Cambridge Assessment International Education

Cambridge IGCSE® (9–1)

MATHEMATICS **0980/04**

Paper 4 (Extended) **For examination from 2020**

MARK SCHEME

Maximum Mark: 130

Specimen

This document has **12** pages. 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 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.

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 mark, 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

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
nfww	not from wrong working
oe	or equivalent
SC	Special Case
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	48	**2**	**M1** for $\frac{72}{3}$
1(a)(ii)	32.4[0]	**1**	
1(a)(iii)	$\frac{13}{30}$	**2**	**M1** for $\frac{72 - \textit{their}\ \textbf{(ii)} - 8.4}{72}$ oe
1(a)(iv)	24	**3**	**M2** for $\frac{19.2}{0.8}$ oe or **M1** for recognising 19.2 is 80%
1(b)	660	**3**	**M2** for $\frac{550 \times 2 \times 10}{100} + 550$ oe or **M1** for $\frac{550 \times 2 \times 10}{100}$ oe
1(c)	663.9[0]	**2**	**M1** for 550×1.019^{10} oe
1(d)	1.5[0]	**3**	**M2** for $\sqrt[10]{\frac{638.3\,[0]}{550}}$ oe or **M1** for $550 \times m^{10} = 638.3[0]$

Question	Answer	Marks	Partial Marks
2(a)(i)	400	**1**	
2(a)(ii)	70	**2**	**M1** for upper quartile = 420 or lower quartile = 350
2(a)(iii)	405 to 410	**1**	
2(a)(iv)	170	**2**	**B1** for 30 seen
2(b)(i)	Mid-values 40, 80, 125, 200 soi	**M1**	
	Σfx with correct frequencies and x's in correct intervals or on boundaries of correct intervals	**M1**	
	÷ 200	**M1**	Dep on second **M1**
	106 nfww	**A1**	**SC2** for correct answer without working
2(b)(ii)	Correct histogram	**4**	**B1** for correct widths **and** **B1** for each rectangle of correct height at 0.8, 1.6, 1.6 (up to **B3**) After 0 scored, **SC1** for 3 correct frequency densities seen
2(b)(iii)	$\frac{3840}{10\,712}$ oe isw $\left[\frac{480}{1339}\right]$	**3**	**M2** for [2×] $\left(\frac{24}{104}\times\frac{80}{103}\right)$ oe or **M1** for $\frac{24}{104}, \frac{80}{103}$ seen

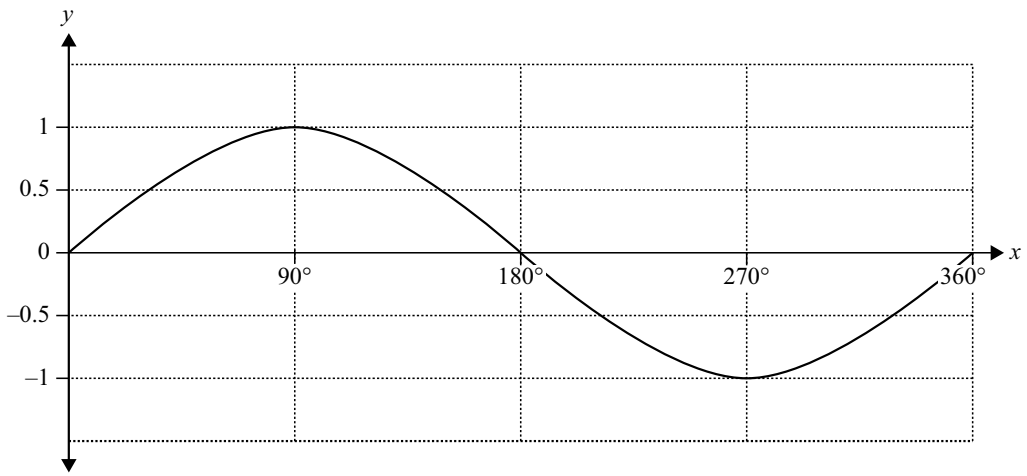
Question	Answer	Marks	Partial Marks
3(a)	9 10.5	**2**	**B1** for each
3(b)	Fully correct curve	**5**	**SC4** for correct curve, but branches joined **B3 FT** for 9 or 10 points plotted or **B2 FT** for 7 or 8 points plotted or **B1 FT** for 5 or 6 points plotted **and B1** for two separate branches not touching or cutting y-axis
3(c)	2.1 to 2.6 8.5 to 9	**2**	**B1** for each
3(d)	2, 3, 5, 7	**2**	**SC1** for correct 4 values and no more than one extra positive integer or ± 2, ± 3, ± 5, ± 7 or 3 correct values and no extras
3(e)	(– 2, – 12)	**1**	
3(f)(i)	$20 + x^2 = x^3$	**M1**	for multiplication by x
	$x^3 - x^2 - 20 = 0$	**A1**	for no errors or omissions
3(f)(ii)	Fully correct curve $y = x^2$	**2**	**SC1** for U-shaped parabola, vertex at origin
3(f)(iii)	3.1 to 3.6	**1**	
3(f)(iv)	3.[0] to 3.1 or **FT** *their* answer to **(f)(iii)**	**1**	**FT** dep on **(f)(iii)** > 0

Question	Answer	Marks	Partial Marks
4(a)(i)	Correct image (2, –5) (4, –5) (4, –2)	**2**	**SC1** for reflection in $y = 0$ or 3 correct points not joined
4(a)(ii)	Correct image (–3, 1) (–6, 1) (–6, –1)	**2**	**SC1** for rotation 90° clockwise any centre or 3 correct points not joined
4(b)	Translation by $\begin{pmatrix}1\\9\end{pmatrix}$	**2**	**B1** for each

Question	Answer	Marks	Partial Marks
5(a)(i)	$[y =] \frac{1}{2}(80 - 2x)$ oe	**M1**	for $40 - x$ is enough
	$A =$ *their* $\frac{1}{2}(80 - 2x) \times x$ oe	**M1**	for $\frac{1}{2}(80 - x)$ or $40 - 2x$ for *their* $\frac{1}{2}(80 - 2x)$
	$A = 40x - x^2$ and $x^2 - 40x + A = 0$	**A1**	for no errors or omissions
5(a)(ii)	$(x - 30)(x - 10)$	**B2**	**B1** for $x(x - 30) - 10(x - 30)$ [= 0] or $x(x - 10) - 30(x - 10)$ [= 0] or **SC1** for $(x + a)(x + b)$ where $ab = 300$ or $a + b = -40$
	30, 10	**B1**	
5(a)(iii)	$\sqrt{(-40)^2 - 4(1)(200)}$ or better	**B1**	Or for $(x - 20)^2$
	$p = --40$ and $r = 2(1)$	**B1**	Must see $\frac{p + \sqrt{q}}{r}$ or $\frac{p - \sqrt{q}}{r}$ or both or for $20 \pm \sqrt{200}$
	5.86 34.14	**B2**	If B0, **SC1** for 5.9 or 5.857 to 5.858 **and** 34.1 or 34.14… or 5.86 **and** 34.14 seen in working or –5.86 **and** –34.14 as final answers
5(b)(i)	$\frac{200}{x} - \frac{200}{x + 10}$	**M2**	Or **M1** for $\frac{200}{x}$ or $\frac{200}{x + 10}$ soi
	$\frac{200(x + 10) - 200x}{x(x + 10)} = \frac{2000}{x(x + 10)}$	**A1**	No errors or omissions
5(b)(ii)	16 (min) 40 (s)	**3**	**B2** for $0.2\dot{7}$ or 0.278 or 0.2777 to 0.2778 or $\frac{5}{18}$ [h] oe or $16.\dot{6}$ or 16.7 or 16.66 to 16.67 or $\frac{50}{3}$ [min] or **M1** for $2000 \div 80(80 + 10)$ or $\frac{200}{80} - \frac{200}{90}$

Question	Answer	Marks	Partial Marks
6(a)(i)	$\frac{1}{2}\mathbf{p}$	**1**	
6(a)(ii)	$\frac{1}{2}\mathbf{p} - \frac{1}{3}\mathbf{r}$	**1**	
6(a)(iii)	$\mathbf{p} + \frac{2}{3}\mathbf{r}$	**1**	
6(b)	$\mathbf{r} + \frac{3}{2}\mathbf{p}$	**2**	**M1** for correct unsimplified answer or for correct route or for recognising $\overrightarrow{OU}$ as position vector
6(c)	6 nfww	**3**	**B2** for $(2k)^2 + ([-]k)^2 = 180$ oe or **M1** for $(2k)^2 + ([-]k)^2$ oe

Question	Answer	Marks	Partial Marks
7(a)	2	**2**	**M1** for $2x + 1 = 1 + 4$
7(b)	$\frac{x-1}{2}$ oe final answer	**2**	**M1** for $y - 1 = 2x$ or $\frac{y}{2} = x + \frac{1}{2}$ or $x = 2y + 1$
7(c)	$4x^2 + 4x + 5$ final answer	**3**	**M1** for $(2x + 1)^2 + 4$ **and B1** for $[(2x + 1)^2 =] 4x^2 + 2x + 2x + 1$ or better
7(d)	$\sqrt{2}$ or 1.41 or 1.414....	**1**	
7(e)	–1	**1**	

Question	Answer	Marks	Partial Marks
8(a)	70.5 and 289.5	**4**	**B3** for one correct value or 2 correct values not rounded to 1 decimal place or **M2** for $\cos^{-1}\left(\frac{1}{3}\right)$ or **M1** for $\cos x = \frac{1}{3}$ If 0 scored **SC1** for two solutions which sum to 360°
8(b)		**2**	**B1** for correct shape but inaccurate amplitude or period

Question	Answer	Marks	Partial Marks
9(a)	45.[0] or 45.01 to 45.02 nfww	**4**	**M2** for $55^2 + 70^2 - 2 \times 55 \times 70 \cos 40$ or **M1** for correct implicit equation **A1** for 2026.[...]
9(b)	84.9 or 84.90 to 84.91	**4**	**B1** for angle $BDC = 40$ soi **M2** for $\frac{70 \sin(\textit{their } 40)}{\sin 32}$ or **M1** for correct implicit equation
9(c)	4060 or 4063 to 4064 nfww	**3**	**M2** for $\frac{1}{2}(55 \times 70 \sin 40)$ $+ \frac{1}{2}(70 \times \textit{their}$ **(b)** $\sin(180 - \textit{their } 40 - 32))$ oe or **M1** for correct method for one of the triangle areas
9(d)	35.4 or 35.35... nfww	**2**	**M1** for $\sin 40 = \frac{\text{distance}}{55}$ or better or for $= \frac{1}{2}(55 \times 70 \sin 40) = (70 \times \text{distance}) \div 2$ or better

Question	Answer	Marks	Partial Marks
10(a)	14 137 to 14 137.2 or 14 139	**2**	**M1** for $\frac{4}{3} \times \pi \times 15^3$
10(b)(i)	104 000 or 103 600 to 103 700	**3**	**M2** for $\pi \times 25^2 \times 60 - 14\,140$ or **M1** for $\pi \times 25^2 \times 60$ **FT** $\pi \times 37\,500 = 117\,809. \ldots$ allow *their* answer as long as it rounds to 14 140
10(b)(ii)	52.8 or 52.75 to 52.81…	**2**	**M1** for *their* **(b)(i)** $\div (\pi \times 25^2)$ or $14\,140 \div (\pi \times 25^2)$ **FT** $\pi \times 25^2 = 1963\ldots$ (allow use of *their* answer as long as it rounds to 14 140) or 7.198 to 7.201…
10(c)	$\sqrt{(5x)^2 + (12x)^2}$	**M1**	
	[slant height =] $13x$	**A1**	
	$\pi(5x)^2$ or $\pi(5x)(13x)$	**M1**	Accept $25\pi x^2$
	$\pi(5x)^2 + \pi(5x)(13x) = 4\pi r^2$	**M1**	
	$r^2 = \frac{90\pi}{4\pi}x^2 = \frac{45}{2}x^2$	**A1**	With all steps shown and no errors seen

Question	Answer	Marks	Partial Marks
11(a)	(0, 16) (4, –16)	**6**	**M1** for $3x^2$ or $12x$ **A1** correct $3x^2 - 12x$ **B1** setting *their* $dy/dx = 0$ **M1** for factorising *their* dy/dx **A1** $x = 0$ and $x = 4$ **A1** (0, 16) and (4, –16)
11(b)	(0, 16) maximum with correct reason (4, –16) minimum with correct reason	**3**	**B2** for both correct with no/one reason or **B1** for one correct (with no reasons) or **M1** correct attempt to find e.g. second derivative or gradients

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