

8300

GCSE MATHEMATICS

Foundation tier – Questions by Topic – Mark Scheme

Number

Compound interest calculations

v1.0

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. e.g. accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
3.14...	Allow answers which begin 3.14 e.g. 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q1.

$$\frac{10}{100}$$

$$100 \times 200\,000 \text{ or } 20\,000$$

$$\text{or } 1.1 \times 200\,000 \text{ or } 220\,000$$

$$\text{or } 1.1^2 \times 200\,000 \text{ or } 1.21 \times 200\,000$$

oe

$$242\,000$$

SC1 for 240 000

M1

A1

[2]

Q2.

$$\frac{20}{100}$$

$$\times 50 \text{ or } 10$$

oe

$$2$$

SC1 for 32

M1

A1

[2]

Q3.

$$1 + \frac{5.1}{100} \text{ or } 1.051 \text{ or } 105.1\%$$

$$\frac{100 + 5.1}{100}$$

oe eg

may be implied by a correct value after one year of their chosen house value

M1

$$1.051^{14} \text{ and } [2, 2.01]$$

may be implied by a correct value after 14 years of their chosen house value

A1

Additional Guidance

(house value =) 100 000 and (value after 1 year =) 105 100

M1

(house value =) 100 000 and (value after 14 years =) [200 600, 200 650]

M1A1

$$\left(1 + \frac{5.1}{100}\right)^{14} = 2.006$$

M1A1

Do not allow a misread of 5.1%

eg1 1.05

M0

eg2 1.052

M0

[2]

Q4.

1 – 0.04 or 0.96
or $0.04 \times 1\,000\,000$ or 40 000
or 960 000

$oe\ eg\ 1 - \frac{4}{100}$
1 040 000 implies M1

M1

Full method for exactly 5 compounded percentage calculations with their multiplier
oe eg $1\,000\,000 \times their\ 0.96^5$

M1

[800 000, 820 000] with M2 awarded

A1

Additional Guidance

815 372.(...) or 815 373 with M2 awarded

M1M1A1

Answer 800 000 from $40\,000 \times 5$

M1M0A0

Answer 800 000 without either 40 000 shown or M2 awarded

M0M0A0

Intermediate values for separate calculations are
960 000, 921 600, 884 736, 849 346.(...)

[3]

Q5.

100(%) – 20(%) or 80(%)
or 1 – 0.2 or 0.8

Implied by 7200

M1

9000×0.80^4

oe
eg 9000×0.80 or 7200
and their 7200×0.80 or 5760
and their 5760×0.80 or 4608
and their 4608×0.80

M1

3686(.40)

Accept 3686 with full method seen

A1

[3]

Q6.

(a) $£2500 \times 1.029^3$

B1

(b) **Alternative method 1**

[2723.86, 2723.90]

ft their part (a)

B1ft

2500×1.035 or $2587.5(0)$

oe

M1

$2500 \times 1.035 \times 1.023 \times 1.023$

or $2587.5(0) \times 1.023 \times 1.023$

or [2707.89, 2707.9(0)]

oe

M1dep

[2723.86, 2723.90]

and [2707.89, 2707.9(0)] and Daniel's.

oe

ft their part (a)

A1ft

Alternative method 2

1.029^3 or 1.089(547) or 1.090

M1

1.035 or 1.023^2 seen

M1

1.035×1.023^2 or 1.083(1575...)

M1dep

1.089(547) and 1.083 and Daniel's

A1

Additional Guidance

Note incorrect answers from part (a) for Alt 1

$£2500 \times 2.9 \times 3 = £21750$

$£2500 \times 2.9^3 = £60972.5(0)$

$£2500 \times 1.029 \times 3 = £7717.5(0)$

[5]

Q7.

(a) **Alternative method 1**

1.025 seen

or 6000×1.025

or 6150

M1

$6000 \times 1.025^2 = 6303.75$

oe

eg 6150×1.025 method **must** be shown

A1

Alternative method 2

0.025×6000 or 150

or 6150

or 0.025×6150

or 153.75

M1

$6000 + 150 + 153.75 = 6303.75$

A1

Additional Guidance

Allow £6303.75p

M1A1

(b) 6303.75×1.024

or 6303.75×0.024

or 151.29

or 151.30

oe

M1

$6303.75 + \text{their } 151.29$

or 6455.04

M1dep

their 6455.04×0.0235

oe

M1dep

151.693... or 151.69 or 151.70

and 151.29 or 151.30

and More

A1

[6]

Q8.

Alternative method 1

6000×1.03 or 6180

or 6000×0.03 or 180

or 6000×1.01 or 6060

or 6000×0.01 or 60

6000×1.05 or 6300

6000×0.05 or 300

M1

their 6180×1.03 or 6365.4(0)

or their 6180×0.03 or 185.4(0)

or 365.4(0)

or their 6060×1.05 or 6363

or their 6060×0.05 or 303 or 363

6000×1.03^2 or 6000×1.0609

or $6000 \times 1.01 \times 1.05$

or 6000×1.0605

or 6300×1.01

or 6300×0.01 or 63

M1dep

6365.4(0) and 6363 and No

or 365.4(0) and 363 and No *accept 2.4(0) difference to imply 'No'*

A1

Alternative method 2

1.03 or 1.01 or 1.05

M1

1.03^2 or 1.03×1.03 or 1.0609

or 0.0609 or 6.09(%)

or 1.01×1.05 or 1.0605

or 0.0605 or 6.05(%)

M1dep

1.0609 and 1.0605 and No

or 0.0609 and 0.0605 and No

or 6.09(%) and 6.05(%) and No

accept 0.0004 difference to imply 'No'

accept 0.04(%) difference to imply 'No'

A1

Additional Guidance

Accept any clear indication that the Offer 1 amount is different to the Offer 2 amount for 'No'

If build up methods are used they must be complete

6000×0.03^2 implies 6000×0.03

M1

1.03^3 implies 1.03

M1

360 without 180 seen (simple interest)

M0

If a different starting value is used, apply Alt 2 with correctly evaluated answers e.g.

M1M1A1

$600 \times 1.03^2 = 636.54$

$600 \times 1.01 \times 1.05 = 636.30$

No, pay less with Offer 1 (condone incorrect choice of Offer 1)

M1M1A1

$500 \times 1.03 = 515$ $515 \times 1.03 = 530.45$

$500 \times 1.01 = 505$ $505 \times 1.05 = 530.25$

No, they are different

[3]

Q9.

120 000 $\times$ 1.05 or 126 000

oe eg 120 000 + 0.05 $\times$ 120 000

may be implied by eg 144 000

M1

120 000 $\times$ 1.05⁴

583 443

or 4

oe eg their 126 000 $\times$ 1.05 or 132 300

and

their 132 300 $\times$ 1.05 or 138 915

and

their 138 915 $\times$ 1.05

M1dep

145 860(.75) or 145 860.8(0)

or 145 861 or 145 900

or 146 000

if no value given implied by M2 seen and 150 000

A1

150 000

ft any answer seen with > 2sf

condone 150 000.00

B1ft

Additional Guidance

126 000 $\times$ 1.05³

M1M1

Answer only

145 860(.75) or 145 860.8(0) or 145 861 or 145 900 or 146 000

M1M1A1B0

Answer only 150 000

Zero

For year on year working allow rounding/truncation if method shown for up to M2A0B1ft

eg 126 000 $\times$ 1.05 = 132000

M1

and 132 000 $\times$ 1.05 = 138 000

and 138 000 $\times$ 1.05 = 144 900 Answer 140000

M1A0B1ft

120 000, 126000, 132 000, 138 000, 144 000 with no method shown does not imply truncation, this is just adding on 6 000 each year

M1M0A0

120 000 + 4 $\times$ 0.05 $\times$ 120 000 or 120 000 + 0.2 $\times$ 120 000 implies M1

M1M0A0

Misreads can score up to M2A0B1ft

Treat calculating 5 years as a misread but otherwise the wrong number of years

eg 120 000 $\times$ 1.05² will score a maximum of M1M0A0B1ft

[4]

Q10.

$2 \times 12 \times 150 \times 1.025$
or $24 \times 150 \times 1.025$
or 3690

Investment A

oe

or $2 \times 12 \times 150 \times 0.025$
or $24 \times 150 \times 0.025$
or 90

M1

1.03×3500
or 3605

Investment B

oe

eg $0.03 \times 3500 + 3500$ or $105 + 3500$

May be implied from $1.03^2 \times 3500$

M1

$1.03^2 \times 3500$
or $1.03 \times$ their 3605
or 1.0609×3500
or 3713(.15)

oe

Dependent on 2nd M1

or $0.03 \times$ their 3605
or 108(.15)

M1dep

23.15

Condone £23.15p

A1

Additional Guidance

If build up methods are used they must be complete

1% – 35

3% = 95 (error without showing method)

95 + 3500 or 3595

M0

1% = 35

3% = $35 \times 3 = 95$ (error but correct method shown)

95 + 3500 or 3595

M1

$1.03^3 \times 3500$ (full method incorrect but implies 1.03×3500)

M0M1M0

[4]

Q11.

Alternative method 1

$(600 \times) 0.8$ or 480

oe

M1

600×0.8^2 or 384

or 600×0.8^3 or 307.2(0)

or 600×0.8^4 or 245.76

or 600×0.8^5 or [196, 197]

M1dep

[196, 197] and incorrect

oe eg 196.61 and no

196.61 still owed

A1

Alternative method 2

600×0.2 or 120

oe

M1

120×0.8 or 96

or 96×0.8 or 76.8(0)

or $76.8(0) \times 0.8$ or 61.44

or 61.44×0.8 or [49.15, 49.16]

oe eg $(600 - 120) \times 0.2$

or 480×0.2

M1dep

[403, 404] and incorrect

oe eg paid off 403.39(2)

A1

Alternative method 3

0.8

M1

0.8^5 or 0.327 68 or 0.3277

or 0.328 or 0.33

M1dep

0.327 68 (or 0.3277 or 0.328

or 0.33) and incorrect

oe

A1

Additional Guidance

Ignore units

Full marks can be awarded for a correct explanation eg 120 and 96 calculated with a comment 'as soon as the payment is below 120 a month it cannot be paid off in five months'

[3]

Q12.

100(%) – 20(%) or 80(%)

or 1 – 0.2 or 0.8

Implied by 6400

M1

8000 × 0.8⁵

oe

eg 8000 × 0.8 or 6400

and their 6400 × 0.8 or 5120

and their 5120 × 0.8 or 4096

and their 4096 × 0.8 or 3276(.80)

and their 3276(.80) × 0.8

M1

2621(.44)

Accept 2600 or 2620 with full method seen

A1

[3]

Q13.

(a) £1500 × 1.016²

B1

Alternative method 1

[1548.38, 1548.39]

ft their part (a)

B1ft

1500 × 1.018 or 1527 *oe*

M1

1500 × 1.018 × 1.013

or 1527 × 1.013

or [1546.85, 1546.86] *oe*

M1dep

[1548.38, 1548.39]

and [1546.85, 1546.86] and Dev's *oe*

ft their part (a)

A1ft

Alternative method 2

1.016² or 1.032(256) or 1.0323

M1

1.018 or 1.013 *seen*

M1

1.018 × 1.013 or 1.031(234)

M1dep

1.032(256) and 1.031 and Dev's

A1

Additional Guidance

Note incorrect answers from part (a) for Alt 1

£1500 × 1.6 × 2 = £4800

£1500 × 1.6² = £3840

£1500 × 1.016 × 2 = £3048

[5]

Q14.**(a) Alternative method 1**

1.015 seen
 or 4000×1.015
 or 4060

M1

$$4000 \times 1.015^2 = 4120.90$$

A1**Alternative method 2**

0.015×4000 or 60
 or 4060
 or 0.015×4060 or 60.9

M1

$$4000 + 60 + 60.9 = 4120.90$$

A1**Additional Guidance**

Allow £4120.90p

M1A1

- (b)** 4120.9×1.014
 or 4120.9×0.014 or 57.6926
 or 57.69 or 57.70 oe

M1

4120.9 + their 57.6926
 or 4178.5926

M1dep

their 4178.5926×0.0135 oe

M1dep

56.4110001 or 56.41 or 56.42
 and 57.6926 or 57.69 or 57.70
 and Less

A1**[6]****Q15.**

$$100(\%) - 14(\%) \text{ or } 86(\%) \text{ or } 1 - 0.14 \text{ or } 0.86$$

Implied by 87 139(.5)

M1

$101\,325 \times 0.86^4$ oe
*eg $101\,325 \times 0.86$ or $87\,139(.5)$
 and their $87\,139(.5) \times 0.86$ or $74\,939(.97)$
 and their $74\,939(.97) \times 0.86$ or $64\,448(.3742)$
 and their $64\,448(.3742) \times 0.86$*

A1

55 425(...)

May be implied by 55 000 or 55 400 or 55 430 or 55 426

A1

55 000

ft their answer rounded to 2sf

B1ft**[4]**