Cambridge Assessment International Education

Cambridge O Level

MATHEMATICS (SYLLABUS D) **4024/02**

Paper 2 Calculator **For examination from 2025**

MARK SCHEME B

Maximum Mark: 100

Specimen

This document has **10** pages. Any blank pages are indicated.

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 descriptions 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 descriptions for the question
- the specific skills defined in the mark scheme or in the generic level descriptions 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 descriptions.

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 descriptions in mind.

Mathematics-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, non-integer 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 A or B 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 help with understanding of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

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.

Types of mark

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

A Accuracy mark, given 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.

Abbreviations

awrt	answers which round to
cao	correct answer only
dep	dependent on the previous mark(s)
FT	follow through after error
isw	ignore subsequent working (after correct answer obtained)
nfww	not from wrong working
oe	or equivalent
SC	special case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	$\frac{20}{7}$ oe	**1**	Accept 2.86 or 2.857…
2	23.5 oe	**1**	
3	48 84 126	**3**	**B1** for 126 **M1** for 48 or 84 or $\frac{108}{162} \times k$ where $k = 72$ or *their* 126 oe
4(a)	41.7 or 41.66 to 41.67 or $41\frac{2}{3}$	**1**	
4(b)	140	**1**	
4(c)	224	**2**	**M1** for $160 \div 5$ [$\times k$] oe where $k = 1$ or 7 or for $\frac{\textit{their}\ \textbf{(b)}}{100} \times 160$
5	$-\frac{1}{5}$ oe	**3**	**M1** for $15 - 10x = 17$ or $3 - 2x = \frac{17}{5}$ **M1** for correctly isolating terms in x from *their* first step
6	49.5 or 49.49 to 49.50 or $35\sqrt{2}$	**4**	**B1** for [$BE =$] $\sqrt{32}$ oe **M1** for *their* $BE \div 2 \times 3$ oe **M1 dep** on at least **B1** or **M1** for $\frac{\textit{their } BE + \textit{their } AF}{2} \times 7$ oe
7(a)	0.35	**2**	**M1** for $1 - (0.1 + 0.55)$
7(b)	20	**1**	
8(a)	60	**2**	**M1** for $\frac{360}{6}$ or $180 - \frac{180(6-2)}{6}$ oe
8(b)	9	**2**	**B1** for 40 or **M1** for $\frac{360}{100 - \textit{their}\ \textbf{(a)}}$ oe
9(a)	3 and 9	**1**	
9(b)	$(A \cup B)'$ oe	**1**	
10(a)	4.73×10^{-2} cao	**1**	

Question	Answer	Marks	Partial Marks
10(b)	[c =] 1.2 [d =] 8	**2**	**B1** for each or **M1** for $\frac{2.7 \times 10^4}{2.25 \times 10^{-4}}$ soi
11(a)	130	**2**	**M1** for $\frac{1500 \times 2\frac{1}{6}[\times 4]}{100}$ oe
11(b)	4 or 4.0[0…]	**3**	**M2** for $\sqrt[5]{\frac{1825}{1500}}$ oe or **M1** for $1500 \times k^5 = 1825$ or better
12(a)	$4x^2 - x$ or $x(4x - 1)$ final answer	**2**	**B1** for $4x^2 + kx$ or $kx^2 - x$ as final answer or for $4x^2 - x$ seen not as final answer
12(b)	$\frac{6x}{a}$ final answer	**2**	**M1** for $\frac{4x}{3y} \times \frac{9y}{2a}$ or for $\frac{12x}{9y} \div \frac{2a}{9y}$ or better
13(a)	576 cao	**1**	
13(b)	60.40	**4**	**B3** for \$636.4[0] or **M3** for 0.32 × 1.075 × 1850 – *their* **(a)** oe or **B2** for \$0.344 or **M2** for 0.32 × 1.075 × 1850 oe or **M1** for 0.32 × 1.075 oe
14(a)	5 000 000	**2**	**M1** for answer figs 5 or for 1 km = 100 000 cm soi
14(b)(i)	250	**2**	**M1** for 180 + 70 or 360 – 110 or for correct indication of the required angle marked on diagram
14(b)(ii)	082	**3**	**M2** for 70 + (180 – 113 – (*their* **(b)(i)** – 195)) or better, where *their* **(b)(i)** > 195 or for 180 – 98 oe or **M1** for angle *BAC* = *their* **(b)(i)** – 195 where *their* **(b)(i)** > 195 or **B1** for angle *BCX* = 98 (where *CX* is line parallel to North line) or for angle *BAC* = 55
15	(–2, 7.5)	**2**	**B1** for one coordinate correct

Question	Answer	Marks	Partial Marks
16(a)	$y = 6x + 3$ oe three term fully simplified equation	**2**	**B1** for $6x + 3$ or $y = 6x + c$ or $y = kx + 3$
16(b)	$-\frac{1}{6}$ oe	**1**	
17	–1, 0, 1, 2	**3**	**B2** for 3 correct and no others or for 4 correct and one extra or **M2** for correct inequality in x, e.g. $2.5 \geqslant x > -2$ or **M1** for correct first step, e.g. $-1 - 4 \leqslant -2x < 8 - 4$ oe
18	$x \geqslant -4$ $y > x + 1$ oe $x + 2y \leqslant 4$ oe	**4**	**B1** for $x \geqslant -4$ **B1** for $y > x + 1$ oe **B2** for $x + 2y \leqslant 4$ oe or **M1** for $x + 2y = 4$ soi If **B0** or **M1** scored award instead, **SC3** for $x > -4$, $y \geqslant x + 1$ oe and $x + 2y < 4$ oe or **SC2** for $x = -4$, $y = x + 1$ and $x + 2y = 4$ soi or **SC1** for $x = -4$ or $y = x + 1$ soi
19(a)(i)	–9	**1**	
19(a)(ii)	77	**2**	**M1** for g(35) or $7 + 2(2x^2 - 3x)$ or better
19(a)(iii)	$\frac{x-7}{2}$ oe final answer	**2**	**M1** for $x = 7 + 2y$ or $y - 7 = 2x$ or $\frac{y}{2} = \frac{7}{2} + x$
19(b)	$2x^2 - 27x + 90$ final answer	**4**	**M1** for $2(x - 6)^2 - 3(x - 6)$ **B2** for $2(x^2 - 6x - 6x + 36) - 3x + 18$ or better or **B1** for [2] $(x^2 - 6x - 6x + 36)$ oe
19(c)	$\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 2 \times -6}}{2 \times 2}$ oe	**M1**	Condone one sign error in substituting
	–1.14 and 2.64 cao	**A2**	**A1** for each or for answers –1.1 **and** 2.6 or for answers 1.14 **and** –2.64 or for –1.137… **and** 2.637… seen If 0 scored **SC1** for two correct answers with no working

Question	Answer	Marks	Partial Marks
20(a)	$[\cos CAD =] \frac{10^2 + 18^2 - 20^2}{2 \times 10 \times 18}$	**M2**	**M1** for $20^2 = 10^2 + 18^2 - 2 \times 10 \times 18\cos(CAD)$
	86.17 to 86.18	**A2**	**A1** for $[\cos CAD =] \frac{1}{15}$ or equivalent fraction or decimal Answer must be given correctly to 2.d.p. or greater accuracy for A2 mark to be awarded
20(b)	118[.0…]	**4**	**M2** for $\frac{35\sin 27}{18}$ oe or **M1** for $\frac{35}{\sin C} = \frac{18}{\sin 27}$ oe **A1** for 61.97… to 62
20(c)	7.75 or 7.749 to 7.751…	**5**	**B3** for BD = 41.1 or 41.07 to 41.08… OR **M2** for $\sqrt{10^2 + 35^2 - 2 \times 10 \times 35 \times \cos(BAD)}$ where BAD = 86.2 + 153 – *their* **(b)** OR **M1** for $10^2 + 35^2 - 2 \times 10 \times 35 \times \cos(BAD)$ **A1** for 1687 to 1688 AND **M1 dep** for *their* $BD \div 5.3$ dep at attempt at cosine rule oe
21(a)	$f = \frac{13.5}{g^3}$ oe	**2**	**M1** for $f = \frac{k}{g^3}$ oe
21(b)	[–]87.5	**3**	**B2** for 12.5 or $\frac{7}{8}$ as final answer or **M1** for $[1-] \left(\frac{1}{2}\right)^3$ oe soi

Question	Answer	Marks	Partial Marks
22	4	**3**	**B1** for 5.75 or 11.5 seen **M1** for $\frac{2 \times (11 \text{ to } 12)}{5.7 + 0.05}$ or for $\frac{2 \times (12 - 0.5)}{5.7 \text{ to } 5.8}$
23	3.27 or 3.267 to 3.268 or $\frac{26}{25}\pi$	**6**	**M1** for [0.6 ÷] $\frac{1.44}{1.44 - 0.48}$ oe **M1** for $1.44^2 + 0.6^2$ oe or $\left(\frac{1.44}{1.5}\right)^2 + \left(\frac{0.6}{1.5}\right)^2$ oe **M3 dep** on at least **M1** for $\pi \times 0.6 \times$ *their* $L - \pi \times$ *their* $0.4 \times$ *their* $l + \pi \times 0.6^2 + \pi \times$ *their* 0.4^2 where L [= 1.56] is slant height of larger cone, l [= 1.04] is slant height of smaller cone removed. *their* $L \neq 1.44$ or **M2 dep** on at least **M1** for $\pi \times 0.6 \times$ *their* $L - \pi \times$ *their* $0.4 \times$ *their* l or **M1** for $\pi \times 0.6^2$ or $\pi \times$ *their* 0.4^2 or $\pi \times 0.6 \times$ *their* L or $\pi \times$ *their* $0.4 \times l$

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