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

| Question | Working | Answer | Mark | Notes |
|---|---|---|---|---|
| **1** (a) | $(26.72\text{K})^2$ or $\frac{15775.36}{22.09}$ | 714.1(40335) | 2 | M1 for 26.72… or 15775.36 or 22.09<br>A1 |
| (b) | | 714 | 1 | B1 ft if at least 4 significant figures in (a) |
| **2** | $60 \times \frac{5}{6}$ | 50 | 2 | M1<br>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 $x = 3$<br>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)<br>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<br>**or** $\frac{12\times60}{16}$ oe **or** $\frac{24\times60}{32}$ oe | 45 | 2 | M1 for a correct equation (accept ratios)<br>**or** a correct calculation<br>A1 cao |
| **5** (a) | $\frac{360}{n}=24$ oe **or** $\frac{360}{24}$ **or**<br>$180-\frac{180(n-2)}{n}=24$ oe **or** $\frac{180(n-2)}{n}=156$ oe | 15 | 2 | M1 for a correct equation or a correct calculation<br>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<br>A1 cao<br>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 × (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<br>A1 cao |

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| **6** (a) | | 4 – 6 | 1 | B1 |
| (b) | $2 \times 5 + 5 \times 12 + 8 \times 10 + 11 \times 4 + 14 \times 1$<br>**or**<br>$10 + 60 + 80 + 44 + 14$ (= 208) | 6.5 | 4 | M2 for at least 4 correct products added (need not be evaluated)<br>If not M2 then award<br>M1 for consistent use of value within interval (including end points) for at least 4 products which must be added<br>**OR**<br>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<br>Allow division by their $\sum f$ provided addition or total under column seen |
| | | | | A1 for 6.5 **or** $6\frac{1}{2}$<br>allow 6 **or** 7 if 6.5 oe seen or 208 ÷ 32 seen |

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|---|---|---|---|---|---|---|
| **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 $x$<br>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<br>eg. ($x$ = ) 15 × sin 42.8 |
| | | | | A1 | for answer in range 10.19 – 10.2 | |

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|---|---|---|---|---|
| **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)<br>A1 |
| (b) | $y = mx + 4$ **or** $y = 2x + c$ | $y = 2x + 4$ | 2 | M1 ft "4" from (a)<br>$m$ and $c$ may be left as letters or shown as any values ($c$ may be 0)<br>**OR**<br>for an answer of $2x + 4$ **or** $M = 2x + 4$<br>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**<br>angle $PRQ = (180 - 62 - 78)$ (=40) | 40 | 2 | M1 ft from (a) for "102" – 62<br>may be marked on the diagram<br>A1 |
| **10** (a) | (CF =) 44 | 350 | 2 | M1 Stated or marked on graph, or corresponding vertical line marked.<br>Also allow 44.5<br>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)<br>A1 |

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|---|---|---|---|---|
| **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.<br>A1 for both correct inequalities |
| **12** (a) | $\pi \times 4^2 \times 12$ | 603 | 2 | M1 Accept 3.14 or better for $\pi$<br>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)<br>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** $12\times4$ **or** $\sqrt[3]{12^3\times64}$ oe **or** $\frac{"603"\times64}{\pi\times(4\times\sqrt[3]{64})^2}$ | | | M1 for a correct expression for height.<br>A1 |

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|---|---|---|---|---|
| **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 ÷ 76<br><br>NB: Accept 1 – 0.24 in place of 0.76 |
| | | | | A1<br><br>NB: An answer of 16 492 scores no marks |
| (b) | E.g. 13 300$(1 - x)^3 = 6500$ **or** 13 300$y^3 = 6500$ | 21.2 | 3 | M1 for a correct equation<br>condone use of $(1 - x)^4$ **or** $y^4$<br>accept $x$% or $y$% in equation |
| | $\sqrt[3]{\frac{6500}{13300}}$ (=0.787…) **or**<br>$1-\sqrt[3]{\frac{6500}{13300}}$ (=0.212…) | | | M1 condone use of 4th root rather than cube root<br>A1 for an answer in the range 21.2 – 21.24<br><br>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 $x^2$<br>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 |

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|---|---|---|---|---|
| **15** | $SQ^2 = 8^2 + 12^2 - 2\times 8\times 12\times\cos 120^o$ | 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 $4\sqrt{19}$ |
| | $\frac{\sin R}{\sqrt{304}} = \frac{\sin 27^\circ}{9}$ | | 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<br>180 – "61.6" – 27 |
| | | | | **Total 6 marks** |

| Question | Working | | Answer | Mark | Notes |
|---|---|---|---|---|---|
| **16** | $5x^2 - 3x - 4(=0)$ **or** $5x^2 - 4 = 3x$ oe<br><br>$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 5 \times (-4)}}{2 \times (5)}$<br>or $\frac{3 \pm \sqrt{89}}{10}$<br><br>$(x =) -0.64339...$ or $(x =) 1.24339K$ | $5y^2 - 49y + 80(=0)$ **or** $5y^2 - 49y = -80$ oe<br><br>$\frac{-(-49) \pm \sqrt{(-49)^2 - 4 \times 5 \times 80}}{2 \times 5}$<br>or $\frac{49 \pm \sqrt{801}}{10}$<br><br>$(y =) 2.06980...$ or $(y =) 7.73019...$ | $x = 1.24$<br>$y = 7.73$<br><br>$x = -0.64$<br>$y = 2.07$ | 4 | M1 Correct quadratic (condone = 0 missing).<br>M1 Correct substitution into quadratic formula, which may be partially evaluated.<br>Accept $3^2$ or $-3^2$<br>Accept $49^2$ or $-49^2$<br>A1 (dep on first M1) for both values of $x$ **or** both values of $y$ correct to at least 2 dp<br><br>A1 (dep on first M1) for correct $x$ and $y$ values, correctly paired. |
| **17** | $\frac{5\sqrt{2} - 3\sqrt{2}}{4}$<br><br>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** $3\sqrt{2}$<br><br>M1 dep on first M1 for method to rationalise the denominator<br><br>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<br>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 |
| | $(AB =)\sqrt{100+49--36.2(346)}$<br>$\left(=\sqrt{185.2(346)}=13.6...\right)$ | | | M1 for correct order of operations and square root |
| | $\frac{10}{\sin A}=\frac{"13.6"}{\sin 105}$ oe<br>**or** $10^2 = 7^2 +$ "13.6"$^2 - 2\times 7\times$"13.6"$\times\cos A$<br>**or** $\frac{1}{2}\times 7\times "13.6"\times \sin A\left(=33.8(074..)\right)$<br>**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<br>ft 33.8 dep on M1 in (a)<br>**or** for a start to a method to find angle $B$ |
| | E.g. $\sin A=\frac{10\sin 105}{"13.6"}\left(=\frac{9.65(925)}{"13.6"}=0.7(09712)\right)$<br>or<br>$\sin A=\frac{33.8}{\frac{1}{2}\times 7\times "13.6"}\left(=\frac{33.8}{47.6(353)}=0.7(09712)\right)$<br>**or** $\cos A=\frac{7^2+"13.6"^2-10^2}{2\times 7\times "13.6"}\left(=0.7(03...)\right)$<br>**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** $A$<br>A1 for answer in range 45.2 to 45.3 |

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|---|---|---|---|---|
| **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 |