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

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| **Question** | **Working** | **Answer** | **Mark** | **AO** | **Notes** | **Grade** |
| **1 a**  **b**  **c** | 1.75 × 3.50 = 6.125  6.13 × 2 = 12.26  6.13 × 1.05 = 6.4365 | £6.13 to nearest penny  £12.26  £6.44 to nearest penny | M1  A1  M1  A1  M1  A1 | 3 | M1 for correct method  A1 cao  M1 for correct method, accept 2 × 6.125 = £12.25  A1 for £12.26 or £12.25  M1 for correct method, accept 6.125 × 1.05 = 6.43125  A1 for £6.44 or £6.43 | B |
| **6** |
| **2** |  | 995 ml | B1 | 3 | B1 for 995 | B |
| **1** |
| **3** | 1 km = 1000 m  = 1000 × 100 cm  = 100 000 cm | 1 km = 100 000 cm | B2 | 3 | B1 for km to metres  B1 for metres to centimetres | B |
| **2** |
| **4** |  | He has forgotten that there are 60 minutes in an hour, not 100. 1 hours is 75 minutes | B1  B1 | 2 | B1 for stating he has used 1 hour as 100 minutes  B1 for correct answer as 75 minutes | B |
| **2** |
| **5** | 15 minutes =  =  hour  Total time is 1 hours + hour = 2 hours  18:40 plus 2 hours gives 20:40. So the film will finish at 20:40.  If Peter’s Dad leaves at 9 p.m. and it is a 20 min drive he will get to the cinema at 9:20 p.m. or 21:20. | No, Peter’s dad is not correct as they will have been waiting for 40 min by the time he gets there. | M1  A1  B1  B1 | 2  3 | M1 for calculating the time the boys will be leaving  A1 cao  B1 for dad’s arrival time  B1 for clear explanation of dad being late | B |
| **4** |

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| **6** |  | could be odd one out as it’s the only terminating decimal equivalent/the only one with 1 as the denominator/unit fraction.  could be odd one out as it’s the only one which is not in its simplest form.  could be odd one out as after simplifying  it’s the only one not having a numerator of 1/unit fraction. | B1  B1  B1 | 2 | B1 for a valid reason for  B1 for a valid reason for  B1 for a valid reason for | B |
| **3** |
| **7 a**  **b** |  | Look at the first decimal place of the decimal, put the numbers in order. If any have the same digit in this place, look to the second decimal place and put these in order. Keep going along the decimal places until all numbers are in order.  E.g. 0.24  Closest to 0.23 as it is smaller than 0.25 which is halfway between the two numbers. | B1  B1  B1 | 2 | B1 for explanation of what you look for when ordering decimals.  B1 for a decimal between 0 .23 and 0.27 (not 0.25)  B1 for clear explanation | B |
| **3** |

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| **8 a**  **b**  **c** | 500 – (85 × 5) = 500 = 75 | 75p  500 – (85 × 5)  e.g. for 500 × (85 ×5)  Pip buys some nails in packs of five. Each pack is in a box containing 85 packs. He has ordered 500 boxes. How many nails has he ordered?  e.g. for 500 + (85 × 5)  Pip buys some nails in packs of five. He buys a box containing 85 packs. He already had 500 nails, so how many has he altogether now?  e.g. for 500 ÷ (85 × 5)  Pip needs 500 nails. The nails come in packs of 5 in boxes containing 85 packs. How many boxes does he need? | B1  B1  B1  B1  B1 | 2  3 | B1 cao  B1 cao  B1 for simple word problem that requires the calculation  B1 for simple word problem that requires the calculation  B1 for simple word problem that requires the calculation | B |
| **4** |
| **9 a**  **b** | Difference between  –123.67 and 1428.62, which equals 1428.62 + 123.67 = 1552.29 | She was overdrawn.  £1552.29 | B1  M1  A1 | 2  3 | B1 a correct answer  M1 for correct method of finding the difference  A1 cao | B |
| **3** |
| **10 a**  **b**  **c** |  | × 100  Because multiplying by 100 will have the effect of moving 72 two places to the left.  e.g. 100 ÷ 4  5 × 5  25 × 10  E.g. I looked for a simple question with an answer of 10 × 25, then realised this is the answer. | B1  B1  B2  B1  B1 | 2 | B1 for a correct operation  B1 for clear explanation  B1 for a suitable question where the answer is 25.  B1 for another suitable question where the answer is 25.  B1 for a correct question with answer of 250  B1 for a clear explanation | B |
| **6** |
| **11** |  | A prime number has only two factors, one and itself. So 36 is not a prime number.  The true statement is that 36 has 8 factors. | B1  B1 | 2 | B1 for clear explanation  B1 for correct true statement | B |
| **2** |
| **12 a**  **b**  **c**  **d**  **e** |  | No, a prime number cannot be a multiple of 4 because a prime number has only two factors, one and itself.  e.g. 501  the sum of its digits is divisible by 3  A number is divisible by 6 if it is divisible by 2 (even) and divisible by 3 (the sum of its digits is divisible by 3)  e.g. 105  It ends in 5 and the sum of its digits is divisible by 3  A number is divisible by 25 if it ends with 00, 25, 50, or 75. | B1  B1  B1  B1  B1  B1  B1  B1 | 2 | B1 for No  B1 for clear explanation  B1 for a suitable number  B1 for clear explanation  B1 for clear explanation  B1 for suitable number  B1 for clear explanation  B1 for clear explanation | B |
| **8** |
| **13** | = 4 | 4 tiles | M1  A1 | 3 | M1 for finding square root of 16  A1 cao | **B** |
| **2** |
| **14** |  | 720  Use multiplication as the inverse of division.  7.2 × 10 × 10 = 7.2 × 100 = 720 | B1  B1 | 2 | B1 for 720  B1 for clear explanation. | B |
| **2** |
| **15** | 1 × 20p (2 × 20p = 40p > 34p)  14p left to find  2 × 5p (3 × 5p = 15p > 14p)  2 × 2p = 4p  Total 34p as required  1 × 20p, 2 × 5p, 2 × 2p: 5 coins | 5 coins | M1  A1 | 3 | M1 for the process of finding suitable coins  A1 cao | B |
| **2** |
| **16 a**  **b** | 1 cm = 10 mm  So 300 cm = 300 × 10 = 3000 mm | So 30 000 mm is longer.  e.g. 500 cm, 5000 mm | M1  B1  B1 | 2 | M1 for method of changing one unit to the other  B1 for correct statement  B1 for a correct example | B |
| **3** |

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| **17** | | 12 × 15 = 180 ice creams all together  Cost of ice creams = 12 × £4.50 = £54  105 × 80p = 8400p = £84  180 – 105 = 75  75 × 50p = 3750p = £37.50  Total sales  £84 + £37.50 = £121.50  Profit = £121.50 – £54 = £67.50 | £67.50 | | B1  B1  B1  B1  B1  M1  A1 | 3 | | B1 for 180  B1 for 54  B1 for 84  B1 for 37.50  B1 for 121.50  M1 for finding difference  A1 cao | B |
| **7** |
| **18 a**  **b** | | 540 – 300 = 240  240 × 5= 1200p = £12  Add £25 for the month  240 × 0.25 = 60  So 180 calls @ 5p  = 180 × 5p = 900p = £9  60 calls @ 3p  = 60 × 3p = 180p = £1.80  Total = £9 + £1.80 = £10.80  Difference = £12 – £10.80 = £1.20 | £37  £1.20 | | M1  A1  A1  M1  B1  B1  M1  A1 | 3 | | M1 for finding how many calls chargeable  A1 for 12  A1 cao  M1 for method of finding 25%  B1 for 9  B1 for 1.80  M1 for finding difference  A1 cao | B |
| **8** |
| **19 a**  **b** | Change both fractions to 12ths  =  =  Between these two is  Change each to a decimal and look at the difference to 1/3  →0.333 333  → 0.322 581, difference is 0.010 752  → 0.327 869, difference is 0.054 644  → 0.296 703, difference is 0.003 663  → 0.331 126, difference is  0.002 208  So  is the closest  OR  Make each fraction have a numerator of 1, so  →  →  →  →  The closer the denominator is to 3, the closer the fraction is to | | |  | B1  B1  M1  B1  B1 | | 2 | B1 for suitable fraction alongside with explanation  B1 for any fraction between  and  M1 for a suitable process of comparing the fractions  B1 for accuracy of results  B1 cao | M |
| **5** | |
| **20** |  | | | Compare the denominator but not take into consideration the numerator. | B1 | | 2 | B1 for clear explanation | M |
| **1** | |

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| **21 a**  **b**  **c** | Total area is 11.25 + 7.5 = 18.75 m2  18.75 × 78 = 1462.5  1463 to nearest whole brick  1463 = 14 ×100 + 63  = 1400 × 1.08 + 63 × 1.79  = £1512 + £112.77  = £1624.77  Or 15 × 100  = 1500 × 1.08  = £1620  Cheaper to buy 15 × 100  1463 ÷ 11 = 133  So buy 133 lots of 10, getting 133 free  Gives 1463 bricks  Would need to buy 1330 bricks at £1.65 plus VAT.  = £1.65 × 1.20 × 1330  = £2633.40  About £1000 more. | 1463 bricks  £1620  No, because the cost is about £1000 more. | M1  M1  A1  M1  A1  B1  M1  A1  M1  B1  B1  B1 | 3 | M1 for process of splitting the shape into two rectangles  M1 for method of finding total area of the shape  A1 cao  M1 for method of finding number of bricks  A1 cao  B1 for showing cheapest way to buy bricks  M1 for method of calculation  A1 cao  M1 for process of finding out how many needed to buy  B1 for 1330  B1 for £2633.40 ft  B1 for stating no with clear explanation | M |
| **12** |
| **22 a**  **b**  **c** |  | 4.6 × 40  = 4.6 × 10 × 4  = 46 × 4  = 184  e.g. 4.6 × 40  Round to 5 × 40 = 200  So the answer in part a makes sense.  e.g. Divide both by 10, or multiply both by 10 to give  11.56 ÷ 0.34 = 34  Or 1156 ÷ 34 = 34 | M1  B1  B1  B1  B1  B1 | 2 | M1 for correct way of creating answer  B1 for 184  B1 for clear explanation  B1 for clear explanation  B1 for first example  B1 for second example | M |
| **6** |
| **23 a**  **b** |  | Story about the calculation  Own calculation story with mark scheme | B2  B2 | 2 | B1 for a sensible story  B1 for suitable involvement of figures  B1 for story with calculation  B1 for suitable mark scheme | M |
| **4** |
| **24 a**  **b**  **c**  **d**  **e** |  | 8 × 100 = 8 × 10 × 10 = 80 × 10 as required  =  =  × 1 as required  6 ÷  is the same as asking how many times does  go into 6 which is 6 × 3 = 18  6 ÷  will be less than 18 as  will go into 6 less times as it is bigger than  Use 3 × 3 = 9 and 3 × 15 = 45 to create, for example:  15 × 3 = 45  45 ÷ 5 = 9  e.g. Bill and Ted’s ages multiply together to make 64. What are their ages?  The product of Bill’s baby sister and his dad is 64. What are their ages?  The link is Bill.  e.g. Three brothers win £15 between them. How much will each receive?  Tom won £5 and bought some games that cost £1 each. How many games did he buy?  The link is winning. | B1  B1  B1  B1  B1  B1  B1  B2  B1  B2  B1 | 2 | B1 for clear explanation  B1 for clear explanation  B1 for clear explanation  B1 for clear explanation  B1 for clear explanation  B1 for first example  B1 for second example  B1 for first suitable question  B1 for second suitable question  B1 for creating and stating a link  B1 for first suitable question  B1 for second suitable question  B1 for creating and stating a link | M |
| **13** |
| **25** |  | 4, 9, 25, 49  They are all the square of a prime number. | A1  B1 | 2 | A1 cao  B1 for clear explanation | M |
| **2** |
| **26** |  | True when:  4 is a factor of each of the numbers  or 4 is a factor of just two of the numbers*.*  False when:  either only one or three of the numbers has a factor of 4 | B1  B1 | 2 | B1 for clear explanation  B1 for clear explanation | M |
| **2** |
| **27 a i**  **ii**  **iii**  **b**  **c** | 629 = *x* × 17  Using inverse operations and rearranging:  629 ÷ 17 = 37 | e.g. 101, 103, 107, 109  103 = 1000  So 93= 729  89 + 11  2484: even so 2 is a factor  17625: ends in 5 so 5 is a factor  3426: even so 2 is a factor  37 | B1  M1  B1  B1  B1  B1  M1  B1 | 2 | B1 for any prime number greater than 100 with justification  M1 for process of looking for 93  B1 cao  B1 for correct pair  B1 for explanation about both even numbers  B1 for explanation about multiple of 5  M1 for process of using inverse operation  B1 cao | M |
| **8** |
| **28** | Try first as 2  Second is 6  Third is 11  Sum is 19, out of range  Try first as 3  Second is 9  Third is 14  Sum is 26, possible  Try first as 5  Second is 15  Third is 20  Sum is 40 out of range | There is only one possible first number and that is 3. | M1  B1  M1  B1  M1  B1  B1 | 3 | M1 for starting with smallest prime of 2  B1 for clearly stating out of range  M1 for trying next prime of 3  B1 for clearly stating it’s a possible one.  M1 for continuing with the next prime 5  B1 for clearly stating out of range  B1 for final solution of only one possible answer | M |
| **7** |

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| **29 a**  **b** |  | Sometimes  True when the cube of a number is greater than 1.  Not true for numbers 1 or less.  Always  The square of a positive number is positive.  The square of a negative number is positive. | B1  B1  B1  B1 | 2 | B1 for sometimes  B1 for clear explanation  B1 for always  B1 for clear explanation | M |
| **4** |
| **30 b**  **c**  **d** |  | 26 or 43  33  62 | B1  B1  B1 |  | B1 for either  B1 cao  B1 cao | M |
| **3** |
| **31 a**  **b**  **c** |  | 10 × 2 or 2 × 10  20 × 10 × 2  = 2 × 10 × 10 × 2  = 2 × 2 × 5 × 2 × 5 × 2  = 2 × 2 × 2 × 2 × 5 × 5  = 24 × 52 as required.  He has treated 2*N*and *N* × 2 as the same calculation. | B1  M1  B1 | 2  3 | B1 for 10 and 2 either way round  M1 for showing the process of reducing to a product of primes  B1 for clear explanation | M |
| **3** |
| **32 a**  **b**  **c**  **d** | 62 ÷ 62 = 62 – 2 | 1  60  60 = 1  When you divide a number by the same number you always get 1.  Any combination of *a* and *b* such that the sum is equal to 9  E.g. *a* = 8, *b* = 1 | B1  M1  A1  B1  B1  B1 | 2 | B1 cao  M1 subtracting the powers  A1 cao  B1 cao  B1 for clear explanation  B1 any correct pair that add up to 9 | M |
| **6** |

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| **33 a i**  **ii**  **iii**  **b**  **c**  **d** |  | Sometimes  True when the digits are to the left of the decimal point.  Sometimes  True when both are positive, false when one is negative.  Sometimes  true for positive numbers,  false for negative numbers  e.g. – × –  =  This works because multiplying two negative numbers gives a positive one. Positive numbers are always larger than negative numbers.  False because 0.1 is smaller than 0.9 | B1  B1  B1  B1  B1  B1  B1  B1  B1 | 2 | B1 for sometimes  B1 for clear explanation  B1 for sometimes  B1 for clear explanation  B1 for sometimes  B1 for clear explanation  B1 for a correct example  B1 for clear explanation  B1 for false with a clear explanation | M |
| **9** |
| **34 a**  **b** | 42 – 15 | 27 °C  Easy, e.g. 1 – 8  Harder, e.g. –3 + –4 | M1  A1  B1  B1 | 2  3 | M1 for subtracting  A1 cao  B1 for a correct example  B1 for a correct, harder example | M |
| **4** |
| **35** |  | Larger  Dividing a positive number by a positive number less than 1 will always result in a larger number than you started with | B1  B1 | 2 | B1 for larger  B1 for clear explanation | M |
| **2** |
| **36** |  | I left home at 10 past 2 and walked for 50 minutes. The temperature was 13 °C.I could see an aeroplane overhead at 3000 feet. Altogether I had walked 3 miles.  Own question similar to the one in part a together with an answer and mark scheme. | B2  B2 | 2 | B1 for rounding the times and temperature sensibly.  B1 for rounding distances sensibly  B1 for suitable question  B1 for the mark scheme | M |
| **4** |

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| **37** | 1 mile =  km  5.5 miles =  × 5.5 km  = 8.8 km | Her usual supermarket is closer. | B1  M1  A1  B1 | 3 | B1 for conversion stated  M1 for multiplying distance by conversion factor  A1 for a correct answer  B1 for clearly stating correct solution. | M |
| **4** |
| **38** | 79 298 – 78 987 = 311 kWh used.  80 kWh @ £20.95= 1676p  = £16.76  311 – 80 = 231  231 kWh@ £10.80 = 2494.80  = £24.948  Total bill = £16.76 + £ 24.948 = £41. 708  Assumptions that if you average consumption over the year April will be representative. | £41.71  Yes | M1  B1  B1  B1  A1  B1 | 2 | M1 for subtracting the given readings to find the amount of electricity used.  B1 multiplying 80 by 20.95 or for writing down £16.76.  B1 for subtracting 80 from 311 and then finding the cost of the remainder used by multiplying by 10.80 or for writing down £24.948  B1 for adding the two amounts found together or writing down £41.708  A1 for conversion to pounds correctly  B1 for assumption made such as that given or showing that the standing order is higher than the cost of electricity used in April.  oe assumptions stated | M |
| **6** |

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| **39** | Assuming inclusive and not a leap year  27 August to 30 December  = 4 + 30 + 31 + 30 + 30 = 125 days  31 December to 9 April  = 1 + 31 + 28 + 31 + 9  = 100  Total number of days = 225 days  Total amount of electricity used  = 55916 – 53480 = 2436 kWh  **Current supplier**  225 × 13.99 = 3147.75  = £31.4775  15.09 × 2436 = 36759.24  =£367.5924  Total = £399.07  **New supplier**  225 × 23.818 = 5359.05  = £53.5905  14.37 × 2436 = 35005.38  = 350.0538  Total = £403.64 | He should stay with his current supplier assuming that electricity use continues at the same level. The summary does not include the summer months when use is likely to be less. The difference is likely to be greater for the summer months. | M1  A1  B1  B2  B1  B2  A1  B2 | 2 | M1 for showing how many days from each month are used and added together.  B1 For stating the assumptions about inclusive days, that this is not a leap year and for calculating number of days correctly.  B1 for showing how to find the difference of the readings  B2 for showing how to calculate each part of the total cost. B1 if the conversion to pounds and correct rounding has not been done.  B1 for showing how the cost is derived for the new supplier with same data as before.  B2 for the finding the total cost and correctly rounding into money units. B1 if the correct amount has been calculated but not rounded or changed to correct monetary units.  A1 for correctly stating he should stay with current supplier.  B2 for clarity of answer, including any assumptions given. | M |
| **11** |

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| **40 a i**  **ii**    **iii**  **iv**  **b** |  | 175 ÷ 8 = 21.875  Round up to the nearest integer, 22, as tables are needed for everybody and you can’t have part of a table.  175 ÷ 8 = £21.875  If all the guests pay the same amount of £21.88 or more there is enough to cover the bill.  175 ÷ 8 = 21.875  Cannot have a fraction of a box, so only 21 boxes can be filled.  21 × 8 = 168 rolls  hence 7 rolls left over  Average speed = distance ÷ time  165 ÷ 8 = 21.875 km/h  You do not need to round this figure off as the speed can be given with this accuracy. | M1  A1  B1  M1  A1  B1  M1  M1  A1  M1  A1  M1  A1  B1  B2 | 2  3 | M1 for dividing guests by number at a table. A1 for the rounded, correct integer.  B1 for explaining the need to round up to the nearest integer.  M1 for dividing bill by the number at the table.  A1 for a correct monetary amount higher than 21.875 and **less** than 22 unless a tip is mentioned  B1 for stating the need to round up in order to create a total higher than the bill if they all pay the same.  M1 for correctly dividing number of bread rolls by number in each box or the number 21.875  M1 for stating the need to truncated amount as you can’t have a fraction of a box A1 for the correct truncation  M1 for dividing number of boxes by 8 or the total 168  A1 for the answer of 7 rolls left over.  M1 for stating formula for calculating speed A1 for the correct answer with correct units.  B1 for stating no need to round off answer  In each case for part **b** 1 mark for answer and an extra mark for describing what is the same and different about each context.  B2 Extra communication marks available for quality of questions and explanations in mark scheme | M |
| **16** |
| **41 a**  **b** | 24 × 72 = 1728  1728 ÷100 = 17.28 | Dividing both by ten  Correct calculation e.g. 2.4 × 7.2 = 17.28  Divide both by 10  24 × 0.72 = 17.28  Divide one of the numbers by 100  Suitable question using concepts introduced in part **a** | B2  B2  B2  B2 | 3 | B1 for each correct statement  B1 for each correct explanation of the relationships between the calculations.  B1 for each set of questions, but the second must be harder than the first.  B2 marks for correct explanation of the relationships between the calculations and identification of progression in difficulty. | M |
| **8** |

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| **42** | 4.75 ≤ space < 4.85  4.25 ≤ car < 4.75 | A: Yes, the car is always smaller than the smallest possible space  B: No, the smallest space is the same size as the largest car length.  C: No, because the car is always smaller than the minimum size of the space you can always say it will fit. | B1  B1  B1  B1  B1 | 3 | B1 for stating upper and lower bounds of space.  B1 for stating upper and lower bounds of car  B1 for correct explanation of why this is definitely true oe  B1 for correct explanation of why this is definitely not true oe  B1 for correct explanation of why this is definitely not true oe | M |
| **5** |
| **43** | 14.5 cm ≤ brick < 15.5 cm | So maximum length for 20 identical bricks is: 20 × 15.5 = 310 cm | M1  A1 | 3 | M1 for identifying the upper bound of the length of one brick and multiplying this by 20  A1 cao | M |
| **2** |
| **44 a**  **b**  **c** |  | How long will it take Barry to recover the money it cost him to convert the car?  Cost of 1 litre of LPG (*l*)  Cost of 1 litre petrol (*p*)  The distance he can travel per litre of each fuel (*dl* and *dp*)  How far does he travel in one month (*d*)  Cost of using LPG per month (*cl*) is:  *cl* = *l* × (*d* ÷ *dl*)  Cost of using Petrol per month (*cp*) is:  *cp* = *p* × (*d* ÷ *dp*)  The saving is *cp* – *cl* | B1  B4  M1  B1  M1  B1  B1  B2 | 3 | B1 for suitable question oe  B1 for each piece of information oe  M1 for trying to find first cost  B1 for correct method of finding this cost  M1 for trying to find second cost  B1 for correct method of finding this cost  B1 for finding this difference correctly  B2 for clarity of explanation throughout part **c** | H |
| **13** |

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| **45** | Assume the dolphin starts from the bottom. A complete cycle from top to bottom, back to top, takes 7 minutes.  Therefore in 90 mins competed the following cycles:  90 ÷ 7 = 12.857 142 8 cycles.  It has therefore completed 12 cycles but is NOT back at the back at the bottom.  To work out which of the other options is correct calculate:  0.857 142 8 × 7 = 6 minutes  Therefore if we assume that the time started by observing the dolphin at the surface, the 6 minutes of the cycle will be towards the end of the cycle, it is on its way up. | On its way up. | M2  B1  M1  B1  A1 | 2  3 | M1 for adding the times to create a 7 minute cycle  M1 for dividing 90 by the time of one cycle  B1 for stating that the dolphin has completed 12 cycles  M1 for multiplying the fraction part of 12.8… by 7  B1 for finding this time and relating it to a part of the cycle  A1 cao | H |
| **6** |
| **46** | 26 letters × 25 numbers  So 26 × 25 = 650 | 650 | B1  M1  A1 | 2  3 | B1 for knowing to use 26 and 25  M1 for 26 × 25  A1 cao | H |
| **6** |
| **47 a**  **b i**  **ii**  **iii**  **iv**  **v**  **vi** | |  |  |  | | --- | --- | --- | | **Planet** | **Distance from the sun (million km)** | **Diameter (km)** | | Mercury | 5.8 × 101 | 4.878 × 103 | | Venus | 1.08 × 102 | 1.2104 × 104 | | Earth | 1.5 × 102 | 1.2756 × 104 | | Mars | 2.28 × 102 | 6.787 × 103 | | Jupiter | 7.78 × 102 | 1.42796 × 105 | | Saturn | 1.427 × 103 | 1.20660 × 105 | | Uranus | 2.871 × 103 | 5.1118 × 104 | | Neptune | 4.497 × 103 | 4.8600 × 104 | | | B2 | 2 | B1 for correct distance column  B1 for correct diameter column  B1 cao  B1 cao  B1 cao  B1 cao  B1 cao  B1 cao | H |
| Jupiter  Mercury  Mercury  Jupiter  Uranus  Earth and Venus | | B6 |
| **8** |

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| **48 a**  **b** |  | False  You can’t find the square root of a negative number that is a real number.  Always true  The cube root of a positive number is positive and the cube root of a negative number is negative. | B1  B1  B1  B1 | 2 | B1 for false  B1 for correct explanation  B1 for always true  B1 for correct explanation | H |
| **4** |
| **49 a i**  **ii**  **b** | 56 ÷ 5–3 = 5(6 – –3) = 59  OR  = = 59  56 × 5–3 = 5(6 + –3) = 53  OR  = 5 × 5 × 5 = 53 | as a power represents the reciprocal of square so the square root. | M2  M2  B2 | 2 | M1 for showing subtraction of indices M1 for recognising 6 – –3 = 6 + 3  Or M1 for showing each number as a product of factors  M1 for combining them to give all the 5s as numerators.  M1 for showing the indices are added  M1 for recognising 6 + –3 = 6 – 3  Or M1 for showing each number as a product of factors  M1 for combining them to give all the 5’s as numerators.  B1 for showing square root  B1 for clear explanation. | H |
| **6** |
| **50 a**  **b**  **c** | 8.848 × 103 ÷ 8.298 × 102 = 10.66  8.298 × 102 ÷ 103 = 0.8298 km  20 ÷ 1 000 000 000 = 2 × 10–8 | 10.66  0.8298 km  2 × 10–8 | M1  A1  M1  A1  M1  A1 | 2 | M1 for dividing mountain by skyscraper  A1 accept 10.66… or 10.7  M1 for dividing skyscraper height by 100  A1 cao  M1 for finding reciprocal of 1 000 000 000  A1 cao | H |
| **6** |
| **51** | Fractions unshaded are  and  =  =  1 – = |  | M1  M1  A1  M1  A1 | 2 | M1 for adding given fractions  M1 for use of common denominator 63  A1 cao  M1 for subtracting fraction sum from 1  A1 ft from their | H |
| **5** |
| **52** | So  of the residential land is used for services.  × 5 =  m2  ( ÷ 15) × 100  = 13.75% | 13.75% of the total area is used for services. | B1  M1  A1  M1  A1 | 3 | B1 for recognising and stating  of residential development is used for the services  M1 for multiplying  by 5  A1 oe  M1 for finding above fraction of 15 and multiplying by 100  A1 accept 14 or 13.8 | H |
| **5** |
| **53** |  | The volume of the 2 cm dice is 2 × 2 × 2 = 8 cm3. The volume of the 4 cm dice is  4 × 4 × 4 = 64 cm3  This is 8 times as much plastic as the 2 cm cube.  The 4 cm cube will use 64 – 8 = 56 cm3 more plastic  Or could say 8 times as much | B2  B1 | 3 | B1 for clear explanation showing how to find volumes of each cube.  B1 for clear indication that the volume of the 4 cm dice is not twice as much as the 2 cm  Or B2 for stating twice as large in dimensions will be 23 as large in volume.  B1 For correctly stating 56 cm3 more plastic  Or for stating 8 times as much | H |
| **3** |
| **54 a**  **b** |  | 75 × 20 = 1500 oe  The approximation will be smaller because each term has been rounded down  = 5 oe  The approximation will be smaller because the numerator has been rounded up and the denominator rounded down. Dividing a smaller number by a larger number will result in a smaller answer. | M1  A1  B1  M1  A1  B1 | 3 | M1 for a suitable rounding of each number  A1 for correctly multiplying the rounded numbers.  B1 for a correct justification  M1 for a suitable rounding of each number  A1 for correctly dividing the rounded numbers.  B1 for a correct justification  In each case answer marks only if the estimation is one that could be done in your head. Explanation marks only for a valid explanation but allow ft for a given approximation | H |
| **6** |
| **55** |  | Three calculations that approximate to 75  e.g. 1.1 × 75.1 based on 1 × 75  24.7 × 3.2 based on 25 × 3  147 ÷ 1.9 based on 150 ÷ 2 | B3  B2  B2 | 2  3 | B1 for each example that approximates to 75  B1 for use of multiplication and division.  B1 for evidence of progression of complexity in the questions oe  B2 for use of mathematical language and possibly connectives in answer | H |
| **7** |

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| **56** | The minimum area is:  14.5 × 18.5 = 268.25  The maximum area is less than:  15.5 × 19.5 = 302.25  Given lengths are 2 sf, so it would be sensible to give area to 2 sf as well.  Where area = 15 × 19 = 285  The sensible answer for the area is 290 m2 | 268.25  302.25  268.25 ≤ floor area < 302.25  290 m2 | M1  A1  M1  A1  A1  B1  B1 | 2 | M1 for multiplying the lower bounds  A1 cao  M1 for multiplying the upper bounds  A1 cao  A1 cao  B1 for explanation of why 2 sf should be used  B1 cao | H |
| **7** |
| **57**  **a**  **b**  **c** | Assume pallets are at maximum of 525 kg.  A 6-axle lorry can carry up to  44 ÷ 0.525 = 83.8  So a maximum of 83 pallets per trip.  A 5-axle lorry can carry up to  40 ÷ 0.525 = 76.2  So a maximum of 76 pallets per trip. | 6 axle max of 83 pallets  5 axle max of 76 pallets  80 is less than 83 but more than 76, so choose the 6-axle lorry, as this can do it in one trip.  150 pallets can be split into two loads of 75, this is less than 76, sochoose 5-axle lorry to make two trips, as this works out cheaper per trip.  159 can be split into two loads, 76 + 83. So choose the 5-axle lorry to make one trip, as this is cheaper per trip, and 6-axle lorry to make one trip as this avoids the need for a third trip. | B1  M1  A1  A1  B2  B2  B2 | 2  3 | B1 for stating maximum possible mass of pallet  M1 for dividing both load limits by maximum pallet  A1 cao  A1 cao  B2 for clear explanation of correct choice  B2 for clear explanation of correct choice  B2 for clear explanation of correct choice | H |
| **10** |

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| **58 a**    **b**  **c**  **d**  **e** | 13.25 ≤ runner 1 < 13.35  13.295 ≤ runner 2 < 13.305 | 0.4 m is written to 1 dp and could have a value between 0.35 m and 0.449999 m  0.400 m is written to 3 dp and could have a value between 0.3995 m and 0.4004999 m  If the answer is required to 3 dp to provide all the information required you need to include 3 dp even if the digits are 0.  425 cm ≤ length < 435 cm  Tenth of a metre or 10 cm.  Therefore Runner 1 fastest time could be faster than Runner 2.  But also true is that the slowest time for runner 1 is slower than the slowest of runner 2.  If each person is measured to the nearest kg, they could each for example have a mass 100.4 kg and 7 × 100.4 > 700 kg. | B2  B1  B1  B1  B1  B1  B2  B1  B2 | 2  3 | B1 for clear explanation  B1 for showing the range of possible values each could have  B1 for clear explanation  B1 for communicating clearly this information  B1 for communicating clearly this information  B1 for runner 1 limits  B1 for runner 2 limits  B2 for clear explanation showing both possibilities  B1 for a given example  B2 for clear and concise explanation | H |
| **12** |
| **59** | Maximum number of people turning up will be 104 (as 105 will round to 110)  Assume 5% of the 280 do not turn up.  0.05 × 280 = 14  Hence assume 266 seats already taken.  365 – 266 = 99 free seats | If the estimate of how many will fail to turn up is correct, 266 seats will be taken with advance sales. This leaves 99 seats free. If up to 99 extra people turn up, they all get seats. If 100–104 turn up, some will not get a seat. | B1  B1  B1  B1  B2 | 3 | B1 for stating maximum number of people that could turn up.  B1 for finding the assumed number not turning up  B1 for finding assumed seats taken  B1 for finding assumed number of free seats  B2 for clear explanation using all the calculated data | H |
| **6** |

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| **60** | 12.25 seconds ≤ time < 12.35 seconds  99.995 m ≤ distance < 100.005 m  Speed = distance ÷ time  Fastest speed is longest distance divided by shortest time  = 100.005 ÷ 12.25 = 8.164 m/s | 8.164 m/s | B1  B1  M1  A1  M1  A1 | 2 | B1 for time range  B1 for distance range  M1 for correct formula used for speed  A1 for explanation of longest distance used with shortest time  M1 for division  A1 for suitably rounded speed (4 or 5 sf) | H |
| **6** |
| **61** | 124.5 ≤ volume < 125.5  Take cube root for lengths of sides giving  4.9933244 ≤ length < 5.0066578  Area of side will be square of lengths, giving  24.933289 ≤ area < 25.066622 | 24.93 cm2 ≤ area < 25.07cm2 | B1  M1  A1  M1  A1 | 2 | B1 for stating limits of accuracy for volume  M1 for finding cube root to find length  A1 for unrounded limits to length  M1 for squaring unrounded length limits  A1 for rounded limits to 3 or 4 sf | H |
| **5** |