GCSE Mathematics (9–1) Practice Tests Set 9 – Paper 3H mark scheme

Question	Working	Answer	Mark	Notes
1 (a)	$(26.72\ldots)^2$ or $\frac{15775.36}{22.09}$	714.1(40335)	2	M1 for 26.72… or 15775.36 or 22.09 A1
(b)		714	1	B1 ft if at least 4 significant figures in (a)
2	$60\times\frac{5}{6}$	50	2	M1 A1 NB: $\frac{50}{60}$ gains M1 A0
3 (a)	$(-1,6),(0,4),(1,2),(2,0),(3,-2)$	correct line between $x=-1$ and $x=3$	3	B3 for a correct line between $x=-1$ and $x=3$ If not B3 then award B2 for a straight line segment through at least 3 of $(-1,6),(0,4),(1,2),(2,0),(3,-2)$ **OR** for all of $(-1,6),(0,4),(1,2),(2,0),(3,-2)$ plotted and not joined **OR** for a line drawn through (0, 4) with a clear attempt at a gradient of −2 (eg a line through (0, 4) and (0.5, 2) If not B2 then award B1 for at least 2 correct points stated or plotted (may be in a table); **ignore any incorrect points either plotted or evaluated** **OR** for a line drawn with negative gradient through (0, 4) **OR** for a straight line with gradient -2
(b)		(1.5, 1) oe	1	B1 for (1.5, 1) **or** ft from (a)

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4		E.g. $\frac{x}{60}=\frac{12}{16}$ oe **or** $12 : 16 = x : 60$ oe **or** $\frac{12\times60}{16}$ oe **or** $\frac{24\times60}{32}$ oe	45	2	M1 for a correct equation (accept ratios) **or** a correct calculation A1 cao
5	(a)	$\frac{360}{n}=24$ oe **or** $\frac{360}{24}$ **or** $180-\frac{180(n-2)}{n}=24$ oe **or** $\frac{180(n-2)}{n}=156$ oe	15	2	M1 for a correct equation or a correct calculation A1 cao
	(b)	$(2\times5-4)\times90$ (=540) **or** (5 – 2) × 180 (=540)	95	3	M1 Complete method to find sum of interior angles.
		$540-(90+137+90+128)$ **or** $540-445$			M1 dep A1 cao SC : If no marks awarded then award B1 for $137 + 128 + 90 + 90 + t = m$ oe **or** $m – (137 + 128 + 90 + 90)$ **or** $m - 445$ where $m > 360$
		Alternative scheme – using exterior angles			
		$2 \times (180 – 90) + (180 – 137) + (180 – 128) + (180 – t) = 360$ **or** $90 + 43 + 90 + 52 + 180 – t = 360$ oe	95	3	M1 for a correct equation using exterior angles
		$455 – 360 (= t)$ **or** $90 + 43 + 90 + 52 + 180 – 360 (= t)$ oe			M1 (dep) for isolating t on one side of the equation A1 cao

Question	Working	Answer	Mark	Notes
6 (a)		4 – 6	1	B1
(b)	$2 \times 5 + 5 \times 12 + 8 \times 10 + 11 \times 4 + 14 \times 1$ **or** $10 + 60 + 80 + 44 + 14$ (= 208)	6.5	4	M2 for at least 4 correct products added (need not be evaluated) If not M2 then award M1 for consistent use of value within interval (including end points) for at least 4 products which must be added **OR** correct mid-points used for at least 4 products and not added
	$\frac{2\times5+5\times12+8\times10+11\times4+14\times1}{5+12+10+4+1}\left(=\frac{208}{32}\right)$			M1 dep on at least M1 Allow division by their $\sum f$ provided addition or total under column seen
				A1 for 6.5 **or** $6\frac{1}{2}$ allow 6 **or** 7 if 6.5 oe seen or 208 ÷ 32 seen

Question	Working	Answer	Mark	Notes		
7	$x^2 + 11^2 = 15^2$ **or** $15^2 - 11^2$ oe	10.2	3	M1	for a correct use of Pythagoras's theorem	M1 for an angle found from a correct method (42.8… , 47.1…) **and used** with a correct trig statement with x eg. $\sin 42.8 = \frac{x}{15}$
	$\sqrt{15^2 - 11^2}$ **or** $\sqrt{104}$ **or** $2\sqrt{26}$			M1	dep on M1	M1 for correct trig statement with x the subject eg. (x =) 15 × sin 42.8
				A1	for answer in range 10.19 – 10.2	

Question	Working	Answer	Mark	Notes
8 (a)	$y = \frac{20-4x}{5}$ or $y = \frac{20}{5} - \frac{4}{5}x$	$-\frac{4}{5}$ oe	2	M1 for correct rearrangement of equation for term in x (condone any errors in constant term) A1
(b)	$y = mx + 4$ **or** $y = 2x + c$	$y = 2x + 4$	2	M1 ft "4" from (a) m and c may be left as letters or shown as any values (c may be 0) **OR** for an answer of $2x + 4$ **or** $M = 2x + 4$ A1 for $y = 2x + 4$ oe
9 (a) (i)		102	1	B1
(ii)			1	B1 (dep on B1 in (i)) for opposite angles of a cyclic quadrilateral add up to 180°
(b)	angle $RSQ = 62$ **or** angle $PRQ = (180 - 62 - 78)$ (=40)	40	2	M1 ft from (a) for "102" – 62 may be marked on the diagram A1
10 (a)	(CF =) 44	350	2	M1 Stated or marked on graph, or corresponding vertical line marked. Also allow 44.5 A1 Allow 345 – 355
(b)	80 (may be seen on graph)	8	2	M1 for use of the graph at 500 calories (can be indicated by a vertical line from 500 to the curve) A1

Question	Working	Answer	Mark	Notes
11 (a)		$p < 28$	1	B1
(b)	$q^2 > \frac{9}{16}$ oe **or** $q > \sqrt{\frac{9}{16}}$ **or** $(\pm)\ 4q > 3$ **or** $\frac{3}{4}$ oe **or** $(4q-3)(4q+3) > 0$ **or** $\frac{0 \pm \sqrt{0-4\times16\times(-9)}}{2\times16}$	$q < -\frac{3}{4}$ or $q > \frac{3}{4}$	3	M1 Allow as equations or incorrect inequality sign
	$\frac{3}{4}$ and $-\frac{3}{4}$ oe **or** $\pm\frac{3}{4}$ oe **or** $\pm\sqrt{\frac{9}{16}}$			M1 for finding both values. A1 for both correct inequalities
12 (a)	$\pi \times 4^2 \times 12$	603	2	M1 Accept 3.14 or better for π A1 for answer in range 603 – 603.3
(b)	$\frac{21}{12}$ oe (=1.75) **or** $\frac{12}{21}$ oe (=0.571..) **or** $\frac{12}{8}$ oe (= 1.5) **or** $\frac{8}{12}$ oe (=0.666…) **or** $\frac{d}{21} = \frac{8}{12}$	14	2	M1 for the correct linear scale factor **or** a correct equation (may be seen in ratio form) A1
(c)	E.g. $\left(\frac{h}{12}\right)^3 = \frac{64V}{V}$ **or** $\left(\frac{h}{12}\right)^3 = 64$ **or** $\sqrt[3]{64}$ (= 4)	48	3	M1 Correct equation for height **or** correct expression for scale factor. ft from (a) if a value is used for the volume.
	$12 \times \sqrt[3]{64}$ **or** 12×4 **or** $\sqrt[3]{12^3 \times 64}$ oe **or** $\frac{"603" \times 64}{\pi \times (4 \times \sqrt[3]{64})^2}$			M1 for a correct expression for height. A1

Question	Working	Answer	Mark	Notes
13 (a)	E.g. 13 300 ÷ 0.76	17 500	3	M2 If not M2 then award M1 for $x \times 0.76 = 13\,300$ **or** $13\,300 \div 76$ NB: Accept 1 – 0.24 in place of 0.76
				A1 NB: An answer of 16 492 scores no marks
(b)	E.g. $13\,300(1-x)^3 = 6500$ **or** $13\,300y^3 = 6500$	21.2	3	M1 for a correct equation condone use of $(1-x)^4$ **or** y^4 accept x% or y% in equation
	$\sqrt[3]{\frac{6500}{13300}}$ (=0.787…) **or** $1-\sqrt[3]{\frac{6500}{13300}}$ (=0.212…)			M1 condone use of 4th root rather than cube root A1 for an answer in the range 21.2 – 21.24 SC: If no marks scored then award B2 for an answer of 16.38 – 16.4 (from using 4 years)
	$x^2 = \frac{13.5}{6} \quad \left(= \frac{27}{12} = \frac{9}{4}\right)$			M1 correct expression for x^2 A1 dep on at least M1 scored

Question	Working	Answer	Mark	Notes
14 (a)	$\frac{1}{6}\times\frac{1}{6}\left(=\frac{1}{36}\right)$	$\frac{3}{36}$ oe	2	M1 or for a fully correct sample space with (3,1) (1,3) (2,2) selected **or** $\frac{x}{36}$ where $x < 36$
				A1 for $\frac{3}{36}$ oe **or** 0.083(3…) **or** 8.3(3…)%
(b)	$\left(1-\frac{3}{36}\right)^3$ **or** $\left(\frac{33}{36}\right)^3$ **or** $\left(\frac{11}{12}\right)^3$	$\frac{1331}{1728}$ oe	2	M1 ft $\frac{3}{36}$ from (a) for $(1-(a))^3$ provided answer to (a) < 1
				A1 for $\frac{1331}{1728}$ oe accept 0.77 to 0.771

Question	Working	Answer	Mark		Notes
15	$SQ^2 = 8^2 + 12^2 - 2\times 8\times 12\times\cos 120^\circ$	91.4	6	M1	If this mark is awarded then ft on the remaining M marks
	$(SQ) = \sqrt{304}$			M1	for correct order of operations e.g. 64 + 144 + 96 or 304 or 17.4…. or $\mathbf{4\sqrt{19}}$
	$\frac{\sin R}{\sqrt{304}} = \frac{\sin 27^\circ}{9}$			M1	
	$R = \sin^{-1}\left(\frac{\sin 27^\circ \times \sqrt{304}}{9}\right)$			M1	can be implied by 61.5833...
	61.58			A1	for 61.58 - 61.6
				B1	ft dep M3 180 – "61.6" – 27
					Total 6 marks

Question	Working		Answer	Mark	Notes
16	$5x^2 - 3x - 4(=0)$ **or** $5x^2 - 4 = 3x$ oe $\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 5 \times (-4)}}{2 \times (5)}$ or $\frac{3 \pm \sqrt{89}}{10}$ $(x =) -0.64339...$ or $(x =) 1.24339\ldots$	$5y^2 - 49y + 80(=0)$ **or** $5y^2 - 49y = -80$ oe $\frac{-(-49) \pm \sqrt{(-49)^2 - 4 \times 5 \times 80}}{2 \times 5}$ or $\frac{49 \pm \sqrt{801}}{10}$ $(y =) 2.06980...$ or $(y =) 7.73019...$	$x = 1.24$ $y = 7.73$ $x = -0.64$ $y = 2.07$	4	M1 Correct quadratic (condone = 0 missing). M1 Correct substitution into quadratic formula, which may be partially evaluated. Accept 3^2 or -3^2 Accept 49^2 or -49^2 A1 (dep on first M1) for both values of x **or** both values of y correct to at least 2 dp A1 (dep on first M1) for correct x and y values, correctly paired.
17	$\frac{5\sqrt{2} - 3\sqrt{2}}{4}$ E.g. $\frac{2\sqrt{2}}{4}$ **or** $\frac{5\sqrt{2} - 3\sqrt{2}}{4} \times \frac{\sqrt{2}}{\sqrt{2}}$		$\frac{1}{\sqrt{2}}$	3	M1 for $5\sqrt{2}$ **and** $3\sqrt{2}$ M1 dep on first M1 for method to rationalise the denominator A1 (dep on M2) for correct steps to correct answer

Question	Working	Answer	Mark	Notes
18 (a)	$\frac{1}{2}\times 7\times 10\times \sin 105$	33.8	2	M1 A1 for answer in range 33.8 – 33.81
(b)	$(AB^2 =)\ 7^2 + 10^2 - 2 \times 7 \times 10 \times \cos(105)$	45.2	5	M1
	$(AB =)\sqrt{100+49--36.2(346)}$ $\left(=\sqrt{185.2(346)}=13.6...\right)$			M1 for correct order of operations and square root
	$\frac{10}{\sin A}=\frac{"13.6"}{\sin 105}$ oe **or** $10^2 = 7^2 + "13.6"^2 - 2\times 7\times "13.6"\times \cos A$ **or** $\frac{1}{2}\times 7\times "13.6"\times \sin A\left(=33.8(074..)\right)$ **or** E.g. $\frac{\sin B}{7}=\frac{\sin 105}{"13.6..."}$ **or** angle $B = 29.7\ldots$			M1 (dep on 1st M1) ft 13.6 ft 33.8 dep on M1 in (a) **or** for a start to a method to find angle B
	E.g. $\sin A=\frac{10\sin 105}{"13.6"}\left(=\frac{9.65(925)}{"13.6"}=0.7(09712)\right)$ or $\sin A=\frac{33.8}{\frac{1}{2}\times 7\times "13.6"}\left(=\frac{33.8}{47.6(353)}=0.7(09712)\right)$ **or** $\cos A=\frac{7^2+"13.6"^2-10^2}{2\times 7\times "13.6"}\left(=0.7(03...)\right)$ **or** $180 - 105 - \sin^{-1}\left(\frac{\sin 105}{"13.6..."}\times 7\right)$			M1 for a correct expression or value for sin$A$ **or** cos$A$ **or** A A1 for answer in range 45.2 to 45.3

Question	Working	Answer	Mark	Notes
19	$\frac{3(2x+1)(2x-1)}{(3x+4)(2x-1)}$	$\frac{3(2x+1)}{3x+4}$	3	M1 for $(2x + 1)(2x – 1)$ **or** $(6x + 3)(2x – 1)$ **or** $(2x + 1)(6x – 3)$
				M1 for $(3x + 4)(2x – 1)$ **or** $(−3x – 4)(1 – 2x)$
				A1 for $\frac{3(2x+1)}{3x+4}$, accept $\frac{6x+3}{3x+4}$

Question	Skill tested	Mean score	Max score	Mean %	ALL	9	8	7	6	5	4
Q01a		1.94	2	97	-	-					
Q01b		0.92	1	92	-	-					
Q02		1.66	2	83	-	-					
Q03a		2.75	3	92	-	-					
Q03b		0.80	1	80	-	-					
Q04		1.63	2	82	-	-					
Q05a		1.61	2	81	-	-					
Q05b		2.59	3	86	-	-					
Q06a		0.84	1	84	-	-					
Q06b		3.21	4	80	-	-					
Q07		2.58	3	86	-	-					
Q08a		1.14	2	57	-	-					
Q08b		1.11	2	56	-	-					
Q09a		1.09	2	55	-	-					
Q09b		1.20	2	60	-	-					
Q10a		1.33	2	67	-	-					
Q10b		1.67	2	84	-	-					
Q11a		0.73	1	73	-	-					
Q11b		1.04	3	35	-	-					
Q12a		1.76	2	88	-	-					
Q12b		1.47	2	74	-	-					
Q12c		1.26	3	42	-	-					
Q13a		1.98	3	66	-	-					
Q13b		1.09	3	36	-	-					
Q14a		0.98	2	49	-	-					
Q14b		0.41	2	21	-	-					
Q15		2.00	4	50	-	-					
Q16		1.29	3	43	-	-					
Q17		1.70	2	85	-	-					
Q18a		2.71	5	54	-	-					
Q18b		1.16	3	39	-	-					
Q19		3.48	6	58	-	-					
		51.13	**80**	**64**		**70**	**61**	**52**	**43**	**34**	**26**

Suggested Grade Boundaries based on peformance of students in Summer 2018

9	8	7	6	5	4	3
65	56	47	39	30	21	16