



General Certificate of Secondary Education

Mathematics 3302

Specification B

Module 3 Tier H 33003H

Mark Scheme

2005 examination – November 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)	i) 1.7583799...	B1	Accept 1.75838(0) and 1.75837
1(a)	ii) 1.76	B1 ft	
1(b)	390 625	B1	Condone 390,625 and 390.625
	3.90625×10^5	B1 ft	ft at least 5 digits Accept 3.91×10^5 or 3.906×10^5 or 3.9×10^5 [or 3.90×10^5] or 3.9062×10^5 or 3.9063×10^5 (all for 2 marks)
2(a)	Increase is 7.2 kg	B1	M1 $\frac{10.9}{3.7} \times 100$ and subtract 100
	Percentage increase is $\frac{7.2}{3.7} \times 100$	M1	B1 = 295 [-100]
	= 195%	A1	Accept 194.6, 194.59... 190 SC2 194 SC2 1.95 \Rightarrow B1
3	In 2001, number is $70\,000 \times 1.06$ = 74 200		
	In 2002, number is $74\,200 \times 1.06$ = 78 652	M1	
	In 2003, number is $78\,652 \times 1.06$ = 83 371		
	In 2004, number is $83\,371 \times 1.06$ = 88 373		
	In 2005, number is $88\,373 \times 1.06$	M1	M2 for $70\,000 \times 1.06^5$
	= 93 676	A1	Accept 93675 or 93675. ...
	= 94 000	A1	Accept 93 700, 93 600 Accept 90 000 if 93676 or 93 700 seen Note: 91000 No marks
4	$3140 \approx 0.8\%$	B1	or $3140 \approx 0.008$ Not for $3140 \approx 0.8$
	Area = $\frac{3140}{0.8} \times 100$	M1	Area = $\frac{3140}{0.008}$
	= 392 500	A1	= 392 500
			SC2 Misplaced point

5(a)	9	B1	
5(b)	Plot points	B1 ft	Tolerance $\pm \frac{1}{2}$ square
	Smooth curve	B1 ft	Tolerance $\pm \frac{1}{2}$ square Must not cross x axis
5(c)	$(3x^2 - 2x + 1) - (3x^2 - 6x + 2)$	M1	Accept $\pm 4x \pm 1$ for M1
	$= 4x - 1$		
	Draw $y = 4x - 1$	B1 ft	
	$x = 0.42, 1.58$	A1	Accept 0.35 to 0.5, 1.5 to 1.65 [inclusive] Delete 1 mark for co-ordinates

6(a)	$A \propto d^2$ or $A = kd^2$	M1	
	When $d = 200$, $A = 20\,000$		
	$20\,000 = k(200)^2$		
	$k = \frac{20000}{200^2}$	M1	
	$k = \frac{20000}{40000}$		or $k = 0.5$ or $\frac{1}{2}$
	$A = 0.5 d^2$	A1	May be seen in (b) or accept $A = kd^2$ and $k = \frac{1}{2}$ oe
6(b)	$A = 0.5(1400)^2$	M1	
	$= 980\,000$	A1	

7	$x = 0.3\dot{4}\dot{2}$ $100x = 34.2\dot{4}\dot{2}$	M1	$x = 0.\dot{4}\dot{2}$ $100x = 42.\dot{4}\dot{2}$ Needs subtraction also
	$99x = 33.9$	A1	$99x = 42$
	$x = \frac{33.9}{99}$		$x = \frac{42}{99}$ $0.3\dot{4}\dot{2} = \frac{3}{10} + \frac{42}{990} = \frac{297+42}{990}$
	$x = \frac{339}{990}$		$= \frac{339}{990}$
	$= \frac{113}{330}$	A1	$= \frac{113}{330}$ Needs a previous fraction correct

8	Price in March 2005 is $\frac{80}{100}$ of 2004 price		
	Price in June 2005 is $\frac{80}{100} \times \frac{5}{6}$ of 2004 price	M1	
	$= \frac{2}{3}$ of 2004 price	A1	
	Percentage discount is $\frac{1}{3} \times 100$	M1	
	$= 33\frac{1}{3}$	A1	If final result 33.3 or 33.33... M2A2
			or Assume price in 2004 was '£600' Price is now $£480 \times \frac{5}{6}$ M1 $= £400$ A1 Percentage discount is $\frac{200}{600} \times 100$ M1 $= 33\frac{1}{3}$ A1 $66\frac{2}{3}$ SC2 or $\frac{1}{6} \times \frac{80}{100}$ M1 $= 13\frac{1}{3}\%$ A1 [13.3 \Rightarrow M1 only] \therefore Discount is $20 + 13\frac{1}{3}$ M1 $= 33\frac{1}{3}\%$ A1
9(a)	2×30 or 3×20	M1	First prime factor correct
	$= 2(\times) 2(\times) 3(\times) 5$	A1	Condone $\times 1$
	$= 2^2 \times 3 \times 5$	A1	
9(b)	HCF is 8	B2	$32 = 2^5$ $120 = 2^3 \times 3 \times 5$ B1 for HCF = 4

10(a)	$\approx \frac{400 \times 3}{0.6}$	M1	At least two suitable [accept 390] Do not accept 1 or 0.5 for 0.6
	$= \frac{1200}{0.6}$	A1	Needs $\frac{1200}{0.6}$ or equivalent [or $\frac{1170}{0.6}$]
	$= 2000$ [Note: No working 0 marks]	A1	[or 1950] [Check not from $\frac{400 \times 5}{1}$]
10(b)	2.4×10^{-6}	B1	
10(c)	$8 (\times) \frac{1}{9}$	B1 B1	B1 for 8; B1 for $\frac{1}{9}$; \times not required
	$= \frac{8}{9}$	B1	

11	Sum is three times the middle number	B2	or use of $x - 1, x, x + 1$ B1
			$= 3x$ oe B1
			SC1 for two correct examples

12(a)	11.5×10^{12}	B1	or correct answer, not in correct standard form, could be normal numbers
	$= 1.15 \times 10^{13}$	B1	
12(b)	0.46×10^{-2}	B1	B1 for digits 46
	4.6×10^{-3}	B1	

13	Minimum length left is minimum started minus maximum used	M1	
	Minimum started is 99.5 m	B1	
	Maximum used per house is 10.25 m	B1	
	Maximum used for nine houses is 92.25 m	M1 ft	$9 \times \text{max}$ [max must be between 10 and 10.5, not inclusive]
	Minimum left is 7.25 m	A1	

14(a)	5	B1	
14(b)	$162 = 2 \times 3^b$		
	$81 = 3^b$	M1	
	$b = 4$ Hence $162 = 2 \times 3^4$	A1	
14(c)	$\frac{1}{32^{\frac{3}{5}}}$	B1	or B1 for $32^{\frac{3}{5}} = 8$ or 2^3
	$= \frac{1}{8}$	B1	

15	$\sqrt{150} = 5\sqrt{6}$	B1	
	$\sqrt{150} - \sqrt{6} = 4\sqrt{6}$	B1	
	$\frac{\sqrt{150} - \sqrt{6}}{\sqrt{12}} = \frac{4\sqrt{6}}{2\sqrt{3}}$ or $\frac{4\sqrt{6}}{\sqrt{2}\sqrt{6}}$	M1	M1 for $\sqrt{12} = 2\sqrt{3}$
	$= 2\sqrt{2}$	A1	SC3 $\frac{4}{\sqrt{2}}$
			OR $\frac{\sqrt{1800} - \sqrt{72}}{12}$ M1
			$= \frac{30\sqrt{2} - 6\sqrt{2}}{12}$ B1
			$= \frac{24\sqrt{2}}{12}$ B1
			$= 2\sqrt{2}$ A1
		or $\frac{5\sqrt{6} - \sqrt{6}}{\sqrt{2}\sqrt{6}}$ M1M1	
		$= \frac{4}{\sqrt{2}}$ A1	
		$= 2\sqrt{2}$ A1	