| **1** | (a) | 5 × (–2)2 – (–2)3 ( = 20 – –8) |  | 2 | M1 | for correct expression  or at least one of 20 or 5 × 4 or – – 8 or (+) 8 |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 28 | A1 |  |
|  | (b) |  | 2*p*(4*p* – 1) | 2 | B2 | B1 for *p*(8*p* – 2) or 2(4*p*2 – *p*)  or 2*p*(4*p* – 1) with two terms inside the bracket with one term correct. |
|  | (c) |  | 12*t*2 – 8*t* | 2 | B2 | B1 for 12*t*2 or – 8*t* |
|  | (d) | 5*x*2 + 20*x* – 2*x* – 8 |  | 2 | M1 | for 4 correct terms (ignoring signs)  or 3 correct terms with correct signs.  or 5*x*2 + 18*x + …*  or … + 18*x* − 8 |
|  |  |  | 5*x*2 + 18*x* – 8 | A1 |  |
|  |  |  |  |  |  | **Total 8 marks** |

| **2** |  | eg  (*x* ± 20)(*x* ± 1) | **or** |  | 3 | M1 | 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 eg or eg  oe |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | (*x* – 20)(*x* – 1) | eg  or or  **or**  oe |  | M1 | dep on M1  for correct factorisation,  or a correct expression for *x* if completing the square.  or a correct substitution into quadratic formula with some processing. |
|  |  |  | | 1, 20 | A1 | for both correct values,  dep on 1st M1 with no incorrect working. |
|  |  |  | |  |  |  | **Total 3 marks** |

| 3 |  | eg. 10*x* + 35*y* = 85 10*x* + 6*y* = −2  with the operation of subtraction  **or** 29*y* = 87  **or** 6*x* + 21*y* = 51  35*x* + 21*y* = −7  with the operation of subtraction  **or** 29*x* = −58  **or** eg  **or** eg |  | 4 | 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, with the correct operation to eliminate one variable (condone one arithmetic error)  **or** isolating *x* or *y* in one equation and substituting into the other (condone one arithmetic error). |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | M1 | dep 1st M1 Substitute found value into one equation **or** correct method to eliminate second unknown. |
|  |  |  | *x* = −2*y* = 3 | A1  A1 | dep 1st M1 |
|  |  |  |  |  |  | **Total 4 marks** |

| 4 |  | E.g.  x2 + 4x – 2x – 8 (= x2 + 2x – 8)  or  x2 – 2x + x – 2 (= x2 − x – 2)  or  x2 + 4x + x + 4 (= x2 + 5x + 4) |  | 3 | M1 | for multiplying out two brackets correctly with no more than one error |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | E.g.  x3 + 2x2 − 8x + x2 + 2x – 8 or  x3 + 4x2 − 2x2 − 8x + x2 + 4x − 2x – 8  or  x3 − x2 − 2x + 4x2 − 4x – 8 or  x3 − 2x2 + x2 − 2x + 4x2 − 8x + 4x – 8    or  x3 + 5x2 + 4x − 2x2 − 10x – 8 or  x3 + 4x2 + x2 + 4x − 2x2 − 8x − 2x – 8 |  |  | M1 | for at least 3 terms correct out of a maximum of 6 terms  or  for at least 4 terms correct out of a maximum of 8 terms |
|  |  |  | x3 + 3x2 − 6x – 8 |  | A1 |  |
|  |  |  |  |  |  | **Total 3 marks** |

| 5 | a | e.g. *A* + 5*z* = oe **or**  *Ay* = *c* – 5*yz* oe |  | 2 | M1 | for a correct first step e.g.  add 5*z* to both sides  **or**  multiply all terms by *y* |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | *c* = *y*(*A* + 5*z*) |  | A1 | oe |
|  | b |  | 1 | 1 | B1 |  |
|  | c | (*x* ± 3)(*x* ± 8) |  | 2 | M1 | or for (*x* ± *a*)(*x* ± *b*) where *ab* = 24 or *a* + *b* = − 11 |
|  |  |  | (*x* − 3)(*x* − 8) |  | A1 |  |
|  |  |  |  |  |  | **Total 5 marks** |

| **6** | (a) |  | 81*k*8 | 2 | B2 | B1 for 81 or *k*8 seen in their final answer. |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  | 7*m*4*n*6 | 2 | B2 | B1 for 7*m*4 or *n*6 in a product with no other terms in *m* or *n* |
|  |  |  |  |  |  | **Total 4 marks** |

| 7 |  | E.g. or |  | 3 | M1 | for expressing both fractions correctly with a common denominator.  Allow as two separate fractions. |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | E.g. |  |  | M1 | for removing brackets correctly in a correct single fraction |
|  |  |  |  |  | A1 | accept |
|  |  |  |  |  |  | **Total 3 marks** |

| 8 |  | e.g.  **and**  or **and** |  | 3 | M1 | for two correct improper fractions |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | e.g.  **or**  **or** oe |  |  | M1 | correct cancelling or multiplication of numerators and denominators without cancelling |
|  |  | e.g. **or**  **or**  **or**  NB: a student can show initially that and they need to show that LHS = | shown |  | A1 | Dep on M2 for conclusion to  from correct working – either sight of the result of the multiplication e.g.  must be seen and equated to or  **or**  correct cancelling prior to the multiplication to  NB: use of decimals scores no marks |
|  |  |  |  |  |  | **Total 3 marks** |

| 9 |  |  |  | 2 | B2 | (B1 for 2 out of 3 terms correct in a 3 term product) |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | **Total 2 marks** |

| **10** |  | eg  **or  or**  **or** or  seen  **or**  or 64 × 4² or 8² × 4² or 8² × 16 or 64 × 16 |  | 3 | M1 | a correct first stage. |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **or** 1024 **or** 32² **or**  or |  | M1 | dep on 1st M mark. |
|  |  |  | 210 | A1 | dependent on first M1  isw if 210 seen but then 10 given as answer. |
|  |  |  |  |  |  | **Total 3 marks** |

| **11** | (a) | vertices at (–9, 6) (–9, 9) (–3, 9) (–6, 6) | Shape in correct position | 2 | B2 | B1 for congruent shape in correct orientation but wrong position  **or** quadrilateral with 2 or 3 vertices correct. |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | vertices at (7, 3) (10, 6) (13, 6) (13, 3) | Shape in correct position | 1 | B1 |  |
|  | (c) |  | enlargement  scale factor 2  centre (– 3, 3) | 3 | B1  B1  B1 | for enlargement, enlarge, etc so long as no mention of rotation, reflection or translation, flip, move etc.  SF 2, double, two times etc.  (– 3, 3) stated. Accept about, from etc. with no mention of line, or column vector. |
|  |  |  |  |  |  | **Total 6 marks** |

| **12** |  | or |  | 5 | M1 | Factorising *x*2 + 2*x* in correct expression on LHS  or for writing the two fractions over a common denominator. |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **or**  **or** 5*x* + 3 = 2*x*(*x* + 2) oe  **or** 5*x* + 3 = 2*x*2 + 4*x* oe |  | M1 | Correct simplified single fraction = 2  or correct equation with no fractions. |
|  |  | 2*x*2 – *x* – 3 (= 0) |  | M1 | Correct 3 term quadratic |
|  |  | (2*x* – 3)(*x* + 1) (=0)  **or**  **or**  oe |  | M1ft | independent  For solving *their* 3 term 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 eg  or eg  oe |
|  |  |  | 1.5 and –1 | A1 | oe dep on M3 |
|  |  |  |  |  |  | **Total 5 marks** |

| 13 |  | E.g.(*x* – 5)2 – 52 (+ 40) or (*x* – 5)2 – 25 (+ 40)  or |  | 2 | M1 | for a correct first step **or**  for equating coefficients |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  | (*x* – 5)2 + 15 |  | A1 | accept *a* = −5, *b* = 15  SC B1 for or |
|  |  |  |  |  |  | **Total 5 marks** |

| **14** |  | or 0.0625 oe | eg |  | 4 | M1 | for sight of oe, even if raised to an incorrect power.  **or** for algebraic approach, separating out the 4, or 5 or −1 in the power |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | or  oe  or  oe  or  or | eg |  | M2 | for a correct expression for *n*  (M1 for one correct algebraic stage eg ) |
|  |  |  | | 32 | A1 |  |
|  |  |  | |  |  |  | **Total 7 marks** |

| 15 |  | x = 4.57.... and 100x = 457.57....or10x = 45.757.... and 1000x = 4575.7....orx = 0.57.... and 100x = 57.57....or10x = 5.757.... and 1000x = 575.7.... |  | 2 | M1 | for selecting 2 recurring decimals that when subtracted give a whole number or terminating decimal eg 453 or 4530 etc eg 100x = 457.57.... and x = 4.57.... or 1000x = 4575.7....and 10x = 45.757.... with intention to subtract. (If recurring dots not shown then allow 10x = 45.757, 100x = 457.57, and 1000x = 4575.7 to at least 5sf)  or  4 + 0.5757 and eg x = 0.57.... , 100x = 57.57.... with intention to subtract. |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | E.g.100x – x = 457.57.... – 4.57.... = 453 and or1000x – 10x = 4575.7.... – 45.757.... = 4530 and or100x – x = 57.57.... – 0.57.... = 57 and (so) 1000x – 10x = 575.7.... – 5.757.... = 570 and (so) | Shown |  | A1 | **for completion to** |
|  |  |  |  |  |  | **Total 2 marks** |

| 16 |  | e.g.  **or** |  | 2 | M1 | **or** for  where *a* ≠ −1 **or**  where *b* ≠ 7 |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | A1 |  |
|  |  |  |  |  |  | **Total 2 marks** |

| **17** |  |  | *y* ≥ 1 oe  *x* ≤ 3 oe  *y* ≤ 3*x* – 2 oe | 3 | B1  B1  B1 | Allow  ≤ *y* ≤ 7  Allow  ≤ *x* ≤ 3  Condone < and > in place of ≤ and ≥ throughout.  SC B1 if no marks awarded, recognition of lines *x* = 3 **and** *y* = 1.  Allow incorrect inequality and condone use of equals signs  eg *y* < 1, *x* = 3  may be seen on diagram. | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | | **Total 3 marks** |

| 18 | a |  |  | 2 | B2  B1 | oe, accept 2 811 072  for  oe where two of *a*, *b* and *c* are correct |
| --- | --- | --- | --- | --- | --- | --- |
|  | b |  |  | 2 | B2  B1 | cao  for  oe where two of *a*, *b* and *c* are correct **or**  2.666...×1013 **or**  an equivalent expression for e.g.  22 × 27 × 35 × 113 × 115 |
|  |  |  |  |  |  | **Total 4 marks** |

| 19 |  | *y*(6*y* + 5) – 2*y*2 = 6 | | |  | | |  | | | | | 5 | | | M1 | for substitution of linear equation into quadratic  **or**  multiplying linear equation by *y* e.g. *xy* – 6*y*2 = 5*y* **and** intention to subtract the two equations | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | E.g.  4*y*2 + 5*y* – 6 (= 0) oe  4*y*2 + 5*y* = 6 | | | E.g.  4*x*2 – 10*x* – 266 (= 0) oe  4*x*2 – 10*x* = 266 | | |  | | | | |  | | | A1 | (dep on M1) writing the correct quadratic expression in form  *ax*2 + *bx* + *c* (= 0)  allow *ax*2 + *bx* = *c* | |
|  |  | E.g. (4*y* − 3)(*y* + 2) (= 0) (*y* =)  oe | | | E.g. (2*x* – 19)(*x* + 7) (= 0)(*x* =) oe | | |  | | | | |  | | | M1 | (dep on M1) for a complete method to solve their 3-term quadratic equation (allow one sign error and some simplification – allow as far as  or | |
|  |  | (*y* =)  and (*y* =) −2 | | | (*x* =)  and (*x* =) −7 | | |  | | | | |  | | | A1 | Dep on first M1  for having two correct *x* values or two correct *y* values | |
|  |  |  | | | | | | *x* = , *y* =  *x* = −7, *y* = −2 | | | | |  | | | A1 | Dep on first M1  Must be paired and labelled correctly | |
|  |  |  | | | | | |  | | | | |  | | |  | **Total 5 marks** | |
| 20 |  | | oe **or**  **or** oe oe **or** oe | | | |  | | | 4 | | M1 | | | for  oe **or** **or**  **or** oe **or** oe **or** oe | | |
|  |  | | oe **and**  **and** oe oe **and** oe | | | |  | | |  | | M1 | | | for  oe **and** **or**  **and** oe **or** oe **and** oe | | |
|  |  | | E.g.2*k* + 6 = 4 + *k* **or** **or** | | | |  | | |  | | M1 | | | for a correct linear equation in *k* | | |
|  |  | |  | | | | −2 | | |  | | A1 | | | dep on at least M2 | | |
|  |  | |  | | | |  | | |  | |  | | | **Total 9 marks** | | |
| 21 |  | | | **or** (0.5, 7.5) oe | |  | | | 5 | | M1 | | |  | | | |
|  |  | | | oe | |  | | |  | | M1 | | |  | | | |
|  |  | | | *m* × ‘’ = −1 oe **or** *m* = oe | |  | | |  | | M1 | | | ft their gradient for use of *m*1 × *m*2 = −1 | | | |
|  |  | | | ‘7.5’ = × ‘0.5’ + *c* **or***c* = 7.8 oe **or** | |  | | |  | | M1 | | | ft dep on first M1 and third M1 | | | |
|  |  | | |  | | 5*y* + 3*x* = 39 | | |  | | A1 | | | oe where *p*, *q* and *r* must be integers | | | |
|  |  | | |  | |  | | |  | |  | | | **Total 5 marks** | | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | **Edexcel averages: scores of candidates who achieved grade:** | | | | | | | | |
| **Qn** | **Mean score** | **Max score** | **Mean %** | **ALL** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **U** |
| **1** | 7.34 | 8 | 92 | 7.34 | 7.93 | 7.71 | 7.69 | 7.25 | 6.42 | 4.52 | 2.46 | 0.72 |
| **2** | 2.49 | 3 | 83 | 2.49 | 2.91 | 2.80 | 2.69 | 2.07 | 1.65 | 0.62 | 0.18 | 0.00 |
| **3** | 3.40 | 4 | 85 | 3.40 | 3.96 | 3.90 | 3.53 | 3.26 | 2.31 | 0.92 | 0.09 | 0.00 |
| **4** | 2.47 | 3 | 82 | 2.47 | 2.95 | 2.84 | 2.61 | 2.09 | 1.47 | 0.96 | 0.13 | 0.00 |
| **5** | 4.02 | 5 | 80 | 4.02 | 4.86 | 4.56 | 4.08 | 3.45 | 2.70 | 1.42 | 0.61 | 0.14 |
| **6** | 3.27 | 4 | 82 | 3.27 | 3.79 | 3.57 | 3.25 | 2.78 | 2.08 | 1.62 | 0.77 | 0.14 |
| **7** | 2.39 | 3 | 80 | 2.39 | 2.86 | 2.57 | 2.39 | 1.95 | 1.68 | 1.15 | 0.22 | 0.00 |
| **8** | 2.27 | 3 | 76 | 2.27 | 2.63 | 2.46 | 2.32 | 2.16 | 1.45 | 1.24 | 0.87 | 0.29 |
| **9** | 1.60 | 2 | 80 | 1.60 | 1.94 | 1.81 | 1.52 | 1.31 | 0.85 | 0.58 | 0.22 | 0.00 |
| **10** | 2.29 | 3 | 76 | 2.29 | 2.94 | 2.68 | 1.99 | 1.57 | 1.08 | 0.27 | 0.23 | 0.29 |
| **11** | 3.98 | 6 | 66 | 3.98 | 5.30 | 4.54 | 3.34 | 2.83 | 2.27 | 1.46 | 0.60 | 0.43 |
| **12** | 3.12 | 5 | 62 | 3.12 | 4.55 | 3.62 | 2.60 | 1.55 | 1.00 | 0.15 | 0.09 | 0.00 |
| **13** | 1.30 | 2 | 65 | 1.30 | 1.90 | 1.57 | 0.99 | 0.67 | 0.20 | 0.13 | 0.00 | 0.00 |
| **14** | 2.51 | 4 | 63 | 2.51 | 3.75 | 2.66 | 1.93 | 1.45 | 0.74 | 0.31 | 0.18 | 0.14 |
| **15** | 1.16 | 2 | 58 | 1.16 | 1.65 | 1.32 | 0.93 | 0.50 | 0.35 | 0.07 | 0.00 | 0.00 |
| **16** | 1.20 | 2 | 60 | 1.20 | 1.86 | 1.28 | 0.91 | 0.57 | 0.32 | 0.11 | 0.04 | 0.00 |
| **17** | 1.82 | 3 | 61 | 1.82 | 2.68 | 2.14 | 1.36 | 0.64 | 0.39 | 0.13 | 0.05 | 0.00 |
| **18** | 2.35 | 4 | 59 | 2.35 | 3.39 | 2.39 | 1.79 | 1.33 | 0.78 | 0.51 | 0.00 | 0.00 |
| **19** | 2.94 | 5 | 59 | 2.94 | 4.56 | 3.49 | 2.06 | 1.15 | 0.61 | 0.15 | 0.00 | 0.29 |
| **20** | 2.33 | 4 | 58 | 2.33 | 3.79 | 2.56 | 1.20 | 0.96 | 0.22 | 0.11 | 0.00 | 0.00 |
| **21** | 2.20 | 5 | 44 | 2.20 | 3.97 | 2.19 | 0.84 | 0.57 | 0.22 | 0.29 | 0.22 | 0.00 |
|  | **56.45** | **80** | **71** | **56.45** | **74.17** | **62.66** | **50.02** | **40.11** | **28.79** | **16.72** | **6.96** | **2.44** |

**Suggested grade boundaries**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Grade** | **9** | **8** | **7** | **6** | **5** | **4** | **3** |
| Mark | 68 | 56 | 45 | 34 | 23 | 12 | 5 |