**IGCSE (9–1) Maths - practice paper 4H mark scheme**

**Results Plus data on 97 of the 100 marks:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Paper 4** |  |  |  |  | **Edexcel averages:** |  |  |  |  |  |
| **Year** | **Paper** | **Qu. no** | **New qu. no.** | **Mean score** | **Max score** | **Mean %** |  | **ALL** | **A\*** | **A** | **B** | **C** | **D** | **E** |
| 1701 | 4HR | Q02 | Q01 | 3.94 | 5 | 78.8 |  | 3.94 | 4.84 | 4.42 | 3.23 | 2.65 | 1.87 | 0.70 |
| 1706 | 4H | Q02c | Q02 | 1.78 | 2 | 89.0 |  | 1.78 | 1.94 | 1.88 | 1.75 | 1.47 | 0.86 | 0.29 |
| 1601 | 3H | Q06 | Q03 | 1.40 | 2 | 70.0 |  | 1.40 | 1.86 | 1.61 | 1.40 | 1.03 | 0.74 | 0.36 |
| 1706 | 4HR | Q10 | Q04a-b | 1.91 | 2 | 95.5 |  | 1.91 | 1.99 | 1.97 | 1.93 | 1.82 | 1.57 | 1.01 |
| 1701 | 4H | Q04b | Q04c | 1.59 | 2 | 79.5 |  | 1.59 | 1.92 | 1.79 | 1.71 | 1.40 | 1.06 | 0.80 |
| 1701 | 4H | Q05 | Q05 | 1.77 | 3 | 59.0 |  | 1.77 | 2.49 | 1.97 | 1.72 | 1.39 | 0.88 | 0.43 |
| 1701 | 4H | Q07 | Q06 | 1.76 | 3 | 58.7 |  | 1.76 | 2.77 | 2.27 | 1.68 | 1.03 | 0.51 | 0.15 |
| 1601 | 4H | Q09c | Q07 | 2.25 | 3 | 75.0 |  | 2.25 | 2.97 | 2.82 | 2.56 | 1.64 | 0.64 | 0.31 |
| 1701 | 4HR | Q09 | Q08 | 4.58 | 7 | 65.4 |  | 4.58 | 6.10 | 4.68 | 3.75 | 2.73 | 1.39 | 0.50 |
| 1701 | 4H | Q10 | Q09 | 2.12 | 3 | 70.7 |  | 2.12 | 2.94 | 2.75 | 2.32 | 1.68 | 0.72 | 0.12 |
| 1706 | 4HR | Q12 | Q10 | 2.49 | 4 | 62.3 |  | 2.49 | 3.80 | 2.89 | 1.63 | 0.51 | 0.12 | 0.01 |
| 1601 | 4H | Q13 | Q11 | 2.22 | 4 | 55.5 |  | 2.22 | 3.77 | 2.91 | 1.60 | 0.69 | 0.21 | 0.04 |
| 1601 | 3H | Q12 | Q12 | 2.30 | 3 | 76.7 |  | 2.30 | 2.89 | 2.78 | 2.52 | 1.84 | 1.03 | 0.55 |
| 1701 | 3HR | Q14 | Q13 | 2.17 | 3 | 72.3 |  | 2.17 | 2.71 | 2.38 | 2.03 | 1.32 | 0.65 | 0.68 |
| 1701 | 4H | Q13 | Q14 | 1.23 | 3 | 41.0 |  | 1.23 | 2.23 | 1.40 | 0.95 | 0.53 | 0.27 | 0.10 |
| 1701 | 4H | Q14 | Q15 | 3.91 | 6 | 65.2 |  | 3.91 | 5.77 | 5.23 | 4.27 | 2.44 | 0.99 | 0.53 |
| 1706 | 3H | Q15 | Q16 | 2.27 | 3 | 75.7 |  | 2.27 | 2.92 | 2.61 | 1.78 | 0.74 | 0.18 | 0.06 |
| 1701 | 4H | Q15 | Q17 | 1.50 | 5 | 30.0 |  | 1.50 | 3.18 | 1.63 | 0.83 | 0.27 | 0.07 | 0.01 |
| 1701 | 4H | Q16 | Q18 | 4.28 | 9 | 47.6 |  | 4.28 | 7.67 | 5.37 | 3.59 | 1.87 | 0.50 | 0.07 |
| SAMs | 2H | Q19 | Q19 |  | 3 |  |  |  |  |  |  |  |  |  |
| 1701 | 4H | Q18 | Q20 | 4.16 | 9 | 46.2 |  | 4.16 | 7.80 | 5.32 | 2.93 | 1.40 | 0.46 | 0.22 |
| 1701 | 4H | Q19 | Q21 | 1.73 | 7 | 24.7 |  | 1.73 | 4.13 | 1.58 | 0.52 | 0.14 | 0.03 | 0.00 |
| 1701 | 4H | Q20 | Q22 | 1.67 | 4 | 41.8 |  | 1.67 | 3.00 | 2.01 | 1.35 | 0.69 | 0.26 | 0.19 |
| 1701 | 4H | Q21 | Q23 | 1.87 | 5 | 37.4 |  | 1.87 | 3.79 | 2.47 | 1.16 | 0.32 | 0.02 | 0.00 |
|  |  |  |  | **54.90** | **97** | **56.6** |  | **54.90** | **83.48** | **64.74** | **47.21** | **29.60** | **15.03** | **7.13** |

**Problem-solving questions: 1, 10, 17, 23**

**Reasoning questions: 6, 7, 8, 11, 18, 19, 22**

| Q | **Working** | **Answer** | **Mark** | **Notes** |
| --- | --- | --- | --- | --- |
| 1 | (a) | 0.15 + 0.4 | 0.55 | 1 | B1 |  |
|  | (b) | or  |  | 2 | M1 |  |
|  |  |  | 0.3 |  | A1 |  |
|  | (c) | 160 × 0.4 |  | 2 | M1 |  |
|  |  |  | 64 |  | A1 |  |
|  |  |  |  |  |  | **Total 5 marks** |

| 2 |  |  | −1, 0, 1, 2, 3 | 2 | B2 | B1 for −2, −1, 0, 1, 2 or list with one error or omission: e.g. −2, −1, 0, 1, 2, 3 **;** −1, 0, 1, 2 ; −1, 1, 2, 3 |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Total 2 marks** |

| **3** |  |  | bisector with construction arcs | 2 | B2 | for bisector within guidelines with two pairs of relevant construction arcs seenIf not B2 then B1 for a bisector within guidelines with no arcs present **or** relevant arcs present with no bisector |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Total 2 marks** |

| 4 | (a) |  | 22 000 000 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  | 9.5 × 105 | 1 | B1 |  |
|  | (c) |  |  | 2 | M1 | for 0.06 oe or  where *n* is a negative integer other than  |
|  |  |  |  |  | A1 |  |
|  |  |  |  |  |  | **Total 4 marks** |

| 5 | (a) |  | straight line from to  | 2 | B2 | B1 for a single straight line with negative gradient that starts at  or ends at Ignore lines before 12:30 |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  | 1 | 1 | B1 | Ft if B1 scored in (a) |
|  |  |  |  |  |  | **Total 3 marks** |

| 6 | (a) | a, b, d, e | a, b, d, e | 2 | B2 | B1 for a, e **or** a, b, d **or**  b, d, e **or**a, b, e **or** a, d, e **or**a, b, c, d, e **or**  a, b, d, e, for a Venn diagram with a, c, e, f correctly shown |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  | c, e, f | 1 | B1 |  |
|  |  |  |  |  |  | **Total 3 marks** |

| **7** |  | 3 – 5*m* = 8 × 4 or 3 – 5*m* = 32 or 32 + 5*m* = 3 |  | 3 | M1 | Multiplying both sides by 4 as a correct first step |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | – 5*m* = ‘32’ – 3 or 3 – ‘32’ = 5*m*– 5*m* = 29 or –29 = 5*m* |  |  | M1 | for isolating 5*m* or −5*m* in a correct equation |
|  |  |  | −5.8 |  | A1  | oe eg  dependent on at least M1 |
|  |  | ***Alternative***  |  |  |  |  |
|  |  |  or  |  | 3 | M1 | For using quarters (or a multiple of 4) and isolating the term in *m* in a correct equation |
|  |  |  or   |  |  | M1 | For isolating 5*m* or −5*m* in a correct equation. |
|  |  |  | −5.8 |  | A1 | oe eg  dependent on at least M1 |
|  |  |  |  |  |  | **Total 3 marks** |

| 8 | (a) | cos *x* =  or cos *x* = 0.545(4545...) |  | 3 | M1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | (*x* = )  |  |  | M1 |  |
|  |  |  | 56.9 |  | A1 | 56.9 – 57 |
|  | (b) | 90 $–$ 56.9(4426885...) oe | 033 | 2 | M1ftA1ft | for complete method, ft from (a) if "(a)" < 90, 90 $–$ their *x*accept (0)33 – (0)33.1 or ft |
|  | (c)(i) |  | 105 | 2 | B1 |  |
|  | (c)(ii) |  | 115 | B1 | Accept  |
|  |  |  |  |  |  | **Total 7 marks** |

| 9 |  | Eg or or or oror or or  |  | 3 | M1 | For a correct method to find an equation in *x* or *y*. Allow one arithmetical error. |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | Eg 5× 6 $–$ 2*y* = 33 or 5× 6 + 8*y* = 18 or5*x* $–$ 2× $–$1.5 = 33 or 5*x* + 8× $–$1.5 = 18 |  |  | M1 | For a correct substitutionDep on first M1awarded |
|  |  |  |  |  | A1 | oedep on M1 |
|  |  |  |  |  |  | **Total 3 marks** |

| 10 | (a) |  |  | 2 | M1 | For (*y*=) *x* + *c* (c may be any number or letter) orFor where *m* is non-zero or for Gradient =  oe or *m* =  oe clearly stated |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | *y* = *x* – 1 oe |  | A1 | For a fully a correct equation for **L**Eg  or 2*y* = *x* – 2 or*y* – 1 = (*x* – 4) or *y* − −2 =(*x* − − 2) M1A0 for *L* = *x* – 1 or *x* – 1 |
|  | (b) | 4 = × 5 + *c* or   |  | 2 | M1ft | For correct substitution of given coordinate into their equation Follow through their gradient in (a) |
|  |  |  | *y* = *x* + 1 |  | A1 | oeEg  SCB1 for (*l* =)*x* + 1 |
|  |  |  |  |  |  | **Total 4 marks** |

| **11** |  | 180 −  or  or 144 oe |  | 4 | M1 | Unless inconsistently labelled |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  or 18 |  |  | M1 | Or M2 for 144 – (180 – 144) |
|  |  | ‘144’ – 2 × ‘18’ |  |  | M1 |
|  |  |  |  108 |  | A1 | dep on M1 |
|  |  | ***Alternative*** |  |  |  |  |
|  |  | Pentagon approach – drawing in a pentagon or a statement recognising that the required angle is one of a regular pentagon  |  | 4 | M1 | May be implied by further work |
|  |  | 180 −  or   |  |  | M2 | (M1 for exterior angle of pentagon as long as not seen as interior angle or given as answer) |
|  |  |  | 108 |  | A1 | dep on M1 |
|  |  |  |  |  |  | **Total 4 marks** |

| **12** |  | 5*t* −5*g*= 2*t* + 7 |  |  | M1 | for expanding bracket within the equation **or** division of all terms by 5 |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | 5*t* – 2*t* = 7 + 5*g* |  |  | M1 | (ft a 4 term equation) to isolate terms in *t* |
|  |  |  |   | 3 | A1 | oe  |
|  |  |  |  |  |  | **Total 3 marks** |

| 13 |  | 9000 × 0.018 (= 162) or9000 × 1.018 (=9162) |  | 3 | M1 | or for × 9000 (=486) or 9486 | M2 for 9000 × 1.0183 |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | (9000 + “162)×0.018 (=164.916)(“9162” + “164.916”)×0.018 (= 167.88…)“9162” + “164.916” + “167.88” |  |  | M1 | for complete method |
|  |  |  | 9494.8(0) |  | A1 | accept 9494.8 - 9495 |
|  |  |  |  |  |  | **Total 3 marks** |

| 14 | (a) |  |  | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | or (=52) |  | 2 | M1 | may be marked on diagram |
|  |  |  | 76 |  | A1 |  |
|  |  |  |  |  |  | **Total 3 marks** |

| 15 | (a) |  |  | 3 | B3 | B1 for each pair.Accept equivalent fractionsEg Accept equivalent decimals correct to at least 2dp (0.23, 0.77, 0.22, 0.78, 0.24, 0.76) |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | or |  | 3 | M1 | ft their tree diagram | M2 for 1 $-$ $\left(\frac{12}{52} × \frac{40}{51} + \frac{40}{52} × \frac{12}{51}\right)$(= 1-0.361(99…)) |
|  |  | or oe |  |  | M1 |
|  |  |  |  |  | A1 | 0.638(009…) rounded or truncated to at least 3 DP or oe |
|  |  |  |  |  |  | **Total 6 marks** |
|  |  | Alternative Method - With Replacement |  |  |  |  |
|  |  | or |  |  | M1 |  | M2 for 1 $-$ $\left(\frac{12}{52} × \frac{40}{52} + \frac{40}{52} × \frac{12}{52}\right)$(=1-0.355(029…)) |
|  |  | or or or or 0.644(970....) oe |  |  | M1 |  |

| 16 |  |  |  |  | M1 | Allow *mP* = *r*³Do not allow *P* = *r*³ |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  oe or *k* = 8 or *m* × 343 = 3.53 oe or *m* = 0.125 oe |  |  | M1  | for correct substitution into a correct equation.Implies first M1 |
|  |  |  | *P* = 8*r*³  | 3 | A1 | for *P* = 8*r*³ oe(*P* must be the subject)(Award M2A0 for correct equation with *r* as subject given as final answer)Award M2A1 if *P* = *kr*³ on the answer line and *k* evaluated as 8Award M2A0 if *P*8*r*3 is given as final answer |
|  |  |  |  |  |  | **Total 3 marks** |

| 17 | (a) |  oe |  | 2 | M1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | A1 |  |
|  | (b) |  |  | 3 | M1 | Ft their in (a)For a correct expression for $\vec{CE}$ or $\vec{EC}$ in terms of column vectors |
|  |  |  |  |  | M1 | Dep on first M1 awardedft their  |
|  |  |  | 7.07 |  | A1 | 7.07106… rounded or truncated to at least 2DPAccept  |
|  |  |  |  |  |  | **Total 5 marks** |

| 18 | (a) |  |  | 2 | M1 | or for a product of powers of 2, 3 and 7 with two powers correct,or for an attempt to find prime factors of 2420208 (allow one arithmetical error) orfor $2^{4}$, $3^{2}$, $7^{5}$ |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | A1 |  |
|  | (b) |  |  | 2 | M1 | or for any two correct. |
|  |  |  | 2, 0,  |  | A1 | Accept $2^{2}$× $3^{0}×$ $7^{-1}$ |
|  | (c) | Eg  or  |  | 2 | M1 | For a correct unsimplified exact expansion  may be simplified to 49 and as far as 20 |
|  |  |  | Show that |  | A1 | Correct solution (simplified correctly)dep on M1 |
|  | (d) | or  or  or oe |  | 3 | M1 | Or for   |
|  |  |  or or  |  |  | M1 |  |
|  |  |  |  |  | A1 | oeEg  or  but not a decimal approximation. |
|  |  |  |  |  |  | **Total 9 marks** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Question** | **Working** | **Answer** | **Mark** | **AO** | **Notes** |
| **19** |  |  | E, B, D, A | 3 | AO1 | B3 | All correct |
|  |  |  |  |  |  |  | B2 for 3 correct |
|  |  |  |  |  |  |  | B1 for 2 correct |

| 20 | (a) |  | 4 | 1 | B1 |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | or (*x* =) $\frac{3}{6}$ $-$ 4 or $\frac{3-4 ×6}{6}$ oe |  | 2 | M1 | or or  |
|  |  |  |  |  | A1 | oe |
|  | (c) |  or or  |  | 2 | M1 | Or for or  |
|  |  |  |  |  | A1 | or  or  or 1.5 |
|  | (d) | or or or |  | 4 | M1 |  |
|  |  | or  |  |  | A1 |  |
|  |  | or  |  |  | M1 | or correct substitution into quadratic formulaor correctly completing the square |
|  |  |  |  |  | A1 | dep on previous M1 |
|  |  |  |  |  |  | **Total 9 marks** |

| 21 | (a) | tangent at  |  | 3 | M1 | For a drawing a tangent |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |   |  |  | M1 | Dep on first M1 awardedFor for any two points on a tangent (ignore negative gradient) or For gradient in the range 4 to 6 inclusive |
|  |  |  |  |  | A1 | Accept answer in the range -6 to -4 inclusivedep on M1 |
|  | (b) | graph  |  | 2 | M1 | For the correct line drawn |
|  |  |  | 2.2 |  | A1 | dep on M1Accept 2.15 – 2.25 |
|  | (c) |  |  |  | M1 | For  or  |
|  |  |  |  |  | A1 | allow  |
|  |  |  |  |  |  | **Total 7 marks** |

| 22 | (a) | oror oror oror   |  | 2 | M1 | Or for 1 (small) square = 0.1 or1 (big) square = 2.5 orFor 6, 10 and 8 marked correctly on the diagram |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 24 |  | A1 |  |
|  | (b) | or or 36 × $\frac{1}{2}$ or $\frac{1}{3}$ × 54 or 18 or 180 (small) squares or 180 × 0.1 or7.2 (big) squares or 7.2 × 2.5 |  | 2 | M1 | For a vertical line at Time = 87 |
|  |  |  | 87 |  | A1 | cao |
|  |  |  |  |  |  | **Total 4 marks** |

| 23 | (a) | Eg or  |  | 3 | M1 | For a correct equation using the Sine Rule |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  or 0.728(5016…) oe or  oroe |  |  | M1 |  |
|  |  |  | 46.8 |  | A1 | Accept 46.7(609...) rounded or truncated to at least 1dp |
|  | (b) | or  |  | 2 | M1 | Or for a correct equation using the Sine Rule |
|  |  |  | 33.1 |  | A1 | Accept 33.0(557...) rounded or truncated to at least 1dp |
|  |  |  |  |  |  | **Total 5 marks** |