AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Secondary Education

Mathematics 3302
Specification B

Module 5 Paper 2 Tier H 33005H2

Mark Scheme
2006 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.

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 5 Paper 2   HIGHER TIER   33005/H2

1	Trial for $3 < x < 4$	B1	Correctly evaluated at least to the nearest whole number
	Two trials for $3.8 \le x \le 3.9$ that "bracket" 72	B1	These trials correct or truncated to at least 1 dp $\underline{x}$ $\quad$ $\underline{x^3 + 4x}$ $\quad$ $\underline{x}$ $\quad$ $\underline{x^3 + 4x}$ 3.1 $\quad$ 42.191 $\quad$ 3.6 $\quad$ 61.056 3.2 $\quad$ 45.568 $\quad$ 3.7 $\quad$ 65.453 3.3 $\quad$ 49.137 $\quad$ 3.8 $\quad$ 70.072 $\qquad\qquad\qquad\qquad$ Allow $\quad$ 70 here 3.4 $\quad$ 52.904 $\quad$ 3.9 $\quad$ 74.919 3.5 $\quad$ 56.875 $\quad$ 3.85 $\quad$ 72.466..
	Trial at 3.85 and answer 3.8	B1 dep	dep on previous B1

2	Use of $\frac{1}{2}$ triangle	M1	Evidence such as 9 in Pythagoras
	$18^2 - 9^2$ $(= 243)$	M1	Need – not +
	$\sqrt{}$ their 243	M1 dep	dep on both M1s above
	15.58 to 15.6	A1	
	Alternative method		
	Use of $\frac{1}{2}$ triangle	M1	Evidence of 60° used
	$\frac{h}{18}$ = sin 60°	M1	or $\frac{h}{9}$ = tan 60°
	$18 \times$ sin 60°	M1	or $9 \times$ tan 60°
	15.58 to 15.6	A1	

3(a)	$5x < 18 - 3$ or 15	M1	Allow $\le$ but not = unless recovered in answer
	$x < 3$	A1	$x = < 3$ scores M1A0
3(b)	$-3 \le y < 0$	M1	$(2y =)$ –6, –5, –4, –3, –2, –1, (0) scores M1
	–3, –2, –1	A2	–1 each error, omission or extra

4	$15 \times 18 \times 50$ $(= 13500)$	M1	
	$12000 \div$ their 13500	M1 dep	Allow also $12 \div$ their 13500 for this M1
	0.88 to 0.90	A1	$0.\dot{8}$

5(a)	$6p^7q^4$	B2	–1 eeoo (count × as one error)
5(b)	$p^2 + 7p + 2p + 14$	M1	For 3 correct terms
	$p^2 + 9p + 14$	A1	
5(c)	$x + 1 = 15 - 6x$	M1	Condone one error
	$7x = 14$	A1	
	2	A1 ft	One mistake only scores M1A0A1 ft

6(a)	Sight of tangent	M1	M2 for any <u>complete</u> method
	$\tan (x) = \dfrac{16}{7}$	M1	$\tan (x) = 2.28(57...)$
	66.3 to 66.4	A1	Note: Measured angle is 64° Accept 66 if method seen
6(b)	cos 37° or sin 53°	M1	M2 for any <u>complete</u> method
	12.6 ÷ cos 37°	M1	
	15.77 to 15.8	A1	

7	Equal arcs on DE and EF and intersecting arcs	M1	
	Bisector accurate to $\pm 2°$	A1	

8(a)	(0, 14)	B1	
8(b)	(2, 0)	B1	
	(3.5, 0)	B1	Condone B as (3.5, 0) and C as (2, 0)
			If the zeros omitted, deduct a mark once only in the whole question

9	47	B1	
	Same segment	B1	On same arc On same chord

10	Substituting in formula (allow one error)	M1	Errors are: Wrong sign for b (starts –3) b^2 wrong (ie 6 or –9) $-4ac = -56$ M0 for: Not dividing whole of top line by 2a Using wrong values for a, b or c Forgetting square root Miscopying formula
	5.53	A1	5.5 and –2.5 or 5.531... and –2.531... gets M1A1A0
	–2.53	A1	**No marks for answer only** **Some working must be seen**

11(a) (i)	*P* and *S*	B1	oe
11(a) (ii)	*S*	B1	oe
11(b)	–2	B1	
11(c)	Sight of $\frac{1}{2}$ and (their –2)	M1	
	$\frac{1}{2}$ × –2 = –1	A1	oe

12	2 × π × 12	M1	oe
	$\frac{40}{360}$ × their (2 × π × 12)	M1 dep	
	8.37 to 8.38 or 8.4	A1	SC2 4.185 to 4.19 or 4.2 SC2 66.98 - 67.02 or 67.0 or 67

13	∠ DTE = 19°	B1	
	TE/sin 16 = 30/sin (their 19)	M1	or DT/sin 145 = 30/sin (their 19)
	TE = 30 × sin 16/sin (their 19) (= 25.399...)	M1	DT = 30 × sin 145/sin 19 (= 52.85...)
	h = their TE × sin 35	M1	*h* = their DT × sin 16
	14.5 to 14.6	A1	14.5 to 14.6 Allow 15 if M marks gained
	Alternative method		
	EF = *h*/tan 35 or *h* tan 55 (= 1.428*h*)	M1	
	DF = *h*/tan 16 or *h* tan 74 (= 3.487*h*)	M1	
	h tan 74 – *h* tan 55 = 30	M1	oe
	$\frac{30}{2.059}$	M1	
	14.5 to 14.6	A1	Allow 15 if M marks gained

14(a)	2.87	B1	
14(b)	7 correct plots	B1 ft	± half a square
	Smooth curve	B1 ft	± half a square
14(c)	Reflection	B1	
	In *x* = 180	B1	or B2 for any correct combination of transformations

15	$\frac{1}{2}$ × 5 × 5 × sin 60 (= 10.8...)	M2	M1 for ht = 5 × sin 60 M1 dep $\frac{1}{2}$ × 5 × their ht
	(their 10.8) × 3	M1 dep	
	32.4 to 32.5	A1	
	Alternative method		
	ht = 5 × sin 60 (= 4.33)	M1	or $\sqrt{(5^2 - 2.5^2)}$
	$\frac{1}{2}$ (5 + 10) × their 4.33	M2 dep	
	32.4 to 32.5	A1	

16	$4\pi r^2 = 1380$	M1	
	$r = \sqrt{\{\frac{1380}{4\pi}\}}$ (= 10.4...)	M1 dep	
	$V = \frac{4}{3} \pi$ (their 10.479)^3	M1	
	4820 to 4821	A1	
	cm^3	B1	UNITS MARK

17	$3(y + 6) - (y + 7)$ $[= 2y + 11]$	M1	Condone lack of brackets May all be multiplied by 2
	$(y + 7)(y + 6)$	M1	As denominator or on right hand side
	2 × their $(2y + 11)$ $= (y + 7)(y + 6)$	M1 dep	dep on both M1s
	$y^2 + 9y + 20 = 0$	A1	
	$y = -4$ or -5	A1	