



## General Certificate of Secondary Education

# Mathematics 4302 (Two Tier) *Specification B*

### *Module 3 Higher Tier*

## Mark Scheme

### *2006 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:**

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

**Module 3 Higher**

<b>Q</b>	<b>Answers</b>	<b>Mark</b>	<b>Comments</b>
<b>1</b>	$660 \div 10 (\times 9)$	M1	66 seen
	594	A1	Both 594 and 66 given is A0
<b>2</b>	$25 \times 1.76 (= 44)$ <b>or</b> $25 \times 1.75 (= 43.75)$	M1	$8 \div 1.76 (= 4.5\dots)$ <b>or</b> $8 \div 1.75 (= 4.5\dots \text{ or } 4.6\dots)$
	their 44 or $43.75 \div 8$	M1dep	$25 \div$ their 4.5... or 4.6
	Answer in range 5.4 to 5.6 inclusive	A1	
<b>3</b>	Chooses to square any number between 0 and 1 exclusive	M1	eg, $0.5^2$ $0.2 \times 0.2$ $(\frac{1}{4})^2$
	Evaluates correctly (conclusion can be implied)	A1	Ignore any squaring of numbers that are not between 0 and 1 exclusive even if they mistakenly give a correct conclusion eg, ignore $-2 \times -2 = -4$
<b>4(a)</b>	$0.175 \times 80$ oe (= 14)	M1	Build up eg, $10(\%) = 80 \div 10 (=8)$ , $5(\%) = (8) \div 2 (=4)$ , $2\frac{1}{2}(\%) = (4) \div 2 (=2)$ <b>and adds</b>
	$80 +$ their 14	M1dep	$80 \times 1.175$ is M2
	2	A1	Answer of 94 implies M2
<b>4(b)</b>	$75 - 66 (= 9)$	M1	$1 - \frac{66}{75} (=0.12)$ <b>or</b> $\frac{66}{75} \times 100 (=88)$
	$\frac{\text{their } 9}{75} \times 100$	M1dep	their $0.12 \times 100$ <b>or</b> $100 -$ their 88
	12	A1	
<b>4(c)</b>	Sight of 0.4 oe	M1	$40(\%) = 18.6(0)$ M1
	$18.6(0) \div 0.4$	M1dep	$1(\%) = 18.6(0) \div 40 (= 0.465)$ $100(\%) = (0.465) \times 100$ M1dep
	46.50	A1	Do not allow 46.5 but implies M2

Q	Answers	Mark	Comments
5(a)	1.25	B1	oe
5(b)(i)	8.55087(...)	B1	
5(b)(ii)	8.6	B1 ft	ft from any (i) > 2 significant figures
6	$6.4 \times 10^{15} \div 8 \times 10^9$	M1	
	800 000	A1	oe eg, $0.8 \times 10^6$ <b>Note:</b> Correct embedded answers in a multiplication are acceptable eg, $8 \times 10^9 \times 800\ 000$ M1 A1 A0 $8 \times 10^9 \times 8 \times 10^5$ M1 A1 A0
	$8 \times 10^5$	A1	
7(a)	$y = \frac{k}{x^2}$ or $y \propto \frac{1}{x^2}$	M1	oe $50 = \frac{k}{2^2}$ implies M1
	$50 \times 2^2 = k$	M1dep	this seen without first line implies M2
	$200 = k$ $y = \frac{200}{x^2}$	A1	Only need the equation if there was no $y = \frac{k}{x^2}$ earlier
7(b)	$32 = \frac{\text{their } k}{x^2}$	M1	
	$x = \sqrt{(\text{their } k \div 32)}$	M1dep	
	2.5	A1	Allow $-2.5$ and $\pm 2, 5$

Q	Answers	Mark	Comments
<b>8</b>	$0.45 \times 0.8(0) (= 0.36)$ <b>or</b> $0.45 \times 80 (= 36)$ <b>or</b> $0.8(0) \times 45 (= 36)$	M1	Chooses number of pupils eg, 100 $0.45 \times (100) = (45)$ $0.8(0) \times (45) = (36)$
	$0.55 \times 0.06 (= 0.033)$ <b>or</b> $0.55 \times 6 (= 3.3)$ <b>or</b> $0.06 \times 55 (= 3.3)$	M1	$0.55 \times (100) = (55)$ $0.06 \times (55) = (3.3)$
	$(0.36) + (0.033)$ <b>or</b> $(36) + (3.3)$	M1dep	$(36) + (3.3)$ Dependent on M2 in all methods
	39.3	A1	SC2 Answer 3930
<b>9(a)</b>	$\frac{300}{500} \times 100$	M1	Build up eg, $10(\%) = 500 \div 10 (=50)$ and $300 \div (50) \times 10$ or $20(\%) = 500 \div 5 (=100)$ and $300 \div (100) \times 20$ or $50(\%) = 250$ and $10(\%) = 50$ and $50 + 10$
	60	A1	
<b>9(b)</b>	250	B1	
<b>9(c)</b>	$140 + \frac{1}{2} \times 140$	M1	$\frac{750}{500} \times 140$
	210	A1	

Q	Answers	Mark	Comments
10	$\frac{10}{100} \times (16.50 + 8.50) (= 2.50)$	M1	$\frac{10}{100} \times 16.50 (= 1.65)$ <b>and</b> $\frac{10}{100} \times 8.50 (= 0.85)$ worked out separately
	$(16.50 + 8.50) - \text{their } 2.5(0)$	M1dep	$16.50 - \text{their } 1.65 (= 14.85)$ <b>and</b> $8.50 - \text{their } 0.85 (= 7.65)$ $\frac{90}{100} \times (16.50 + 8.50)$ is M2 or $\frac{90}{100}$ of each worked out separately is M2
	22.50	A1	Do not accept 22.5 but M2 implied SC1 Answer 14.85 or 7.65
11	$\frac{8 \times 500}{0.5} (= \frac{4000}{0.5})$ or $\frac{8 \times 503}{0.5} (= \frac{4024}{0.5})$	B2	B1 for any two values correct
	8 000 or 8048 SC1 Either answer with no working	B1	Allow B1 for: $\frac{10 \times 500(\text{or } 503)}{0.5}$ or $\frac{8 \times 500(\text{or } 503)}{0.4}$ and B1 for 10000 (or 10060)
12(a)	2 (and) 75 or 3 (and) 50 or 5 (and) 30	M1	Do not allow for a list of factors even in pairs
	$2 (\times) 3 (\times) 5 (\times) 5$	A1	Condone factor of 1
	$2 \times 3 \times 5^2$	A1	Must have $\times$ signs Do not allow factor of 1
12(b)	$3 (\times) 5 (\times) 5$	M1	Selects all common factors from $3^2 \times 5^2$ and their (a)
	75	A1	SC1 Answer 15 or 25

Q	Answers	Mark	Comments
13	34500 or 8200	B1	Allow $34.5 \times 10^3$ (-) $8.2 \times 10^3$ or $3.45 \times 10^4$ (-) $0.82 \times 10^4$
	26300	B1	Correct answer in any form
14(a)	All points plotted correctly (within half a square)  Smooth curve drawn through all points (within half a square – ft their points but curve must be approximately a U parabola)	B1, B1ft	SC1 Misses out 1 point when plotting but joins with acceptable curve
14(b)	Identifies at least one point of intersection with $x$ -axis	M1	
	Two $x$ values that are their graph's intersections with $x$ -axis	A1ft	<b>Graphical</b> solutions only Only ft for one solution $-4 < x < -3$ and one solution $0 < x < 1$
14(c)	Subtracts or equates $x^2 + 3x - 2$ and $x^2 - 3$	M1	Subtraction in either order
	Obtains $(y =) 3x + 1$	A1	
	$-1.9 \leq x \leq -1.6$ and $1.6 \leq x \leq 1.9$	A1	<b>Graphical</b> solutions from drawing a straight line (do not allow solutions from a graph of $y = x^2 - 3$ )
15(a)	$5\sqrt{3}$ or $3\sqrt{3}$	M1	
	$8\sqrt{3}$	A1	
15(b)	$\frac{21}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$	M1	$\frac{21\sqrt{7}}{7}$
	$3\sqrt{7}$	A1	

Q	Answers	Mark	Comments
16(a)	$3^{20}$	B1	
16(b)	$\frac{1}{1000^{\frac{2}{3}}}$ or $\frac{1}{\left(1000^{\frac{1}{3}}\right)^2}$ or $\left(1000^{\frac{1}{3}}\right)^{-2}$ or $10^{-2}$ or $100^{-1}$	B1	
	$\frac{1}{100}$	B1	