

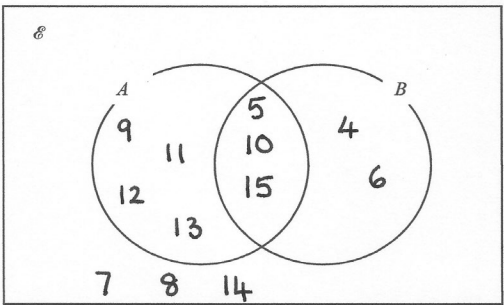
| Q | Working                                                                                                                                                                                                                                                             | Answer                         | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | eg $6x + 10y = 6.2$ _____<br>$\quad \underline{6x + 3y = 3.75}$<br>$\quad \quad 7y = 2.45$<br><br>eg $30x + 15y = 18.75$ _____<br>$\quad \underline{9x + 15y = 9.3}$<br>$\quad \quad 21x = 9.45$<br><br><b>or</b> eg $6\left(\frac{3.1 - 5y}{3}\right) + 3y = 3.75$ |                                | 3    | M1 for correct method to eliminate one variable – multiplying one or both equations so the coefficient of $x$ or $y$ is the same in both (condone one arithmetic error), with the intention to subtract all 3 terms to eliminate one variable (intention to subtract is clearly showing a minus sign or subtracting 2 or 3 out of 3 terms)<br><br><b>or</b> isolating $x$ or $y$ in one equation and substituting into the other |
|   | eg. $6 \times "0.45" + 3y = 3.75$<br>or $3 \times "0.45" + 5y = 3.1$<br><br><b>or</b> $3x + 5 \times "0.35" = 3.1$<br>or $6x + 3 \times "0.35" = 3.75$                                                                                                              |                                |      | M1 dep. Substitute found value into one equation <b>or</b> correct method to eliminate second unknown.                                                                                                                                                                                                                                                                                                                           |
|   |                                                                                                                                                                                                                                                                     | $x = 0.45$ oe<br>$y = 0.35$ oe |      | A1 dep M1                                                                                                                                                                                                                                                                                                                                                                                                                        |
|   |                                                                                                                                                                                                                                                                     |                                |      | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                                                                                                                                                             |

| Q | Working | Answer                                                                             | Mark  | Notes                                                                                                          |
|---|---------|------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------|
| 2 | (a)     | $5x \leq 2 + 7$ or $5x \leq 9$ or $\frac{5x}{5} \leq \frac{7}{5} + \frac{2}{5}$ oe | 2     | M1 allow any sign instead of $\leq$<br>or for an answer of 1.8 oe<br>or $x$ and 1.8 oe with the incorrect sign |
|   |         | $x \leq 1.8$                                                                       |       | A1 oe                                                                                                          |
|   | (b)(i)  | $(y \pm 7)(y \pm 5)$                                                               | 2     | M1 for $(y \pm 7)(y \pm 5)$<br>or $(y + a)(y + b)$ where $ab = -35$<br>or $a + b = -2$                         |
|   |         | $(y - 7)(y + 5)$                                                                   |       | A1 isw if student goes on to solve the equation in this part                                                   |
|   | (ii)    |                                                                                    | 7, -5 | 1                                                                                                              |
|   |         |                                                                                    |       | Total 5 marks                                                                                                  |

|   |     |                |                        |   |                                                                                                                                                                               |
|---|-----|----------------|------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | (a) |                | $\frac{a}{1}$          | 1 | B1                                                                                                                                                                            |
|   | (b) |                | $w^{12}$               | 1 | B1                                                                                                                                                                            |
|   | (c) |                | $64x^{10}y^6$          | 2 | B2 if not B2 then award B1 for 2 correct parts as part of a product eg $kx^{10}y^6$ where $k \neq 64$<br>or $64x^ky^6$ where $k \neq 10$<br>or $64x^{10}y^k$ where $k \neq 6$ |
|   | (d) | $c + 8v = t^3$ |                        | 2 | M1                                                                                                                                                                            |
|   |     |                | $t = \sqrt[3]{c + 8v}$ |   | A1 oe<br><br>SCB1 for an answer of $t = \frac{c + 8v}{3}$ oe                                                                                                                  |
|   |     |                |                        |   | Total 6 marks                                                                                                                                                                 |

| Q     | Working             | Answer               | Mark | Notes                                                                                                                                                                                                                                                                                                                                          |
|-------|---------------------|----------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 (a) | $2y - 4y + 8 - y^2$ |                      | 2    | M1 for 3 correct terms <b>or</b><br>for 4 correct terms ignoring signs <b>or</b><br>$\dots - 2y - y^2$ <b>or</b><br>$8 - 2y - \dots$                                                                                                                                                                                                           |
|       |                     | $8 - 2y - y^2$       |      | A1 Any order but simplified.                                                                                                                                                                                                                                                                                                                   |
|       |                     |                      |      | <b>Total 2 marks</b>                                                                                                                                                                                                                                                                                                                           |
| (b)   |                     | $5b^3c(3b^2 - 7c^8)$ | 2    | B2 fully correct <b>or</b><br>B1 for a correct partial factorisation<br>with at least two terms outside the<br>bracket eg $5b^3(3b^2c - 7c^9)$ or<br>$5c(3b^5 - 7b^3c^8)$ etc<br><b>or</b> the fully correct factor outside the<br>bracket with a two term expression in<br>terms of $b$ and $c$ inside the bracket eg<br>$5b^3c(15b^2 - c^8)$ |
|       |                     |                      |      | <b>Total 2 marks</b>                                                                                                                                                                                                                                                                                                                           |

| Q | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Answer | Mark | Notes                                                                                                                                                                                                                                                                                              |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | eg $\frac{27}{4}$ and $\frac{18}{7}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        | 3    | M1 Both fractions expressed as improper fractions.                                                                                                                                                                                                                                                 |
|   | $\frac{27}{4} \times \frac{7}{18}$ oe<br>or eg $\frac{189}{28} \div \frac{72}{28}$                                                                                                                                                                                                                                                                                                                                                                                                                                              |        |      | M1 for both fractions expressed as equivalent fractions with denominators that are a common multiple of 4 and 7 (seeing this stage gains M2)                                                                                                                                                       |
|   | eg $\frac{27}{4} \times \frac{7}{18} = \frac{189}{72} = \frac{21}{8} = 2\frac{5}{8}$<br>or $\frac{27}{4} \times \frac{7}{18} = \frac{189}{72} = 2\frac{45}{72} = 2\frac{5}{8}$<br>or $\frac{27^3}{4} \times \frac{7}{18^2} = \frac{21}{8} = 2\frac{5}{8}$<br>or $\frac{189}{28} \div \frac{72}{28} = \frac{189}{72} = 2\frac{45}{72} = 2\frac{5}{8}$ oe<br>if the student clearly shows $2\frac{5}{8} = \frac{21}{8}$ then they only need to complete the LHS to $\frac{21}{8}$ (often done in 1 <sup>st</sup> line of working) | shown  |      | A1 dep M2 conclusion to $2\frac{5}{8}$ from correct working – either sight of the result of the multiplication e.g. $\frac{189}{72}$ must be seen then cancelled or correct cancelling prior to the multiplication with $\frac{21}{8}$ seen.<br>NB entire solution using decimals scores no marks. |
|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |      | <b>Total 3 marks</b>                                                                                                                                                                                                                                                                               |

| Q | Working                                                                                                                                                                               | Answer                | Mark | Notes                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | $5x(x+2) = 5x^2 + 10x$<br><b>or</b> $(x+2)(3x-4) = 3x^2 - 4x + 6x - 8 (= 3x^2 + 2x - 8)$<br><b>or</b> $5x(3x-4) = 15x^2 - 20x$                                                        |                       | 3    | M1 for a correct intention to multiply all 3 factors by starting to multiply 2 factors only, allow one error                                                                                                                  |
|   | eg<br>$[(5x^2 + 10x)(3x-4) =] 15x^3 - 20x^2 + 30x^2 - 40x$<br><b>or</b> $[5x(3x^2 + 2x - 8) =] 15x^3 + 10x^2 - 40x$<br><b>or</b> $[(x+2)(15x^2 - 20x) =] 15x^3 - 20x^2 + 30x^2 - 40x$ |                       |      | M1 (dep)ft for expanding by the third factor, allow one error<br><br>(some may do the expansion in one stage and will get to $15x^3 - 20x^2 + 30x^2 - 40x$ without firstly expanding two factors, allow two errors)           |
|   |                                                                                                                                                                                       | $15x^3 + 10x^2 - 40x$ |      | A1 isw correct factorisation<br>eg $5(3x^3 + 2x^2 - 8x)$<br><br>do not isw incorrect factorisation<br>eg $15x^3 + 10x^2 - 40x = 3x^3 + 2x^2 - 8x$                                                                             |
|   |                                                                                                                                                                                       |                       |      | <b>Total 3 marks</b>                                                                                                                                                                                                          |
| 7 |                                                                                                    |                       | 3    | B3 all 4 parts of diagram correct<br><br>(B2 for 2 or 3 parts correct)<br><br>(B1 for 1 part correct)<br><br>SCB1 if no marks scored, award B1 if 4,6 in the section $A \cap B'$ and 9, 11, 12, 13 in the section $A' \cap B$ |
|   |                                                                                                                                                                                       |                       |      | <b>Total 3 marks</b>                                                                                                                                                                                                          |

| Q     | Working                | Answer                          | Mark | Notes                                                                     |
|-------|------------------------|---------------------------------|------|---------------------------------------------------------------------------|
| 8 (a) | $700 \div 200 (= 3.5)$ |                                 | 3    | M1 or 3.5 shown on diagram – within bounds of overlay                     |
|       |                        |                                 |      | M1 for line drawn at correct angle $\pm 2^\circ$ within bounds of overlay |
|       |                        | C indicated in correct position |      | A1 for C drawn within bounds of overlay, inclusive of lines.              |
| (b)   |                        | (1 : ) 20 000                   | 1    | B1                                                                        |
|       |                        |                                 |      | <b>Total 4 marks</b>                                                      |

|       |                    |        |   |                                                                                  |
|-------|--------------------|--------|---|----------------------------------------------------------------------------------|
| 9 (a) | eg $2y = -7x(+10)$ |        | 2 | M1 for $2y = -7x(+10)$<br>or an answer of $-3.5x$ oe<br>or an answer of $3.5$ oe |
|       |                    | $-3.5$ |   | A1 oe                                                                            |
| (b)   |                    | (0, 5) | 1 | B1 cao                                                                           |
|       |                    |        |   | <b>Total 3 marks</b>                                                             |

|    |                                 |   |   |                                                                         |
|----|---------------------------------|---|---|-------------------------------------------------------------------------|
| 10 | 5 5 7 8 10 12 13 14 16 21 23    |   | 3 | M1 For ordering the numbers<br>Allow one error or omission in the list. |
|    | 16 & 7 identified for LQ and UQ |   |   | M1 For identifying 16 and 7 – may also have identified the median (12)  |
|    |                                 | 9 |   | A1                                                                      |
|    |                                 |   |   | <b>Total 3 marks</b>                                                    |

| Q      | Working                                                                      | Answer                 | Mark | Notes                          |
|--------|------------------------------------------------------------------------------|------------------------|------|--------------------------------|
| 11 (a) | $12.6 \times 10^{(-24+145)}$ or $12.6 \times 10^{121}$ or $1.26 \times 10^n$ |                        | 2    | M1                             |
|        |                                                                              | $1.26 \times 10^{122}$ |      | A1 allow $1.3 \times 10^{122}$ |
| (b)    | 216 or 2.16 or $10^{120}$ or $10^{122}$ or $6^3 \times 10^{40 \times 3}$     |                        | 3    | M1 or for digits 216           |
|        | $216 \times 10^{120}$ oe or $2.16 \times 10^n$ where $n \neq 122$            |                        |      | M1                             |
|        |                                                                              | $2.16 \times 10^{122}$ |      | A1                             |
|        |                                                                              |                        |      | <b>Total 5 marks</b>           |

|    |                                                                                                                                                                                                                                                                                                   |                       |   |                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | $\left(\frac{2w^2}{y^5}\right)^{-3}$ or $\left(\frac{y^{20}}{16w^8}\right)^{\frac{3}{4}}$ or $\left(\frac{4096w^{24}}{y^{60}}\right)^{-\frac{1}{4}}$                                                                                                                                              |                       | 3 | M1 for one of fourth rooting or reciprocating or cubing                                                                                                                   |
|    | $\left(\frac{8w^6}{y^{15}}\right)^{-1}$ or $\frac{2^{-3}w^{-6}}{y^{-15}}$ or $\frac{1}{8}w^{-6}$ or $\left(\frac{y^5}{2w^2}\right)^3$ or $\left(\frac{y^{60}}{4096w^{24}}\right)^{\frac{1}{4}}$<br>or $\frac{0.125y^{15}}{w^6}$ or $\frac{0.125w^{-6}}{y^{-15}}$ or $\frac{0.125}{y^{-15}w^6}$ oe |                       |   | M1 for two of fourth rooting or reciprocating or cubing                                                                                                                   |
|    |                                                                                                                                                                                                                                                                                                   | $\frac{y^{15}}{8w^6}$ |   | A1 allow $\frac{y^{15}}{8w^6}$ or $\frac{y^{15}w^{-6}}{8}$ or $0.125y^{15}w^{-6}$<br>or $\frac{1}{8}y^{15}w^{-6}$ or $\frac{w^{-6}}{8y^{-15}}$ or $\frac{1}{8y^{-15}w^6}$ |
|    |                                                                                                                                                                                                                                                                                                   |                       |   | <b>Total 3 marks</b>                                                                                                                                                      |

| Q | Working | Answer | Mark | Notes |
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|           |     |  |       |   |                                                         |
|-----------|-----|--|-------|---|---------------------------------------------------------|
| <b>13</b> | (a) |  | 17.75 | 1 | B1 oe                                                   |
|           | (b) |  | 18.25 | 1 | B1 oe 18.249 (allow 18.249...)                          |
|           |     |  |       |   | SC B1 for 17.5 in (a) <b>and</b> 18.5 (or 18.49) in (b) |
|           |     |  |       |   | <b>Total 2 marks</b>                                    |

|           |      |  |         |   |                      |
|-----------|------|--|---------|---|----------------------|
| <b>14</b> | (i)  |  | (-4, 7) | 1 | B1                   |
|           | (ii) |  | (5, 10) | 1 | B1                   |
|           |      |  |         |   | <b>Total 2 marks</b> |

|           |  |  |                 |   |                                      |
|-----------|--|--|-----------------|---|--------------------------------------|
| <b>15</b> |  |  | $x \geq -1$     | 1 | B1 oe condone $>$ in place of $\geq$ |
|           |  |  | $y \geq x$      | 1 | B1 oe condone $>$ in place of $\geq$ |
|           |  |  | $x + 2y \leq 8$ | 1 | B1 oe condone $<$ in place of $\leq$ |
|           |  |  |                 |   | SCB1 if all inequalities reversed    |
|           |  |  |                 |   | <b>Total 3 marks</b>                 |

| Q  | Working                                                                                                                                                                                                                            | Answer                                                                                                                                                                                                                                | Mark | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | $3x^2 + (2x-3)^2 - x(2x-3) = 5$                                                                                                                                                                                                    | $3\left(\frac{y+3}{2}\right)^2 + y^2 - y\left(\frac{y+3}{2}\right) = 5$                                                                                                                                                               | 5    | M1 Correct substitution of $x$ for $y$ (or $y$ for $x$ )                                                                                                                                                                                                                                                                                                                                                                                                           |
|    | $5x^2 - 9x + 4 (= 0)$ oe<br>or $5x^2 - 9x = -4$                                                                                                                                                                                    | $5y^2 + 12y + 7 (= 0)$ oe<br>or $5y^2 + 12y = -7$                                                                                                                                                                                     |      | M1 for a correct equation in the form $ax^2 + bx + c (= 0)$ oe or $ax^2 + bx = -c$                                                                                                                                                                                                                                                                                                                                                                                 |
|    | $(5x-4)(x-1)(=0)$ or<br>$(x =) \frac{9 \pm \sqrt{(-9)^2 - 4 \times 5 \times 4}}{2 \times 5}$ or<br>$5\left[x - \left(\frac{9}{10}\right)^2 - \left(\frac{9}{10}\right)^2\right] + 4 (= 0)$<br>[leading to $x$ values of 0.8 and 1] | $(5y+7)(y+1)(=0)$ or<br>$(y =) \frac{-12 \pm \sqrt{12^2 - 4 \times 5 \times 7}}{2 \times 5}$<br>or<br>$5\left[\left(y + \frac{6}{5}\right)^2 - \left(\frac{6}{5}\right)^2\right] + 7 (= 0)$<br>[leading to $y$ values of -1.4 and -1] |      | M1ft dep on M1 for solving their quadratic equation using any correct method - if factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as<br>$\frac{9 \pm \sqrt{81-80}}{10}$ oe or $\frac{-12 \pm \sqrt{144-140}}{10}$ oe<br>or $5\left(x - \frac{9}{10}\right)^2 - \frac{1}{20}$ oe or $5\left(y + \frac{6}{5}\right)^2 - \frac{1}{5}$ |
|    | $(y =) 2 \times "0.8" - 3$<br>and $2 \times "1" - 3$                                                                                                                                                                               | $(x =) \frac{"-1.4"+3}{2}$<br>and $\frac{"-1"+3}{2}$                                                                                                                                                                                  |      | M1 dep on previous M1                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|    |                                                                                                                                                                                                                                    | $x = 0.8$ &<br>$y = -1.4$ /<br>$x = 1$ &<br>$y = -1$                                                                                                                                                                                  |      | A1 oe, for both solutions dep on M2                                                                                                                                                                                                                                                                                                                                                                                                                                |
|    |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                       |      | <b>Total 5 marks</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               |

| Q   | Working                                                                                                                                                          | Answer               | Mark | Notes                                                                                                                                                                                                                     |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 17  | $\frac{360}{10} (= 36)$ ext angle<br>or $\frac{(10-2) \times 180}{10} (= 144)$                                                                                   |                      | 4    | M1 method to find interior or exterior angle.<br>(angles may be seen on diagram)                                                                                                                                          |
|     | $x = "144" - 90 (= 54)$ or<br>$x = \frac{"540" - 3 \times "144"}{2} (= 54)$ or<br>$x = 90 - "36" (= 54)$<br>54 on the diagram is insufficient – must see working |                      |      | M1 method to find $x$ (must show it is intended to be $x$ )<br>eg use of int angle – $90^\circ$<br>use of ext angle + $x = 90^\circ$ use of pentagon<br><i>GHIJA</i><br>All figures in “ “ must come from correct working |
|     | $BAD = CDA = GDE = DGF = \frac{360 - 2 \times "144"}{2} (= 36)$                                                                                                  |                      |      | M1 A correct method to find an angle of $36^\circ$ within the shape (not exterior angle)<br>or<br>$36^\circ$ shown in correct place in diagram                                                                            |
|     | There are other correct methods.<br>Please check for correct working.                                                                                            | $x = 54$<br>$y = 54$ |      | A1 dep on M3 to find each of $x$ and $y$ and the correct value of 54 for both from correct working                                                                                                                        |
|     |                                                                                                                                                                  |                      |      | <b>Total 4 marks</b>                                                                                                                                                                                                      |
| ALT | $ADG = "144" - 2 \times "36" (= 72)$                                                                                                                             |                      |      | M1                                                                                                                                                                                                                        |
|     | $JA$ is parallel to $GD$                                                                                                                                         |                      |      | M1                                                                                                                                                                                                                        |
|     | $DGA = DAG (y)$ [isosceles triangle]                                                                                                                             |                      |      | M1                                                                                                                                                                                                                        |
|     | $x = DGA = y$                                                                                                                                                    | shown                |      | A1                                                                                                                                                                                                                        |
|     | There are other correct methods.<br>Please check for correct working.                                                                                            |                      |      | <b>Total 4 marks</b>                                                                                                                                                                                                      |

| Q  | Working                                                                                                                                    | Answer         | Mark | Notes                                                                                                                                   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 18 | eg $\frac{\sqrt{12}}{\sqrt{3}+2} \times \frac{\sqrt{3}-2}{\sqrt{3}-2}$                                                                     |                | 3    | M1 rationalise denominator – award for seeing multiplication by $\frac{\sqrt{3}-2}{\sqrt{3}-2}$<br>or $\frac{-\sqrt{3}+2}{-\sqrt{3}+2}$ |
|    | eg $\frac{(\sqrt{36}-2\sqrt{12})}{3-4}$ or $\frac{(6-2\sqrt{12})}{-1}$ or $-6+2\sqrt{12}$<br>or $\frac{6-4\sqrt{3}}{-1}$ or $=6+4\sqrt{3}$ |                |      | M1 dep M1 correctly simplifying numerator and denominator.<br><br>(denominator could be $3-4$ or $-1$ )                                 |
|    |                                                                                                                                            | $-6+\sqrt{48}$ |      | A1 dep M2 must be in correct form (including $\sqrt{48}$ )<br>allow $a = -6$ and $b = 48$                                               |
|    |                                                                                                                                            |                |      | <b>Total 3 marks</b>                                                                                                                    |

| Q      | Working                 | Answer       | Mark | Notes                                                                                                                                                                                                 |
|--------|-------------------------|--------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 (a) |                         | -0.2 and 2.2 | 2    | B2 Both correct to 1 decimal place<br><br>(B1 for (-0.2, 0), (2.2, 0))<br><b>or</b><br>a single correct value to 1 decimal place<br><b>or</b><br>both values within<br>-0.2 to -0.23 and 2.2 to 2.23) |
| (b)    | (y =) $-2x + 1$ oe seen |              | 3    | M1 Written – could be label on graph                                                                                                                                                                  |
|        | $y = -2x + 1$ drawn     |              |      | M1 dep on previous M1 for drawing<br>$y = -2x + 1$ passing through (-1, 3)<br>and (2, -3)<br>(allow 1 square tolerance)                                                                               |
|        |                         | -0.6 and 1.6 |      | A1 dep on M2 for both answers to<br>1 decimal place                                                                                                                                                   |
|        |                         |              |      | <b>Total 5 marks</b>                                                                                                                                                                                  |

| Q      | Working                | Answer            | Mark | Notes                                            |
|--------|------------------------|-------------------|------|--------------------------------------------------|
| 20 (a) | $7 - 3(x^2 - 4x)$      |                   | 3    | M1 <b>or</b> for one of $a$ , $b$ or $c$ correct |
|        | $7 - 3[(x - 2)^2 - 4]$ |                   |      | M1 <b>or</b> for two of $a$ , $b$ or $c$ correct |
|        |                        | $19 - 3(x - 2)^2$ |      | A1                                               |
|        | (b)                    | (2, 19)           | 1    | B1 ft their expression                           |
|        |                        |                   |      | <b>Total 4 marks</b>                             |

| Q  | Working                                                                                                                                                                                                                                                                                            | Answer        | Mark | Notes                                                                                                                                                                                                                           |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | eg $(2n + 1)^2 + (2n - 1)^2$<br>or<br>$(2n + 1)^2 + (2n + 3)^2$ oe                                                                                                                                                                                                                                 |               | 3    | M1 for setting up a correct algebraic expression (any letter can be used) must have intention to add (may come after expanding)                                                                                                 |
|    | Eg $4n^2 + 4n + 1 + 4n^2 - 4n + 1$<br><b>or</b> $8n^2 + 2$<br><b>or</b><br>$4n^2 + 4n + 1 + 4n^2 + 12n + 9$<br><b>or</b> $8n^2 + 16n + 10$<br>oe                                                                                                                                                   |               |      | M1 correct expansion of brackets and correct signs or a correct result.                                                                                                                                                         |
|    | eg $8 \times n^2 + 2$<br><br>$\frac{8n^2 + 16n + 10}{8} = n^2 + 2n + \frac{10}{8}$ which shows a remainder of 2 or $10 - 8 = 2$ or<br>$\frac{8n^2 + 16n + 10}{8} = n^2 + 2n + 1$ remainder 2 oe<br><br>$\frac{8n^2 + 16n + 10}{8} = n^2 + 2n + 1 + \frac{2}{8}$ oe<br><br>$8(n^2 + 2n + 1) + 2$ oe | shown clearly |      | A1 conclusion dep on M2 for eg $8n^2 + 2$ <b>and</b> a suitable conclusion (may be shown as a calculation/in numbers). The conclusion must be an intention to show that the result is a multiple of 8 and there is 2 remaining. |
|    |                                                                                                                                                                                                                                                                                                    |               |      | <b>Total 3 marks</b>                                                                                                                                                                                                            |

| Q  | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Answer                                | Mark | Notes                                                                                                                                                                                   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22 | eg $\overrightarrow{ON} = 8\mathbf{a} + \frac{1}{2}(6\mathbf{b} - 8\mathbf{a})(= 3\mathbf{b} + 4\mathbf{a})$ or $\overrightarrow{ON} = 6\mathbf{b} + \frac{1}{2}(-6\mathbf{b} + 8\mathbf{a})(= 3\mathbf{b} + 4\mathbf{a})$<br>or $\overrightarrow{NO} = \frac{1}{2}(8\mathbf{a} - 6\mathbf{b}) - 8\mathbf{a}(= -4\mathbf{a} - 3\mathbf{b})$ or $\overrightarrow{NO} = -6\mathbf{b} + \frac{1}{2}(6\mathbf{b} - 8\mathbf{a})(= -3\mathbf{b} - 4\mathbf{a})$<br>or $\overrightarrow{AM} = -8\mathbf{a} + \frac{1}{3}(6\mathbf{b})(= 2\mathbf{b} - 8\mathbf{a})$ or $\overrightarrow{AM} = -8\mathbf{a} + 6\mathbf{b} - \frac{2}{3}(6\mathbf{b})(= 2\mathbf{b} - 8\mathbf{a})$<br>or $\overrightarrow{MA} = 8\mathbf{a} - \frac{1}{3}(6\mathbf{b})(= 8\mathbf{a} - 2\mathbf{b})$ or $\overrightarrow{MA} = \frac{2}{3}(6\mathbf{b}) + 8\mathbf{a} - 6\mathbf{b}(= 8\mathbf{a} - 2\mathbf{b})$ |                                       | 5    | M1 a correct expression for $\overrightarrow{ON}$<br>or $\overrightarrow{NO}$ or $\overrightarrow{AM}$ or $\overrightarrow{MA}$                                                         |
|    | $\overrightarrow{OP} = \mu(3\mathbf{b} + 4\mathbf{a})$ and one of<br>eg $\overrightarrow{OP} = 8\mathbf{a} + x(2\mathbf{b} - 8\mathbf{a})(= (8 - 8x)\mathbf{a} + 2x\mathbf{b})$ or<br>$\overrightarrow{OP} = 2\mathbf{b} + y(8\mathbf{a} - 2\mathbf{b})(= (2 - 2y)\mathbf{b} + 8y\mathbf{a})$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                       |      | M2 oe<br>(M1 for one correct<br>expression for $\overrightarrow{OP}$ )<br>(where $\mu, x, y$ are scalars)                                                                               |
|    | eg<br>$\frac{4}{3} = \frac{8y}{2 - 2y}$ or $\frac{4}{3} = \frac{8 - 8x}{2x}$ oe or $3\mu = 2x$ and $4\mu = 8 - 8x$<br>or $3\mu = 2 - 2y$ and $4\mu = 8y$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                       |      | M1 A correct expression to find<br>the position of $P$ along $\overrightarrow{ON}$<br>or two correct simultaneous<br>equations coming from the<br>expressions for $\overrightarrow{OP}$ |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $2\mathbf{a} + \frac{3}{2}\mathbf{b}$ |      | A1 dep on M3, oe eg $2\mathbf{a} + 1.5\mathbf{b}$                                                                                                                                       |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |      | Total 5 marks                                                                                                                                                                           |

| Q | Working | Answer | Mark | Notes |
|---|---------|--------|------|-------|
|---|---------|--------|------|-------|

|     |            |           |        | Edexcel averages: scores of candidates who achieved grade: |       |       |       |       |       |       |      |      |
|-----|------------|-----------|--------|------------------------------------------------------------|-------|-------|-------|-------|-------|-------|------|------|
| Qn  | Mean score | Max score | Mean % | ALL                                                        | 9     | 8     | 7     | 6     | 5     | 4     | 3    | U    |
| 1   | 2.37       | 3         | 79     | 2.37                                                       | 2.96  | 2.91  | 2.81  | 2.57  | 1.97  | 1.32  | 0.42 | 0.04 |
| 2   | 3.85       | 5         | 77     | 3.85                                                       | 4.95  | 4.76  | 4.52  | 3.95  | 3.15  | 2.03  | 1.02 | 0.00 |
| 3   | 4.81       | 6         | 80     | 4.81                                                       | 5.85  | 5.66  | 5.39  | 4.84  | 4.12  | 3.22  | 2.15 | 0.00 |
| 4   | 3.04       | 4         | 76     | 3.04                                                       | 3.85  | 3.67  | 3.42  | 3.10  | 2.52  | 1.91  | 1.01 | 0.00 |
| 5   | 2.25       | 3         | 75     | 2.25                                                       | 2.84  | 2.67  | 2.48  | 2.20  | 1.85  | 1.53  | 0.86 | 0.35 |
| 6   | 2.02       | 3         | 67     | 2.02                                                       | 2.83  | 2.69  | 2.46  | 2.10  | 1.29  | 0.64  | 0.25 | 0.13 |
| 7   | 2.16       | 3         | 72     | 2.16                                                       | 2.84  | 2.71  | 2.42  | 2.04  | 1.66  | 1.14  | 0.96 | 0.55 |
| 8   | 2.21       | 4         | 55     | 2.21                                                       | 3.38  | 2.70  | 2.46  | 2.05  | 1.39  | 0.91  | 0.46 | 0.00 |
| 9   | 1.52       | 3         | 51     | 1.52                                                       | 2.81  | 2.41  | 1.73  | 0.92  | 0.35  | 0.12  | 0.07 | 0.00 |
| 10  | 1.55       | 3         | 52     | 1.55                                                       | 2.56  | 1.95  | 1.66  | 1.41  | 0.81  | 0.45  | 0.26 | 0.04 |
| 11a | 0.99       | 2         | 50     | 0.99                                                       | 1.63  | 1.25  | 1.04  | 0.84  | 0.57  | 0.35  | 0.13 | 0.09 |
| 11b | 1.63       | 3         | 54     | 1.63                                                       | 2.73  | 2.22  | 1.72  | 1.41  | 0.77  | 0.39  | 0.24 | 0.09 |
| 12  | 1.53       | 3         | 51     | 1.53                                                       | 2.59  | 1.95  | 1.62  | 1.18  | 0.87  | 0.61  | 0.17 | 0.04 |
| 13  | 0.91       | 2         | 46     | 0.91                                                       | 1.42  | 1.13  | 0.92  | 0.83  | 0.62  | 0.31  | 0.14 | 0.00 |
| 14  | 0.87       | 2         | 44     | 0.87                                                       | 1.83  | 1.42  | 0.80  | 0.36  | 0.17  | 0.04  | 0.04 | 0.00 |
| 15  | 1.24       | 3         | 41     | 1.24                                                       | 2.63  | 1.89  | 1.15  | 0.56  | 0.25  | 0.08  | 0.03 | 0.02 |
| 16  | 2.14       | 5         | 43     | 2.14                                                       | 4.54  | 3.40  | 1.85  | 0.92  | 0.43  | 0.20  | 0.07 | 0.00 |
| 17  | 1.19       | 4         | 30     | 1.19                                                       | 2.56  | 1.64  | 1.07  | 0.57  | 0.32  | 0.11  | 0.04 | 0.04 |
| 18  | 0.95       | 3         | 32     | 0.95                                                       | 2.09  | 1.38  | 0.74  | 0.44  | 0.21  | 0.09  | 0.03 | 0.00 |
| 19  | 1.00       | 5         | 20     | 1.00                                                       | 2.06  | 1.30  | 0.94  | 0.59  | 0.28  | 0.14  | 0.03 | 0.00 |
| 20  | 0.84       | 3         | 28     | 0.84                                                       | 2.38  | 1.08  | 0.41  | 0.09  | 0.01  | 0.00  | 0.00 | 0.00 |
| 21  | 0.74       | 3         | 25     | 0.74                                                       | 2.00  | 0.97  | 0.38  | 0.15  | 0.02  | 0.01  | 0.00 | 0.00 |
| 22  | 0.77       | 5         | 15     | 0.77                                                       | 2.30  | 0.79  | 0.30  | 0.16  | 0.01  | 0.00  | 0.00 | 0.00 |
|     | 40.58      | 80        | 41     | 40.58                                                      | 65.63 | 52.55 | 42.29 | 33.28 | 23.64 | 15.60 | 8.38 | 1.39 |

| Q | Working | Answer | Mark | Notes |
|---|---------|--------|------|-------|
|---|---------|--------|------|-------|

**Suggested grade boundaries**

| Grade | 9  | 8  | 7  | 6  | 5  | 4  | 3 |
|-------|----|----|----|----|----|----|---|
| Mark  | 59 | 47 | 38 | 28 | 20 | 12 | 7 |