Level 3 Certificate

Quantitative Problem Solving (MEI)

Unit **H867/01** Introduction to quantitative reasoning

OCR Level 3 Certificate in Quantitative Problem Solving (MEI)

Mark Schemes for June 2016

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Mark schemes should be read in conjunction with the published question papers and the report on the examination.
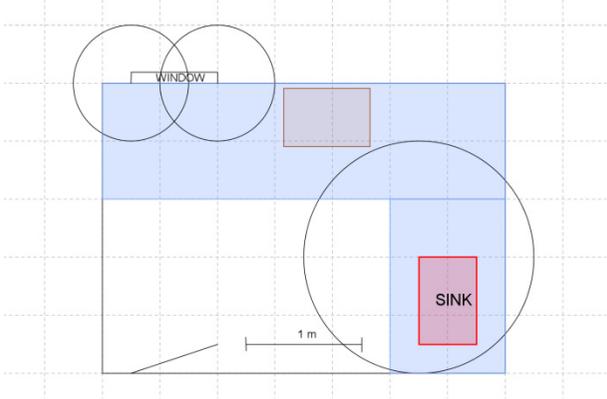
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Question			Answer	Marks	Guidance
1			For 100m $Z = \frac{10.23-10.99}{0.25} = (-)3.04$	M1	Attempting to use z-scores (possibly implicitly)
				A1	Needs full accuracy.
			For long jump $Z = 2$	A1	
			So 100m should score more points.	E1	
				[4]	

Question			Answer	Marks	Guidance
2	i		13824 19683 21952 32768 27000	B1 [1]	at least 4 correct numbers (to 3sf or better)
2	ii			G1 G1 G1ft [3]	at least two correct points (within one square) – no ft all points correct (within one square) – no ft Reasonable line of best fit
2	iii		$$\text{gradient} = \frac{y\text{-difference}}{x\text{-difference}}$$ $$a \approx 0.0001 (\text{kg/cm}^3)$$	M1 A1 [2]	needs some evidence, e.g. a triangle on graph. Do not allow for gradient of line from (0,0) to a single point on the table ft their graph
2	iv		$$0.0001 \times 36^3 \approx 4.7\text{kg}$$ So the rabbit is overweight.	M1 A1 E1 [3]	correct model used ft their value of a Must be consistent with working above.

Question			Answer	Marks	Guidance
2	v		Any sensible reason e.g. Points lie close to a straight line.	E1 **[1]**	
3	i		416×1.04 $= 432.64$ $432.64 \times 5 = 2163.2 (\text{million tonnes})$	M1 A1 A1 **[3]**	Adding on 4% by any method Accept to 3sf
	ii		Attempting to find at least one CO2 per person ratio Allow C02 values between LB and UB or their 3i answer Using valid population Allow figure for 5 year period Selecting a pair of values for which their ratio exceeds 6 and making a comparison with 6 Target is not certain to be met	M1 M1 M1 E1 **[4]**	 Must be for 1 year Ft their 3i if used May be their only ratio Conclusion clearly stated www Don't allow if they state that exceeding 6 to nnes is meeting the target
			Alternative method Attempting to find at least limit for CO2 based on 6 tonnes per person Using valid population Comparing a predicted CO2 that exceeds their limit with their limit Target is not certain to be met	M1 M1 M1 E1 **[4]**	Allow any value between LB and UB Allow any value between UB and LB Conclusion clearly stated

Question			Answer	Marks	Guidance
4	i		0.75m It does not satisfy the regulations	B1 E1 **[2]**	
4	ii		Anywhere on the surface outside of the circles: 	B1 B1 B1 **[3]**	Entirely on blue surface More than 1m from sink (allow =1m from sink) More than 50cm from window (allow =0.5m from window)

Question			Answer	Marks	Guidance
5	i		Totals 92, 908, 48, 952	B1	
			1000÷48	M1	Allow for 48÷1000
			Which is about 1 <u>in</u> 21 or 1 <u>in</u> 20	A1	
				[3]	
5	ii		$\frac{48}{1000} \times 300{,}000 = 14{,}400$ patients	M1	Finding number with diabetes
				A1	ft their ans 5i if used
			Total cost $= 2{,}600 \times 14{,}400 = £37440000$	M1	Finding total cost
			$\approx £37$ million	A1	Rounded to the nearest million
				[4]	ft their number of patients
5	iii		e.g. Researcher's results are relevant to area of the hospital.	E1	Any relevant comment.
			Everybody who is diabetic gets treatment.	[1]	
5	iv		$\frac{44}{48} (\approx 0.917)$	B1	Denominator
				B1	Numerator
				[2]	
5	v		$\frac{44}{92} (\approx 0.478)$	B1	Denominator
				B1	Numerator
				[2]	
5	vi		Yes or no, supported by relevant comment e.g. since the probability of someone with a positive result actually having diabetes is relatively low.	E1	
				[1]	

	Question		Answer	Marks	Guidance
6	i		- A larger percentage of people used the internet (daily)in 2013 - The use is lower for older people - Proportion using internet is increasing.	B1 B1 **[2]**	Allow any two distinct evaluative comments.
6	ii		$$7.4 \times 0.88 = 6.5 \text{ million}$$ $$9.0 \times 0.76 = 6.8 \text{ million}$$ The claim is not true.	M1 A1 E1 **[3]**	attempt to work out both numbers at least one correct number Correct conclusion www.
6	iii		$$7.4 \times 0.88 + 8.7 \times 0.84 + \cdots = 36.458$$ Total population 52 million $$\frac{36.458}{52} \times 100\% = 70.1(12)$$	M1 A1 M1 M1 A1 **[5]**	attempt at a total number of people who use internet daily attempt to find total population divide by "52" art 70.1

Question			Answer	Marks	Guidance
7	i		$10^{-3} \div (5 \times 10^{-6})$ $= 200$	M1 A1 **[2]**	Allow for $(5 \times 10^{-6}) \div 10^{-3}$
7	ii		2×10^4 or $20{,}000$ (hours)	B1 B1 **[2]**	For $2\times$ Correct power of 10
7	iii	A	$24 \times 365 \times 2$ $= 17{,}520$ $\approx 20{,}000$ (hours)	M1 A1 **[2]**	Allow 365 or better. Answer rounded to nearest 10,000.
7	iii	B	200 (tonnes)	B1 **[1]**	

Question			Answer	Marks	Guidance
8	i		Taxable income $= (24000 - 10600 - 1200)$ $(= 12200)$	M1	For attempt to subtract both allowance and pension (condone confusing annual and monthly values)
			$(= 12200 \times 0.20) = 2440$	A1	All numbers correct
					N.b. allow going straight to monthly calculations and scaling up.
				[2]	
8	ii		$24000 - 8065 - 1200$ $(= 14735)$	M1	For attempt to subtract allowance and pension only (condone confusing monthly and annual values)
			14735×0.12 $(= 1768.2)$	M1	applying a correct percentage to either annual or monthly income with some deductions
			$1768.2 \div 12 = 147.35$	A1	art 147
				[3]	
8	iii		$= (A2 - 10600) * 0.20$	B1	A2-10600 seen
				B1	( )*0.2 and starts with = Do not allow for any formula containing
				[2]	B2
8	iv			B1B1	At least one in each column correct

	2880
2880	3000
3080	3120
3280	3240
3480	3360
3680	

B1	All correct
[3]	

Question			Answer	Marks	Guidance
8	v		£26 000 and £27 000	B1	FT their table (only if complete)
				[1]	
8	vi		$24\,000 \times 1.02 (= 24\,480)$	M1	using an appropriate method to increase salary by 2%
			$(24\,480 - 10\,600 - 1200) \times 0.20$ $= 2536$	M1	using their '24480'
				A1	exact answer
				M1	using their '2536'
			$(2536 - 2440) \div 2440 (\times 100)$ $= 3.93\%$	A1	art 3.9
				[5]	
			Alternative method Additional income $24\,000 \times 0.02 (= 480)$	M1	Attempting 2% of salary
				M1	Understanding all payable at basic rate (may be implied)
			All payable at basic rate Extra tax	A1	using their '96'
			$480 \times 0.20 = 96$ $(96) \div 2440 (\times 100)$	M1	art 3.9
			$= 3.93\%$	A1	
				[5]	

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