

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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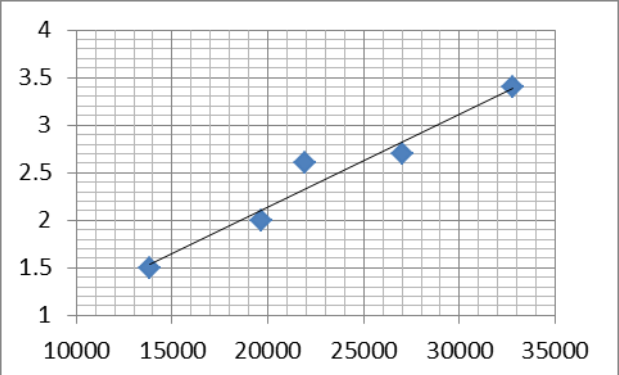
All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

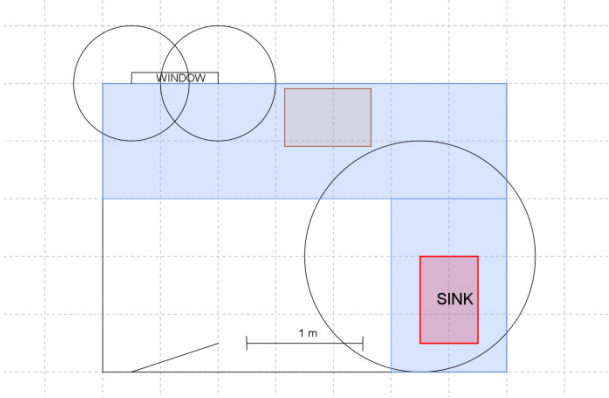
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Question		Answer	Marks	Guidance
1		For 100m $Z = \frac{10.23 - 10.99}{0.25} = (-)3.04$ For long jump $Z = 2$ So 100m should score more points.	M1 A1 A1 E1 [4]	Attempting to use z-scores (possibly implicitly) Needs full accuracy.

Question		Answer	Marks	Guidance
2	i	13824	B1	at least 4 correct numbers (to 3sf or better)
		19683	[1]	
		21952		
		32768		
		27000		
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	$0.0001 \times 36^3 \approx 4.7\text{kg}$ <p>So the rabbit is overweight.</p>	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	<p>Attempting to find at least one CO₂ per person ratio</p> <p>Allow CO₂ values between LB and UB or their 3i answer Using valid population Allow figure for 5 year period</p> <p>Selecting a pair of values for which their ratio exceeds 6 and making a comparison with 6</p> <p>Target is not certain to be met</p>	M1 M1 M1 E1 [4]	<p>Must be for 1 year Ft their 3i if used</p> <p>May be their only ratio Conclusion clearly stated www Don't allow if they state that exceeding 6 tonnes is meeting the target</p>
		<p>Alternative method</p> <p>Attempting to find at least limit for CO₂ based on 6 tonnes per person</p> <p>Using valid population</p> <p>Comparing a predicted CO₂ that exceeds their limit with their limit</p> <p>Target is not certain to be met</p>	M1 M1 M1 E1 [4]	<p>Allow any value between LB and UB</p> <p>Allow any value between UB and LB</p> <p>Conclusion clearly stated</p>

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 1000÷48 Which is about 1 <u>in</u> 21 or 1 <u>in</u> 20	B1 M1 A1 [3]	Allow for 48÷1000
5	ii	$\frac{48}{1000} \times 300,000 = 14,400 \text{ patients}$ Total cost = $2,600 \times 14,400 = \text{£}37440000$ $\approx \text{£}37 \text{ million}$	M1 A1 M1 A1 [4]	Finding number with diabetes ft their ans 5i if used Finding total cost Rounded to the nearest million ft their number of patients
5	iii	e.g. Researcher's results are relevant to area of the hospital. Everybody who is diabetic gets treatment.	E1 [1]	Any relevant comment.
5	iv	$\frac{44}{48} (\approx 0.917)$	B1 B1 [2]	Denominator Numerator
5	v	$\frac{44}{92} (\approx 0.478)$	B1 B1 [2]	Denominator Numerator
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	<ul style="list-style-type: none"> - 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	$7.4 \times 0.88 = 6.5 \text{ million}$ $9.0 \times 0.76 = 6.8 \text{ million}$ <p>The claim is not true.</p>	M1 A1 E1 [3]	attempt to work out both numbers at least one correct number Correct conclusion www.
6	iii	$7.4 \times 0.88 + 8.7 \times 0.84 + \dots = 36.458$ <p>Total population 52 million</p> $\frac{36.458}{52} \times 100\% = 70.1(12)$	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× Correct power of 10
7	iii	A	$24 \times 365 \times 2$ $= 17,520$ $\approx 20,000 \text{ (hours)}$	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	$\text{Taxable income} = (24000 - 10600 - 1200) (= 12200)$ $ (= 12200 \times 0.20) = 2440$	M1 A1 [2]	For attempt to subtract both allowance and pension (condone confusing annual and monthly values) All numbers correct N.b. allow going straight to monthly calculations and scaling up.												
8	ii	$24000 - 8065 - 1200 (= 14735)$ $14735 \times 0.12 (= 1768.2)$ $1768.2 \div 12 = 147.35$	M1 M1 A1 [3]	For attempt to subtract allowance and pension only (condone confusing monthly and annual values) applying a correct percentage to either annual or monthly income with some deductions art 147												
8	iii	$= (A2 - 10600) * 0.20$	B1 B1 [2]	A2-10600 seen ()*0.2 and starts with = Do not allow for any formula containing B2												
8	iv	<table border="1"> <tr><td></td><td>2880</td></tr> <tr><td>2880</td><td>3000</td></tr> <tr><td>3080</td><td>3120</td></tr> <tr><td>3280</td><td>3240</td></tr> <tr><td>3480</td><td>3360</td></tr> <tr><td>3680</td><td></td></tr> </table>		2880	2880	3000	3080	3120	3280	3240	3480	3360	3680		B1B1 B1 [3]	At least one in each column correct All correct
	2880															
2880	3000															
3080	3120															
3280	3240															
3480	3360															
3680																

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

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