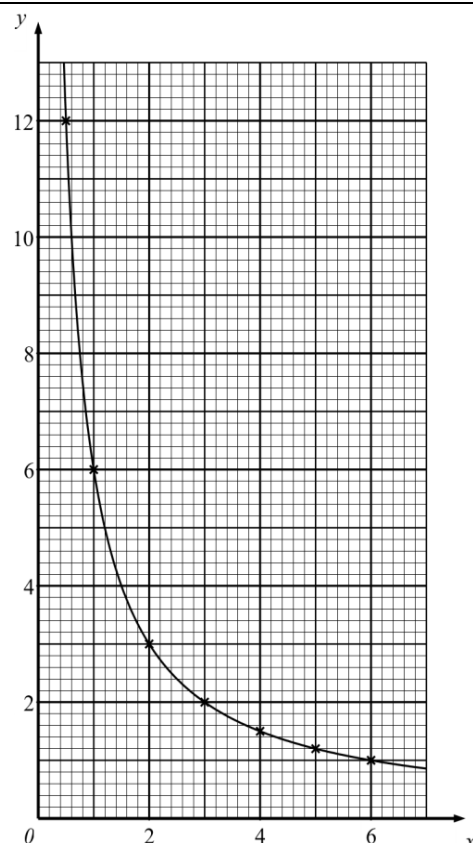


| Q     | Working                                                                                                      | Answer            | Mark | Notes                                                                                                                                                                 |
|-------|--------------------------------------------------------------------------------------------------------------|-------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 (a) | $4y > 12 - 5$                                                                                                |                   | 2    | M1 Allow $y = \frac{7}{4}$ oe or $y > -\frac{7}{4}$ or $y < \frac{7}{4}$                                                                                              |
|       |                                                                                                              | $y > \frac{7}{4}$ |      | A1 oe                                                                                                                                                                 |
| (b)   | $12x - 10$<br><b>or</b> $2(6x - 5) = 4x - 7$<br><b>or</b><br>$6x - 5 = \frac{4}{2} \quad x - \frac{7}{2}$ oe |                   | 3    | M1 for removal of fraction <b>and</b><br>multiplying out LHS<br><b>or</b> rearranging to remove the fraction<br><b>or</b><br>separating fraction (RHS) in an equation |
|       | $12x - 4x = -7 + 10$ oe<br><b>or</b><br>$6x - \frac{4}{2} \quad x = -\frac{7}{2} + 5$ oe                     |                   |      | M1 ft (dep on 4 terms) for terms in $x$ on one side of equation and number terms on the other                                                                         |
|       |                                                                                                              | $\frac{3}{8}$     |      | A1 (dep M1) oe                                                                                                                                                        |
|       |                                                                                                              |                   |      | <b>Total 5 marks</b>                                                                                                                                                  |

|       |                                                                                                                     |   |   |                                                                                                                  |
|-------|---------------------------------------------------------------------------------------------------------------------|---|---|------------------------------------------------------------------------------------------------------------------|
| 2 (a) |                                                                                                                     | 1 | 1 | B1                                                                                                               |
| (b)   |                                                                                                                     | 6 | 1 | B1                                                                                                               |
| (c)   | $206 + m - 214 = -3$ oe<br><b>or</b> $\frac{7^{-3} \times 7^{214}}{7^{206}}$ <b>or</b> $\frac{7^{211}}{7^{206}}$ oe |   | 2 | M1 allow $7^{206+m-214} = 7^{-3}$ oe (must be in the form $7^x = 7^y$ where $x$ and $y$ are correct expressions) |
|       |                                                                                                                     | 5 |   | A1 accept $7^5$                                                                                                  |
|       |                                                                                                                     |   |   | <b>Total 4 marks</b>                                                                                             |

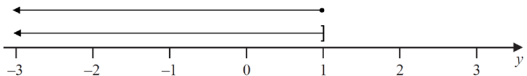
| Q     | Working | Answer             | Mark | Notes                |
|-------|---------|--------------------|------|----------------------|
| 3 (a) |         | 50 000             | 1    | B1                   |
| (b)   |         | $6 \times 10^{-5}$ | 1    | B1                   |
|       |         |                    |      | <b>Total 2 marks</b> |

|   |     |                                                                                                                                                                                                          |                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                           |     |   |   |   |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |
|---|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|---|---|---|---|----|---|---|---|-----|-----|---|---------------|---|-------------------------------------------------------------------------------------------------------|
| 4 | (a) | <table><tr><td>x</td><td>0.5</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>12</td><td>6</td><td>3</td><td>2</td><td>1.5</td><td>1.2</td><td>1</td></tr></table> | x                                                   | 0.5 | 1                                                                                                                                                                                                                                                                                                                                                                                         | 2   | 3 | 4 | 5 | 6 | y | 12 | 6 | 3 | 2 | 1.5 | 1.2 | 1 | Correct table | 2 | B2 for all 4 correct values oe (ie $\frac{6}{5}$ or $\frac{3}{2}$ )<br>(B1 for 2 or 3 correct values) |
|   |     | x                                                                                                                                                                                                        | 0.5                                                 | 1   | 2                                                                                                                                                                                                                                                                                                                                                                                         | 3   | 4 | 5 | 6 |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |
| y | 12  | 6                                                                                                                                                                                                        | 3                                                   | 2   | 1.5                                                                                                                                                                                                                                                                                                                                                                                       | 1.2 | 1 |   |   |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |
|   |     |                                                                                                                                                                                                          |                                                     |     |                                                                                                                                                                                                                                                                                                                                                                                           |     |   |   |   |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |
|   | (b) |                                                                                                                        | Correct graph<br>7 points joined by a smooth curve. | 2   | M1ft (dep B1 in (a)) for 6 or 7 points plotted correctly using their values (within the circles on overlay).<br>May be implied by curve passing through correct point.<br><br>A1ft only allow one incorrect value from the table in (a), and for a curve that is decreasing throughout for $x = 0.5$ to $x = 6$ .<br><br>Ignore graph to the right of (6, 1) and to the left of (0.5, 12) |     |   |   |   |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |
|   |     |                                                                                                                                                                                                          |                                                     |     | Total 4 marks                                                                                                                                                                                                                                                                                                                                                                             |     |   |   |   |   |   |    |   |   |   |     |     |   |               |   |                                                                                                       |

| Q            | Working                                       | Answer        | Mark | Notes                                                                                                                                                                                                                                    |
|--------------|-----------------------------------------------|---------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5</b> (a) |                                               | 15, 0, -1, 3  | 2    | B2 for 4 correct values<br>(B1 for 2 or 3 correct values)                                                                                                                                                                                |
| (b)          | (-2, 15) (-1, 8) (0, 3) (2, -1) (3, 0) (4, 3) |               | 2    | M1 (dep on B1) ft from (a) for at least 5 points plotted correctly                                                                                                                                                                       |
|              |                                               | correct graph |      | A1 for a correct graph<br>(clear intention to go through all the points and which must be curved at the bottom)<br><b>Note:</b> If a fully correct graph is shown, but an incomplete table is shown in (a), then award the marks for (a) |
|              |                                               |               |      | <b>Total 4 marks</b>                                                                                                                                                                                                                     |

|              |                      |                  |   |                                                                                                                             |
|--------------|----------------------|------------------|---|-----------------------------------------------------------------------------------------------------------------------------|
| <b>6</b> (a) |                      | $x^9$            | 1 | B1 cao                                                                                                                      |
| (b)          |                      | $64y^6$          | 2 | B2 for $64y^6$<br>(B1 for $ky^6$ where $k \neq 64$ or $64y^m$ where $m \neq 6$ )                                            |
| (c)          | $(n \pm 3)(n \pm 4)$ |                  | 2 | M1 for $(n \pm 3)(n \pm 4)$ or $(n + a)(n + b)$ where $ab = 12$ or $a + b = -7$<br>Condone use of a different letter to $n$ |
|              |                      | $(n - 3)(n - 4)$ |   | A1                                                                                                                          |
|              |                      |                  |   | <b>Total 5 marks</b>                                                                                                        |

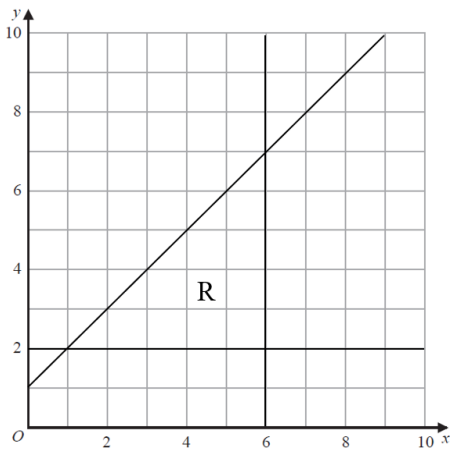
| Q                    | Working                                                                                                                               | Answer              | Mark | Notes                                                                                                                                                                                                                                                                                  |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7                    | $n(3n^2 + 5n - 12n - 20)$ or $n(3n^2 - 7n - 20)$ or<br>$(3n^2 + 5n)(n - 4)$ or $(n^2 - 4n)(3n + 5)$ or<br>$3n^3 + 5n^2 - 12n^2 - 20n$ |                     | 2    | M1 for a correct partial expansion (may be unsimplified) (allow one error in the expansion of $(n - 4)(3n + 5)$ e.g. for any 3 correct terms<br><b>or</b><br>for 4 out of 4 correct terms ignoring signs<br><b>or</b><br>for $3n^2 - 7n \dots$<br><b>or</b><br>for $\dots - 7n - 20$ ) |
|                      |                                                                                                                                       | $3n^3 - 7n^2 - 20n$ |      | A1 oe e.g. if correct answer seen allow further factorisation to $n(3n^2 - 7n - 20)$                                                                                                                                                                                                   |
| <b>Total 2 marks</b> |                                                                                                                                       |                     |      |                                                                                                                                                                                                                                                                                        |

|                      |                                                                                     |                                                                     |   |                                                                                                                                                                                                                                                                       |
|----------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 (a)                |                                                                                     | $-2, -1, 0, 1, 2$                                                   | 2 | B2 for $-2, -1, 0, 1, 2$ with no additions or repeats<br>(B1 for 4 of $-2, -1, 0, 1, 2$ with no additions or repeats<br><b>or</b><br>for 6 values with no more than one incorrect value e.g. all of $-2, -1, 0, 1, 2, 3$<br><b>or</b><br>for 5 values with one error) |
| (b)                  |  | Closed circle at $x = 1$<br>and<br>a line with an arrow to the left | 1 | B1 for a closed circle at $x = 1$ and a line with an arrow of any length to the left<br><br>Allow ] for a closed circle<br><br>Allow a line without an arrow if it reaches to at least $-3$                                                                           |
| <b>Total 3 marks</b> |                                                                                     |                                                                     |   |                                                                                                                                                                                                                                                                       |

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

|   |  |                     |   |                                                                                                                                                                                                   |
|---|--|---------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9 |  | $y = -3x + 5$<br>oe | 2 | B2 fully correct equation eg $y = -3x + 5$<br>or $y - 5 = -3(x - 0)$<br><br>If not B2 then B1 for<br>$y = -3x + a$ with $a \neq 5$<br>or<br>$y = bx + 5$ ( $b \neq 0, -3$ ) or<br>(L =) $-3x + 5$ |
|   |  |                     |   | <b>Total 2 marks</b>                                                                                                                                                                              |

|    |    |  |   |                                                                                                                                |
|----|----|--|---|--------------------------------------------------------------------------------------------------------------------------------|
| 10 | 30 |  | 1 | for a start to the process<br>eg, $5406 \div 6$ (=901) <b>or</b> $5400 \div 6$ (=900) <b>or</b><br>$5000 \div 6$ (= 833.333..) |
|    |    |  | 1 | process to find the length of one side,<br>eg $\sqrt{901}$ <b>or</b> $\sqrt{900}$ <b>or</b> $\sqrt{833.33..}$                  |
|    |    |  | 1 | for 30                                                                                                                         |

| Q  | Working                                                                                                                  | Answer                    | Mark | Notes                                                                                                                                  |
|----|--------------------------------------------------------------------------------------------------------------------------|---------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Lines (solid or dashed) $x = 6$ and $y = 2$ drawn                                                                        |                           | 3    | B1 The lines $x = 6$ and $y = 2$ should extend far enough to intersect with each other.                                                |
|    | Line (solid or dashed) $y = x + 1$ drawn                                                                                 |                           |      | B1 The line should extend from at least $x = 1$ to $x = 6$ <b>or</b> far enough to intersect with their horizontal and vertical lines. |
|    | Region R shown (shaded or not shaded)  | Correct region identified |      | B1 dep on B2                                                                                                                           |
|    |                                                                                                                          |                           |      | <b>Total 3 marks</b>                                                                                                                   |

| Q  | Working                         |                                      | Answer | Mark | Notes                                                                                                                                                      |
|----|---------------------------------|--------------------------------------|--------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | $n^2 t^3 = 4d + t^3$            | $n^2 = \frac{4d}{t^3} + 1$           |        | 4    | M1 for multiplying by the denominator<br>or for dividing the RHS by $t^3$                                                                                  |
|    | $t^3 (n^2 - 1) = 4d$ oe         | $n^2 - 1 = \frac{4d}{t^3}$           |        |      | M1 for isolating terms in $t^3$ <b>and</b> factorising the correct expression of the equation<br>or for isolating the $\frac{4d}{t^3}$ term                |
|    | $t^3 = \frac{4d}{(n^2 - 1)}$ oe | $t^3 = \frac{4d}{(n^2 - 1)}$         |        |      | M1 for making $t^3$ the subject                                                                                                                            |
|    |                                 | $t = \sqrt[3]{\frac{4d}{(n^2 - 1)}}$ |        |      | A1 oe eg $t = \sqrt[3]{\frac{4d}{(n^2 - 1)}}$ or $t = \left(\frac{4d}{n^2 - 1}\right)^{\frac{1}{3}}$<br>SC B2 for $t = t = \sqrt[3]{\frac{4d}{(n^2 + 1)}}$ |
|    |                                 |                                      |        |      | <b>Total 4 marks</b>                                                                                                                                       |

| Q      | Working                                    | Answer                 | Mark | Notes                                                                                                                                                                                                                                                                                                                                                    |
|--------|--------------------------------------------|------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 (a) |                                            | 48                     | 1    | B1 allow 47 – 49<br>Accept $\frac{n}{110}$ where $n$ is in the range 47 – 49                                                                                                                                                                                                                                                                             |
| (b)    |                                            | 46                     | 1    | B1 allow 45.5 – 46.5                                                                                                                                                                                                                                                                                                                                     |
| (c)    | 40 and 56                                  |                        | 2    | M1 for both values. LQ of 40 – 41 and UQ in the range 56 – 58.<br><br>or for use of 15 and 45 (eg indicated by marks on horizontal axis that correspond to 15 and 45 on the vertical axis.)<br>or for use of 15.25 and 45.75 (eg indicated by marks on horizontal axis that correspond to 15.25 and 45.75 on the vertical axis.)                         |
|        |                                            | 16 to 18               |      | A1 accept 16 to 18                                                                                                                                                                                                                                                                                                                                       |
| (d)    |                                            | Yes and correct reason | 1    | B1 ft dep on M1 in (c) but ft their reading of the horizontal axis.<br>For stating yes <b>and</b> the <u>IQR</u> for the <u>Algebra</u> test is <u>greater</u> than IQR for the Geometry test oe<br>If using value in (c) less than 9, only accept ‘no’ and <u>IQR</u> for the <u>Algebra</u> test is <u>less</u> than the IQR for the Geometry test oe. |
| (e)    | 60 – ‘50’ (= 10)                           |                        | 3    | M1 may be seen embedded as $\frac{10}{60} = \left(\frac{1}{6}\right)$ oe<br>(eg reading of 50 from graph stated or indicated by marks on vertical axis that correspond to 64 on the horizontal axis).<br>Allow 60 – ‘50’ – 1 (= 9) oe                                                                                                                    |
|        | $\frac{'10'}{60} \times \frac{'10'-1}{59}$ |                        |      | M1 for use of $\frac{n}{60} \times \frac{n-1}{59}$ with any integer $n$ such that $2 \leq n \leq 59$                                                                                                                                                                                                                                                     |
|        |                                            | $\frac{3}{118}$        |      | A1 oe (accept 0.025 or better)<br>Allow $\frac{6}{295}$ (= 0.02 or better) if using $\frac{9}{60} \times \frac{8}{59}$                                                                                                                                                                                                                                   |

| Q | Working | Answer | Mark | Notes         |
|---|---------|--------|------|---------------|
|   |         |        |      | Total 8 marks |

| Q  | Working                                                                                                                                                                                               | Answer             | Mark | Notes                                                                                        |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------|----------------------------------------------------------------------------------------------|
| 14 | $\frac{12}{4x} + \frac{2(x+2)}{4x} + \frac{x}{4x}$ oe or $\frac{12+2(x+2)+x}{4x}$ oe<br>$\frac{3(8x)}{8x^2} + \frac{4x(x+2)}{8x^2} + \frac{2x^2}{8x^2}$ oe or<br>$\frac{3(8x)+4x(x+2)+2x^2}{8x^2}$ oe |                    | 3    | M1 for three correct fractions with a common denominator <b>or</b> a single correct fraction |
|    | $\frac{12+2x+4+x}{4x}$ oe or<br>$\frac{24x+4x^2+8x+2x^2}{8x^2}$ oe or<br>$\frac{6x^2+32x}{8x^2}$ oe or $\frac{3x^2+16x}{4x^2}$ oe or $\frac{6x+32}{8x}$ oe                                            |                    |      | M1 for a correct single fraction with brackets expanded                                      |
|    |                                                                                                                                                                                                       | $\frac{3x+16}{4x}$ |      | A1 oe $\frac{16+3x}{4x}$                                                                     |
|    |                                                                                                                                                                                                       |                    |      | <b>Total 3 marks</b>                                                                         |

| Q  | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Answer | Mark | Notes                                                                                                                                                                                                     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 | $ABC = 90^\circ$ and $ACB (= ADB) = 180 - 90 - 55$<br>$(= 35)$<br><b>or</b><br>$ABO = 55^\circ$ and $AOB = 180 - 2 \times 55 (= 70)$<br><b>or</b><br>$BDC = 55^\circ$ , $ADC = 90^\circ$ and $ADB = 90 - 55 (= 35)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        | 4    | M1                                                                                                                                                                                                        |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 35     |      | A1 for $ADB = 35$                                                                                                                                                                                         |
|    | <u>Angles</u> in a <u>semicircle</u> are $90^\circ$<br><u>Angles</u> in a <u>triangle</u> add to $180^\circ$ (Angles in a <u>triangle</u> add to <u><math>180^\circ</math></u> )<br><u>Angles</u> in the <u>same segment</u> (are equal) OR <u>angles</u> at the circumference <u>subtend(ed)</u> from the same <u>arc/chord</u> of the circle (are equal)<br><b>or</b><br>Angles in an <u>isosceles</u> triangle (are equal)<br><u>Angles</u> in a <u>triangle</u> sum to $180^\circ$ (Angles in a <u>triangle</u> add to <u><math>180^\circ</math></u> )<br><u>Angle</u> at the <u>centre</u> is $2 \times$ (double) angle at <u>circumference</u> / <u>angle</u> at <u>circumference</u> is $\frac{1}{2}$ angle at <u>centre</u><br><b>or</b><br><u>Angles</u> in the <u>same segment</u> (are equal) OR <u>angles</u> at the circumference <u>subtend(ed)</u> from the same <u>arc/chord</u> of the circle<br><u>Angles</u> in a <u>semicircle</u> are $90^\circ$ |        |      | B2 (dep on M1) for all 3 reasons appropriate to their method<br><br>B1 (dep on M1) for one correct circle theorem appropriate to their method)<br><br>NB For the third method only 2 reasons are required |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |      | <b>Total 4 marks</b>                                                                                                                                                                                      |

| Q  | Working                                                                                                                                                                                                                                                                                                                                 | Answer           | Mark | Notes                                                                                                                                                                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | $3(x^2 + 4x) + 19$ <b>and</b> $3[(x + 2)^2 - 2^2] + 19$ <b>or</b><br>$3\left(x^2 + 4x + \frac{19}{3}\right)$ <b>and</b> $3\left((x + 2)^2 - 2^2 + \frac{19}{3}\right)$ <b>or</b><br>$a = 3$ and $2ab = 12$ oe and $b^2a + c = 19$ oe <b>or</b><br>$a = 3$ and $b = \frac{12}{2 \times 3}$ oe and $c = -\frac{12^2}{4 \times 3} + 19$ oe |                  |      | M1 for correctly taking out a factor of 3 and correctly completing the square<br><b>or</b><br>for equating coefficients by expanding<br>$a(x + b)^2 + c = ax^2 + 2abx + b^2a + c$<br><b>or</b><br>for equating coefficients by using<br>$ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a} + c$ |
|    |                                                                                                                                                                                                                                                                                                                                         | $3(x + 2)^2 + 7$ |      | A1 accept $a = 3, b = 2, c = 7$                                                                                                                                                                                                                                                                                 |
|    |                                                                                                                                                                                                                                                                                                                                         |                  |      | <b>Total 2 marks</b>                                                                                                                                                                                                                                                                                            |

|    |       |  |    |   |                      |
|----|-------|--|----|---|----------------------|
| 17 | (i)   |  | 19 | 1 | B1                   |
|    | (ii)  |  | 0  | 1 | B1                   |
|    | (iii) |  | 11 | 1 | B1                   |
|    | (iv)  |  | 28 | 1 | B1                   |
|    |       |  |    |   | <b>Total 4 marks</b> |

|    |        |  |           |   |    |
|----|--------|--|-----------|---|----|
| 18 | (a)(i) |  | $(-6, 1)$ | 2 | B1 |
|----|--------|--|-----------|---|----|

| Q    | Working                    | Answer              | Mark | Notes                                                                             |
|------|----------------------------|---------------------|------|-----------------------------------------------------------------------------------|
| (ii) |                            | $(-2, -4)$          |      | B1                                                                                |
| (b)  | $(-1, 6), (3, -2), (7, 6)$ | Fully correct graph | 2    | B2 for a fully correct graph<br>(B1 for a V shape with least value at $(3, -2)$ ) |
| (c)  |                            | $-3, 4$             | 2    | B2 for 2 correct values in any order<br>(B1 for 1 correct value)                  |
|      |                            |                     |      | <b>Total 6 marks</b>                                                              |

| Q  | Working                                                                                                                                                                                                                                                                                                                                                                                                             | Answer         | Mark | Notes                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19 |                                                                                                                                                                                                                                                                                                                                                                                                                     | $-\frac{4}{3}$ | 1    | B1                                                                                                                                                                              |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                     |                |      | <b>Total 1 mark</b>                                                                                                                                                             |
| 20 | <p>E.g. <math>n, n + 1, n + 2</math></p> <p><math>(n^2 =)n^2</math><br/> <math>((n+1)^2 =)n^2 + n + n + 1 = n^2 + 2n + 1</math> oe<br/> <math>((n+2)^2 =)n^2 + 2n + 2n + 4 = n^2 + 4n + 4</math> oe<br/> or<br/> E.g. <math>n - 1, n, n + 1</math></p> <p><math>((n-1)^2 =)n^2 - n - n + 1 = n^2 - 2n + 1</math> oe<br/> <math>(n^2 =)n^2</math><br/> <math>((n+1)^2 =)n^2 + n + n + 1 = n^2 + 2n + 1</math> oe</p> |                | 3    | <p>M1 for 3 appropriate terms for their 3 numbers <b>and</b> for correctly finding the expansion of at least 2 squares<br/> (Allow <math>2 \times</math> middle number + 2)</p> |
|    | <p><math>n^2 + n^2 + 2n + 2n + 4 (= 2n^2 + 4n + 4)</math> oe and<br/> <math>2(n+1)^2 = 2n^2 + 2n + 2n + 2 (= 2n^2 + 4n + 2)</math> oe<br/> or<br/> <math>n^2 - 2n + 1 + n^2 + 2n + 1 (= 2n^2 + 2)</math> oe</p>                                                                                                                                                                                                     |                |      | <p>M1 for finding the sum of first and last square <b>and</b> double the square of the middle<br/> (Allow <math>2 \times</math> middle number + 2)</p>                          |
|    | <p>E.g. <math>2n^2 + 4n + 4 = 2n^2 + 4n + 2 + 2</math> oe or<br/> <math>2(x+1)^2 + 2 = 2(x+1)^2 + 2</math> oe<br/> or<br/> <math>2n^2 + 2 = 2n^2 + 2</math> oe</p>                                                                                                                                                                                                                                                  | Complete proof |      | <p>A1 for conclusion from two correct expressions<br/> e.g. <math>2n^2 + 4n + 4</math> <b>and</b> <math>2n^2 + 4n + 2</math></p>                                                |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                     |                |      | <b>Total 3 marks</b>                                                                                                                                                            |

| Q  | Working                                                                                             | Answer   | Mark | Notes                                                                                                  |
|----|-----------------------------------------------------------------------------------------------------|----------|------|--------------------------------------------------------------------------------------------------------|
| 21 | Line drawn at (2, 1) with a positive gradient that does not intersect the curve at any other point. |          | 3    | M1 for a tangent drawn at $x = 2$                                                                      |
|    |                                                                                                     |          |      | M1 (dep M1) for a correct method to work out the gradient of the tangent.                              |
|    |                                                                                                     | 1.5 to 3 |      | A1 for 1.5 to 3<br>accept answers in the range 1.5 – 3 so long as a tangent at $x = 2$ has been drawn. |
|    |                                                                                                     |          |      | <b>Total 3 marks</b>                                                                                   |

| Q  | Working                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Answer                                                         | Mark          | Notes                                                                                                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22 | $(\overrightarrow{ON} = \lambda(\mathbf{a} + \mathbf{b})) (= \lambda\mathbf{a} + \lambda\mathbf{b})$ or<br>$(\overrightarrow{NY} = (1 - \lambda)(\mathbf{a} + \mathbf{b})) (= (1 - \lambda)\mathbf{a} + (1 - \lambda)\mathbf{b})$                                                                                                                                                                                                                                                                                             |                                                                | 5             | M1 for finding a vector for $\overrightarrow{ON}$ or $\overrightarrow{NY}$ or $\overrightarrow{NO}$ or $\overrightarrow{YN}$ in terms $\mathbf{a}$ and $\mathbf{b}$ and using $\lambda$ oe (can be embedded)        |
|    | $(\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON} =) -0.5\mathbf{a} + \lambda\mathbf{a} + \lambda\mathbf{b} (= (\lambda - 0.5)\mathbf{a} + \lambda\mathbf{b})$ or<br>$(\overrightarrow{MZ} = \overrightarrow{MO} + \overrightarrow{OZ} =) -0.5\mathbf{a} + 3\mathbf{b}$ or $(\overrightarrow{MN} = \overrightarrow{MX} + \overrightarrow{XY} + \overrightarrow{YN} =) 0.5\mathbf{a} + \mathbf{b} + (\lambda - 1)(\mathbf{a} + \mathbf{b}) (= (\lambda - 0.5)\mathbf{a} + \lambda\mathbf{b})$                  |                                                                |               | M1 for finding a vector for $\overrightarrow{MN}$ or $\overrightarrow{NM}$ or $\overrightarrow{MZ}$ or $\overrightarrow{ZM}$                                                                                        |
|    | $(\overrightarrow{MN} = \mu\overrightarrow{MZ} =) \mu(-0.5\mathbf{a} + 3\mathbf{b}) (= -0.5\mu\mathbf{a} + 3\mu\mathbf{b})$ or<br>$(\overrightarrow{ON} = \overrightarrow{OM} + \overrightarrow{MN} =) 0.5\mathbf{a} + \mu(-0.5\mathbf{a} + 3\mathbf{b}) (= (0.5 - 0.5\mu)\mathbf{a} + 3\mu\mathbf{b})$ or<br>$(\overrightarrow{NY} = \overrightarrow{NM} + \overrightarrow{MX} + \overrightarrow{XY} =) -\mu(-0.5\mathbf{a} + 3\mathbf{b}) + 0.5\mathbf{a} + \mathbf{b} (= (0.5 + 0.5\mu)\mathbf{a} + (1 - 3\mu)\mathbf{b})$ |                                                                |               | M1 for finding a vector for $\overrightarrow{MN}$ or $\overrightarrow{ON}$ or $\overrightarrow{NY}$ or $\overrightarrow{NM}$ or $\overrightarrow{NO}$ or $\overrightarrow{YN}$ using another variable e.g. $\mu$ oe |
|    | $-0.5\mu = -0.5 + \lambda$ oe<br>$3\mu = \lambda$ oe                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $1 - \lambda = 0.5\mu + 0.5$ oe<br>$1 - \lambda = 1 - 3\mu$ oe |               | M1 for setting up <b>two</b> simultaneous equations using the components of $\mathbf{a}$ and $\mathbf{b}$ for $\overrightarrow{MN}$ or $\overrightarrow{ON}$ or $\overrightarrow{NY}$ oe                            |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                | $\frac{3}{7}$ | A1 (allow $\frac{3}{7} = 0.42(8571\dots)$ to 2 sf truncated or rounded)                                                                                                                                             |
|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                |               | <b>Total 5 marks</b>                                                                                                                                                                                                |

| Q                 | Working                                                                                                                                                                                                                                                                                                                                                                                                       | Answer        | Mark | Notes                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>22<br/>ALT</b> | $(\overrightarrow{ON} =) \lambda(\mathbf{a} + \mathbf{b}) (= \lambda\mathbf{a} + \lambda\mathbf{b})$ <b>or</b><br>$(\overrightarrow{NY} =) (1 - \lambda)(\mathbf{a} + \mathbf{b}) (= (1 - \lambda)\mathbf{a} + (1 - \lambda)\mathbf{b})$                                                                                                                                                                      |               | 5    | M1 for finding a vector for $\overrightarrow{ON}$ <b>or</b> $\overrightarrow{NY}$ <b>or</b> $\overrightarrow{NO}$ <b>or</b> $\overrightarrow{YN}$ in terms <b>a</b> and <b>b</b> and using $\lambda$ oe |
|                   | $(\overrightarrow{MN} = \overrightarrow{MO} + \overrightarrow{ON} =) -0.5\mathbf{a} + \lambda\mathbf{a} + \lambda\mathbf{b} (= (\lambda - 0.5)\mathbf{a} + \lambda\mathbf{b})$ <b>or</b><br>$(\overrightarrow{MN} = \overrightarrow{MX} + \overrightarrow{XY} + \overrightarrow{YN} =) 0.5\mathbf{a} + \mathbf{b} + (\lambda - 1)(\mathbf{a} + \mathbf{b}) (= (\lambda - 0.5)\mathbf{a} + \lambda\mathbf{b})$ |               |      | M1 for finding a vector for $\overrightarrow{MN}$ <b>or</b> $\overrightarrow{NM}$ in terms <b>a</b> and <b>b</b> and using $\lambda$ oe                                                                 |
|                   | $(\overrightarrow{NZ} = \overrightarrow{NO} + \overrightarrow{OZ} =) -\lambda(\mathbf{a} + \mathbf{b}) + 3\mathbf{b} (= -\lambda\mathbf{a} + (3 - \lambda)\mathbf{b})$ <b>or</b><br>$(\overrightarrow{NZ} = \overrightarrow{NY} + \overrightarrow{YZ} =) (1 - \lambda)(\mathbf{a} + \mathbf{b}) - \mathbf{b} - \mathbf{a} + 3\mathbf{b} (= -\lambda\mathbf{a} + (3 - \lambda)\mathbf{b})$                     |               |      | M1 for finding a vector for $\overrightarrow{NZ}$ <b>or</b> $\overrightarrow{ZN}$ in terms <b>a</b> and <b>b</b> and using $\lambda$ oe                                                                 |
|                   | $\frac{\lambda - 0.5}{-\lambda} = \frac{\lambda}{3 - \lambda}$ oe                                                                                                                                                                                                                                                                                                                                             |               |      | M1 for setting up an equation using the components of $\overrightarrow{MN}$ and $\overrightarrow{NZ}$ oe                                                                                                |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                               | $\frac{3}{7}$ |      | A1 (allow $\frac{3}{7} = 0.42(8571\dots)$ to 2 sf truncated or rounded)                                                                                                                                 |
|                   |                                                                                                                                                                                                                                                                                                                                                                                                               |               |      | <b>Total 5 marks</b>                                                                                                                                                                                    |

| 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  | 4.45         | 5         | 89        | 4.45                                                       | 4.92         | 4.85         | 4.78         | 4.22         | 3.66         | 2.03         | 0.59        | 0.00        |
| 2  | 3.61         | 4         | 90        | 3.61                                                       | 3.97         | 3.86         | 3.75         | 3.47         | 2.98         | 2.10         | 1.05        | 0.00        |
| 3  | 1.84         | 2         | 92        | 1.84                                                       | 1.94         | 1.89         | 1.87         | 1.82         | 1.70         | 1.55         | 1.22        | 0.00        |
| 4  | 3.69         | 4         | 92        | 3.69                                                       | 3.92         | 3.83         | 3.73         | 3.64         | 3.47         | 2.84         | 1.75        | 0.00        |
| 5  | 3.54         | 4         | 89        | 3.54                                                       | 3.90         | 3.77         | 3.64         | 3.29         | 3.05         | 2.32         | 1.25        | 0.00        |
| 6  | 4.44         | 5         | 89        | 4.44                                                       | 4.94         | 4.85         | 4.54         | 4.14         | 3.65         | 2.48         | 1.48        | 0.00        |
| 7  | 1.62         | 2         | 81        | 1.62                                                       | 1.92         | 1.86         | 1.67         | 1.38         | 1.15         | 0.37         | 0.33        | 0.00        |
| 8  | 2.35         | 3         | 78        | 2.35                                                       | 2.71         | 2.62         | 2.40         | 2.10         | 1.62         | 1.33         | 0.44        | 0.00        |
| 9  | 1.52         | 2         | 76        | 1.52                                                       | 1.95         | 1.88         | 1.51         | 1.07         | 0.52         | 0.24         | 0.00        | 0.00        |
| 10 | 1.36         | 3         | 45        | 1.36                                                       | 2.76         | 2.58         | 2.11         | 1.79         | 1.21         | 0.83         | 0.67        | 0.42        |
| 11 | 1.86         | 3         | 62        | 1.86                                                       | 2.77         | 2.22         | 1.51         | 0.77         | 0.39         | 0.09         | 0.04        | 0.10        |
| 12 | 2.46         | 4         | 62        | 2.46                                                       | 3.70         | 2.76         | 1.87         | 1.28         | 0.60         | 0.25         | 0.04        | 0.00        |
| 13 | 4.24         | 8         | 53        | 4.24                                                       | 6.22         | 4.40         | 3.29         | 2.48         | 1.45         | 1.01         | 0.29        | 0.00        |
| 14 | 1.71         | 3         | 57        | 1.71                                                       | 2.54         | 1.86         | 1.31         | 1.02         | 0.61         | 0.03         | 0.00        | 0.00        |
| 15 | 1.87         | 4         | 47        | 1.87                                                       | 2.86         | 2.05         | 1.36         | 0.85         | 0.48         | 0.34         | 0.19        | 0.00        |
| 16 | 0.97         | 2         | 49        | 0.97                                                       | 1.67         | 0.92         | 0.58         | 0.29         | 0.22         | 0.03         | 0.00        | 0.00        |
| 17 | 1.54         | 4         | 39        | 1.54                                                       | 2.49         | 1.47         | 1.04         | 0.61         | 0.40         | 0.23         | 0.18        | 0.00        |
| 18 | 2.74         | 6         | 46        | 2.74                                                       | 4.81         | 2.90         | 1.44         | 0.54         | 0.23         | 0.13         | 0.04        | 0.00        |
| 19 | 0.44         | 1         | 44        | 0.44                                                       | 0.82         | 0.40         | 0.20         | 0.08         | 0.01         | 0.00         | 0.00        | 0.00        |
| 20 | 1.33         | 3         | 44        | 1.33                                                       | 2.38         | 1.43         | 0.52         | 0.29         | 0.10         | 0.06         | 0.00        | 0.00        |
| 21 | 1.17         | 3         | 39        | 1.17                                                       | 2.16         | 1.16         | 0.40         | 0.16         | 0.10         | 0.01         | 0.00        | 0.00        |
| 22 | 1.04         | 5         | 21        | 1.04                                                       | 2.18         | 0.67         | 0.24         | 0.08         | 0.03         | 0.00         | 0.00        | 0.00        |
|    | <b>49.79</b> | <b>80</b> | <b>62</b> | <b>49.79</b>                                               | <b>67.53</b> | <b>54.23</b> | <b>43.76</b> | <b>35.37</b> | <b>27.63</b> | <b>18.27</b> | <b>9.56</b> | <b>0.52</b> |

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

**Suggested grade boundaries**

| Grade | 9  | 8  | 7  | 6  | 5  | 4  | 3 |
|-------|----|----|----|----|----|----|---|
| Mark  | 61 | 49 | 39 | 31 | 23 | 14 | 8 |