheme	Marks
(a)	$\dfrac{(x+5)(2x-1)}{(x+5)(x-3)} = \dfrac{(2x-1)}{(x-3)}$	M1 B1 A1 aef
		(3)
(b)	$\ln\left(\dfrac{2x^2+9x-5}{x^2+2x-15}\right)=1$	M1
	$\dfrac{2x^2+9x-5}{x^2+2x-15}=\mathrm{e}$	dM1
	$\dfrac{2x-1}{x-3}=\mathrm{e} \Rightarrow \quad 3\mathrm{e}-1 = x(\mathrm{e}-2)$	M1
	$\Rightarrow x = \dfrac{3\mathrm{e}-1}{\mathrm{e}-2}$	A1 aef cso
		(4) [7]
	(a) M1: An attempt to factorise the numerator. B1: Correct factorisation of denominator to give $(x+5)(x-3)$. Can be seen anywhere. (b) M1: Uses a correct law of logarithms to combine at least two terms. This usually is achieved by the subtraction law of logarithms to give $\ln\left(\dfrac{2x^2+9x-5}{x^2+2x-15}\right)=1.$ The product law of logarithms can be used to achieve $\ln\left(2x^2+9x-5\right)=\ln\left(\mathrm{e}\left(x^2+2x-15\right)\right).$ The product and quotient law could also be used to achieve $\ln\left(\dfrac{2x^2+9x-5}{\mathrm{e}(x^2+2x-15)}\right)=0.$ dM1: Removing ln's correctly by the realisation that the anti-ln of 1 is e. Note that this mark is dependent on the previous method mark being awarded. M1: Collect x terms together and factorise. Note that this is not a dependent method mark. A1: $\dfrac{3\mathrm{e}-1}{\mathrm{e}-2}$ or $\dfrac{3\mathrm{e}^1-1}{\mathrm{e}^1-2}$ or $\dfrac{1-3\mathrm{e}}{2-\mathrm{e}}$. aef Note that the answer needs to be in terms of e. The decimal answer is 9.9610559… Note that the solution must be correct in order for you to award this final accuracy mark. **Note: See Appendix for an alternative method of long division.**	

Q3.

Question Number	Scheme	Marks
(a)		
	(i) $\frown$ shape (anywhere on diagram)	B1
	Passing through or stopping at (0, 0) and (4,0) only(Needn't be $\frown$ shape)	B1
	(ii) correct shape (-ve cubic) with a max and min drawn anywhere	B1
	Minimum or maximum at (0,0)	B1
	Passes through or stops at (7,0) but <u>NOT</u> touching. (7, 0) should be to right of (4,0) or B0	B1 (5)
	Condone (0,4) or (0, 7) marked correctly on x-axis. Don't penalise poor overlap near origin. **Points must be marked on the sketch...not in the text**	
(b)	$x(4-x)=x^2(7-x)$ $(0=)x[7x-x^2-(4-x)]$	M1
	$(0=)x[7x-x^2-(4-x)]$ (o.e.)	B1ft
	$0=x(x^2-8x+4)$ *	A1 cso (3)
(c)	$\left(0=x^2-8x+4\Rightarrow\right)x=\dfrac{8\pm\sqrt{64-16}}{2}$ or $(x\pm4)^2-4^2+4(=0)$	M1
	$(x-4)^2=12$	A1
	$=\dfrac{8\pm4\sqrt{3}}{2}$ or $(x-4)=\pm2\sqrt{3}$	B1
	$x=4\pm2\sqrt{3}$	A1
	From sketch A is $x=4-2\sqrt{3}$	M1
	So $y=(4-2\sqrt{3})(4-[4-2\sqrt{3}])$ (dependent on 1st M1)	M1
	$\underline{=-12+8\sqrt{3}}$	A1 (7)
		15

	Notes	
(b)	M1 for forming a suitable equation B1 for a common factor of x taken out legitimately. Can treat this as an M mark. Can ft their cubic = 0 found from an attempt at solving their equations e.g. $x^3-8x^2-4x=x(...$ A1cso no incorrect working seen. The "= 0" is required but condone missing from some lines of working. Cancelling the x scores B0A0.	
(c)	1st M1 for some use of the correct formula or attempt to complete the square 1st A1 for a fully correct expression: condone + instead of $\pm$ or for $(x-4)^2=12$ B1 for simplifying $\sqrt{48}=4\sqrt{3}$ or $\sqrt{12}=2\sqrt{3}$ .Can be scored independently of this expression 2nd A1 for correct solution of the form $p+q\sqrt{3}$: can be $\pm$ or + or − 2nd M1 for selecting their answer in the interval (0,4). If they have no value in (0,4) score M0 3rd M1 for attempting $y=$...using their x in correct equation. An expression needed for M1A0 3rd A1 for correct answer. If 2 answers are given A0.	

Q4.

Question Number	Scheme	Marks
(a)	$m_{AB} = \frac{4-0}{7-2} \quad \left(= \frac{4}{5}\right)$	M1
	Equation of AB is: $y - 0 = \frac{4}{5}(x-2)$ or $y - 4 = \frac{4}{5}(x-7)$ (o.e.)	M1
	$4x - 5y - 8 = 0$ (o.e.)	A1 (3)
(b)	$(AB =)\sqrt{(7-2)^2 + (4-0)^2}$	M1
	$= \sqrt{41}$	A1 (2)
(c)	Using isos triangle with $AB = AC$ then $t = 2 \times y_A = 2 \times 4 = 8$	B1 (1)
(d)	Area of triangle $= \frac{1}{2}t \times (7-2)$	M1
	$= \underline{20}$	A1 (2)
		8

	Notes
(a)	**Apply the usual rules for quoting formulae here.** For a correctly quoted formula with some correct substitution award M1 If no formula is quoted then a fully correct expression is needed for the M mark 1st M1 for attempt at gradient of AB. Some correct substitution in correct formula. 2nd M1 for an attempt at equation of AB. Follow through their gradient, not e.g. $-\frac{1}{m}$ Using $y = mx + c$ scores this mark when c is found. Use of $\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$ scores 1st M1 for denominator, 2nd M1 for use of a correct point A1 requires integer form but allow $5y + 8 = 4x$ etc. Must have an "=" or A0
(b)	M1 for an expression for AB or AB^2. Ignore what is "left" of the equals sign
(c)	B1 for $t = 8$. May be implied by correct coordinates (2, 8) or the value appearing in (d)
(d)	M1 for an expression for the area of the triangle, follow through their t $(\neq 0)$ but must have the $(7-2)$ or 5 and the $\frac{1}{2}$.
DET	e.g. $\begin{matrix} 2 & 7 & 2 & 2 \\ 0 & 4 & t & 0 \end{matrix}$ Area $= \frac{1}{2}\left[8 + 7t + 0 - (0 + 8 + 2t)\right]$ Must have the $\frac{1}{2}$ for M1

Q5.

Question Number	Scheme	Marks
	(a) $(10-2)^2+(7-1)^2$ or $\sqrt{(10-2)^2+(7-1)^2}$	M1 A1
	$(x\pm 2)^2+(y\pm 1)^2=k$ (k a positive <u>value</u>)	M1
	$(x-2)^2+(y-1)^2=100$ (Accept 10^2 for 100)	A1
	(Answer only scores full marks)	(4)
	(b) (Gradient of radius =) $\frac{7-1}{10-2}=\frac{6}{8}$ (or equiv.) Must be seen in part (b)	B1
	Gradient of tangent $=\frac{-4}{3}$ (Using perpendicular gradient method)	M1
	$y-7=m(x-10)$ Eqn., in any form, of a line through (10, 7) with any numerical gradient (except 0 or ∞)	M1
	$y-7=\frac{-4}{3}(x-10)$ or equiv (ft gradient of <u>radius</u>, dep. on <u>both</u> M marks)	A1ft
	$\{3y=-4x+61\}$ (N.B. The A1 is only available as <u>ft</u> after B0) The unsimplified version scores the A mark (isw if necessary... subsequent mistakes in simplification are not penalised here. The equation must at some stage be <u>exact</u>, not, e.g. $y=-1.3x+20.3$	(4)
	(c) $\sqrt{r^2-\left(\frac{r}{2}\right)^2}$ Condone sign slip if there is evidence of correct use of Pythag.	M1
	$=\sqrt{10^2-5^2}$ or numerically exact equivalent	A1
	$PQ\left(=2\sqrt{75}\right)=10\sqrt{3}$ Simplest surd form $10\sqrt{3}$ required for final mark	A1
		(3) **11**
	(b) 2^{nd} M: Using (10, 7) to find the equation, in any form, of a straight line through (10, 7), with any numerical gradient (except 0 or ∞). <u>Alternative:</u> 2^{nd} M: Using (10, 7) and an m value in $y=mx+c$ to find a value of c. (b) <u>Alternative</u> for first 2 marks (differentiation): $2(x-2)+2(y-1)\frac{\mathrm{d}y}{\mathrm{d}x}=0$ or equiv. B1 Substitute $x=10$ and $y=7$ to find a value for $\frac{\mathrm{d}y}{\mathrm{d}x}$ M1 (This M mark can be awarded generously, even if the attempted 'differentiation' is not 'implicit'). (c) <u>Alternatives</u>: To score M1, must be a <u>fully</u> correct method to obtain $\frac{1}{2}PQ$ or PQ. 1^{st} A1: For alternative methods that find PQ directly, this mark is for an <u>exact numerically correct version</u> of PQ.	

Q6.

Question Number	Scheme	Marks
(a)	$(y=)\frac{3x^2}{2}-\frac{5x^{\frac{1}{2}}}{\frac{1}{2}}-2x\ \ (+c)$	M1A1A1
	$f(4)=5\ \ \Rightarrow 5=\frac{3}{2}\times16-10\times2-8+c$	M1
	$\underline{c=9}$	A1 (5)
	$\left[f(x)=\frac{3}{2}x^2-10x^{\frac{1}{2}}-2x+9\right]$	
(b)	$m=3\times4-\frac{5}{2}-2\ \left(=7.5\text{ or }\frac{15}{2}\right)$	M1
	Equation is: $y-5=\frac{15}{2}(x-4)$	M1A1
	$\underline{2y-15x+50=0}$ o.e.	A1 (4) **(9marks)**
(a)	1st M1 for an attempt to integrate $x^n\to x^{n+1}$ 1st A1 for at least 2 correct terms in x (unsimplified) 2nd A1 for all 3 terms in x correct (condone missing $+c$ at this point). Needn't be simplified 2nd M1 for using the point (4, 5) to form a linear equation for c. Must use $x=4$ and $y=5$ and have no x term and the function must have "changed". 3rd A1 for $c=9$. The final expression is not required.	
(b)	1st M1 for an attempt to evaluate $f'(4)$. Some correct use of $x=4$ in $f'(x)$ but condone slips. They must therefore have at least 3×4 or $-\frac{5}{2}$ and clearly be using $f'(x)$ with $x=4$. Award this mark wherever it is seen. 2nd M1 for using their value of m [or their $-\frac{1}{m}$] (provided it clearly comes from using $x=4$ in $f'(x)$) to form an equation of the line through (4,5)). Allow this mark for an attempt at a normal or tangent. Their m must be numerical. Use of $y=mx+c$ scores this mark when c is found. 1st A1 for any correct expression for the equation of the line 2nd A1 for any correct equation with integer coefficients. An "=" is required. e.g. $2y=15x-50$ etc as long as the equation is correct and has integer coefficients.	
Normal	Attempt at normal can score both M marks in (b) but A0A0	

Q7.

Question Number	Scheme	Marks
	(a) $\left(\frac{\mathrm{d}y}{\mathrm{d}x}=\right)\ 2x-\frac{1}{2}kx^{-\frac{1}{2}}$ (Having an extra term, e.g. $+C$, is A0)	M1 A1 (2)
	(b) Substituting $x=4$ into their $\frac{\mathrm{d}y}{\mathrm{d}x}$ and 'compare with zero' (The mark is allowed for : $<, >, =, \leq, \geq$)	M1
	$8-\frac{k}{4}<0$ $k>32$ (or $32<k$) Correct inequality needed	A1 (2) 4
	(a) M: $x^2 \to cx$ or $k\sqrt{x} \to cx^{-\frac{1}{2}}$ (c constant, $c \neq 0$) (b) Substitution of $x=4$ into y scores M0. However, $\frac{\mathrm{d}y}{\mathrm{d}x}$ is sometimes called y, and in this case the M mark can be given. $\frac{\mathrm{d}y}{\mathrm{d}x}=0$ may be 'implied' for M1, when, for example, a value of k or an inequality solution for k is found. Working must be seen to justify marks in (b), i.e. $k>32$ alone is M0 A0.	

Q8.

Question Number	Scheme	Marks
	(a) $\frac{dy}{dx} = 3x^2 - 20x + k$ (Differentiation is required)	M1 A1
	At $x = 2$, $\frac{dy}{dx} = 0$, so $12 - 40 + k = 0$ $k = 28$ (*)	A1 cso
	N.B. The '= 0' must be seen at some stage to score the final mark.	
	Alternatively: (using $k = 28$) $\frac{dy}{dx} = 3x^2 - 20x + 28$ (M1 A1) 'Assuming' $k = 28$ only scores the final cso mark if there is justification that $\frac{dy}{dx} = 0$ at $x = 2$ represents the maximum turning point.	(3)
	(b) $\int (x^3 - 10x^2 + 28x)\,dx = \frac{x^4}{4} - \frac{10x^3}{3} + \frac{28x^2}{2}$ Allow $\frac{kx^2}{2}$ for $\frac{28x^2}{2}$	M1 A1
	$\left[\frac{x^4}{4} - \frac{10x^3}{3} + 14x^2\right]_0^2 = \ldots$ $\left(= 4 - \frac{80}{3} + 56 = \frac{100}{3}\right)$ (With limits 0 to 2, substitute the limit 2 into a 'changed function')	M1
	y-coordinate of $P = 8 - 40 + 56 = 24$ Allow if seen in part (a) (The B1 for 24 may be scored by implication from later working)	B1
	Area of rectangle $= 2 \times$ (their y-coordinate of P) Area of $R =$ (their 48) $-\left(\text{their } \frac{100}{3}\right)$ $= \frac{44}{3}$ $\left(14\frac{2}{3} \text{ or } 14.\dot{6}\right)$	M1 A1
	If the subtraction is the 'wrong way round', the final A mark is lost.	(6) 9
	(a) M: $x^n \to cx^{n-1}$ (c constant, $c \neq 0$) for one term, seen in part (a). (b) 1st M: $x^n \to cx^{n+1}$ (c constant, $c \neq 0$) for one term. Integrating the gradient function loses this M mark. 2ndM: Requires use of limits 0 and 2, with 2 substituted into a 'changed function'. (It may, for example, have been differentiated). Final M: Subtract their values either way round. This mark is dependent on the use of calculus and a correct method attempt for the area of the rectangle. A1: Must be exact, not 14.67 or similar, but isw after seeing, say, $\frac{44}{3}$. Alternative: (effectively finding area of rectangle by integration) $\int \{24 - (x^3 - 10x^2 + 28x)\}\,dx = 24x - \left(\frac{x^4}{4} - \frac{10x^3}{3} + \frac{28x^2}{2}\right)$, etc. This can be marked equivalently, with the 1st A being for integrating the same 3 terms correctly. The 3rd M (for subtraction) will be scored at the same stage as the 2nd M. If the subtraction is the 'wrong way round', the final A mark is lost.	

Q9.

Question Number	Scheme	Marks
	(a) $2\log_3(x-5)=\log_3(x-5)^2$	B1
	$\log_3(x-5)^2-\log_3(2x-13)=\log_3\dfrac{(x-5)^2}{2x-13}$	M1
	$\log_3 3=1$ seen or used correctly	B1
	$\log_3\left(\dfrac{P}{Q}\right)=1 \Rightarrow P=3Q \quad \left\{\dfrac{(x-5)^2}{2x-13}=3 \Rightarrow (x-5)^2=3(2x-13)\right\}$	M1
	$x^2-16x+64=0$ (*)	A1 cso
		(5)
	(b) $(x-8)(x-8)=0 \Rightarrow x=8$ Must be seen in part (b). Or: Substitute $x=8$ into original equation and verify. Having additional solution(s) such as $x=-8$ loses the A mark. $x=8$ with no working scores both marks.	M1 A1 (2) 7

(a) Marks may be awarded if equivalent work is seen in part (b).

1st M: $\log_3(x-5)^2-\log_3(2x-13)=\dfrac{\log_3(x-5)^2}{\log_3(2x-13)}$ is M0

$2\log_3(x-5)-\log_3(2x-13)=2\log\dfrac{x-5}{2x-13}$ is M0

2^{nd} M: After the first mistake above, this mark is available only if there is 'recovery' to the required $\log_3\left(\dfrac{P}{Q}\right)=1 \Rightarrow P=3Q$. Even then the final mark (cso) is lost.

'Cancelling logs', e.g. $\dfrac{\log_3(x-5)^2}{\log_3(2x-13)}=\dfrac{(x-5)^2}{2x-13}$ will also lose the 2^{nd} M.

A typical wrong solution:

$\log_3\dfrac{(x-5)^2}{2x-13}=1 \Rightarrow \log_3\dfrac{(x-5)^2}{2x-13}=3 \Rightarrow \dfrac{(x-5)^2}{2x-13}=3 \Rightarrow (x-5)^2=3(2x-13)$

(Wrong step here)

This, with no evidence elsewhere of $\log_3 3=1$, scores B1 M1 B0 M0 A0

However, $\log_3\dfrac{(x-5)^2}{2x-13}=1 \Rightarrow \dfrac{(x-5)^2}{2x-13}=3$ is correct and could lead to full marks.

(Here $\log_3 3=1$ is implied).

No log methods shown:

It is not acceptable to jump immediately to $\dfrac{(x-5)^2}{2x-13}=3$. The only mark this scores is the 1^{st} B1 (by generous implication).

(b) M1: Attempt to solve the given quadratic equation (usual rules), so the factors $(x-8)(x-8)$ with no solution is M0.

Q10.

Question Number	Scheme	Marks	
	(a) $\tan\theta = \frac{2}{5}$ (or 0.4) (i.s.w. if a value of θ is subsequently found) Requires the correct value with no incorrect working seen.	B1	(1)
	(b) awrt 21.8 (α) (Also allow awrt 68.2, ft from $\tan\theta = \frac{5}{2}$ in (a), but no other ft) (This value must be seen in part (b). It may be implied by a correct solution, e.g. 10.9)	B1	
	$180+\alpha$ $(=201.8)$, or $90+(\alpha/2)$ (if division by 2 has already occurred) (α found from $\tan 2x = \ldots$ or $\tan x = \ldots$ or $\sin 2x = \pm\ldots$ or $\cos 2x = \pm\ldots$)	M1	
	$360+\alpha$ $(=381.8)$, or $180+(\alpha/2)$ (α found from $\tan 2x = \ldots$ or $\sin 2x = \ldots$ or $\cos 2x = \ldots$) OR $540+\alpha$ $(=561.8)$, or $270+(\alpha/2)$ (α found from $\tan 2x = \ldots$)	M1	
	Dividing at least one of the angles by 2 (α found from $\tan 2x = \ldots$ or $\sin 2x = \ldots$ or $\cos 2x = \ldots$)	M1	
	$x = 10.9,\ 100.9,\ 190.9,\ 280.9$ (Allow awrt)	A1	(5) 6

(b) Extra solution(s) in range: Loses the final A mark.
Extra solutions outside range: Ignore (whether correct or not).

<u>Common answers</u>:
10.9 and 100.9 would score B1 M1 M0 M1 A0 (Ensure that <u>these</u> M marks are awarded)
10.9 and 190.9 would score B1 M0 M1 M1 A0 (Ensure that <u>these</u> M marks are awarded)

<u>Alternatives</u>:

(i) $2\cos 2x - 5\sin 2x = 0$ $\quad R\cos(2x+\lambda)=0$ $\quad \lambda = 68.2 \Rightarrow 2x + 68.2 = 90$ B1
$2x+\lambda = 270$ M1
$2x+\lambda = 450$ or $2x+\lambda = 630$ M1
Subtracting λ and dividing by 2 (at least once) M1

(ii) $25\sin^2 2x = 4\cos^2 2x = 4(1-\sin^2 2x)$
$29\sin^2 2x = 4$ $\quad 2x = 21.8$ B1
The M marks are scored as in the main scheme, but extra solutions will be likely, losing the A mark.

<u>Using radians</u>:
B1: Can be given for awrt 0.38 (β)
M1: For $\pi+\beta$ <u>or</u> $180+\beta$
M1: For $2\pi+\beta$ or $3\pi+\beta$ (Must now be consistently radians)
M1: For dividing at least one of the angles by 2
A1: For this mark, the answers must be in degrees.

<u>(Correct) answers only (or by graphical methods)</u>:
B and M marks can be awarded by implication, e.g.
10.9 scores B1 M0 M0 M1 A0
10.9, 100.9 scores B1 M1 M0 M1 A0
10.9, 100.9, 190.9, 280.9 scores full marks.
Using 11, etc. instead of 10.9 can still score the M marks by implication.

Q 11.

Q11	Scheme	Marks
	$\sqrt{(4)^2 + (-2k)^2} = \sqrt{(3k)^2 + (-2)^2}$	M1
	$16 + 4k^2 = 9k^2 + 4$	M1A1
	$5k^2 - 12 = 0$	
	$k = \pm\sqrt{\frac{12}{5}}$	
	Since $k > 0\,, k = \sqrt{\frac{12}{5}}$	A1

Q12.

Q12	Scheme	Marks
	Let the 2 rational numbers be $\frac{a}{b}$ *and* $\frac{c}{d}$ where a,b,c,d are non-zero integers	
	$\frac{a}{b} + \frac{c}{d} = \frac{ad}{bd} + \frac{bc}{bd} = \frac{ad+bc}{bd}$	M1A1
	As ad and bd are both the product of integers, they both are integers too and $ad + bc$ is also an integer	
	So $\frac{ad+bc}{bd}$ is a rational number since the numerator denominator are both integers	C1

Q13.

(i)	10	**1**	
(ii)	[x =] 5 or ft their (i) ÷ 2 ht = 5[m] cao	**1** **1**	not necessarily ft from (i) eg they may start again with calculus to get $x = 5$
(iii)	$d = 7/2$ o.e. [y =] $1/5 \times 3.5 \times (10 - 3.5)$ o.e. or ft $= 91/20$ o.e. cao isw	**M1** **M1** **A1**	or ft their (ii) − 1.5 or their (i) ÷ 2 − 1.5 o.e. or $7 - 1/5 \times 3.5^2$ or ft or showing $y - 4 = 11/20$ o.e. cao
(iv)	$4.5 = 1/5 \times x(10 - x)$ o.e. $22.5 = x(10 - x)$ o.e. $2x^2 - 20x + 45$ [= 0] o.e. eg $x^2 - 10x + 22.5$ [=0] or $(x - 5)^2 = 2.5$ [x =] $\dfrac{20 \pm \sqrt{40}}{4}$ or $5 \pm \dfrac{1}{2}\sqrt{10}$ o.e. width = $\sqrt{10}$ o.e. eg $2\sqrt{2.5}$ cao	**M1** **M1** **A1** **M1** **A1**	 eg $4.5 = x(2 - 0.2x)$ etc cao; accept versions with fractional coefficients of x^2, isw or $x - 5 = [\pm]\sqrt{2.5}$ o.e.; ft their quadratic eqn provided at least M1 gained already; condone one error in formula or substitution; need not be simplified or be real accept simple equivalents only