AQA Qualifications

GCSE

Methods in Mathematics (Linked Pair Pilot)

93651H
Unit 1: Higher Tier
Mark Scheme

9365
November 2013

Version 1.0 Final Mark Scheme

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Glossary for Mark Schemes

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

M	Method marks are awarded for a correct method which could lead to a correct answer.
M dep	A method mark dependent on a previous method mark being awarded.
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.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
Q	Marks awarded for quality of written communication.
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. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
25.3 …	Allow answers which begin 25.3 e.g. 25.3, 25.31, 25.378.
Use of brackets	It is not necessary to see the bracketed work to award the marks.

M1 Higher Tier

Q	Answer	Mark	Comments
1	$5x + 20$ circled	B1	
2(a)	$3(x - 7)$	B1	
2(b)	$x(x + 6)$	B1	
3	0.24 for D	B1	
	(1 – 0.12 – their 0.24) ÷ 2 or 0.64 ÷ 2 or 0.32	M1	
	0.32 for B and C	A1ft	oe ft their value for D SC2 correct values in wrong order
4	Links all four correctly $x^2 + 4x - 7$ – Equation $x^2 + 4x - 7 > 14$ – Expression $x^2 + 4x - 7 = 14$ – Formula $A = x^2 + 4x - 7$ – Inequality	B2	B1 links any two correctly
5(a)	8	B1	
5(b)	Plots the given points correctly	M1	
	Correct curve from $x = -2$ to $x = 3$	A1ft	ft their y value in (a) if $3 < y \leq 10$
5(c)	$x = 1$	B1	

Q	Answer	Mark	Comments
6	$9x - 5x$ or $4x$ or 22 + 6 or 28	M1	Correctly rearranges unknown or number
	$4x = 28$	A1	
	7	A1ft	ft their rearrangement with one error if M1 scored
7(a)	40 in correct place	B1	
7(b)	27/100	B1	oe
7(c)	12/100	B1	oe SC1 27/60 oe in (b) and 12/60 oe in (c) or correct probabilities in words for (b) and (c)
8(a)	n^8	B1	
8(b)	n^4	B1	
8(c)	n^{12}	B1	
9	$y = 3x + 6$	B3	oe B2 $y = 3x \pm c$ or $3x + 6$ B1 indication that gradient is 6 ÷ 2 or 3 or $y = mx + 6$

Q	Answer	Mark	Comments
10	0.7 on 'First event' branch	B1	oe fraction, decimal or percentage
	0.5 on 'Second event' top branch	B1	oe fraction, decimal or percentage
	All four values in middle column 0.5 or other three values correct for their value in top branch	B1	oe fraction, decimal or percentage
	0.15 0.15 0.35 0.35 or correct multiplication of their first and second columns in three boxes on right	B1ft	ft their values All probabilities must be between 0 and 1
11	4 and 40 000 and 200	B2	B1 for any correct value of $n \times 10^n$, where $n > 1$ 200, 3000, 40 000, 500 000, 6 000 000 etc

Q	Answer	Mark	Comments
12 **Alt 1**	2/3 × 2/3 or 4/9	B1	
	1/3 × 2/3 or 2/9	M1	
	Their 2/9 × 2	M1dep	
	4/9 and 4/9	Q1	Strand (ii) Full method and all probabilities shown
12 **Alt 2**	2/3 × 2/3 or 4/9	B1	
	1/3 × 1/3 or 1/9	M1	
	1 – their 1/9 – their 4/9	M1dep	
	4/9 and 4/9	Q1	Strand (ii) Full method and all probabilities shown
12 **Alt 3**	P(B,B) = 2/3 x 2/3	M1	
	P(B,R) = 2/3 x 1/3 or P(R,B) = 1/3 x 2/3 or P(R,R) = 1/3 x 1/3	M1	
	4/9 or 2/9 or 1/9	A1	
	Completion of argument showing P(B,B) = 4/9 **and** either P(R,B) + P(B,R) = 2/9 + 2/9 = 4/9 or P (one of each colour) = 1 – P(B,B) – P(R,R) = 1 – 4/9 – 1/9 = 4/9	Q1	Strand (ii) Full method and all probabilities shown
13(a)	Correct curve	B1	Through (0, 0), (90, 2), (180, 0), (270, -2) and (360, 0)
13(b)	Correct curve	B1	Through (0,1), (90, 0), (180, -1), (270, 0) and (360, 1)
13(c)	Correct curve	B1ft	Through (0,2), (90,1), (180,0), (270,1) and (360,2) ft their (b) translated 1 up

Q	Answer	Mark	Comments
14 Alt 1	$P = 4Q$ or ('k' =) 4 *or* $Q = 30/R$ or ('k' =) 30	M1	Condone 4 × 5 = 20 Condone 30 ÷ 6 = 5
	$P = 4Q$ and $Q = 30/R$ *or* 'k' = 4 and 'k' = 30 or $P = 120/R$	M1	
	12	A1ft	ft their equations of the form $P = nQ$ and $Q = m/R$ and M1M0 scored
14 Alt 2	$10 \div 6$ or $1\frac{2}{3}$	M1	
	$20 \div 1\frac{2}{3}$	M1	
	12	A1ft	ft 20 ÷ their ratio and M1M0 scored
14 Alt 3	6 ÷ 10 or 0.6	M1	
	20 × their 0.6	M1	
	12	A1ft	ft 20 × their ratio and M1M0 scored
15(a)	60 ÷ 3 or 60 ÷ 300 × 100	M1	
	20	A1	
15(b)	480 ÷ (1 + 3) or 480 ÷ 4 or 120	M1	
	120 : 360	A1	
16	1275 – 1 or 1274 or 1275 + 51 or 1326	M1	
	1325	A1	An answer of 1275 scores 0

Q	Answer	Mark	Comments
17	4/5 × 8/3 or 0.8 ÷ 0.375	M1	
	32/15 or 480/225 or $2.1\dot{3}$	A1	oe fraction
	2 2/15	B1ft	oe mixed number eg 2 30/225 ft their improper fraction or decimal
18 **Alt1**	$3x – 2 + x + 10$ or $4x + 8$	M1	
	$4x + 8 = 52$ or $4x = 44$	M1	
	11	A1	SC2 $3x – 2 + x + 10 = 52$ and one error in simplification, rearrangement and solution or $4x + 12 = 52$ and answer 10 or $4x – 12 = 52$ and answer 16 or $4x – 8 = 52$ and answer 15
18 **Alt 2**	52 – 10 + 2 or 44	M1	
	Their 44 ÷ 4	M1dep	
	11	A1	SC2 $3x – 2 + x + 10 = 52$ and one error in simplification, rearrangement and solution or $4x + 12 = 52$ and answer 10 or $4x – 12 = 52$ and answer 16 or $4x – 8 = 52$ and answer 15

Q	Answer	Mark	Comments
19 **Alt 1**	Lists or constructs a sample space for the outcomes with at least 4 correct values shown.	M1	
	35, 14, –28, –42, 10, –20, –30, –8, –12, 24 or 4 positive signs and 6 negative signs	A1	Could be 20 outcomes if order of choice is included.
	4/10	B1ft	oe Correct probability for their outcomes (minimum 6) Correct answer scores 3 marks with no incorrect working SC2 13/25 for using same number twice
19 **Alt 2**	$2/5 \times \frac{1}{4}$ or $3/5 \times \frac{1}{2}$	M1	
	$2/5 \times \frac{1}{4} + 3/5 \times \frac{1}{2}$	A1	
	4/10	B1ft	oe Correct addition of their two products and M1 scored Correct answer scores 3 marks with no incorrect working SC2 13/25 for using same number twice
19 **Alt 3**	$2/5 \times \frac{3}{4}$	M1	
	$1 - (2/5 \times \frac{3}{4} + 3/5 \times \frac{1}{2})$	A1	
	4/10	B1ft	oe Correct addition of their two products and subtraction from 1 and M1 scored Correct answer scores 3 marks with no incorrect working SC2 13/25 for using same number twice

Q	Answer	Mark	Comments
20	2/4 + 1/4 or ¾ or 0.5 + 0.25 or 0.75	M1	Finds a common denominator
	45 ÷ their 3 × their 4	M1	42 ÷ their 0.75
	60	A1	
21	$6x^2 - 21x + 8x - 28$	M1	Four terms, with any three correct and one in x^2
	$6x^2 - 13x - 28$	A1	
22	5 divided by 12 with at least 0.4 found or $0.08\dot{3} \times 5$	M1	An actual division process must be seen
	$(0).41\dot{6}$	A1	Correct notation Condone any notation with extra digits 6 which would produce the same result eg $(0).416\dot{6}$ or $(0).41\dot{6}\dot{6}$

Q	Answer	Mark	Comments
23 **Alt 1**	$30x + 5y = 10$ $(2x + 5y = -4)$	M1	oe allow one multiplication error
	$28x = 14$	A1	oe
	$x = \frac{1}{2}$, $y = -1$	A1	SC1 Correct answer without algebraic working
23 **Alt 2**	$(6x + y = 2)$ $6x + 15y = -12$	M1	oe allow one multiplication error
	$14y = -14$	A1	oe
	$x = \frac{1}{2}$, $y = -1$	A1	
23 **Alt 3**	$(y = 2 - 6x)$ and $2x + 5(2 - 6x) = -4$ or $2x + 10 - 30x = -4$	M1	
	$28x = 14$	A1	
	$x = \frac{1}{2}$, $y = -1$	A1	SC1 Correct answer without algebraic working
24(a)	$x^3 - x^2 + x - 1 \equiv (x^2 + 1)(x - 1)$	Q1	Strand (i) Correct terminology.
24(b) **Alt 1**	$64 - 16 + 4 - 1 = 51$	B1	
	$(16 + 1)(4 - 1) = 17 \times 3 = 51$	B1	May multiply out into four terms after substitution
24(c)	$1/(x - 1)$	B1	
25	$2^3 \times 17$	M1	8×17
	136	A1	

Q	Answer	Mark	Comments
26	$pr = 4 - r$	M1	$p = \frac{4}{r} - 1$
	$pr + r = 4$	M1	$p + 1 = \frac{4}{r}$
	$r = \frac{4}{p+1}$	A1	
27	$(\frac{1}{64})^{½}$ or $1/\sqrt{64}$ or $\sqrt[4]{16^3}$ or $(16^{\frac{1}{4}})^3$ or shows that $64^{½} = \sqrt{64}$ or shows that $16^{¼} = 2$	M1	Not that $64^{-½} = \sqrt{64}$
	$\frac{1}{8}$ (oe) or 8	A1	
	1 and $\frac{1}{8}$ (oe) and 8	Q1	Strand (ii) Correct working and evaluation of both terms leading to an answer of 1.
28	Finds common denominator	M1	For at least two terms. Condone algebraic error(s) with numerator(s)
	$\frac{5x^2 + 15 + 8 - 5x^2}{10x}$	M1	oe May still be three separate expressions
	$\frac{23}{10x}$	A1	