OCR
Oxford Cambridge and RSA

Level 3 Certificate

Quantitative Reasoning (MEI)

Unit **H866/01** Introduction to quantitative reasoning

OCR Level 3 Certificate

Mark Schemes for June 2018

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

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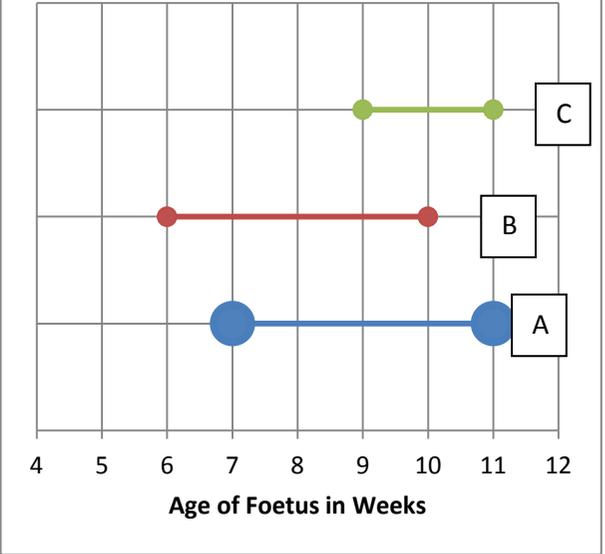
Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARK SCHEME: FORMAT 1

Question			Answer	Marks	Guidance
1	i		$\dfrac{12.6 + 13.1 + 12.5 + 12.8 + 13.0}{5}\left(=\dfrac{64}{5}\right) = 12.8(s)$	B1 **[1]**	
1	ii		$\dfrac{10}{12.8} = 0.78(125)$ (litres/sec)	(M1) A1 **[2]**	Full follow through from part (i) Not 0.8 or 0.7
1	iii		$0.78(125) = \dfrac{6000}{t}$ or $0.78(125)t = 6000$ $t = \dfrac{6000}{0.78(125)} = 7680(\text{s})$ or $7692(\text{s})$ $\dfrac{"7680"}{3600}(= 2.133 \dots)$ ≈ 2 hours	(M1) M1 (A1) M1 B1ft **[5]**	Substitute correct numbers (FT from (ii)) rearrange correctly (with their numbers) art 7700, can be implied Allow the alternative approach, not using the estimate, but using 10 litres → 12.8 s so 600 x (10 litres) takes 600 x (12.8 a) = 7680 division by 3600, possibly in stages. If no working SC1 for answer of 2 hours Allow equivalent, non-algebraic approaches.

2	i		e.g. pizza is same shape (or circular) or depth is the same for both pizzas. or same type/specification/quality	E1 [1]	Any relevant assumption
2	ii		Many students will (implicitly) assume a circular pizza: $4.5^2\pi(= 63.6)$, $12^2\pi(= 113.1)$ Medium pizza: $10 \div 63.6 = 0.157$ (£/sq in) or $\frac{63.6}{10} = 6.36$ (sq in/£) Large pizza: $14 \div 113.1 = 0.124$ (£/sq in) or $\frac{12^2\pi}{14} = 8.08$ (sq in / £) The large pizza is better value. Alternative if using diameter in place of radius: $9^2\pi(= 254.5)$, $12^2\pi(= 452.4)$ Medium pizza: $10 \div 254.5 = 0.039$ (£/sq in) or $\frac{254.5}{10} = 25.4$ (sq in/£) Large pizza: $14 \div 452.4 = 0.031$ (£/sq in) or $\frac{12^2\pi}{14} = 32.3$ (sq in / £) The large pizza is better value.	M1 M1 A1 B1 ft M0 M1 M1 B1 ft	Attempt at an area calculation Attempt two consistent divisions Both numbers correct may be rounded to 2sf. Answer consistent with the calculation Can be gained if "per inch" used providing supported by consistent "wrong" working.

					$(1.16(666\ldots)$ and $1.11(\ldots))$
		Alternatively, an approach using scale factors is possible (and indeed preferable!): Price scale factor is $14 \div 10 = 1.4$ (or $0.714\ldots$) Area scale factor is $12^2 \div 9^2 \approx 1.78$ ($0.562\ldots$) The larger pizza is better value.		M1 M1 A1 B1ft **[4]**	Attempting "price ratio" For area comparison Also accept any answer which follows on from their assumptions (e.g. if thickness changes in proportion)
3	i	 **Age of Foetus in Weeks**		M1 A1 A1 A1 **[4]**	One bar correctly centered 6-10 bar (Condone lack of circles at end or added circles) 9-11 bar (Condone lack of circles at end) All three bars correctly labeled (allow ft from correctly centered lines) If no lines but dots SC1 for each pair of dots (unambiguous) If no lines but dots correct and unambiguously labelled gains SC3

3	ii		Between 9 and 10 weeks.	B1 B1 [2]	1 mark for each number. FT from their graph (a possible two marks but need both lines)
4	i		200×96.88 $= 19376$ (rupees)	M1 A1 [2]	For choosing the correct "sell rate" cao
4	ii		$19376 \div 103.46$ $= (£)187.28$ $\frac{200 - "187.28"}{200} \times 100$ $= 6.36(\%)$ *or* $6.4(\%)$ or $6.3599(4...)\%$ or 6% (with working)	M1 A1 M1 A1cao [4]	Their value divided by a rate from table. FT Calculation doesn't need $\times 100$ _____ OR ALTERNATIVE METHOD _____ Using the actual exchange rates themselves M1 for $(96.88 \div 103.46)$ A1 $= 0.9364$ ...... M1 for $(1 - 0.9364 ......)$ oe _____ Ignore extraneous minus signs.

4	iii		(US:) $(55 + 8) \div 1.46$ or (US:) $55 \div 1.46$	M1	Accept alternative method converting £ to $.
			$\approx$ (£)43. (15)	A1	(No credit for "55")
			The UK deal is cheaper	B1ft [3]	Conclusion consistent with their calculations. Full working (not necessarily correct) must be seen.
4	iv		e.g consider buying something for say 100 EUR (need least £)		Method converting £ to € (see below)
			Bank: $\frac{"100"}{1.31} = $ (£)76.34 oe	M1	Dividing by appropriate rate. Can be implied. *Their* amount (not necessarily explicitly stated) $\div 1.31$
			Credit card: $\frac{("100" \times 1.03)}{1.34}$	M1	Consistent with their "100"
			$= ((£)76.87)$	A1	
				B1ft	
			The bank provides better value.	[4]	Answer consistent with calculations. Full working must be seen. (Full working must include account taken of commission but not necessarily correct)
			Alternative Methods:		_____ OR ALTERNATIVE METHODS _____
			[1]Credit card rate is equivalent to $\frac{1.34}{1.03} = 1.30$	M1A1 A1	Fraction
			So bank provides better value.	A1 [4]	Answer

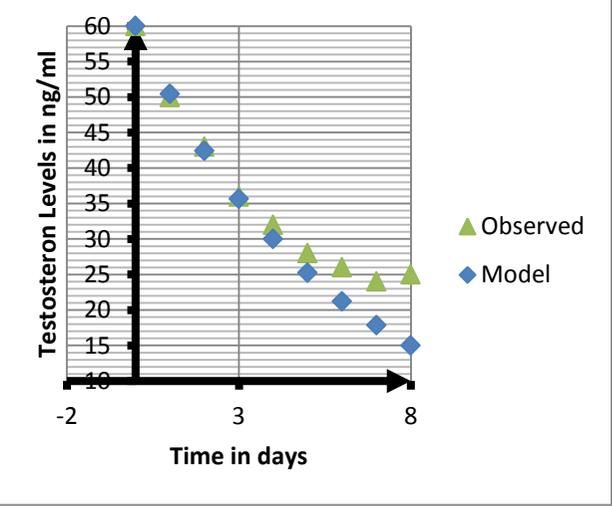|					
			[2] Method involving starting from a sum of money in sterling say (£100) (so best is most €) Bank: "£100" x 131 = (€)"131" Credit card: $\dfrac{("100" \times 1.34)}{1.03}$ = (€) "1.30(0097)"	____ M1 M1 A1 B1(ft) **[4]**	From correct method but if M0 SC1 for ("100" × 1.34)×0.97 = 129.(98) i.e. effectively awarding correct answer to a partially correct method. Answer consistent with calculations., working must be seen. (Working must include account taken of commission but not necessarily correct)
5	i		60 miles = (60 ÷ 5) × 8000 = 96000m 60 mph = $\dfrac{"96000"}{3600}$ = 26.7 or 27 or 26.67 or 26.6(recurring)(ms^{-1})	M1 M1 A1 **[3]**	Any relevant to conversion from Imperial into metric. (e.g. 60 mph to 96 kph) FT from error in conversion (most likely km to m) CAO

5	ii		$\dfrac{26.7}{3.2}$	M1	Full follow through from part (i)
			$= 8.3 \ (\mathrm{m}s^{-2})$	A1	
			Yes, it is safe.	B1 (dep)	FT based on their calculation
				[3]	
5	iii		Tangent around 0.05s or triangle somewhere in the region 0.04 to 0.075	B1	
			change in y	M1	from their triangle
			change in x	M1	
			$\dfrac{their \ \text{change in y}}{their \ \text{change in x}}$	M1	Based on *their* stated figures.
			$(-)500$ to $600 \ (\mathrm{m/s}^2)$	A1	CAO
			not safe	B1	consistent with their numerical answer
				[6]	
6	i		Underestimate.	B1	
			Some head injuries may go unreported or be reported somewhere other than the emergency room.	B1	
				[2]	

6	ii		American football: $\frac{46\,948}{18300000} = 0.0025(65\ldots)$ oe	M1	At least one correct calculation attempted (allow working in millions, %) Allow rot to 2sf or more
			winter sports: $\frac{16\,948}{10\,800\,000} = 0.0015(69\ldots)$ oe		
			cycling: $\frac{85\,389}{46\,800\,000} = 0.0018(24\ldots)$ .oe	A1	At least two correct
			Football has the largest number of admissions per participant or it is the least safe oe	A1	All the numbers and conclusion correct

Condone responses given as unit fractions, e.g $\frac{1}{390}$ (see below) – but not 1 in 390 or 1:390

_____ **For inverse of the rates** _____

(Effectively condoning the mis-read of "rate of accidents" as "what's the least safe sport")
Full credit for 1 in 390 or 389 and
1 in 637 and 1 in 548 iff correct units attached
e.g. "1 in X participants received head injuries with American football" oe as the most dangerous oe
_____
SC2 for all inverses correct :-1 in 390 or 389 / 1 in 637 / 1 in 548 or 398.79 ... / 637.24 ... / 548.07 ... (rot to 2 sf etc. as with the correct "non-inverse")and "America football" as the largest relative number of admission or most dangerous.
or
SC1 for at least two inverse rates correct (to the above accuracy |
| | | | | [3] | |

6	iii		• Severity of injuries / fatalities • Whether there are other types of injuries • How often the participants do the activity • Whether injuries are equally spread across participants. • Data about other sports (e.g. boxing.) • Data over several years	B1 B1 [2]	one mark per relevant answer

7	i			A	B		B1	any one correct
			1	t	C		B1	all correct
			2	0	60			
			3	1	50.45			
			4	2	42.43			
			5	3	35.68			
			6	4	**30.00 or 30**			
			7	5	**25.23**			
			8	6	**21.21**			
			9	7	**17.84**		**[2]**	
			10	8	15.00			

7	ii				B1	(note cell references can be absolute or relative)
		=60*<u>0.5^</u>(0.25*A3) or =**$B$2*<u>0.5^</u>**(0.25*A3)			B1	
		=60*0.5^<u>(0.25*A3)</u> or =$B$2*0.5^<u>(0.25*A3)</u>			B1	
		<u>= 60*</u>0.5^(0.25*A3) or <u>=$B$2*</u>0.5^(0.25*A3)			B1	
					[3]	

7	iii	4 (days) [1]	B1 ft	from their spreadsheet; units not required
7	iv	Day 7	M1 A1ft [2]	Any attempt to solve equation or making clear that they are looking for value of 20 (or less) in table. (e.g. 17.48 – **using** reading rather than day or cell 9)
7	v		A1 A1 [2]	At least 3 points plotted correctly. All points plotted correctly (±0.5 division). If not clear whether first three days (4 points) are plotted award this mark if correct points plotted for all the other 5 days (see overlay)
7	vi	It starts off a good model or gets worse oe	B1	Must relate to the model (each one implies the other) "shows the same trend" oe gains no credit – the observed is levelling out the model is tending to zero.

8	i		The points lie on **the** straight line	B1 [1]	Mention of "line of best fit" , "**a** straight line" or "correlation" not allowed. The line existed before the points were plotted.
8	ii		$59.0 \pm 2 \times 9.9$	M1	Any interval centered on 59. (49.1 – 68.9 common, also average of two stated ends = 59)
			39.2 to 78.8 (cm)	M1	
				A1 [3]	2×9.9 or 19.8 allow 39 to 79
8	iii	A	Tree diagram or use of formula	M1	at least the relevant branches correctly numerically labeled (may be implied)
			0.95×0.95 or 95×0.95	M1	
			$0.9(025)$ or 90%	A1 [3]	Accept equivalent.
8	Iii	B	Girls are (statistically) independent oe	B1 [1]	
8	iv		0.95 or 95%	B1 [1]	
8	v		There will be more needed closer to the middle of the range or Non-uniform (distribution) oe. Less small and large girls	B1 [1]	Beware repeating the question as an answer. Absolute minimum of "more girls of certain sizes". Focus should be on customer sizes not their preferences.

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance
programme your call may be recorded or monitored