AQA Qualifications

AQA Level 2 Certificate

FURTHER MATHEMATICS

Level 2 (8360)

Mark Scheme

Worksheet 11

Sequences

Version 2.0

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AQA
Devas Street
Manchester
M16 6EX

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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 $\frac{1}{2}$

11 Sequences

For the *n*th terms of quadratic sequences two methods are shown (see example 2).
Other valid methods may be used.

Question	Answer	Mark	Comments
1	$-4n$	M1	
	$254 - 4n$	A1	
	$254 - 4n < 0$	M1	oe
	64th	A1	
2	**Method A** 8 9 14 23 36 1 5 9 13 4 4 4	M1	
	Subtract $2n^2$ from sequence 6 1 –4 ……	A1	
	*n*th term of this sequence is 11 $-5n$	M1	
	Giving $2n^2 - 5n + 11$	A1	
Alt 2	**Method B** Using $an^2 + bn + c$ $a + b + c = 8$ $4a + 2b + c = 9$ $9a + 3b + c = 14$	M1	
	$3a + b = 1$ $5a + b = 5$	M1	oe
	$a = 2$ and $b = -5$	A1	
	Giving $2n^2 - 5n + 11$	A1	

Question	Answer	Mark	Comments
3(a)	Use Method A or B from Q2	3 marks	or any other valid method
3(b)(i)	$n^2 + 3n + 1$	B1	
3(b)(ii)	$n^2 + 4n$	B1	

Question	Answer	Mark	Comments
4(a)	$3n + 1$	B1	
4(b)	$(3n + 1)^2$	B1	oe
4(c)	$49 \times 169 = 7^2 \times 13^2$	B1	oe 8281
	30th is 91^2	M1	
	$= (7 \times 13)^2$ $= 7^2 \times 13^2$	A1	oe 8281

Question	Answer	Mark	Comments
5	nth term of lengths is $n + 3$	M1	
	nth term of widths is $n + 2$	M1	
	Area is $(n + 3)(n + 2)$	M1	
	$n^2 + 3n + 2n + 6$ $= n^2 + 5n + 6$	A1	
Alt 5	nth term of 12 20 30 by Method A or Method B	4 marks	or any other valid method

Question	Answer	Mark	Comments
6(a)	$a + 9b = 35$ $a + 15b = 59$	M1	
	$6b = 24$	M1	oe
	$b = 4$	A1	
	$a = -1$	A1 ft	
6(b)	3 11 19 … …	B1 ft	
	$8n - 5$	B1 ft	

Question	Answer	Mark	Comments
7(a)	$\frac{3n+1}{n} - \frac{3(n+1)+1}{n+1}$	M1	oe eg subtracts in different order
	$\frac{(3n+1)(n+1) - n(3n+4)}{n(n+1)}$	M1	oe
	$\frac{3n^2+n+3n+1-3n^2-4n}{n(n+1)}$ $= \frac{1}{n(n+1)}$	A1	
Alt 7(a)	$\frac{3n+1}{n} = 3 + \frac{1}{n}$	M1	oe eg subtracts in different order
	$(3 + \frac{1}{n}) - (3 + \frac{1}{n+1})$	M1	oe
	$\frac{n+1-n}{n(n+1)}$ $= \frac{1}{n(n+1)}$	A1	
7(b)	Any substitution and evaluation for $1 \leqslant n \leqslant 10$ eg $\frac{1}{9 \times 10} = \frac{1}{90}$ or $\frac{1}{10 \times 11} = \frac{1}{110}$	M1	oe eg $1 < 0.01n^2 + 0.01n$ and attempt to solve
	10th and 11th	A1	
7(c)	3	B1	

Question	Answer	Mark	Comments
8	$\frac{5n+2}{2n} = \frac{5n}{2n} + \frac{2}{2n}$	M1	oe
	$\left(\frac{5}{2} + \frac{1}{n}\right)$		
	$\frac{1}{n} \to 0$ as $n \to \infty$ $\quad S = \frac{5}{2}$ (= 2.5)	A1	

Question	Answer	Mark	Comments
9	Odd number is $2n + 1$ **or** $2n - 1$	M1	
	$2n - 1$ **and** $2n + 1$	M1	
	Sequence is $(2n - 1)(2n + 1)$ $(= 4n^2 - 1)$	A1	
Alt 9	Using Method A or Method B giving $4n^2 - 1$	3 marks	or any other valid method eg 1 4 9 16 $\to n^2$ 4 16 36 64 $\to 4n^2$ 3 15 35 63 $\to 4n^2 - 1$

Question	Answer	Mark	Comments
10(a)	$T_1 = \frac{1}{5}$	B1	
	$T_2 = \frac{7}{14}$ $\left(= \frac{1}{2}\right)$	B1	oe
	$\frac{5}{10} - \frac{2}{10} = \frac{3}{10}$	B1	oe
10(b)	$\frac{2}{3}$	B1	