

## 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        |
| <b>SAMs</b> | <b>2H</b> | <b>Q19</b> | <b>Q19</b>  |              | <b>3</b>  |             |                   |              |              |              |              |              |             |
| 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        |
|             |           |            |             | <b>54.90</b> | <b>97</b> | <b>56.6</b> | <b>54.90</b>      | <b>83.48</b> | <b>64.74</b> | <b>47.21</b> | <b>29.60</b> | <b>15.03</b> | <b>7.13</b> |

**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)   | $\frac{1 - (0.15 + 0.4)}{3}$ or $\frac{0.45}{3}$ (= 0.15) | 0.3    | 2    | M1                   |
|       |   |        |      | A1                   |
| (c)   | $160 \times 0.4$  | 64     | 2    | M1                   |
|       |   |        |      | A1                   |
|       |   |        |      | <b>Total 5 marks</b> |

|   |  |                |   |   |
|---|--|----------------|---|---|
| 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 |
|   |  |                |   | <b>Total 2 marks</b>  |

|   |  |                                 |   |   |
|---|--|---------------------------------|---|---|
| 3 |  | bisector with construction arcs | 2 | B2 for bisector within guidelines with two pairs of relevant construction arcs seen<br><br>If not B2 then B1 for a bisector within guidelines with no arcs present <b>or</b> relevant arcs present with no bisector |
|   |  |                                 |   | <b>Total 2 marks</b>  |

|       |  |                    |   |   |
|-------|--|--------------------|---|---|
| 4 (a) |  | 22 000 000         | 1 | B1  |
| (b)   |  | $9.5 \times 10^5$  | 1 | B1  |
| (c)   |  | $6 \times 10^{-2}$ | 2 | M1 for 0.06 oe or $6 \times 10^n$ where $n$ is a negative integer other than -2 |
|       |  |                    |   | A1  |
|       |  |                    |   | <b>Total 4 marks</b>  |

|          |     |  |   |   |  |
|----------|-----|--|---|---|--|
| <b>5</b> | (a) |  | straight line from<br>(1230, 3.5) to<br>(1315, 0) | 2 | B2 B1 for a single straight line with<br>negative gradient that starts at<br>(1230, 3.5) or ends at (1315, 0)<br>Ignore lines before 12:30 |
|          | (b) |  | 1   | 1 | B1 Ft if B1 scored in (a)  |
|          |     |  |   |   | <b>Total 3 marks</b>   |

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

|   |   |      |   |    |   |
|---|---|------|---|----|---|
| 7 | $3 - 5m = 8 \times 4$ or $3 - 5m = 32$ or $32 + 5m = 3$                 | -5.8 | 3 | M1 | Multiplying both sides by 4 as a correct first step   |
|   | $-5m = '32' - 3$ or $3 - '32' = 5m$<br>$-5m = 29$ or $-29 = 5m$         |      |   | M1 | for isolating $5m$ or $-5m$ in a correct equation   |
|   |   |      |   | A1 | oe eg $\frac{-29}{5}$ dependent on at least M1  |
|   | <i>Alternative</i>  |      |   |    |   |
|   | $\frac{-5m}{4} = 8 - \frac{3}{4}$ or $\frac{5m}{4} = \frac{3}{4} - 8$   | -5.8 | 3 | M1 | For using quarters (or a multiple of 4) and isolating the term in $m$ in a correct equation |
|   | $-5m = (8 - \frac{3}{4}) \times 4$ or $5m = (\frac{3}{4} - 8) \times 4$ |      |   | M1 | For isolating $5m$ or $-5m$ in a correct equation.  |
|   |   |      |   | A1 | oe eg $\frac{-29}{5}$ dependent on at least M1  |
|   |   |      |   |    | <b>Total 3 marks</b>  |

|   |         |  |      |   |                      |  |           |
|---|---------|--|------|---|----------------------|--|-----------|
| 8 | (a)     | $\cos x = \frac{60}{110}$ or $\cos x = 0.545(4545\dots)$ | 56.9 | 3 | M1                   |  |           |
|   |         | $(x =) \cos^{-1}\left(\frac{60}{110}\right)$             |      |   |                      | M1   |           |
|   |         |  |      |   |                      | A1   | 56.9 – 57 |
|   | (b)     | $90 - 56.9(4426885\dots)$ oe                             | 033  | 2 | M1ft                 | for complete method, ft from (a) if "(a)" < 90, 90 – their $x$ |           |
|   |         |  |      |   | A1ft                 | accept (0)33 – (0)33.1 or ft                                   |           |
|   | (c)(i)  |  | 105  | 2 | B1                   |  |           |
|   | (c)(ii) |  | 115  |   | B1                   | Accept 114.9   |           |
|   |         |  |      |   | <b>Total 7 marks</b> |  |           |

|   |  |                   |   |   |
|---|--|-------------------|---|---|
| 9 | <b>Eg</b> $8y - 2y = 18 - 33$ <b>or</b> $10y = -15$ <b>or</b><br>$-2y - 8y = 33 - 18$ <b>or</b> $-10y = 15$ <b>or</b><br>$25x = 150$ <b>or</b> $5x + 4(5x - 33) = 18$ <b>or</b><br>$33 + 2y + 8y = 18$ <b>or</b> $18 - 8y - 2y = 33$ |                   | 3 | M1 For a correct method to find an equation in $x$ or $y$ . Allow one arithmetical error. |
|   | <b>Eg</b> $5 \times 6 - 2y = 33$ <b>or</b> $5 \times 6 + 8y = 18$ <b>or</b><br>$5x - 2 \times -1.5 = 33$ <b>or</b> $5x + 8 \times -1.5 = 18$   |                   |   | M1 For a correct substitution<br>Dep on first M1 awarded                                  |
|   |  | $x = 6, y = -1.5$ |   | A1 oe<br>dep on M1  |
|   |  |                   |   | <b>Total 3 marks</b>  |

|        |  |                                   |   |  |
|--------|--|-----------------------------------|---|--|
| 10 (a) |  | $y = \frac{1}{2}x - 1$ oe         | 2 | M1<br>For $(y=) \frac{3}{6}x + c$ (c may be any number or letter) or<br>For $(y =) mx - 1$ where $m$ is non-zero or for<br>Gradient = $\frac{3}{6}$ oe or $m = \frac{3}{6}$ oe<br>clearly stated                                   |
|        |  |                                   |   | A1<br>For a fully a correct equation for <b>L</b><br>Eg<br>$y = \frac{3}{6}x - 1$ or $2y = x - 2$ or<br>$y - 1 = \frac{1}{2}(x - 4)$ or<br>$y - -2 = \frac{1}{2}(x - -2)$<br>M1A0 for $L = \frac{1}{2}x - 1$ or $\frac{1}{2}x - 1$ |
| (b)    | $4 = \frac{1}{2} \times 5 + c$ or $y - 4 = \frac{1}{2}(x - 5)$ | $y = \frac{1}{2}x + 1\frac{1}{2}$ | 2 | M1ft<br>For correct substitution of given coordinate into their equation<br>Follow through their gradient in (a)   |
|        |  |                                   |   | A1<br>oe<br>Eg $y = \frac{1}{2}(x + 3)$<br>SCB1 for $(l =) \frac{1}{2}x + 1\frac{1}{2}$  |
|        |  |                                   |   | <b>Total 4 marks</b>   |

|           |   |     |   |                      |  |
|-----------|---|-----|---|----------------------|--|
| <b>11</b> | $180 - \frac{360}{10}$ or $\frac{(10-2) \times 180}{10}$ or 144 oe  | 108 | 4 | M1                   | Unless inconsistently labelled   |
|           | $\frac{180 - '144'}{2}$ or 18   |     |   | M1                   | Or M2 for $144 - (180 - 144)$  |
|           | '144' - $2 \times$ '18'   |     |   | M1                   |  |
|           |   |     |   | A1                   | dep on M1  |
|           | <i>Alternative</i>  |     |   |                      |  |
|           | Pentagon approach – drawing in a pentagon or a statement recognising that the required angle is one of a regular pentagon | 108 | 4 | M1                   | May be implied by further work   |
|           | $180 - \frac{360}{5}$ or $\frac{(5-2) \times 180}{5}$   |     |   | M2                   | (M1 for exterior angle of pentagon as long as not seen as interior angle or given as answer) |
|           |   |     |   | A1                   | dep on M1  |
|           |   |     |   | <b>Total 4 marks</b> |  |

|           |                    |                        |   |                      |  |
|-----------|--------------------|------------------------|---|----------------------|--|
| <b>12</b> | $5t - 5g = 2t + 7$ | $t = \frac{5g + 7}{3}$ | 3 | M1                   | for expanding bracket within the equation <b>or</b> division of all terms by 5 |
|           | $5t - 2t = 7 + 5g$ |                        |   | M1                   | (ft a 4 term equation) to isolate terms in $t$                                 |
|           |                    |                        |   | A1                   | oe   |
|           |                    |                        |   | <b>Total 3 marks</b> |  |

|           |  |           |   |  |                              |
|-----------|--|-----------|---|--|------------------------------|
| <b>13</b> | $9000 \times 0.018 (= 162)$ or<br>$9000 \times 1.018 (=9162)$  | 9494.8(0) | 3 | M1 or for $\frac{3 \times 1.8}{100} \times 9000$<br>(=486) or 9486 | M2 for $9000 \times 1.018^3$ |
|           | ( $9000 + "162" \times 0.018 (=164.916)$<br>( $"9162" + "164.916"$ ) $\times 0.018 (= 167.88\dots)$<br>"9162" + "164.916" + "167.88" |           |   | M1 for complete method   |                              |
|           |  |           |   | A1 accept 9494.8 - 9495  | <b>Total 3 marks</b>         |

|           |     |  |            |   |                             |
|-----------|-----|--|------------|---|-----------------------------|
| <b>14</b> | (a) |  | $79^\circ$ | 1 | B1                          |
|           | (b) | $\angle BDE = 79 - 41$ or $180 - 101 - 41 (= 38)$ <b>or</b><br>$\angle OBE = 90 - 38$ or $90 - (180 - 101 - 41) (=52)$ |            | 2 | M1 may be marked on diagram |
|           |     |  | <b>76</b>  |   | A1                          |
|           |     |  |            |   | <b>Total 3 marks</b>        |



|        |  |  |   |                      |   |
|--------|--|--|---|----------------------|---|
| 15 (a) |  | $\frac{12}{52}, \frac{40}{52}, \frac{11}{51}, \frac{40}{51}, \frac{12}{51}, \frac{39}{51}$ | 3 | B3                   | B1 for each pair.<br>Accept equivalent fractions<br>Eg<br>$\frac{12}{52} = \frac{3}{13}, \frac{40}{52} = \frac{10}{13}, \frac{12}{51} = \frac{4}{17}, \frac{39}{51} = \frac{13}{17}$<br>Accept equivalent decimals correct to at least 2dp (0.23, 0.77, 0.22, 0.78, 0.24, 0.76) |
| (b)    | $\frac{12}{52} \times \frac{11}{51}$ or $\frac{132}{2652}$ or $\frac{11}{221}$ or 0.049(773...) <b>or</b><br>$\frac{40}{52} \times \frac{39}{51}$ or $\frac{1560}{2652}$ or $\frac{130}{221}$ or $\frac{10}{17}$ or 0.588(235...)                        |  | 3 | M1                   | ft their tree diagram   |
|        | $\frac{12}{52} \times \frac{11}{51} + \frac{40}{52} \times \frac{39}{51}$ <b>or</b> $\frac{132}{2652} + \frac{1560}{2652}$ or $\frac{11}{221} + \frac{10}{17}$ <b>oe</b>   |  |   | M1                   | M2 for<br>$1 - \left( \frac{12}{52} \times \frac{40}{51} + \frac{40}{52} \times \frac{12}{51} \right)$<br>(= 1-0.361(99...))  |
|        |  | $\frac{141}{221}$  |   | A1                   | 0.638(009...) rounded or truncated to at least 3 DP or oe   |
|        |  |  |   | <b>Total 6 marks</b> |   |
|        | <b>Alternative Method - With Replacement</b>   |  |   |                      |   |
|        | $\frac{12}{52} \times \frac{12}{52}$ or $\frac{144}{2704}$ or $\frac{9}{169}$ or 0.053(254...) <b>or</b><br>$\frac{40}{52} \times \frac{40}{52}$ or $\frac{1600}{2704}$ or $\frac{100}{169}$ or 0.591(715...)  |  |   | M1                   | M2 for<br>$1 - \left( \frac{12}{52} \times \frac{40}{52} + \frac{40}{52} \times \frac{12}{52} \right)$<br>(=1-0.355(029...))  |
|        | $\frac{12}{52} \times \frac{12}{52} + \frac{40}{52} \times \frac{40}{52}$ <b>or</b> $\frac{144}{2704} + \frac{1600}{2704}$ or $\frac{9}{169} + \frac{100}{169}$ <b>or</b><br>$\frac{1744}{2704}$ <b>or</b> $\frac{109}{169}$ <b>or 0.644(970....) oe</b> |  |   | M1                   |   |

|           |   |            |   |   |
|-----------|---|------------|---|---|
| <b>16</b> | $P = kr^3$  |            |   | M1 Allow $mP = r^3$<br>Do not allow $P = r^3$   |
|           | $343 = k \times 3.5^3$ oe or $k = 8$ <b>or</b><br>$m \times 343 = 3.5^3$ oe or $m = 0.125$ oe |            |   | M1 for correct substitution into a correct equation.<br>Implies first M1  |
|           |   | $P = 8r^3$ | 3 | A1 for $P = 8r^3$ oe ( $P$ must be the subject)<br><br>(Award M2A0 for correct equation with $r$ as subject given as final answer)<br><br>Award M2A1 if $P = kr^3$ on the answer line and $k$ evaluated as 8<br>Award M2A0 if $P \propto 8r^3$ is given as final answer |
|           |   |            |   | <b>Total 3 marks</b>  |

|           |     |   |   |   |  |
|-----------|-----|---|---|---|--|
| <b>17</b> | (a) | $\begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ oe   |   | 2 | M1   |
|           |     |   | $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$ |   | A1   |
|           | (b) | $2\begin{pmatrix} 4 \\ -1 \end{pmatrix} - \begin{pmatrix} 1 \\ -3 \end{pmatrix} (= \begin{pmatrix} 7 \\ 1 \end{pmatrix})$ |   | 3 | M1 Ft their $\overline{BC}$ in (a)<br>For a correct expression for $\overline{CE}$ or $\overline{EC}$ in terms of column vectors |
|           |     | $\sqrt{7^2 + 1^2}$  |   |   | M1 Dep on first M1 awarded<br>ft their $\overline{CE}$   |
|           |     |   | <b>7.07</b>                             |   | A1 7.07106... rounded or truncated to at least 2DP<br>Accept $\sqrt{50}$ or $5\sqrt{2}$  |
|           |     |   |   |   | <b>Total 5 marks</b>   |

|    |     |  |                             |   |  |
|----|-----|--|-----------------------------|---|--|
| 18 | (a) | $2^{3+1} \times 3^{1+1} \times 7^{2+3}$  |                             | 2 | M1 or for a product of powers of 2, 3 and 7 with two powers correct,<br>or for an attempt to find prime factors of 2420208 (allow one arithmetical error) or for $2^4, 3^2, 7^5$ |
|    |     |  | $2^4 \times 3^2 \times 7^5$ |   | A1   |
|    | (b) | $2^{3-1} \times 3^{1-1} \times 7^{2-3}$  |                             | 2 | M1 or for any two correct.   |
|    |     |  | 2, 0, -1                    |   | A1 Accept $2^2 \times 3^0 \times 7^{-1}$   |
|    | (c) | Eg $7^2 - (2\sqrt{5})^2$ or $7^2 - 14\sqrt{5} + 14\sqrt{5} - (2\sqrt{5})^2$                        |                             | 2 | M1 For a correct unsimplified exact expansion $7^2$ may be simplified to 49 and $(2\sqrt{5})^2$ as far as 20   |
|    |     |  | Show that                   |   | A1 Correct solution (simplified correctly) dep on M1   |
|    | (d) | $\frac{1}{9^{4/3}}$ or $9^{-4/3}$ or $\frac{1}{\sqrt[3]{(3^2)^4}}$ or $\frac{1}{\sqrt[3]{3^8}}$ oe |                             | 3 | M1 Or for $9^4 = 3^8$  |
|    |     | $(3^2)^{-4/3}$ or $3^{-8/3}$ or $\frac{1}{3^{8/3}}$  |                             |   | M1   |
|    |     |  | $-\frac{8}{3}$              |   | A1 oe<br>Eg $-2\frac{2}{3}$ or $-2.\dot{6}$ but not a decimal approximation.   |
|    |     |  |                             |   | <b>Total 9 marks</b>   |

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

|    |     |   |                    |   |   |
|----|-----|---|--------------------|---|---|
| 20 | (a) |   | 4                  | 1 | B1  |
|    | (b) | $6 = \frac{3}{x+4}$ or $(x =) \frac{3}{6} - 4$ or $\frac{3-4 \times 6}{6}$ oe   |                    | 2 | M1 or $(g^{-1}(x) =) \frac{3}{x} - 4$ or $\frac{3-4x}{x}$                               |
|    |     |   | $-3\frac{1}{2}$    |   | A1 oe   |
|    | (c) | $f(-3)$ or $\frac{2 \times -3}{3 \times -3 + 5}$ or $\frac{2 \times \frac{3}{-5+4}}{3 \times \frac{3}{-5+4} + 5}$   |                    | 2 | M1 Or for $(g(-5) =) \frac{3}{-5+4}$ or $-3$  |
|    |     |   | $1\frac{1}{2}$     |   | A1 or $\frac{6}{4}$ or $\frac{3}{2}$ or 1.5   |
|    | (d) | $2x(x+4) = 3(3x+5)$ or $2x^2 + 8x = 9x + 15$ oe or $\frac{2x(x+4)}{(3x+5)(x+4)} = \frac{3(3x+5)}{(3x+5)(x+4)}$ or $\frac{2x(x+4)}{(3x+5)(x+4)} - \frac{3(3x+5)}{(3x+5)(x+4)} (= 0)$ |                    | 4 | M1  |
|    |     | $2x^2 - x - 15 (= 0)$ or $\frac{2x^2 - x - 15}{(3x+5)(x+4)} (= 0)$  |                    |   | A1  |
|    |     | $(2x+5)(x-3) (= 0)$ or $\frac{(2x+5)(x-3)}{(3x+5)(x+4)} (= 0)$  |                    |   | M1 or correct substitution into quadratic formula<br>or correctly completing the square |
|    |     |   | $-2\frac{1}{2}, 3$ |   | A1 dep on previous M1   |
|    |     |   |                    |   | <b>Total 9 marks</b>  |

|           |     |   |        |   |   |
|-----------|-----|---|--------|---|---|
| <b>21</b> | (a) | tangent at $(-1, 6)$  |        | 3 | M1 For a drawing a tangent  |
|           |     | $\frac{\text{difference in } y \text{ values}}{\text{difference in } x \text{ values}}$ |        |   | M1 Dep on first M1 awarded<br>For $\frac{\text{difference in } y \text{ values}}{\text{difference in } x \text{ values}}$ for any two points on a tangent (ignore negative gradient) or<br>For gradient in the range 4 to 6 inclusive |
|           |     |   | -5     |   | A1 Accept answer in the range -6 to -4 inclusive<br>dep on M1   |
|           | (b) | graph $y = -2x + 7$   |        | 2 | M1 For the correct line drawn   |
|           |     |   | 2.2    |   | A1 dep on M1<br>Accept 2.15 – 2.25  |
|           | (c) |   |        |   | M1 For $a = -4$ or 8.2,, $b$ ,, 8.3   |
|           |     |   | -4,8.2 |   | A1 allow 8.2,, $b$ ,, 8.3   |
|           |     |   |        |   | <b>Total 7 marks</b>  |

|           |     |   |    |   |   |
|-----------|-----|---|----|---|---|
| <b>22</b> | (a) | $6+10+8$ or<br>$12 \times \frac{1}{2} + 20 \times \frac{1}{2} + 16 \times \frac{1}{2}$ or $48 \times 0.5$ or<br>$60 \times 0.1 + 100 \times 0.1 + 80 \times 0.1$ or $240 \times 0.1$ or<br>$2.4 \times 2.5 + 4 \times 2.5 + 3.2 \times 2.5$ or $9.6 \times 2.5$ |    | 2 | M1 Or for 1 (small) square = 0.1 or<br>1 (big) square = 2.5 or<br>For 6, 10 and 8 marked correctly on the diagram |
|           |     |   | 24 |   | A1  |
|           | (b) | $50-6-10-16$ or $50-32$ or $36 \times \frac{1}{2}$ or $\frac{1}{3} \times 54$ or 18 or<br>180 (small) squares or $180 \times 0.1$ or<br>7.2 (big) squares or $7.2 \times 2.5$   |    | 2 | M1 For a vertical line at Time = 87   |
|           |     |   | 87 |   | A1 cao  |
|           |     |   |    |   | <b>Total 4 marks</b>  |

|           |     |  |      |   |   |
|-----------|-----|--|------|---|---|
| <b>23</b> | (a) | Eg $\frac{16.5}{\sin BAK} = \frac{21}{\sin 68}$ or $\frac{\sin BAK}{16.5} = \frac{\sin 68}{21}$  |      | 3 | M1 For a correct equation using the Sine Rule               |
|           |     | ( $\sin BAK =$ ) $\frac{16.5 \times \sin 68}{21}$ or 0.728(5016...) oe or<br>( $BAK =$ ) $\sin^{-1}\left(\frac{16.5 \times \sin 68}{21}\right)$ or<br>( $BAK =$ ) $\sin^{-1}(0.728(5016...))$ oe |      |   | M1  |
|           |     |  | 46.8 |   | A1 Accept 46.7(609...) rounded or truncated to at least 1dp |
|           | (b) | $\sin \alpha = \frac{9}{16.5}$ or ( $\alpha =$ ) $\sin^{-1}\left(\frac{9}{16.5}\right)$  |      | 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 |
|           |     |  |      |   | <b>Total 5 marks</b>  |