General Certificate of Secondary Education
November 2021

Mathematics

M2
(With calculator)
Foundation Tier

[GMC21]

MONDAY 29 NOVEMBER, MORNING

MARK
SCHEME

GCSE MATHEMATICS

Introduction

The mark scheme normally provides the most popular solution to each question. Other solutions given by candidates are evaluated and credit given as appropriate; these alternative methods are not usually illustrated in the published mark scheme.

The marks awarded for each question are shown in the right hand column and they are prefixed by the letters **M**, **W** and **MW** as appropriate. The key to the mark scheme is given below:

M   indicates marks for correct method.

W   indicates marks for working.

MW   indicates marks for combined method and working.

The solution to a question gains marks for correct method and marks for an accurate working based on this method. Where the method is not correct no marks can be given.

A later part of a question may require a candidate to use an answer obtained from an earlier part of the same question. A candidate who gets the wrong answer to the earlier part and goes on to the later part is naturally unaware that the wrong data is being used and is actually undertaking the solution of a parallel problem from the point at which the error occurred. If such a candidate continues to apply correct method, then the candidate's individual working must be followed through from the error. If no further errors are made, then the candidate is penalised only for the initial error. Solutions containing two or more working or transcription errors are treated in the same way. This process is usually referred to as "follow-through marking" and allows a candidate to gain credit for that part of a solution which follows a working or transcription error.

Positive marking:

It is our intention to reward candidates for any demonstration of relevant knowledge, skills or understanding. For this reason we adopt a policy of **following through** their answers, that is, having penalised a candidate for an error, we mark the succeeding parts of the question using the candidate's value or answers and award marks accordingly.

Some common examples of this occur in the following cases:

(a) a numerical error in one entry in a table of values might lead to several answers being incorrect, but these might not be essentially separate errors;

(b) readings taken from candidates' inaccurate graphs may not agree with the answers expected but might be consistent with the graphs drawn.

When the candidate misreads a question in such a way as to make the question easier only a proportion of the marks will be available (based on the professional judgement of the examining team).
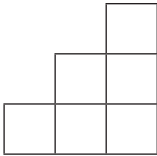
General Marking Advice

(i)   If the correct answer is seen in the body of the script and the answer given in the answer line is clearly a transcription error, full marks should be awarded.

(ii) If the answer is missing, but the correct answer is seen in the body of the script, full marks should be awarded.

(iii) If the correct answer is seen in working but a completely different answer is seen in the answer space, then some marks will be awarded depending on the severity of the error.

(iv) Work crossed out but not replaced should be marked.

(v)   In general, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered (with no solution offered on the answer line), mark the poorest answer.

(vi) For methods not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work.

(vii) Where a follow-through mark is indicated on the mark scheme for a particular part question, the marker must ensure that you refer back to the answer of the previous part of the question.

(viii) Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures seen, e.g. the answer in the mark scheme is 4.65 and the candidate then correctly rounds to 4.7 or 5 on the answer line. Allow full marks for 4.65 seen in the working.

(ix) Anything in the mark scheme which is in brackets (...) is not required for the mark to be earned, but if present it must be correct.

(x)   For any question, the range of answers given in the mark scheme is inclusive.

COVID-19 Context
Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

1 (a) −570 , −190 , 65 , 230 , 460
   (or Jonny, Jason, Sara, Bernie, Wendy) A2

(b) −70 .... A1

(c) 800 .... A1 4

2 (a) 37 .... A1

(b) 165 ÷ 6 .... M1 A1
   27.5 .... A1

(c) 25.5 .... A1 5

3 (a) Propeller A1

(b) Anchor A1

(c) Lifebuoy and Wheel A1 3

4 (a) evidence of 40% or 0.4 .... MA1

   Yes because 40% is greater than 35% A1

(b) 15 × 4 .... MA1
   60 .... A1 4

5 26 × 45.50 = 1183 .... M1 A1
   1183 + 300 = 1483 .... MA1 3

6 (a) (2 × 4) + (2 × 2.5) MA1
   13 .... A1

(b) 19.9 − 12.2 = 7.7   or 19.9 = 2 × 6.1 + 2w or 19.9 = 12.2 + 2w ... MA1
   7.7 ÷ 2   or 7.7 = 2w MA1
   3.85 .... A1 5

7 (a) 15 .... A1

(b) 5 × 2 × 3 .... M1
   30 .... A1 3

8 200 − (3 × 16.75) = 149.75 .... MA1
   149.75 ÷ 12.30 = 12.17...... .... MA1
   12 .... A1 3

9 (a) $180 - 90 - 64$ or $90 - 64$ M1
$= 26$ A1

(b) $180 - 26 = 154$ MA1

$\dfrac{180 - 154}{2}$ M1

$= 13$ A1   5

10 $11 \times 4.30 = 47.30$ MA1
$66.55 - 47.30 = 19.25$ MA1
$19.25 \div 7$ MA1
2.75 A1   4

11 (a) Correct side elevation   A2

(b) 16   A1   3

12 3 outside circles   A1
4 in overlap   A1
2 in Music only   A1   3

13 40 people $= 360°$ so 1 person $= 9°$ MA1
$45° = 5$ people and $108° = 12$ people   MA1
$5 + 12 + 7 + 10 = 34$ people   MA1
6 people $= 54°$ MA1   4

alternative solution

40 people $= 360°$ so 1 person $= 9°$ MA1
7 people $= 63°$ and 10 people $= 90°$ MA1
$63 + 90 + 45 + 108 = 306°$ MA1
$360 - 306 = 54°$ MA1

14 $28 \times 22 = 616$ MA1

$\pi \times 8^2$ M1
$= 201.06(19298)$ A1

$616 - 201.06 = 414.94 \, \text{m}^2$ A1 A1 (units)   5

15 (a) 15% of 75 = 11.25   MA1
       75 – 11.25   MA1
       63.75   A1

(b) 20% of 63.75 = 12.75   MA1
       63.75 – 12.75 = 51   A1

(c) 35% of 75 = 26.25 and 75 – 26.25 = 48.75   MA1
       No, not equal to 51   A1   **7**

16 (a) data is not in order   A1

(b)
0.3	2 6 9
0.4	3 8 9
0.5	1 2 2 4 4
0.6	0 2 4 8

       A2

(c) data is now in order
    (data is easier to read or other correct alternatives)   A1

(d) 0.52   A1   **5**

17 any class correctly changed to a percentage   MA1

   85%   87.5%   86.36%   (accept decimals)   MA1

   B   A1   **3**

18 attempt to change to common denominator and add   MA1

$\frac{2}{5} + \frac{1}{4} + \frac{3}{20} = \frac{16}{20}$ or equivalent   A1

$1 - \frac{16}{20} = \frac{4}{20}$ or $\frac{1}{5}$ or equivalent   A1   **3**

alternative solution

$\frac{2}{5}$ of 400 = 160 $\frac{1}{4}$ of 400 = 100 $\frac{3}{20}$ of 400 = 60   MA1

160 + 100 + 60 = 320   400 – 320 = 80   MA1

$\frac{80}{400}$ or equivalent   A1

19 (a) $\frac{1}{2}(6 + 10)h = 36$

      $8h = 36$ MA1

      $h = \frac{36}{8}$

      $h = 4.5$ A1

(b) Base of right-angled triangle = 2 cm   MA1

    $2^2 + y^2 = 5^2$ MA1

    $4 + y^2 = 25$

    $y^2 = 21$ MA1

    $y = \sqrt{21}$

    $y = 4.58(2575695)$ MA1   **6**

20 (a) 300   A1

(b) (i) $2^2 \times 3^3 \times 5^2$ A1

(ii) No because not all the prime factors are squared   A1   **3**
        or alternative
        No because 2700 is not a square number

21 speed $= \dfrac{5}{\left(\frac{24}{60}\right)}$ or $5 \div 0.4$ MA1

    $= 12.5$ km/hr   A1   **2**

alternative solution

5 km = 24 minutes ($\div$ 4)

1.25 km = 6 mins ($\times$ 10)   MA1

12.5 km = 60 mins = 1 hour   A1

22 152 650 – 104 760 = 47 890   MA1

    $\dfrac{47\,890}{152\,650} \times 100 = 31.3724\ldots\ldots$ MA1

    31.4   A1   **3**

23 $49 \times 1.04 = 50.96$ MA1

    $49 \times 1.04^2 = 52.998\ldots..$ or equivalent method   MA1

    $49 \times 1.04^3 = 55.118\ldots\ldots$ MA1

    3   A1   **4**

24 $18 \times 1.5 + 45 \times 4.5 + 37 \times 7.5 + 19 \times 10.5 + 4 \times 13.5$ MA2

    $= \dfrac{760.5}{123}$ MA1

    $= 6.18$ A1   **4**

			AVAILABLE MARKS
25	The estimate for her own blood pressure is reliable as it lies within given readings on the scatter graph but the reading for her father is not as reliable as it lies outside the given readings on the scatter graph (or some similar explanation relating to extrapolation/interpolation)	A2	2
26	4c = 2c + 11	MA1	
	2c = 11	MA1	
	c = 5.5	A1	
	22	A1	4
		Total	**100**