Mark Scheme

GCSE Mathematics and Numeracy Unit 1: Higher Tier SAMs	Mark	Comments
1(a) Any 2 of the following statements e.g. 'No time frame e.g. per day, per week etc', 'Groups are not continuous e.g. no group for 1.5 hours', 'No group if you exercise for more than 7 hours'	E2	Ignore additional spurious comments E1 for 1 correct statement
1(b) A criticism regarding e.g. '(Not representative of Year 11 as a whole as) most GCSE PE pupils will do more than 2.5 hours of exercise each week', or '(Not representative of Year 11 as a whole as) not many of these pupils will do less than 2.5 hours of exercise each week', or 'Most GCSE PE pupils are likely to do more exercise than Yr 11 pupils in general'	E1	Ignore additional spurious comments Accept e.g. 'Not a representative sample of Year 11', or 'Wouldn't represent Year 11 as a whole'
2. (Electricity cost is) 660 × 0.29 or 660 × 29	M1	
= (£) 191.4(0) or 19140 (p)	A1	If units are given, they must be correct
(Standing charge + electricity is) (£) 236.4(0) or 23640 (p)	B1	FT 45 + 'their 191.4(0)' or 4500 + 'their 19140'
(Total bill including VAT is) 1.05 × 236.4(0) or 1.05 × 23640	M1	FT 'their (£) 236.4(0)' or 'their 23640 (p)' including if standing charge omitted
= (£) 248.22 or 24822 (p)	A1	Only FT if 5% has been added correctly to 'their (£) 236.4(0)' or 'their 23640 (p)'
3. (Selling price =) 14 × 1.35 or equivalent (=£18.9(0))	M1	M1 marks can be performed in either order
(Sale price =) 18.9(0) × (1 − 1/5) or equivalent	M1	FT 'their 18.9(0)' × (1 − 1/5)
(Sale price =) (£)15.12	A2	A1 for any of the following: • (14 × 1.35 = £) 18.9(0) • (14 × 4/5 = £) 11.2(0) • 'their 14 × 1.35' × (1 − 1/5) correctly evaluated, allowing truncation or rounding to the nearest penny if applicable • 'their 14 × (1 − 1/5)' × 1.35 correctly evaluated, allowing truncation or rounding to the nearest penny if applicable
(Profit =) (£) 1.12	B1	FT 'their 15.12' – 14 provided at least M1 previously awarded

3. <u>Alternative method:</u> *(Fractional profit =) 1.35 × (1 − 1/5) – 1 or equivalent* *OR* *(Percentage profit =) 135% × 80% – 100%* *= 0.08 or 2/25 or 8%* *(Profit =) 0.08 × 14 or 2/25 × 14 or 8/100 × 14 or equivalent* *= (£) 1.12*	*M2* *A1* *M1* *A1*	*Award M1 for any one of the following:* • *1.35 × (1 − 1/5) or equivalent (= 1.08 or 27/25)* • *135% × 80% (= 108%)* *FT 'their 0.08' or equivalent provided at least M1 previously awarded*
4(a) 5 (km)	B2	B1 for any one of the following: • 3.6 + (3.6 – 2.2) allowing for 1 slip, possibly repeated, in reading the scale • 3.6 + 1.4 allowing for a slip in the reading of 3.6
4(b) 11:12	B2	Accept 11:12 a.m. B1 for sight of 1 hour 12 minutes (or 1:12)
4(c) (Average speed =) $3.6 \times 2 \div \frac{(10 + 15 + 20)}{60}$ or $\frac{7.2}{0.75}$ or equivalent = 9.6 (km/h)	M2 A1	Allow M1 for any one of the following: • use of 7.2 ÷ 'their time', including use of 45 • use of …… ÷ (10 + 15 + 20) • use of …… ÷ 45 • use of 0.75 FT from M1 for any one of the following: • 7.2 ÷ 'their time', including use of 45, correctly evaluated • 'their distance' ÷ 0.75 correctly evaluated
5. $\frac{385}{5 + 6} \times 5$ (÷4) or $\frac{385}{5 + 6} \times 6$ (÷4) (Sian will save) (£) 43.75 AND (Kim will save) (£) 52.5(0)	M1 A2	Answer space takes precedence A1 for any one of the following: • Correct answers but in the wrong order • (Sian will save) (£) 43.75 • Kim will save (£) 52.5(0) • (Sian) (£) 175 AND (Kim) (£) 210

6. (Change to €) 450 × 1.19 = (€) 535.5(0) (Only €20 and €50 notes so closest he can buy) (€) 540 (Cost in £ to buy € 540 is) 540 ÷ 1.19 or 450 + 4.5(0) ÷ 1.19 = (£)453.78(151…)	M1 A1 A1 M1 A1	FT 'their (€) 535.5(0)' (provided not a multiple of 20 or 50) rounded down or up to the closest multiple of 10 (that is greater than 30) May be implied by (€) 4.5(0) more needs to be bought (€) 540 implies previous M1A1 provided not from incorrect working FT 'their 540' provided it is a multiple of 10 or FT 'their 4.5(0)'
Organisation and communication Writing	OC1 W1	For OC1, candidates will be expected to: • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means For W1, candidates will be expected to: • show all their working • use correct mathematical form in their working • use appropriate terminology, units, etc.
7(a) (Tax at 40%) 0.4 × (58 000 – 50 000) or 0.4 × 8000 or equivalent = (£)3200	M1 A1	
7(b) (Amount of tax at 20% = 10 500 – 3200 =) (£)7300 $\frac{7300}{0.2}$ or 7300 × 5 = (£)36 500 (Personal allowance is) (£)13 500	B1 M1 A1 A1	FT 10 500 – 'their 3200' from (a) FT 'their 7300' provided < 10 500 Allow M1 for 0.2 × x = 7300 CAO FT from M1A0 for 50 000 – 'their 36 500' provided > 0

8(a) (Volume of flowerbed =) $\frac{1}{2} \times (380 + 165) \times 213$ $\times 30$ $= 1\,741(.275)$ (litres)	 M1 m1 A2	 A1 for $1\,741\,275$ (cm^3)
8(b) $8 \times 0.98^2 \times 1.06^5$ Answer in the range (£)10.27 to (£)10.29	M2 A1	OR equivalent method to decrease by 2% and to increase by 6% on different amounts *$(8 \times 0.98^2 = 7.6832)$* *$(8 \times 1.06^5 = 10.7058\ldots)$* M1 for sight of either • 8×0.98^2 (× …) or equivalent OR • 8×1.06^5 (× …) or equivalent CAO
9(a)(i) 1.5×10^6	B1	
9(a)(ii) $\frac{9.48 \times 10^3}{4 \times 10^4}$ (× 100) or equivalent = 23.7 (%)	M1 A1	 Allow 24% from correct working
9(a)(iii) 143% = 152(000 000) (Planned cost =) $\frac{152(000\,000)}{1.43}$ or equivalent = (£)106(.29 million)	B1 M1 A1	 Needs to be a complete method e.g. 152(000 000) ÷ 143 × 100 Allow (£) 106 293 706.3… to be rounded appropriately e.g. (£) 106 000 000 or (£) 106 300 000 or (£) 106 290 000 Award A0 for an answer of 100 000 000
9(b) (Greatest possible perimeter =) 120.25×2 + 79.25×2 or equivalent = 399 (m)	M1 A1	Allow M1 for use of 120 < 'their 120.25 ≤ 120.5 and 79 < 'their 79.25' ≤ 79.5 CAO
9(c) (200 ÷ 8 =) 25 or 200 ÷ 25 = 8 or 8 × 25 = 200 1 2 3 4 5 6 7 8 20 45 70 95 120 145 170 195	B1 B1	B1 may be implied by consistent position pattern +25 indicated, or B1 allowed for sight of 45 for voucher 2 CAO

10(a)(i) 4 $\times \frac{7}{5}$ or $\times 1.4$ or equivalent $\times \frac{125}{85}$ or $\times 1.47(058\ldots)$ or equivalent = 9 (painters)	 M1 M1 A2	<u>A table method altering all 3 values in the same ratio at the same time is M0</u> M marks may be seen in either order e.g. <u>Hours</u> <u>Area</u> <u>Painters</u> 5 85 5.6 **FT from M0 previously awarded** Must be from use of 4 e.g. if this calculation is performed first <u>Hours</u> <u>Area</u> <u>Painters</u> 7 125 5.8(823…) CAO A1 for 8(.235…) OR A1 on FT from only M1 mark previously awarded for their final answer rounded up, provided their final answer is not an integer
10(a)(i) <u>Alternative method 1</u>: *(Area painted per hour per painter =)* *85 ÷ 7 ÷ 4 (= 3.03(571…))* *(Number of painters needed =)* *125 ÷ ((85 ÷ 7 ÷ 4) × 5)* *= 9 (painters)*	 *M1* *M1* *A2*	 *CAO* *A1 for 8(.235…) OR* *A1 on FT from M1M0 previously awarded for their final answer rounded up, provided their final answer is not an integer*
10(a)(i) <u>Alternative method 2:</u> <u>Hours</u> <u>Area</u> <u>Painters</u> *10.2(941…)* *125* *4* *OR* *5* *60.7(142…)* *4* *4 × <u>10.2(941…)</u> OR 4 × <u>125</u> or 4 × 2.058(823…)* *5* *60.7(142…)* *or equivalent* *= 9 (painters)*	 *M1* *M1* *A2*	 *FT from 4(painters), 125 (m^2), n (hours) for $4 \times \frac{n}{5}$* *OR* *FT from 4(painters), n (m^2), 5 (hours) for $4 \times \frac{125}{n}$* *CAO* *A1 for 8(.235…) OR* *A1 on FT from M1M0 previously awarded for their final answer rounded up, provided their final answer is not an integer*
10(a)(ii) Valid assumption e.g. 'All painters work at the same rate (or speed)', 'They all paint 3(.03…) (m^2) in an hour' 'Each painter is equally efficient'	B1	Do not accept e.g. 'The rooms (or walls) are the same shape', 'They don't have breaks', 'Each painter works at a constant speed'

10(b) $20 \times \frac{\text{number of staff}}{(15+40+21+29)}$ or $20 \times \frac{\text{number of staff}}{105}$	M1	Sight of this calculation for any job type
(Number of plumbers =) 4	A1	
(List of unrounded answers) 2.8(57…) or 2.86 or 2.9, 7.6(190…), 5.5(238…)	A1	OR A1 for 3, 8, 6 Implies the award of M1
(Number in sample =) 3, 8, 4, 5	A1	If M1A1A0 awarded, A1 for 3, 8, 4, 5 provided their unrounded answers would not lead to different numbers in the sample, OR A1 on FT from their unrounded answers, provided: • any 2 or 3 unrounded answers are correct, AND • the correct numbers in the sample are given for their unrounded answers (including any decisions regarding rounding down), AND • the sample numbers add to 20 If no working shown, award SC2 for 3, 8, 4, 5
11. Banc y Bobl $1.00425^{12} - 1$ OR $\left(1+\frac{0.051}{12}\right)^{12}-1$	M1	
= 0.0522(091…) or 5.22(091…)%	A1	Accept 0.052 or 5.2% provided not from incorrect working Do not accept 0.052(…) % unless corrected in further work
First Access Bank $\left(1+\frac{0.0512}{4}\right)^{4}-1$	M1	
= 0.0521(914…) or 5.21(914…)%	A1	Accept 0.052 or 5.2% provided not from incorrect working Do not accept 0.052(…) % unless corrected in further work
(Mari should invest in) Banc y Bobl	B1	FT 'their 0.0522(091…) or 5.22(091…)%' AND FT 'their 0.0521(914…) or 5.21(914…)%' provided at least one M1 mark previously awarded and their values are accurate enough to allow comparison

12(a) (Monthly payments =) $\frac{\frac{0.075}{12}\times(22000-5000)}{1-\left(1+\frac{0.075}{12}\right)^{-7\times12}}$ OR $\frac{0.00625\times17000}{1-(1+0.00625)^{-84}}$ or equivalent	M2	M1 for an expression with only 1 (possibly repeated) incorrect substitution, but do not allow use of r = 7.5
= (£)260.75	A1	Accept (£)260.75(068…)
12(b) 260.75×7×12 − 293.93×6×12	M1	FT 'their (£)260.75' from (a) Allow use of their unrounded answer to part (a) and their unrounded (£)293.93 if the formula has been used to calculate it
= (£)740.04	A1	Use of: • (£)260.75(068…) leads to (£)740.09(79…) or 740.10 • (£)260.75(068…) and (£)293.93(19…) leads to (£)739.96
13. MS based on MS for A17 Num U2H Qu9c		Accept use of ·4999… and 12·24999… throughout, but not ·49 and 12·249 Accept values of π of between 3.14 and 3.142 throughout
(Surface area of half-hemisphere =) $(4\times\pi\times12{\cdot}25^2)\div4$ or equivalent	B1	(= 471 to 471·6… (m^2)) Allow B1 for 11·5 ≤ 'their 12.25' ≤ 12·5
(Curved surface area of half cylinder =) $(\pi\times24{\cdot}5\times43{\cdot}5)\div2$ or equivalent	B1	(= 1673 to 1674·75 (m^2)) Allow B1 for 23 ≤ 'their 24.5' ≤ 25 AND 42 ≤ 'their 43.5' ≤ 44
(Total surface area =) $(4\times\pi\times12{\cdot}25^2)\div4 + (\pi\times24{\cdot}5\times43{\cdot}5)\div2 + (\pi\times12{\cdot}25^2)\div2$ (=471 to 471.6..) (1673 to 1674.5) (235.5 to 235.8..)	M3	Bounds need to be correct for M3 M2 for summing any 2 fully correct terms M1 for $(4\times\pi\times12{\cdot}25^2)\div4 + (\pi\times24{\cdot}5\times43{\cdot}5)\div2 + (\pi\times12{\cdot}25^2)\div2$ where 12 < 'their 12.25' ≤ 12.5 and 24 < 'their 24.5' ≤ 25 and 43 < 'their 43.5' ≤ 44
= 2379·5 to 2382 (m^2)	A1	CAO
(Number of tins needed =) (2379·5 to 2382) ÷ 39·5	M1	(= 60·2… to 60·3) FT 'their 2379.5 to 2382' Allow M1 only for use of 39 ≤ 'their 39.5 < 40
= 61 (tins)	A1	FT a correctly rounded up answer to their calculation, and must be from dividing by 39.5

How to read the mark scheme

- ‘M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- ‘m’ marks are dependant method marks. They are only given if the relevant previous ‘M’ mark has been earned.
- ‘A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- ‘S’ marks are awarded for strategy
- ‘E’ marks are awarded for explanation
- ‘U’ marks are awarded for units
- ‘P’ marks are awarded for plotting points
- ‘C’ marks are awarded for drawing curves
- ‘OC’ marks are awarded for ‘organising and communicating’, a strand of OCW (organising, communicating and writing accurately)
- ‘W’ marks are awarded for ‘writing accurately’, a strand of OCW (organising, communicating and writing accurately)
- ‘SC’ marks are awards for special cases
- CAO: correct answer only
- ISW: ignore subsequent working
- FT: follow through

Assessment mapping

Q.	Topic	Max mark	AO1	AO2	AO3	Common Qn (Fn)	Common marks (Fn)	OCW
1								
1	PE questionnaire	3	3			7	3	
2	Mr Bevan's electricity bill	5		5		8	5	
3	Hisako's profit - % increase, fractional decrease	5		5				
4	Nerys' travel graph - speed, share in a ratio	7		4	3	9	7	
5	Saving to buy a guitar - ratio	3		3		10	3	
6	Hefin's holiday - exchange rate	7		7				*
7	Muhammad's income tax	6	2		4			
8	Flowerbed - vol trap prism, rep % change	7	7			11	4	
9	Principality - st form, perc, rev %, bounds, sys samp	10	8	2				
10	Building company - proportionality, strat sampling	9	4	5				
11	Comparing AERs	5		5				
12	Car loan - APR, monthly payments	5	3	2				
13	Painting a storage building - surface area, bounds	8			8			
	Totals	**80**	**27**	**38**	**15**		**22**	