Bands 5 – 7 Problem Solving – Test 1 Answers

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | Length scale factor = 165 ÷ 133 = 1.24  Width scale factor = 82 ÷ 72 = 1.14  The two are not similar because their scale factors for length and width differ | 1 mark for length scale factor  1 mark for width scale factor  1 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 multiplying  1 mark for 5.4 x 10-1  1 mark for correct answer | 3 |
| 3. | fish are tagged  =  320 fish | 1 mark for seen  1 mark for an equivalent fraction seen  1 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 written  1 mark for equation set up for x  1 mark for brackets correctly expanded  1 mark for correct answer | 4 |
| 5. |  | 1 mark for 4 m from C  1 mark for 10 m from C  1 mark for 14 m from house  1 mark for correct region shaded | 4 |
| 6. | |  |  |  | | --- | --- | --- | |  | 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 seen  1 mark for at least 3 calculations for first car  1 mark for at least 3 calculations for second car  1 mark for correct answer | 4 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 7. | |  |  |  | | --- | --- | --- | | 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   |  |  |  | | --- | --- | --- | | 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 m  Ben 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 calculated  1 mark for 273 ÷ 36  1 mark for Ben’s mean  1 mark for m x f calculated  1 mark for 380.75 ÷ 51  1 mark for Jamie’s mean  1 mark for correct conclusion | 7 |

|  |  |  |  |
| --- | --- | --- | --- |
| 8. | y = -½x + c  0 = -½ x -4 + c  c = -2  y = -½x - 2 | 1 mark for gradient –½  1 mark for substituting gradient and (-4, 0) into y = mx + c  1 mark for y-intercept calculated  1 mark for correct answer | 4 |
| 9. | 2x(2x + 5) + (2x – 3)(x + 1) = 102  4x² + 10x + 2x² - 3x + 2x – 3 – 102 = 0  6x² + 9x – 105 = 0  2x² + 3x – 35 = 0  (2x – 7)(x + 5) = 0  x = 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 = 102  1 mark for rearranged to equal 0  1 mark for factorisation  1 mark for x values found  1 mark for 3.5 chosen  1 mark for correct answer | 6 |

|  |  |  |  |
| --- | --- | --- | --- |
| 10. | 12² = 144  = = 8.4852… = 8.49 cm | 1 mark for 12²  1 mark for dividing by 2 (equal sides)  1 mark for √  1 mark for 8 seen  1 mark for correct answer | 5 |
| 11. | PQ = = 3  QR = = 6  PR = = 9  As the vector is a factor of both (all) vectors therefore are parallel  Both share a point therefore collinear | 2 marks for any 2 of the vectors  2 marks for any 2 of the vectors factorised  1 mark for parallel conclusion  1 mark for collinear conclusion | 6 |