| 1 |  | oe |  | 5 | M1 for correctly using | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | M1 for correctly rearranging for *V* | |
|  |  | oe |  |  | M1ft their 2000 for their *V* | |
|  |  | oe (= 6.3661…) |  |  | M1ft their 2000 dep on previous M1 for correctly rearranging for *h* | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 6.4 |  | A1 awrt 6.4 | |
|  |  |  |  |  |  | **Total 5 marks** |

| 2 |  | 12 × 2.45 (= 29.4) **or** 21 ÷ 12 (= 1.75) |  | 3 | M1 |
| --- | --- | --- | --- | --- | --- |
|  |  | oe **or** oe **or**  oe **or**  oe |  |  | M1 or an answer of 140(%) |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 40 |  | A1 |
|  |  |  |  |  | **Total 3 marks** |

| 3 |  | × 25 000 (=1125) **or** **or**  1150 × 3 (= 3450) **or**  25 000 + 1150 × 3 (= 28 450)  (allow for this mark) |  | 4 | M1 finding 4.5% or 104.5% of 25 000 (allow for 3 × 0.045 × 25 000 oe)  **or**  the total interest for T bank  **or**  the total amount gained for T bank | | M2 for  (=28 529.(15313)) |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | × (25 000 + ‘1125’) (= 1175.625 or 1175 or 1176) **and** × (25 000 + ‘1125’ + ‘1175.625’) (= 1228.529) **or** |  |  | M1 completing the interest for C bank  **or**  completing the total amount for C bank | |
|  |  | ‘1125’ + ‘1176’ + ‘1229’ (= 3530) **or**  ‘28 529’ – 25 000 (=3529)  **and** 3 × 1150 (= 3450)  **or**  ‘28 529’ **and** 25 000 + ‘3450’ (= 28 450) |  |  | M1 for total interest for C bank and total interest for T bank  **or**  total amount for C bank and total amount for T bank | | |
|  |  | *Working required* | 79 or 80 |  | A1 dep on M2  Allow 79 - 80 | | |
|  |  |  |  |  |  | **Total 4 marks** | |

| 4 | (a) |  |  | 1 | B1 | 31/70  Accept 0.44(28571…..) or 44.(2…)% |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) | 4 × 6 + 12 × 14 + 20 × 19 + 28 × 25 + 36 × 6 (= 1488)    **or**  24 + 168 + 380 + 700 + 216 (= 1488) |  | 4 | M2 for at least **4** correct products added (need not be evaluated)  If not M2 then award:  (M1 for consistent use of value within interval (including end points) for at least **4** products which must be added  or  correct midpoints used for at least **4** products and not added) | |
|  |  | oe eg ‘1488’ ÷ 70 |  |  | M1 dep on at least M1  Allow division by their Σ*f* provided addition or total under column seen | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 21.26 |  | A1 awrt 21.26  accept 21.3 | |
|  |  |  |  |  | **Total 5 marks** | |

| 5 |  | E.g.  2 × 2 × 900 or 22 × 900 or 2 × 3 × 600 or  2 × 5 × 360 or 3 × 3 × 400 or 32 × 400 or  3 × 5 × 240 or 5 × 5 × 144 or 52 × 144 | |  | 3 | M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 900  (see LHS for examples of the amount of work needed for the award of this mark, allow no more than one mistake ft in factor tree or table  (eg one mistake with 2 prime factors ft:  3600 = 1800 × 20 = 2 × 900 × 4 × 5 or  360 = 2 × 2 × 90) | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| E.g.   |  |  | | --- | --- | | 2 | 3600 | | 2 | 1800 | |  | 900 | | E.g. |
|  |  | E.g. 2 × 2 × 2 × 2 × 3 × 3 × 5 × 5 | |  |  | M1 for 2, 2, 2, 2, 3, 3, 5, 5 or 24 , 32 , 52 or 24 + 32 + 52 (ignore 1s) (may be a fully correct factor tree or ladder) | |
| E.g.   |  |  | | --- | --- | | 2 | 3600 | | 2 | 1800 | | 2 | 900 | | 2 | 450 | | 3 | 225 | | 3 | 75 | | 5 | 25 | | 5 | 5 | |  | (1) | | E.g. |
|  |  | *Working required* | | 24 × 32 × 52 |  | A1 dep on M2  can be any order (allow 24 . 32 . 52)  (SCB1 for 3.6 × 23 × 53) | |
|  |  |  | |  |  |  | **Total 3 marks** |

| 6 |  | (5 ‒ 2) × 180 ‒ 112 ‒ 102 ‒ 96 (= 230) oe eg  (= 230)    **or**  360 ‒ (180 ‒ 112) ‒ (180 ‒ 102) ‒ (180 ‒ 96)  (= 360 ‒ 68 ‒ 78 ‒ 104 = 360 ‒ 230 = 130) oe |  | 5 | M1 | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | (= 115) **or** ‘130’ ÷ 2 (= 65) |  |  | M1 dep on previous mark | |
|  |  | (= 135)**or** 180 – (360 ÷ 8) (= 135)**or** as exterior angle of octagon |  |  | M1 indep  Withhold the mark for  if shown as an interior angle | |
|  |  | 360 – ‘115’ – ‘135’**or**  ‘65’ + ‘45’ |  |  | M1 | |
|  |  | *Working required* | 110 |  | A1 dep on M1 | |
|  |  |  |  |  |  | **Total 5 marks** |

| 7 |  | 4 × (5 – *x*) **or** 5 × (2*x* – 1) **or** 20 – 4*x* **or** 10*x* – 5 oe | |  | 4 | M1 | for setting up a correct algebraic expression for area *A* or area *B* (could be seen as part of an equation)  (condone lack of brackets for multiplying if meaning is clear for this mark only) |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | one from:  4(5 – *x*) = 20 – 4*x*  or  2 × 4(5 – *x*) = 40 ‒ 8*x*  or  0.5 × 4(5 – *x*) = 10 ‒ 2*x*  oe | **and** one from:  5(2*x* – 1) = 10*x* – 5  or  2 × 5(2*x* – 1) = 20*x* – 10  or  0.5 × 5(2*x* – 1) = 5*x* ‒ 2.5  oe |  |  | M1 | for expanding 2 sets of brackets correctly (one for each shape)  [allow ×2 or ÷2 for the wrong shape for this mark]  Need not be in an equation at this stage. |
|  |  | eg10*x* + 8*x* = 40 + 5 **or** – 5 – 40 = − 10*x* – 8*x* **or**  18*x* = 45 **or** −45 = −18*x*  **or**  4*x* + 5*x* = 20 + 2.5 oe | |  |  | M1 | for a correct equation with terms in *x* on one side and number terms the other side |
|  |  | *Working required* | | 2.5 |  | A1 | oe dep on M1 |
|  |  |  | |  |  |  | **Total 4 marks** |

| 8 |  | 0.22*x* = 5.48 oe or  (1% =) 5.48 ÷ 22 (= 0.24909…) or  100 ÷ 22 (= 4.54…) |  |  | M1 | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | (*x* =) 5.48 ÷ 0.22 oe or  (100% =) 5.48 ÷ 22 × 100 or  “0.24909…” × 100 or  5.48 × “4.54…” |  |  | M1 | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 24.9 |  | A1 awrt 24.9 | |
|  |  |  |  |  |  | **Total 3 marks** |

| 8 **ALT 1** |  | 0.22*x* = 5 480 000 oe or  (1% =) 5 480 000 ÷ 22 (= 249 090.9091…) or  100 ÷ 22 (= 4.54…) |  |  | M1 | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | 5 480 000 ÷ “0.22” oe or  (100% =) 5 480 000 ÷ 22 × 100 or  “249 090.9091…”× 100 or  5 480 000 × “4.54…” |  |  | M1 | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 24 900 000 |  | A1 awrt 24 900 000 | |
|  |  |  |  |  |  | **Total 3 marks** |

| 9 |  | or or  oe (where 6 = 15 ‒ 4 ‒ 5) |  | 3 | M1 oe  for one correct product (allow decimals to 2 dp rounded or truncated) | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | oe eg  (where 6 = 15 ‒ 4 ‒ 5) |  |  | M1 oe  for the sum of all three correct products | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  | A1 oe 0.34(222….) or 34.(222…)%  (if no marks awarded, SCB2 for  oe from non-replacement,  SCB1 for a fully correct method for non-replacement) | |
|  |  |  |  |  |  | **Total 3 marks** |

| 10 | (a) | 54 ÷ 9 × 4 oe or oe |  | 2 | M1 Allow 0.44(44…) × 54 or | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working* | 24 |  | A1 | |
|  | (b) | or or  54 – “24” (= 30) and “30” – “24”  or 2 × “30” – 54 |  | 2 | M1 ft if “24” < 27 or | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 6 |  | A1 | |
|  |  |  |  |  |  | **Total 4 marks** |

| 11 |  | (*AC*2 =) 92 + 122 – 2 × 9 × 12 × cos 60 (= 117) or (*AC*2 =) 81 + 144 – 108 (= 117) oe |  | 5 | M1 oe eg  (where *AM* is perpendicular to *BC*) | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | (*AC* = )or or 10.8(16653…) |  |  | A1 oe | |
|  |  | (area *ABC* =)0.5 × 9 × 12 × sin 60 (=or 46.7(653….)) |  |  | M1 indep or | |
|  |  | (area *ACD* = )0.5 × 7 × × sin 84 (=37.6(50896…)) |  |  | M1 dep on 1st M1 | |
|  |  | *Working required* | 84.4 |  | A1 dep on M3 awrt 84.4 | |
|  |  |  |  |  |  | **Total 5 marks** |

| 12 |  | 2 × 0.75 (= 1.5) oe or 2 × 0.75 × 2 (= 3) oe |  | 5 | M1 for area of rectangle | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *π* × (0.5 ÷ 2)2 (= 0.1963) or  *π* × (0.5 ÷ 2)2 (= 0.09817) |  |  | M1 for area of circle  **or**  area of semicircle | |
|  |  | “1.5” – “0.09817” (= 1.4018…) or  “3” – “0.1963” (= 2.8036…) |  |  | M1 | |
|  |  | “1.4018” × 2 × 250 ÷ 4 (= 175.228…) or  “2.8036” × 250 ÷ 4 (= 175.228…) or  “1.4018” × 250 ÷ 4 (= 87.6…) |  |  | M1or for 87 – 88 | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 175 |  | A1 Allow 175 – 176 | |
|  |  |  |  |  |  | **Total 5 marks** |

| 13 | and oe  **or**  and oe | | M2 for an arithmetical method (must see the calculation to find 0.22 or 0.26 or 0.74 and 0.48 oe)  E.g.  6.1(0) – 5.88 (= 0.22) oe  **or**  3.92 – 3.66 (= 0.26) oe  **or**  1.96 – 1.22 (= 0.74) oe and 1.22 – “0.74” (= 0.48) |  | 5 | M1 for setting up both equations oe  Allow the use of apples and pears oe throughout, e.g.  5 apples + 3 pears = 1.96 and  3 apples + 2 pears = 1.22 | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | E.g.    Subtracting | E.g.    Subtracting |  |  | M1 for a correct method to eliminate *a* or *p*: coefficients of *a* or *p* the same **and** correct operation to eliminate selected variable (condone any one arithmetic error) **or**  to find the cost of 1 apple and 1 pear | |
| E.g. and oe  Subtracting | |
|  | E.g.  or | E.g.  or | E.g.  3 × 0.22 (= 0.66)  1.96 – “0.66” (= 1.3(0))  “1.3(0)” ÷ 5 (= 0.26)  **or**  5 × 0.26 (= 1.3(0))  1.96 – “1.3(0)” (= 0.66)  “0.66” ÷ 3 (= 0.22)  **or**  Apple and pear is 0.48 oe |  |  | M1 (dep on M2) for substituting their value found (must be > 0) of one variable into one of the equations **or**  for repeating above method to find second variable **or**  for third working column allow**or**  for a complete arithmetical method to find the other value | |
| E.g  oe | |
|  | or oe or | | |  |  | M1 (dep on M3) can be implied by  10(*a* + *p*) provided *a* and *p* must be > 0 | |
|  | *Working required* | | | 4.8(0) |  | A1 dep M2 | |
|  |  | | |  |  |  | **Total 5 marks** |

| 14 | (a) | 0.8, 2.6, 1.9, 1.6, 0.3 | Correct histogram | 3 | B3 fully correct histogram  (B2 for at least 3 correct frequency densities or at least 3 correct bars  **or**  all five bars of correct width with heights in the correct ratio  B1 for 2 correct frequency densities or  2 correct bars – but these bars must be of different widths, ie not 1st and 3rd)  **or**  three bars of correct width with heights in the correct ratio) | |
| --- | --- | --- | --- | --- | --- | --- |
|  | (b) |  |  | 2 | M1 for where *n* < 40 or for | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* |  |  | A1 for oe  If M0 then SCB1 for (or 0.057…) | |
|  |  |  |  |  |  | **Total 5 marks** |

| 15 | (a) | 1.75 × 106 ÷ 2.4 × 107 or  1 750 000 ÷ 24 000 000 oe eg |  | 3 | M1 |
| --- | --- | --- | --- | --- | --- |
|  |  | 0.0729(16…) or 0.072 or 0.073 or for or 7.29(16…)% or 7.2% or 7.3% |  |  | A1 |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 7.3 × 10−2 |  | A1 accept 7.3 × 10−2 or better  (7.29(16….) × 10−2) |
|  | (b) | 2.4 × 107 × 5.01 × 1021 ÷ 3 oe |  | 2 | M1 |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 4 × 1028 |  | A1 accept 4 × 1028 , 4.0 × 1028 ,  4.01 × 1028 ,  4.008 × 1028 |
|  |  |  |  |  | **Total 5 marks** |

| 16 | |  | | LW = 180 oe (9LW = 1620) or  4L × (L + W) = 1620 oe or  5W × (L + W) = 1620 oe or  4L = 5W oe (oe or oe) | | | | |  | 5 | M2 for any two correct equations from  (i) LW = 180 oe (9LW = 1620)  (ii) 4L × (L + W) = 1620 oe  (iii) 5W × (L + W) = 1620 oe  (iv) 4L = 5W oe (oe or oe)  (M1 for one correct equation or 1620 ÷ 9 (= 180)) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | oe or oe or oe or  oe or  oe or oe or  oe or  oe | | | | |  |  | M1 for a correct equation in terms of one variable only |
|  | |  | | Correct answer scores full marks (unless from obvious incorrect working) | | | | | L = 15andW = 12 |  | A2 for both correct  (A1 for one correct)  Award 4 marks for L = 12 and W = 15 dep on M3 |
|  |  | |  | |  |  |  | **Total 5 marks** | | | |

| 17 |  | eg oe |  | 6 | M1 for using the formula for the volume of a sphere correctly and equating it to 288 | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | *x* = 12 |  |  | A1 | |
|  |  | oe  **or** |  |  | M1 (dep on first M1 and using their value for *x*) for using Pythagoras to find the perp height of faces *CAD* or *BAE*  or  a correct method to find angle *CAD* or *BAE* | |
|  |  | oe  **or** |  |  | M1 (dep on first M1 and using their value for *x*) for using Pythagoras to find the perp height of faces *ABC* or *AED*  or  a correct method to find angle *BAC* or *DAE* | |
|  |  | (‘12’ × 2(‘12’)) + 2(0.5 × ‘12’ × ‘’) +2(0.5 × 2‘12’ × ‘’) oe eg  or  ‘288’ + 2 × ‘367.129’…+ 2 × ‘723.59…’ oe |  |  | M1 (dep on first M1 using their value for *x* and correct working for heights of each triangle )for working out the total surface area of the pyramid | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 2469 |  | A1 2469 - 2470 | |
|  | | |  |  |  | **Total 6 marks** |

| 18 |  | or  or (= ) or |  | 5 | M1 for finding the common difference (*d*)  in terms of *k* | |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | eg oe or  oe |  |  | M1 dep equating 2 different expressions in terms of *k* using their value(s) of *d* in terms of *k* (or from working using *k*)  or other correct method to find *k* | |
|  |  | *k* = −20 |  |  | A1 | |
|  |  | oe |  |  | M1 dep on previous M1 for correctly substituting, into  or  all values to be numerical | |
|  |  | *Correct answer scores full marks (unless from obvious incorrect working)* | 1575 |  | A1 | |
|  |  |  |  |  |  | **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** | 3.42 | 5 | 68 | 3.42 | 4.93 | 4.61 | 4.07 | 2.99 | 1.83 | 0.63 | 0.21 | 0.13 |
| **2** | 2.30 | 3 | 77 | 2.30 | 2.92 | 2.70 | 2.41 | 2.27 | 1.79 | 1.34 | 0.94 | 0.53 |
| **3** | 2.95 | 4 | 74 | 2.95 | 3.88 | 3.54 | 3.09 | 2.73 | 2.42 | 1.63 | 0.67 | 0.22 |
| **4** | 3.53 | 5 | 71 | 3.53 | 4.83 | 4.37 | 3.85 | 3.26 | 2.54 | 1.41 | 0.65 | 0.04 |
| **5** | 2.01 | 3 | 67 | 2.01 | 2.73 | 2.51 | 2.13 | 1.79 | 1.56 | 0.92 | 0.34 | 0.11 |
| **6** | 3.20 | 5 | 64 | 3.20 | 4.88 | 4.43 | 3.45 | 2.61 | 1.62 | 0.60 | 0.14 | 0.00 |
| **7** | 2.65 | 4 | 66 | 2.65 | 3.84 | 3.46 | 2.73 | 2.30 | 1.62 | 0.87 | 0.54 | 0.29 |
| **8** | 1.90 | 3 | 63 | 1.90 | 2.89 | 2.33 | 1.86 | 1.54 | 1.17 | 0.75 | 0.51 | 0.04 |
| **9** | 1.68 | 3 | 56 | 1.68 | 2.84 | 2.54 | 1.86 | 1.02 | 0.32 | 0.15 | 0.02 | 0.00 |
| **10** | 2.62 | 4 | 66 | 2.62 | 3.53 | 3.01 | 2.46 | 2.36 | 2.07 | 1.71 | 1.08 | 0.62 |
| **11** | 2.63 | 5 | 53 | 2.63 | 4.60 | 3.74 | 2.78 | 1.49 | 0.66 | 0.22 | 0.08 | 0.02 |
| **12** | 2.53 | 5 | 51 | 2.53 | 3.86 | 3.25 | 2.77 | 1.97 | 1.34 | 0.73 | 0.24 | 0.26 |
| **13** | 2.72 | 5 | 54 | 2.72 | 4.66 | 3.83 | 2.67 | 1.64 | 1.06 | 0.37 | 0.10 | 0.02 |
| **14** | 2.50 | 5 | 50 | 2.50 | 4.42 | 3.25 | 2.26 | 1.72 | 0.99 | 0.46 | 0.15 | 0.06 |
| **15** | 1.64 | 5 | 33 | 1.64 | 3.03 | 2.03 | 1.49 | 1.00 | 0.61 | 0.34 | 0.19 | 0.00 |
| **16** | 1.90 | 5 | 38 | 1.90 | 3.75 | 2.01 | 1.25 | 1.12 | 0.91 | 0.68 | 0.35 | 0.28 |
| **17** | 1.45 | 6 | 24 | 1.45 | 3.20 | 1.66 | 1.12 | 0.57 | 0.23 | 0.12 | 0.02 | 0.00 |
| **18** | 0.88 | 5 | 18 | 0.88 | 2.55 | 0.63 | 0.29 | 0.11 | 0.04 | 0.02 | 0.00 | 0.00 |
|  | **42.51** | **80** | **53** | **42.51** | **67.34** | **53.90** | **42.54** | **32.49** | **22.78** | **12.95** | **6.23** | **2.62** |

**Suggested grade boundaries**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Grade** | **9** | **8** | **7** | **6** | **5** | **4** | **3** |
| Mark | 61 | 48 | 38 | 28 | 18 | 10 | 4 |