



General Certificate of Secondary Education

Mathematics 3302

Specification B

Module 3 Tier H 33003H

Mark Scheme

2005 examination – June 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.

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	$\frac{15}{100} \times 60 (= 9)$ or $100 - 15 (= 85)$	M1	$60 - 53 (= 7)$ or $\frac{53}{60} \times 100 (= 88.)$
	$60 - \text{their } 9 (= 51)$ or $\frac{85}{100} \times 60 (= 51)$	M1 dep	$\frac{\text{their } 7}{60} \times 100 (= 11.6...)$ or $100 - \text{their } 88.3... (= 11.6...)$
	Yes and explanation eg 2 pounds more or sight of 51 No ft on explanations	A1	Yes and explanation eg About 3% more or sight of 11.6... No ft on explanations SC2 9 and Yes
2	$\frac{7}{9} \times 279\ 000$	M1	For the 9 allow their sum of 2 and 7
	217 000	A1	SC1 Answers of 62 000 or both of 62 000 and 217 000
3(a)	$2500 \times 1.02 (= 2550)$	M1	2% of 2500 + 2500
	their 2550×1.02^2 Note: 2500×1.02^3 scores M1M1	M1 dep	2% of their 2550 + their 2550 (= 2601) 2% of their 2601 + their 2601
	2653.02	A1	Do not accept 2653 unless full value seen earlier (however answer of 2653 implies M2) SC1 Answer of 4320 or 2650
(b)	$221.45 = 103\%$	M1	1.03 seen
	$\frac{221.45}{103} \times 100$	M1 dep	oe
	215	A1	Beware of answer rounded to 215 from using 97% SC2 Answer 6.45

4(a)	J(upiter)	B1	Accept 1.9×10^{27}
(b)	$\frac{6.0 \times 10^{24}}{3.3 \times 10^{23}} \quad \{= 18.\dots\}$ or $1.8 \times 3.3 \times 10^{23} (= 5.94 \times 10^{23})$ or 5.9×10^{23} or 6×10^{23} or $\frac{6.0 \times 10^{24}}{1.8} (= 3.3\dots \times 10^{24})$	M1	Allow 3 to be used for 3.3 (giving 20) Allow 2 to be used for 1.8 (giving 6.6×10^{23}) Allow 3 to be used for 3.3 (giving 5.4×10^{23}) Allow 2 to be used for 1.8 (giving 3×10^{24})
	No and valid explanation (No may be implied by explanation)	A1	eg For explanation - obtains the answers given in M1 or refers to powers of 10 being different SC2 No calculations seen but totally convincing answer in words eg States that it is about 18 times as heavy
(c)	$6.53(0) \times 10^9$	B1	Allow any number of zeros after the 3
(d)	$4.86 \times 10^4 \div 2.27 \times 10^3$	M1	Allow approximations of these numbers to 1 or 2 sf
	21.4(0969163...)	A1	Allow rounding or truncating to 1 dp or better
	21 or 21.4(:1)	B1 ft	ft from value or calculation seen to 1, 2 or 3 sf SC1 0.05 or 0.047 or 0.0467
5(a)	8.5×10	M1	$90 - 0.5 \times 10$
	85	A1	
(b)	75	B1	
	No and complete explanation eg $(85 + 75 =) 160$	B1 ft	ft for explanation their minimum nuts (84.5 to 85 inclusive) + their minimum treacle (74.5 to 75 inclusive)

6(a)	$d = kt^2$	M1	Allow $d \propto t^2$
	$490 = k \times 100$	M1 dep	
	$k = 4.9$	A1	$d = 4.9 t^2$ only needed if equation not seen for first M1
(b)	30.625	B1 ft	ft only from $d = kt^2$ with incorrect k Condone 30.6 and 30.63
(c)	Correct sketch of parabola starting from origin	B1	

7(a)	19683	B1	
(b)	0.03125 or $\frac{1}{32}$	B1	

8	$0.5 \times 0.6 \times \frac{x}{(100)} = 0.255$	M1	oe $50 \times 60 \times x = 25.5$ is M0
	$x = \frac{0.255(\times 100)}{0.5 \times 0.6}$	M1 dep	
	85	A1	Correct answer scores 3 marks unless clearly from an incorrect method

Alt 8	Starts with a number of applicants eg 100 and calculates (50 and) 30	M1	
	$x = \frac{25.5(\times 100)}{30}$	M1 dep	oe
	85	A1	

9(a)	$\frac{1}{0.2}$ or $1 \div 0.2$	M1	$\frac{10}{2}$ oe fraction
	5(.0)	A1	Do not allow equivalent
(b)	i) 5	B1	oe
	ii) $\frac{4}{3}$	B1	oe

10	$\frac{500(\times)2}{40(+)60}$ or $\frac{505(\times)2}{40(+)60}$ or $\frac{510(\times)2}{40(+)60}$	M1	Two out of four correct
	10 or 10.1 or 10.2	A1	Condone for 2 marks $\frac{500 \times 1.9}{100} = 9.5$ and $\frac{505 \times 2}{101} = 10$ and $\frac{505 \times 1.9}{101} = 9.5$

11(a)	$2(\times) 18$ or $3(\times) 12$ or $2^2(\times) 9$ or $4(\times) 3^2$ or $2(\times) 3(\times) 6$	M1	For correct use of prime and other factor(s) May be seen on ‘exploding tree’ or ‘division’ list List of factors is M0 unless paired and includes 2, 18 or 3, 12
	$2 \times 2 \times 3 \times 3$ or 2.2.3.3	A1	$2^2 \times 3^2$ “1 \times ” included is A0
(b)	$45 = 3(\times) 3(\times) 5$	M1	36, 72, 108, 144, 180, ... and 45, 90, 135, 180, ...
	180	A1	Accept $2^2 \times 3^2 \times 5$ SC1 Answer of any other common multiple eg 360, 540, 720 etc

12(a)	i) -2 and 3	B1	If non-graphical method used B0
	ii) $-1.6 \leq x \leq -1.5$	B1	
	$2.5 \leq x \leq 2.6$	B1	
(b)	$x^2 - x - 6 = x + 3 (= y)$ or attempt to subtract the given equations	M1	oe
	$x^2 - 2x - 9 = 0$	A1	
(c)	$x^2 - x - 6 - x + 2 (= 0)$ or attempt to subtract the equations ($y =$) $x^2 - x - 6$ and ($0 =$) $x^2 - 2x - 4$	M1	$x^2 - 2x - 4 + x - 2$
	$y = x - 2$	A1	Must have $y =$ (may be seen on the graph) SC1 $y = x + 2$ or $y = -x - 2$ or $y = 2 - x$

13(a)	$\frac{18}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \left(\frac{18\sqrt{3}}{3}\right)$	M1	
	$6\sqrt{3}$	A1	Allow $\frac{6\sqrt{3}}{1}$
(b)	$3^4 = 81$ or $4^4 = 256$	M1	$100^{\frac{1}{4}} = 10^{\frac{1}{2}} = \sqrt{10}$
	$3^4 = 81$ and $4^4 = 256$	A1	3^2 is 9 (or less than 10) and 4^2 is 16 (or greater than 10) or $\sqrt{9} = 3$ and $\sqrt{16} = 4$ Accept $\sqrt{10}$ is 3(...)

14(a)	$\frac{1}{6}$ and $\frac{2}{3}$	B1 B1	One or two correct and one incorrect answer given will be B1B0 One or two correct and both incorrect answers given B0B0
(b)	$0.\dot{2}$	B1	Accept 0.2^r or $0.2\dots$
(c)	$1000x = 154.\dot{5}\dot{4}$ $10x = 1.5\dot{4}$ and subtracts	M1	$100x = 15.4\dot{5}\dot{4}$ and subtracts x
	$990x = 153$	A1	$99x = 15.3$
	$\frac{153}{990}$ (oe fraction) = $\frac{17}{110}$	A1	Must see an equivalent fraction as well as $\frac{17}{110}$

Alt 14(c)	$0.1 + 0.054$ $1000n = 54.54$ $10n = 0.54$ and subtracts	M1	$100n = 5.45$ and subtracts n
	$990n = 54$	A1	$99n = 5.4$
	$\frac{153}{990}$ (oe fraction) = $\frac{17}{110}$	A1	Must see an equivalent fraction as well as $\frac{17}{110}$

15(a)	$\sqrt{20} = 2\sqrt{5}$	B1	
	$3\sqrt{5}$	B1	
(b)	$3\sqrt{5} - 2\sqrt{5}$	M1	$\frac{\sqrt{5}(1+\sqrt{4})}{\sqrt{5}(\sqrt{9}-\sqrt{4})}$
	$\frac{\text{their } p\sqrt{5}}{\sqrt{5}}$	A1 ft	
	3	A1	