Bands 5 – 7 Problem Solving – Test 1 Answers

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| 1. | Length scale factor = 165 ÷ 133 = 1.24Width scale factor = 82 ÷ 72 = 1.14The two are not similar because their scale factors for length and width differ | 1 mark for length scale factor1 mark for width scale factor1 mark for correct conclusion | 3 |
| 2. | 3 x 1.7 x 10-29 x 1028= 5.4 x 10-1= 0.54 kg | 1 mark for multiplying1 mark for 5.4 x 10-11 mark for correct answer | 3 |
| 3. | $\frac{5}{40}$ fish are tagged$\frac{5}{40}$ = $\frac{40}{320}$320 fish | 1 mark for $\frac{5}{40}$ seen1 mark for an equivalent fraction seen1 mark for correct answer | 3 |
| 4. | x(x + 6) = (x + 3)(x + 1) x² + 6x = x² + x + 3x + 3 2x = 3 x = 1.5 | 1 mark for at least 1 area written1 mark for equation set up for x1 mark for brackets correctly expanded1 mark for correct answer | 4 |
| 5. |  | 1 mark for 4 m from C1 mark for 10 m from C1 mark for 14 m from house1 mark for correct region shaded | 4 |
| 6. |

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|  | First car (x 0.9) | Second car (- 800) |
| Week 0 | 10 000 | 10 000 |
| Week 1 | 9000 | 9200 |
| Week 2 | 8100 | 8400 |
| Week 3 | 7290 | 7600 |
| Week 4 | 6561 | 6800 |
| Week 5 | 5904.90 | 6000 |
| Week 6 | 5314.41 | 5200 |
| Week 7 | 4782.97 | 4400 |
| Week 8 | 4304.67 | 3600 |

After 6 weeks | 1 mark for x 0.9 seen1 mark for at least 3 calculations for first car1 mark for at least 3 calculations for second car1 mark for correct answer | 4 |

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| 7. |

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| Distance (d m) | Ben’s frequency | M x f |
| 6.5 ≤ d < 7.0 | 3 | 20.25 |
| 7.0 ≤ d < 7.5 | 7 | 50.75 |
| 7.5 ≤ d < 8.0 | 25 | 193.75 |
| 8.0 ≤ d < 8.5 | 1 | 8.25 |
| 8.5 ≤ d < 9.0 | 0 | 0 |

273 ÷ 36 = 7.583 m

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| Distance (d m) | Jamie’s frequency | M x f |
| 6.5 ≤ d < 7.0 | 8 | 54 |
| 7.0 ≤ d < 7.5 | 18 | 130.5 |
| 7.5 ≤ d < 8.0 | 21 | 162.75 |
| 8.0 ≤ d < 8.5 | 3 | 24.75 |
| 8.5 ≤ d < 9.0 | 1 | 8.75 |

380.75 ÷ 51 = 7.466 mBen has a better chance of beating the champion as his mean is higher, despite Jamie having had more practice. | 1 mark for m x f calculated1 mark for 273 ÷ 361 mark for Ben’s mean1 mark for m x f calculated1 mark for 380.75 ÷ 511 mark for Jamie’s mean1 mark for correct conclusion | 7 |

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| 8. | y = -½x + c0 = -½ x -4 + cc = -2y = -½x - 2 | 1 mark for gradient –½1 mark for substituting gradient and (-4, 0) into y = mx + c1 mark for y-intercept calculated1 mark for correct answer | 4 |
| 9. |  2x(2x + 5) + (2x – 3)(x + 1) = 1024x² + 10x + 2x² - 3x + 2x – 3 – 102 = 0 6x² + 9x – 105 = 0 2x² + 3x – 35 = 0 (2x – 7)(x + 5) = 0x = 3.5 or -5 (cannot be -5 as negative length does not make sense)2 x 3.5 + 5 = 12 cm | 1 mark for equation set up for area of hexagon = 1021 mark for rearranged to equal 01 mark for factorisation1 mark for x values found1 mark for 3.5 chosen1 mark for correct answer | 6 |

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| 10. | 12² = 144$\sqrt{144 ÷2}$ = $\sqrt{72}$ = 8.4852… = 8.49 cm | 1 mark for 12²1 mark for dividing by 2 (equal sides)1 mark for √1 mark for 8 seen1 mark for correct answer | 5 |
| 11. | PQ = $\left(\begin{matrix}3\\3\end{matrix}\right)$ = 3$\left(\begin{matrix}1\\1\end{matrix}\right)$QR = $\left(\begin{matrix}6\\6\end{matrix}\right)$ = 6$\left(\begin{matrix}1\\1\end{matrix}\right)$PR = $\left(\begin{matrix}9\\9\end{matrix}\right)$ = 9$\left(\begin{matrix}1\\1\end{matrix}\right)$As the vector $\left(\begin{matrix}1\\1\end{matrix}\right)$ is a factor of both (all) vectors therefore are parallelBoth share a point therefore collinear | 2 marks for any 2 of the vectors2 marks for any 2 of the vectors factorised1 mark for parallel conclusion1 mark for collinear conclusion | 6 |