

| | | | | | |
|----------------------|-----|--|-------|---|--|
| 1 | (a) | | h^9 | 1 | B1 |
| | (b) | $(-5)^2 - 4 \times -5$ oe e.g. $25 + 20$ | | 2 | M1 for a correct substitution A1 |
| | (c) | $5x - 3 = 4(2x + 3)$ oe or $\frac{5x}{4} - \frac{3}{4} = 2x + 3$ oe | | 3 | M1 for correctly removing the denominator, condone missing brackets |
| | | e.g. $5x - 8x = 12 + 3$ or $-3x = 12 + 3$ or $8x - 5x = -12 - 3$ or $3x = -12 - 3$ or $-\frac{3}{4} - 3 = 2x - \frac{5x}{4}$ or $-\frac{15}{4} = \frac{3x}{4}$ | | | M1 for a correct rearrangement with terms in x on one side and numbers on the other, allow correct rearrangement of their equation in the form $ax + b = cx + d$ |
| | | | -5 | | A1 dep on at least M1 SCB2 for an answer of $x = -2$ coming from $5x - 3 = 8x + 3$ or $x = 5$ coming from $5x - 3 = 2x + 12$ |
| Total 6 marks | | | | | |

| | | | | | |
|----------------------|-----|--|----|---|---------------------|
| 2 | (a) | | 0 | 1 | B1 condone 150^0 |
| | (b) | | -2 | 1 | B1 condone 3^{-2} |
| Total 2 marks | | | | | |

| | | | | | |
|---|----------|--|---|---|---|
| 3 | (a) | | $4k$ | 1 | B1 |
| | (b) (i) | | 9^4 | 1 | B1 |
| | (b) (ii) | | 3^8 | 1 | B1 |
| | (c) | | 5^{19} | 1 | B1 |
| | (d) | | | 2 | M1 A factor tree / division ladder of 3 or more factors ($\neq 1$), multiplying to 800, which must include 2 and 5. Condone 1 error when product $\neq 800$ |
| | | | $2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$ | | A1 Dep on M1 oe eg $2^5 \times 5^2$ |

| | | | | | |
|---|-----|--|---|---|----|
| 4 | (c) | | 1 | 1 | B1 |
|---|-----|--|---|---|----|

| | | | | | |
|----------------------|-----|---|-------|---|---|
| 5 | (a) | | x^7 | 1 | B1 |
| | (b) | eg $7^8 \times 7^4 = 7^{12}$ or $7^8 \div 7^3 = 7^5$ or $7^5 \times 7^4$ or $7^4 \div 7^3 = 7$ or $7^8 \times 7$ or $7^{12} \div 7^3 = 7^{12-3}$ | | 2 | M1 for one correct step – must be written as a power of 7 |
| | | | 7^9 | | A1 for 7^9 |
| Total 3 marks | | | | | |

| | | | | | |
|---|---|--|---|---|----|
| 6 | b | | 1 | 1 | B1 |
|---|---|--|---|---|----|

| | | | | | |
|---|-----|--|---|---|----|
| 7 | (a) | | 1 | 1 | B1 |
|---|-----|--|---|---|----|

| | | | | | |
|---|-----|--|------------------|---|--|
| 8 | (b) | | 1 | 1 | B1 |
| | (c) | | $\frac{y^2}{2x}$ | 2 | B2 for $\frac{y^2}{2x}$ oe eg $\frac{0.5y^2}{x}$, $0.5y^2x^{-1}$, $\frac{y^2x^{-1}}{2}$, $\frac{1}{2xy^{-2}}$ oe If not B2, award B1 for 2 of number, x , y correct eg $\frac{ky^2}{x}$ where $k \neq \frac{1}{2}$ or $\frac{y^2}{2x^m}$ where $m \neq 1$ or $0.5y^2$ or $\frac{y^p}{2x}$ where $p \neq 2$) oe [one term can be missing with 2 correct for B1] |

| | | | | | |
|----------------------|-----|--|--------------|---|--|
| 9 | (a) | | 8 | 1 | B1 |
| | (b) | | 11 | 1 | B1 accept x^{11} |
| | (c) | | $8k^6m^{12}$ | 2 | B2 for all correct B1 for two correct from 8 or k^6 or m^{12} |
| Total 4 marks | | | | | |

| | | | | | |
|----------------------|-----|----------------------|------------------|---|---|
| 10 | (a) | | x^9 | 1 | B1 cao |
| | (b) | | $64y^6$ | 2 | B2 for $64y^6$ (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 $a + b = -7$ Condone use of a different letter to n |
| | | | $(n - 3)(n - 4)$ | | A1 |
| Total 5 marks | | | | | |

| | | | | | |
|----------------------|-----|---|---|---|--|
| 11 | (a) | | 1 | 1 | B1 |
| | (b) | | 6 | 1 | B1 |
| | (c) | $206 + m - 214 = -3$ oe or $\frac{7^{-3} \times 7^{214}}{7^{206}}$ or $\frac{7^{211}}{7^{206}}$ 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 |
| Total 4 marks | | | | | |

| | | | | | |
|----|-----|--|------------|---|--|
| 12 | (c) | | $5h$ | 1 | B1 oe |
| | (d) | | $3a + 11f$ | 2 | B2 oe eg $11f + 3a$ (B1 for $3a$ or $11f$) |

| | | | | | |
|----------------------|-----|----------------|------------------------|---|---|
| 13 | (a) | | a^{11} | 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 $k \neq 64$ or $64x^ky^6$ where $k \neq 10$ or $64x^{10}y^k$ where $k \neq 6$ |
| | (d) | $c + 8v = t^3$ | | 2 | M1 A1 oe SCB1 for an answer of $t = \frac{c + 8v}{3}$ oe |
| | | | $t = \sqrt[3]{c + 8v}$ | | |
| Total 6 marks | | | | | |

| | | | | | |
|----|-----|--|---|---|----|
| 14 | (a) | | 1 | 1 | B1 |
|----|-----|--|---|---|----|

| | | | | | |
|----------------------|-----|--|-----------------|---|---|
| 15 | (a) | | m^7 | 1 | B1 |
| | (b) | | 8 | 1 | B1 Allow k^8 |
| | (c) | | $9x^{12}y^{16}$ | 2 | B2 B1 for a product in the form ax^py^q where 2 from a , p or q are correct eg $3x^{12}y^{16}$ (Allow $9x^{12}$ or $9y^{16}$ or $x^{12}y^{16}$ so as long as not added to any other terms) |
| Total 4 marks | | | | | |

| | | | | | |
|----------------------|-----|--|----|---|-------------------|
| 16 | (a) | | 1 | 1 | B1 cao |
| | (b) | | -6 | 1 | B1 Allow 3^{-6} |
| Total 2 marks | | | | | |

| | | | | | |
|----------------------|--------|---|--------------------|---|--|
| 17 | (a) | | $8c^{12}d^{21}$ | 2 | B2 (B1 for 2 correct terms as part of a product) |
| | (b) | | 5 | 1 | B1 |
| | (c) | | $4a^2b(4b^2 + 5a)$ | 2 | B2 B1 for any correct partial factorisation with at least 2 factors, or the correct common factor with no more than 1 error inside the bracket |
| | (d)(i) | $(x \pm 11)(x \pm 2)$ | | 2 | M1 for $(x \pm 11)(x \pm 2)$ or for $(x + a)(x + b)$ with $ab = -22$ or $a + b = 9$ |
| | | <i>Correct answer scores full marks (unless from obvious incorrect working)</i> | $(x + 11)(x - 2)$ | | A1 for correct factors |
| | (ii) | | -11, 2 | 1 | B1ft ft dep on factorising in the form $(x + p)(x + q)$ |
| Total 8 marks | | | | | |