AQA

# GCSE
# MATHEMATICS

**2023 PRACTICE PAPER SET 2** Higher Tier Paper 1

Mark Scheme

8300/1H

Version 1.1

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from aqa.org.uk

# 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.<br>eg 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 eg 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.

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 1 | $x^2$ or $3x$ | M1 | |
| | $x^2 + 3x$ | A1 | |
| 2 | $6.16 \times 10^4$ | B1 | |
| 3 | $\frac{1}{20}$ | B1 | |
| 4 | $n + 1$ | B1 | |
| 5 | A pair of intersecting arcs of equal radii from ends of line with two intersections | M1 | oe |
| | Perpendicular line drawn through points of intersection | A1 | 1 mm tolerance |
| 6 | **Alternative method 1** | | |
| | radius = $12 \div 4$ or 3<br>or diameter = $12 \div 2$ or 6<br>or $12 \times 6$ or 72 | M1 | |
| | $\pi \times$ their $3^2$ or $9\pi$ | M1 | |
| | $2 \times \pi \times$ their $3^2$ or $18\pi$ | M1dep | |
| | $72 - 18\pi$ | A1 | Ignore attempts at factorisation<br>Do not ignore further work |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 6 cont | **Alternative method 2** | | |
| | radius = 12 ÷ 4 or 3<br>or diameter = 12 ÷ 2 or 6<br>or 6 × 6 or 36 | M1 | |
| | $\pi \times$ their $3^2$ or $9\pi$ | M1 | |
| | $36 - 9\pi$ | M1dep | |
| | $2(36 - 9\pi)$ | A1 | Ignore attempts at expansion<br>Do not ignore further work |
| | **Additional Guidance** | | |
| | $72 - 18\pi = 54\pi$ | | M1M1M1A0 |
| | $72 - 18\pi = 9(8 - 3\pi)$ (error in factorisation) | | M1M1M1A1 |
| | Accept 3.14 or better for $\pi$ for method marks | | |
| 7 | 12 ÷ 3 or 4 | M1 | |
| | 4 × 7 or 28 | M1dep | |
| | 40 | A1 | SC1 50 |
| 8(a) | 180 – 125 or 55 | M1 | |
| | 125 ÷ 50<br>or 2.5 or 2h 30 minutes | M1 | oe |
| | their 55 ÷ 60 or 11/12 h or 55 min | M1dep | Dependent on 1st M1 or subtracting 25 from their distance<br>oe |
| | 3 hours and 25 minutes | A1 | 205 mins |
| 8(b) | (The journey will) take longer | B1 | oe |
| | **Additional Guidance** | | |
| | More time | B1 | |
| | (The journey will) be slower | B0 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 9 | $\frac{20}{32}$ or $\frac{15}{24}$ | B1 | oe<br>0.625<br>or 62.5% |
| | A correct probability from each bag, with attempt at a comparable form, with at least one correct | M1 | eg denominator same for both<br>$\frac{60}{96}$ twice , $\frac{5}{8}$ twice oe<br>or 0.625 twice<br>or 62.5% twice |
| | No ticked **AND** both probabilities correct<br>and in the same format | A1 | eg<br>No<br>both the same with the correct value given |
| | **Additional Guidance** | | |
| | if same ratio (e.g. 5:3 or 3:5) seen for both and tick NO | | B1M1A1 |
| 10 | $\sqrt{30} > 5$ | B1 | oe May be implied by numerator is negative |
| | negative ÷ positive = negative<br>and No | B1 | |
| 11 | $\frac{10}{100}$ × 200 000 or 20 000<br>or 1.1 × 200 000 or 220 000<br>or $1.1^2$ × 200 000 or 1.21 × 200 000 | M1 | oe |
| | 242 000 | A1 | SC1 240 000 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 12 | **Alternative method 1** | | |
| | $6^2 + 8^2$<br>or 36 + 64<br>or 100 | M1 | |
| | $\sqrt{8^2+6^2}$ or $\sqrt{100}$ | M1dep | oe |
| | $\sqrt{100}$ = 10 = diameter | A1 | oe<br>eg the diagonal of the rectangle is equal to the diameter<br>two intersecting diagonals of length 10 cm touch the outside of circle so all rectangles whose diagonal is of length10 cm can be cut from the circle |
| **13** | 4 | B1 | |
| **14** | $5x^2 - 15x + 2x - 6$<br>or $5x^2 - 13x - 6$ | M1 | 4 terms with at least 3 correct<br>or 3 terms with at least 2 correct |
| | $5x^2 + (a$ – their 13$)x$ – their 6 + $b$<br>or $a$ – their 13 = –16<br>or $b$ – their 6 = 7 | M1 | |
| | $a = -3$ | A1 | |
| | $b = 13$ | A1 | |
| | **Additional Guidance** | | |
| | $a$ – their 13 = –16, $a = -3$ | | M1A1 |
| | $a$ – their 13 = –16, $a = -3$ and $b - 6 = 7$, $b = 13$ | | M1A1M1A1 |
| | $-3x + 13$ | | M1A1M1A1 |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **15** | $1\frac{5}{6} \div 4\frac{1}{8}$<br>or $\frac{11}{6}$ and $\frac{33}{8}$ | M1 | oe<br>eg $\frac{44}{24}$ and $\frac{99}{24}$ |
| | $\frac{11}{6} \div \frac{33}{8}$<br>or $\frac{11}{6} \times \frac{8}{33}$ or $\frac{8}{18}$ | M1 | oe unsimplified correct fraction |
| | $\frac{4}{9}$ | A1 | |
| **16** | 3 | B1 | |
| | $\frac{1}{2^2}$ or $\frac{1}{4}$ or 0.25 | M1 | $\frac{3}{4}$ scores B1M1 |
| | 0.75 | A1 | |
| **17(a)** | Probability of red(and/or blue) is not $\frac{1}{3}$<br>or<br>Probability of red is $\frac{1}{4}$ | B1 | oe |
| | He should multiply the answer by 2 | B1 | Any statement implying there are two ways the outcome is satisfied |
| **17(b)** | $\sqrt{\frac{25}{81}}$ or $\frac{\sqrt{25}}{\sqrt{81}}$ or $\frac{5}{9}$ | M1 | |
| | 360 × their $\frac{5}{9}$ | M1dep | oe |
| | 200 | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **18** | $\frac{16x+12}{12}$ or $\frac{6x-15}{12}$<br>or $16x + 12$ and $6x - 15$ | M1 | oe<br>Eg with brackets in the numerator |
| | $\frac{16x+12}{12}+\frac{6x-15}{12} = \frac{22x-3}{12}$ | A1 | |
| **19** | 10 | B1 | |
| **20** | $\frac{1}{2}$ | B1 | oe |
| **21** | **Alternative method 1** | | |
| | $10x = 3.666..$<br>and<br>$9x = 3.3$ | M1 | oe method $100x = 36.66…$<br>and<br>$99x = 36.3$ |
| | $\frac{33}{90}$ | M1 | oe fraction $\frac{363}{990}$ |
| | $\frac{11}{30}$ | A1ft | Correct simplification of their fraction and M1 scored |
| | **Alternative method 2** | | |
| | $0.3 + 0.066… = \frac{3}{10} + 0.066…$<br>and<br>$100x = 6.66…$<br>and<br>$99x = 36.3$ | M1 | oe method |
| | $\frac{297}{990}+\frac{66}{990}$ or $\frac{363}{990}$ | M1 | oe fractions |
| | $\frac{11}{30}$ | A1ft | Correct simplification of their fraction and M1 scored |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **21 cont** | **Alternative method 3** | | |
| | $\frac{3}{10}+\frac{6}{90}$ | M1 | oe method |
| | $\frac{27}{90}+\frac{6}{90}$ or $\frac{33}{90}$ | M1 | oe fractions with common denominator |
| | $\frac{11}{30}$ | A1ft | Correct simplification of their fraction and M1 scored |
| **22** | 54 ÷ 6 (× 5) or 9 or 45 | M1 | oe |
| | 45 in V only and 9 in P only | A1 | |
| | their 45 + $x$ = 4(their 9 + $x$) or<br>their 45 + $x$ = their 36 + 4$x$ | M1 | oe any letter |
| | 3 in V and P | A1ft | ft their 45 and their 9<br>Award if V total = 4 × P total |
| | 18 not in V or P | B1ft | ft their 45 and their 9 and 3<br>Award if the four values total 75 |
| **23** | **Alternative method 1** | | |
| | 600 ÷ 1.2 or 500<br>or<br>528 ÷ 1.2 or 440 | M1 | oe |
| | their 500 – their 440<br>or<br>60 | M1 | cost of helmet before VAT |
| | 60 × 0.2<br>or<br>60 × 1.2 or 12 or 72 | M1 | |
| | $\frac{12}{600}\times 100$ | M1 | oe |
| | 2(%) | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **23 cont** | **Alternative method 2** | | |
| | 600 – 528 or 72 | M1 | |
| | 72 ÷1.2<br>or<br>60 | M1 | |
| | their 72 – their 60<br>or<br>12 | M1 | |
| | $\frac{12}{600}\times 100$ | M1 | |
| | 2(%) | A1 | |
| **24(a)** | 1 – 1 = 0<br>and<br>After 1 it's all 0s | B1 | oe<br>Do not accept a list of zeros |
| **24(b)** | 1 – (–1) = 2 | B1 | oe |
| | 4 – 2 = 2<br>and<br>After –1 it's all 2s | B1 | oe<br>Do not accept a list of twos |
| **24(c)** | $1-\sqrt{2}-\sqrt{2}+2$<br>or<br>$1-2\sqrt{2}+2$<br>or<br>$3-2\sqrt{2}$ | M1 | Allow one error with four terms |
| | $2-\sqrt{2}$ | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 25 | **Alternative method 1** | | |
| | $\left(\frac{10}{\sqrt{2}} =\right) \frac{10\sqrt{2}}{2\sqrt{2}}$ or $\frac{10\sqrt{2}}{2}$ or $5\sqrt{2}$ | M1 | |
| | $\left(\sqrt{18} =\right) 3\sqrt{2}$ | M1 | |
| | $8\sqrt{2}$ or $a = 8, b = 2$ | A1 | |
| | **Alternative method 2** | | |
| | $\frac{10+\sqrt{36}}{\sqrt{2}} \quad \left(=\frac{16}{\sqrt{2}}\right)$ | M1 | |
| | $\frac{16}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or $\frac{16\sqrt{2}}{2}$ | M1 | |
| | $8\sqrt{2}$ or $a = 8, b = 2$ | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| 26 | **Alternative method 1** | | |
| | $y = 2x - 5$ | M1 | |
| | $x^2 - 2(2x - 5) = 31$<br>or<br>$x^2 - 4x + 10 = 31$ | M1 | Eliminating a variable<br>oe |
| | $x^2 - 4x - 21 = 0$ | A1 | Collecting terms |
| | $(x + 3)(x - 7)$ (= 0) | M1 | Correct and accurate method to solve their 3-term quadratic equation<br>$\frac{4 \pm \sqrt{(-4)^2 - 4 \times 1 \times (-21)}}{2 \times 1}$ |
| | $x = -3$ and $x = 7$<br>or<br>$x = -3$ and $y = -11$<br>or<br>$x = 7$ and $y = 9$ | A1 | |
| | $x = -3$, $y = -11$ and $x = 7$, $y = 9$ | A1 | |
| | **Alternative method 2** | | |
| | $4x = 2y + 10$ | M1 | Equating coefficients |
| | $x^2 - (4x - 10) = 31$ | M1 | Eliminating a variable<br>oe |
| | $x^2 - 4x - 21 = 0$ | A1 | Collecting terms |
| | $(x + 3)(x - 7)$ (= 0) | M1 | Correct and accurate method to solve their 3-term quadratic equation<br>$\frac{4 \pm \sqrt{(-4)^2 - 4 \times 1 \times (-21)}}{2 \times 1}$ |
| | $x = -3$ and $x = 7$<br>or<br>$x = -3$ and $y = -11$<br>or<br>$x = 7$ and $y = 9$ | A1 | |
| | $x = -3$, $y = -11$ and $x = 7$, $y = 9$ | A1 | |

| Q | Answer | Mark | Comments |
|---|---|---|---|
| **26 cont** | **Alternative method 3** | | |
| | $x = \frac{y+5}{2}$ | M1 | |
| | $\left(\frac{y+5}{2}\right)^2 - 2y = 31$ | M1 | Eliminating a variable<br>oe |
| | $y^2 + 2y - 99 = 0$ | A1 | Collecting terms |
| | $(y + 11)(y - 9)$ (= 0) | M1 | Correct and accurate method to solve their 3-term quadratic equation<br>$\frac{-2 \pm \sqrt{(2)^2 - 4 \times 1 \times (-99)}}{2 \times 1}$ |
| | $y = -11$ and $y = 9$<br>or<br>$x = -3$ and $y = -11$<br>or<br>$x = 7$ and $y = 9$ | A1 | |
| | $x = -3$, $y = -11$ and $x = 7$, $y = 9$ | A1 | |
| **27** | Angle *BCA* = 36°, *CBA* is a right-angle<br>180 – 90 – 36 = 54 | M1 | Angles may be on diagram |
| | ($x$ =) 54° | A1 | |
| | Angle *CAD* = 180 – 36 – 95 = 49 | B1 | Angles may be on diagram |
| | 90 – 49<br>($y$ =) 41° | B1ft | |