EXPERT TUITION

Maths Questions By Topic:

Ratio, Proportion & Rates of Change

Mark Scheme

Edexcel GCSE (Higher)

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Table Of Contents

Question	Answer	Mark	Mark scheme	Additional guidance
1	Rahim and correct figures	P1	for start to the process to find 20% for Tamara, eg 220000 × 0.2 oe (= 44000) **or** 30% for Rahim, eg 160000 × 0.3 oe (= 48000) **OR** for 1 – 0.2 (= 0.8) **or** 100 – 20 (= 80) **or** 1 + 0.3 (= 1.3) **or** 100 + 30 (= 130)	Build up processes are acceptable but must be complete and correct
		P1	for a complete process to find at least one new value, eg 220000 – "44000" (= 176 000) or 160000 + "48000" (=208 000) **OR** 220000 × "0.8" (=176 000) **or** 160000 × "1.3" (= 208 000)	
		A1	for one correct value, 176 000 **or** 208 000	
		C1	for correct conclusion supported by correct figures eg Rahim, 176 000 and 208 000	Award 0 marks for a correct answer with no supportive working
2	33	P1	for relating 24 to 8 parts **or** (1 part =) 24 ÷ 8 (= 3) **or** for 15 – 7 (= 8) **or** starts to use a build-up method, eg (8 :) 14 : 30	8 parts = 24
		P1	for 15 – 4 (= 11) **and** 24 ÷ 8 (= 3) **or** 15 × 3 (= 45) **and** 4 × 3 (= 12) **or** for 12 (: 21) : 45	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
3	17.6	P1	for correct trig statement, eg $\sin 30 = \frac{h}{6}$	
		P1	for complete process to find h, eg $6 \times \frac{1}{2}$ (= 3)	
		P1	for correct substitution into the area of a trapezium formula, eg $\frac{1}{2}(a+b)\times"3" = 66$ **or** $a + b = 44$ **or** $\frac{1}{2}(2x+3x)\times h = 66$	
		P1	for complete correct process to find the length of AB, eg $\left[\frac{66\times 2}{3} \div (2+"3")\right] \times 2$	
		A1	cao	An answer of $\frac{88}{5}$ gets P4 A0

Question	Answer	Mark	Mark scheme	Additional guidance
4	20	P1	for process to find SP of 24 chocolate bars, eg. 0.50 × 24 (= 12) oe **or** for process to find the overall profit eg (24 × 0.5) – 10 (= 2) **or** for process to find CP of one chocolate bar, eg. 1000 ÷ 24 (= 41.66…) oe	Working can be carried out in either pounds or pence.
		P1	(dep) for start to a process to find percentage profit, eg. using $\frac{"12"-10}{10}$ **or** $\frac{"12"}{10}$ **or** $\frac{50-"41.66..."}{"41.66..."}$ oe with consistent units	
		A1	cao	
5	450	M1	for 18 ÷ 3 (=6)	Ignore units
		M1	for substitution eg. $75=\frac{F}{"6"}$ or 75 × "6"	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
6	6 : 15 : 20	P1	chooses a multiplier to equate the two fractions in terms of b eg $\frac{2}{5}\times\frac{3}{3}\left(=\frac{6}{15}\right)$ **or** $\frac{3}{4}\times\frac{5}{5}\left(=\frac{15}{20}\right)$ **or** lists equivalent fractions to $\frac{2}{5}$ up to at least $\frac{6}{15}$, eg. $\frac{2}{5}, \frac{4}{10}, \frac{6}{15}, \ldots..$ **or** lists equivalent fractions to $\frac{3}{4}$ up to at least $\frac{15}{20}$, eg. $\frac{3}{4}, \frac{6}{8}, \frac{9}{12}, \frac{12}{16}, \frac{15}{20}, \ldots..$ **or** (a : b =) 2 : 5 **and** (b : c =) 3 : 4 **or** for 6 : 15 or 15 : 20 seen	
		P1	puts into related terms ready for ratio eg $\frac{2}{5}\times\frac{3}{3}=\frac{6}{15}$ **and** $\frac{3}{4}\times\frac{5}{5}=\frac{15}{20}$ **or** for (a : b =) 6 : 15 **and** (b : c =) 15 : 20 **or** lists equivalent ratios up to a common element for b, eg a : b = 2 : 5, 4 : 10, 6 : <u>15</u> **and** b : c = 3 : 4, 6 : 8, 9 : 12, 12 : 16, <u>15</u> : 20	Need not be written in ratio form
		A1	for 6 : 15 : 20 oe	Accept equivalent ratios Accept a =6, b = 15 and c = 20
7	196	P1	for vol A = 1400 ÷ 70 (=20) **or** for mass B = 280 × 30 (=8400)	
		P1	for density C = $\frac{1400+"8400"}{"20"+30}$ $\left(=\frac{9800}{50}\right)$ or answer with digits 196	
		A1	cao	An answer of 350 from 70 + 280 gets no marks

Question	Answer	Mark	Mark scheme	Additional guidance
8	20	P1	for a statement of proportionality eg $x = k\sqrt{y}$ **or** 1.44 oe	Must be written in the form of an equation with a constant term, accept $x \propto k\sqrt{y}$
		P1	for using $\sqrt{1.44}$ as multiplier eg $(x_2 =) k\sqrt{1.44y}$ **or** 1.2 oe	
		A1	cao	
9	$\frac{27}{56}$	P1	for $\frac{3}{8}$ **and** $\frac{7}{9}$ **OR** uses a total of 72 cards and shows a process to find the number of cards with a black shape **or** the number of cards with a triangle,	72 or any multiple of 72
			eg $72 \div 8 \times 3$ (=27) **or** $72 \div 9 \times 7$ (=56)	Could be seen in a ratio, eg 27 : 45 or 16 : 56
		P1	for process shown to divide fractions $\frac{3}{8} \div \frac{7}{9}$ **or** $\frac{3}{8} \times \frac{9}{7}$	Accept the division shown as $\frac{\frac{3}{8}}{\frac{7}{9}}$
			OR for $\frac{3}{8} \times \frac{9}{9}$ $(= \frac{27}{72})$ **and** $\frac{7}{9} \times \frac{8}{8} (= \frac{56}{72})$	
			OR uses a total of 72 cards and shows a process to find the number of cards with a black shape **and** the number of cards with a triangle,	
			eg $72 \div 8 \times 3$ (=27) **and** $72 \div 9 \times 7$ (=56)	Could be seen in ratios, eg 27 : 45 and 16 : 56
		A1	for $\frac{27}{56}$ or any other equivalent fraction	Answer of 27 : 56 gets P2A0

Question	Answer	Mark	Mark scheme	Additional guidance
10	2 (supported)	P1 P1 P1 A1	for a process to find the number of men, eg. (60 ÷ 2) ÷ 3 (= 10) for a process to find the number of children, eg. 60 – "30" – "10" (= 20) for a start of a process to find the value of n, eg. ("20" : "10") ÷ 5 or 20 : 10 = 10 : 5 or "20" ÷ "10" for 2 with supportive working	 60 ÷ 3 = 20 scores no marks Any ratio must come from correct processes to find the number of children and the number of men Award 0 marks for 2 with no correct supportive working Award full marks for 2 : 1 given as a final answer from correct supportive working
11 (i)	Distance in the range 20 to 23	P1	for a process to draw a bearing of 070°, eg. a line drawn 70° from the North line at P	Accept a line of any length as long as the intention is clear.
(ii)	Bearing in the range 317 to 330	P1 P1 A1 A1	for a process to work out the distance PQ, eg. 12 × 1.5 (= 18) (dep previous P1) for the process to use the given scale, eg. "18" ÷ 4 (= 4.5 cm) (dep P3) for distance in the range 20 to 23 (dep P3) for bearing in the range 317 to 330	 Award P3 for Q shown in the correct place on the diagram. 4.5 scores 2 marks provided there is a link to 12 × 1.5 (= 18) Award no marks if no supportive processes Award no marks if no supportive processes Award A0A0 if Q is not in the correct place

Question	Answer	Mark	Mark scheme	Additional guidance
12 (a)	21.6	M1	for a method using distance = speed × time, eg. $72 \times \frac{18}{60}$ or 7.2 km in 6 minutes, so 7.2 × 3 oe partitioning method	Accept 72 × 18
		A1	for 21.6 oe	
(b)	No (supported)	M1	for a method to convert 20 m/s to km/h or 72 km/h to m/s, eg. $20 \times \frac{3600}{1000}$ (= 72) or $72 \times \frac{1000}{3600}$ (= 20)	Accept methods to convert **both** speeds to km/s or m/h
		C1	for No since 72 km/h = 20 m/s oe	
13	4	P1	for process to find ratio of corresponding lengths, eg. $\sqrt{4}$: $\sqrt{9}$ (= 2 : 3)	
		P1	for process to find ratio of volumes, eg "2"^{3} : "3"^{3} (= 8 : 27)	
		P1	for "27" ÷ "8" (= 3.375)	This may be seen by checking their volume, eg. "8" × 4 (= 32) and "8" × 3 (= 24)
		A1	for rounding to give an answer of 4 from correct working	An answer of 4 with no supportive working gets no marks

Question	Answer	Mark	Mark scheme	Additional guidance
14 (a)	600	P1	for starting process to calculate amount of flour eg $60 \div 15$ (= 4) **or** 3×50 (= 150)	4 implied by 200g of sugar
		P1	for complete process eg $\frac{60}{15} \times$ "150"	
		A1	cao	
(b)	2	P1	for process to calculate amount of butter eg $\frac{60}{15} \times 2 \times 50$ (= 400)	
			OR for process to calculate the number of packs of butter needed eg [butter] ÷ 250	[butter] must be clearly stated or calculated, may be seen in part (a)
		A1	cao	2 must not come from incorrect working
15	96	P1	for process to find the ratio of the number of pens of each colour sold, eg $2 \times 7 : 5 \times 3 : 6 \times 4$ (= 14 : 15 : 24)	Does not have to be seen as a ratio but all three needed
		P1	for process to find the proportion of green pens sold, eg $\frac{212}{"14"+"15"+"24"}$ **or** $\frac{"24"}{"14"+"15"+"24"}$	
		P1	for a complete process to find the number of green pens sold, eg $\frac{212}{"14"+"15"+"24"} \times$ "24" **or** $\frac{"24"}{"14"+"15"+"24"} \times 212$	P3 can be implied by the values 56, 60 and 96
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
16	$\frac{4}{9}$	P1	for process to find link between volume of Q and volume of P **or** between volume of R and volume of Q, eg ratio 1.5 : 1 **or** Q = 1.5P **or** P = $\frac{2}{3}$Q **or** two values in the ratio 1 : 1.5 such as 100 and 150	
		P1	for process to find link between volume of R and volume of P eg 1.5² : 1 **or** two values in the ratio 1 : 2.25 such as 100 and 225	$1.5^2 (=\frac{9}{4})$ is enough for this mark, award P1P1
		A1	for $\frac{4}{9}$ oe fraction eg $\frac{100}{225}$	Accept P = $\frac{4}{9}$R
17	$h = \frac{120}{\sqrt{t}}$	P1	for setting up a proportional relationship between h and p, eg $h \propto \frac{1}{p}$ **or** $h = \frac{k}{p}$ **OR** a proportional relationship between p and t, eg $p \propto \sqrt{t}$ **or** $p = K\sqrt{t}$	Condone the use of '$\propto$' instead of '=' for the first two P marks Relationship may be implied by substitution
		P1	for process to substitute at least 2 values, eg $10 = \frac{k}{6}$ ($k = 60$) **or** $6 = K\sqrt{144}$ ($K = 0.5$)	
		P1	for full process leading to $h = \frac{"60"}{p}$ oe **and** $p =$ "0.5"$\sqrt{t}$ oe	Both constants must come from a correct process
		A1	$h = \frac{120}{\sqrt{t}}$ oe eg $h = \frac{120\sqrt{t}}{t}$ **or** $h = \frac{60}{0.5\sqrt{t}}$	Formula for h in terms of t Does not need to be in simplest form

Question	Answer	Mark	Mark scheme	Additional guidance
18	No (supported)	P1	for start to process, eg. $2100 \times \frac{40}{100}$ (= 840) **or** 100 – 40 (= 60)	May compare bonus shares of a single salesman or total bonus share for all 7 salesmen.
		P1	for process to find the 7 salesmen's share of bonus, eg 2100 – "840" (= 1260) **or** $2100 \times \frac{"60"}{100}$ (= 1260)	
		P1	for process to find bonus amount each salesman gets eg "1260" ÷ 7 (= 180) **OR** process to find the total bonus for all salesmen if shared equally, eg $\frac{2100}{10} \times 7$ (= 1470)	
		P1	for process to compare what a single salesman gets under each scheme, eg "180" × $\frac{25}{100}$ (= 45) and "$\frac{2100}{10}$" – "180" (= 30) **or** "180" × $\frac{25}{100}$ (= 45) and "180" + "45" (= 225) oe and $\frac{2100}{10}$ (= 210) **or** ("$\frac{2100}{10}$" – "180") ÷ "180" × 100 (= 16.6...) **OR** process to compare what all salesmen gets under each scheme, eg "1260" × $\frac{25}{100}$ (= 315) and "1470" – "1260" (= 210) **or** "1260" × $\frac{25}{100}$ (= 315) and "1260" + "315" (= 1575) oe and "1470" **or** ("1470" – "1260") ÷ "1260" × 100 (= 16.6...)	
		A1	'No' supported by correct figures, eg 45 and 30, 225 and 210 **or** 1575 and 1470 **or** 16.(6...)(% and 25%)	Do not award unless correct figures have been shown to support a statement made that the salesman was not correct.

Question	Answer	Mark	Mark scheme	Additional guidance
19 (a)	200	M1	for $120 \times 5 \div 3$ oe	
		A1	cao	
(b)	statement	C1	Statement that each tap fills at the same rate or that the rate does not change over time Examples **Acceptable responses:** Taps are running at the same speed They (clearly referring to taps) all fill the pool with the same volume of water The amount of water is the same in the same time (again referring to taps) Each tap is doing a fifth of the filling That all taps take equal time to fill the pool All taps produce the same amount of water That the water flow stays at the same rate over the whole time. **Non acceptable responses** It will take more time because there are less taps The less taps used the longer it takes to fill the pool That 1 tap can take up to 24 mins each 3 taps will take longer to fill the pool	Any statement referring to the same amount of water flowing from each tap is acceptable.
20 (a)	16 to 20	P1	for using time = $\frac{\text{distance}}{\text{speed}}$, eg $\frac{1}{200}$ or $\frac{1}{213}$ **or** for 1 hour = 60×60 (= 3600) seconds	
		P1	complete process, eg $\frac{1}{200} \times 60 \times 60$ oe or $\frac{1}{213} \times 60 \times 60$ oe	Calculation could be done in stages.
		A1	for answer in range 16 to 20	
(b)	decision with reason	C1	(dep on correct use of time = $\frac{\text{distance}}{\text{speed}}$) for reason related to their response to part(a), eg overestimate as speed rounded down	

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21	20	P1	for start of process, eg $\frac{125}{100}$ oe or $\frac{100}{125}$ oe or $\frac{25}{125}$	Values of amount of cereal and cost may be used, eg. 100g of cereal costing £10 An acceptable start of a process would then be: 125g of cereal costing £10 using Jack's idea
		P1	for a suitable process to develop a percentage, either 80% or 20% eg. $\frac{100}{125} = \frac{x}{100}$ or $\frac{125-100}{125} = \frac{x}{100}$ **or** $\frac{p}{1.25m} = \frac{xp}{m}$ or $\frac{0.25p}{1.25m} = \frac{xp}{m}$	
		A1	cao	
22	3 : 10	P1	process to find ratio of lengths **A**:**B** = $\sqrt{4}$:$\sqrt{25}$ (= 2:5 or $\frac{2}{5}$ or 2, 5)	Accept working in fractions for the award of process marks but the final answer must be in correct simplified ratio notation
		P1	for process to find ratio of lengths **B**:**C** = $\sqrt[3]{27}$: $\sqrt[3]{64}$ (= 3:4 or $\frac{3}{4}$ or 3, 4)	
		P1	for process to write as one ratio eg. finding a common multiple of 3 and 5 **or** 6 : 15 : 20 oe	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
23	140	P1	for beginning to solve the problem eg 50 ÷ 5 × 8 (= 80) **or** 14 : 8 : 5 oe **or** 14 : 8 and 8 : 5 oe (linked)	80 may be seen in the ratio 80 : 50
		P1	for a full process to solve the problem eg "80" ÷ 4 × 7 **or** $\frac{50}{5}$ × "14" **or** 140 : 80 : 50	
		A1	cao	If 140 clearly identified as houses in working award full marks
24	30	P1	for full process to find the number of bags sold eg 5 × 1000 ÷ 250 (= 20) **OR** for process to find selling price of 1 kg of sweets eg 0.65 × 4 (= 2.60)	This could be by repeated addition Calculations can be in £ or pence
		P1	for [number of bags] × 0.65 **or** "20" × 0.65 (= 13) **or** "2.60" × 5 (= 13) **OR** for 10 ÷ "20" oe (= 0.50) **OR** for 0.65 × 4 (= 2.60) **and** 10 ÷ 5 (= 2)	[number of bags] can only come from 5 × 10 ÷ 250 (= 0.2) or 5 × 100 ÷ 250 (= 2) or 5 ÷ 250 (= 0.02)
		P1	(dep on previous P1) for a process to find the percentage profit eg ("13" – 10) ÷ 10 × 100 **or** (0.65 – "0.50") ÷ "0.50" × 100 **or** ("2.60" – "2") ÷ "2" × 100 **OR** "13" ÷ 10 ×100 (= 130) oe	3/10 or 0.3 is not enough but should be awarded 2 marks Award P3 for 130(%)
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
25	216	P1	for process to work with ratio eg 72 ÷ (3 + 4 + 5) (= 6) **or** 72 ÷ 12 (= 6)	
		P1	for process to find length of base or height of triangle eg 3 × "6" (= 18) **or** 4 × "6" (= 24) **OR** process to find area scale factor eg "6" × "6" (= 36)	
		P1	complete process to find the area of the triangle eg ½ × "18" × "24" **or** ½ × 3 × 4 × "6"^{2}	
		A1	cao	
26	$y = \frac{100}{9x^4}$	P1	for setting up a correct proportional relationship, eg $d \propto x^2$ **or** $d = kx^2$	Condone the use of '$\propto$' instead of '=' for the four P marks
		P1	for setting up a second proportional relationship, eg $y \propto \frac{1}{d^2}$ **or** $y = \frac{K}{d^2}$	
		P1	(dep P1) for a process to find one of the constants of proportionality eg $24 = k \times 2^2$ ($k = 6$) **or** $4 = K \div 100$ ($K = 400$)	
		P1	full process to find y in terms of x eg $y = \frac{"400"}{("6"x^2)^2}$ oe	Both constants must come from a correct process
		A1	$y = \frac{100}{9x^4}$ oe	Expression must have been simplified, but could be given other equivalent ways eg $y = 11.111.. x^{-4}$

Question	Working	Answer	Mark	Notes
27		14:21:42	P1 P1 P1 A1	for 2 out of 3 expressions in one letter eg from x, $x+7$ $2x+14$ **or** see a set of numbers to show interpretation of the relationships, eg 10, 17, 34 (dep) for sum of their 3 expressions =77 eg $x + x+7+2x+14 = 77$ oe **or** 2 systematic correct trials including addition for a correct process to isolate their term in x **or** $x=14$ for ratio 14:21:42 oe
28		22.5	P1 P1 P1 P1 A1	for process to find James' speed eg $50 \div 2.5 (=20)$ **or** $50 \div 150 (=\frac{1}{3})$ for process to find James' time for 15 km eg $15 \div$ "20" (=0.75) **or** $15 \div \frac{1}{3}$ (=45) for process to find Peter's time for 15 km eg "45" − 5 (=40) for process to find Peter's speed eg $15 \div$ "40" **or** $15 \div \frac{"40"}{60}$ oe
29 (a)		120	P1 A1	for $\frac{4\times450}{15}$ **or** $\frac{4}{15} = \frac{x}{450}$ oe cao
(b)		$\frac{165}{450}$	P1 A1	5.5 **or** 6.5 **or** 165 **or** $\frac{5\times450}{15}$ (=150) and $\frac{6\times450}{15}$ (=180) for $\frac{165}{450}$ oe
30	$ky-y=x+kx$ $y(k-1)=x(1+k)$	$y = \frac{x(k+1)}{k-1}$	M1 M1 A1	$y + x = k(y - x)$ **or** $\frac{y+x}{y-x} = k$ oe For isolating x and y on opposite sides eg $ky - y = x + kx$ Completing correct algebraic reasoning to reach conclusion

Question	Working	Answer	Mark	Notes
31		$\frac{7}{3}$	M1 M1 A1	for $y = k\sqrt[3]{x}$ oe **or** $\frac{7}{6} = \sqrt[3]{8}\,k$ oe for $k = \frac{7}{6 \times \sqrt[3]{8}}$ oe for $\frac{7}{3}$ oe
32		2, 14.5	P1 A1 P1 A1 C1	for scale factor of $\frac{12}{3}$ **or** $\frac{3}{12}$ **or** $\frac{15}{12}$ **or** $\frac{12}{15}$ **or** $\frac{8}{12}$ **or** $\frac{12}{8}$ **or** $\frac{15}{8}$ oe **or** correctly identifies 2 pairs of corresponding sides for x=2 for complete method to find other value for x eg $\frac{15}{8}\times 12 - 8$ for x = 14.5 Describes both assumptions for similarity
33		500	M1 A1	recognition of 1.2 or 120% oe eg 600 ÷ 1.2 oe or $x \times 1.2 = 600$ oe or 120%=600 cao
34 (a)		$y = \frac{9}{x^2}$	M1 A1	begins to work with $y = \frac{k}{x^2}$ oe e.g. subs of a pair of numbers into $y = \frac{k}{x^2}$ or states k=9 for $y = \frac{9}{x^2}$ Accept $y = 9x^{-2}$
(b)		$\frac{3}{4}$	M1 A1	ft (dep on previous M1) subs y = 16 into proportional formula of the form $y = \frac{k}{x^2}$ oe oe

Question	Working	Answer	Mark	Notes
35		$\frac{1}{3}$	P1	process to solve the problem e.g. $\frac{3}{10}\times\frac{4}{9}(=\frac{12}{90}=\frac{2}{15})$ OR finds the number of white circles for their chosen number OR for 9 : 21 (or a multiple of 9 : 21)
			P1	second step of the process e.g. $\frac{7}{10}\times\frac{2}{7}(=\frac{14}{70}=\frac{2}{10}=\frac{1}{5})$ OR finds the number of black circles for their chosen number OR for a multiple of 2 : 5 where the ratio parts sum to "21"
			P1	for complete process e.g. $"\frac{2}{15}"+"\frac{1}{5}"\left(=\frac{4}{30}+\frac{6}{30}\right)$ OR finds the total number of circles for their chosen number OR for 3 ratios that could be used to solve the problem eg 9 : 21 with 4 : 5 with 6 : 15
			A1	for $\frac{1}{3}$ oe

Question	Working	Answer	Notes
36 (a)		48	P1 start to process eg. 3 × 80 (=240) P1 '240' ÷ 5 A1
(b)			C1 eg. she may drive a different distance and therefore her average speed could be different
37		28	P1 Process to start to solve problem eg. $\frac{3}{5} \times 40$ **or** divide any number in the ratio 3:2 P1 Second step in process to solve problem eg. $\frac{2}{5} \times 10$ or find number of males/females under 25 for candidate's chosen number P1 for complete process A1
38		150 000	M1 $60 \div 100^2$ **or** $900 \div 60$ **or** $900 \div$ "60" A1
39		No with reason	C1 Starts to formulate reason eg. No with partial explanation or 0.8 × 0.7 or starts to use figures C1 No with full explanation eg. 0.8 × 0.7 = 0.56 so only 44% reduction

Question	Working	Answer	Notes
40		Given result	M1 For length scale factor eg $\sqrt{\frac{4}{9}}$ **or** 120 : 405 M1 $\left(\sqrt{\frac{4}{9}}\right)^3 \times 405$ **or** $2^3 : 3^3$ (from 120 : 405) A1 120 from correct arithmetic **or** conclusion relating $2^3 : 3^3$ with $2^2 : 3^2$ with correct working

Question	Working	Answer	Notes
41		4 m^2	B1 substitution into formula eg $35 = \frac{140}{A}$ oe A1 4 stated C1 (indep) units stated
42 (a)		5	P1 begins to work with scaling factors (eg 5) or ÷6 A1 cao
(b)		10	P1 works with 1:2 ratio eg no. red counters is 30÷2 (=15) A1 ft
43		37.5 mph	P1 shows process of finding first distance eg 50 × 3 (=150) P1 shows process of finding time for second part eg 150 ÷ 30 (=5 h) P1 shows process of working with av sp. (dist ÷ time) (= 300÷(3+5) = 300÷8) C1 conclusion with supporting evidence, correct notation and units eg 37.5 mph
44		D, A, B, C	B2 B2 for all correct (B1 for at least 2 correct)

Question	Working	Answer	Notes
45	16 ÷ 4 $\frac{1\times4}{2}$ =2 or $\frac{1}{2}\times\frac{1}{4}=\frac{1}{8}$ $\frac{2\times4}{2}$ =4 or $\frac{1}{2}\times\frac{1}{2}=\frac{1}{4}$ $\frac{1\times4}{2}+\frac{2\times4}{2}=6$ or $\frac{1}{2}\times\frac{1}{4}+\frac{1}{2}\times\frac{1}{2}=\frac{3}{8}$ $16-6=10$ or $1-\frac{3}{8}=\frac{5}{8}$	$\frac{5}{8}$	P1 Using side lengths of 4 P1 Method to find fraction or area for one unshaded triangle P1 Method to complete fraction or area for total unshaded region P1 Method to find total fraction or area for shaded region A1 for $\frac{5}{8}$ oe or 0.625
46	$\frac{90}{2}\times3=135$ $\frac{84}{60}\times100=140$	Combination with reason	P1 Links either $\frac{2}{3}$ with 90 and 60% with 84 P1 Process to find original price of microwave oven eg $\frac{90}{2}\times3$ (=135) P1 Process to find original price of combination oven eg $\frac{84}{60}\times100$ (=140) A1 Correct original prices £135 and £140 with interpretation of results to conclude that combination oven had greater normal price.
47		9	M1 Finds constant 36 × 1.5 (=54) or $\frac{6}{1.5}$=4 M1 54 ” 6 or 36 ” 4 A1 9 cao

Question	Answer	Mark	Mark scheme	Additional guidance
48 (a)	80	M1	for a complete method eg $\frac{20}{15} \times 60$ **or** 20×4 **or** $20 \div \frac{1}{4}$	
		A1	cao	
(b)	Travel graph	M1	for method to find distance travelled in last 20 minutes, eg $75 \times \frac{20}{60}$ (= 25)	Can be implied by a distance of 25km drawn on the graph
		C2	for a fully correct travel graph	
		(C1	for horizontal straight line from (10 15, 20) to (10 25, 20) **or** for a line of the correct length and gradient to indicate a speed of 75km/h eg a straight line from (10 25, 20) to (10 45, 45))	
49	1.6	P1	for 1.8×80 (= 144) **or** 1.2×40 (= 48) or for 192 **or** for 80 : 40 = 2 : 1	
		P1	for ("144" + "48") ÷ (80 + 40) or 192 ÷ 120 **or** for $(1.8 \times 2 + 1.2) \div 3$ or $4.8 \div 3$	
		A1	oe	
50	344 580.48	P1	for a start to the process to find the initial investment eg 344 605 ÷ 1.025 oe (= 336 200) **or** for 1.025^3 (= 1.07689….)	
		P1	for complete process to find original investment, eg 344 605 ÷ 1.025^3 oe (= 319 078 to 320 265)	
		P1	for [initial investment] $\times 1.02^2 \times 1.035$ oe	[initial investment] must be clearly what they believe to be that and cannot be 344605
		A1	for answer in the range 343 587 to 344 581	

Question	Answer	Mark	Mark scheme	Additional guidance
51	25 : 36	P1	for $\sqrt[3]{125}$ (= 5) **and** $\sqrt[3]{27}$ (= 3) oe **OR** for correct process to find the radius of A and radius of B (3.10… and 1.86…)	Accept scale factors expressed as fractions or decimals eg 1.66, 1.67, 0.6 or better Ignore units throughout
		P1	for method to find values in ratio of length between *A* and *C* eg 5 **and** 2×3 (= 6) oe **or** "3.10…" **and** "1.86…" × 2 (=3.72…) **OR** 25 **and** 36 **OR** for correct process to find SA of A **and** SA of C (120.(8…)) and (174.(0…))	For both P marks the lengths need not be written as a ratio
		A1	for 25 : 36 oe eg 1: 1.44	

Question	Answer	Mark	Mark scheme	Additional guidance
52	No	P1	for 3000 ÷ (2 + 3) (= 600)	
	(supported)	P1	for "600" × 2 (= 1200) **or** "600" × 3 (= 1800) **or** "600" ÷ 6 (= 100) **or** "600" ÷ 20 (= 30)	
		P1	for "1200" ÷ 6 (= 200) **or** "1800" ÷ 20 (= 90) **or** "100" × 2 (= 200) **or** "30" × 3 (= 90)	
		P1	for "90" ÷ ("200" + "90") × 100 (= 31.0...) oe **or** "90" ÷ ("200" + "90") (= 0.31...) **or** 0.3 × ("200" + "90") (= 87)oe	Full method to compare
		C1	correct conclusion **and** fully correct calculations with accurate figure eg No and 87 **or** No and 31% **or** No and 0.31	No working, answer only no marks No may be implied by a statement
53 (a)	580	M1	for method to find value before increase eg 551 ÷ 0.95	
		A1	cao	
(b)	6354.67	M1	for 6000 × 1.024 oe (= 6144)	
		M1	for "6144" × 1.017^2 oe	6000 × 1.024 × 1.017^2 scores M2
		A1	for 6354.66 **or** 6354.67 **or** 6354.68	If correct answer is stated then subsequently rounded isw and award 3 marks If correct answer stated and then interest only given as the answer award M2A0

Question	Answer	Mark	Mark scheme	Additional guidance
54 (a)	−0.09	M1	for suitable method to find gradient, eg 27 ÷ 300	Any readings from the graph must be reasonable. Condone missing negative for M1
		A1	for answer in the range −0.1 to −0.08 oe	
(b)		C1	for explanation **Acceptable examples** volume of petrol used each km litres/km Rate of fuel consumption For every 9 litres you can travel 100 km **Not acceptable examples** volume ÷ distance volume of petrol used per distance km/litre as distance increases volume decreases	Can ft explanation linked to incorrect gradient in part (a)

Question	Answer	Mark	Mark scheme	Additional guidance
55	18	P1	for 240 ÷ 10 (= 24) **or** 240 ÷ 8 (= 30)	Accept 3 + 7 for 10, 3 + 5 for 8
		P1	for 3 × "24" (= 72) **or** 7 × "24" (= 168) **or** 3 × "30" (= 90) **or** 5 × "30" (= 150)	
		P1	for 3 × "24" (= 72) **and** 3 × "30" (= 90) **or** 7 × "24" (= 168) **and** 5 × "30" (= 150)	
		A1	Cao	
56	6	M1	for 720 ÷ 40 (= 18) **or** 720 ÷ 30 (= 24)	
		M1	for a complete process eg (720 ÷ 30) – (720 ÷ 40) **or** "18" × 4/3 – "18" **or** "24" – "24" × 3/4	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
57	2.2	P1	works out interest for one year, eg 3550 × 0.026 (= 92.3(0)) **or** 3550 × 1.026 (=3642.3(0))	
		P1	for compound interest calculation, eg 3550×1.026^2 (= 3736.9…) **or** for an answer given as 0.0219… or 1.0219…	
		A1	answer in range 2.19 to 2.2	If an answer in the range is seen in working and then incorrectly rounded award full marks
58 (a)	163 or 164	P1	uses formula eg 1.2 × 200 – 50 (= 190)	
		P1	for complete process, eg May: 1.2 × "190" – 50 (= 178) **and** June: 1.2 × "178" – 50 (= 163.6)	
		A1	for 163 or 164	
(b)	Statement	C1	(dep P1) ft statement, eg there won't be any rabbits, fewer rabbits, decrease	

Question	Answer	Mark	Mark scheme	Additional guidance
59	168	P1	for working with ratio to find the amount for C or D eg 1.5 × 2 (=3) or (A, B, C, D =) 2 , 7 , 3 , 3 oe **OR** for suitable expressions linking A with C or D, eg. A = x, C = 1.5x	
		P1	for "2 + 3 + 3 + 7" (=15) **OR** adds 4 suitable expressions, eg. "x + 3.5x + 1.5x + 1.5x" (= 7.5x)	
		P1	for a complete process to find the amount of money eg 360 ÷ "15"× 7 **OR** 360 ÷ "7.5" × 3.5	
		A1	cao	
60 (a)	100 : 81	M1	for a scale factor of 0.9 oe used; **OR** for 10 : 9 oe **OR** 81 : 100 oe **OR** 81%	
		A1	for 100 : 81 oe	eg. 1 : 0.81, accept 1.23(4...) : 1
(b)	6 : 5	P1	for 1.44 oe used as the scale factor **or** 1.2 oe **OR** for 144 : 100 oe or $\sqrt{144} : \sqrt{100}$ oe **OR** 5 : 6 oe	
		A1	for 6 : 5 oe	eg 1.2 : 1, accept 1 : 0.83(3...)

Question	Answer	Mark	Mark scheme	Additional guidance
61 (a)	Explanation	C1	For stating the LCM of (4+7) and (5+3) is 88 **or** there is no smaller multiple of 8 and 11 (than 88)	
(b)	23	P1	for using a scale factor appropriately eg 4 × 8 (=32) **or** 3 × 11 (=33) **or** 7 × 8 (=56) **or** 5 × 11 (=55) **or** for writing a pair of suitable fractions, eg $\frac{7}{11}$ and $\frac{3}{8}$ **or** $\frac{4}{11}$ and $\frac{5}{8}$ **or** $\frac{3}{8}$ and $\frac{4}{11}$	May be seen in a two-way table or probability tree
		P1	for finding the number of large cubes and red cubes **or** small and yellow **or** small and red eg 7 × 8 (=56) and 3 × 11 (=33) **or** 4 × 8 (=32) and 5 × 11 (=55) **or** 4 × 8 (=32) and 3 × 11 (=33) **OR** a suitable fractional equation, eg $\frac{7}{11} - x = \frac{3}{8}$ **or** $\frac{5}{8} - x = \frac{4}{11}$ **or** $x = 1 - \frac{3}{8} - \frac{4}{11}$ **OR** a suitable pair of probabilities with a common denominator, eg $\frac{56}{88}$ and $\frac{33}{88}$ **or** $\frac{32}{88}$ and $\frac{55}{88}$ **or** $\frac{33}{88}$ and $\frac{32}{88}$	May be seen in a two-way table or probability tree $\frac{23}{88}$ scores P2A0
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
62 (a)	Ben (supported)	P1	shows how to work interest out for one year eg 2000 × 0.025 (= 50) **or** 1600 × 0.035 (= 56) **or** 150 **or** 168 **or** 2000×1.025 (= 2050**) or** 1600 × 1.035 (= 1656)	Throughout accept figures ±1 pence which do not need to be presented in money notation (to 2dp) or with monetary symbols.
		P1	shows compound interest calculation for one account eg 2050→51.25 **or** 2101.25→52.53 **or** 1656→57.96 **or** 1713.96→59.99 eg 2000×1.025^3 (= 2153.78**) or** 1600 × 1.035^3 (= 1773.95)	Award mark for a correct process shown, for which these figures can be taken as implying the process.
		P1	shows complete compound interest calculation for both accounts eg 2000×1.025^3 (= 2153.78**) and** 1600 × 1.035^3 (= 1773.95) OR one interest stated correctly eg 153.78 **or** 173.95	As above, award mark for both correct processes shown for both accounts, which these figures can be taken as implying the process.
		C1	Ben (shares) supported by 153.78 **and** 173.95	Accept an answer of "shares".
62 (b)	conclusion	C1	conclusion (ft) eg no change, shares now 182.5… **Acceptable examples** no since shares/Ben now 182.5 Still Ben since 182.5 > Ali No; he only gets 8.57 more No; he gets 68.56 instead of 59.98 (3^{rd} yr) No; Ben already gets more interest, he would just get even more **Not acceptable examples** no shares now 182.5 Still Ben since less than Ali 182.5 > 153.78 no; he needs 20.17 more .	Conclusion needs to be supported. ft is from part (a); calculations carried out as part of (b) need to be correct for the comparison to be valid.

Question	Answer	Mark	Mark scheme		Additional guidance
63	No	P1	calculates area of trapezium eg ½ × 7 × (10+16) (= 91)		
	(supported)	P1	for division by coverage eg ÷2 or [area of trapezium] ÷ 2 (= 45.5) or process to find coverage per tin eg 5 × 2 (= 10)	for process to find number of tins bought eg 160 ÷ 16.99 = 9 tins	[area of trapezium] needs to be clearly stated if the process of finding the area is not clear
		P1	for division to find the number of tins eg ÷5 or "45.5" ÷ 5 (= 9.1) **or** [area of trapezium] ÷ "10" (= 9.1)	for using whole no. of tins to find total litres eg 9 × 5 (= 45)	
		P1	(dep on at least P2) for a process to multiply a whole number of tins (rounded up) by 16.99	(dep on at least P2) for a process to find the total coverage eg "45" × 2 (= 90)	
		C1	for 'No' supported by correct figures eg 169.9 or 90 **and** 91		There must be a conclusion ("No" or equivalent wording) including the figure 169.9 and working showing processes followed.

Question	Answer	Mark	Mark scheme	Additional guidance
64	35	P1	use of ratio 2:3 and tin quantities to find overall ratio of litres eg 4:3 or 4 tins : 3 tins **or** 20 litres (Y) & 30 litres (B)	
		P1	calculates total cost of making paint eg $4 \times 26 + 3 \times 48$ (50 litres) **or** 104+144 (=248)	Could be multiples 4 & 3 (for an amount which is a multiple of 50 litres). "248" is the total cost for making 50 litres
		A1	calculates comparable cost eg 10 litres (1 tin) green paint made as 49.6 **or** differences (profit) for 1 tin as 17.36 or 5 tins as 86.8 **or** total comparable costs for 50 litres as 334.8 **and** 248, for 25 litres as 167.4 **and** 124 or 1 litres as 33.48 **and** 24.8	"248" $\div$ 5 = 49.6 for 10 litre (1 tin) green paint made Profit on 10 litres is 66.96 − 49.60 = 17.36 Profit on 50 litres is 304.8 − 248 = 86.8 334.8 comes from 5×66.96 and is the selling price for 50 litres green paint
		P1	for percentage calculation eg $\frac{1736}{4960} \times 100$, $\frac{"334.8" - "248"}{"248"} \times 100$	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
65	4 : 1	P1	for associating algebraic expressions with the correct ratio eg $p-5 : q-5$ (= 5 : 1) or $p+20 : q+20$ (= 5 : 2)	
		P1	for $\frac{p+20}{q+20}=\frac{5}{2}$ **or** $\frac{p-5}{q-5}=\frac{5}{1}$ oe **or** $p-5=5(q-5)$ **or** $2(p+20)=5(q+20)$ oe	Award for one of the two simultaneous equations eg $5q-p=20$, $5q-2p=-60$ oe
		M1	for a complete method shown to find p **or** q	Award for a simultaneous equation method to eliminate one variable leading to either $p = 80$ or $q = 20$
		M1	for a complete method shown to find p **and** q **or** two values for p and q that are in the ratio 4 : 1 or an unsimplified ratio 4 : 1 (eg 80 : 20) or an answer of 1 : 4	Award for a simultaneous equation method to eliminate both variables leading to either $p = 80$ **and** $q = 20$
		A1	cao	
66	3.75	P1	works to find vol of frustum eg $1/3\pi(3.6)^2\times6.4 - 1/3\pi(1.8)^2\times3.2$ or 86.858.. − 10.857… (=24.192π or 76.00..)	
		P1	works to find vol of hemisphere eg $\frac{1}{2}\times\frac{4}{3}\pi\times3.6^3$ (=31.104π or 97.7....)	781.7… by use of diameter does not get the mark
		P1	mass of frustum as [vol]×density eg "76.00" × 2.4 (=182.4..) **or** mass of hemisphere as [vol]×density eg "97.7...."×4.8 (=469.037...)	[vol] is their volume which could be ft using the radius, using the diameter, or could be another value as long as it is stated as being the volume, or clearly intended from working.
		P1	mean density as total mass ÷ total volume eg ("182.4.." + "469.037") ÷ ("76…" + "97.7..") or "651.4..". ÷ "173.7...."	All figures must come from correct method shown.
		A1	answer in the range 3.7 to 3.8	

Question	Answer	Mark	Mark scheme	Additional guidance
67	3 : 5	P1	for process to find 20% **or** 120% of the cost, eg 8500 × 0.2 (= 1700) oe **or** 8500 × 1.2 (= 10 200) oe	When partitioning all figures quoted must be correct or a full method shown eg 10% = 8500 ÷ 10 (=850) and 20% = "850" + "850" (=1700)
		P1	for process to find total cost of payments, eg 12 × 531.25 (= 6375)	
		P1	for complete process to find value of deposit, eg "10 200" – "6375" (= 3825) **or** 8500 – "6375" (=2125) **and** "2125" + "1700" (=3825) **OR** the deposit as a proportion of the total cost, eg $1 - \frac{"6375"}{"10200"}$ $(=\frac{3}{8})$	May be seen as a fraction of the total eg $\frac{3825}{10200}$ $(=\frac{3}{8})$
		P1	for finding a correct un-simplified ratio, eg "3825" : "6375" oe **or** 5:3 **or** 1.$\dot{6}$: 1 **or** $\frac{5}{3}$: 1	Figures at this stage must be expressed as part of a ratio eg 51:85, $\frac{3}{8} : \frac{5}{8}$
		A1	Accept 1: 1.$\dot{6}$, 1: $\frac{5}{3}$	Ignore consistent units

Question	Answer	Mark	Mark scheme	Additional guidance
68	No (supported)	P1	For a process to calculate the initial or new pressure, eg (70 +10) ÷ (20+10) (=2.6 to 2.7) **or** 80 ÷ 30 (=2.6 to 2.7) **or** 70 ÷ 20 (=3.5)	Accept any value in the range 2.6 to 2.7 if unsupported by working
		P1	For a complete process to make a comparison eg. 0.8 × "3.5" (=2.8) **OR** $\frac{("3.5"-"2.6")}{"3.5"} \times 100$ (=22 to 26) **OR** "3.5" × 0.2 (=0.7) **and** 80 ÷ 30 (=2.6 to 2.7) **OR** $\frac{"2.6"}{"3.5"}$ (× 100) (=0.74 to 0.78 **or** 74 to 78)	
		A1	for a correct conclusion supported by accurate figures eg 2.8 **and** 2.6(6…) **OR** decrease is 24% (or 22% to 26%) **OR** 0.7 **and** 2.6 to 2.7 **and** 3.5 **OR** 0.7 **and** 0.9 **OR** 0.76 (or 0.74 to 0.78) **OR** 76% (or 74% to 78%)	Allow truncation or rounding of figures
69	12 508.7(0)	P1	for start of process to find interest rate for year 1 eg 12336 ÷ 12000 (=1.028) **or** (12336 – 12000) ÷ 12000 (=0.028) **OR** forms a suitable equation, eg 12000 × $(1 + \frac{x}{100})$ = 12336	
		P1	for complete process to find the interest rate for year 1 eg ("1.028" – 1) × 100 (=2.8) **or** "0.028" × 100 (=2.8) **OR** correct process to solve correct equation eg (12336 – 12000) ÷ 120 (=2.8)	Rate of interest = 2.8, or x = 2.8 implies P2
		P1	for complete process to find the value at the end of 2 years eg ("2.8" ÷ 2 + 100) ÷ 100 × 12336	
		A1	accept 12508.7 to 12508.71 **or** 12509	12509 must come from correct working
70	BDAC	B2	all correct	
		(B1	for at least 2 correct)	

Question	Working	Answer	Mark	Notes
71	£6 − £5.64 = 36p or 50p – 47p = 3p	6.4	P1	for a strategy to compare the same number of bottles e.g. £5.64 ÷ 12 (= 47 or 0.47) or 12 × 50p (= 6 or 600) or 36 or 0.36 or 3 or 0.03
			P1	for start of process to find percentage profit e.g. $\frac{"36"}{564}$ or $\frac{"3"}{"47"}$ or $\frac{"6"}{5.64}$ or $\frac{50}{"47"}$ oe with consistent units
	6.3829787…%		A1	for answer in the range 6.3 to 6.4
72		$\frac{1}{11}$	P1	for starting the process, eg by writing down a correct ratio or using a given number of cubes for one relationship, eg 2B 1Y or B:Y = 2:1 or 4G 1B or G:B = 4:1 or 8G, 1Y or G:Y = 8:1 oe or yellow = 2, blue = 4, or states 2:1:8 oe in any order (can be algebraic)
			P1	for complete process to find possible number of each colour or equivalent ratio, eg 8G 2B 1Y or G:B:Y = 8:2:1 oe or yellow = 2, blue = 4, green = 16 oe (can be algebraic)
			A1	$\frac{1}{11}$ oe
73		65.60	P1	for start in using inverse proportionality, eg 5 × 4.5 (= 22.5) or 4.5 = $\frac{k}{5}$ or 5 × 4.5 × 60 (= 1350) or $\frac{5}{3}$ or $\frac{3}{5}$
			P1	for process to find number of hours for each cleaner today, eg $\frac{22.5}{3}$ (= 7.5)
			A1	for 65.6(0) (SC B2 for 61.5(0))

Question	Working	Answer	Mark	Notes
74 (a)		58600	M1	for a complete method, eg 50000×1.02^8 (= 58582(.969...)) or for finding the increase in value of the company after 8 years, eg 8582(.969...) or 8600
			A1	cao
(b)		4.5	P1	for a process to find multiplier for 6 year period, eg 325 ÷ 250 oe (= 1.3) or 130(%) or for $250000 \times y^6 = 325000$
			P1	for a process to find multiplier for one year, eg $("1.3")^{\frac{1}{6}}$ or 1.044…or 1.045
			A1	4.4 – 4.5
75		0.98	B1	cao

Question	Working	Answer	Mark	Notes
76		Yes	P1	for process to work out the total number of children, e.g. 117 × 4 (= 468)
		(supported)	P1	(dep P1) for process to work out total number of adults or the total number of people, e.g. "468" × 5 ÷ 2 (= 1170) or "468" × 7÷ 2 (= 1638)
			A1	for 1170 or 1638
			P1	for process to work out the percentage of theatre full, e.g. $\frac{"468"+"1170"}{2600}\times$ 100 (= 63) or for a process to work out 60% of 2600 (= 1560)
			C1	for a correct conclusion supported by correct figures e.g. 63% or 1560 **and** 1638
				OR
			P1	for a process to work out 60% of 2600, eg. $\frac{60}{100} \times 2600$ (= 1560)
			P1	(dep P1) for process to work out this total number of children, e.g. "1560" × 2 ÷ 7 (= 445(.7…))
			A1	for 445(.7…)
			P1	for process to work out children in the circle, eg. "445(.7…)" ÷ 4 (= 111 to 112)
			C1	for a correct conclusion supported by correct figures e.g. 111 to 112 [Where appropriate accept rounded or truncated values]
			P1	for a process to find the maximum number of children, eg. 2600 × 2 ÷ 7 (= 742(.8…))
			P1	for process to work out the total number of children, e.g. 117 × 4 (= 468)
			A1	for 468 and 742(.8…)
			P1	for $\frac{"468"}{"742(.8..)"}\times$ 100 (= 63) or process to work out 60% of "742(.8...)" (= 445(.7…))
			C1	for a correct conclusion supported by correct figures e.g. 63% or 468 and 445(.7…) [Where appropriate accept rounded or truncated values]

Question	Working	Answer	Mark	Notes
77 (a)		57.1	P1	for a process to find time from Liverpool to Manchester, eg. 56 ÷ 70 (= 0.8 (hrs) or 48 (mins))
			P1	for a process to find total distance, eg. 56 + 61 (= 117) or the total time, eg. "48" + 75 (= 123) or "0.8" + $\frac{75}{60}$ (= 2.05) with consistent units of time
			P1	(dep P2) for a correct process to find average speed with consistent units of time, eg."117" ÷ "2.05" or "117" ÷ "123"
			A1	for answer in the range 57 to 57.1
(b)		explanation	C1	for explaining that the time taken for the two parts of the journey must be the same or the distance from Leeds to York is $\frac{3}{4}$ of the distance from Barnsley to Leeds
78 (a)		3.9	M1	for a ratio of $\frac{8.1}{5.4}$ (=1.5) oe or $\frac{5.4}{8.1}$ (=0.66..) oe or $\frac{2.6}{5.4}$ (= 0.48..) oe or $\frac{5.4}{2.6}$ (= 2.07..) oe
			A1	cao
(b)		2.05	M1	for $\frac{5.4}{8.1} \times 6.15$ oe (= 4.1) or $\frac{2.7}{8.1} \times 6.15$ oe or ft "scale factor" from (a)
			A1	cao
79		Secure Bank (supported)	P1	for a process to work out the interest after one year e.g. 0.02 × 25000 (=500) or 0.043 × 25000 (=1075) or for 1.02 or 25500 or 1.043 or 26075
			P1	for process to find value of the investment after 3 years or the multiplicative factor for 3 years at one of the banks, e.g. 25000 × 1.02 × 1.02 × 1.02 oe (= 26530…) or 1.02^3 (= 1.0612…) or 25000 × 1.043 × 1.009 ×1.009 oe (= 26546…) or 1.043 × 1.009 ×1.009 (= 1.0618.....) [accept total interest of 1530.. or 1546.. if final values of investment are not found]
			C1	for Secure Bank from correct figures, eg. 26530.. and 26546.. or 1530… and 1546… or 1.0612... and 1.0618…

Question	Working	Answer	Notes
80		96	P1 a strategy to start to solve the problem eg 18 ÷ (7 − 4) (=6) P1 for completing the process of solution eg "6" × (4 + 5 + 7) A1 cao
81		conclusion (supported)	P1 30 ÷ 70 (=0.428) | 26 ÷ 60 (=0.4333…) | 30 ÷ 26 (=1.153…) P1 60 × "0.428…" | 70 ×"0.4333…" | 60× "1.153…" C1 for conclusion linked to 25.7 mins, 30.3 miles or 69.2 mph
82		6 : 2 : 1	M1 for correct interpretation of any one statement eg. 3 : 1; 1 : 0.5 A1 accept any equivalent ratio eg. 3 : 1 : 0.5
83 (a)		1.8%	P1 for start to process eg. 2000 × 1.025 (=2050) P1 for process to use all given information eg "2050" × m^2 = 2124.46 **or** $"2050"\times\left(1+\frac{x}{100}\right)^2 = 2124.46$ P1 for process to find their unknown eg $m = \sqrt{\frac{2124.46}{2050}} (= 1.01799...)$ A1 for 1.79% – 1.8 %
(b)		200	M1 225 ÷ 1.125 oe A1
84		20	M1 Establishing method linked to proportion eg $d=k\div c$ or $25=k\div 280$ M1 (dep) substitution eg d = 7000 ÷ 350 or 25 × 280 ÷ 350 oe A1 cao

Question	Working	Answer	Notes
85	£: 1980 ÷ 1.34 = 1477.61 2250 ÷ 1.52 = **1480.26** : 1480 × 1.34 = 1983.2 2250 ÷ 1.52 × 1.34 = 1983.55 $: 1480 × 1.52 = 2249.6 1980 ÷ 1.34 × 1.52 = **2245.9**	Jardins of Paris supporting evidence	P1 correct process to convert one price to another currecncy, eg 1980 ÷ 1.34 P1 for a complete process leading to 3 prices in the same currency C1 for 3 correct and consistent results and a correct comparison made. P1 C1
86 (a)		graph	M1 for method to start to find distance cycled in 36 mins, eg. line drawn of correct gradient or $15 \times \frac{36}{60}$ or 15 × 36 C1 for correct graph from 9.00 am to 9.36 am C1 for graph drawn from "(9.36, 9)" to (10.45, "9" + 8)
(b)		4.5	M1 for 18 × 0.25oe A1 cao
87		8112	M1 for complete method, eg. 7500×1.04^2 A1 cao

Question	Working	Answer	Notes
88		No with supporting evidence	P1 for the start of a correct process, eg. two of x, $2x$ and $2x+7$ oe or a fully correct trial, eg. 5 + 10 + 17 = 32 P1 (dep on P1) for setting up an equation using 3 algebraic terms, eg. $x + 2x + 2x + 7 = 57$ or a correct trial totalling 57, eg. 10 + 20 + 27 = 57 C1 for a correct deduction from correct answers, eg. Chris has 20 so it is impossible for all to have 20 since 60 marbles would be needed.
89 (a)		–1.5	M1 for method to find gradient, eg. 210 ÷ 140 A1 for correct interpretation of the negative gradient
(b)			C1 for explanation, eg. rate of change of depth of water in tank
90		18.3	P1 for a start to the process interpreting the information correctly, eg. $T = k\sqrt{L}$ oe P1 for a correct scale factor of 1.4 A1 for 18.3 to 18.4
91 (a)		3 to 4	C1 for a tangent drawn at $t = 6$ B1 for a gradient in the range 3 to 4 or ft "tangent"
(b)		452	C1 for splitting the area into 3 strips and a method of finding the area of one shape under the graph, eg. $\frac{1}{2} \times 4 \times 35$ (= 70) M1 for complete process to find the area under the graph, eg "70" + $\frac{1}{2} \times 4 \times (35 + 51)$ (= 172) + $\frac{1}{2} \times 4 \times (51 + 54)$ (= 210) [= 452] A1 for 452
92		10169 or 10171	P1 for correct use of formula to find number in 2016, eg. 1.05(9500 – 250) (= 9712.5) P1 for complete iterative process, eg. 2017: 1.05("9712.5" – 250) (= 9935.625) 2018: 1.05("9935.625" – 250) C1 for answer of 10169.90... rounded or truncated to nearest whole number

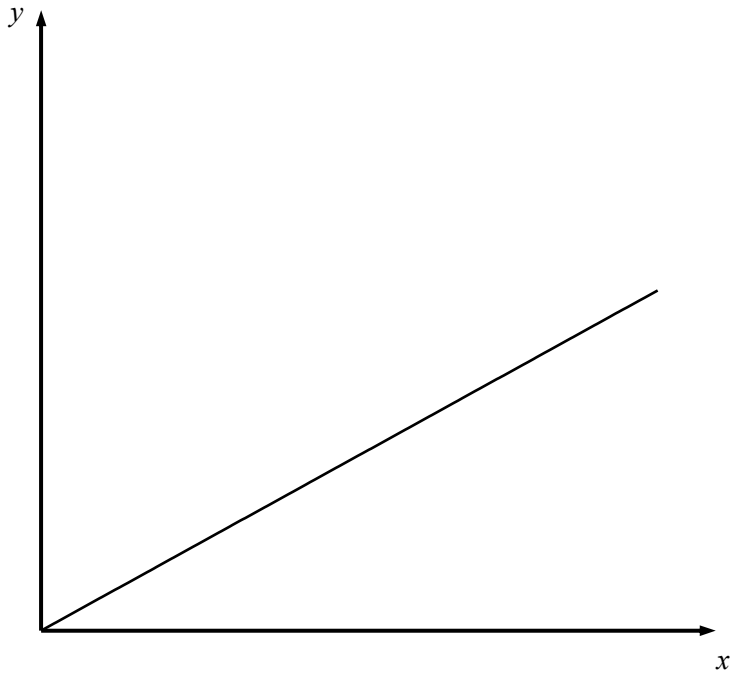
Question	Working	Answer	Notes
93	6 : 5 = 12 : 10 2 : 1 = 10 : 5 C : S : P = 12 : 10 : 5 $\frac{10}{27} \times 189$	70	P1 P1 for strategy to start to solve the problem eg 12 : 10 and 10: 5 P1 P1 for process to solve the problem eg $\frac{10}{27} \times 189$ A1 A1 cao
94 (a)		18	B1 cao
(b)		$5(x - 1)$	M1 for method to find inverse function A1 for $5(x - 1)$ or $5x - 5$
(c)		$9x - 48$ shown	M1 for method to find composite function A1 for working leading to $9x - 48$
95 (a)	$1560000 \times (1.052)^2$	1730000	P1 for process to find population in 2016 P1 for complete process to find population in 2017 A1 for 1725000 - 1730000
(b)(i)		2020	P1 for process to find when population will exceed 2 000 000 A1 for 2020
(ii)			C1 for correct comment on how assumption will affect the answer, eg if the percentage growth is higher the population may exceed 2 000 000 earlier.

Question	Working	Answer	Notes
96		explanation	C1 for a correct evaluation, eg the value of D should be multiplied by 8, she has used 2×3 instead of 2^3
97 (a)		1.0 – 1.3	M1 for finding gradient by drawing tangent M1 for method to calculate gradient A1 For 1.0 – 1.3
(b)			C1 for acceleration C1 for eg " 4 second after the start of the race", "when the speed is 7.6 m/s", "in m/s^2"
(c)		limitation	C1 for comment, eg dependent on accuracy of constructing a tangent
98	$\frac{2x-1}{x-4} = \frac{16x+1}{2x-1}$ $(2x-1)^2 = (16x+1)(x-4)$ $12x^2 - 59x - 5 = 0$ $(12x+1)(x-5) = 0$	$-\frac{1}{12}$, 5	P1 for process to write as an equation P1 for process to clear the fractions P1 for process to write equation in form $ax^2 + bx + c = 0$ P1 for process to solve the equation A1 cao

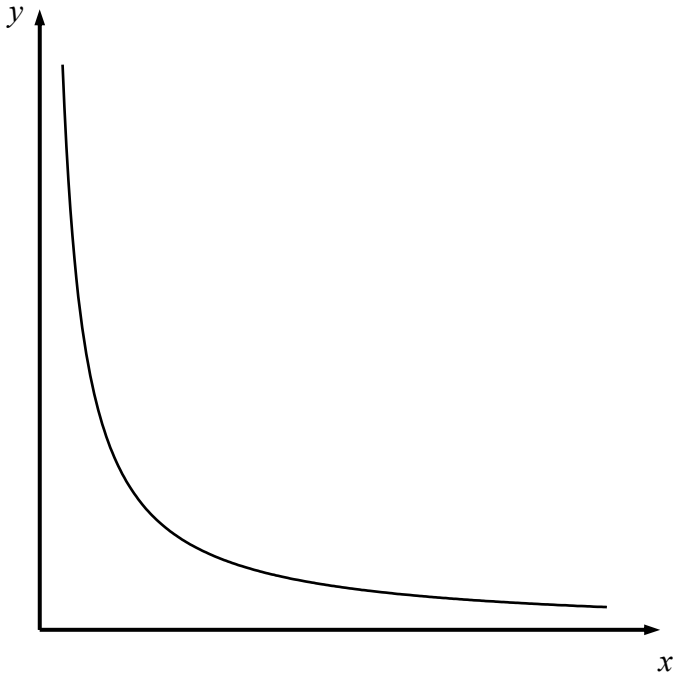
Question	Answer	Mark	Mark scheme	Additional guidance
99	12.85 or 12.86 or 13.5(0)	P1	for 9 + 2 + 1 (= 12)	Award this mark for sight of 4500, 1000 or 500
		P1	for working out how many lots of 175g are needed eg 6000 ÷ "12"× 2 ÷ 175 (= 5.71...)	Process may lead to 5 or 6 instead of 5.71...
		P1	for a complete process eg "5.71..." × 2.25 (= 12.857...)	"5.71…" (ft) may be rounded or truncated.eg "6"
		A1	for 12.85 or 12.86 or 13.5(0)	

Question	Answer	Mark	Mark scheme	Additional guidance
100	260	P1	conversion to common units of capacity eg 2.2 × 4.54 (= 9.988) or 8 ÷ 4.54 (= 1.76...) **OR** for Company A 2400 ÷ 4.54 (= 528.63...) **OR** 2400 ÷ 8 (= 300) **OR** a rate per minute 8 ÷ [time for Company A] (= 4.8…) oe	Results of calculations may be truncated or rounded. [time for Company A] could be 1 min 40 sec or 1.66… or 1.6 or 1.40 etc as long as it is clear it relates to 1 min 40 sec
		P1	for a complete process to find the time for company A or company B in minutes. eg in litres Company A 2400 ÷ "4.8…" (= 500) or "300" × [1 min 40 sec] (= 500) **or** Company B 2400 ÷ "9.988" (= 240.28...) **OR** eg in gallons Company A "528.63.." ÷ ("1.76..." ÷ [1 min 40 sec]) (= 500) **or** Company B "528.63…" ÷ 2.2 (= 240.28…)	
		P1	for complete processes to find the times for both company A and company B in minutes. Company A eg in litres 2400 ÷ "4.8…" (= 500) or "300" × [1 min 40 sec](= 500) **or** in gallons "528.63.." ÷ ("1.76. .." ÷ [1 min 40 sec]) (= 500) **AND** Company B eg in litres 2400 ÷ "9.988" (= 240.28...) or in gallons "528.63…" ÷ 2.2 (= 240.28…)	
		A1	for an answer in the range 259 to 260	If the answer is given within the range but then rounded incorrectly award full marks.
101 (a)	Graph sketched	C1	Sketch	Accept freehand provided intention is clear
(b)	Graph sketched	C1	Sketch	

Question 101(a)



Question 101(b)



Question	Answer	Mark	Mark scheme	Additional guidance
102	8 : 12 : 9 : 1	P1	for 2 + 3 (= 5) and 9 + 1 (= 10) OR for assigning a total number of sweets for F + G and O + J eg F + G = 100, O + J = 50	May be in algebraic form, eg $2a + 3a$ (= $5a$) and $9a + 1a$ (= $10a$) May be in algebraic form, eg F + G= $5a$, O + J = $2.5a$
		P1	for finding correct multiplier for relationship between totals for F + G and O + J eg × 4 to get from 5, 10 to 20, 10 OR for working out the number of sweets from their totals for F, G eg 40, 60 or for O, J, eg 45, 5	
		P1	for 2 × 4 (= 8) and 3 × 4 (= 12) OR for ratio in unsimplified form, eg 40 : 60 : 45 : 5	
		A1	cao	
103	0.7 to 1.1	M1	for tangent to the curve drawn at $t = 12$	
		M1	for method to find the gradient of their tangent, eg 28 ÷ 30	Working may be seen on the diagram
		A1	for answer in the range 0.7 to 1.1 dependent upon tangent drawn	Ignore negative signs

Question	Answer	Mark	Mark scheme	Additional guidance
104	$x = \frac{1}{2}z^6$	M1	for setting up an equation eg $x = ky^2$ oe **or** $y = cz^3$ oe	Accept use of proportionality sign, eg $x \propto y^2$ or $y \propto z^3$ or $x \propto ky^2$ or $y \propto cz^3$
		M1	for eliminating y eg $x = k(cz^3)^2$ oe OR substitutes values in both equations, eg $32 = ky^2$ and $y = c2^3$	Accept use of proportionality sign, eg $32 \propto ky^2$ and $y \propto c2^3$
		M1	for substituting in 32 and 2 to find the constant, eg $32 = m2^6$ OR combines equations, eg $32 = k\,c^2 2^6$	
		A1	oe	
105	0.95	P1	for initial use of the formula eg $3610 = kP_n$ or $P_{n+1} = 4000k$ or for $P_{n+2} = k^2 P_n$ or for $3610 = k^2 \times 4000$	Accept n or any integer replacement for n
		P1	for a complete method to find k eg $\sqrt{\frac{3610}{4000}}$ or ± 0.95	This may be seen in steps
		A1	oe	

Question	Answer	Mark	Mark scheme	Additional guidance
106	2 hours 45 minutes	P1	for 30 ÷ 24 (= 1.25) or 12 ÷ 8 (= 1.5)	May be written in hours and/or minutes
		P1	for finding the sum of their two times eg "1.25" + "1.5" (= 2.75) or 165 (minutes)	or 3 h 15 min or 2 h 75 min
		A1	cao	
107 (a)	Yes (supported)	P1	for start of process, eg 5 × 9 (= 45) **or** 10 × 14 (= 140) **or** 5 × 2 (= 10 (kg)) **or** 3 ÷ 2 (= 1.5 (boxes))	Accept values rounded or truncated to 1dp in both (a) and (b). Ignore units
		P1	for process using ratio of areas, eg "140" ÷ "45" (= 3.1...) **or** for using ratio of amount of seed eg "10" ÷ 3 (= 3.3...) **or** for finding coverage for 1 kg of grass seed, eg "45" ÷ 3 (= 15 (m^2))	
		P1	for process to find amount of seed needed, eg "140" ÷ "45" × 3 (= 9.3...kg) **or** "140" ÷ "45" × "1.5" (= 4.6...(boxes)) oe **or** "15" × 2 (= 30 (m^2 per box)) **and** "140" ÷ "30" (= 4.6...(boxes)) **or** for process to find area that can be seeded, eg "10" ÷ 3 × "45" (= 150 (m^2)) **or** "140" ÷ "10" (= 14 (m^2)) oe	Accept 9.4 Accept 4.7
		C1	for "Yes" supported by correct figures eg 4.6...(and 5), **or** 9.3...and 10 **or** 150 and 140 (or 140 to 148.5) **or** 15 and 14	
(b)	Yes, (does not have enough) (supported)	C1	for reasoning supported with correct figures, eg does not have enough seed and compares 9 (kg) with 9.3…(kg) or 4.5 (boxes) with 4.6… (boxes) or 135 (m^2) with 140 (m^2) ft from (a)	Values used in (a) do not need repeating in (b) as long as intention is clear

Question	Answer	Mark	Mark scheme	Additional guidance
108 (a)	3 : 4	P1	for start of process, eg isolate terms in c, eg $4c = 3d$ **or** divide all terms by d, eg $\frac{5c}{d}+1=\frac{c}{d}+4$	
		A1	for 3 : 4	Accept any equivalent ratio or $c = 3$, $d = 4$
(b)	5 : 2	P1	for start of process: to take all terms to one side eg $6x^2 - 7xy - 20y^2 (= 0)$ **or** divide all terms by y^2, eg $\frac{6x^2}{y^2}=\frac{7xy}{y^2}+\frac{20y^2}{y^2}$ **or** substitute a value of x ($x > 0$) or a value of y ($y > 0$) into the equation, eg $x = 5$, $150 = 35y + 20y^2$	
		P1	for second step in process, eg $(2x – 5y)(3x + 4y) (= 0)$ **or** $6p^2 – 7p – 20 (= 0)$ (where $p=\frac{x}{y}$) **or** $20y^2 + 35y - 150 (= 0)$	
		A1	5 : 2	Accept $x = 5$, $y = 2$ or equivalent ratios,eg, $1 : \frac{2}{5}$

Question	Answer	Mark	Mark scheme	Additional guidance
109	37 000	B1	cao	
110	50	B1	for finding the time difference, eg, 1hr 18 mins or 78 mins oe	Allow 1.18 for this mark 118 scores B0
		P1	for correct process to convert minutes to hours, eg 18 ÷ 60 (=0.3) **or** 78 ÷ 60 (=1.3) **or** for a correct process to convert speed in miles per minute to mph eg "0.833.." × 60	For a conversion of time or speed
		P1	for using speed = distance ÷ time eg, 65 ÷ [time] **or** 65 ÷ 78 (=0.833..)	[time] is what the candidate clearly indicates as time difference
		A1	cao SCB2 for 83(.333…) seen as the answer	
111	739	P1	process to find the volume of C, eg $\pi \times 3^2 \times 25$ (= 706.8583471 or 225π)	For use of 3.14 Volume of C is 706.5
		P1	process to find the volume of A **or** the volume of B, eg "706.8..." × $\frac{2}{2+13}$ (= 94.24777961 or 30π) or "706.8…" × $\frac{13}{2+13}$ (= 612.6105675 or 195π) **or** process to work with density and ratio, eg (2 × 1.21 + 13 × 1.02) (= 15.68)	Volume of A is 94.2 Volume of B is 612.3
		P1	process to find the mass of C, eg "30π" × 1.21 (= 114.0398133) + "195π" × 1.02 (= 624.8627788) **or** "225π" × "15.68" ÷ (2+13)	Mass of A is 113.982 Mass of B is 624.546
		A1	for an answer in the range 738.5 to 739	Do not award accuracy mark if the figure is from obvious incorrect working

Question	Answer	Mark	Mark scheme	Additional guidance
112	$\frac{13}{20}$	P1	for finding the fraction who chose either soup ($\frac{2}{5}$ oe) or chose prawns ($\frac{3}{5}$ oe) **or** for process to share any number in the ratio 2 : 3 eg 100 ÷ (2 + 3) × 2 (=40)	Starting number 100 Soup : Prawn 40:60
		P1	for a process that could lead to the proportion who chose lasagne or curry for either starter, eg sharing 40% (soup) in the ratio 5 : 3 **or** sharing 60% (prawns) in the ratio 1 : 5 **or** $\frac{2}{5} \times \frac{5}{8}$ **or** $\frac{2}{5} \times \frac{3}{8}$ **or** $\frac{3}{5} \times \frac{1}{6}$ **or** $\frac{3}{5} \times \frac{5}{6}$ **or** for continuing the process with their starting number to find the number who chose lasagne or curry for either starter	L:C L:C 25:15 10:50
		P1	for a complete process to find the proportion who chose curry for **both** starters, eg($\frac{2}{5} \times \frac{3}{8}$) + ($\frac{3}{5} \times \frac{5}{6}$) **or** to find the number who chose curry for **both** starter for their starting number	15 + 50 =65 and $\frac{15+50}{100}$
		A1	$\frac{13}{20}$ or equivalent fraction	

Question	Answer	Mark	Mark scheme	Additional guidance
113	−7.5	M1	for stating a correct relationship, eg $y = \frac{k}{x^2}$ **or** $8 = \frac{k}{2.5^2}$	Accept y α $\frac{k}{x^2}$ where k may be 1
		A1	for k = 50, could be seen in an equation	
		A1	−7.5 oe	
114	3.4	M1	for drawing a suitable tangent at t = 6	
		M1	for a full method to find the gradient of the tangent at t=6, eg 20 ÷ 5.8	Use of change in y over change in x
		A1	answer in the range 3.05 to 3.7	Answers of $\frac{10}{6}$ oe scores no marks

Question	Answer	Mark	Mark scheme	Additional guidance
115	12272.70 12272.71 or 12272.72	M1	for evidence of using a correct first step eg 200000 × 0.015 (= 3000) or 200000 × 1.015 (= 203000)	
		M1	for evidence of a compound interest method eg 203000 × 0.015 (= 3045) or 203000 × 1.015 (= 206045) **or** 206045 × 0.015 (= 3090.675) or 206045 × 1.015 (= 209135.675) **or** 209135.675 × 0.015 (= 3137.035...) or 209135.675 × 1.015 (212272.710...) **or** 200000×1.015^t, $t \geq 2$	values may be rounded or truncated to 2 dp
		A1	for 12272.7(0) or 12272.71 or 12272.72 SC B2 for 212272.7(0) or 212272.71 or 212272.72	
116	10	P1	for a process to start to solve the problem eg 6 × 9 (= 54) machine days needed or 12 (machine days used in first 3 days) or 42 (machine days needed after first 3 days) or 6 (machine days not used in first 3 days) or 3 + 4 + 5 equivalent to 2 days with 6 machines or has used 48 machine days in first 9 days	eg 3 + 4 + 5 (= 12) eg 6 ×9 – 12 (= 42) eg 3 + 2 + 1 = 6 eg 12 ÷ 6 = 2
		P1	for "42" ÷ 6 (= 7) (more days needed) or 3 days − 2 (equivalent) days (= 1) extra day needed to make up for the days not used	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
117	1.8	P1	process to find the amount of interest before tax eg 28.80 ÷ 20 × 100 (= 144) OR for equation which would lead to (x =) 0.018, 1.8 or 1.018 eg 0.2 × 8000 × x = 28.8 or $\frac{8000(100+x)}{100}$ = 8144	
		P1	process to find the interest rate eg $\frac{"144"}{8000}$ (= 0.018) or $\frac{"8144"}{8000}$ (= 1.018)	These numerical expressions may be seen multiplied by 100, eg $\frac{144}{8000} \times 100$
		A1	cao	
118	1.01	P1	for 1.09 × 60 (= 65.4 or $\frac{327}{5}$) **or** 0.97 × 128 (= 124.16 or $\frac{3104}{25}$)	Note that the volumes may be converted to ml, eg 1.09 × 60000 (= 65400)
		P1	for 1.09 × 60 (= 65.4 or $\frac{327}{5}$) **and** 0.97 × 128 (= 124.16 or $\frac{3104}{25}$) **or** "65.4" + "124.16" (= 189.56 or $\frac{4739}{25}$)	
		P1	for a complete process to find the density of antifreeze eg ("65.4" + "124.16") ÷ 188 or 189.56 ÷ 188 or $\frac{4739}{25}$ ÷188	Candidates working in ml must use 188,000
		A1	for answer in the range 1.00 to 1.01	If an answer within the range is seen in working but then rounded incorrectly award full marks. Accept 1 for 1.00 Note that the correct value is 1.008.....

Question	Answer	Mark	Mark scheme	Additional guidance
119	260 to 260.5	M1	for 883 – 245 (=638) **or** 883 ÷ 245 (=3.60..) **or** 883 ÷ 245 × 100 (=360(.408...)) oe	
		M1	for a complete method to find the percentage increase eg "638" ÷ 245 × 100 (=260(.408..)) **or** 883 ÷ 245 × 100 − 100 (=260(.408..)) oe	
		A1	Accept answers in the range 260 to 260.5	
120	5	M1	"2" ÷ 40 × 100	"2" comes from their reading of the height of the 20 to 24 column
		A1	cao	
121 (a)	2 mins 48 secs	P1	for an appropriate first step eg 700 ÷ 475 (=1.47..) **or** 475 ÷ [time] (= 4.16.. m/s) **or** [time] ÷ 475 (= 0.24 s/m)	[time] what candidate indicates as time of first race Units are not needed and can be ignored if given
		P1	for a complete method to find the required time eg 700 ÷ 475 × [time] (=168) **or** 700 ÷ (475 ÷ [time]) (=168) **or** [time] ÷ 475 ×700 (=168)	Allow calculation in stages and appropriate rounding.
		A1	cao	
(b)	Statement	C1	eg takes less time **Acceptable examples** Quicker time Faster time Reduces my answer to part (a) **Not acceptable examples** It is an underestimate The amount of time could/may increase Laura goes faster	

Question	Answer	Mark	Mark scheme	Additional guidance
122	8	P1	process to start the problem eg $xy = 45$ **and** $xz = 15$ **and** $yz = 27$ **or** 5×9 (=45) **and** 3×9 (=27) **and** 3×5 (=15) **or** 3, 5 and 9 stated	Maybe seen on diagram
		P1	for $3 \times 5 \times 9$ (=135) **or** 2 of "9" ÷ 2.5 (=3.6) **or** "5" ÷ 2.5 (=2) **or** "3" ÷ 2.5 (=1.2)	
		P1	for 2.5^3 (=15.625) **or** all of "9" ÷ 2.5 (=3.6) **and** "5" ÷ 2.5 (=2) **and** "3" ÷ 2.5 (=1.2)	
		P1	for a complete process to find the number of cubes possible eg [volume] ÷ "15.625" (=8.64) **or** "3.6" × "2" × "1.2" (=8.64)	[Volume] must come from multiplying together what they clearly indicate as the 3 dimensions of the cuboid. The three dimensions cannot be 45, 27 and 15
		A1	cao	
123	408	M1	for 1.01×400 (= 404) or 408.04 or 412.08	412(.08) on the answer line M1A0 1.01×400 may be seen as part of a calculation
		A1	cao	
124	Evidence of solution	M1	for constructing an equation eg $y \propto \frac{1}{x^3}$ or eg $y = \frac{k}{x^3}$ oe	
		M1	for substituting in the values a and 44 into $y = \frac{k}{x^3}$	
		C1	for a complete method to use the equation, the value of k and $x = 2a$ to show $y = 5.5$ eg $(2a)^3y = 44a^3$ and $y = 44a^3 \div 8a^3 = 5.5$	Must show all steps clearly

Question	Answer	Mark	Mark scheme	Additional guidance
125 (a)	4.52×10^3	M1	for $2.04.... \times 10^7$ oe eg $2.04....\times 10^{-5} \div 10^{-12}$ or $20.4... \times 10^6$ or 204(08163.27) **or** for correct value of T, 4517.(53....), not written in standard form, eg 4520	May be given correct to 3 sig figs or more
		A1	for answer in the range 4.51×10^3 to 4.52×10^3 (SC B1 for $6.32\ldots\times 10^{-1}$)	
(b)	Explanation	M1	for method to find the scale factor or decreased value in T, eg $\sqrt{\frac{1.1}{1.05^3}}$ (= 0.97.....) oe or $\sqrt{\frac{5.6\times 10^{-5}\times 1.1}{(1.4\times 10^{-4}\times 1.05)^3}}$ (= $4.40\ldots\times 10^3$) oe	Award mark for a correct method to calculate the scale factor or the percentage increases in w and d^3 or the decreased value of T
		C1	(dep M1) for explanation eg value of scale factor less than 1, so a decrease in T **OR** compares $4.40\ldots\times 10^3$ with their value of T from (a) provided answer to (a) is greater	This mark may only be awarded if supported by numerical evidence

Question	Answer	Mark	Mark scheme	Additional guidance
126	150 000	P1	for process to find cost in 2007, eg 162 000 ÷ 0.9 (= 180 000) oe	
		P1	for process to find cost in 2003, eg [cost in 2007] ÷ 1.2 (= 150 000) oe	Award 2 marks for 162 000 ÷ 1.08 oe
		A1	cao	
127 (a)	1.5	M1	for method to find the gradient of the line, eg $\frac{12}{8}$	Must see use of scales.
		A1	for 1.5 oe	
(b)	Explanation	C1	Explanation relating to rate of change of volume with time, eg rate at which the container fills or change in number of litres per second or number of litres added per second	Ignore any quantities given. Award the mark for an explanation involving rate.
(c)	Explanation	C1	Explanation relating to volume (amount) of liquid in the container at the start eg number of litres in the container when $t = 0$, amount of liquid in the container to start with	
128	6.50	M1	for method to find ratio or scale factor of lengths or volumes eg $\sqrt{3} : 2$ or 1 : 1.15(47....) or 0.86(60…) : 1 or $\sqrt{27} : 8$ oe	Scale factors may just be seen as 1.15..., 0.86...etc
		M1	for complete method to find ratio of volumes and use to find required volume eg 10 ÷ ("1.15...")^3 or 10 × (“0.86…”)^3	
		A1	for answer in the range 6.49 to 6.53	If an answer is given within the range then incorrectly rounded to 3 sig figs, award full marks. Accept 6.5

Question	Working	Answer	Mark	Notes
129		New York (supported)	P1 P1 C1	for changing between £ and $, eg 1.089×1.46 (= 1.58(9.)) or 2.83÷1.46 (= 1.93(8.)) or between litres and gallons, eg 1.089×3.785 (= 4.12(1.)) or 2.83÷3.785 (= 0.74(7.)) for a complete process to give values that can be used for comparison, eg "1.938..." ÷ 3.785 (= 0.51(2.)) **or** "1.589..."...× 3.785 (= 6.01(7.)) **or** 1.089 × 3.785 = (4.12(1.)) and 2.83 ÷ 1.46 (= 1.93(8.)) for New York and correct comparative values
130		648	M2 [M1 A1	a complete method, eg 12.5 × 1000 ÷ 19.3 for using volume = mass/density, eg 12500 ÷ 19.3 (condone inconsistent units or incorrect conversions) may be implied by digits 647... or 648...] for answer in range 647 to 648
131		15	P1 P1 A1	strategy to start the problem, eg 8 : 20 and 20 : 5 process to solve the problem, eg $\frac{5}{33}\times 100$ or 24 : 60 : 15 cao
132 (a)		5	M1 A1	evaluates $(0.85)^n$ or 12 500 × $(0.85)^n$ for at least one value of n cao
(b)		2.4	P1 P1 A1	for a process to find the amount of interest before tax, eg 79.20 ÷ 0.6 (= 132) for a process to find value of R, eg "132"÷5500×100 cao
133		Shown	M1 M1 A1	for $\sqrt[3]{\frac{8}{27}}\left(=\frac{2}{3}\right)$ or $\sqrt[3]{\frac{27}{8}}\left(=\frac{3}{2}\right)$ or 2 : 3 or 3 : 2 for $\left(\sqrt[3]{\frac{8}{27}}\right)^2\left(=\frac{4}{9}\right)$ or $\left(\sqrt[3]{\frac{27}{8}}\right)^2\left(=\frac{9}{4}\right)$ or 4 : 9 or 9 : 4 132 from correct arithmetic

Question	Working	Answer	Mark	Notes
134		68	P1 P1 P1 P1 A1 OR P1 P1 P1 P1 A1	for a process to find the number of vanilla cakes, eg 420 × 2 ÷ 7 oe (= 120) for a process to find the number of banana cakes, eg 420 × 0.35 oe (= 147) (dep P1) for a full process to find the number of lemon/chocolate cakes eg 420 – (vanilla cakes) – (banana cakes) (= 153) (dep on previous P1) for a process to find the number of lemon cakes eg "153" ÷ 9 × 4 oe (= 68) cao for writing two proportions in the same format for combining the proportions of vanilla and banana cakes eg 2/7 + 7/20 (= 89/140) (dep P1) for a full process to find the proportion or number of lemon/chocolate cakes eg 1 – "89/140" (= 51/140) (dep on previous P1) for a process to find the number of lemon cakes eg "51/140" × 420 ÷ 9 × 4 (= 68) cao
135		1.01	P1 P1 P1 A1	fruit syrup 15 × 1.4 (= 21) or water 280 × 0.99 (= 277.2) or apple juice 25 × 1.05 (= 26.25) (dep P1) for complete process to find the total mass e.g. "277.2" + "26.25" + "21" (= 324.45) or a weighted density eg 15 × 1.4 ÷ 320 (= 0.065625) or 280 × 0.99 ÷ 320 (= 0.86625) or 25 × 1.05 ÷ 320 (= 0.08203125) (dep P2) for complete process to find the density eg "324.45" ÷ 320 (=1.01..) or "0.065625" + "0.86625" + "0.08203125" (= 1.0139..) 1.01 to 1.014
136		6 (%)	P1 P1 A1	for y^5 oe or 8029.35 ÷ 6000 for a process to find 1+x e.g. $\sqrt[5]{(8029.35 \div 6000)}$ or 1.06 or 1.0599.. 5.99 to 6
137		3 : 4 : 11	P1 P1 A1	Makes a start e.g. by using multipliers e.g. 1 + 5 = 6 and 7 + 11 = 18 and 6 × 3 = 18 or AB:BD = 3:15 or x=3y (appropriate x and y shown) or $\frac{1}{6} = \frac{3}{18}$ Complete process to find ratios e.g. (7 + 11) ÷ (1 + 5) = 3 and 1 × "3" : 7 − ("3" × 1) : 11 oe

Question	Working	Answer	Mark	Notes
138 (a)		x_1=-2.64 x_2= -2.57392 x_3=-2.603767255	M1 M1 A1	for substitution of −2.5 into the equation (to get $x_1 = -2.64$) for substitution of "$x_1 = -2.64$" and "$x_2 = -2.57392$" to give x_2 and x_3 for $x_1 = -2.64$ oe, $x_2 = -2.57(392)$ and $x_3 = -2.6(03767255)$ Condone $x_3 = -2.61$ if $x_2 = -2.57$ is used in the substitution
(b)		Statements	C1 C1	Connection between equation and iterative form in (a) e.g. rearrangement Statement e.g. iteration is an estimation of a solution

Question	Working	Answer	Notes
139 (a)	550 × 3.5601	1958	M1 550 × 3.5601 A1
(b)	210 ÷7 × 2 = 30 × 2 Or 60 ÷2 = 30 and 30 × 7 = 210	Shown	M1 For correct method to convert cost in UK to lira or vice versa, using Asif's approximation C1 Shown with correct calculations
(c)		Correct evaluation	C1 For an evaluation e.g. It is a sensible start to the method because he can do the calculations without a calculator and 3.5 lira to the £ is a good approximation
140		Have a water meter (from working with correct figures)	P1 Process to find number of litres eg. 180 ÷ 1000 P1 Full process to find cost per day P1 Full process to find total cost of water used per year (accept use of alternative time period for both options) P1 Full process with consistent units for total cost of water A1 Correct decision from correct figures (88.13154 or correct figure for their time period)
141		15, 20, 24	P1 Process to start to find common multiple eg. prime factor decomposition of 6 and 8 or list of at least 3 multiples of all numbers P1 process to find number of packets for at least colour **or** 120 identified A1
142 (a)	1000, 1500, 2250, ...	Correct Argument	M1 Method to find 1st 3 terms C1 Convincing reason e.g. common ratio is 1.5
(b)	$1000\times1.5^9 = k\times1000\times1.5^5$ $k = \frac{1.5^9}{1.5^5}$	5.0625	P1 Process to find the value of k A1
(c)		Correct sketches	C1 Draws both exponential curves intersecting on y axis and clearly labelled

Question	Working	Answer	Notes
143 (a)	160 tiles 18 packs	18	M1 a full method to find the area of the trapezium M1 a full method to calculate both areas in consistent units M1 for the area of the trapezium ÷ area of a tile (with consistent units) M1 (dep on previous M) for complete method to find the number of packs required A1
(b)	176 tiles 20 packs	Supported statement	P1 finding the number of packs for 10% more tiles or 10% of their number of packs, ft from (a) C1 Statement, eg. increase in packs is 2 more which is more than 10%
144 (a)		2500	P1 for use of 1.03 P1 for a full method equivalent to $\div 1.03^2$ A1 2500
(b)		Saver account with support	P1 process to find a comparable total interest figure or to compare investment for a given amount A1 for conclusion with supporting statement or figures seen eg 21.6(65..)>21
145	$\sqrt{(253.5 \div 6)}$ $6.5^3 \times 2 = 549.25$ $549.25 \div 10 = 54.925$	55	P1 a process to find the scale factor of 6.5 P1 for a full process to find the amount of clay required C1 for stating 55 bags

Question	Working	Answer	Notes
146		171	P1 for process to find one share P1 for process to find total A1 cao
147 (a)		1.95	M1 method to find one temperature eg 4500 ÷ 1200 M1 for complete method A1 cao
(b)		D	B1 cao
148 (a)		36.4	P1 start process eg method to find area of trapezium P1 complete process to find volume of tank P1 process to find time eg volume × 1000 ÷ 300 P1 process to find 85% of volume or of time A1 for 36.4 or 36 mins 24 secs
(b)			C1 explanation eg if the average rate was slower it would take more time, if the average rate was faster it would take less time
149 (a)		No with reason	C1 partial explanation, eg 0.96 × 0.975 C1 No with full explanation, eg 0.96 × 0.975 = 0.936 so only a 6.4% reduction
(b)		3.15	P1 complete process to find value after 2 years eg (145000 – '5800') × 2.5/100 oe or 145000 × 0.96 × 0.975 (= 135720) P1 (140 000 – '135720') ÷ '135720' × 100 oe A1 for 3.15 – 3.154

Question	Working	Answer	Notes
150		1 : 2.53	P1 for substituting values to find surface gravity of either Earth (= 9.805..) or Jupiter (= 24.796..) P1 for complete process A1 for 1 : 2.528 to 2.53
151		12.2	P1 begins process eg 150÷19.3 (= 7.77..) or 150÷8.9 (= 16.85..) P1 complete process to find total volume P1 complete process to find the density of the alloy A1 for answer in range 12.1 to 12.2

Question	Working	Answer	Mark	Notes
*152		Yes (supported)	5	M1 for method to calculate profit on one laptop e.g. 400 × 0.3 oe (= 120) **or** 400 × 0.15 oe (= 60) M1 for method to calculate selling price of one of the two deals e.g. 400 × 1.3 oe (= 520) **or** 400 × 1.15 oe (= 460) M1 for method to calculate the total selling price of one laptop e.g. 40 × 400 × 1.3 oe (= 20 800) **or** 10 × 400 × 1.15 oe (= 4600) M1 for total income e.g. "20 800" + "4600" C1 for Yes **and** (£)25 400 **or** Yes with £400 more **OR** M1 for a method for the profit on one laptop e.g. 400 × 0.3 oe (=120) **or** 400 × 0.15 oe (= 60) M1 for a method for the total profit for one of the two deals e.g. 40 × "120" (= 4800) **or** 10 × "60" (= 600) M1 for a method for total profit "4800" + "600" (= 5400) M1 for a method for target profit e.g. 25 000 − 400 × 50 (= 5000) C1 for Yes with (£)5400 **and** (£)5000 **or** Yes with £400 more **OR** M1 for a method for the profit on one laptop e.g. 400 × 0.3 oe (= 120) **or** 400 × 0.15 oe (= 60) M1 for a method for the total profit for one of the two deals e.g. 40 × "120" oe (= 4800) **or** 10 × "60" (= 600) M1 for 50 × 400 + "4800" or 50 × 400 + "600" M1 for 50 × 400 + "4800" + "600" (= 25400) C1 for Yes **and** (£)25 400 **or** Yes with £400 more
153 (a)		40 100	3	M1 for method to find unit weight eg 60 ÷ 3 (= 20) M1 for complete method to find weight of one of the other ingredients eg "20" × 2 (= 40) or "20" × 5 (= 100) A1 cao
(b)		1.44	3	M1 for a complete method to work out the weight of nuts needed eg 300 ÷ (3 + 2 + 5) × 3 (= 90) or 300 ÷ (60 + "40" + "100") × 60 (= 90) M1 for a complete method to work out the cost eg (800 ÷ 500) × "90" (= 144) A1 cao

Question	Working	Answer	Mark	Notes
154 (a)		4	2	M1 for 20 ÷ 5 (=4) Allow build up method to 4 lots of 1:5 A1 cao
(b)		6	2	M1 for a full method to find the number of red counters needed eg 20 ÷ 2 – "4" A1 ft from (a)
155 (a)		5	1	B1 cao
(b)		Lines added	2	B1 for a horizontal line from (5, 8) to (6.30, 8) B1 for a single straight line with the correct gradient and length, down to the time axis eg (6.30, 8) to (8.30, 0)
*156		Bathroom Mart and correct figures	4	M1 for $\frac{1}{3} \times 1500$ (= 500) or $\frac{2}{3} \times 1500$ (= 1000) M2 for a correct method to reduce 1500 by 60% and then by a further 15% eg 1500 × "0.4" × "0.85" (= 510) oe (M1 for method to find 60% or 40% of 1500 e.g. $\frac{60}{100} \times 1500$ (= 900) C1 for 510 **and** 500 with a correct conclusion.
157 (a)		1.21×10^4	2	M1 for 12.1 × 1000 (= 12100) oe A1 cao
(b)		4.5	3	M1 for $4.503 \times 10^9 \div 10^6$ (= 4503) oe or for $4.503 \times 10^9 \div 10^3$ (= 4503000) oe M1 for $4.503 \times 10^9 \div 10^6 \div 10^3$ (=4.503 with no other digits) A1 for cao

Question	Working	Answer	Mark	Notes
158		1.2	3	M1 for $I \propto \frac{1}{d^2}$ or $I = \frac{k}{d^2}$ or $k = Id^2$ or $30 = \frac{k}{2^2}$ or $k = 120$ M1 (dep) for $I = \frac{"120"}{10^2}$ A1 cao
159		32 : 45	5	M1 for a correct expression for surface area of the cylinder ($=2\times\pi\times3^2 + 6\pi h$) or surface area of the sphere ($=4\times\pi\times6^2$) M1 (dep) for equating 'surface area of cylinder' and '2 × surface area of sphere', $2\times\pi\times3^2 + 6\pi h = 2\times4\times\pi\times6^2$ M1 (dep) for a method to isolate h M1 for $\pi\times3^2\times$'45' oe and $\frac{4}{3}\times\pi\times6^3$ oe A1 cao

Question	Working	Answer	Mark	Notes
160		36	3	M1 for correct method to work out 20% of 30% (=6%) M1 for 30% + "6%" A1cao OR M1 for complete and correct method to find amount of money spent on rent eg 800 × 0.3 (=240) oe M1 for correct method to find rent next month (288) eg "240" × 1.2 (=288) oe or $\frac{"288"}{800}\times 100$ oe or 30 × 1.2 A1 cao
161		100, 25, 4	4	M1 for $y=\frac{k}{x^2}$ oe or $1=\frac{k}{10^2}$ M1 for complete method to find k or $y=\frac{100}{x^2}$ oe OR (dep on M1) for $k = 100$ A1 for one entry correct A1 for other two entries correct

Question		Working	Answer	Mark	Notes
162			69	4	M1 for finding 15% of £720 (=108) M1 (dep) for finding total of £720 plus interest (or 115% etc) (=828) M1 (dep on previous M1) dividing by 12 A1 cao OR M1 finding 720 ÷ 12 (=60) M1 (dep) finding 15% of "60" (=9) M1 (dep on previous M1) for adding, e.g. 60 + 9 A1 cao
163			20	3	M1 for 330÷120 (=2.75) or 200÷60 (=3 1/3) or 450 ÷180 (=2.5) M1 for 450÷180 (=2.5) AND 8×"2.5" A1 cao OR M1 for 120÷8 (=15) or 60÷8 (=7.5) or 180÷8 (=22.5) M1 for 330÷(120÷8) [=22] or 200÷(60÷8) [=26.6..] or 450÷(180÷8) A1 cao OR M1 for multiples of 120:60:180 M1 for multiplication linked to 450 and 8+8+4 A1 cao

Question	Working	Answer	Mark	Notes
*164	1195 4780 + 5975 2 3 9 0 4 | 0 6 | 1 8 | 2 5 | 1 0 | 1 5 | 4 5 | 5 9 7 5 | | 200 | 30 | 9 | | 20 | 4000 | 600 | 180 | | 5 | 1000 | 150 | 45 | 4000 + 1000 + 600 + 150 + 180 + 45 = 5975	Kirsty's Plants with correct calculations	5	M1 for complete method with relative place value correct. Condone 1 multiplication error, addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation or digits 5975 M1 for a complete method to find 120% of £52.50 A1 for 59.75 and 63(.00) C1 (dep on M2) for correct conclusion for their figures **OR** M1 for the start of a method to divide £52.50 by 25, eg. 2 rem 2 M1 for a complete method to divide £52.50 by 25, condone one arithmetic error, or digits 21 M1 for a complete method to find 120% of '£2.10' A1 for 2.52 C1 (dep on M2) for correct conclusion for their figures **OR** M1 for a complete method to find 120% of £52.50 M1 for the start of a method to divide '63' by 25, eg. 2 rem 13 M1 for a complete method to divide '63' by 25, condone one arithmetic error, or digits 252 A1 for 2.52 C1 (dep on M2) for correct conclusion for their figures
165		54	3	M1 for any correct use of distance, speed, time formulae, eg.10 ÷ 40 (=0.25) or 15 min M1 (dep) for a complete method to find speed from G to H, eg.18 ÷ (35 – "15") × 60 oe. A1 cao

Question		Working	Answer	Mark	Notes
166			900	4	M1 for 0.2 × 7000 (=1400) or 1.2 × 7000 (=8400) oe M1 for 7000 + "1400" − 3000 (=5400) oe M1 for "5400" ÷ 6 A1 cao
167			25	4	M1 for 600 ÷ 4 (=150) M1 for 4500 ÷ "150" (=30) M1 for 750 ÷ "30" A1 for 25 with supporting working **OR** M1 for 4500 ÷ 750 (=6) or 750 ÷ 4500 (= $\frac{1}{6}$) M1 for 600 ÷ 4 (=150) or 600 ÷ "6" (=100) or 600 × "$\frac{1}{6}$" (=100) M1 for "150" ÷ "6" or "100" ÷ 4 or 150 × "$\frac{1}{6}$" A1 for 25 with supporting working **OR** M1 for 4500 ÷ 750 (=6) or 750 ÷ 4500 (= $\frac{1}{6}$) M1 for $\frac{1}{4} \times \frac{1}{"6"} \left(= \frac{1}{24}\right)$ M1 for "$\frac{1}{24}$" × 600 A1 for 25 with supporting working

Question		Working	Answer	Mark	Notes
168			25.60	4	M1 for a correct method to find $\frac{1}{3}$ of 24 (=8) or $\frac{2}{3}$ of 24 (=16) M1 for a correct method to find 60% (= 7.2) or 40% (= 4.8) of 12 or 60% (=14.4) or 40% (= 9.6) of 24 M1 (dep on at least M1) for a method to find the sum of their discounted adult ticket + 2 × their discounted child ticket A1 25.6(0)
169			Correct region	3	B1 for full line drawn 1.5 cm from edge of patio and parallel to it B1 for full arc of circle radius 3 cm centre the centre of the pond B1 ft for shading region to the right of their vertical line **and** outside the arc of their circle with correct centre

Question		Working	Answer	Mark	Notes
170			90 450 225 1.5 960	3	M1 for 6 ÷ 4 (= 1.5) or 4 ÷ 6 (= 0.66..) or ÷4 × 6 oe or sight of any one of the correct answers A1 for three correct A1 for all correct
171			164	5	M1 200 ÷ (3+2) (= 40) or an equivalent ratio seen M1 (dep) 3 ×'40' (= 120) or 2 ×'40' (= 80) or 120: 80 or 80:120 M1 a complete method to find 70% of their total number of large letters e.g. 0.7 × '80' (=56) M1 multiplies their three totals by the correct unit price and adds, e.g. 60(p) × '120' + (£)1 × '56' + (£)1.50 × '24' A1 164
172		120 ÷ 20 = 6 $6^2 = 36$ 36×300 = 10 800	10 800	3	M1 120 ÷ 20 (= 6) oe, can be implied by $120^2 \div 20^2$ M1 '6'^{2} × 300 A1 cao
173			100	4	M1 $y = kx^2$ oe or $36 = k \times 3^2$ A1 $k = 4$ M1 (dep on M1) (y =) '4'×5^2 A1 cao

Question		Working	Answer	Mark	Notes
174			24	4	M1 for 0.15 × 240 (= 36) oe M1 for $\frac{3}{4}$ × 240 (= 180) oe M1 (dep on both prev M1) for 240 – "180" – "36" A1 cao **OR** M1 for 15(%) + 75(%) (= 90(%)) M1 for 100(%) – "90(%)" (= 10(%)) M1 (dep on both prev M1) for " $\frac{10}{100}$ " × 240 oe A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for "0.9" × 240(= 216) oe M1 (dep on both prev M1) for 240 ˜ "216" A1 cao **OR** M1 for 0.15 + 0.75(= 0.9) oe M1 for 1 – "0.9"(= 0.1) oe M1 (dep on both prev M1) for "0.1" × 240 oe A1 cao

Question		Working	Answer	Mark	Notes
***175 QWC**		$\frac{30}{24} \times 60 = 75$	Debbie + explanation	4	M1 for reading 24 (mins) and 30 (km) or a pair of other values for Debbie M1 for correct method to calculate speed eg. 30 ÷ 24 oe A1 for 74 – 76 or for 1.2 – 1.3 and 1.1 C1 (dep on M2) for correct conclusion, eg Debbie is fastest from comparison of "74 – 76" with 66 (kph) or "1.2 – 1.3" and 1.1 (km per minute) **OR** M1 for using an appropriate pair of values for Ian's speed eg 66 and 60, 33 and 30, 11 and 10 M1 for pair of values plotted on graph A1 for correct line drawn C1 (dep on M2) for Debbie is fastest from comparison of gradients. **OR** M1 for reading 24 (mins) and 30 (km) or a pair other values for Debbie M1 for Ian's time for same distance or Ian's distance for same time. A1 for a pair of comparable values. C1 (dep on M2) for Debbie is fastest from comparison of comparable values.
*176 QWC			Yes with explanation	3	M1 for bearing ± 2 ° within overlay M1 for use of scale to show arc within overlay or line drawn from C to ship's course with measurement C1(dep M1) for comparison leading to a suitable conclusion from a correct method
177			£500	3	M1 for 70% = 350 or $\frac{350}{70}$ M1 for $\frac{350}{70} \times 100$ oe A1 cao

Question		Working	Answer	Mark	Notes
178			1 hour 45 mins	6	M1 for method to find volume of pond, eg $\frac{1}{2}(1.3 + 0.5) \times 2 \times 1$ (= 1.8) M1 for method to find the volume of water emptied in 30 minutes, eg $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) A1 for correct rate, eg 0.8 m^3/hr, 0.4 m^3 in 30 minutes M1 for correct method to find total time taken to empty the pond, eg "1.8" ÷ "0.8" M1 for method to find extra time, eg 2 hrs 15 minutes − 30 minutes A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins **OR** M1 for method to find volume of water emptied in 30 minutes,.eg. $1 \times 2 \times 0.2$ (= 0.4), $100 \times 200 \times 20$ (= 400000) M1 for method to work out rate of water loss eg. "0.4" × 2 A1 for correct rate, eg 0.8 m^3/hr M1 for correct method to work out remaining volume of water eg. $\frac{1}{2}(1.1 + 0.3) \times 2 \times 1$ (= 1.4) M1 for method to work out time, eg "1.4" ÷ "0.8" A1 for 1.75 hours, $1\frac{3}{4}$ hours, 1 hour 45 mins or 105 mins NB working could be in 3D or in 2D and in metres or cm throughout

Question		Working	Answer	Mark	Notes
179			1200 cm^3	4	M1 for $10 \times 2 \times 2$ and 15×2 M1 for "40" × "30" A1 for 1200 B1 (indep) for cm^3 OR M1 for 10×15 or 2^3 or 8 indicated as scale factor M1 for $10 \times 15 \times 2 \times 2 \times 2$ A1 for 1200 B1 (indep) for cm^3 SC B2 for 600 cm^3 (B1 for 600)

Question		Working	Answer	Mark	Notes
180	(a)		8	1	B1 for 8 (.00)
	(b)		550	4	M1 for 600 – 200 (= 400) M1 for correct method to convert '$400' to £ M1 (dep on the previous M1) for 800 – '$400' in £s A1 for value in the range 540 –560 **OR** M1 for correct method to convert $600 **and** $200 to pounds M1 for '375'–'125' M1 (dep on the previous M1) 800 –'250' A1 for a value in the range 540-560 **OR** M1 for correct method to convert £800 to dollars M1 for '1280' + 200 – 600 M1 (dep on the previous M1) for attempt to convert '$880' back to £ A1 for value in the range 540 – 560

Question		Working	Answer	Mark	Notes
181			730	5	M1 for $\frac{5}{100}\times 200$ (= 10) oe M1 for $\frac{10}{100}\times 350$ (= 35) oe M1 for 6 × '10' **or** 4 × '35' M1 (dep on M1 earned for a correct method for a percentage calculation) for "60" + "140"+ 530 A1 cao **Or** M1 for 6 × 200 (= 1200) or 4 × 350 (= 1400) M1 for $\frac{5}{100}\times "1200" (=60)$ oe M1 for $\frac{10}{100}\times "1400" (=140)$ oe M1(dep on M1 earned for a correct method for a percentage calculation) for "60" + "140"+ 530 A1 cao

Question		Working	Answer	Mark	Notes
182			240	4	M1 for 16 × 2 (= 32 girls) M1 for 16 + '16 × 2' (= 48) M1 (dep on the previous M1) for (16 + '32')× 5 **or** (16 + '32') × (4 + 1) A1 cao OR M1 for 1 : 2 = 3 parts M1 for 5 schools × 3 parts (= 15 parts) M1 (dep on the previous M1) for '15' parts × 16 A1 cao **SC B2** for 176 given on the answer line
183			Required region	4	M1 arc radius 5 cm centre *C* M1 bisector of angle *BAD* M1 line 3 cm from *DC* A1 for correct region identified (see overlay)

Question		Working	Answer	Mark	Notes
184		180×1.5 40×1.5 110×1.5 30×1.5	Flour = 270 Ginger = 60 Butter = 165 Sugar = 45	3	M1 for ×24÷16 oe or 24/16 or 1.5 seen or 180 + 90 (=270) or 40 + 20 (=60) or 110 + 55 (=165) or 30 + 15 (=45) or sight of any one of the correct answers A2 for all 4 correct answers (A1 for 2 or 3 correct answers)
185			Region shaded	3	**B1** for circle arc of radius 3cm (± 2mm) centre Burford **B1** for circle arc of radius 5cm (± 2mm) centre Hightown **B1** for overlapping regions of circle arcs shade
186		180÷9×1:180÷9×3:180÷9×5 =20:60:100 Not enough cement (but enough sand and enough gravel) OR 1×15:3×15:5×15 =15:45:75 15+45+75=135 (<180) Not enough cement (to make 180kg of concrete)	No + reason	4	M1 for 180 ÷ (1+3+5) (= 20) or 3 multiples of 1: 3: 5 M1 for 1×"20" or 3×"20" or 5×"20" or 20 seen or 60 seen or 100 seen A1 for (Cement =) 20, (Sand =) 60, (Gravel) = 100 C1 ft (provided both Ms awarded) for not enough cement oe **OR** M1 for (1×15 and) 3×15 and 5×15 or 9×15 or sight of the numbers 15, 45, 75 together. M1 for '15' + '45' + '75' A1 for 135 (<180) C1 ft (provided both Ms awarded) for not enough cement oe
187	(a)		640	2	M1 for $80\times\left(\frac{8}{4}\right)^3$ or $80\div\left(\frac{4}{8}\right)^3$ A1 cao
	(b)		40	2	M1 for $160\div\left(\frac{8}{4}\right)^2$ or $160\times\left(\frac{4}{8}\right)^2$ or ft their scale factor from (a) A1 cao

Question		Working	Answer	Mark	Notes
188	(a)		30	2	M1 for 25 ÷ 10 or 2.5 seen or 10 ÷ 25 or 0.4 seen or 12 + 12 + 6 oe or a complete method eg. 25 × 12 ÷ 10 oe A1 cao
	(b)	*1000 ÷ 200 × 12*	60	2	M1 for 500÷50 or 1000÷200 or 500÷10 OR correct scale factor clearly linked with one ingredient eg. 10 with sugar or 5 with butter or flour or 50 with milk OR answer of 120 or 600 A1 cao

Question		Working	Answer	Mark	Notes
189		2.25 × 60 ÷ 100 = 1.35 1.35 + 0.80 = 2.15 1.5 × 60 ÷ 100 = 0.90 0.90 + 1.90 = 2.80 **OR**	Railtickets with correct calculations	4	NB. All work may be done in pence throughout M1 for correct method to find credit card charge for one company eg. 0.0225 × 60(=1.35) oe **or** 0.015 × 60 (=0.9) oe M1 (dep) for correct method to find total additional charge or total price for one company eg. 0.0225×60 + 0.80 **or** 0.015×60 + 1.90 **or** 2.15 **or** 2.8(0) **or** 62.15 **or** 62.8(0) A1 for 2.15 **and** 2.8(0) **or** 62.15 **and** 62.8(0) C1 (dep on M1) for a statement deducing the cheapest company, but figures used for the comparison must also be stated somewhere, and a clear association with the name of each company **OR** M1 for correct method to find percentage of (60+booking fee) eg. 0.0225 × 60.8(=1.368) oe **or** 0.015 × 61.9(=0.9285) M1 (dep) for correct method to find total cost or total additional cost eg. '1.368' + 60.8(=62.168) **or** '1.368' + 0.8 (=2.168) **or** '0.9285' + 61.9 (=62.8285) **or** '0.9285' +1.9 (=2.8285) A1 for 62.168 **or** 62.17 **AND** 62.8285 **or** 62.83 **OR** 2.168 **or** 2.17 **AND** 2.8285 **or** 2.83 C1 (dep on M1) for a statement deducing the cheapest company, but figures used for the comparison must also be stated somewhere, and a clear association with the name of each company **OR**

Question	Working	Answer	Mark	Notes
189 Continued	2.25 – 1.5 = 0.75 0.075 × 60 ÷ 100 = 0.45 0.80 + 0.45 = 1.25 1.25 < 1.90			M1 for correct method to find difference in cost of credit card charge eg. (2.25 – 1.5) × 60 ÷ 100 oe **or** 0.45 seen M1 (dep) for using difference with booking fee or finding difference between booking fees eg. 0.80 + "0.45"(=1.25) **or** 1.90 – "0.45" (=1.45) **or** 1.90 – 0.8 (=1.1(0)) A1 1.25 **and** 1.9(0) **or** 0.45 **and** 1.1(0) C1 (dep on M1) for a statement deducing the cheapest company, but figures used for the comparison must also be stated somewhere, and a clear association with the name of each company QWC: Decision and justification should be clear with working clearly presented and attributable

190 QWC iii FE		See table at end	Best month and supporting explanation	4	M1 Converts for at least 2 months to a common format (fractions, decimals or %age) A1 all correct C1 for Council target: No (yes) dep on M1 and consistent with the candidates calculations **QWC: Decisions should be stated, following through from working out** C1 March with all calculations correct for the 3 months **QWC: Decisions should be stated, following through from working out**
					Total for Question: 4 marks

	Fraction	Decimal	%	kg
Jan	$\frac{1}{10}$	0.1	10%	Not known
Feb	$\frac{1}{8}$	0.125	12.5%	15 kg
Mar	$\frac{13}{100}$	0.13	13%	14.56 kg

191 FE		15400 ÷ 70 × 100 = 22000 22000 × 2÷ 100	440	4	M1 15400 ÷ 70 × 100 oe A1 22000 M1 '22000' × 2 ÷ 100 oe A1 cao
					Total for Question: 4 marks

Question	Working	Answer	Mark	Notes
192		555	3	M1 for recognising that 1295 is 70% eg 70% = 1295 M1 for 10% = 1295 ÷ 7 (=185) or 1% = 1295 ÷ 70 (=18.5) or 1295 × $\frac{3}{7}$ oe or (1295 – 185) ÷ 2 or $1295 \times \frac{10}{7}$ oe (=1850) A1 cao
193	**£:** 189 ÷ 1.39= 135.97 174 ÷ 1.27 = 137.01 **SF:** 115 × 1.39 = 159.85 174 ÷ 1.27 × 1.39 = 190.44 **€:** 115 × 1.27 = 146.05 189 ÷ 1.39 × 1.27 = 172.68	London with correct comparable figures	3	M1 for method to convert one price to another currency, eg 189 ÷ 1.39 M1 for a complete method leading to 3 prices in the same currency or to figures that can be used to compare the 3 prices A1 for London and correct comparable figures (accept rounded or truncated to the nearest unit)
194		23	3	M1 for method to find difference in cost, eg 23×24 – 425 (= 127) or for 425 ÷ (23×24) (= 0.7699...) or 24 – (425 ÷ 23) (=5.52…) M1 for $\frac{"127"}{"552"} \times 100$ oe or or 100 – "0.7699 "×100 or $\frac{"5.52"}{24} \times 100$ A1for answer in range 23 – 23.01
195		Correct region	3	B1 for perpendicular bisector of the line *AB* B1 for arc of circle centre *B* radius 4 cm B1 for shading correct region
*196		Simple with correct comparable values	4	M1 for a method to calculate 2.15% or 2.3% or 102.15% or 102.3% of 15000 M1 for a complete method to calculate using a compound interest rate of 2.15% for 3 years eg 1.0215^3 (=1.065(89…)) or $1.0215^3 \times 15000$ (=15988.45) M1 for a complete method to calculate using a simple interest rate of 2.3% for 3 years e.g 1+0.023 × 3(=1.069) or 15000 + 0.069× 15000 (=16035) or 0.023 × 3 C1 for a correct decision in a statement based on their two accurate comparable values eg 16035, 15988 to 15988.50 or 1035, 988 to 988.50 or 1.065(89...), 1.069 or 6.6%, 6.9 %

Question	Working	Answer	Mark	Notes
197		8.4	3	M1 for using $d = m/v$ e.g. $11.34 = 74 / V$ or vol. of lead (= 6.5(25...) or vol. of tin (= 17.2(3...) M1 (dep) for a complete method using 200 ÷ "total volume" A1 for answer in range 8.4 to 8.44
198		3072	3	M1 for $12 = \frac{k}{8^2}$ or 12×8^2 (= 768) oe or $(8 \div 0.5)^2$ (= 256) M1 (dep) for substituting into $T = \frac{k}{d^2}$ e.g $(T =) \frac{"768"}{0.5^2}$ oe eg $12 \times 8^2 \div 0.5^2$ oe A1 cao

Question	Working	Answer	Mark	Notes
199 (a)		225 : 475	2	M1 for 700 ÷ 2 + 125 (= 475) **or** 700 ÷ 2 – 125 (= 225) A1 for 225 : 475 oe, eg 9:19
(b)		175, 455	3	M1 for 630 ÷ (5 + 13) (= 35) M1 for "35" × 5 (= 175) **or** "35" × 13 (= 455) A1 cao
*200		Comparison	3	M1 for 23.50 × 1.34 A1 for 31.49 C1 (dep M1) for 'euros' stated and a comparison ft their "31.49" OR M1 for 31 ÷ 1.34 A1 for 23.13(43...) C1 (dep M1) for '£' stated and a comparison ft their "23.13" OR M1 for 31 ÷ 23.50 A1 for 1.31(91...) C1 (dep M1) for comparison ft their "1.31(91...)" and explanation linked to conversion rate.

Question		Working	Answer	Mark	Notes
201	(a)		4 : 3	2	M1 for 720 : 540 oe or for 3 : 4 or 1 : $\frac{4}{3}$ oe or $\frac{3}{4}$: 1 oe A1 for 4 : 3 or $\frac{4}{3}$ (or 1 .33….) : 1 or 1 : $\frac{3}{4}$ (or 0.75)
	(b)		480	2	M1 for 720 ÷ 3 (= 240) or scale factor of $\frac{3}{2}$ or $\frac{2}{3}$ oe or 720 : 480 A1 cao
202			42.28	5	M1 for method to find weekly mileage, eg. 18 × 2 × 5 (= 180) or weekly car park charge, eg. 3.50 × 5 (= 17.50) M1 for method to find fuel used in a relevant journey, eg. "180" ÷ 45.2 (= 3.9823 gallons) or 18 ÷ 45.2 (= 0.39823 gallons) M1 for a correct use of the conversion factor to convert between gallons and litres, eg. "3.9823" × 4.546 (= 18.1 …. litres) or "0.39823" × 4.546 (= 1.81 …. litres) or 1.369 × 4.546 (= 6.22... £/gallon) or 45.2 ÷ 4.546 (= 9.94… miles/litre) M1 for a method to find the cost of a relevant journey, eg. "18.1…" × 1.369 (= 24.78 …) or "1.81…" × 1.369 (= 2.478 …) or "3.9823" × "6.22..." (= 24.78...) A1 for answer in the range 42.26 to 42.3(0) NB candidates could work in litres or in gallons and/or could work in £ or p

Journeys in miles	Fuel used in gallons; miles ÷ 45.2	Fuel used in litres, gallons × 4.546	Cost of journey in £, litres × 1.369 or gallons × 6.22...
18	0.398...	1.81...	2.478...
36	0.796...	3.62...	4.956...
90	1.991...	9.05...	12.39...
180	3.98...	18.1...	24.78...
252	5.57...	25.3...	34.69...

Question		Working	Answer	Mark	Notes
203			No (supported)	4	M1 for a correct method to calculate 77% of 15000 or 0.77 seen eg. 15000 × 0.77 oe (= 11550) or 15000 – $\frac{23}{100} \times 15000$ oe (= 15000 – 3450 = 11550) M1 for demonstrating a correct compound interest method over 3 years, eg "11550" × 0.82 (=9471) **and** "9471" × 0.82 (=7766.22) or "11550" × 0.82^2 or 0.77×0.82^2 (=0.517748) A1 for 7766(.22) or 0.51(7748) or 0.48(2252) C1 ft (dep on M2) for a statement giving the correct decision for their calculated values

Question		Working	Answer	Mark	Notes
204			49	3	M1 for converting calculations to common units (either system is acceptable) M1 for dividing their total capacity by the refuelling rate A1 48.9 - 49.1
205		0.65×80 = 52 $\frac{5}{8}$×80 = 50 52 - 50 Or $\frac{5}{8}$=0.625 0.65 − 0.625=0.025 0.025×80	2	4	M1 for method to calculate the time Celina sings M1 for method to calculate the time Zoe sings M1(dep on at least M1) for finding the difference between two times A1 cao Or M1 for a conversion to a common representation M1 (dep on M1) for finding the difference in their chosen representation M1 for using their proportional difference multiplied by 80 A1 cao
206	(a	9×6	54	2	M1 for a method to find the speed e.g 9 ÷ 10, 9 ÷ 0.16 A1 cao
	(b)		Graph completed	3	B1 horizontal line from (30,21) to (45,21) M1 for a complete method to show the return journey is 30 mins or ½ hour evidenced by the line on the graph or by calculation A1 Correct line drawn from Luscoe (x,21) to (x + 30,0)
207	(a		76	3	M1 for 89% = 68 M1 for 68 ÷ 0.89 oe A1 for 76 – 76.41
	(b)		11.8	2	M1 for (68 − 60) ÷ 68 × 100 oe A1for 11.7 - 12

Question		Working	Answer	Mark	Notes
208		$\pi 2^2 \times 2 = 8\pi$ $\pi 2^2 \times \frac{20}{360} \times 3 + \pi 2^2 \times \frac{340}{360} \times 2$ $8\pi : \frac{74}{9}\pi$: 72 : 74 Or $\frac{20}{360} \times 3 + \frac{340}{360} \times 2 = \frac{37}{18}$ $2 : \frac{37}{18}$ 36:37	36:37	4	M1 method to find relative cost of design A e.g. $\pi 2^2$, $k \times \pi 2^2$ M1 for a complete method to find the relative cost of the watch face for design B e.g. $\pi 2^2 \times \frac{20}{360} \times \frac{3}{5} + \pi 2^2 \times \frac{340}{360} \times \frac{2}{5}$ M1 (dep on M1, M1) for the cost of design A: cost of design B A1 cao Or M1 for method to find fraction of the sectors in design B $\frac{20}{360}, \frac{340}{360}$ M1 for complete method to find the relative cost of the watch face for design B M1 (dep on M1,M1) for the cost of design A: cost of design B A1 cao

Question		Working	Answer	Mark	Notes
209			68 34 51	3	M1 for 153 ÷ (4 + 2 + 3) (=17) or for a correct method to scale up to at least 44:22:33 without error M1 (dep M1) for "17" × 4 or "17" × 2 or "17" × 3 or for a complete method to build up to 68:34:51 with at least two of these values correct A1 for 68, 34, 51 in any order (If M0,SC B2 for two correct lengths)
210			Loci drawn	3	B1 for line parallel to *BC* and 3 cm from *BC* B1 for arc drawn, centre *C*, with radius 4 cm B1 ft for shading a region below their horizontal line **and** inside their arc
211		Volume of A = $\frac{140}{0.7} = 200$ Volume of B = $\frac{128}{1.6} = 80$ Mass of C = 140+128 = 268 Density of C = $\frac{268}{280}$	0.957	4	M1 for finding the volume of either liquid A or B or the mass of liquid C M1 for a complete method to find the volume AND mass of liquid C M1 (dep M2) for "total mass" ÷ " total volume" A1 for 0.957 to 0.96
212		$3^2 \times 180$	1620	2	M1 for using a scale factor of 3^2 (= 9) A1 cao
213			1.25	3	M1 100 – 12 (= 88) or 0.88 or 1.1 ÷ 88 (= 0.0125) M1 for complete method, eg 1.1 ÷ 0.88 A1 cao (SC B2 for 1250 as answer)

Question		Working	Answer	Mark	Notes
214	(a)		360	2	M1 30 ÷ 10 (= 3) or 120 ÷ 10 (=12) or 120 + 120 + 120 oe A1 cao
	(b)		25	2	M1 for $\frac{750}{300}$ (=2.5) oe A1 cao
215			2.10 euros or £1.81	3	M1 for 2.5 × 1.16 (= 2.9) M1 (dep) for 5 – "2.9" (=2.1) A1 for 2.1(0) euros OR M1 for 5 ÷ 1.16 (= 4.31...) M1 (dep) for "4.31" – 2.50 (=1.81) A1 for £1.81
*216			Decision (No the attendance target was not met)	3	M1 for attempting to find total number of students or 1210 seen M1 for $\frac{'1092'}{'1210'} \times 100$ oe or $\frac{'118'}{'1210'} \times 100$ oe C1 for correct decision with 90.(2479...) or correct decision with 6 and 9.(752...) **OR** M1 for attempting to find total number of students or 1210 seen M1 for $\frac{94}{100} \times$ '1210' oe C1 for correct decision with 1137 (.4) and 1092 or correct decision with 72(.6) and 118 **OR** M1 for a correct % method for one year, e.g. $\frac{192}{208} \times 100$ or $\frac{94}{100} \times 208$ M1 for a correct % method for each year C1 for correct decision with 92.(30...), 90.(87...), 89.(31...), 89.(27...), 89.(91...) or 195(.5..), 226.(9…), 246.(2..), 245.(3…), 223.(7…)

Question		Working	Answer	Mark	Notes
*217		$1.025^2 = 1.050625$ 1.04×1.015 $= 1.0556$	Bonus Saver with correct comparable values	4	M1 for a method to calculate 4% or 2.5% of 20000 (= 800 or 20800 or 500 or 20500) M1 for a method to calculate using a compound interest method, eg 1.025^2 oe or 1.04 followed by 1.015 oe A1 for 1.050625 or 1.0556 or 10556 or 556 or 21112 or 21012.5 or 1112 or 1012.5 C1 for a correct decision in a statement with two correct comparable values. **NB** all final money values can be rounded or truncated to nearest integer or left unrounded.

Question		Working	Answer	Mark	Notes
218			186.20	5	M1 for use of consistent units to find volume, 11 × 4 × 0.06 (=2.64) or 1100× 400 × 6 (=2640000) M1 (dep on vol calculation) for attempt to find number of bags needed, eg "2.64" ÷ 0.4 (=6.6 →7) M1 for the cost of gravel before discount eg "6.6" × 38 or "7" × 38 M1 for attempt to find the total cost after discount"266" × 0.7 oe A1 for 186.2(0) OR M1 for cost of gravel per bag after discount, 38 × 0.7 (=26.60) M1 for use of consistent units to find volume, 11 × 4 × 0.06 (=2.64) or 1100× 400 × 6 (=2640000) M1 (dep on vol calculation) for attempt to find number of bags needed, eg "2.64" ÷ 0.4 M1 for total cost of gravel after discount "7" × "26.6" A1 for 186.2(0)
219	(a)		209.69 or 209.70	3	M1 for $200 \times \frac{3.3}{100}$ oe or 200 × 1.033 or 6.6(0) or 206.6(0) M1 (dep) for (200 + "6.6") × $\frac{1.5}{100}$ oe or 200 × 1.033 × 1.015 oe or 3.099 or 3.09 or 3.10 or an answer between 209.69 and 209.7 A1 for 209.69 or 209.7(0)
	(b)	Train Pay Diff Old 200 510 310 New 225 535.50 310.50 Diff 25 25.50 50p	Comparison	3	M1 for method to find cost of tickets before increase eg $\frac{225}{1.125}$ (=200) oe or $\frac{225}{112.5} \times 12.5$ oe or pay before increase, $\frac{535.50}{1.05}$ (=510) oe A1 for 25 (train) **and** 25.5(0) (pay) or 310 **and** 310.5(0) C1 (dep on M1) ft for statement comparing rises leading to conclusion based on two comparable amounts eg pay increase greater than train increase

Question		Working	Answer	Mark	Notes
220			8	3	M1 for $p = \frac{k}{t}$ oe ($k \neq 1$) or $12 = \frac{k}{4}$ M1 for correct method to find k or $p = \frac{48}{t}$ oe or (dep on M1) for k=48 A1 cao OR M1 for $\frac{6}{4}$ oe M1 for $12 \div \frac{6}{4}$ oe A1 cao

Question	Working	Answer	Mark	Notes
221 (a)		12	2	M1 for $32 \div 8$ (=4) **or** $\frac{3}{8} \times 32$ oe A1 for 12
(b)		36	2	M1 for correct method to find 45% of 80 A1 cao
222		£26.50 **or** HK$325.95	3	M1 for 3179.55 ÷ 12.3 (=258.5) M1 (dep) for 285 - '258.5' A1 for £26.50 (correctly stated with currency) **OR** M1 for 285 × 12.3 (=3505.5) M1 (dep) for '3505.5' - 3179.55 (=325.95) A1 for HK$325.95 (correctly stated with currency)
223		Merit	3	M1 for $\frac{62}{80} \times 100$ (=77.5) A1 for 77.5% **or** 78% B1 ft (dep on M1) for 'Merit' **OR** M1 for calculating a percentage between 70 and 85% of 80 eg 0.7×80 (=56) **or** 0.84 × 80 (=67.2) **or** 0.85 × 80 (=68) A1 for 56 **and** 67(.2) or 68 or for two appropriate values which can be compared with 62 B1 ft (dep on M1) for 'Merit'

Question	Working	Answer	Mark	Notes
*224	Distance ÷ speed: 30 ÷ 70 (= 0.42-0.43); Distance ÷ time: 30 ÷ 26 (=1.15…); Speed × time: = 70 × 26 (=1820 mins); mph to miles/min =70÷ 60 (=1.16-1.17); Minutes to hours is 26 ÷ 60 (=0.43…)	No with correct figure	3	M1 for a calculation which uses the Time × Speed = Distance relationship **OR** a conversion of units eg between hours & minutes or between mph & miles per min M1 for a calculation involving both of the above C1 for "no" with a correct calculation, with units, from working: 25.2-25.8 minutes, 30.1-30.8 miles, 69-69.3 mph NB: 70 ÷ 26 × 30 as a single stage calculation gets 0 marks
225		116	3	M1 for 80% or 0.8 seen oe or $\frac{464}{0.8}$ (=580) M1 for $\frac{464}{0.8} - 464$ A1 cao **OR** M1 for 80% or 0.8 seen oe M1 for 464 ÷ 4 **or** 464 ÷ (80÷20) A1 cao

Question		Working	Answer	Mark	Notes
*226			Not enough mincemeat since 600<700 OR Only able to make 38 mince pies since insufficient mincemeat	4	M1 for 45 ÷ 18 (= 2.5) M1 for 2.5 used as factor or divisor A1 for ingredients as 562.5 and 875 and 250 and 700 and 2.5 (accept 2 or 3) OR for availables as 400, 400, 200 240, 2.4 (accept 2 or 3) C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe (with some supportive evidence) OR M1 for a correct method to determine the number of pies one ingredient could produce M1 for a correct method to determine the number of pies **all** ingredient could produce A1 for 80 and 51 and 90 and 38 and 108 C1 ft (dep on at least M1) for identifying and stating which ingredient is insufficient for the recipe. (with some supportive evidence)

Question		Working	Answer	Mark	Notes
227			28% or $\frac{14}{50}$	4	M1 for 100 --30 (= 70) or $1 - \frac{3}{10}$ $(= \frac{7}{10})$ M1 for "70" ÷ (3 + 2) (= 14) or $"\frac{7}{10}" \div (3+2)$ $(= \frac{7}{50})$ M1 for "14" × 2 or $\frac{7}{50} \times 2$ A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for a correct method to find (100-30)% of any actual sum of money M1 for "350" ÷ (3 + 2) (= 70) M1 for "70" × 2 A1 for 28% or $\frac{14}{50}$ oe **OR** M1 for starting with two numbers in ratio 3:2, eg 21 and 14 M1 for equating sum of their numbers to 100 – 30 (=70%), eg '21' + '14' (=35) M1 for scaling sum of their numbers to 100%, eg '35'÷70×100 (=50) A1 for 28% or $\frac{14}{50}$ oe SC: award B3 for oe answers expressed in an incorrect form eg $\frac{2.8}{10}$

Question		Working	Answer	Mark	Notes
*228			The Friendly Bank	4	M1 for a correct method to find interest for the first year for either bank **OR** correct method to find the value of investment after one year for either bank **OR** use of the multiplier 1.04 or 1.05 M1 for a correct full method to find the value of the investment (or the value of the total interest) at the end of 2 years in either bank A1 for 2100.8(0) and 2110.5(0) (accept 100.8(0) and 110.5(0)) C1 (dep on M1) ft for a correct comparison of *their* total amounts, identifying the bank from their calculations **OR** M1 for either 1.04 × 1.01 or 1.05 × 1.005 M1 for 1.04 × 1.01 and 1.05 × 1.005 A1 for 1.0504 and 1.05525 C1 (dep on M1) ft for a correct comparison of *their* total multiplying factors identifying the bank from their calculations
229			1.33	3	M1 for $3.4 = \frac{k}{5^2}$ oe or 3.4×5^2 (=85) M1 for '3.4×5^2' $\div 8^2$ A1 for answer in range 1.32 to 1.33 or $\frac{85}{64}$

Question		Working	Answer	Mark	Notes
*230			No + comparison	3	M1 for a correct start to the process eg. $\frac{225}{9}$ **or** $\frac{\mathbf{475}}{\mathbf{225}}$ **or** $\frac{\mathbf{20}}{\mathbf{9}}$ **or** $\frac{475}{20}$ M1 for completion of a fully correct method that will lead to an appropriate comparison C1 (dep on M2) for a correct statement with conclusion with 500 g **or** 25g more needed **or** 19 cakes **or** 25g **and** 23.75g SC :If **no** working then B1 for a correct statement with correct figures and units

Question		Working	Answer	Mark	Notes
231			414.96	5	M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method to find the cost of oil required before the discount M1 for a correct method of finding 5% of their calculated cost M1 (dep on previous M1) for a correct method to find the discounted cost A1 for correct answer of 414.96 or 41496p **OR** M1 for a correct method of finding 5% of the cost of 1 litre of oil M1 (dep on previous M1) for a correct method to find the discounted cost of 1 litre of oil M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method to find the discounted cost of the oil required A1 for correct answer of 414.96 or 41496p **OR** M1 for a correct method to work out the amount of oil required to fill the tank M1 for a correct method of finding 5% of their calculated amount of oil M1 (dep on previous M1) for a correct method to find the reduced amount of oil M1 for a correct method to find the cost of the reduced amount of oil A1 for correct answer of 414.96 or 41496p

Question		Working	Answer	Mark	Notes
232*	(a)		2.5	2	M1 for 15 ÷ 6 oe A1 for 2.5 or $2\frac{1}{2}$
	*(b)		Yes + evidence	2	M1 for a correct method to change 15 miles into kilometres C1(dep M1) for 24 km **and** statement with correct conclusion [SC: B1 for "Yes" oe and 24 km shown if M0 scored] or M1 for a correct method to change 20 kilometres into miles C1(dep M1) for 12.5 miles **and** statement with correct conclusion [SC: B1 for "Yes" oe and 12.5 miles shown if M0 scored]

Question		Working	Answer	Mark	Notes
233	(a)	154500 – 150000 $\frac{4500}{150000}\times 100$	3	3	M1 for 154500 – 150000 or 4500 M1 for $\frac{'154500-150000'}{150000}\times 100$ oe A1 cao **OR** M1 for $\frac{154500}{150000}$ (× 100) M1 for "$\frac{154500}{150000}\times 100$ " − 100 oe A1 cao
	(b)	154500 × $\frac{4}{100}$ + 154500 160680 × $\frac{4}{100}$ + 160680 or 154500 × 1.04^2	167107.20	3	M1 for 154500 × $\frac{4}{100}$ or 6180 **or** 12360 **or** 160680 **or** 166860 **or** 1.04 × 154500 M1 (dep) for (154500 + '6180') × $\frac{4}{100}$ or 6427.2(0) or ' 160680' × 1.04 A1 for 167107.2(0) as final answer **OR** M2 for 154500 × 1.04^2 (M1 for 154500 × 1.04) A1 167107.2(0) as final answer

Question		Working	Answer	Mark	Notes
*234		$3 \times £193.86 = £581.58$ £581.58 ×0.85=£494.343	£494.34	5	M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M1 '581.58'× '0.15' (=87.23(7)) M1 (dep on the previous M1) '581.58' − '87.23(7)' (= 494.34(3) **or** 494.35) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **OR** M1 3 × 193.86 (= 581.58) B1 ft correct discount % identified or used in working (may be identified in table) M2 '581.58'× '0.85' **(=** 494.34(3)) (M1 '581.58' × '1.15' (=668.81(7)) C1 (dep on all method marks) for £494.34 **or** £494.35 identified as final answer with correct money notation **NB. Throughout, values may be rounded or truncated to 2 decimal places**
235		25 ÷ 50 = 0.5 h = 30 min 25 ÷ 60 = 0.416 h = 25 min	5	3	M1 for 25 ÷ 50 **or** $\frac{60}{50} \times 25$ **or** 30 (min) **or** 0.5(h) **or** 25 ÷ 60 **or** $\frac{60}{60} \times 25$ **or** 25 (min) **or** 0.41(6)(h) **or** 0.42 (h) M1(dep) '0.5' –' 0.416 '**or** '30' – '25' A1 cao **OR** M1 for 60 ÷ 25 (= 2.4) **and** 60 ÷ "2.4" **or** 50 ÷ 25 (= 2) **and** 60 ÷ "2" M1(dep) '30' – '25' A1 cao

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>236</td><td></td><td>For example
<table>
<tr><th></th><th>UK</th><th>USA</th></tr>
<tr><td>$ per US gal</td><td>($)6.90(8412)</td><td>[$3.15]</td></tr>
<tr><td>£ per litre</td><td>[£1.24]</td><td>(£)0.56(53...)</td></tr>
<tr><td>£ per US gal</td><td>(£)4.69(96)</td><td>(£)2.14(28...)</td></tr>
<tr><td>$ per litre</td><td>($)1.82(28)</td><td>($)0.83(11...)</td></tr>
</table>
Cost in £ per US gal of UK fuel= £1.24 × 3.79 = £4.6996
Cost in $ per US gal of UK fuel = $1.47 × 4.6996 = $6.908412

OR
Cost in £ of 1 US gal of US fuel = $3.15 ÷ 1.47 = £2.14
Cost in £ per litre of US fuel = £2.14 ÷ 3.79 =£0. 56(5..

OR
Cost in UK in £ per US gal = £1.24 × 3.79 (=£4.6996)
Cost in USA in £ per US gal = £3.15 ÷ 1.47 (=2.1428)

OR
Cost in UK is $ per litre = £1.24 × 1.47 (=1.8228)
Cost in USA in $ per litre = 3.15 ÷ 3.79 (=0.8311...)</td><td>Cheaper in US</td><td>4</td><td>M1 for 1.24 × 3.79 (= 4.6996) or
1.24 × 1.47 (=1.8228)
M1 for 1.47 × ‘4.6996’ or 3.79 × '1.8228'
A1 for 6.90(8412)
C1 (dep on M2) for $’6.90(8412)’ or $'6.91' and reaching a conclusion consistent with their calculation

OR
M1 for 3.15 ÷ 1.47 (=2.1428..) or
3.15 ÷ 3.79 (=0.8311)
M1 for ‘2.14’ ÷ 3.79 or '0.8311' ÷ 1.47
A1 for 0. 56(53…)
C1 (dep on M2) for £’0. 56(53...)’ or '£0.57' and reaching a conclusion consistent with their calculation

OR
M1 1.24 × 3.79 (= 4.6996)
M1 3.15 ÷ 1.47 (=2.1428..)
A1 4.69(96) and 2.14(28...)
C1 (dep on M2) for £'4.69(96)' or £'4.70’ AND £‘2.14(28...)’ and reaching a conclusion consistent with their calculation

OR
M1 for 1.24 × 1.47 (=1.8228)
M1 for 3.15 ÷ 3.79 (=0.8311...)
A1 for 1.82(28) and 0.83(11...)
C1 (dep on M2) for $'1.82(28)' and $'0.83(11...)' and reaching a conclusion consistent with their calculation

NB: Throughout values can be rounded or truncated to 1 or more decimal places. In order to award the communication mark, correct currency must be shown with the calculated value(s) but these can still be rounded or truncated to one or more decimal places as they are being used for comparison.</td></tr>
</table>

Question		Working	Answer	Mark	Notes
237		Volume = $\frac{5\times12}{2}\times15$ Mass = $\frac{5\times12}{2}\times15\times6.6$	2970	3	M1 $\frac{5\times12}{2}\times15$ (=450) M1 (dep on 1st M1) $'450'\times6.6$ A1 cao SC: If no marks awarded then award B1 for an answer of 5940
238		$\frac{64.8-59.3}{64.8}\times100$ (=8.487...) **OR** $\frac{59.3}{64.8}\times100$ = 91.512 100 – '91.512' =8.487...)	8.49	3	M1 64.8 − 59.3 (=5.5) M1 (dep) $\frac{'5.5'}{64.8}\times100$ oe A1 8.48 – 8.49 **OR** M1 $\frac{59.3}{64.8}\times100$ oe (= 91.5(12...)) M1 (dep) 100 – '91.5' A1 8.48 – 8.49 **OR** M1 $\frac{59.3}{64.8}$ (=0.915(12...)) M1 (dep) 100 × (1 − '0.915') A1 8.48 − 8.49

Question		Working	Answer	Mark	Notes
239		16 metres: 8×10^8 km. 16: $8 \times 10^8 \times 1000$ 16: 8×10^{11} 1: 5×10^{10} **OR** 2 m to 10^8 km 2m to 100 000 000 000m 1m to 50 000 000 000m	1: 5×10^{10}	3	M1 (indep) correct method to convert to consistent units M1 $\frac{'8\times10^8'}{'16'}$ (units may not be consistent) **or** 5×10^{10} oe **or** 5×10^7 oe A1 1: 5×10^{10} **or** 1: 50 000 000 000 **OR** M1 (indep) correct method to convert to consistent units M1 $\frac{'16'}{8}$ to $'10^8'$ A1 1: 5×10^{10} **or** 1: 50 000 000 000

Question		Working	Answer	Mark	Notes
240		$(17 – 2.8) \times 9.5 = 134.9$ $\pi \times (3.8 \div 2)^2 = 11.34...$ $134.9 – 2 \times 11.34... = 112.21$ $112.21 \div 25 = 4.488$	5	5	M1 for $(17 – 2.8) \times 9.5$ (=134.9) or $17 \times 9.5 – 2.8 \times 9.5$ (= 161.5 – 26.6 = 134.9) M1 for $\pi \times (3.8 \div 2)^2$ (= 11.33 – 11.35) M1 (dep on M1) for '134.9' – 2 × '11.34' A1 for 112 - 113 C1(dep on at least M1) for 'He needs 5 boxes' ft from candidate's calculation rounded up to the next integer
241			Farm shop	4	M1 for 12.5 ÷ 2.5 (=5) M1 for '5'×1.83 or '5' × 183 A1 for (£)9.15 or 915(p) C1 (dep on at least M1) for decision ft working shown **OR** M1 for 12.5 ÷ 2.5 (=5) M1 for 9 ÷ '5' or 900 ÷ '5' A1 for (£)1.8(0) or 180(p) C1 (dep on at least M1) for decision ft working shown **OR** M1 for 9 ÷ 12.5 (=0.72) **or** 1.83 ÷ 2.5 (=0.732) M1 for 9 ÷ 12.5 (=0.72) **and** 1.83 ÷ 2.5 (=0.732) A1 for 72(p) **and** 73.(2)(p) or (£)0.72 **and** (£)0.73(2) C1 (dep on at least M1) for decision ft working shown **OR** M1 for 12.5 ÷ 9 (= 1.388...) M1 for 2.5 ÷ 1.83 (= 1.366...) A1 for 1.38.... **and** 1.36... truncated or rounded C1 (dep on at least M1) for decision ft working shown

Question		Working	Answer	Mark	Notes
242			51	3	M1 200 × 25.82 (= 5164) A1 for 5164 or 5160 or 5100 or 5200 or 51.64 or 51.6(0) or 52 A1 for 51 cao **OR** M1 for 100 ÷ 25.82 (= 3.87…) **and** 200 ÷ '3.87…' (= 51.64) A1 for 5164 or 5160 or 5100 or 5200 or 51.64 or 51.6(0) or 52 A1 for 51 cao

<table>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>*243</td><td></td><td>180 × 365 =65700
65700 ÷1000 =65.7
65.7 × 91.22 =5993.154
5993.154÷100 + 28.20 =88.13...

<table><tr><td>D</td><td>U</td><td>C</td><td>T</td></tr><tr><td>366</td><td>65880</td><td>6010</td><td>88.30</td></tr><tr><td>365</td><td>65700</td><td>5993</td><td>88.13</td></tr><tr><td></td><td>65000</td><td>5929</td><td>87.49</td></tr><tr><td></td><td>66000</td><td>6020</td><td>88.40</td></tr><tr><td>364</td><td>65520</td><td>5976</td><td>87.96</td></tr><tr><td>360</td><td>64800</td><td>5911</td><td>87.31</td></tr><tr><td>~~336~~</td><td>~~60480~~</td><td>5517</td><td>83.37</td></tr></table></td><td>Decision (Should have a water meter installed)</td><td>5</td><td>Per year
M1 for 180 × ‘365’ (= 65700)
M1 for ‘65700’ ÷ 1000 (= 65.7 or 65 or 66)
M1 for ‘65.7’ × 91.22 (= 5993...)
A1 for answer in range (£)87 to (£)89
C1 (dep on at least M1) for conclusion following from working seen

OR (per day)
M1 for 107 ÷ ‘365’ (= 0.293…)
M1 for 180 ÷ 1000 × 91.22 (= 16.4196)
M1 for 28.2 ÷ ‘365’ + ‘0.164196’ (units must be consistent)
A1 for 29 – 30(p) and 24 – 24.3(p) oe
C1 (dep on at least M1) for conclusion following from working seen

OR
M1 for (107 – 28.20) ÷ 0.9122 (= 86.384..)
M1 for ‘86.384..’× 1000 (= 86384.5…)
M1 for ‘365’ × 180 (= 65700)
A1 for 65700 and 86384.5...
C1 (dep on at least M1) for conclusion following from working seen

NB : Allow 365 or 366 or 52×7 (=364) or 12 × 30 (=360) or 365¼ for number of days</td></tr>
</table>

Question		Working	Answer	Mark	Notes
244		$6200 \times 1.025^3 =$ OR $6200 + \frac{2.5}{100} \times 6200 = 6355$ $6355 + \frac{2.5}{100} \times 6355 = 6513.875$ $6513.875 + \frac{2.5}{100} \times 6513.875 =$	6676.72	3	M2 for 6200×1.025^3 (= 6676.72...) (M1 for 6200×1.025^n, $n \neq 3$) A1 for 6676.72, accept 6676.71 or 6676.73 **OR** M1 for 6200×1.025 **or** for $6200 + \frac{2.5}{100} \times 6200$ oe **or** for 6355 or 155 or 465 or 6665 M1 (dep) for a complete compound interest method shown for 3 years A1 for 6676.72, accept 6676.71 or 6676.73 [SC B2 for 476.71 or 476.72 or 476.73 seen]