Practice Tests Set 15 – Paper 1H mark scheme, performance data and suggested grade boundaries

Q	Working	Answer	Mark	Notes
1 (b)	$(-5)^2 - 4 \times -5$ oe e.g. $25 + 20$		2 M1	for a correct substitution
		45	A1	
2 (c)	$5x - 3 = 4(2x + 3)$ oe **or** $\frac{5x}{4} - \frac{3}{4} = 2x + 3$ oe		3 M1	for correctly removing the denominator, condone missing brackets
	e.g. $5x - 8x = 12 + 3$ **or** $-3x = 12 + 3$ **or** $8x - 5x = -12 - 3$ **or** $3x = -12 - 3$ **or** $-\frac{3}{4} - 3 = 2x - \frac{5x}{4}$ **or** $-\frac{15}{4} = \frac{3x}{4}$		M1	for a correct rearrangement with terms in x on one side and numbers on the other, allow correct rearrangement of their equation in the form $ax + b = cx + d$
		-5	A1	dep on at least M1 SCB2 for an answer of $x = -2$ coming from $5x - 3 = 8x + 3$ **or** $x = 5$ coming from $5x - 3 = 2x + 12$
				Total 3 marks
3 (a)		0	1 B1	condone 150^0
(b)		-2	1 B1	condone 3^{-2}
				Total 2 marks

Q	Working	Answer	Mark	Notes
4	e.g. $35x + 10y = 27.5$ **or** $21x + 6y = 16.5$ $6x - 10y = 34$ $\quad$ $21x - 35y = 119$ $41x = 61.5$ $\quad$ $41y = -102.5$ e.g. $3x - 5\left(\frac{5.5 - 7x}{2}\right) = 17$ or $7\left(\frac{17 + 5y}{3}\right) + 2y = 5.5$ oe		4	M1 for a correct method to eliminate x or y: coefficients of x or y the same **and** correct operator to eliminate selected variable (condone any one arithmetic error in multiplication) **or** writing x or y in terms of the other variable and correctly substituting.
		$x = 1.5$ **or** $y = -2.5$		A1 oe, dep on M1
				M1 (dep on 1st M1) for a correct method to find other variable by substitution of found variable into one equation **or** for repeating the above method to find the second variable.
		$x = 1.5$ **and** $y = -2.5$		A1 oe, dep on M1
				Total 4 marks

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Q	Working	Answer	Mark	Notes
5 (a)			2	M1 for $(x \pm 6)(x \pm 7)$
		$(x + 6)(x - 7)$		A1 for $(x + 6)(x - 7)$ or $(x - 7)(x + 6)$ isw roots given if candidate solves the quadratic = 0
(b)	$3x - 8x < 3 - 15$ or $15 - 3 < 8x - 3x$		3	M1 accept as equation or with the wrong inequality sign.
	$-5x < -12$ or $12 < 5x$			M1 accept as equation or with the wrong inequality sign.
		$x > 2.4$		A1 Accept $2.4 < x$ or $x > \frac{12}{5}$ oe allow $(-\infty, 2.4)$ award M1 M1 A0 for 2.4 with = sign or no inequality or incorrect inequality sign.
				Total 5 marks

Q	Working	Answer	Mark	Notes
6	$(4x+1)(x-3)=4x^2-12x+x-3(=4x^2-11x-3)$ $(4x+1)(5x+6)=20x^2+24x+5x+6(=20x^2+29x+6)$ $(x-3)(5x+6)=5x^2+6x-15x-18(=5x^2-9x-18)$		3	M1 for multiplying 2 brackets with at least 3 out of 4 terms correct
	$(5x+6)(4x^2-11x-3)=20x^3-55x^2-15x+24x^2-66x-18$ $(x-3)(20x^2+29x+6)=20x^3+29x^2+6x-60x^2-87x-18$ $(4x+1)(5x^2-9x-18)=20x^3-36x^2-72x+5x^2-9x-18$			M1 (dep) for multiplying the product of the first 2 brackets (ft from the 1st stage) by the 3rd bracket, and getting at least 3 out of 6 or 4 out of 8 terms correct
		$20x^3-31x^2-81x-18$		A1
	Alternative			
	$20x^3+24x^2-60x^2+5x^2-15x+6x-72x-18$			B2 for at least 6 out of 8 terms correct (B1 for 4 or 5 out of 8 correct terms)
		$20x^3-31x^2-81x-18$		A1
				Total 3 marks

Q	Working		Answer	Mark	Notes
7 (a)		9, 28, 45, 63, 76, 80	1	B1	
(b)			2	B2	for a correct cf graph with points at ends of intervals and joined with a curve or line segments If not B2 then B1 for 5 or 6 of their points (ft from a table with only one arithmetic error) at ends of intervals and joined with a curve or line segments **OR** for 5 or 6 points plotted correctly at ends of intervals not joined **OR** for 5 or 6 of their points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with a curve or line segments
(c)	e.g. reading across from 40 and reading down		2	M1	ft reading from a cf graph provided method is shown
		35 - 38		A1	ft from their cf graph
					Total 5 marks

Q	Working	Answer	Mark	Notes
8	e.g. $\frac{15}{4}$		3	M1 for $3\frac{3}{4}$ expressed as an improper fraction
	e.g. $\frac{\cancel{15}^{5}}{4}\times\frac{7}{\cancel{9}^{3}}$ **OR** $\frac{105}{36}$ oe			M1 correct cancelling or multiplication of numerators and denominators without cancelling
	e.g. $\frac{\cancel{15}^{5}}{4}\times\frac{7}{\cancel{9}^{3}}=\frac{35}{12}=2\frac{11}{12}$ **or** $\frac{15}{4}\times\frac{7}{9}=\frac{105}{36}=\frac{35}{12}=2\frac{11}{12}$ **or** $\frac{15}{4}\times\frac{7}{9}=\frac{105}{36}=2\frac{33}{36}=2\frac{11}{12}$	shown		A1 dep on M2, for conclusion to $2\frac{11}{12}$ from correct working – either sight of the result of the multiplication e.g. $\frac{105}{36}$ oe must be seen **or** correct cancelling prior to the multiplication to $\frac{35}{12}$ NB: use of decimals scores no marks
				Total 3 marks

9	(a)		33.75	1	B1 oe eg 33.750
	(b)		33.85	1	B1 allow $33.84\dot{9}$ or 33.849^{r} or "33.8499…" do NOT allow 33.879 without indication of recurring "9"
					Total 2 marks

Q	Working	Answer	Mark	Notes
10 (a) (i)		40	2 B1	cao (may be written on the diagram)
(ii)		Angles in same segment (are equal)	B1	**or** angles at the circumference from the same arc of the circle **or** angles on the same arc of the circle **Alternatively**: (two applications of) Opposite angles of a cyclic quadrilateral sum to 180°
(b)		140	1 B1	cao (may be written on the diagram)
				Total 3 marks

Q	Working	Answer	Mark	Notes
11 (a)		(−4.5) 3 4.5 (3) 1.5 (3) 10.5	2	B2 for all correct (B1 for any two correct) No points in table but correctly plotted on grid, award mark
(b)	(−3, −4.5) (−2,3) (−1,4.5) (0,3) (1,1.5) (2,3) (3,10.5)	Smooth curve	2	B2 for a correct smooth curve. Points or curve passing through correct values within half a small square. (B1 for at least 5 points plotted correctly; ft from table for plotting only provided B1 awarded in part (a))
(c)			2	M1 for drawing $y = -x - 1$ with two correct points plotted and intersection with curve. **or** for stating $y = -x - 1$ **or** for $\frac{1}{2}x^3 - 2x + 3 = -x - 1$ seen
		−2.3 to −2.4		A1 ft their curve dep on M1 **and** line $y = -x - 1$ drawn
				Total 6 marks

Q	Working	Answer	Mark	Notes
12	$yn^2 = n^2 + d$ **or** $y = 1 + \frac{d}{n^2}$		4	M1
	$yn^2 - n^2 = d$ **or** $-d = n^2 - yn^2$ **or** $y - 1 = \frac{d}{n^2}$			M1
	$n^2(y-1) = d$ **or** $-d = (1-y)n^2$			M1 for factorising n^2 from a suitable expression. or $n^2 = \frac{d}{y-1}$
		$n = \sqrt{\frac{d}{y-1}}$		A1 Accept $n = \sqrt{\frac{-d}{1-y}}$ Penalise $\pm\sqrt{}$
				Total 4 marks

Q	Working	Answer	Mark	Notes
13 (a)	$T = \frac{k}{m^2}$ or $Tm^2 = k$		3	M1 for a correct equation with a constant Do not allow constant = 1
	$30 \times 0.5^2 = k$ or $30 = \frac{k}{0.5^2}$ or $k = 7.5$ or $k = \frac{15}{2}$			M1 dep on M1 for correct substitution in a correct equation M2 for $k = 7.5$ or $k = \frac{15}{2}$
		$T = \frac{7.5}{m^2}$		A1 for $T = \frac{7.5}{m^2}$ or $T = \frac{15}{2m^2}$ SCB2 for $Tm^2 = 7.5$ or $Tm^2 = \frac{15}{2}$ or $m^2 = \frac{7.5}{T}$ or $m^2 = \frac{15}{2T}$
(b)		750	1	B1 cao
				Total 4 marks

Q	Working	Answer	Mark	Notes
14			2	M1 Arcs on *BC*, *AB* and arcs from these points meeting **or** for bisector without arcs
		Correct bisector		A1 must see correct arcs
				Total 2 marks
15	$-3\left(x^2-4x\right)+7$ or $-3\left(x^2-4x-\frac{7}{3}\right)$		4	M1 for factorising the expression to find *b* or *b* = −3 stated or shown clearly in answer.
	$-3\left[(x-2)^2.....\right]$ or c = –2 $-3\left[(x-2)^2-4\right]+7$ or $-3\left[(x-2)^2-4-\frac{7}{3}\right]$			M1 or for *c* shown clearly in answer.
	$-3(x-2)^2+12+7$ or $-3\left[(x-2)^2-\frac{19}{3}\right]$			M1 fully correct method.
		$19-3(x-2)^2$		A1 for $19-3(x-2)^2$ oe
				Total 4 marks

Q	Working	Answer	Mark	Notes
16 (a)	(f(2.6) =) $5 \times 2.6 - 7$ (= 6) **or** $\text{gf}(x) = \frac{5(5x-7)}{5x-7+4}$ oe		2	M1 for finding f(2.6) **or** gf(x)
		3		A1
(b)	$5\left(\frac{5x}{x+4}\right) - 7 = 2$ **or** $\frac{5x}{x+4} = \frac{2+7}{5}$ oe		3	M1
	$25x = 9(x + 4)$ oe			M1 for removing the denominator $(x + 4)$ in a correct equation
		2.25		A1 oe
ALT (b)	$\text{fg}(x) = 2 \Rightarrow \text{g}(x) = \text{f}^{-1}(2)$ (=9/5) and attempt at f^{-1} or $\text{f}^{-1}(2)$			M1
	$x = \text{g}^{-1}$("9/5")			M1
		2.25		A1 oe
(c)	$y = \frac{5x}{x+4}$ **or** $x = \frac{5y}{y+4}$ $y(x+4) = 5x$ $x(y+4) = 5y$		3	M1
	e.g. $4y = x(5 - y)$ **or** e.g. $4x = y(5 - x)$			M1 for a correct rearrangement and factorising
		$\frac{4x}{5-x}$		A1 oe e.g. $\frac{-4x}{x-5}$
				Total 8 marks

Q	Working	Answer		Mark	Notes
17	$(y-4)^2-(y-4)+y^2=10$ or $x^2-x+(x+4)^2=10$		6	M1	for substituting linear equation into the quadratic equation
	$2y^2-9y+10=0$ or $2x^2+7x+6=0$			A1	for a correct equation in the form $ax^2 + bx + c = 0$ or $ax^2 + bx = -c$ or equations of the same form but in y
	$(2y-5)(y-2)=0$ or $\frac{--9\pm\sqrt{(-9)^2-(4\times2\times10)}}{2\times2}$ or $(2x+3)(x+2)=0$ or $\frac{-7\pm\sqrt{7^2-(4\times2\times6)}}{2\times2}$			M1ft	For solving *their* 3 term quadratic equation using any correct method. If factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as eg $\frac{-7\pm\sqrt{49-48}}{4}$ or eg $\left(x+\frac{7}{4}\right)^2-\frac{1}{16}=0$ oe $\frac{9\pm\sqrt{81-80}}{4}$ or eg $\left(y-\frac{9}{4}\right)^2-\frac{1}{16}=0$ oe
	(- 1.5, 2.5) and (- 2, 2)			A1	for both pairs of coordinates oe eg $\left(\frac{-3}{2},\frac{5}{2}\right)$ accept coordinates listed as pairs, ie x_1, y_1, x_2, y_2
	$\sqrt{('-1.5'-'-2')^2+('2.5'-'2')^2}$			M1	dep on M1 for finding length of AB
		$\frac{\sqrt{2}}{2}$		A1	dep M3
					Total 6 marks

Q	Working	Answer	Mark	Notes
18		*BDF* = 70°	4 B1	may be marked on diagram
		Alternate segment theorem	B1	reason, the angle between a tangent and a chord is equal to the angle subtended in the alternate segment
		EFB = 180 – (70 + 40) = 70 opposite angles in a cyclic quadrilateral	B1	Angle *EFB* with reason, opposite angles in a cyclic quadrilateral sum to 180°
		CBF = *EFB* alternate angles therefore *EF* is parallel to *ABC*	B1	conclusion, alternate angles are equal
				Total 4 marks

Q	Working	Answer	Mark	Notes
19	$\overrightarrow{AB} = 2\mathbf{b} - 2\mathbf{a}$ or $\overrightarrow{BA} = 2\mathbf{a} - 2\mathbf{b}$ $\overrightarrow{MN} = 10\mathbf{a} - \mathbf{b}$ or $\overrightarrow{NM} = -10\mathbf{a} + \mathbf{b}$		5	M1 for finding $\overrightarrow{AB}$ or $\overrightarrow{BA}$ or $\overrightarrow{MN}$ or $\overrightarrow{NM}$
	eg $\overrightarrow{MP} = -\mathbf{b} + 2\mathbf{a} + k(2\mathbf{b} - 2\mathbf{a})$ and $\overrightarrow{MP} = l(10\mathbf{a} - \mathbf{b})$ or eg $\overrightarrow{MP} = \mathbf{b} + k(2\mathbf{a} - 2\mathbf{b})$ and $\overrightarrow{MP} = l(10\mathbf{a} - \mathbf{b})$ or eg $\overrightarrow{PN} = 8\mathbf{a} + k(2\mathbf{a} - 2\mathbf{b})$ and $\overrightarrow{PN} = l(10\mathbf{a} - \mathbf{b})$ or eg $\overrightarrow{AP} = 8\mathbf{a} + k(\mathbf{b} - 10\mathbf{a})$ and $\overrightarrow{AP} = l(2\mathbf{b} - 2\mathbf{a})$ or eg $\overrightarrow{AP} = -2\mathbf{a} + \mathbf{b} + k(10\mathbf{a} - \mathbf{b})$ and $\overrightarrow{AP} = l(2\mathbf{b} - 2\mathbf{a})$ or eg $\overrightarrow{AM} = k(2\mathbf{b} - 2\mathbf{a}) + l(\mathbf{b} - 10\mathbf{a})$ and $\overrightarrow{AM} = -2\mathbf{a} + \mathbf{b}$			M2 for writing eg $\overrightarrow{MP}$ or $\overrightarrow{PN}$ or $\overrightarrow{AP}$ or $\overrightarrow{AM}$ in two different ways in terms of **a** and **b** (M1 for writing eg $\overrightarrow{MP}$ or $\overrightarrow{PN}$ or $\overrightarrow{AP}$ or $\overrightarrow{AM}$ in one way) These may be written as eg $\overrightarrow{PM}$ in place of $\overrightarrow{MP}$
	eg $2-2k=10\lambda$ and $-1+k=-\lambda$ (from $\overrightarrow{MP}$ 1st) or eg $2k=10\lambda$ and $1-2k=-\lambda$ (from $\overrightarrow{MP}$ 2nd) or eg $8+2k=10\lambda$ and $-2k=-\lambda$ (from $\overrightarrow{PN}$) or eg $8-10k=-2\lambda$ and $k=2\lambda$ (from $\overrightarrow{AP}$ 1st) or eg $-2+10k=-2\lambda$ and $1-k=2\lambda$ (from $\overrightarrow{AP}$ 2nd) or eg $-2k-10\lambda=-2$ and $2k+\lambda=1$ (from $\overrightarrow{AM}$)			M1 dep M3 for writing a pair of equations using their variables. $\overrightarrow{MP}$ (1st) leads to $\lambda=\frac{1}{9}, k=\frac{4}{9}$ $\overrightarrow{MP}$ (2nd) leads to $\lambda=\frac{1}{9}, k=\frac{5}{9}$ $\overrightarrow{PN}$ leads to $\lambda=\frac{8}{9}, k=\frac{4}{9}$ $\overrightarrow{AP}$ (1st) leads to $\lambda=\frac{4}{9}, k=\frac{8}{9}$ $\overrightarrow{AP}$ (2nd) leads to $\lambda=\frac{4}{9}, k=\frac{1}{9}$ $\overrightarrow{AM}$ leads to $\lambda=\frac{1}{9}, k=\frac{4}{9}$
		4 : 5		A1 cao

Q	Working	Answer	Mark	Notes
20	$12^2 = 2^4 \times 3^2$ **or** $2 \times 12^2 = 2^5 \times 3^2$ oe **or** $\frac{2\times12^2}{3^2}(=32) = 2^5$		5	M1
	$18^{4n} = (2 \times 3^2)^{4n}$ **or** $2^{4n} \times 3^{2\times4n}$			M1
	$3n^2 - 14n - 5\ (= 0)$			A1
	e.g. $(3n + 1)(n - 5)(= 0)$ $n = \frac{14 \pm \sqrt{(-14)^2 - (4\times3\times-5)}}{2\times3}$			M1 for solving their 3 term quadratic equation using any correct method - if factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as e.g. $\frac{14 \pm \sqrt{196+60}}{6}$ oe)
		$-\frac{1}{3}$, 5		A1 Allow −0.33 or better for $-\frac{1}{3}$
				Total 5 marks

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Q	Working	Answer	Mark	Notes

					Edexcel averages: scores of candidates who achieved grade:							
Qn	**Skill tested**	**Mean score**	**Max score**	**Mean %**	**ALL**	**9**	**8**	**7**	**6**	**5**	**4**	**3**
1	Expressions and formulae	1.69	2	85	1.69	1.99	1.94	1.80	1.64	1.27	0.57	0.00
2	Linear equations	2.70	3	90	2.70	2.98	2.88	2.75	2.74	2.35	2.11	0.33
3	Powers and roots	1.67	2	84	1.67	1.96	1.79	1.73	1.49	1.38	1.03	0.33
4	Simultaneous linear equations	3.31	4	83	3.31	3.95	3.85	3.42	2.89	2.38	1.39	0.67
5	Inequalities	4.04	5	81	4.04	4.89	4.59	4.07	3.77	2.61	1.96	1.11
6	Algebraic manipulation	2.35	3	78	2.35	2.96	2.68	2.38	2.04	1.69	0.64	0.11
7	Statistical measures	3.89	5	78	3.89	4.75	4.43	3.95	3.68	2.68	1.53	0.22
8	Fractions	2.21	3	74	2.21	2.64	2.30	2.36	2.17	1.62	1.11	0.33
9	Degree of accuracy	1.31	2	66	1.31	1.89	1.55	1.32	0.79	0.58	0.18	0.00
10	Angles, lines and triangles	1.93	3	64	1.93	2.46	2.21	1.98	1.45	1.16	0.93	0.11
11	Graphs	3.78	6	63	3.78	4.78	3.87	3.57	3.17	2.95	2.25	1.11
12	Algebraic manipulation	2.47	4	62	2.47	3.78	3.17	2.15	1.40	0.55	0.25	0.11
13	Proportion	2.22	4	56	2.22	3.49	2.60	1.79	1.24	0.83	0.36	0.00
14	Construction	1.09	2	55	1.09	1.68	1.33	0.89	0.55	0.50	0.11	0.00
15	Quadratic equations	1.95	4	49	1.95	3.51	2.15	1.50	0.64	0.18	0.18	0.00
16	Function notation	4.31	8	54	4.31	7.42	5.18	1.40	1.17	0.32	0.44	0.00
17	Quadratic equations	2.49	6	42	2.49	5.11	2.61	1.08	0.53	0.14	0.11	0.00
18	Geometrical reasoning	0.97	4	24	0.97	1.97	1.02	0.48	0.09	0.13	0.07	0.00
19	Vectors	0.67	5	13	0.67	1.37	0.74	0.35	0.04	0.04	0.00	0.00
20	Powers and roots	1.37	5	27	1.37	3.28	1.02	0.31	0.06	0.06	0.00	0.00
	TOTAL	**46.42**	**80**	**58**	**46.42**	**66.86**	**51.91**	**39.28**	**31.55**	**23.42**	**15.22**	**4.43**

Suggested grade boundaries

Grade	9	8	7	6	5	4	3
Mark	60	46	36	28	19	10	2