Level 2 Certificate in Further Mathematics

Specimen Paper 1 8360/1

Mark Scheme

Mark Schemes

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

It is not possible to indicate all the possible approaches to questions that would gain credit in a 'live' examination. The principles we work to are given in the glossary on page 3 of this mark scheme.

- Evidence of any method that would lead to a correct answer, if applied accurately, is generally worthy of credit.
- Accuracy marks are awarded for correct answers following on from a correct method. The correct method may be implied, but in this qualification there is a greater expectation that method will be appropriate and clearly shown.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Glossary for Mark Schemes

These examinations are marked in such a way as to award positive achievement wherever possible. Thus, for these papers, marks are awarded under various categories.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
M Dep	A method mark dependent on a previous method mark being awarded.
B Dep	A mark that can only be awarded if a previous independent mark has been awarded.
ft	Follow through marks. Marks awarded following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$

Paper 1 - Non-Calculator

Q	Answer	Mark	Comments
1(a)	$21x - 7 + 2x + 14 = 18x - 3$	M1	Allow one error
	Their $21x + 2x - 18x = -3 + 7 - 14$	M1	Allow one rearrangement error
	$5x = -10$	A1ft	
	$x = -2$	A1ft	Must have gained M2 for ft
1(b)	$3x + 10 = 16$	M1	
	$x = 2$	A1	
2(a)	$4n + 13 = 6n - 21$	M1	List terms in both sequences with 81 appearing in both lists
	$6n - 4n = 13 + 21$	M1	$4n + 13 = 81$ or $6n - 21 = 81$
	17	A1	
2(b)	Attempt at first differences (at least three) 6 8 10 12	M1	Alternative - Works with $an^2 + bn + c$ Attempt to find at least two of the three equations in a, *b* and *c* eg, any two of $a + b + c = 4$ $4a + 2b + c = 10$ $9a + 3b + c = 18$
	Attempt at second differences (at least two) and divides their second difference by 2 to obtain coefficient of n^2 2 2 2 and $1n^2$	M1	Eliminates one letter from any two of their equations eg, $3a + b = 6$ or $5a + b = 8$ or $8a + 2b = 14$
	Subtracts n^2 from original sequence $4 - 1$ $10 - 4$ $18 - 9$ $28 - 16$ $40 - 25$ (= 3 6 9 12 15)	M1	Eliminates the same letter from a different pair of their equations
	Attempt at differences of their 3 6 9 12 15 or $3n$	M1	Attempt at solving their two equations in two variables
	$n^2 + 3n$	A1	(a = 1, b = 3, c = 0) $n^2 + 3n$

Q	Answer	Mark	Comments
3(a)	U shape crossing x-axis in two places	B1	
	-3 and 3 marked	B1	
3(b)	$-2, -1, 0, 1, 2$	B2	Any 3 of these B1 These 5 plus -3 and 3 B1
4	Graph drawn	B3	B1 For each part Accept vertices of trapezium clearly marked
	$\frac{1}{2}$ (4 + 2) × 3	M1	Attempt to find their area
	9	A1 ft	
5	Attempt to work out the scale on the y-axis eg, 0, 2, 4, seen as labels or statement that y-axis goes up in 2s or evidence that y intercept is 2 for given line	M1	
	Attempt to work out the scale on the x-axis eg, 0, 1, 2, seen as labels or evidence of using gradient of 2 for given line and scale on y-axis to work out horizontal scale	M1	
	Evidence of working out gradient eg, triangle drawn on graph or 2 ÷ 2 or 1	M1	
	$y = x - 3$	A1	oe

Q	Answer	Mark	Comments
6	Attempts division before subtraction	B1	
	$\frac{7}{4} \div \frac{9}{8}$	M1	Allow one error in numerators
	$\frac{14}{9}$	A1	oe fraction
	$\frac{24}{9}$ – their $\frac{14}{9}$	M1	
	$\frac{10}{9}$	A1ft	oe ft $2\frac{2}{3}$ – their $\frac{14}{9}$
7(a)	$x = 9^{\frac{3}{2}}$	M1	oe
	27	A1	
7(b)	$\frac{1}{5^2}$ or $y^{-1} = 25$ or $y^{\frac{1}{2}} = \frac{1}{5}$ or $\frac{1}{y^{\frac{1}{2}}} = 5$	M1	
	$\frac{1}{25}$	A1	oe
8	$cd = 8(c - d)$	M1	or $c = \frac{8c - 8d}{d}$
	$cd = 8c - 8d$	M1	
	$cd + 8d = 8c$	M1	
	$d = \frac{8c}{(c + 8)}$	A1	
9	270 − 17 (= 253) or 270 + 17 (= 287)	M1	
	253 and 287	A1	

Q	Answer	Mark	Comments
10(a)	$5\sqrt{3}$ (+) $2\sqrt{3}$	M1	
	$7\sqrt{3}$	A1	
10(b)	$\frac{(2\sqrt{2}+1)(\sqrt{2}+3)}{(\sqrt{2}-3)(\sqrt{2}+3)}$	M1	
	Num $2 \times 2 + \sqrt{2} + 6\sqrt{2} + 3$	M1	
	$7 + 7\sqrt{2}$	A1	
	Denom $2 - 9$	A1	
	$-1 - \sqrt{2}$	A1ft	Allow $-(1 + \sqrt{2})$ ft If both Ms awarded
11	$24 - -1$ (= 25) or $23 - -7$ (= 30)	M1	
	$\frac{2}{5}$ × their 25 (= 10) or $\frac{2}{5}$ × their 30 (=12)	M1	$\frac{3}{5}$ × their 25 (= 15) or $\frac{3}{5}$ × their 30 (= 18)
	-1 + their 10 (= 9) or -7 + their 12 (= 5)	M1	24 – their 15 (= 9) or 23 – their 18 (= 5)
	(9, 5)	A1	
12	$\frac{\sin^2 x}{\cos^2 x} - 1$	M1	Use of $\tan x \equiv \frac{\sin x}{\cos x}$
	$\frac{\sin^2 x - \cos^2 x}{\cos^2 x}$	M1	
	$\frac{1 - \cos^2 x - \cos^2 x}{\cos^2 x}$	A1	

Q	Answer	Mark	Comments
13(a)	$\left(\frac{dy}{dx} =\right)\ 2x + 3$	M1	$(x + 1\frac{1}{2})^2 - 1\frac{1}{2}^2 + 4$
	$x = -1\frac{1}{2}$	A1	oe
	$y = (-1\frac{1}{2})^2 + 3\,(-1\frac{1}{2}) + 4$	M1	$(x + 1\frac{1}{2})^2 + 1.75$
	$y = 1\frac{3}{4}$	A1ft	oe turning points at $(-1\frac{1}{2}, 1\frac{3}{4})$ Allow follow through if first M1 awarded
13(b)	Sketch showing turning point above x-axis and statement that curve never crosses x-axis so no solution (B1 For sketch showing turning point above x-axis with statement not made)	B2	B2 A complete valid explanation using correct mathematical language eg, stating that $b^2 - 4ac = -7$ which is < 0 so implies no real solution due to a negative number not having a real square root B1 For a partially correct explanation using correct mathematical language eg, stating that $b^2 - 4ac = -7$ which is < 0 so implies no real solution
14	$BD = 3\sqrt{2}\ \cos 45\ (= 3)$ or $AB = 3\sqrt{2}\ \sin 45\ (= 3)$	M1	
	$BC =$ their $\frac{AB}{\tan 60} = \left(\frac{3}{\sqrt{3}}\right)$	M1	
	$BC = \frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	M1	
	$3 - \sqrt{3}$	A1	

Q	Answer	Mark	Comments
15	$\angle BCA = \angle BAE$ Alternate segment theorem	B1	oe Correct geometrical reasons must be given
	$\angle BAE = \angle DBA$ Alternate angles equal	B1	oe Correct geometrical reasons must be given
	$\angle DBA = \angle ACD$ Angles in the same segment are equal	B1	oe Correct geometrical reasons must be given
	So $\angle BCA = \angle ACD$ AC bisects $\angle BCD$	B1	SC2 For correct argument without reasons