

Cambridge IGCSE™

MATHEMATICS**0580/32**

Paper 3 (Core)

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MARK SCHEME

Maximum Mark: 80

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **15** printed pages.

General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: - the specific content defined in the mark scheme - the specific skills defined in the mark scheme or in the level descriptions - the standard of response required as exemplified by the standardisation scripts.
2	Examiners must award whole marks (not half marks, or other fractions).
3	Examiners must award marks positively . This means that: - marks are not deducted for errors or omissions - marks are awarded for correct/valid answers as defined in the mark scheme and also for other valid answers which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate - the quality of spelling, punctuation and grammar are judged only when the mark scheme indicates that these features are specifically assessed in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must consistently apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the full range of marks defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and must not award marks 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 or sign 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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	More information required
	Accuracy mark awarded zero
	Accuracy mark awarded one
	Accuracy mark awarded two
	Accuracy mark awarded three
	Independent mark awarded zero
	Independent mark awarded one
	Independent mark awarded two
	Independent mark awarded three
	Benefit of the doubt

Annotation	Meaning
	Communication mark
	Incorrect
	Follow through
Highlighter	Highlight a key point in the working
	Ignore subsequent work
	Method mark awarded zero
	Method mark awarded one
	Method mark awarded two
	Method mark awarded three
	Misread
	Omission
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.
On-page comment	Allows comments to be entered in speech bubbles on the candidate response.
	Premature rounding/approximation
	Special case
	Indicates that work/page has been seen
	Transcription error

Annotation	Meaning
	Correct
	Correct answer from incorrect working

PUBLISHED**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
nfwf	not from wrong working
oe	or equivalent
rot	rounded or truncated
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks	Guidance
1	400 053	1		Ignore any commas, dots, spaces.
2(a)	54	1		
2(b)	1, 2, 5, 10	2	B1 for 3 correct and no extras or for 4 correct and one extra	
3	6 2.3[0]	3	B2 for 32.7 or 2.3[0] or M2 for $35 - 6 \times 5.45$ oe or M1 for $\frac{35}{5.45}$ oe	M1 implied by 6.4[2...] seen in working or 6 in correct place on answer line.
4(a)	1.2	1		Accept $1\frac{1}{5}$ or $\frac{6}{5}$.
4(b)	-56.25	1		Accept $-\frac{225}{4}$ or $-56\frac{1}{4}$. Accept -56 or -56.3 or -56.2 if -56.25 seen in working.
5(a)	0.79	3	M1 for $1.59 + 0.25$ M1 for $1.43 - 0.38$	M1 implied by 1.84. M1 implied by 1.05. M1M1 for $(1.59 + 0.25) - (1.43 - 0.38)$ oe Equivalent e.g. $0.25 + 0.16 + 0.38$, $0.63 + 0.16$
5(b)	1.59 cao	1		
6	A correct reason e.g. 3 is a factor of 39	1		Reason must contain 3 and/or 13 in a correct statement. e.g. 13 is a factor of 39 $3 \times 13 = 39$ 39 is in the 3 (or 13) times table 39 is a multiple of 3 (or 13)

Question	Answer	Marks	Partial Marks	Guidance
7	4.5	2	M1 for $\frac{2.7}{3} [\times k]$ where $k = 1, 2$ or 5 oe	Implied by 0.9, 1.8 or $\frac{2.7}{0.6}$ oe
8	V marked correctly	2	B1 for bearing of 112 B1 for distance from T as 4.7 cm	V need not be labelled if clear intention e.g. end of line. Line need not be drawn. Bearing tolerance 110 to 114. Distance tolerance 4.5 to 4.9.
9	526[.00] or 526.3[0] or 526.3...	1		
10	1147.5[0]	2	M1 for $8500 \times \frac{4.5}{100} [\times 3]$ oe	Accept, for 2 marks, 1150, 1148, 1147 only if 1147.5[0] seen in working. M1 implied by 1150, 1147, 1148 as final answer. M1 implied by final answer 383 or 382.5 or 9650 or 9648 or 9647 or 9647.5 or by 1147.5 seen and then subtracted from principal or principal added. For method do not accept 4.5% for $\frac{4.5}{100}$ unless recovered.
11	183.8 cao	2	B1 for 184, 183.81, 183.816, 183.82 as final answer or before rounding. or for rounding <i>their</i> answer correct to 1dp	<i>their</i> answer must be seen and have at least 2dp
12	$x(x+7)$ final answer	1		Condone missing final bracket.
13(a)	0	1		
13(b)	9	1		

Question	Answer	Marks	Partial Marks	Guidance
14(a)	$3C + 67$ final answer	2	B1 for a correct unsimplified final answer e.g. $60 + C + 2C + 7$ or for $3C + k$ or $kC + 67$ $k \neq 0$ as final answer or for correct answer seen and spoilt	Equation will score B1 only if $n = 3C + 67$, $C = 3C + 67$, etc.
14(b)(i)	$\frac{3C + 67}{2}$ oe final answer	1	FT $\frac{\text{their(a)}}{2}$ oe	FT any expression/equation in C . Accept $C = (3C + 67) / 2$, $(C = 3C + 67) / 2$ etc.
14(b)(ii)	35	4	M1FT for <i>their (b)(i)</i> = 86 M1FT for a first correct step to solve e.g. $3C + 67 = 172$ or $1.5C + 33.5 = 86$ M1FT for a second correct step e.g. $3C = 172 - 67$ or better or $1.5C = 86 - 33.5$ or better	FT is from $\frac{aC + b}{d}$ Dealing with division FT is from $aC + b = c$ to $aC = c - b$ or $C + \frac{b}{a} = \frac{c}{a}$ if FT from <i>their (b)(i)</i> is from a different form then if FT is from $aC + b$ M1FT for $aC + b = 86$ M0 as no division M1FT for $aC = 86 - b$ if FT is from $\frac{aC}{b}$ M1FT for $\frac{aC}{b} = 86$ M1FT for $aC = 86 \times b$ M0 as no second step needed
15(a)	2 5 8	1		

Question	Answer	Marks	Partial Marks	Guidance
15(b)	326 329 332	2	B1 for 1 or 2 correct and no extras or for 3 correct and one extra or M1 for $3n-1=k$ where k is one of the numbers in the list (not 327 or 331)	
16(a)	8	1		
16(b)	0.45 0.15	3	B2 for either 0.45 or 0.15 seen in table or M2 for $\frac{1-0.4}{4} \times k$ where $k=1$ or 3 so or M1 for $1-0.4$ If 0 scored SC1 for 2 answers that total 0.6	M2 seen or implied by 0.15 or 0.45 M1 seen or implied by 0.6
17(a)	42	2	M1 for $9+12+6+7+(9-6)+(12-7)$ oe or better or $2 \times (9+12)$ or better	M1 for e.g. $9+12+6+7+3+5$
17(b)	5.83 or 5.830 to 5.831	2	M1 for $(9-6)^2 + (12-7)^2$ oe or for $3^2 + k^2, k \neq 0$ or $j^2 + 5^2, j \neq 0$ oe or for $(\text{their } 3)^2 + (\text{their } 5)^2$ if <i>their</i> 3 and <i>their</i> 5 marked on diagram	For 2 marks accept $\sqrt{34}$ as final answer on answer line. Accept 6 or 5.8 for 2 marks if 5.83 or 5.830 to 5.831 seen in working. M1 implied by $3^2 + 5^2, 9 + 25, 34$

Question	Answer	Marks	Partial Marks	Guidance
17(c)	9.33 or 9.327....	3	B2 for 87 or M2 for $\sqrt{12 \times 9 - 7 \times 3}$ oe or $\sqrt{12 \times 6 + 5 \times 3}$ oe or $\sqrt{9 \times 5 + 7 \times 6}$ oe or M1 for $12 \times 9 - 7 \times 3$ oe or $12 \times 6 + 5 \times 3$ oe or $9 \times 5 + 7 \times 6$ oe If 0 scored SC1 for $\sqrt{\text{their area}}$	For 3 marks accept $\sqrt{87}$ as final answer on answer line. Accept 9 or 9.3 or 9.32 for 3 marks if 9.33 or 9.327.... seen in working. Working space for this part takes precedence however B2, M2 or M1 may be awarded for working seen in or by the diagram. For M2 and M1 accept (9 – 6) for 3, (12 – 7) for 5 Accept other alternative long methods for M2 or M1. Accept <i>their area</i> = k but not $k = 42$
18(a)	1, 5, 7, 7, 1	3	B2 for 3 correct B1 for 1 correct	
18(b)	Correct curve	4	B3FT for 7 points correctly plotted or B2FT for 5 points correctly plotted or B1FT for 3 points correctly plotted	Mark curve first. For 4 marks must not be ruled and must go above $y = 7$ and below $y = 7.5$ between $x = 1$ and $x = 2$. Correct curve must be continuous, parabolic in shape and close to symmetrical. Tolerance half a small square radially. Curve must not be vertical at $x = -2$ and $x = 5$ for more than 5 small squares.
18(c)	$(1.5, k)$ where $7 < k \leq 7.5$	1		

Question	Answer	Marks	Partial Marks	Guidance
18(d)	$[x =] -1.3$ to -1.1 [or $x =] 4.1$ to 4.3	2	FT <i>their</i> curve B1 for each	FT tolerance ± 0.05
19	Correct pie chart	4	B3 for one sector drawn of 126, 80 or 154 and 126 and 80 seen or B2 for one sector drawn of 126, 80 or 154 or for 126 and 80 seen or M1 for $\frac{35}{100} \times 360$ or $\frac{2}{9} \times 360$ or B1 for one accurate sector FT <i>their</i> seen values	Tolerance $\pm 2^\circ$. 2 sectors must be within tolerance for 4 marks. Ignore labels. M1 implied by 126 or 80
20	37.2 or 37.16 to 37.17	4	M3 for $\frac{25 \times 60 - 12 \times \pi \times 5^2}{25 \times 60} [\times 100]$ oe or $[100 -] \frac{12 \times \pi \times 5^2}{25 \times 60} \times 100$ oe or $\left(1 - \frac{12 \times \pi \times 5^2}{25 \times 60}\right) [\times 100]$ oe or M2 for $25 \times 60 - 12 \times \pi \times 5^2$ oe or $\left(\frac{12 \times \pi \times 5^2}{25 \times 60}\right)$ oe or M1 for 25×60 or $[12 \times] \pi \times 5^2$ soi	Accept 40 or 37 or 37.1 for 4 marks if 37.2 or 37.16 to 37.17 seen in working. M3 implied by 0.371 to 0.372 M3 implied by 62.8 to 62.9 M3 implied by 0.371 to 0.372 M2 implied by 557 to 558 M2 implied by 0.628 to 0.629 M1 implied by 1500 or 300 π or 942 to 943 or 25 π or 78.5 to 78.6

Question	Answer	Marks	Partial Marks	Guidance
21	17 09	3	B2 for 2 h 39 [min] or M1 for $\frac{106}{40}$ oe	Accept, for 3 marks, 5.09 pm or for example, 17:09, 17.09. B2 implied by final answer of 17h 09 or 1709pm or 17°09°. Accept, for B2, $2\frac{39}{60}$. M1 soi by 2.65, $2\frac{13}{20}$, $2\frac{26}{40}$, $\frac{53}{20}$, 159.
22	270	2	B1 for 270k as final answer or M1 for [54 =] $2 \times 3 \times 3 \times 3$ or 18×3 and [90 =] $2 \times 3 \times 3 \times 5$ or 18×5 or [54 =] 2,3,3,3 and [90 =] 2,3,3,5 or 2 correct factor trees or tables or a list of multiples of both 54 and 90 with at least 3 of each or $2 \times 3 \times 3 \times 3 \times 5$ oe or correct Venn diagram	[54],108,162, 216, 270 [90], 180, 270
23	625 675	2	B1 for each If 0 scored SC1 for both correct but answers reversed	
24	452 or 452.3 to 452.45	2	M1 for $4 \times \pi \times 6^2$ oe	Accept 144π for 2 marks as final answer on answer line. Accept 450 for 2 marks if 452 or 452.3 to 452.45 seen in working. M1 implied by 452.1 to 452.6 .
	cm ²	1		
25	$\sqrt{0.4}$	1		

Question	Answer	Marks	Partial Marks	Guidance
26	61.7 or 61.74 to 61.75	4	M2 for $(QR =) 23 \times \cos 44$ oe or M1 for $\cos 44 = \frac{QR}{23}$ oe M1FT for $(PR =) \text{their } QR \times \tan(31 + 44)$ oe OR M1 for $(RS =) 23 \times \sin 44$ oe M1 for $(PS =) \frac{23 \times \sin 31}{\sin(90 - 31 - 44)}$ oe M1FT dep for $RS + PS$ OR M1 for $(RS =) 23 \times \sin 44$ oe M1FT for $(QR =) \sqrt{23^2 - \text{their } RS^2}$ oe M1FT for $(PR =) \text{their } QR \times \tan(31 + 44)$ oe	Accept 60 or 62 or 61.8 for 4 marks if 61.7 or 61.74 to 61.75 seen in working M2 implied by 16.5 or 16.54... Allow 'QR' for <i>their</i> QR. M1 imp by 16.0 or 15.9 or 15.98 or 15.97... M1 imp by 45.8 or 45.7 or 45.77 or 45.76... dep on M1M1 M1 imp by 16.0 or 15.9 or 15.98 or 15.97... M1M1 imp by 16.5 or 16.54... Allow 'QR' for <i>their</i> QR. Accept other alternative methods.