

## APPLICATIONS UNIT 2

### HIGHER TIER

| <b>Applications Unit 2 Higher Tier<br/>January 2015</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Mark</b>                                                                                              | <b>Comment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 1(a) 325 (euros)<br>(b) 300 (euros)<br>(c) Idea of scatter not showing which apartment is which so there is uncertainty, e.g. ‘Suggest perhaps the apartment costing 300€, ≈3.2km from the centre may be the luxury apartment but there is not information to tell us this on the scatter diagram’<br><br>(d) Suitable line of best fit, in appropriate direction with points above and below the straight line drawn<br>(e) Accurate reading <b>from their line of best fit</b>                                                                                                                                                                                                                                                                                                                                                                   | B1<br>B1<br>E1<br><br><br>B1<br>B1<br>5                                                                  | Must show uncertainty in the response<br><br><br>Intention of straight line<br><br>Tolerance within a small square                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 2(a) 74 / 2.54 75 / 2. 54 or 49 x 2.54<br>All 3 correct answers in the table<br>29 (inches)<br>30 (inches)<br>124 (cm)<br><br>(b) All 3 correct entries,<br>(buy) small<br>(buy) medium<br>(buy) large                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | M1<br>A2<br><br><br><br>B2<br><br><br>5                                                                  | A1 for correct unrounded answers,<br>(29.13...     29.52..... 124.46.....)<br>OR for 29 and 30<br>OR for 124 (allow 125 from converting backwards)<br><br>B1 for any 1 or 2 correct entries<br>Allow use of the appropriate range of measurements as the indication of size                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3(a) (Change into CYN) $460 \times 9.28$<br>(No coins, so can buy only) 4268 (CYN)<br><br>(Cost to Dewi for 4268 CYN is ) $4268 \div 9.28$<br>(£) 459.91<br><br>QWC2: Candidates will be expected to <ul style="list-style-type: none"> <li>present work clearly, with words explaining process or steps</li> </ul> <b>AND</b> <ul style="list-style-type: none"> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer</li> </ul> QWC1: Candidates will be expected to <ul style="list-style-type: none"> <li>present work clearly, with words explaining process or steps</li> </ul> <b>OR</b> <ul style="list-style-type: none"> <li>make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer</li> </ul> | M1<br>A2<br><br>M1<br>A1<br><br>QWC<br>2<br><br><br><br><br><br><br><br><br><br>M1<br>A1<br>B1<br><br>10 | A1 for an answer of 4268.8 (CYN) or 4269(CYN)<br><i>If no marks, then SC1 for an answer of 4333 (using incorrect rate &amp; rounding down)</i><br>FT their whole number of CYN<br>An answer of 459.91379... implies M1, A0<br><br>QWC2 Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.<br><br>FT ‘100 – their 98.51’ provided M1 awarded<br>For B1 the answer must be to the nearest penny. |

| Applications Unit 2 Higher Tier<br>January 2015                                                                                                                                                                                         | Mark           | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
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| 4(a) Volume = $\pi \times 23^2 \times 125$<br>Answers in the range 207.6 to 207.8(...) or 208 (litres)                                                                                                                                  | M1<br>A2       | Ignore place value changes for '23' and '125'<br>Accept 66.125 $\pi$<br>A1 for answers in the range 207600 to 207822 or 208000(cm <sup>3</sup> ) or 207 (litres) or 66125 $\pi$<br><i>If no marks, award SC1 for use of 46 for radius giving) approximately 831 litres</i>                                                                                                                                                                                                                                                                |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (b) $150 \times 4500 \times \dots = 1.2$ million<br>Cost per litre $1\,200\,000 \div (150 \times 4500)$                                                                                                                                 | B1             | Ignore errors for their 1.2 million providing unambiguous.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (£)1.78                                                                                                                                                                                                                                 | M1             | Calculation that could lead to a correct answer, may be shown in stages<br>Do not accept 1.2 million $\div (150 \times 4500)$ for M1 unless answer of 1.7(777....)                                                                                                                                                                                                                                                                                                                                                                        |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (c) Either $(100 \times) 1000/1700$<br>or $1000 \times 159 \div 1700$ or equivalent                                                                                                                                                     | A1             | Accept 1.77(77....). If units are given they must be correct.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| 58.8(%) or 59(%)                                                                                                                                                                                                                        | B1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| Answers in the range 93.5(..litres) to 94(.. litres)                                                                                                                                                                                    | B1             | FT their % provided initial B1 awarded<br>Accept unsupported answer or an answer provided no inappropriate working is seen for B3                                                                                                                                                                                                                                                                                                                                                                                                         |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
|                                                                                                                                                                                                                                         | 9              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| 5(a) (G3 =) C3 + D3 + E3 + F3 OR (G3=) sum(C3:F3)                                                                                                                                                                                       | B1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (H3=) $100 \times G3 / (4 \times B3)$<br>OR $100 \times (C3 + D3 + E3 + F3) / (4 \times B3)$                                                                                                                                            | B4             | Condone $\times$ for $*$ and $\div$ for $/$<br>Award B3 for the fraction, i.e. $*100$ omitted but otherwise correct, or if 1 minor slip in the formula (not for omitted $*4$ ), e.g. missing bracket(s) or a missing term.<br>Award B2 for 2 errors, e.g.<br>$100 \times G3 / 4 \times 30$<br>(missing $()$ and use of 30 not B3), or<br>$100 \times (C3 + D3 + E3 + F3) / B3$<br>(missing $4*$ and $()$ )<br>Award B1 for 3 errors e.g. $G3 / 4 \times 30$<br>or $(C3+D3+E3+F3) / 4 \times 30$ or<br>$G3 / 120$ or $(C3+D3+E3+F3) / 120$ |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (b) G3 27 AND<br>G4 23<br>$(7+6+3+11)/(4 \times 30) \quad (\times 100)$<br>H3 22.5                                                                                                                                                      | B1             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| H4 57.5                                                                                                                                                                                                                                 | M1<br>A1       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| F5 4 AND G5 8                                                                                                                                                                                                                           | B1<br>B1<br>10 | FT their $G4 \times 100 \div 40$ correct to 1dp<br>CAO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| 6(a) 11<br>(b) (£)62<br>(c)                                                                                                                                                                                                             | B1<br>B1       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| <table><tr><td></td><td>Median<br/>in £</td><td>Range<br/>in £</td><td>Mode<br/>in £</td></tr><tr><td>Jenkins</td><td>46.5(0)</td><td>35</td><td>32</td></tr><tr><td>Hollow Electric</td><td>47</td><td>34</td><td>48</td></tr></table> |                | Median<br>in £                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Range<br>in £ | Mode<br>in £ | Jenkins | 46.5(0) | 35 | 32 | Hollow Electric | 47 | 34 | 48 | B4 | All entries correct OR<br>B3 for 5 correct entries<br>B2 for 3 or 4 correct entries<br>B1 for 1 or 2 correct entries |
|                                                                                                                                                                                                                                         | Median<br>in £ | Range<br>in £                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mode<br>in £  |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| Jenkins                                                                                                                                                                                                                                 | 46.5(0)        | 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 32            |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| Hollow Electric                                                                                                                                                                                                                         | 47             | 34                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 48            |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
| (d) Shows understanding that median (and range) similar, mode for Hollow Electric indicates more expensive, accept conclusion Jenkins cheaper or that the two makes are quite similar                                                   | B1             | FT their table provided at least B2 previously awarded<br>B0 if range considered as an average.<br>Allow conclusion from their correct calculation of means: Jenkins $511 \div 12 = 42.5833\dots$<br>Hollow Electric $482 \div 11 = 43.8181\dots$                                                                                                                                                                                                                                                                                         |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |
|                                                                                                                                                                                                                                         | 7              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |              |         |         |    |    |                 |    |    |    |    |                                                                                                                      |

| Applications Unit 2 Higher Tier<br>January 2015                                                                                                                                                                                                                                                                                                                                                                                                      | Mark                                                              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| 7. $6B + 5C = 116$ AND $4B + 8C = 138$<br><br>Method to solve, e.g. equal coefficients with an appropriate attempt to subtract the equations<br>Correct first value<br>Method to find the second variable<br>Correct second value with indication showing order, such as completing the table, e.g.<br>Ben (£)8.5(0) per hr, Ceri (£)13(.00) per hr                                                                                                  | B2<br><br>M1<br><br>A1<br>m1<br>A1<br><br>6                       | B1 for either equation<br>FT provided at least 1 equation is correct<br>Allow 1 slip in non equated variable<br><br><br>FT from their first value<br><br><br>Unsupported answers gain no marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 8(a)(Length) $6.2 \times 2.4/4$ or equivalent<br>3.7(2 cm)<br><br>(Area) 8.9(28cm <sup>2</sup> )<br><br>(b) Explains he is incorrect, e.g. 'Leo is wrong it has reflection (symmetry)' or 'the original does not have (rotational) symmetry'                                                                                                                                                                                                         | M1<br>A1<br>A1<br><br>E1<br><br><br>4                             | Ignore any incorrect place value with '2.4' and '6'<br><br>( $2.4 \times 3.72 = 8.928$ ) FT 'their $3.72 \times 2.4$ ' correctly evaluated provided M1 awarded<br>Must mention the reflection (symmetry) of the new OR that the original does not have (rotational) symmetry.<br>Allow if incorrect is stated or implied with a correct reason provided no more than one incorrect statement is given                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 9(a) b) $5600 \times 1.85/100$ or $5600 \times 0.0185 (= 103.60)$<br><br>$(1 + 0.0185)^{15} \times 5600$<br><br>(£) 7372(.308954...)<br><br>Conclusion, e.g. 'Yes (he will have more than he needs)'<br><br><br><br><br><br>(b) (AER% =) $100 \left( 1 + \frac{2.15}{100 \times 12} \right)^{12} - 100$<br>OR $100(1 + 2.15 \div (100 \times 12))^{12} - 100 = 2.17(\dots\%)$<br><br><br><br>Advise, e.g. 'Greenash as more interest (at 2.18%p.a.)' | B1<br><br>M1<br>A1<br><br>E1<br><br><br>B4<br><br><br>E1<br><br>9 | May be embedded in further calculation<br><br>OR sight of a full cumulative method for at least 13 years<br>Accept correct evaluation from at least 13years cumulative (e.g. 13years gives (£)7106(.8..) to (£)7107)<br><i>B1 and SC1 for depreciation 4231.97..., but no FT</i><br><br>FT interpretation provided B1 and M1 awarded<br><i>If M0 awarded and simple interest used with interest shown or implied as over (£)1400 for 14 or 15 years award SC1 or with conclusion 'Yes' award SC2.</i><br><i>If also stated that using compound interest the amount will be greater award SC3</i><br><br>For B4 condone missing brackets in the denominator if the answer correct.<br>Award B3 for correct formula (including brackets in the denominator) but incorrect answer between 1 and 5 inclusive.<br>Award B2 for correct formula and answer not between 1 and 5.<br>Award B1 for one error in the formula e.g. missing brackets, 2000 not 100, a 12 missing, 0.0215 used.<br><br>FT their appropriate interpretation provided at least B2 awarded and APR for Greenash is 2.18%. |

| Applications Unit 2 Higher Tier<br>January 2015                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Mark                                                                                                      | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <p>10. Plot 1<br/>Opposite side = <math>25 \times \sin 37</math><br/>Opposite side 15(.04537...metres)<br/>Adjacent side = <math>25 \times \cos 37</math><br/>Adjacent side = 19.9658...metres or 20 (metres)</p> <p>Perimeter Plot 1 (<math>25 + 15 + 20 =</math>) 60 (metres)</p> <p>Plot 2<br/><math>\text{unknown}^2 = 36^2 - 25^2</math><br/>unknown length 25.9(036.. metres) or 26(metres)<br/>Perimeter Plot 2 (<math>25 + 36 + 26 =</math>) 87 (metres)</p> <p>Plot 3<br/>Strategy, considers fraction of a circle OR<br/>sight of <math>2 \times \pi \times 36</math><br/><math>\text{Arc} = 2 \times \pi \times 36 \times 22.5/360</math><br/>Answers between 14 (metres) to 14.14...(metres)<br/>inclusive<br/>Perimeter Plot 3 (<math>36 + 36 + 14 =</math>) 86 (metres)</p> | <p>M2<br/>A1<br/>M2<br/>A1</p> <p>B1</p> <p>M1<br/>A1<br/>B1</p> <p>S1<br/>M1<br/>A1<br/>B1</p> <p>14</p> | <p>M1 for <math>\sin 37 = \text{opposite side}/25</math></p> <p>M1 for <math>\cos 37 = \text{adjacent side}/25</math><br/>Accept rounded or truncated to 19.97 or 19.96 or 19.9 or 20.0<br/><i>Alternative 3 marks once opposite or adjacent side found are:</i><br/><math>25^2 - \text{opp}^2 = \text{adj}^2</math> or <math>25^2 - \text{adj}^2 = \text{opp}^2</math><br/><i>Substitution of 25 and their(FT) appropriate measurement</i> M1<br/><math>\text{opp}^2 = 226.36...</math> or <math>\text{opp} = \sqrt{226.36}...</math> or<br/><math>\text{adj}^2 = 398.6(3...)</math> or <math>\text{adj} = \sqrt{398.6(3...)}</math> or FT with their appropriate measurement A1<br/>Opposite or adjacent as before or FT A1<br/>FT provided at least 1 method mark for each stage of Plot 1 working has been awarded</p> <p>FT provided at least M1 for Plot 2 awarded</p> <p>OR equivalent to <math>72\pi</math> or a fraction (percentage) of <math>72\pi</math> in working</p> <p>An answer of 226(.. metres) implies S1 only (Allow <math>9\pi/2</math>)</p> <p>FT provided at least S1 awarded for Plot 3<br/><u>Do not penalise not rounding each perimeter to the nearest metre more than once, i.e. first B0 then FT to allow unrounded for further B marks</u></p> |
| <p>11(a) <math>G + B &lt; 4000</math><br/><math>0.3(0)G + 0.2(0)B &gt; 960</math></p> <p>(b) Line <math>G + B = 4000</math> shown<br/>Line <math>0.3G + 0.2B = 960</math> shown<br/>Region between the lines indicated (left hand end only)</p> <p>(c) <b>Using their graph</b> to show Ifor's point outside the region with 'No' in the table<br/><b>Using their graph</b> to show Simone's point inside the region with 'Yes' in the table</p>                                                                                                                                                                                                                                                                                                                                          | <p>B1<br/>B1<br/>B1<br/>B1<br/>B1</p> <p>B1<br/>B1</p> <p>7</p>                                           | <p><i>If no marks, then SC1 for <math>G+B...4000</math> AND <math>(0.)3(0)G + (0.)2(0)B...960</math>, with the gaps here both being inequalities</i></p> <p>FT from their inequalities if possible</p> <p>Accept FT from either line correct but for a similar region</p> <p><b>MUST</b> be a FT from their (non spurious) graph in (c)<br/>Do not accept numerical explanations. Accept unambiguous unlabelled plots provided the table is completed correctly</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>12. Sight of 297.5 and 302.5 (litres)<br/>AND 239 and 241 (seconds)</p> <p>(Least) 297.5/241<br/>1.23 (litres per second)<br/>(Greatest) 302.5/239<br/>1.27 (litres per second)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>B2</p> <p>M1<br/>A1<br/>M1<br/>A1</p> <p>6</p>                                                         | <p>B1 for any 2 of these</p> <p>FT their litres and seconds provided neither 300 nor 240 used, and appropriately <math>&gt;</math> or <math>&lt;</math> these values</p> <p><i>If neither A mark awarded, then SC1 for unrounded or truncated answers (greatest 1.26569... AND least 1.2344...)</i></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| 13.                                                                                                                                                      |      | <i>Ignore irrelevant missing zeros for pence throughout</i>                                                                                                                                                                                                                                                |
| (a)(i) Carli index<br>$\left( \frac{\frac{1.02}{0.92} + \frac{0.93}{0.91} + \frac{0.92}{0.90} + \frac{0.94}{0.94}}{4} \right) \times 100$ 103.8(2239...) | M1   | Correct formula and substitution                                                                                                                                                                                                                                                                           |
|                                                                                                                                                          | A2   | A1 for 4.15(289...)(÷4 ×100)                                                                                                                                                                                                                                                                               |
| (ii) Dutot index<br>$\left( \frac{\frac{1.02 + 0.93 + 0.92 + 0.94}{4}}{\frac{0.92 + 0.91 + 0.90 + 0.94}{4}} \right) \times 100$ 103.8(147..)             | M1   | Correct formula and substitution, both ÷4 may be omitted, however if ÷3 shown in the formula M0                                                                                                                                                                                                            |
|                                                                                                                                                          | A2   | A1 for 3.81/ 3.67 (×100) or 0.9525/ 0.9175 (×100)                                                                                                                                                                                                                                                          |
|                                                                                                                                                          |      | <i>If no marks then</i>                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                          |      | <ul style="list-style-type: none"> <li>for answers from inverting substitution,<br/>SC1 for Carli 96.46... or 96.5,<br/>and SC1 for Dutot 96.325...</li> <li>for answers from showing ÷3,<br/>SC1 for Carli 138.3... or 138.4.,<br/>and SC1 for Dutot 103.8..(or 104 from<br/>1.27÷1.22(33...))</li> </ul> |
| (b) 3.8(%) AND 3.8(%)                                                                                                                                    | B1   | FT for their difference from 100 provided at least 1 mark awarded in each of (a)(i) and (a)(ii)<br>Accept any indication of this knowledge                                                                                                                                                                 |
| (c) Indicates that the division by the number of supermarkets on the numerator and the denominator are common and can be cancelled or omitted            | E1   | (Allow in words)                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                          | 8    |                                                                                                                                                                                                                                                                                                            |