|  |
| --- |
| Guidance on the use of codes for this mark scheme |
| M | Method mark |
| A | Accuracy mark |
| B | Mark awarded independent of method |
| C | Communication mark |
| P | Proof, process or justification mark |
| cao | Correct answer only |
| oe | Or equivalent |
| ft | Follow through |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Question**  | **Working** | **Answer** | **Mark** | **AO** | **Notes**  | **Grade** |
| **1** | 2 kg = 2000 g2000 ÷ 400 = 5 5 × 30 = 150 min150 min = 2 hours 30 minsPlus 20 mins rest give 2 hours 50 min So if it is put on at 6:30 pm it will be ready at 9:20 pm. | No, she needs to put it on earlier.  | P1A1P1A1B1C1 | 3 | P1 for method of finding how many lots of 30 minutes are neededA1 caoP1 for method of finding total timeA1 caoB1 ftC1 No and a clear summing up of why it won’t be ready | B |
| **6** |
| **2** | 2 + 1 = 360 ÷3 = 20 2 × 20 = 40 She spends £40 on clothes  | £40 | M1P1A1 |  | M1 for adding ratios to 3P1 for process of finding the 2 shareA1 cao | B |
| **3** |
| **3 a** **b** **c** **d** |  = 0.17 (to 2 dp)1 – 0.17 = 0.83 = 83%Or 150 – 25 = 125 = 0.83 = 83%(to 2 dp)= 37.5= 38 to nearest car are red 17% green + 25% redTotal 42%Less than half the cars are accounted for, so there could be one third silver.150 ÷3 = 50 which is a whole number. | 83%YesNo, she is not right.Yes, he could be right.  | P1A1M1C1P1C1P1C1 | 23 | M1 for process of finding part of a ratioA1 answer correct to 2 sf or moreM1 for diving by 4C1 showing nearest whole number is more than 25P1 adding both together in some wayC1 for no with justificationP1 for process looking at how many available to be silverC1 for yes with suitable justification | B |
| **8** |
| **4** | One day is 60 × 24 = 1440 minutes1440 ÷ 5 = 288 minutesThis is less than 360 minutes. | 360 minutes is longer. | P1M1A1 | 2 | P1 finding a day in minutes.M1 dividing total minutes by 5A1 cao | B |
| **3** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **5 a** **b** |  | 1%, by dividing by 100Then multiply that figure by the percentage needed.E.g. find 8% of £3232 ÷ 100 = 0.320.32 × 8 = 2.56So 8% of £32 is £2.5620% is 2 × 10% or  so need to divide by 10 then multiply by 2Or divide by 5. | M1C2C1 | 2 | P1 for process of finding a percentageC1 for first exampleC1 for second exampleC1 for clear explanation | B |
| **4** |
| **6 a** **b** |  | Look for common factors.When there are no common factors, it’s in its simplest form.e.g. start with the ratio 12 : 18Common factors are 2, 3 and 6Dividing the ration by 6 gives 2 : 32 and 3 have no common factors, so you know that it is in its simplest form. | C1C1P1C1 | 2 | C1 for clear explanationC1 for clear explanationP1 for having a satisfactory exampleC1 for the accompanying explanation | B |
| **4** |
| **7**  | 7 – 4 = 3So 3 parts = £120120 ÷ 3 = 40So one part = £40So Peter got 2 × £40 = £80 | £80 | P1B1M1A1A1 | 3 | P1 for process of sorting the ratiosB1 for finding 3 parts = 120M1 dividing by 3A1 caoA1 cao | B |
| **5** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **8 a** **b** **c** |  | Correct = 0.66666 = 0.60.6666 > 0.6Correct  × 100% = 60%Not correct × 150 = 1050.75 × 150 = 112.5 | B1C1B1P1B1C1 | 2 | B1 for correctC1 for clear explanationB1 for correctP1 with clear justificationB1 for not correctC1 for clear explanation | B |
| **6** |
| **9 a** **b** | 48 ÷ 3 = 16 pupils liked football best48 ÷ 4 = 12 liked tennis48 ÷ 8 × 3 = 18 liked athletics Total 16 + 12 + 18 = 46Balance = 48 – 46 = 2 +  = So  of total = 150 of total = 150 ÷ 3 = 50So total = 4 × 50 = 200 | 2 liked swimming200 | P1A3P1P1B1P1C1 | 3 | P1 for process of finding each partA1 for each correct sport foundP1 for correct process leading to 2P1 for combining fractionsB1 for recognising  is 150P1 for process of getting from  to the wholeC1 for correct answer alongside justification | M |
| **9** |
| **10** | 15 mm × 1.25 = 18.75 mm= 19 mm to next whole number 19 mm × 1.25 = 23.75 mm= 24 mm to next whole number24 mm × 1.25 = 30 mm30 mm × 1.25 = 37.5 mm= 38 mm to next whole number38 mm × 1.25 = 47.5 mm= 48 mm to next whole number | 15 mm, 19 mm, 24 mm, 30 mm, 38 mm, 48 mm | M1A1P1A1A1A1A1C1 | 3 | M1 for method of increasing by 25%A1 for 19P1 for method of continuing in same wayA1 for 24A1 for 30A1 for 38A1 for 48C1 for complete correct solution | M |
| **8** |
| **11** | One years interest is£2500 × 0.02 = £50Number of years needed to get £160 in interest£160 ÷ £50 = 3.24 years’ interest is £50 × 4 = £200Next whole year above is 4. | 4 years  | P1A1P1A1A1 | 3 | P1 for finding one years interestA1 caoP1 for setting up equation for number of yearsA1 for 3.2A1 cao | M |
| **5** |
| **12** | Ratio of areas of small to large is 1 : 2 of small square is shaded.As a fraction of the larger square, this is ×  = Total shaded is  + =  =   |  | P1C1M1A1M1A1 | 3 | M1 process of sorting ratioC1 for explanation of each part M1 finding fraction in small squareA1 caoM1 adding the two fractionsA1 cao | M |
| **6** |
| **13** | If Anna starts with fare of £*x*New fare is *x* × 1.15= 1.15*x*A reduction of 15% on that will give negotiated fare as1.15*x* × 0.85= 0.9775*x* | No, she is better off. | P1M1A1P1M1A1C1 | 23 | P1 process of stating a starting fare, say £*x*M1 finding 15% increaseA1 caoP1 method of reducing new fare by 15%M1 finding 15% reduction.A1 caoC1 No with clear justification | M |
| **7** |
| **14** | Pens-R-Us Pay for 20 get 10 free Cost £1.50 × 20 = £30Budget StationeryNumber of pens 4 × (5 + 3) = 32So pay for 20 and get 12 free.Cost is the same.  | Budget Stationery has the better deal as Sian will get 32 pens for the same price as 30 at Pens-R-Us | P1A1P1A1C1 | 23 | P1 for process for cost at Pens-R-UsA1 caoP1 for method at Budget StationeryA1 caoC1 correct final statement . | M |
| **5** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **15** | Pay for 1000 ml and get 1500 mlRatio in ml, pay : free 1000: 5002 : 1Buy one get one freeRatio in ml, pay : free 300 : 3001 : 1So buy one get one free is the better deal. | Buy one get one free is the better deal as you get a higher ratio of shampoo free. | P1A1P1A1C1 | 23 | P1 for process of finding ratioA1 for usable ratioP1 for process of finding ratioA1 answer in a suitable form to compareC1 for buy one get one free with explanation | M |
| **5** |
| **16 a** **b** **c** **d** | 1 : 6 ≠ 6 : 1Because 1 : 6 = 6 : 36 (× 6)Or 6 : 1 = 1 :  (÷ 6)19 : 95 (÷19)1 : 51 × 19 : 5 × 19B : G2 : 54 : 106 : 15 (21 pupils)7 : 17.5 (not possible!)8 : 20 (28 pupils) | No19 : 95 (÷19)1 : 5No, 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 pupils. This means that there can only be multiples of 7 pupils in the club. 24 is not a multiple of 7 | P1B1C1C1 | 2 |  P1 for process of finding each ratio in its unitary form as a method of comparison, oeB1 for calculation showing a multiplicative cancelling downC1 for an understanding of scale and equivalence of unitsC1 for reference to multiples of 7 | M |
| **4** |
| **17 a** **b** | Packs of 3:90 ÷ 3 = 3030 packs × £1.50 = £45Packs of 15:90 ÷ 15 = 66 packs × £5 = £30Packs of 25: 90 is not divisible by 25.Buy 2 get one free on packs of 15.15 + 15 = £1015 = free15 + 15 = £1015 = free So new cost = £20Or (3 × 15)+ (3 × 15) = 90£10 + £10 = £20 | 6 packs of 15No , still select 6 packs of 15 but it now costs less ! | B1A1B1C1 | 2 |  B1 for correct combination to 90A1 for correct costB1 for a method for calculating  of the costC1 for correct justification of choice | M |
| **4** |
| **18** | Appropriate workings related to their question. | e.g. A shop increased its prices by 10%. When an item costs £100, how much more does it costs after the price increase? £10 | C1 | 23 | C1 for clarity of question | M |
| **1** |
| **19 a** **b** **c**  | M : W5 : 224 women so the total member ship is:5 × 12 : 2 × 12 60 : 24Total membership = 60 + 24 = 84R : S : J = 2 : 3 : 52 + 3 + 5 = 10£85 ÷10 = £8.50Shaun pays 3 × £8.50 = £25.50 | 84 £25.50Own question like the one in part aFor example: a tennis club has 30 male members. The ratio of women to men is 6 : 5. How many female members are there? 36 | M1A1M1A1C1 | 3 | M1 for multiplying by 12 oeA1 for 84 members in totalM1 for division of 85 by 10A1 for correct multiplication 3 × £8.50 oeC1 for correct type of question | H |
| **5** |
| **20 a** **b** **c** | *b*2 =  × *b*1=  × 8 = 10 hours*b*2 costs £198*b*1 costs £118198 ÷ 118 = 1.68 to 2 dp5 ÷ 4 =1.25*b*2 = =  = £147.50Reduction is:£198 – £147.50 = £50.50 | 10 hoursThe increase in cost is proportionally more than the increase in battery life.£50.50  | P1A1B1C1M1A1 | 3 | M1 for process of setting up equationA1 caoB1 for division of more expensive cost by cheaper costC1 for use of comparison to justifyM1 for multiplying cheaper cost by 5 and dividing by 4A1 cao | H |
| **6** |
| **21 a** **b** | 5 × 90 = 450 minutes £6.50 ÷ 450 = 1.44p per minute5 × 80 = 400 minutes£6.50 ÷400 = 1.625p per minute5 × 80 = 400 minutes£4.00 ÷ 400 = 1p per min **cheapest**Or450 ÷ 6.50 = 69 minutes per £1400 ÷ 6.50 = 62 minutes per £1400 ÷ 4.00 = 100 minutes per £1 **best value** | Best buy is 5 pack for 80 minutes each @ £4.0080 minutes is not long enough. | P1B2C1 | 3 | P1 for method of multiplying up for total minutes and then division to identify either cost per minute or time per £B1 for correct workings in first of the three casesB1 for the correct working in the second two casesC1 for explanation of possible reasons not to choose the best buy | H |
| **4** |
| **22** | 800 × 1.19 = €952800 × 1.22 = €976€976 – €952 = €24  | They will get €24 more. | M1B1A1 | 2 | M1 for multiplicationsB1 for subtraction ftA1 cao | H |
| **3** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **23 a** **b** | 8 kg = 8000 g8000 ÷ 250 = 323 kg = 3000 g3000÷ 85 = 35 (to nearest whole number) 2 kg = 2000 g2000 ÷ 20 =1007 kg = 7000 g7000 ÷ 250 = 28So the limiting value is the amount of icing sugar. Therefore she can make 24 × 28 = 672 biscuits.Number of packets = 672 ÷ 15 = 44.844 × 0.75 = 3333 × £2.99 = £98.6744 – 33 = 11 discounted £2.99 × 0.85 = £2.54 to 2 dp11 × 2.54 = £27.94Total sales = £98.67 + £27.94 = £126.61Total costs = £59 + £26 = £85% profit = (£126.81 – £85)/£850.489529412 × 100%= 48.95% | So she can make 44 complete packs of 15 biscuits.49% profit to the nearest integer. | P1B1P1B1M1A1M1A1 | 23 | P1 for process of division to see how many batches of 15 biscuits can be made with each ingredientsB1 for 32, 35 100 and 28P1 for correct identification of limiting valueB1 for correct cost of three-quarters of biscuitsM1 for use of 0.85 multiplierA1 caoM1 for division of total sales by total cost (ft)A1 for correct % with rounding | H |
| **8** |
| **24** | £595 × 1.20 = £71420% discount£714 × 0.8 = £571.20£571.20 – £595= £23.80Or£595 × 0.8 = £476£476 × 1.2 = £571.20 |  He is overpaying by £23.80Disagree; he would pay the shop more than he needs to. | P1M1B1C1 | 2 | P1 for process: multiplying by 1.2 to find cost with VATM1 for multiplying by 0.8 to find 20% reduced price (ft)B1 for subtracting to find overpaymentC1 for demonstrating over-payment with explanation | H |
| **4** |
| **25 a** **b** |  | *A* × 0.85 = *B**A* = *B* ÷ 0.85  | M1P1 | 2 | M1 for correct formulaP1 for correct rearrangement of ÷ by 0.85 | H |
| **2** |
| **26 a** **b** | *A* × 1.5 × 1.5 = A × 1.52= A × 2.25A × 0.75 × 1.20 = 0.9AA × 1.20 × 0.75 = 0.9A | No: an increase to A of 50% followed by another increase of 50% gives 2.25A.Doubling would be 2A2A ≠ 2.25AIf the original cost is A, the cost after a discount of 25% is 0.75*A* to pay VAT at 20% gives a new price of 0.9A*.*If VAT is added first, the price is 1.2A. A 25% reduction fives a new price of 0.9A*.*Because multiplication is commutative, the prices are the same. It makes no difference. | C1P1C1 | 2 | C1 for clear explanation with calculated justification oeP1 for method of setting up both equationsC1 for clear explanation with calculated justification oe | H |
| **3** |
| **27 a** **b** **c** **d** **e** | A ×  = £996A = £996 × A × 1.04 = £6.50A = £6.50 ÷ 1.04A × 1.07 = £957.65A = £957.65 ÷ 1.07For an original amount *A*, the multiplier is b for a percentage increase or decrease, and the new value is *C*A × b = C | £1162£6.25£895A = C × Multiplier (x)x > 1 increase0< x <1 decrease | M1A1M1A1M1A1C1C1 | 23 | M1 for multiplication and rearrangementA1 caoM1 for multiplication by 1.04 and rearrangement.A1 caoM1 for multiplication by 1.07 and rearrangementA1 caoC1 for correct explanation either in words or by a general formula, provided the variables are definedC1 for clarity that a decrease will have a multiplier between 0 and 1 and increase will have a multiplier greater than 1 ( a multiplier of 1 will not change the value) | H |
| **8** |
| **28** | Current costs are £1.50/mile and 20p/minuteCompetitive pricing structure: answers will vary.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Time taken | 2 minutes | 5 minutes | 10 minutes | 12 minutes | 15 minutes |
| 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 |

 | P1B1B1 | 23 | P1 for process of finding chargesB1 for working out current price structureB1 for a 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 | H |
| **3** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **29 a** **b** **c** |  | Travel 30 miles in 45 minutes45 minutes =  hour30 ÷ =  = = 40 mph as required Not changing minutes into hours Units of speed = units of distance ÷ units of time | C1C1C1C1 | 2 | C1 correct explanation with calculation that indicates 10 miles every 15 minutes implies 40 miles every 60 minutes oeC1 clear explanation of given resultC1 for stating a common misconceptionC1 for correctly stating the relationship between speed, distance and time | H |
| 4 |
| **30** | A rectangle 1 m × 2 mArea = 2 m2A rectangle 4 m × 8 mArea = 32 m2Length scale factor = 4Area scale factor = 16 (42)Area = 2 × 16 = 32 m2 | 32 m2 | P1A1 | 23 | P1 for process of trial and improvementA1 cao | H |
| **2** |
| **31** | 75 ÷ 30 = 2.5Length scale factor is 2.5Volume scale factor is(2.5)3= 15.6255 × 15.625 = 78.125 litres | 78.125 litres | B1M1A1 | 23 | B1 for calculation of length scale factor.M1 for calculation of volume scale factor.A1 cao | H |
| **3** |
| **32** | Length scale factor = 450 ÷ 15 = 30Volume scale factor = 303= 27 000450 × 27 000= 12 150 000 cm3(÷ 1003 or 1 000 000 for m3)= 12.15 m3  | 12.15 m3 | B1M1M1A1 | 3 | B1 for calculation of length scale factorM1 for calculation of volume scale factorM1 for correct conversion to cubic metresA1 cao | H |
| **4** |
| **33** | In year 1£8000 × 0.03 = £240Interest = £240So total at end of year 1 = £8000 + £240 = £8240Year 2£8240 × 0.03 = £247.20Interest = £247.20At end of year 2 = £8240 + £247.20 = £8487.20Year 3£8487.20 × 0.03 = £254.61(Banks round down)Interest = £254.61At end of year 3 = £8487.20 + £254.61 = £8741.81 | £8741.81 | P1M1A1B1B1A1C1 | 2 | P1 for showing the concept of compound interest.M1 for any suitable method of calculating total at end of year 1A1 caoB1 for any suitable method of calculating total at end of year 2 (ft)B1 for any suitable method of calculating total at end of year 3 (ft)A1 cao (accept £8741.82).C1 for clarity of explanation through set out of calculations | H |
| **7** |
| **34** | Let starting amount be BThen B × 0.8*n*< Divide both sides by B0.8*n* < 0.5Trial and improvement0.82 = 0.64 not yet0.83 = 0.512 not yet0.84 = 0.4096 now less than a halfOR starting with a given amountSay £100£100 × 0.8 =£80£80 × 0.8 = £64£64 × 0.8 = £51.20£51.20 × 0.8 = £40.96 | 4 weeks  | P1M1P1A1 | 2 | P1 for choosing a starting a position, either a variable like B or a specific amount like £100M1 for working through the weeks in some wayP1 for 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 balancecao | H |
| **4** |