Cambridge Assessment International Education

Cambridge IGCSE™

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/62**

Paper 6 (Extended) **May/June 2021**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.
3	Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.
4	Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).
5	Where a candidate has misread a number in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 mark for the misread.
6	Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

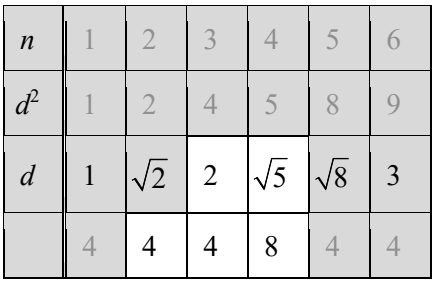
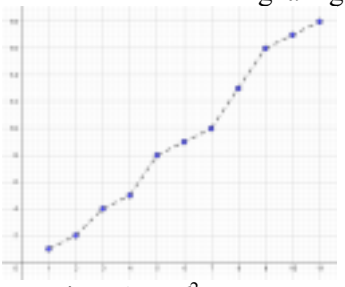
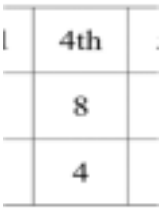
A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation '**dep**' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

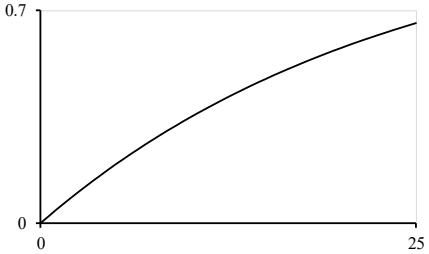
Abbreviations

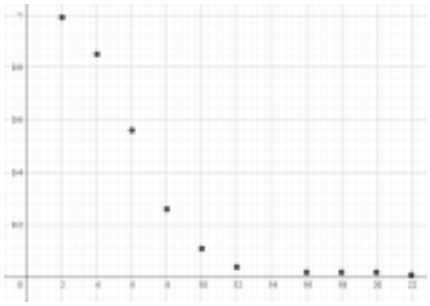
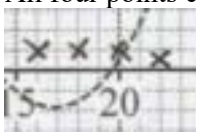
awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

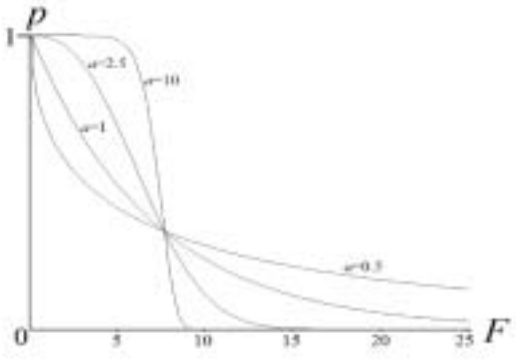
Question	Answer	Marks	Partial Marks
A	**INVESTIGATION NEAREST NEIGHBOUR**		
1	(1, –1), (–1, 1), (–1, –1)	**2**	**B1** for at least two correct and at most one error
2	Right-angled triangle with dimensions or 'Pythagoras' seen.	**1**	
	$1^2 + 1^2$ leading to distance = $\sqrt{2}$	**1**	
3(a)		**2**	**B1** for 3 or 4 cells correct
3(b)	Two correct ratios seen. or one correct ratio giving another value for d^2 or n. or correct sketch of e.g. d^2 against n  or ratio = 1 so $d^2 = n$.	**1**	
	No or not proportional and ratios not equal or sketch not a straight line or $d^2 \neq n$	**1**	Dependent on *their* numerical or graphical evidence or $d^2 = n$
3(c)	$2^2 + 4^2 = 20$ oe	**C1**	
	(2, 4), (2, –4), (4, 2), (4, –2), (–2, 4), (–2, –4), (–4, 2) and (–4, –2)	**2**	**B1** for at least 4 correct and at most 2 wrong, ignoring repeats.
4		**2**	**B1** for each correct cell
	$2^2 + 2^2$	**C1**	

Question	Answer	Marks	Partial Marks
5(a)(i)	<table><tr><td>(1, 0)</td><td>(–1, 1)</td><td>(–1, 2)</td><td>(2, –2)</td><td>(2, 2)</td><td>(0, –3)</td></tr><tr><td>✓</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td></tr><tr><td></td><td></td><td>✓</td><td></td><td>✓</td><td></td></tr></table>	**2**	**B1** for 3 or 4 columns correct
5(a)(ii)	0 and –4	**2**	**B1** for each
5(b)(i)	360 ÷ 3 [= 120°] oe or 60 × 2 [= 120°] or 180 – 60 [= 120°] or explanation of a calculation in words	**1**	
5(b)(ii)	$1^2 + 2^2 - 2$ [× 1] × 2×cos120[°] or vertical height above x-axis = $\sqrt{3}$ oe soi and [d =] $\sqrt{2^2+3}$	**C1**	
	$d = \sqrt{7}$ or 2.65	**1**	
5(c)	$d^2 = a^2 + b^2 - 2ab\cos120^{[\circ]}$	**1**	
	$\cos120^{[\circ]} = -0.5$ or $-\frac{1}{2}$ soi leading to $d = \sqrt{a^2+b^2+ab}$	**1**	
5(d)	(2, 2), (–2, –2), (2, –4), (–2, 4), (4, –2) or (–4, 2)	**C1**	
	Correct working from *their* written coordinates e.g. $\sqrt{2^2+2^2+2\times2}$	**C1**	
	$\sqrt{12}$ or $2\sqrt{3}$	**1**	
5(e)	**Method 1 Calculating distances.**		
	$d = \sqrt{13}$ soi nfww	**2**	**B1** for correct square root value of d between 3 and 5 (except 4) nfww
	d = 4 or $\sqrt{16}$ soi nfww	**1**	
	$\sqrt{13} < \sqrt{14} < \sqrt{16}$ (or 4) oe or $\sqrt{13}$ for the 7th nearest neighbour and $\sqrt{16}$ for the 8th nearest neighbour. or Circles drawn through (3, 1) and through (4, 0), and "no points between them" oe	**C1**	

Question	Answer	Marks	Partial Marks
5(e)	**Method 2 Solving quadratic equations**		
	$x^2 = 14$ oe and x is not an integer or not possible Solve $1 + x^2 \pm x = 14$ and $4 + x^2 \pm 2x = 14$ and $9 + x^2 \pm 3x = 14$ and $16 + x^2 \pm 4x = 14$ or better to get x is not an integer.	**4**	**C1** for $x^2 = 14$ oe and x is not an integer or not possible or for writing one correct equation. **B2** for solving three equations, or **B1** for solving one equation.
	Method 3 Solving a general quadratic		
	For (x, b) $x^2 + b^2 + bx = 14$ and $x^2 + bx + b^2 - 14 = 0$	**C1**	
	$x = \dfrac{-b \pm \sqrt{b^2 - 4(b^2 - 14)}}{2}$ or $b^2 - 4(b^2 - 14)$ must square or positive oe	**1**	
	$-3b^2 + 56 = 56, 53, 44, 29$ or 8	**1**	
	None have an exact square root oe	**1**	
	Method 4		
	$(a + b)^2 = 14 + ab$ or $(a - b)^2 = 14 - 3ab$ leading to $14 - 3ab$ or $14 + ab$ is a square.	**C1**	
	$3ab = 14, 13, 10$ and 5 $[a, b > 0]$	**2**	**B1** for one
	a or b cannot both be integers [and by symmetry of nearest neighbours there are no negative values possible]	**1**	

Question	Answer	Marks	Partial Marks
B	**MODELLING HIGH RIVER FLOWS**		
6(a)	$\frac{24+1}{3}$ or $\frac{25}{3}$ seen	**C1**	
	$8\frac{1}{3}$ or 8.33[…]	**1**	
6(b)	$\frac{3}{25}$ or 0.12[…] or 12%	**1**	**FT** *their* (a) if answer less than 1
7(a)(i)	$1 - p$ oe	**1**	
7(a)(ii)	$(1 - p)^{10}$	**1**	**FT** *their* (a)(i)
7(a)(iii)	[Probability of occurring =] 1 – probability of not occurring oe	**1**	Dependent on (a)(ii) unless $(1- p)^{10}$ explained here.
7(b)(i)	Correct sketch 	**2**	**B1** for convex increasing curve ending at least 5 mm above x-axis **B1** for an increasing curve passing through (0, 0) and reaching $x = 25$
	Correct scale on y-axis implying y between 0.5 and 0.9 when $x = 25$.	**C1**	
7(b)(ii)	Horizontal line at $y = 0.5$ or $\frac{\log 0.5}{\log 0.96}$ oe or $1- (1–0.04)^{17} = 0.5004$[…] and $1- (1–0.04)^{16} = 0.48$ or 0.479[…]	**C1**	
	16[.9…] or 17	**1**	

Question	Answer	Marks	Partial Marks
8(a)	No and two correct values of k or No and one correct value of k substituted to find correctly a different value of p or F. or No and two correct differences. or No and sketch of p against F is not a straight line oe 	**2**	**B1** for one correct value of k or *their* k substituted to find correctly a different value of p or F. or one correct difference or sketch of p against F If 0 scored, **SC1** for linear regression line $y = -0.047x + 0.83$ or better
8(b)	No and two correct values of c or No and one correct value of c substituted to find a different value of p or F.	**2**	**B1** for one correct value of c or *their* c substituted to find correctly (to 2 decimal places) a different value of p or F.
8(c)(i)	All four points correctly plotted. 	**1**	
8(c)(ii)	Good model up to about 14 000 m/s^3 oe	**1**	
	Not a good model greater than about 14 000 m/s^3 oe	**1**	
9(a)	**Method 1**		
	$p = 3^{-1^a}$ nfww	**1**	
	$3^{-1} = \frac{1}{3}$	**1**	
	Method 2		
	$p = \frac{1}{3^{\left(\frac{F}{b}\right)^a}}$	**1**	
	$\frac{1}{3^{1^a}} = \frac{1}{3}$	**1**	

Question	Answer	Marks	Partial Marks
9(b)	0.33[…] is closest to 0.26 oe	**1**	
9(c)(i)	Correct sketch showing three more curves. 	**2**	**B1** for all three correct curves. **B1** for all of *their* three curves intersecting at the same point on the *p*-axis and at another single point.
	1 at the *p*-intercept of the given curve.	**C1**	
	Labelling each of *their* curves with a correct *a* value oe	**C1**	
9(c)(ii)	(0, 1) and (8, 0.33)	**2**	**B1** for each point
9(c)(iii)	The gradient decreases oe	**1**	
9(c)(iv)	2.5	**1**	
	Best match to the data oe or closest to the points oe	**1**	Dependent on first mark