



**General Certificate of Secondary Education  
March 2012**

**Mathematics**

**43602H**

**Higher**

**Unit 2**

**Final**

***Mark Scheme***

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**The following abbreviations are used on the mark scheme:**

|                             |  |
|-----------------------------|--|
| <b>M</b>                    | Method marks awarded for a correct method.   |
| <b>M dep</b>                | A method mark which is dependent on a previous method mark being awarded.  |
| <b>A</b>                    | Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied. |
| <b>B</b>                    | Marks awarded independent of method.   |
| <b>Q</b>                    | Marks awarded for quality of written communication.  |
| <b>ft</b>                   | Follow through marks. Marks awarded for correct working following a mistake in an earlier step.                                    |
| <b>SC</b>                   | Special Case. Marks awarded for a common misinterpretation which has some mathematical worth.                                      |
| <b>oe</b>                   | Or equivalent.   |
| <b>[<i>a</i>, <i>b</i>]</b> | Accept values between <i>a</i> and <i>b</i> inclusive.   |

**UNIT 2**

**HIGHER TIER**

**43602H**

|    |  |    |  |
|----|--|----|--|
| 1a | 41 37 33   | B2 | B1 for one or two correct                  |
| 1b | Sequence continued correctly for at least 2 more terms (29, 25, ...)<br>Subtracts 4 correctly at least twice<br>or correctly trials at least two integer values for $n$ greater than 3<br>or $45 - 4n = 0$<br>or $45 - 4n < 0$ | M1 | oe<br>oe                                   |
|    | -3   | A1 | Answer of 12<br>or testing $n = 12$ is SC1 |

|   |   |    |                       |
|---|---|----|-----------------------|
| 2 | $\frac{(5 \times -4) - (-8)}{-4 + 2}$               | M1 | oe<br>Allow one error |
|   | -20 + 8 or -12 in numerator<br>or -2 in denominator | A1 |                       |
|   | 6   | A1 |                       |

|   |  |    |  |
|---|--|----|--|
| 3 | Attempts to process one piece of information                           | M1 | eg 2 : 9 or 4 : 16<br>0.22... or 0.25<br>$\frac{6}{27} = \frac{2}{9}$ or $\frac{8}{32} = \frac{4}{16}$<br>$\frac{6}{27} \times 100$ or $\frac{8}{32} \times 100$<br>$\frac{24}{108}$ or $\frac{24}{96}$ $\frac{192}{864}$ or $\frac{216}{864}$<br>or 8 goals in 32 games is 1 goal every 4 games<br>$4 \frac{1}{2}$ or 4<br>oe |
|   | Writes both pieces of information in a form that allows for comparison | A1 | eg 2 : 9 and 2 : 8<br>0.22 ... and 0.25<br>(1 : 4.5 and 1 : 4 are acceptable)<br>$4 \frac{1}{2}$ and 4<br>$\frac{2}{9}$ and $\frac{2}{8}$ $\frac{24}{108}$ and $\frac{24}{96}$<br>$\frac{8}{36}$ and $\frac{9}{36}$ $\frac{192}{864}$ and $\frac{216}{864}$<br>oe  |
|   | Correct decision from their working                                    | Q1 | Strand (iii)<br>Dependent on M1  |

|   |   |        |   |
|---|---|--------|---|
| 4 | $\frac{1}{3}$ or $\frac{3}{4}$ or $1 - \frac{2}{3}$<br>or $1 - \frac{1}{4}$ seen  | M1     | oe  |
|   | $18 = \frac{3}{4}$ or $\frac{1}{4} = 6$ or $\frac{1}{3} = 6$<br>or $\frac{1}{2}$ or $6 \times 3 (= 18)$<br>or $\frac{2}{3} \times \frac{3}{4}$ seen | M1 dep |   |
|   | $6 \times 4$ or $\frac{\text{their } 18}{3} \times 4$ or $18 + 6$   | M1 dep | Calculation leading to a final answer of 24   |
|   | 24  | A1     | SC1 for $\frac{11}{12}$<br>SC2 for 72<br>$(£)6 = \frac{2}{3} \rightarrow (£)9$<br>then $\frac{9 \times 4}{3} = 12$ is SC3 |

|   |  |        |                         |
|---|--|--------|-------------------------|
| 5 | $12\ 500 - 11\ 750$ or 750                   | M1     |                         |
|   | $\frac{\text{their } 750}{12500} \times 100$ | M1 dep | oe eg $\frac{750}{125}$ |
|   | 6  | A1     | SC2 for 94              |
|   | <b>Alternative method</b>                    |        |                         |
|   | $\frac{11750}{12500} \times 100$             | M1     |                         |
|   | $100 - \text{their } 94$                     | M1 dep |                         |
|   | 6  | A1     | SC2 for 94              |

|   |   |                                     |                                       |                              |
|---|---|-------------------------------------|---------------------------------------|------------------------------|
| 6   | $100 \times 0.84$ or $60 \times 1.1(0)$       | M1                                  | 84 or 66 or 150                       | Money out                    |
|   | their $150 \times 1.4$ (= 210)                | M1 dep                              | oe dep on first M1                    | Required total sales income  |
|   | $100 \times 1.2(0)$ or $40 \times 1.6(0)$     | M1                                  | 120 or 64 or 184                      | Money in after 40 packs sold |
|   | (their 210 – their 184) $\div$ 20             | M1 dep                              | dep on 2nd and 3rd M1                 | Money needed $\div$ 20       |
|   | 1.30  | A1                                  | Do not accept 1.3                     |                              |
|   | <b>Alternative method 1</b>                   |                                     |                                       |                              |
|   | $100 \times 0.84$ or $60 \times 1.1(0)$       | M1                                  | 84 or 66 or 150                       | Money out                    |
|   | $100 \times 1.2(0)$ or $40 \times 1.6(0)$     | M1                                  | 120 or 64 or 184                      | Money in after 40 packs sold |
|   | their 184 – their 150                         | M1 dep                              | 34 if correct dep on 1st and 2nd M1   | Profit after 40 packs sold   |
|   | $(0.4 \times$ their 150 – their 34) $\div$ 20 | M1 dep                              | dep on 3rd M1                         | Money needed $\div$ 20       |
|   | 1.30  | A1                                  | Do not accept 1.3                     |                              |
|   | <b>Alternative method 2</b>                   |                                     |                                       |                              |
|   | $100 \times 0.84$ or $60 \times 1.1(0)$       | M1                                  | 84 or 66 or 150                       | Money out                    |
|   | $100 \times 0.36$ or $40 \times 0.50$         | M1                                  | 36 or 20 or 56                        | Profit so far                |
|   | $(0.4 \times$ their 150 – their 56) $\div$ 20 | M1 dep                              | 0.20 if correct dep on 1st and 2nd M1 | Profit per pack needed       |
|   | their 0.20 + 1.10                             | M1 dep                              | dep on 3rd M1                         | Cost price + profit per pack |
|   | 1.30  | A1                                  | Do not accept 1.3                     |                              |
|   | <b>Alternative method 3</b>                   |                                     |                                       |                              |
|   | $100 \times 1.2(0)$ or $100 \times 0.84$      | M1                                  | 120 or 84 or 36                       | Profit                       |
|   | $40 \times 1.6(0)$ or $60 \times 1.1(0)$      | M1                                  | 64 or 66 or –2                        | Profit                       |
| their 36 + their (–2)                         | M1 dep  | 34 if correct dep on 1st and 2nd M1 | Profit after 40 packs sold            |                              |
| $(0.4 \times$ their 150 – their 34) $\div$ 20 | M1 dep  | dep on 3rd M1                       | Money needed $\div$ 20                |                              |
| 1.30  | A1  | Do not accept 1.3                   |                                       |                              |

|    |   |       |           |
|----|---|-------|-----------|
| 7a | $C = 10d + 20$  | B1    |           |
| 7b | Plots at least two correct points<br>( $\pm \frac{1}{2}$ sq)                          | M1    |           |
|    | Correct line from (0, 30) at least<br>to intersection at (5, 70)                      | A1    |           |
| 7c | First Cars  | B1 ft | Strict ft |
|    | Cheaper (check graph)<br>Graph lower down<br>Roys Rentals = 90<br>and First Cars = 86 | B1 ft | oe        |

|    |   |    |   |
|----|---|----|---|
| 8a | $12 - x = 15$ or $12 - x = 5 \times 3$  | M1 | oe $4 - \frac{x}{3} = 5$  |
|    | $-x = \text{their } 15 - 12$<br>or $x = 12 - \text{their } 15$                          | M1 | or $4 - 5 = \frac{x}{3}$<br>$-1 = \frac{x}{3}$<br>or $5 - 4 = \frac{-x}{3}$ |
|    | -3  | A1 |   |
| 8b | $3t = s - 4$ or $\frac{s}{3} = t + \frac{4}{3}$   | M1 | oe  |
|    | $(t =) \frac{s-4}{3}$ or $(t =) \frac{s}{3} - \frac{4}{3}$<br>or $(t =) \frac{4-s}{-3}$ | A1 | oe<br>SC1 $(t =) \frac{4-s}{3}$ or $(t =) \frac{s+4}{3}$                    |

|   |                     |    |  |
|---|---------------------|----|--|
| 9 | -3, -2, -1, 0, 1, 2 | B2 | One error or omission B1<br>$-4 < n \leq 2$ B1 |
|---|---------------------|----|--|

|    |  |        |  |
|----|--|--------|--|
| 10 | $3x + 4 (+) 3x (+) x (+) x (+) x - 7$<br>(= 150) | M1     | oe 4 or 5 correct terms                      |
|    | $3x + 4 + 3x + x + x + x - 7 = 150$              | M1 dep | oe ft their terms                            |
|    | $9x - 3 = 150$ or $9x = 150 + 3$                 | A1 ft  | oe ft their equation                         |
|    | $x = 17$   | A1     | SC3 for solution by trial and<br>improvement |

|    |                    |    |   |
|----|--------------------|----|---|
| 11 | $(3m + k)(3m - k)$ | B2 | B1 for $(9m \dots k)(m \dots k)$<br>or $(3m + k)(3m + k)$<br>or $(3m + k)^2$ or $(3m - k)(3m - k)$<br>or $(3m - k)^2$ |
|----|--------------------|----|---|

|    |   |    |   |
|----|---|----|---|
| 12 | $16a - 40$ seen   | B1 |   |
|    | $4a - 8$ or $4b - 8$<br>or $4(a - 2)$ or $4(b - 2)$   | M1 |   |
|    | $4(4a - 8) - 8$<br>or $16a - 32 - 8$  | A1 |   |
|    | Complete algebraic solution including<br>$b = 4a - 8$ <b>and</b> either $c = 4b - 8$<br>or $c = 16a - 40$ | Q1 | Strand (ii)<br>Numerical verification scores zero marks |

|    |           |    |  |
|----|-----------|----|--|
| 13 | $3x^4y^6$ | B2 | B1 for two parts correct<br>Do not accept $\times$ signs between terms (counts as one error) |
|----|-----------|----|--|

|     |   |    |   |
|-----|---|----|---|
| 14a | $(3n + a)(n + b)$                               | M1 | Where $ab = \pm 4$ or $3b + a = \pm 7$            |
|     | $(3n + 4)(n + 1)$                               | A1 |   |
| 14b | Sight of 34 and 11 or 22 and 17<br>or 2 and 187 | M1 | Seen on factor tree or correct division by primes |
|     | $2 \times 11 \times 17$                         | A1 | oe must see multiplication signs                  |

|              |   |   |  |
|--------------|---|---|--|
| 15a          | $\sqrt{80} = 4\sqrt{5}$ or $\sqrt{16 \times 5}$<br>or $\sqrt{4 \times 20}$<br>$\sqrt{180} = 6\sqrt{5}$ or $\sqrt{36 \times 5}$<br>or $\sqrt{9 \times 20}$ or $\sqrt{4 \times 45}$ | M1  | oe or better eg $3\sqrt{20}$<br>Can be written as separate roots<br>eg $\sqrt{36} (\times) \sqrt{5}$ |
|              | $10\sqrt{5}$  | A1  |  |
|              | 15b   | $\frac{77}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}}$ or $\frac{77 \times \sqrt{11}}{11}$ | M1   |
| $7\sqrt{11}$ |   | A1  |  |

|    |  |    |  |
|----|--|----|--|
| 16 | $(\sqrt[3]{64})^2$ or $\sqrt[3]{(64^2)}$ or $4^2$<br>or $\sqrt[3]{4096}$ | M1 |  |
|    | 16   | A1 |  |



|     |  |    |   |
|-----|--|----|---|
| 17a | $(3x + 1)^2 = 9x^2 + 3x + 3x + 1$  | B1 |   |
| 17b | $9x^2 + 3x + 3x + 1 = 4x^2 - x + 7$<br>or $9x^2 + 6x + 1 = 4x^2 - x + 7$ | B1 | oe  |
|     | $5x^2 + 7x - 6 = 0$  | M1 | ft their expansion of $(3x + 1)^2$ with all terms correctly collected on one side of the equation           |
|     | $(5x - 3)(x + 2) (= 0)$<br>or $(5x + a)(x + b) (= 0)$                    | M1 | $ab = \pm 6$ or $5b + a = \pm 7$<br>ft their quadratic or quadratic formula allowing one substitution error |
|     | $x = 0.6$ and $x = -2$<br>or $x = 0.6$ and $y = 2.8$                     | A1 | oe  |
|     | $y = 2.8$ and $y = -5$<br>or $x = -2$ and $y = -5$                       | A1 | oe  |

|    |  |       |  |
|----|--|-------|--|
| 18 | $3y + 12 = 0$  | M1    | Attempt to find y-intercept or the value of y when $x = 0$<br>or $y = \frac{-4x}{3} - 4$ |
|    | $y = -4$   | A1    | May be seen on diagram   |
|    | Gradient = $\frac{4}{6}$ ( $= \frac{2}{3}$ ) or $\frac{0 - (-4)}{6 - 0}$ | M1    | oe ft their $-4$<br>Gradient must be positive  |
|    | $y = \frac{2}{3}x - 4$   | A1 ft | oe<br>SC3 for $y = \frac{-2}{3}x - 4$  |