



Mark Scheme (Results)

Predicted Paper 3 - Set 1

Edexcel-style GCSE

In Mathematics (PA-1MA1/3H)

Higher (Calculator) Paper 3H

General Marking Guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- 1.** All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.
- 2.** All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no answer) indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

Questions where working is not required: In general, the correct answer should be given full marks.

Questions that specifically require working: In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

3. Crossed out work

This should be marked unless the candidate has replaced it with an alternative response.

4. Choice of method

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line. If no answer appears on the answer line, mark both methods **then award the lower number of marks.**

5. Incorrect method

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review for your Team Leader to check.

6. Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award. Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

7. Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg. incorrect algebraic simplification).

8. Probability

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

9. Linear equations

Unless indicated otherwise in the mark scheme, full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously identified in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

10. Range of answers

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range

11. Number in brackets after a calculation

Where there is a number in brackets after a calculation eg $2 \times 6 (=12)$ then the mark can be awarded **either** for the correct method, implied by the calculation **or** for the correct answer to the calculation.

12. Use of inverted commas

Some numbers in the mark scheme will appear inside inverted commas eg "12" $\times$ 50 ; the number in inverted commas cannot be any number – it must come from a correct method or process but the candidate may make an arithmetic error in their working.

13. Word in square brackets

Where a word is used in square brackets eg [area] $\times$ 1.5 : the value used for [area] does not have to come from a correct method or process but is the value that the candidate believes is the area. If there are any constraints on the value that can be used, details will be given in the mark scheme.

14. Misread

If a candidate misreads a number from the question. eg uses 252 instead of 255; method or process marks may be awarded provided the question has not been simplified. Examiners should send any instance of a suspected misread to review.

Guidance on the use of abbreviations within this mark scheme

M	method mark awarded for a correct method or partial method
P	process mark awarded for a correct process as part of a problem solving question
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
C	communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity
B	unconditional accuracy mark (no method needed)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
1	$w = (r+1)/(2r-2)$ Or $w = (r+1)/(2(r-1))$	M1	For the correct rearrangement to make w the subject of.	Accept equivalent forms. Multiply both sides by $(2w - 1)$, collect w terms, factor and divide. Common error: stopping at $r(2w - 1) = 2w + 1$ without completing the rearrangement.
2	$x = 7/5$ or $x = 1.4$	M1 M1 A1	For clearing fractions by multiplying through by 6 (or equivalent LCM method) Must reach: $3x + 3 = 10 - 2x$ or equivalent. Allow for intermediate steps shown. oe	If multiplying by 6: $6x - 3(x - 1) = 6 - 2(x - 2)$. Accept multiplication of individual terms. Do not award marks if expansion errors lead to $5x=2$ or $x=2$
3a	0.025	M1 A1	For dividing coefficients: $8 \div 32 = 0.25$ or $1/4$ cao.	Work with coefficients and powers of 10 separately.
3b	1.58×10^3	P1 P1 A1	For substituting values and simplifying under the square root 20.25/8.1 $\approx$ 2.5 and $10^8/10^2 = 10^6$. Accept showing working with different intermediate steps. awrt 1.58×10^3	$\sqrt{((4.5 \times 10^4)^2 / (8.1 \times 10^2))}$. Alternative: $(4.5 \times 10^4)/\sqrt{(8.1 \times 10^2)}$

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
4	1.00 g/cm ³	P1 P1 P1 A1	For converting volumes to cm ³ : 50 litres = 50,000 cm ³ ; 130 litres = 130,000 cm ³ ; 180 litres = 180,000 cm ³ Allow $1.09 \times 50 \times 1000$. Accept values showing 54,500 g or 54.5 kg. Allow $0.97 \times 130 \times 1000$. Accept 126,100 g or 126.1 kg. $(54,500 + 126,100) / 180,000 = 180,600 / 180,000 = 1.003\dots$ Accept showing $180.6 / 180 = 1.003\dots$ awrt 1.00 g / cm ³	Accept 50×10^3 or 50,000. Accept cm ³ or alternative notation. Use 1 litre = 1000 cm ³ .
5a	4/21 or 8/42	M1 A1	for identifying matching cases and calculating probabilities Accept 8/42 or 4/21. As decimal 0.190 (3dp) or 0.19 (2dp) only if clearly stated.	Both 2s: $(2/7) \times (1/6) = 2/42$. Both 4s: $(3/7) \times (2/6) = 6/42$. Both 5s or both 6s are impossible (one of each). $P = 2/42 + 6/42 = 8/42 = 4/21$ Do not accept 3/21.
5b		P1 P1 A1	For setting up a systematic method to find all cases where second > first First 2, second 4: $(2/7) \times (3/6) = 6/42$; First 2, second 5: $(2/7) \times (1/6) = 2/42$; First 2, second 6: $(2/7) \times (1/6) = 2/42$; First 4, second 5: $(3/7) \times (1/6) = 3/42$; First 4, second 6: $(3/7) \times (1/6) = 3/42$; First 5, second 6: $(1/7) \times (1/6) = 1/42$. Total = $6 + 2 + 2 + 3 + 3 + 1 = 17$ cases. 17/42 cao	Must show a method such as a table, list or systematic enumeration of cases. Accept only 17/42 as the final answer (cannot simplify further). Do not accept decimal equivalents unless explicitly requested.

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
6a	10.39 cm ²	M1	M1 for applying the correct formula for triangle area with sine	Area = $(1/2) \times AB \times AC \times \sin(BAC)$. = $(1/2) \times 4 \times 6 \times \sin(60^\circ)$ Accept 10.39. If 10.39... is seen, 10.4 is accepted; otherwise, 10.39 is the expected accuracy.
		A1	$(1/2) \times 4 \times 6 \times (\sqrt{3}/2) = 12 \times (\sqrt{3}/2) = 6\sqrt{3} = 10.39...$	
6b	5.3 cm	M1	For taking the square root and rounding correctly.	$BC^2 = 4^2 + 6^2 - 2(4)(6)\cos(60^\circ) = 16 + 36 - 48(1/2) = 52 - 24 = 28$ Accept 5.3. Do not accept 5.29 (not enough rounding).
		A1	awrt 5.3	
7	No. The exterior and interior angles cannot both be marked at the same vertex on the exterior of the polygon	B1	For stating No and giving valid geometric reasoning	Accept: "The interior angle is inside the polygon and the exterior angle is outside, so they cannot both be at the same position" or "The angles marked cannot both exist at the same vertex as shown" or "Exterior and interior angles are supplementary and are at different positions". The candidate must reference the positioning or relationship of angles. Do not accept vague statements like 'the angles are wrong' without referencing the vertex or the supplementary relationship."
8a	$3(x - 2)^2 - 6$	M1	Factoring out the coefficient.	$3(x^2 - 4x) + 6$
		M1	$3(x^2 - 4x + 4 - 4) + 6 = 3((x - 2)^2 - 4) + 6$	

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
		A1	$3(x-2)^2-6$ cao	
8b	(2, -6)	B1	For writing down the coordinates of the turning point from the completed square form cao.	From $3(x-2)^2-6$, the turning point is at (2, -6). Independent mark - no requirement to complete part (a) correctly.
9	$y = 3x - 1$	M1	M1 for finding the gradient from two points on the line	From the graph: points (0, -1) and (1, 2). Gradient $m = (2 - (-1))/(1 - 0) = 3/1 = 3$. Alternative: $\Delta y/\Delta x = 3$
		A1	oe	
10a	2	M1	For identifying the median position (15th/16th).	Median position = $(30 + 1)/2 = 15.5$ (between 15th and 16th values). For 30 items, the median is the average of the 15th and 16th values, but both fall in the same class.
10b		A1	2 cao	Accept 2.1 or $63/30$ or 2.10. Do not accept 2 (common error from rounding).
		M1	M1 for calculating the sum of (value $\times$ frequency) $(0 \times 4) + (1 \times 6) + (2 \times 8) + (3 \times 7) + (4 \times 5) + (5 \times 0) = 0 + 6 + 16 + 21 + 20 + 0 = 63$	
		M1	Mean = $63/3$	
		A1	2.1 ca	
11	$4x - y$	M1	For recognising vector path $QS + SP = QP$ In triangle RSP: $RS + SP = RP$, so $SP = RP - RS = (2x + 3y) - (x + 2y) = x + y$	Must establish the route through the quadrilateral to get from Q to P. Allow alternative approaches using other vector paths Do not accept (4, -1) or other coordinate interpretations.
		M1	$QP = QS + SP = (3x - 2y) + (x + y) = 4x - y$.	
		A1	$4x - y$. oe	

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
12a	HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, TTTT (all 16 outcomes)	M1	For listing outcomes systematically	Accept: organised list in order, complete probability tree diagram, or table format. Must show all 16 outcomes. $2^4 = 16$ possible outcomes.
		A1	oe	
12b(i)		B1	5/16 oe	HHHH (1 outcome), HHHT, HHTH, HTHH, THHH (4 outcomes with exactly 3 heads). Total = 5 outcomes Accept 0.31 or 31%
12b(ii)		B1	15/16 oe	$P(\text{at most 3 heads}) = 1 - P(4 \text{ heads}) = 1 - 1/16 = 15/16$. Alternative: Count all outcomes except HHHH = 15 outcomes Accept 0.93 oe or 0.94 Accept 93% oe or 94%
13	Line C and Line D	B1	For identifying lines with equal gradients. cao	Convert to $y = mx + c$ form: Line A: $y = 3x - 2$, $m = 3$. Line B: $2y = -3x - 8 \rightarrow y = -3/2x - 4$, $m = -3/2$. Line C: $3x - 2y = 6 \rightarrow y = 3/2x - 3$, $m = 3/2$. Line D: $2y = 3x + 10 \rightarrow y = 3/2x + 5$, $m = 3/2$. Lines C and D both have a gradient of $3/2$.
14	2%	M1	M1 for finding the interest amount before tax $\text{Interest rate} = (\text{Interest} / \text{Principal}) \times 100\% = (£200 / £10,000) \times 100\%$	If tax is 15% of interest and tax = £30, then: $0.15 \times \text{Interest} = £30$. $\text{Interest} = £30 \div 0.15 = £200$ Accept 2%, 0.02, or 2. Must be stated as a percentage or equivalent
		M1		
		A1	2% oe	

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
15	8	M1	M1 for calculating Sean's total amount Albert: $(1 + 2/5) \times £80 = 7/5 \times £80 = 1.4 \times £80 = £112$	Sean: $(100 + 30)\%$ of $£80 = 130\%$ of $£80 = 1.3 \times £80 = £104$. Allow: $£80 + (0.30 \times £80) = £80 + £24 = £104$
		A1	8 cao	
		A1 for £8 as final answer	Accept £8 or 8. Do not accept 8 without currency unless the context is clear.	
16	$y = -2/3 x + 13/3$	M1	for finding the gradient of the radius from $O(0,0)$ to $A(2,3)$: $m = 3/2$	May be implied by subsequent working
		M1	for finding the perpendicular gradient of the tangent, $m = -2/3$ (negative reciprocal of $3/2$)	FT from their gradient of radius
		M1	for substituting $(2,3)$ into $y = mx + c$ with their tangent gradient . $y - 3 = -2/3(x - 2)$. Multiply through by 3: $3y - 9 = -2x + 4$. Rearrange: $2x + 3y = 13$	FT
		A1	oe	Accept $2x + 3y = 13$
17	Angle BAC = 40° , Angle BEC = 110°	M1	for recognizing triangle OBC is isosceles ($OB = OC = \text{radii}$) for establishing angle $OCB = 20^\circ$	
		M1	In triangle OBC: $20^\circ + 20^\circ + \text{angle BOC} = 180^\circ$. Angle BOC = 140° . AB and AC are tangents, so angle OBA = angle OCA = 90° (radius perpendicular to tangent).	FT For finding angle BAC using tangent properties
		A1	Cao for angle BAC = 40° .	In quadrilateral ABOC: angle BAC + angle BOC + $90^\circ + 90^\circ = 360^\circ$. Angle BAC = $360^\circ - 140^\circ - 180^\circ = 40^\circ$
		M1	Angle BOC = 140° (central angle). The reflex angle BOC = $360^\circ - 140^\circ = 220^\circ$.	for calculating angle BEC using the inscribed angle theorem
		A1	Cao for Angle BEC = 110° .	For an inscribed angle subtending same arc: angle BEC = $220^\circ / 2 = 110^\circ$. (Inscribed angle = half central angle) Reasoning must show understanding of tangent, isosceles triangle, and angle theorems.

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
18a	Positive correlation	B1	for identifying type of correlation from scatter graph	
18b	(14, 75)	B1		Accept equivalent coordinate notation
19	Enlargement centre (-1, 1) scale factor -1/2	B1	Identifies enlargement as the transformation	Award no marks if more than one transformation type is stated.
		B1	Centre of enlargement (-1,1)	Accept coordinates given in correct order
		B1	Oe For scale factor of -1/2	Accept 0.5
		B1	for drawing construction lines between corresponding vertices.	Draw lines through corresponding vertices to find centre at (-1, 1). Scale factor is -1/2 (negative indicating additional rotation). Allow alternative descriptions.
20	$n^2 + 2n + 3$	M1	for calculating second differences	For calculating Second differences = 2,2,2,2. Constant second difference indicates quadratic sequence. Coefficient of $n^2 = 2/2 = 1$ second difference seen at least once and not contradicted by a different value unless recovered may be seen by the sequence
		M1	for finding formula by checking against known terms	Assume $a_n = n^2 + bn + c$. For $n=1$: $1 + b + c = 6 \rightarrow b + c = 5$. For $n=2$: $4 + 2b + c = 11 \rightarrow 2b + c = 7$. Subtracting: $b = 2, c = 3$. Formula: $n^2 + 2n + 3$
		A1	Oe for $n^2 + 2n + 3$	Accept $3 + 2n + n^2$
21	$3(s + 9)(s - 9)$	M1	for factoring out common factor $s^2 - 81 = s^2 - 9^2 = (s + 9)(s - 9)$	
		A1	Oe for $3(s + 9)(s - 9)$	Accept: $3(s + 9)(s - 9)$ $3(s - 9)(s + 9)$ $(3s + 27)(s - 9)$ $(3s - 27)(s + 9)$.

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
22	8	P1	for finding the interior angle of the regular polygon $360 - 90 - 135 = 135^\circ$	Angles around a point are 360° ED, DC, CF are consecutive sides of a regular polygon. Interior angle = 135°
		P1	for calculating the number of sides	Dep on P1 Interior angle formula: $(n-2) \times 180^\circ / n = 135^\circ$. Solve: $135n = 180n - 360$. $45n = 360$. $n = 8$
		A1	Cao for 8	Accept 8 only. This is a regular octagon
23	Proof	M1	for setting up correct equations to eliminate the recurring decimal, eg : $1000x = 35.555...$ $100x = 3.555...$	Only the 5 is recurring.
		A1	Cao for 32/900	Must show algebraic manipulation leading to $x = 32/900$. The answer must be reached through a systematic algebraic method. For explicitly showing the subtraction $900x = 32$
24	£31,224.24	M1	for applying compound interest formula correctly Interest = A - P= £331,224.24 - £300,000 = £31,224.24)	
		A1	Oe for £31,224.24	Accept £31,224.24 or £31,224.2 or £31,224 (to nearest £). Do not accept £31,200 (insufficient precision).
25	35	P1	For setting up an expression for the total work done over 6 days,	Day 1: x men Day 2: (x-10) Day 3: (x-12) Day 4: (x-14) Day 5: (x-16) Day 6: (x-18)
		P1	For equating to the original total work formula,	If job takes 4 days with x men: $4x = \text{total work}$. With drop-out pattern over 6 days $6x - 70 = 4x$. $2x = 70$. $x = 35$
		A1	Cao for 35	Verification: $35 + 25 + 23 + 21 + 19 + 17 = 140 = 4 \times 35$

Paper: PA-1MA1/3H				
Question	Answer	Mark	Mark Scheme	Additional guidance
26	21.23°	M1	for finding BD using triangle BCD dimensions BC = 5 cm, CD = 9 cm. Assuming a right angle or using the dimensions given: $BD^2 = BC^2 + CD^2$ (if rectangular base) = 25 + 81 = 106. But more likely: use 3D coordinates. Place B at origin, C(5,0,0), D(5,9,0), A(0,0,4).	Recognize the 3D structure of the triangular prism ABCDEF with diagonal AD
		M1	for calculating AD using 3D Pythagoras	$AD^2 = (0-5)^2 + (0-9)^2 + (4-0)^2 = 25 + 81 + 16 = 122$. So $AD = \sqrt{122} \approx 11.045$ cm
		M1	for setting up the correct trigonometric ratio	$\sin(\text{ADB}) = AB / AD = 4 / \sqrt{122} = 0.3629\dots$ Angle ADB = $\arcsin(0.3629\dots) \approx 21.22^\circ$
		A1	Oe for 21.22° or 21.23° to 2 decimal places	Accept 21.22° or 21.23°. Tolerance: $\pm 0.01^\circ$ acceptable due to rounding. Do not accept 21.2°.