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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Mathematics 3302
Specification B

Module 3 Tier H 33003H

Mark Scheme

2006 examination - March series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

The following abbreviations are used on the mark scheme:

M	Method marks awarded for a correct method.
A	Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied.
B	Marks awarded independent of method.
M dep	A method mark which is dependent on a previous method mark being awarded.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special Case. Marks awarded for a common misinterpretation which has some mathematical worth.
oe	Or equivalent.
eeoo	Each error or omission.

MODULE 3 HIGHER TIER 33003H

1(a)	0.0428669(…)	B1	Allow 0.042867
1(b)	0.0429	B1 ft	ft from value > 3 sf seen

2(a)	572 ÷ 13 (= 44)	M1	
	their 44 × 25	M1 dep	their 44 × 12 + 572
	1100	A1	SC1 Answer 528
2(b)	It depends upon the actual numbers of girls and boys in the year **or** Gives a number of girls and boys for Year 10 that is not in the ratio 13:12 **or** Gives a ratio for girls to boys that is not 13:12	B1	There may be more boys (than girls) There may be fewer girls (than boys) There may be the same number of each gender

3(a)	3.2	B1	
3(b)(i)	their 3.2 × 0.8 evaluated correctly	B1 ft	2.56 if (a) correct
3(b)(ii)	their (b)(i) × 0.8 × 0.8	M1	1.6(384) if correct Could be seen in stages ie their (b)(i) × 0.8 their calculated value × 0.8 If starts again must see 4×0.8^4
	3	A1	**3 with no working scores M0A0** Do not award A1 for an answer of 3 if there were numerical errors previously SC2 2.0(48) and answer 3
3(c)	Sight of 0.7(0)	M1	70(%) = 1.82
	1.82 ÷ 0.7	M1	1(%) = 1.82 ÷ 70 (= 0.026) 100(%) = their 0.026 × 100
	2.6	A1	SC2 Answer 2.275 SC1 Digits 26

4(a)	1.153×10^6	B1	Allow 1.153000×10^6
4(b)	Attempt to add 1 153 000, 4.07×10^5 and 4.6 million	M1	Numbers all in same form with at least two correct
	6 160 000 (oe) and Yes	A1	Must have both

5(a)	$y = \frac{k}{x}$ or $y \ \alpha \ \frac{1}{x}$	M1	oe
	$(16.5 = \frac{k}{20})$	M1	
	$k = 330$ $(y = \frac{330}{x}$ oe)	A1	Only need the equation if have not seen $y = \frac{k}{x}$ earlier
5(b)	$x = \frac{(\text{their } k)}{75}$	M1	
	4.4	A1	

6	315 (Allow 314.999…)	B1	Ignore 305 if seen as well
	49.5	B1	Ignore 50.5 if seen as well
	$\frac{\text{their } \mathbf{max} \text{ miles}}{\text{their } \mathbf{min} \text{ litres}}$	M1	$\frac{315}{49.5}$ if correct
	6.3636363636…	A1	Allow 6.3, 6.4, 6.363, 6.36, 6.364 etc provided there is evidence to support these answers (B2 M1 awarded) **Always check the working** eg $\frac{314.9}{49.5} = 6.36$ (2 dp) scoring B0B1M1A0

7	$2\sqrt{3}\sqrt{3}$ (+) $2\sqrt{3}\sqrt{8}$	M1	$2\sqrt{9}$ (+) $2\sqrt{3}\sqrt{8}$ **or** $2\sqrt{9}$ (+) $2\sqrt{24}$ **or** $2\sqrt{9}$ (+) $2\sqrt{3} \times 2\sqrt{2}$
	6 (+) $2\sqrt{24}$	A1	6 (+) $2\sqrt{3} \times 2\sqrt{2}$
	$6 + 4\sqrt{6}$	A1	SC1 6 or $4\sqrt{6}$ seen

8	Sight of 0.85 **or** 1.224	M1	85% **or** 122.4%
	1.224 ÷ 0.85	M1 dep	(= 1.44)
	√ their 1.44	M1 dep	(= 1.2)
	20	A1	SC3 Answer 2 SC2 Answer 44

Alt 8	Chooses a 2003 pay value eg 1000 (1000) × 0.85 **or** (1000) × 1.224	M1	or finds 15% then subtracts **or** finds 22.4% then adds
	(1224) ÷ (850)	M1 dep	(= 1.44)
	√ their 1.44	M1 dep	(= 1.2)
	20	A1	SC3 Answer 2 SC2 Answer 44

9	2 (×) 54 or 3 (×) 36	M1	Using 2 or 3 in valid method eg factor tree Do not award for a list of all factors even if in product pairs
	2 (×) 2 (×) 3 (×) 3 (×) 3	A1	Condone use of 1
	$2^2 \times 3^3$	A1	Do not allow factor of 1

10(a)	3.97×10^{-7}	B1	
10(b)	15000×10^8	B1	or correct answer in any form
	1.5×10^{12}	B1 ft	ft from value seen
10(c)	Sight of 0.75 or 10^{-4} or correct answer in any form	B1	eg 0.000075
	7.5×10^{-5}	B1	SC1 Answer 7.5^{-5}

11	$\frac{7}{4}$ (÷) $\frac{15}{11}$	M1	Conversion of both to **improper** fractions **(one fraction correct)**	
	their $\frac{7}{4}$ × their $\frac{11}{15}$	M1 dep	Change to multiplication and inversion of second fraction	
	$\frac{77}{60}$	A1	$1\frac{17}{60}$	If correct answer converted to mixed number incorrectly regard as further work

12(a)	–5 4	B1 B1	
12(b)	Points plotted accurately	B1 ft	ft their table of values $\pm \frac{1}{2}$ square vertically & horizontally
	Smooth curve	B1 ft	ft their plotted points ($\pm \frac{1}{2}$ square diagonally) but curve must look like a parabola
12(c)	–2 and (1.5)	B1 ft	Must have –2 ft their graph for other value (which must **not** be an integer) Must have exactly 2 solutions
12(d)	Draws $y = 2x + 1$ correctly	B1	
	$2 \leq x \leq 2.3$ **and** $-1.8 \leq x \leq -1.5$	B1 dep	Must have 2 values Coordinates given B0 Dependent on first B1

13	$5\sqrt{2}$ (– $\sqrt{2} = 4\sqrt{2}$)	B1	If attempts to square the bracket $\sqrt{2500} \pm \sqrt{50}\sqrt{2} \pm \sqrt{50}\sqrt{2} \pm \sqrt{4}$ M1 32 A1
	32	B1	

14(a)	2 (×) $\frac{1}{25}$ (×) 1	B3	1 mark for each value Allow 0.04 for 5^{-2} Do not allow $\frac{1}{5^2}$
	$\frac{2}{25}$	B1	oe
14(b)	$\frac{1}{64^{\frac{2}{3}}}$ **or** $(4^3)^{-\frac{2}{3}}$ **or** $\frac{1}{(4^3)^{\frac{2}{3}}}$	M1	4^{-2} **or** $\frac{1}{4^2}$ **or** $\frac{1}{(64^{\frac{1}{3}})^2}$ **or** $(64^{\frac{1}{3}})^{-2}$
	$\frac{1}{16}$	A1	

15	$100n = 21.6161\ldots$ $n = 0.21616\ldots$ **and subtracts**	M1	$1000n = 216.1616\ldots$ $10n = 2.1616\ldots$ **and subtracts**
	$99n = 21.4$	A1	$990n = 214$
	$\frac{21.4}{99} = \frac{107}{495}$ **Must see** $\frac{21.4}{99}$ or $\frac{214}{990}$ as well as $\frac{107}{495}$	A1	$\frac{214}{990} = \frac{107}{495}$ **Must see** $\frac{214}{990}$ as well as $\frac{107}{495}$

Alt 15	$0.2 + 0.01616\ldots$ $100n = 1.61616...$ $n = 0.01616\ldots$ **and subtracts** (or uses $1000n$ and $10n$ **and subtracts**)	M1	$0.2 + 0.01616\ldots$ $100n = 16.1616...$ $n = 0.1616\ldots$ **and subtracts** (or uses $1000n$ and $10n$ **and subtracts**)
	$99n = 1.6$	A1	$99n = 16$ **and** obtains $\frac{16}{990}$
	$\frac{2}{10} + \frac{1.6}{99} = \frac{198+16}{990} = \frac{214}{990} = \frac{107}{495}$ **Must see** $\frac{214}{990}$ as well as $\frac{107}{495}$	A1	$\frac{2}{10} + \frac{16}{990} = \frac{198+16}{990} = \frac{214}{990} = \frac{107}{495}$ **Must see** $\frac{214}{990}$ as well as $\frac{107}{495}$
			SC2 $0.2 + \frac{16}{990}$ and fully correct subsequent working

16	$x^2 + x - 7 \pm 3x \pm 2$ **or** $3x - 2 \pm x^2 \pm x \pm 7$	M1	$x^2 + x - 7 = \pm 3x \pm 2$ **or** $3x - 2 = \pm x^2 \pm x \pm 7$
	$x^2 + 4x - 9$ **or** $-x^2 + 2x + 5$	A1	
	$y = x^2 + 4x - 9$ **or** $y = -x^2 + 2x + 5$	A1	SC1 $x^2 - 2x - 5$ $x^2 - 2x - 9$ $x^2 + 4x - 5$ $x^2 + 4x + 5$ $x^2 + 2x + 5$ $x^2 + 2x - 9$ $-x^2 + 4x + 5$ $-x^2 + 4x - 9$ $-x^2 + 2x - 9$ SC2 y = any of the above