OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE MATHEMATICS

(9260)

PAPER 2 – Extension Tier
Mark Scheme

Specimen 2018

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.

Glossary for Mark Schemes

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

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

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.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
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.
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.
3.14 …	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q	Answer	Mark	Comments
1	$-7 \leqslant x < 6$	B1	
2	252°	B1	
3	2.5 cm/s	B1	
4	$\frac{4}{9}$	B1	
5	**Alternative method 1**		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB =$ their 75 and $\angle BCD = 180 -$ their 75 or $105°$	M1	oe Angle may be seen on diagram
	$x = 105 - 75 = 30°$	A1	Full method required
	Alternative method 2		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB =$ their 75 and $\angle ABP =$ their $75 - 15$ or $60°$ and $\angle BAC = 180 - 90 -$ their 60	M1	oe Angles may be seen on diagram
	$x = \angle BAC = 30°$	A1	Full method required

Q	Answer	Mark	Comments
5	**Alternative method 3**		
	$\angle PCB = 180 - 90 - 15$ or $75°$ or $\angle PCB = 90 - 15$	M1	oe Angle may be seen on diagram
	$\angle ABC = \angle PCB$ = their 75 and $\angle BAC$ = 180 – their 75 – their 75	M1	oe Angle may be seen on diagram
	$x = \angle BAC = 30°$	A1	Full method required
6	**Alternative method 1**		
	$\frac{3}{5} + \frac{1}{6}$ or $\frac{23}{30}$	M1	
	1 – their $\frac{23}{30}$ or $\frac{7}{30}$	M1dep	
	56 ÷ their $\frac{7}{30}$ or 56 × 30 or 1680 or 56 ÷ 7 or 8 or 240	M1dep	oe
	(240 ÷ 6 =) 40	A1	
	Alternative method 2		
	$1 - \frac{1}{6}$ or $\frac{5}{6}$	M1	
	Their $\frac{5}{6} - \frac{3}{5}$ or $\frac{7}{30}$	M1dep	
	56 ÷ their $\frac{7}{30}$ or 56 × 30 or 1680 or 56 ÷ 7 or 8 or 240	M1dep	oe
	(240 ÷ 6 =) 40	A1	

Q	Answer	Mark	Comments
7(a)	0.3 or $\frac{3}{10}$ or 30%	B1	oe
7(b)	0.11 or $\frac{11}{100}$ or 11%	B1	oe
7(c)	200×0.15 or $\frac{30}{200}$	M1	oe
	30	A1	
8	Intersecting arcs on both sides of line joining sockets, of same radius centred on each socket	M1	
	Perpendicular bisector of sockets within tolerance (at least 3 cm long)	A1	Tolerance is $\pm$ 1 mm through their intersecting arcs
	Point marked on wall 2 cm from doors on either side	B1	
	Socket marked on bottom wall where their perpendicular bisector does intersect the wall	A1	The mark is for showing that the socket can only be fitted on the bottom wall. If both positions marked then A0
9	**Alternative method 1**		
	60×0.5 or 30	M1	oe
	$(100 - 60) \times 0.2$ or 8	M1	oe
	38	A1	SC2 0.38
	Alternative method 2		
	Implies boys are 40% and works out 50% of their girl total	M1	eg 60 and 40 seen and $\frac{1}{2} \times 60 = 30$ or 120 and 80 seen and $\frac{1}{2} \times 120 = 60$
	Works out 20% of their boy total	M1dep	eg 0.2×40 or 8 or 0.2×80 or 16
	38	A1	oe

Q	Answer	Mark	Comments
10	$\frac{(16\times 2+7x+20\times 12+10\times 17)}{(16+x+20+10)} = 8.5$	M1	
	their $(32 + 7x + 240 + 170)$ $= 8.5 \times$ their $(46 + x)$	M1dep	
	their 442 – their $391 = 8.5x - 7x$	M1	
	$x = 34$	A1	
11(a)	$\cos x = \frac{8}{11}$ or $\sin x = \frac{\sqrt{11^2-8^2}}{11}$ or $\tan x = \frac{\sqrt{11^2-8^2}}{8}$	M1	oe
	43(.3 ….)	A1	
11(b)	$\tan 40 = \frac{y}{37}$ or $\tan 50 = \frac{37}{y}$	M1	oe $x = 48.3\ldots$ and $37^2 + y^2 = 48.3^2$ 48.3 cos 50 or 48.3 sin 40
	31. (…)	A1	
12	Straight line through (–3, 0) and (0, 3)	B1	Lines must be ruled Only penalise (by 1 mark) extended lines if B1 B1 B1 SC2 Any graph that passes through (–3, 0) **and** (0, 3) **and** (1, 3) **and** (2, 1)
	Straight line through (0, 3) and (1, 3)	B1	
	Straight line through (1, 3) and (2, 1)	B1	
13	$\frac{25x}{4}$	B1	

Q	Answer	Mark	Comments
14	**Alternative method 1**		
	2 parts → 116	M1	oe
	116 ÷ 2 × 16	M1	oe
	928	A1	
	Alternative method 2		
	Writes at least 3 ratios or numbers of boys and girls equivalent to 9 : 7	M1	eg 18 : 14 and 180 : 140 and 360 : 280
	522 and 406	M1	
	928	A1	
	Alternative method 3		
	-b = g + 116 and 7 b = 9g	M1	
	7(g + 116) = 9g	M1	
	928	A1	
15	1800×1.04 or 1872	M1	oe $1800 \times 1.04^n = 2000$
	1800×1.04^2 or 1946.88 or 1946 or 1947	M1dep	oe Accept rounding [1946, 1947] $2000 \div 1800 = 1.04^n$
	1800×1.04^3 or 2024.7…	M1dep	oe Accept rounding [2023, 2025] Between 2 and 3 years
	3	A1	Must not come from simple interest

Q	Answer	Mark	Comments
16(a)	$3x(4x + 1) – 2(6x – 3)$	M1	If expanded straight away allow one sign or arithmetic error eg $12x^2 + 3x – 12x – 6$ (must have an x^2 term 2'x' terms and a constant term) Condone missing bracket eg $3x \times 2x + 1 – 2 \times 6x – 3$
	$12x^2 + 3x – 12x + 6$	A1	
16(b)	$12x^2 – 9x + 6 = 6$ or $12x^2 – 9x = 0$ or $12x^2 = 9x$	M1	oe If their equation in (a) is $12x^2 – 9x – 6$ leading to $122 – 9x – 12 = 0$ award M1
	$x(12x – 9)$ or $3x(4x – 3)$ or $x(4x – 3)$ or $12x^2 = 9x$	M1dep	Use formula or completing the square $\frac{9 \pm \sqrt{81}}{24}$ oe or $(x – \frac{3}{8})^2 = \frac{9}{64}$ oe $\frac{3 \pm \sqrt{73}}{8}$ from equation above
	$x = \frac{3}{4}$	A1	oe If $x = 0$ is given do not award A1
17(a)	$x^3 – 2x^2$	B2	B1 for x^3 B1 for $–2x^2$
17(b)	$3x^2$ or $–4x$	M1	At least one term of their $x^3 – 2x^2$ differentiated correctly
	$3(3)^2 – 4(3)$ or $27 – 12$	M1dep	oe Substitutes $x = 3$ in their $\frac{dy}{dx}$ their $\frac{dy}{dx}$ must be an expression in x Allow even if their (a) has only one term
	15	A1ft	ft M2 and their (a) Only ft if their (a) has at least two terms of different order and all of their terms are differentiated correctly

Q	Answer	Mark	Comments
17(c)	$y - 9 =$ their $15(x - 3)$ or $y =$ their $15x + c$ and substitutes (3, 9)	M1	oe e.g. $\frac{9-y}{3-x}$ = their 15 their 15 from (b) Allow $y - 9 = \frac{-1}{their 15}(x - 3)$ or $y = \frac{-1}{their 15}x + c$ and substitutes (3, 9) for M1 A0 only
	$y = 15x - 36$	A1ft	ft their 15 from (b) $15x - 36$ is M1 A0 unless $y = 15x - 36$ seen in working

Q	Answer	Mark	Comments
18	**Alternative method 1**		
	First and second differences correct ie 4 6 8 (10) 2 2 (2)	M1	
	Correctly subtracts their $\frac{2}{2}n^2$ from given sequence ie 10 11 12 (13 14)	M1	
	(1)n	M1dep	Dep on M2
	$n^2 + n + 9$	A1	oe eg $n^2 + n + 10 - 1$
	Alternative method 2		
	Any three of $a + b + c = 11$ $4a + 2b + c = 15$ $9a + 3b + c = 21$ $16a + 4b + c = 29$ $25a + 5b + c = 39$	M1	Allow one error but each of their three equations must have a, b and c
	Eliminates one variable to obtain a pair of equations in two variables eg $3a + b = 4$ **and** $5a + b = 6$	M1	Allow one error
	Eliminates one variable correctly eg $2a = 2$	M1 dep	Dep on M2
	$n^2 + n + 9$	A1	oe eg $n^2 + n + 10 - 1$

Q	Answer	Mark	Comments
19	$\frac{16^2+9^2-20^2}{2\times16\times9}$ (= – 0.21875)	M1	oe eg $\frac{256+81-400}{288}$ or $-\frac{63}{288}$ or $-288\cos x = 63$
	$\cos^{-1}\frac{16^2+9^2-20^2}{2\times16\times9}$	M1	oe This mark implies M1
	[102.6, 102.64]	A1	Allow 103 if correct working for M1 M1 seen SC2 [77.36, 77.4]
20	Attempt at one frequency density	M1	May be on diagram 17 ÷ 10 (= 1.7) or 12 ÷ 5 (= 2.4) or 3 ÷ 15 (= 0.2) or 9 ÷ 30 (= 0.3) Tolerance $\pm\frac{1}{2}$ square
	Three or four correct frequency densities	A1	At least three from 1.7, 2.4, 0.2 and 0.3
	Fully correct histogram	A1	
21(a)	$2n + 3$	B1	
21(b)	$(2n + 3)^2 - (2n + 1)^2$ **or** $4n^2 + 6n + 6n + 9$ or $4n^2 + 2n + 2n + 1$	M1	
	$12n + 9 - 4n - 1$	A1	
	$8n + 8$ or $8(n + 1)$	A1	

Q	Answer	Mark	Comments
22(a)	$(x-5)^2+1$	M1	
	$x^2-5x-5x+25+1$ $=x^2-10x+26$	A1	
22(b)	x^2+1-5 or x^2-4	B1	
	$x^2-10x+26=$ their (x^2-4)	M1	
	$-10x=-4-26$ or $-10x=-30$ or $10x=30$	M1	oe
	3	A1	
23(a)	substitute $t=0$ into formula and state $a^0=1$	B1	
23(b)	$a^3=\frac{6144}{12\,000}$ or $(a=)\sqrt[3]{\frac{6144}{12\,000}}$	M1	
	0.8	A1	oe
23(c)	**Alternative method 1**		
	$12\,000\times0.8^8=[2013, 2013.3]$ and $12\,000\div6=2000$ or $[2013, 2013.3]\times6=$ $[12078, 12\,079.8]$	B1	
	Alternative method 2		
	$0.8^8=[0.16.\ 0.17]$ and $\frac{1}{6}=[0.16.\ 0.17]$	B1	

Q	Answer	Mark	Comments
24	**Alternative method 1**		
	1495 or 1505 or $1504.\dot{9}$ seen	B1	
	74.5 or 75.5 or 75.49 seen	B1	
	$\frac{1495}{75.5}$ or $\frac{1495}{75.4\dot{9}}$	M1	$\frac{\text{their min}\,(450,\,1500]}{\text{their max}\,(75{,}76]}$
	19.8(…)	A1	Must come from the correct calculation
	19	A1ft	Rounding down their answer ft their 19.8
	Alternative method 2		
	74.5 or 75.5 or $75.4\dot{9}$ seen	B1	
	Any trial correctly evaluated	M1	eg $18 \times 75.5 = 1359$
	$19 \times 75.5 = 1434.5$	A1	Accept $75.4\dot{9}$
	$20 \times 75.5 = 1510$	A1	Accept $75.4\dot{9}$
	19	A1ft	Lower value

25	*AD* = *AE* (10 (cm) or sides of a square) or sides marked as 10 on diagram	B1	Must give a reason or mark sides as 10 on diagram
	AB = *AG* (10 (cm) or sides of a square) or sides marked as 10 on diagram	B1	Must give a reason or mark sides as 10 on diagram
	Angle *DAG* = angle *EAB* (135 or 90 + 45)	B1	Must state 135 or 90 + 45 or 135 shown for both angles on diagram
	Congruent due to SAS (could be expressed in words eg two sides and angle between them the same) or Congruent due to ASA or AAS or SAA with 22.5 shown or stated (after 135 seen) as one of the other angles. (could be in words eg two angles and the sides between them, or two angles and a side)	B1	B0 for congruent without SAS, AAS etc or the appropriate reason for their proof stated in words (strand (ii))

Q	Answer	Mark	Comments
26	$\frac{12}{10}$ (= 1.2) or $\frac{10}{12}$	M1	
	500 × their 1.2^3	M1dep	oe
	864	A1	Accept [863, 854]
27(a)	$-\mathbf{p}$ (+) $2\mathbf{q} - \mathbf{p}$ (+) $5\mathbf{p}$	B1	oe
27(b)	$\mathbf{q} - \frac{1}{2}\mathbf{p}$ or $-\mathbf{q} + \frac{1}{2}\mathbf{p}$ or $2\mathbf{p}$ or $-2\mathbf{p}$ or $3\mathbf{p}$ or $-3\mathbf{p}$	M1	$\frac{1}{2}(2\mathbf{q} - \mathbf{p})$ or $\frac{1}{2}(\mathbf{p} - 2\mathbf{q})$
	$(\vec{MN} =) \mathbf{q} - \frac{1}{2}\mathbf{p} + 2\mathbf{p}$ or $(\vec{NM} =) -(\mathbf{q} + \frac{3}{2}\mathbf{p})$	M1dep	oe $(\vec{MN} =) -\mathbf{q} + \frac{1}{2}\mathbf{p} + \mathbf{p} + 3\mathbf{p} + 2\mathbf{q} - 3\mathbf{p}$ or $(\vec{NM} =) -3\mathbf{p} - 3\mathbf{p} - 2\mathbf{q} - \mathrm{p} + \mathbf{q} - \frac{1}{2}\mathbf{p}$
	$(\vec{MN} =) \mathbf{q} + \frac{3}{2}\mathbf{p}$ or $(\vec{NM} =) -(\mathbf{q} + \frac{3}{2}\mathbf{p})$	A1	oe Must be fully simplified
	$\frac{1}{2}$ or MN is a multiple/fraction of CB (therefore parallel)	A1	oe $\vec{CB} = 2(\mathbf{q} + \frac{3}{2}\mathbf{p})$ or $\frac{1}{2}\vec{CB} = \mathbf{q} + \frac{3}{2}\mathbf{p}$ or $2(\mathbf{q} + \frac{3}{2}\mathbf{p}) = \frac{1}{2}(2\mathbf{q} + 3\mathbf{p})$ $MN = \frac{1}{2}CB$ or $CB = 2MN$ or $CB : MN = 2 : 1$

Q	Answer	Mark	Comments
28	**Alternative method 1**		
	$y = -3x - 4x$	B1	
	$x^2 + 2x + 5 =$ their $-3 - 4x$	M1	
	$x^2 + 6x + 8 = 0$	A1ft	ft their $-3 - 4x$
	$(x + 4)(x + 2)\ (= 0)$	M1	Correct method to solve their quadratic equation
	$x = -4, -2$	A1ft	ft their quadratic equation
	$y = 13, 5$	A1	SC2 both pairs of correct values without valid working
	Alternative method 2		
	$x = \frac{-3 - y}{4}$	B1	
	$y =$ (their $\frac{-3 - y}{4}$)$^2 + 2(\frac{-3 - y}{4}) + 5$	M1	
	$y^2 - 18y + 65 = 0$	A1ft	ft their $\frac{-3 - y}{4}$
	$(y - 5)(y - 13)\ (= 0)$	M1	Correct method to solve their quadratic equation
	$x = -4, -2$	A1ft	ft their quadratic equation
	$y = 13, 5$	A1	SC2 both pairs of correct values without valid working

Q	Answer	Mark	Comments
28	**Alternative method 3**		
	$4x + x^2 + 2x + 5 = -3$	B1	oe
	$x^2 + 6x + 5 = -3$	M1	
	$x^2 + 6x + 8 = 0$	A1	
	$(x + 4)(x + 2)\ (= 0)$	M1	Correct method to solve their quadratic equation
	$x = -4, -2$	A1ft	ft their quadratic equation
	$y = 13, 5$	A1	SC2 both pairs of correct values without valid working
	Alternative method 4		
	$4x + y = -3$ and $y - x^2 - 2x = 5$ or $4x + y = -3$ and $-2x + y = x^2 + 5$	B1	oe the equations must be used as simultaneous equations
	$4x + x^2 + 2x = -8$ or $x^2 + 6x = -8$ or $6x = -3 - x^2 - 5$	M1	oe
	$x^2 + 6x + 8 = 0$	A1	
	$(x + 4)(x + 2)\ (= 0)$	M1	Correct method to solve their quadratic equation
	$x = -4, -2$	A1ft	ft their quadratic equation
	$y = 13, 5$	A1	SC2 both pairs of correct values without valid working