

## IGCSE (9–1) Maths - practice paper 2H mark scheme

### Results Plus data on 92 of the 100 marks:

Paper 2							Edexcel averages:						
Year	Paper	Qu. no	New qu. no.	Mean score	Max score	Mean %	ALL	A*	A	B	C	D	E
1706	4HR	Q02	Q01	3.09	4	77.3	3.09	3.78	3.31	2.84	2.20	1.32	0.49
1701	4H	Q02	Q02	4.51	5	90.2	4.51	4.97	4.88	4.72	4.44	3.89	2.45
1701	3H	Q05c, e	Q03a-b	2.53	4	63.3	2.53	3.68	3.11	2.59	1.83	0.93	0.48
1606	3H	Q7b	Q03c	1.85	2	92.5	1.85	1.98	1.95	1.86	1.51	0.95	0.36
1701	3H	Q09	Q04	1.73	3	57.7	1.73	2.68	2.28	1.72	1.13	0.40	0.17
1701	3H	Q10	Q05	1.77	3	59.0	1.77	2.88	2.39	1.63	0.99	0.37	0.09
1706	4H	Q08	Q06	2.09	3	69.7	2.09	2.92	2.35	1.41	0.58	0.23	0.12
1706	4H	Q09	Q07	3.37	4	84.3	3.37	3.86	3.62	3.23	2.39	1.04	0.28
1706	4H	Q10	Q08a,b,d,e	4.86	6	81.0	4.86	5.74	5.03	4.31	3.50	2.54	1.39
1706	4HR	Q05g	Q08c	0.91	1	91.0	0.91	0.99	0.94	0.88	0.81	0.71	0.49
1706	4H	Q11	Q09	3.09	5	61.8	3.09	4.66	3.39	1.78	0.53	0.14	0.18
1706	4H	Q12	Q10	1.42	3	47.3	1.42	1.96	1.42	1.05	0.66	0.42	0.22
1706	4H	Q13	Q11	2.56	5	51.2	2.56	4.13	2.55	1.18	0.47	0.28	0.19
1706	4H	Q14	Q12	2.76	4	69.0	2.76	3.40	2.87	2.34	1.72	1.14	0.61
1706	3HR	Q13	Q13	1.46	3	48.7	1.46	2.62	1.67	0.82	0.33	0.07	0.02
1706	4H	Q15	Q14	3.27	6	54.5	3.27	5.27	3.36	1.49	0.53	0.18	0.04
1706	4H	Q16	Q15	4.17	5	83.4	4.17	4.90	4.62	3.82	2.50	1.40	0.64
1706	4H	Q17	Q16	3.38	6	56.3	3.38	5.44	3.31	1.70	0.71	0.32	0.11
1706	4H	Q18	Q17	1.53	3	51.0	1.53	2.25	1.63	0.96	0.39	0.11	0.03
1706	4H	Q19	Q18	1.79	3	59.7	1.79	2.65	1.95	1.09	0.38	0.21	0.07
1706	4H	Q20	Q19	1.50	4	37.5	1.50	2.65	1.37	0.53	0.13	0.05	0.01
Spec pprs	1H	Q20	Q20		4								
1706	4H	Q21	Q21	2.30	6	38.3	2.30	4.53	1.78	0.43	0.05	0.01	0.01
SAMs	2H	Q24	Q22		4								
1706	4H	Q23	Q23	0.95	4	23.8	0.95	2.18	0.37	0.06	0.02	0.02	0.01
				<b>56.89</b>	<b>92</b>	<b>61.8</b>	<b>56.89</b>	<b>80.12</b>	<b>60.15</b>	<b>42.44</b>	<b>27.80</b>	<b>16.73</b>	<b>8.46</b>

**Problem-solving questions:** 1, 7, 9, 16, 18, 21, 23

**Reasoning questions:** 2, 12, 13, 14, 17, 20, 22

Q	Working	Answer	Mark	Notes
1	(a) (i)	5, 15	1	B1
	(ii)	5, 7, 9, 10, 11, 13, 15	1	B1
	(b)	4, 6, 8, 10, 12, 14	2	B2 B2 for all correct and none incorrect. If not B2 then B1 for 4 or more correct and no more than 1 incorrect.
				<b>Total 4 marks</b>

2	(a)	$1 - 0.4 - 0.2 - 0.1$ or 0.3	3	M1
		$\frac{1 - 0.4 - 0.2 - 0.1}{2}$ or "0.3" 2		M1 dep
		0.15		A1
	(b)	$200 \times 0.4$	2	M1
		80		A1 Note: Award M1A1 for 80 out of 200 Award M1A0 for 80/200
				<b>Total 5 marks</b>

3	(a)	$7 \times (-2)^2 + 5$ or $7 \times 4 + 5$ or $7(-2)^2 + 5$	2	M1 for correct substitution or $7 \times 4$ or 28
		33		A1
	(b)	$-7t \geq 31 - 3$ or $7t \leq 3 - 31$ oe	2	M1 $-7t \geq 31 - 3$ or $7t \leq 3 - 31$ or $-4$ or $t \geq -4$ accept an equation or the wrong inequality sign in the working
		$t \leq -4$		A1 or for $-4 \geq t$

3	(c)			M1	for 3 correct terms <b>or</b> 4 correct terms ignoring signs <b>or</b> $x^2 - 7x + a$ for any non-zero value of $a$ <b>or</b> ... $- 7x - 18$
			$x^2 - 7x - 18$	2	A1
		<b>Total 6 marks</b>			

4	$4x^2 + 6x + 6x + 9$ or $4x^2 + 12x + 9$		3	M1	for at least 3 terms correct in expansion of first pair of brackets
	$2x^2 - 10x + 3x - 15$ or $2x^2 - 7x - 15$			M1	for at least 3 terms correct in expansion of second pair of brackets <b>or</b> all 4 terms correct ignoring signs  allow $-2x^2 - 7x - 15$
		$2x^2 + 19x + 24$		A1	
	Alternative method				
	$(2x + 3)[(2x + 3) - (x - 5)]$			M1	
	$(2x + 3)(x + 8)$			M1	
		$2x^2 + 19x + 24$		A1	
<b>Total 3 marks</b>					

<b>5</b>	$0.82x = 25.83$ or $82\% = 25.83$		3	M1 or for use of 0.82 in a calculation
	$\frac{25.83}{0.82}$ or $\frac{25.83}{82} \times 100$			M1
		31.5(0)		A1
				<b>Total 3 marks</b>

<b>6</b>	$180 - 156 (=24)$ or $180(n - 2) = 156n$ oe or $90(2n - 4) = 156n$ oe			M1
	$360 \div "24"$ or $(180 \times 2) \div (180 - 156)$ or $\frac{90 \times 4}{2 \times 90 - 156}$			M1 complete method
		15	3	A1
				<b>Total 3 marks</b>

<b>7</b>	$420 \div (4 + 5 + 3) (=35)$ [or Manu = 140 or Liam = 175]			M1	M2 for
	$"35" \times 3 (=105)$			M1 or Ned = 105	$\frac{3}{12} \times 420$ oe
	$\frac{"105"+75}{420} \times 100$ oe			M1	
		43	4	A1	42.85 – 43
					<b>Total 4 marks</b>

<b>8</b>	(a)		$e^{15}$	1	B1
	(b)				M1 for $ng^8$ or $4g^m$ or $\frac{4g^9}{g}$
			$4g^8$	2	A1 (condone $\frac{4}{1}g^8$ )
	(c)		$e^{15}$	1	B1
	(d)		1	1	B1
	(e)	$(3x^2)^2$ or $9(x^2)^2$ or $(729x^{12})^{\frac{1}{3}}$ or $9(x^{12})^{\frac{1}{3}}$ or $\sqrt[3]{729x^{12}}$ or $9\sqrt[3]{x^{12}}$			M1 or $kx^4$ or $9x^n$ (not just 9 or $x^n$ )
			$9x^4$	2	A1
					<b>Total 7 marks</b>

<b>9</b>	eg $(d^2 =) 7^2 + 7^2$ or $r^2 + r^2 = 7^2$ or $\cos 45 = \frac{7}{d}$ or $\sin 45 = \frac{7}{d}$ or $\cos 45 = \frac{r}{7}$ or $\sin 45 = \frac{r}{7}$			M1	Start of method to find radius or diameter of circle
	eg $(d=)\sqrt{98}$ (9.899..) or $(r=)\sqrt{\frac{49}{2}}$ (=4.9...) or $d = \frac{7}{\cos 45}$ or $d = \frac{7}{\sin 45}$ or $r^2 = 24.5$ or $r = 7\cos 45$ or $r = 7\sin 45$			M1	complete method to find radius or diameter or $r^2$ (if method to find radius or diameter shown then allow use of radius = 5 for method marks only)
	eg. $\pi \times "4.9.."^2$ (=76.969...)			M1	For method to find area of circle or semi-circle or quarter circle – use of radius from correct working
	eg. $\pi \times "4.9.."^2 - 7^2$			M1	for complete method
		28	5	A1	27.9 – 28
					<b>Total 5 marks</b>



<b>13</b>				M1 for either $y = 2x + 1$ <b>or</b> $x + y = 10$ drawn correctly
				M1 for all lines drawn correctly
		Correct region	3	A1 for all 3 lines correct and the region identified Lines may be full lines or broken lines
				<b>Total 3 marks</b>

14	(a)	$\frac{1}{2} \times (x+5+2x-4) \times (x+3)$ or $(3x+1)(x+3) = 120$ or $(2x-4)(x+3) + \frac{1}{2}(9-x)(x+3)$ or $(x+5)(x+3) - \frac{1}{2}(9-x)(x+3)$			M1 correct expression for area (trapezium)  (rectangle + triangle) (rectangle – triangle)
		$\frac{1}{2} \times (3x^2 + 9x + x + 3) = 60$ oe			M1 correct expansion of (all pairs) brackets in a correct equation
		$3x^2 + 10x + 3 = 120$ or $1.5x^2 + 5x + 1.5 = 60$	shown	3	A1 dep on fully correct working to get to $3x^2 + 10x - 117 = 0$
	(b)	$\frac{-10 \pm \sqrt{1504}}{6}$ or $\frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times -1404}}{2 \times 3}$ oe or $\frac{-10 \pm 4\sqrt{94}}{6}$ NB: denominator must be $2 \times 3$ or 6 and there must be evidence for correct order of operations in the numerator			M2 If not M2 then M1 for  $\frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times -117}}{2 \times 3}$ (may have just + rather than $\pm$ ) Condone one sign error in substitution; allow partial evaluation
			4.80	3	A1 Award M2A1 for answers in range 4.796 – 4.8 (and no other answer) with sufficient correct working that would gain at least M1 [Award M2A0 for working sufficient for M1 with both the –ve and +ve answers (–8.13 & 4.80)]
<b>Total 6 marks</b>					



<b>15</b>	(a)		0.2, 0.65, 0.35, 0.4, 0.6	2	B2oe	B1 for any 2 correct probabilities (in correct position)
	(b)	$0.8 \times "0.35" (=0.28)$ or $"0.2" \times "0.4" (=0.08)$			M1	ft from (a)   M2 ft from (a) for $1 - (0.8 \times '0.6' + '0.2' \times '0.6')$ M1 for $1 - (0.8 \times '0.65')$ or $1 - ('0.2' \times '0.6')$
		$0.8 \times "0.35" + "0.2" \times "0.4"$			M1	ft from (a)
			0.36 oe	3	A1	eg $\frac{9}{25}$ , 36%
						<b>Total 5 marks</b>

<b>16</b>	(a)		$24x^2 - 6x - 25$	2	M1	for 2 correct from $3 \times 8x^2$ , $-3 \times 2x$ , $-25$
	(b)	$24x^2 - 6x - 25 = 5$			A1	fully correct
		$24x^2 - 6x - 30 (= 0)$ or $4x^2 - x - 5 (= 0)$ or $12x^2 - 3x - 15 (= 0)$			M1	ft from (a) for a 3 term quadratic with no coefficients of zero
		$(4x - 5)(6x + 6) (= 0)$ or $(4x - 5)(x + 1) (= 0)$ $(4x - 5)(3x + 3) (= 0)$ or $\frac{- -1 \pm \sqrt{(-1)^2 - 4 \times 4 \times -5}}{2 \times 4}$			M1	ft from (a) for a 3 term quadratic with no coefficients of zero. If using quadratic formula some simplification may be seen.
			1.25 oe, -1	4	A1	cao dep on M1 [ignore attempts to work out y values]
						<b>Total 6 marks</b>

<b>17</b>	$60 \div 30 (=2)$ or $270 \div 60 (=4.5)$ or $150 \div 30 (=5)$ or $156 \div 120 (=1.3)$ or $24 \div 60 (=0.4)$			M1	for use of area eg. any one correct fd or any 2 correct bars of different widths
	fd : 2, 4.5, 5, 1.3, 0.4			M1	for any 4 correct fd or bars
		histogram	3	A1	for a correct histogram, including frequency density (FD) label and scale/correct key
				<b>Total 3 marks</b>	

<b>18</b>	$0.5 \times 6.4 \times 9.7 \times \sin 110 (= 29.16\dots)$			M1	M2 for $6.4 \times 9.7 \times \sin 110$
	$2 \times "29.16\dots"$			M1	
		58.3	3	A1	for 58.3 – 58.4
	alternative				
	$AC = \sqrt{6.4^2 + 9.7^2 - 2 \times 9.7 \times 6.4 \times \cos 110} (=13.323\dots)$ $DAC = \sin^{-1}\left(\frac{\sin 110}{'13.323'} \times 9.7\right) (= 43.167\dots)$ or $ACD = \sin^{-1}\left(\frac{\sin 110}{'13.323'} \times 6.4\right) (= 26.83\dots)$			M1	For method to find <i>AC</i> and angle <i>DAC</i> or angle <i>ACD</i>
	Area = $(\sin '43.167..' \times 6.4 \times 2 \times '13.323..') \div 2$ Or area = $(\sin '26.83..' \times 9.7 \times 2 \times '13.323..' ) \div 2$			M1	find <i>DB</i> and then area using half product of diagonals
		58.3		A1	for 58.3 – 58.4
				<b>Total 3 marks</b>	

<b>19</b>	45.75 or 45.85 or 63.25 or 63.75			B1	Accept 45.849 or 45.8499... or 63.749 or 63.7499...
	$\frac{63.25}{45.85}$ (= 1.379)... or $\frac{45.85}{60}$ (=0.764)...			M1	Or for $\frac{LB_1}{UB_2}$ or $\frac{UB_2}{60}$ where $63.25 \leq LB_1 < 63.5$ , $45.8 < UB_2 \leq 45.85$
	$\frac{63.25}{45.85} \times 60$ oe e.g. $\frac{63.25}{0.764...}$			M1	$\frac{LB_1}{UB_2} \times 60$ oe, e.g. ' $\frac{LB_1}{0.764...}$ '
		82.8	4	A1	Or better (82.76990185)
					<b>Total 4 marks</b>

<b>20</b>	eg. $2n + 1, 2n + 3$			M1	for algebraic representation of two consecutive odd numbers
	$(2n + 3)^2 - (2n + 1)^2 =$ $(4n^2 + 6n + 6n + 9) - (4n^2 + 2n + 2n + 1)$			M1	for correct expansion of at least one bracket
	$8n + 8$			M1	for simplified answer, may be factorised
		proof	4	A1	for completion of proof
					<b>Total 4 marks</b>

<b>21</b>	$15.6^2 + 4.3^2 - 2 \times 15.6 \times 4.3 \times \cos 72^\circ (=220.39\dots)$			M1	substitution into Cosine rule
	$LN = 14.8(4561\dots)$			A1	14.8(4561\dots)
	$\frac{\sin 58}{"14.8.."} = \frac{\sin MLN}{13.7} \quad \text{or}$ $\frac{\sin NLP}{4.3} = \frac{\sin 72}{"14.8"} \quad \text{or}$ $\frac{\sin LNP}{15.6} = \frac{\sin 72}{"14.8.."} $			M1	ft $LN$ dep on 1 <sup>st</sup> M1 or correct start to alternative method to find angle $MLN$ <b>or</b> angle $NLP$ <b>or</b> angle $LNP$  $[4.3^2 = 14.8..^2 + 15.6^2 - 2 \times 14.8 \times 15.6 \cos NLP]$
	$MLN = \sin^{-1} \left( \frac{\sin 58}{"14.8.."} \times 13.7 \right) (=51.49..) \quad \text{or}$ $NLP = \sin^{-1} \left( \frac{\sin 72}{"14.8"} \times 4.3 \right) (=15.99..) \quad \text{or}$ $LNP = \sin^{-1} \left( \frac{\sin 72}{"14.8"} \times 15.6 \right) (=87.99 \text{ or } 92.00..) $			M1	ft $LN$ dep on 1 <sup>st</sup> M1 or complete alternative method to find angle $MLN$ <b>or</b> angle $NLP$ <b>or</b> angle $LNP$  NB: $LNP = 180 - 87.99 = 92.009\dots$  $NLP = \cos^{-1} \left( \frac{14.8..^2 + 15.6^2 - 4.3^2}{2 \times 14.8.. \times 15.6} \right)$
	$MLN = \sin^{-1} \left( \frac{\sin 58}{"14.8.."} \times 13.7 \right) (=51.49..) \quad \text{and}$ $NLP = \sin^{-1} \left( \frac{\sin 72}{"14.8"} \times 4.3 \right) (=15.99..) \quad \text{or}$ $LNP = \sin^{-1} \left( \frac{\sin 72}{"14.8"} \times 15.6 \right) (=87.99 \text{ or } 92.00..) $			M1	ft $LN$ dep on 1 <sup>st</sup> M1 or complete method to find angle $MLN$ <b>and</b> angle $NLP$ (or $LNP$ acute or obtuse)
		67.5	6	A1	for 67.46 – 67.8
					<b>Total 6 marks</b>

Question	Working	Answer	Mark	AO	Notes
22	$\frac{(\sqrt{12}-1)(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}$ $\frac{2\sqrt{12}-2+\sqrt{12}\sqrt{3}-\sqrt{3}}{4-3}$ $\sqrt{12}=2\sqrt{3}$	shown	4	AO1	M1 method to rationalise M1 correct expansion of brackets B1 may be seen before expansion A1 answer from fully correct working with all steps seen

23	$\frac{4\pi r^2}{2} + \pi r^2 = \frac{16}{3}\pi$ or $3\pi r^2 = \frac{16}{3}\pi$				M1 allow $\frac{4\pi r^2}{2} + \pi r^2 = 16.755\dots$
	$r = \frac{4}{3}$ oe				A1 (allow 1.33... or better)
	$\frac{1}{2} \times \frac{4}{3} \pi \left(\frac{4}{3}\right)^3$				M1 dep on 1st M1 (need not include $\pi$ ) or answer of $\frac{128}{81}\pi (=4.96(44\dots))$
			$\frac{128}{81}$	4	A1 $1\frac{47}{81}$ (accept 1.58(024...))
					<b>Total 4 marks</b>