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| Guidance on the use of codes for this mark scheme | |
| M | Method mark |
| A | Accuracy mark |
| B | Working mark |
| cao | Correct answer only |
| oe | Or equivalent |
| ft | Follow through |

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| **Question** | **Working** | **Answer** | **Mark** | **AO** | **Notes** | **Grade** |
| **1 a**  **b**  **c**  **d** | 1 : 6 ≠ 6 : 1  because 1 : 6 = 6 : 36 (×6)  Or 6:1 = 1:  (÷6)  19 : 95  = 1 × 19 : 5 × 19  = 1 : 5  B: G  2 : 5  4 : 10  6 : 15 (21 students)  7 : 17.5 (not possible)  8 : 20 (28 students) | No  19 : 95 (÷19)  1 : 5  No, because the units must be the same in order to compare  No, to retain this ratio requires 2 boys and 5 girls each time, so 7 students. This means that there can only be multiples of 7 students in the club.  24 is not a multiple of 7. | M1  B1  B1  B1 | 2 | M1 for demonstrating an understanding of each ratio in its unitary form as a method of comparison, oe  B1 for calculation showing cancelling  B1 for an understanding of scale and equivalence of units  B1 for reference to multiples of 7 | B |
| **4** |
| **2 a**  **b** | Packs of 3:  90 ÷ 3 = 30  30 packs cost 30 × £1.50 = £45  Packs of 15:  90 ÷ 15 = 6  6 packs cost 6 × £5= £30  Packs of 25:  Not possible, because 90 is not divisible by 25.  Buy 2 get one free on packs of 15.  Buy two packs of 15 for £10  Get a pack of 15 free.  45 will cost £20.  So new cost = £20  Or (3 × 15) + (3 × 15) = 90  £10 + £10 = £20 | 6 packs of 15.  6 packs of 15 for £30.  No, still buy 6 packs of 15 but now for the lower price of £20. | B1  B1  B1  B1 | 2 | B1 for correct combination to 90  B1 for correct cost  B1 for a method for calculating of the cost  B1 for correct justification of choice | B |
| **4** |

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| **3 a**  **b** | Appropriate workings related to their question. | For example:  Easy: a shop increased its prices by 10%. If an item costs £100, how much more does it costs after the price increase? £10  Easy to find because original amount is £100.  Difficult: A worker’s hourly rate increased by 25%. If the hourly rate was £8 before the increase, how much does the worker get paid per hour after the increase? **£10**  Difficult to find because the percentage is not a multiple of 10 and context is more complex. | B1  B1  B1  B1 | 2  3 | B1 for clarity of question  B1 for explanation that links complexity of mathematics to context of question  B1 for clarity of question  B1 for explanation that links complexity of mathematics to context of question | B |
| **4** |
| **4** |  | The formula for density is:  density = mass ÷ volume  If the objects have the same volume but different masses, this formula indicates that the densities will be different and so suggests the objects are made from different metals. | B1 | 3 | B1 for insight into the effect of changing a variable in a formula | M |
| **1** |

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| **5 a**  **b** | 1 g/cm3 = 1000 kg/m3  So  2.3 g/cm3 = 2300 kg/m3  Use the formula:  density =  Rearrange the formula:  volume = mass ÷ density  1 tonne = 1000 kg  so volume = kg  2.7 g/cm3 = 2700 kg/m3  They both have the same volume.  Again, use the formula:  mass = density × volume  13 × 2700 = 35 100  The granite has a mass of 35.1 tonnes and the sandstone has a mass of 30 tonnes  OR  =1.17 | = 13 m3 to nearest m3  5.1 tonnes heavier or 17% heavier. | M1  M1  A1  M1  M1  A1 | 2  3 | M1 for conversion from g/cm3 to kg/m3  M1 for correct rearrangement of formula  A1 oe  M1 for calculating correct tonnage for granite  M1 for correct method for comparison of mass  A1 for stating correct comparison | M |
| **6** |

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| **6** | p0 = 630 kg/m3  pm = 550 kg/m3  m0 = 315 g  = 0.315 kg  Start with the formula: p =  Rearrange to: v =  The carvings are identical so the volume is the same.    Rearranging:  m*m* = 550 ×  = 0.275 kg | Mass = 275 g or 0.275 kg | M1  M1  A1 | 3 | M1 for dividing mass by volume and making correct comparison  M1 for rearranging  A1 oe | M |
| **3** |
| **7 a**  **b**  **c** | The ratio men : women is 5 : 2.  There are 24 women so the total membership is:  5 × 12 : 2 × 12  The ratio becomes 60 : 24  Then the total membership =  60 + 24 = 84  The ratio R : S : J is 2 : 3 : 5.  There are 10 shares.  £85 ÷ 10 = £8.50  Shaun pays 3 × £8.50 = £25.50 | 84  £25.50  Own question like the one in part a. For example: In a tennis club, 30 members are men. The ratio of women to men is 6 : 5. How many of the members are female? **36** | M1  A1  M1  A1  B1 | 3 | M1 for multiplying by 12 oe  A1 for 84 members in total  M1 for division of 85 by 10  A1 for correct multiplication 3 × £8.50 oe  B1 for correct type of question | M |
| **5** |
| **8 a**  **b**  **c** | b2 =  × b1  b2 =  × 8  = = 10 hours  b2 costs £198  b1 costs £118  = 1.68 to 2dp  = 1.25  =  b2 =  =  Reduction is:  £198 – £147.50 = £50.50 | 10 hours  The increase in cost is proportionally more than the increase in battery life.  She would need a reduction of £50.50. | M1  A1  B1  B1  M1  A1 | 3 | M1 for process of setting up equation  A1 cao  B1 for division of higher cost by lower cost  B1 for use of comparison to justify the answer  M1 for multiplying lower cost by 5 and dividing by 4  A1 cao | M |
| **6** |
| **9 a**  **b** | For the first 5-pack:  5 × 90 minutes = 450 minutes  £6.60 = 660p  650p ÷ 450 = 1.44p per minute  For the 10-pack:  10 × 80 = 800 minutes for £6.50 ÷ 800 = 0.8125p per minute cheapest  For the second 5-pack:  5 × 80 = 400 minutes  £4.00 = 400p  400p ÷ 400 = 1p per minute  Or  450 ÷ 6.50 = 69 minutes per £1  800 ÷ 6.50 = 123 minutes per £1 best value  400 ÷ 4.00 = 100 minutes per £1 | The best buy is the 10-pack of 80 minutes each @ £6.50.  There are more CDs than are needed.  A recording time of 80 minutes is not long enough.  £6.50 is too expensive at time of purchase (prefer just to spend £4). | M1  B2  A1 | 3 | M1 for process of multiplying up for total minutes and then division to identify either cost per minute or time per £  B2 for correct workings in each of the three cases  A1 for explanation of possible reasons not to choose the best buy | M |
| **4** |
| **10** | £800 × 1.19 gives €952  £800 × 1.22 gives €976  €976 – €952 = €24 | They will get €24 more. | M1  M1  A1 | 2 | M1 for multiplications  M1 for subtraction ft  A1 cao | M |
| **3** |
| **11 a i**  **ii**  **iii**  **b** | By expressing this as: ‘How many….. in ….’  Use chosen method from part a to explain correctly how to divide, using fractions. |  | B2  B1  B1  B1  M1 | 2 | B1 for correct justification  B1 for showing diagram oe  B1 for correct justification showing diagram oe  1 for correct justification showing diagram oe  B1 for correct explanation  M1 for process showing that dividing by doubles the number of pieces, so is the same as multiplying by 2 | M |
| **6** |

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| **12 a**  **b** | 8 kg = 8000 g  8000 ÷ 250 = 32  3 kg = 3000 g  3000 ÷ 85 = 35 (to nearest whole number)  2 kg = 2000 g  2000 ÷ 20 = 100  7 kg = 7000 g  7000 ÷ 250 = 28  So the limiting value is the amount of icing sugar. Therefore she can make 24 × 28 = 672 biscuits.  672 ÷ 15 = 44.8  44 ×  = 33  33 × £2.99 = £98.67  44 – 33 = 11 discounted  £2.99 × 0.85 = £2.54 to 2 dp  11 × 2.54 = £27.94  Total sales  = £98.67 + £27.94  = £126.61  Total costs  = £59 + £26 = £85  To calculate percentage profit:  profit =  = 0.489 529 412  and percentage profit  = 0.489 529 412 × 100% = 48.95% | She can make 44 complete packs of 15 biscuits.  49% profit to the nearest integer. | M1  B1  M1  A1  M1  A1  M1  A1 | 2  3 | M1 for process of division to see how many batches of 15 biscuits can be made with each ingredient  B1 for 32, 35, 100 and 28  M1 for correct identification of limiting value  A1 for correct cost of  of biscuits  M1 for use of 0.85 multiplier  A1 for cao  M1 for division of total sales by total cost (ft)  A1 for correct percentage with rounding | M |
| **8** |
| **13** | Price including VAT = £595 × 1.20 = £714  With a 20% discount: £714 × 0.8 = £571.20  £571.20 – £595 = £23.80  OR  £595 × 0.8 = £476  £476 × 1.2 = £571.20 | He is overpaying by £23.80  Disagree. He would pay the shop more than he needs to. | M1  M1  M1  A1 | 2 | M1 for process of multiplying by 1.2 to find cost with VAT  M1 for multiplying by 0.8 to find 20% reduced price (ft)  M1 for subtracting to find overpayment  A1 for demonstrating overpayment with explanation | M |
| **4** |
| **14 a**  **b**  **c**  **d** |  | With a reduction of 15%, the sale price (*B*) is A × 0.85.  A =  Yes, the new value will always be the original value multiplied by a percentage, calculated from the percentage change. For a reduction, the multiplier is (100 – the percentage reduction)%, for an increase it is (100 + the percentage increase)%.  Percentage change problem, for example: The cost of a new car was £*A*.  In the new financial year, it increased by 5% to £B. Write a formula to describe the proportional change.  B = A × 1.05 and A = . | M1  M1  A1  B1 | 2 | M1 for correct formula  M1 for correct rearrangement of ÷ by 0.85  A1 for clear explanation  B1 for clarity of communication of question | M |
| **4** |
| **15 a**  **b**  **c** | A × 1.5 × 1.5 = A × 1.52  = A × 2.25  80% discount gives a price of A × 0.20.  60% followed by 20% gives a price of  A × 0.4 × 0.8 = A × 0.32.  A × 0.75 × 1.20 = 0.9A  A × 1.20 × 0.75 =0.9A | No, an increase to *A* of 50% followed by another increase of 50% gives 2.25*A*.  Doubling would give 2*A* and 2*A* ≠ 2.25*A*.  An 80% discount off the price of A gives a new price of 0.2A.  A 60% discount off the price of A, followed by a further 20% discount, gives a new price of 0.32A so the 80% discount is better value.  If the original cost is A, the cost after a discount of 25% is 0.75A and paying VAT at 20% gives a new price of 0.9A.  If VAT is added first, the price is 1.2A. A 25% reduction gives a new price of 0.9A.  Because multiplication is commutative, the final prices are the same. It makes no difference. | B1  B1  B1 | 2 | B1 for clear explanation with calculated justification oe  B1 for clear explanation with calculated justification oe  B1 for clear explanation with calculated justification oe | M |
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| **16 a**  **b**  **c**  **d**  **e** | *A* ×= £996  *A* = £996 ×  = £1162  *A* × 1.04 = £6.50  *A* =  = £6.25  *A* × 1.07 = £957.65  *A* = £= £895  If the original amount is A, the multiplier is b for a percentage increase or decrease, and the new value is C:  A × b = C | £1162    £6.25  £895  *A* = *C* ×  If the multiplier is x:  x > 1 means an increase  0 < x < 1 means a decrease. | M1  A1  M1  A1  M1  A1  B1  B1 | 2  3 | M1 for multiplication  A1 cao  M1 for multiplication by 1.04 and rearrangement  A1 cao  M1 for multiplication by 1.07 and rearrangement  A1 cao  B1 for correct explanation either in words or by a general formula, provided the variables are defined  B1 for clarity that a decrease has a multiplier between 0 and 1 and increase has a multiplier greater than 1 (a multiplier of 1 will not change the value) | M |
| **8** |
| **17 a**  **b** | Comparing salary in May and April:  £1568 – £1544 = £24  Comparing sales in May and April: £24 is earned on £4000 sales.  24 000 ÷ 4000 = 6  6 × £24 = £144  £1544 – £144 = £1400  So the basic salary is £1400.  £1553 – £1400 = £153  == 6.375  6.375 × 4000 = £25 500  Own question | £25 500  Own question | B1  B1  B1  B1  B1 | 3 | B1 for subtraction of April salary from May salary  B1 for clearly comparing the salary difference with the sales difference  B1 for division and multiplication to establish basic salary (ft)  B1 for correct calculations to find sales figure (ft)  B1 for clear question with reasoning and solution | M |
| **5** |

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| **18** | Number on Saturday = 2 × number on Friday  S × 1.5 = (2F) × 1.5  S =  = 2*F* | There are still twice as many visitors on Saturday as on Friday. There are 100% more visitors on Saturday compared to Friday. | B1 | 3 | B1 for an explanation that includes an appreciation that the two sets of visitors increase proportionally and that the original proportion therefore does not change oe | M |
| **1** |
| 1. **a**   **b** | Number of workers = W  Number of days = t  K = constant  W =  2 =  so k = 40  W =  With 3 workers:  3=  t = = 13 days  This is Thursday of week 3. | They would finish after 13days.  They would probably get in each other’s way and would not be able to complete the job in a very short time.  Some jobs have to wait until others are finished, for example, they can’t paint until the walls have been plastered. | M1  A1  B1 | 3 | M1 for finding constant of proportionality  A1 for division of 40 by 3 and relating this to number of days worked  B1 for an appropriate reason oe | M |
| **3** |
|  |  | Current costs are £1.50 per mile and 20p per minute.  Competitive pricing structure: answers will vary.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Time taken | 2 min | 5 min | 10 min | 12 min | 15 min | | Distance | 1 mile | 2 miles | 3 miles | 5 miles | 6 miles | | Total charge  (A) | £2.50 | £4.00 | £6.50 | £9.90 | £12.00 | | Total charge (B) | £1.90 | £4.00 | £6.50 | £9.90 | £21 | | M1  A1  B1 | 2  3 | M1 for process of finding charges  A1 for working out current price structure  B1 for correct calculation of a pricing structure that has an element of competition  The suggestion (B) competes for short distances, matches for mid distances and is not competitive for longer journeys. | M |
| **3** |
| **21 a**  **b**  **c**  **d** |  | Travel 30 miles in 45 minutes.  45 minutes = hour  =  =  = 40 mph as required  Not changing minutes into hours.  Units of speed =  Own easy and difficult examples | B1  B1  B1  B1  B2 | 2 | B1 for correct explanation with calculation that indicates 10 miles every 15 minutes implies 40 miles every 60 minutes oe  B1 for clear explanation  B1 for stating a common misconception  B1 for correctly stating the relationship between speed, distance and time  B1 for one easy and one difficult example with justification  B1 for multiple different examples | M |
| **6** |
| **22** | A rectangle 1 m × 2 m  Area = 2 m2  A rectangle 4 m × 8 m  Area = 32 m2  Length scale factor = 4  Area scale factor = 16 (42) | 32 m2 | M1  A1 | 2  3 | M1 for process of trial and improvement  A1 cao | M |
| **1** |
| **23** | 75 ÷ 30 = 2.5  Length scale factor is 2.5  Volume scale factor is  (2.5)3 = 15.625  5000 × 15.625= 78,125 cm3 = 78.125 litres | 78.125 litres | M1  M1  A1 | 2  3 | M1 for calculation of length scale factor  M1 for calculation of volume scale factor  A1 cao | M |
| **3** |
| **24** | Length scale factor = 450 ÷ 15 = 30  Volume scale factor = 303 = 27 000  450 × 27 000 = 12 150 000 cm3  (÷ 1003 for m3 )  = 12.15 m3 | 12.15 m3 | M1  M1  M1  A1 | 3 | M1 for calculation of length scale factor  M1 for calculation of volume scale factor  M1 for correct conversion to cubic metres  A1 cao | M |
| **4** |
| **25** | Length scale factor = 18 ÷ 12 = 1.5  Volume scale factor = (1.5)3  Volume of paint in big tin = 800 ml × (1.5)3 = 2700 ml  2700 ÷ 800 = 3.375  So he can fill 3 tins. | 3 small tins can be filled from one large tin. | M1  M1  A1 | 2 | M1 for calculation of length scale factor  M1 for calculation of volume scale factor  A1 cao | M |
| **3** |
| **26 a**  **b** | New area is (a × 1.15)2  = a2 × 1.152  = 1.3225a2  Percentage increase =  (1.3225 – 1) × 100%  Area = a × 1.15 × b × 0.95  = ab × 1.15 × 0.95 = 1.0925ab  Percentage increase (1.0925 – 1) × 100% | Area increases by 32.25%.  Area increases by 9.25%. | M1  A1  M1  A1 | 2 | M1 for use of correct multiplier showing 15% increase  A1 cao  M1 for use of correct multiplier showing 15% length increase and 5% width decrease  A1 cao | M |
| **4** |
| **27 a**  **b**  **c**  **d** | |  |  |  | | --- | --- | --- | | **A** | **B** | **C** | | 5 | **4** | 17 | | 4 | 3.2 | 13.6 | | 2 | 1.6 | **6.8** | | 8 | 6.4 | 27.2 | | 12 | 9.6 | 40.8 | | 6.8 | 5.44 | 23.12 | | 2.8 | 2.24 | 9.52 |   = = 0.8  = = 3.4  This also means that  == 4.25  So yes there is enough information.  13 items  e.g.   |  |  |  | | --- | --- | --- | | **A** | **B** | **C** | | ● |  |  | |  | ● | ● | |  | ● | ● | |  | ● | ● | |  | ● | ● | |  | ● | ● | |  | ● | ● |   One variable is isolated from the other two.  9 items e.g.   |  |  |  | | --- | --- | --- | | **A** | **B** | **C** | | ● |  | ● | |  | ● | ● | |  |  | ● | |  |  | ● | |  |  | ● | |  |  | ● | |  |  | ● |   There should be at least one value in each row and two rows should have at least two pairs linking a different pair.  Always start in a row where at least 2 quantities are given, to work out the third quantity, so that relationships between all three are known. Then use these to work out other quantities.  In this example there are 2 possible starting points. | Yes, there is sufficient information. | B1  B1  B1  B1  B1 | 2 | B1 if all three ratios are shown as part of the explanation and justification of answer  B1 for clear explanation of as many values entered as possible such that one variable remains isolated from the other two oe  B1 for clear explanation that there should be at least one value in each row and two rows should have at least two values linking a different pair of A, B, C oe  B1 for clear explanation  B1 for explanation of the best starting point and stating how many different starting points there are | M |
| **5** |
| **28** | In year 1:  £8000 × 0.027 = £216  Interest = £216  Less 20% tax:  £216 × 0.8 = £172.80  So the total at end of year 1  = £8000 + £172.80  =£8172.80  In year 2:  £8172.80 × 0.027 = £220.67  Interest = £220.67  Less 20% tax:  £220.67 × 0.8= £176.54  At end of year 2 :  Amount = £8172.80 + £176.54  = £8349.34 | No, Sam is incorrect.  She will have £8349.34  See workings as explanation. | M1  M1  M1  A1 | 2 | M1 for use of correct multipliers  M1 for multistep calculation for year 1  M1 for multistep calculation for Year 2 (ft)  A1 for clarity of explanation through setting out of calculations | M |
| **4** |
| **29** | B × 0.8*n*<  Divide both sides by B.  0.8*n*<  0.83 = 0.512  0.84 = 0.4096  OR  £100 × 0.8 =£80  £80 × 0.8 = £64  £64 × 0.8 = £51.20  £51.20 × 0.8 = £40.96 | 4 weeks | M1  M1  M1  A1 | 2 | M1 for choosing a starting a position, either a variable such as *B* or a specific amount such as £100  M1 for working through the weeks in some way  M1 for the process of finding amounts for weeks 3 and 4 to show the point at which the bank account first dips below 50% of the original balance  cao | H |
| **4** |
| **30** |  | 1. graph d 2. graph e 3. graph b 4. graph c 5. graph f 6. graph a | B6 | 2 | B1 for each correctly identified graph with reference to why, for example:  f(x) ∝ x2 is graph d as points are (–2, 4), (–1, 1), (0, 0), (1, 1), (2, 4) and it is a parabola  f(x) = 2x , x >0 f(x) = –2x , x < 0 is graph e as it is linear and has no negative f(x) values; the gradient is 2 and –2 | H |
| **6** |
| **31 a**  **b**  **c** | y =  xy = k where k is the constant of proportionality | Inverse proportion describes the relationship between two variables such that as one increases the other decreases.  xy = k  or y =  Own problem, for example: It takes 5 men 10 days to dig a hole. The number of men, y, is inversely proportional to the number of days, x. How long would it take for ten men to dig the same hole? (5 days) | B1  M1  A1 | 2 | B1 for clear explanation of inverse proportion  M1 for correct equation  A1 for clear question | H |
| **3** |
| **32 a**  **b**  **c** | r = 6 × 103 m  F*1* ∝  =  F*2* ∝  =  = 0.996 | Fg =  0.996 to 3 dp  The difference is too small (reference part b). | M1  M1  A1  A1 | 2 | M1 for correct function  M1 for calculation of F1 and F2  A1 cao  A1 for correct interpretation of a scale factor close to 1 | H |
| **4** |
| **33** |  | The speed of the faster car is 40 mph.  T = =  So they meet after 30 minutes.  Speeds are in the ratio  1 : 2 = 20 : 40 = 10 : 20  So the cars meet when the slower car has travelled 10 miles and the faster car has travelled 20 miles. It will take half an hour for a car travelling at 20 mph to go a distance of 10 miles. | M1  B1  A1 | 2 | M1 for recognising and using the ratio of the speeds  B1 for clarity of reasoning and explanation, diagram oe  A1 cao | H |
| **3** |
| **34** | 4y = 2x2  y =  gradient =  =  =  = 3 | 3 | M1  A1 | 2 | M1 for rearranging and substituting given values of x  A1 cao | H |
| **2** |
| **35** |  | =  =  As above. | M1  A1 | 2 | M1 for appropriate substitution to enable comparison with Q35  A1 for showing that the two functions give the same answer | H |
| **2** |
| **36 a**  **b** | f*(*x*) =* mx +c  The gradient =  *=*  *=* m  f*(*x*) =* at x *= 2*  The gradient =  *=* *(*2x *+* h*)* h*→ 0*  *=* *(*2x*) =* x  At x= 2, gradient = 2.  From the graph, points on the tangent are (1, 0) and (2, 2).  The gradient = = 2 | As working  As working | M1  A1  M1  A1  A1 | 2 | M1 for clarity of proof  A1 for accuracy with manipulation of function  M1 for clear reasoning  A1 for accuracy with manipulation of function to show a gradient of 2  A1 for gradient from points on the straight line | H |
| **5** |
| **37 a**  **b** | £28 000 × 1.053 = £32 413.50  £14 500 × 1.05*n*> £ 20 000  = 1.4  Try n = 7 years.  £14 500 × 1.057 = £20 402.96 | £32 413.50  7 years | B1  M1  A1 | 2 | B1 for identification and use of multiplier  M1 for trial and improvement or reasoning to try 7 years  A1 cao | H |
| **3** |
| **38** | Sycamore:  4 × 1.0811 = 9.327  4 × 1.0812 = 10.073  Conifer:  2 × 1.1511 = 9.305  2 × 1.1512 = 10.7 | 12 years  After 11 years, the sycamore is 9.326 m tall and the conifer is 9.305 m tall. After 12 years, the sycamore is 10.073 m tall and the conifer is 10.7 m tall. | M1  M1  A1 | 2 | M1 for correct calculation method to find heights of trees  M1 for clarity of final reasoning  A1 for finding all four heights after 11 and 12 years | H |
| **3** |

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| **39 a**  **b**  **c** | A × 1.04*n*= 2A  Divide both sides by A.  1.04*n*≥ 2  1.0410 = 1.48 (2 dp)  1.0415 = 1.80 (2 dp)  1.0420 = 2.19 (2 dp)  1.0417 = 1.95 (2 dp)  1.0418 = 2.03 (2 dp)    0.6*n*= 0.1  0.62 = 0.36  0.65 = 0.077 76  0.64 = 0.1296 | 18 years  4 bounces  Own problem | M1  A1  M1  A1  B1 | 2 | M1 for appropriate iterations to find 2*A*  A1 cao  M1 for appropriate iterations to find number of bounces  A1 cao  B1 for clarity, relevance and accuracy of own question | H |
| **5** |
| **40 a**  **b** | *f*(x) *=* a*(*b*)x*  Day Number of bacteria   1. 1 2. 2 3. 4 4. 8 5. 16 6. 32 7. 64 = 26 | 26 = 64  The population doubles each day.  a and b are constants.  a is the starting size of the population and so doesn’t change.  b is the multiplier (by how much the population grows each day) and the value of this doesn’t change.  x is a variable as it represents the changing number of days. | M1  A1  B3 | 2 | M1 for correct iterations  A1 cao  B3: one mark for each explanation of a, b and x | H |
| **5** |

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| **41**  **I**  **ii**  **iii** |  | F(x) = a(b)*x*  b < 1 the population decreases.  b = 1 the population stays the same.  b > 1 the population increases. | B3 | 2 | B1 for each correct explanation of the impact on the population as b varies | H |
| **3** |
| **42 a**  **b** | Epidemic started by a single carrier so  *x*0 = 1.  Considering infection after 10 days so *t* = 10. | x*n* + 1 = *Rt*x0  x10 = *R*10  Newspaper headline to engage readers with the story of this epidemic e.g. how long before x people are infected. | M1  A1  B1 | 2 | M1 for correct interpretation of , and use of, the iterative formula  A1 for cao  B1 for relevant , informative headline | H |
| **3** |
| **43** |  | 0.43 bar | M1  A1 | 2 | M1 for correct use of formula  A1 cao | H |
| **2** |
| **44 a**  **b** | x *=* 1 +  x(x – 3) = x – 3 + 11  x*2 –* 3x *=* x + 8  x*2 –* 4x – 8 *=* 0  if x1= 5  x*2*= 1 +  = 1 +  = 6.5  x3 = 1 +  = 4.14286  … | Show that… as workings.  x = –1.46 to 2 dp | M1  A1  M1  M1  A1 | 3 | M1 for algebraic manipulation  B1 for clarity of justification  M1 for correct use of iteration  M1 for substitutions  A1 for one root found (no credit if both roots are found)  Using x = 5 as the first iteration, after 19 iterations you arrive at x = –1.46 to 2 dp  Likewise, if the first trial is –1, 11 iterations lead to the solution x *= –*1.46 to 2 dp. | H |
| **5** |