SOLUTIONS

# GCSE Maths: Algebra

Mark schemes for the Grade 4 starter questions

| | |
|---|---|
| Questions | **20** |
| Total marks | **69** |
| Sub-topics covered | **13** |
| Papers drawn from | **19** |
| Years | **2017 to 2024** |

The official Edexcel mark scheme for every question in the Algebra question booklet, in the same order.

Question numbers match: Question 7 here answers Question 7 there.

M marks are for method, A marks for accuracy, B marks stand alone.
'oe' means or equivalent; 'cao' means correct answer only.

## A2 Substitution into Formulae

### Question 1

November 2019 · Paper 2 · Q8

**3 marks**

| | | | | |
|---|---|---|---|---|
| 8 | 6 | M1 | for 720 ÷ 40 (= 18) **or** 720 ÷ 30 (= 24) | |
| | | M1 | for a complete process<br>eg (720 ÷ 30) – (720 ÷ 40) **or** "18" × 4/3 – "18" **or** "24" – "24" × 3/4 | |
| | | A1 | cao | |

## A4 Manipulating Algebraic Expressions

### Question 2

November 2019 · Paper 3 · Q1

**4 marks**

| | | | | | |
|---|---|---|---|---|---|
| 1 | (a) | $x^2 - 4x - 45$ | M1 | for 3 of 4 terms correct **or** 4 terms correct ignoring signs | 3 terms correct can be implied, eg $x^2 - 4x + c$ |
| | | | A1 | cao | |
| | (b) | $3x(3x + 2)$ | B2 | for $3x(3x + 2)$ | |
| | | | (B1 | for $3(3x^2 + 2x)$ **or** $x(9x + 6)$ **or** $3x(ax + b)$ where $a$ and $b$ are integers **or** $(3x + 2)$ as a factor ) | |

### Question 3

June 2018 · Paper 2 · Q1

**5 marks**

| | | | | | |
|---|---|---|---|---|---|
| 1 | (a) | $m^7$ | B1 | cao | |
| | (b) | $125n^3p^9$ | B2 | cao | Allow multiplication signs |
| | | | (B1 | for 2 of 3 terms correct in a single product) | $125n^3p^x$ or $125n^xp^9$ where $x \neq 0$ or $an^3p^9$ where $a$ is a number |
| | (c) | $8q^6r^3$ | B2 | cao | Allow multiplication signs |
| | | | (B1 | for 2 of 3 terms correct in a single product) | $8q^6r^x$ or $8q^xr^3$ where $x \neq 0$ or $aq^6r^3$ where $a$ is a number |

## A5 Formulae and Changing the Subject

### Question 4

November 2022 · Paper 3 · Q1

**2 marks**

| | | | | |
|---|---|---|---|---|
| 1 | $a = \frac{p+9}{3}$ | M1 | for correct first step to rearrange, eg $p + 9 = 3a – 9 + 9$<br>or $\frac{p}{3} = \frac{3a-9}{3}$ oe<br>or answer ambiguously shown eg $a = p + 9 \div 3$<br>or answer given as $\frac{p+9}{3}$ oe | May be seen in different equivalent forms but must be carried out, not just intention seen. |
| | | A1 | oe | |

## A8 Coordinates in Four Quadrants

### Question 5

June 2022 · Paper 2 · Q5

**4 marks**

| | | | | |
|---|---|---|---|---|
| 5 | 14.5, 21 | P1 | for process to work with coordinates,<br>eg 4 – (−3) (= 7) **or** 9 – 1 (= 8) | Accept in reverse order eg −3 − 4 (= −7) and negative distances throughout |
| | | P1 | for process to use ratio,<br>eg "7" ÷ 2 (= 3.5) **or** "8" ÷ 2 (= 4) **or** "7" × 3 (= 21) **or** "8" × 3 (= 24) | This mark is implied by 10.5 or 12 or 17.5 or 20 |
| | | P1 | for complete process to find $x$ or $y$ coordinate of $N$,<br>eg "3.5" × 3 + 4 **or** "4" × 3 + 9 **or** "3.5" × 5 –3 **or** "4" × 5 + 1<br>**OR** to find both the required distances<br>eg "3.5" × 3 (= 10.5) **and** "4" ×3 (= 12)<br>**or** "21" ÷ 2 (= 10.5) **and** "24" ÷ 2 (= 12)<br>**or** "3.5" × 5 (= 17.5) **and** "4" × 5 (= 20) | |
| | | A1 | oe | |

## A9 Straight-Line Graphs

### Question 6

November 2018 · Paper 2 · Q6

**3 marks**

| | | | | |
|---|---|---|---|---|
| 6 | 7 | P1 | process to use gradient eg $y = 3x + c$ **or** c = −6 **or** $\frac{15-9}{d-5}$<br>**or** (15 − 9) ÷ 3 **or** (6, 12) | Condone use of a letter other than $d$, for $d$ |
| | | P1 | (dep) full process to rearrange equation formed to isolate $d$<br>eg rearrangement of $15 = 3d - 6$ or $3 = \frac{15-9}{d-5}$ **or** for $5 + \frac{15-9}{3}$ | Must show processes to get as far as $d =$<br>Award P2 for an answer of (7, 15) |
| | | A1 | cao | |

### Question 7

June 2024 · Paper 1 · Q6

**4 marks**

| | | | | | |
|---|---|---|---|---|---|
| 6 | (a) | $y = \frac{3}{2}x + 3$ | M1 | for a correct method to find the gradient of the line,<br>eg $\frac{6-3}{2-0}$ (= $\frac{3}{2}$) | |
| | | | | **or** identifies 3 as the intercept in words or in a partial equation | Just circling 3 is insufficient |
| | | | | **or** for $y = [\frac{3}{2}]x + c$ | $[\frac{3}{2}]$ must be identifiable as their gradient |
| | | | | **or** for $y - b = [\frac{3}{2}](x - a)$ where $(a, b)$ is a correct coordinate | $c$ must be seen either as a letter or a number |
| | | | M1 | for $y = \frac{3}{2}x$ (+ $c$) oe **or** for $y =$ "$\frac{3}{2}$"$x + 3$, $m \neq 0$ **or** (**L** =) $\frac{3}{2}x + 3$<br>**or** $y - y_1 = \frac{3}{2}(x - x_1)$ **or** $y - b =$ "$\frac{3}{2}$"$(x - a)$ where $(a, b)$ is a correct coordinate | Award of this mark implies the first M1 |
| | | | A1 | oe | Any correct equation gets 3 marks |
| | (b) | Equation | B1 | for $y = 5x + c$, $c \neq 0$ oe | May be in any equivalent form |

## A11 Quadratic Graphs

### Question 8

November 2017 · Paper 1 · Q7

**1 mark**

| | | | | | |
|---|---|---|---|---|---|
| 7 | | Comment | B1 | for correct mathematical comment eg line segments not a curve **or** should draw freehand **or** should not use a ruler, **or** should be a curve<br><br>NB Do not accept statements about scale or plotting accuracy. | |

## A12 Recognising and Sketching Standard Graphs

### Question 9

November 2019 · Paper 2 · Q5

**2 marks**

| | | | | | |
|---|---|---|---|---|---|
| 5 | (a) | F | B1 | cao | |
| | (b) | D | B1 | cao | |

### Question 10

November 2020 · Paper 2 · Q4

**4 marks**

| | | | | | |
|---|---|---|---|---|---|
| 4 | (a) | 13, (6), 5, 4, –3 | B2 | for all 4 values correct | |
| | | | (B1 | for 2 or 3 correct values) | |
| | (b) | Correct graph | M1 | ft (dep on B1) for plotting at least 4 of the points from their table correctly | |
| | | | A1 | for a fully correct curve drawn | Accept a freehand curve drawn that is not made of line segments<br>Line sections outside the required range can be ignored. |

## A17 Solving Linear Equations

### Question 11

November 2017 · Paper 2 · Q1

**3 marks**

| | | | | | |
|---|---|---|---|---|---|
| 1 | | $1\frac{1}{2}$ | M1 | for correct expansion of the bracket or dividing all terms by 3 as a first step<br>eg $3x - 3$ or $(5x - 6)/3 = 3(x - 1)/3$ | |
| | | | M1 | for isolating terms in $x$ on one side of an equation eg $5x - 6 - 3x = -3$<br>or both constants on one side of an equation, eg $5x = 3x - 3 + 6$ ,<br>ft $5x - 6 = 3x - 1$ | |
| | | | A1 | for $1\frac{1}{2}$ oe | |

## Question 12

June 2018 · Paper 3 · Q7

**3 marks**

| | | | | |
|---|---|---|---|---|
| 7 | 3.8 | M1 | for a correct first step,<br>eg $5 - x = 2(2x - 7)$ or $5 - x = 4x - 14$ or $\frac{5}{2} - \frac{x}{2} = 2x - 7$ | Method must show LHS ×2 and both terms on RHS ×2 or $5 - x$ and both terms on RHS ×2 |
| | | M1 | (dep) for isolating terms in $x$<br>eg $4x + x = 14 + 5$ or $-\frac{x}{2} - 2x = -7 - \frac{5}{2}$ | eg $-4x$ both sides with $-5$ both sides or $+x$ both sides with $+14$ both sides |
| | | A1 | oe | Accept $\frac{19}{5}$, $3\frac{4}{5}$ oe but not $\frac{-19}{-5}$ oe |

# A21 Forming and Solving Equations from Situations

## Question 13

November 2017 · Paper 3 · Q6

**5 marks**

| | | | | |
|---|---|---|---|---|
| 6 | | 147 | P1 | starts process, eg uses $x$ and $x + 7$ |
| | | | P1 | starts to work with at least 6 correct sides, may be on the diagram or in an expression |
| | | | P1 | (dep on previous P1) gives a correct expression for the perimeter,<br>eg $x + x + 7 + x + 7 + x + 7 + x + x + 7 + x + 7 + x + 7$<br>or adds at least 6 correct sides and equates to 70 |
| | | | A1 | for width = 3.5 oe **and** length = 10.5 oe |
| | | | B1 | ft (dep P2) for correct area for their $x$ |

## Question 14

June 2022 · Paper 3 · Q3

**5 marks**

| | | | | |
|---|---|---|---|---|
| 3 | 1.5 | P1 | for process to develop 3 algebraic expressions, eg. (R =) $n$, (S =) $2n$, (T =) $2n - 6$, oe, at least two must be correct.<br>**or** for selecting 3 values satisfying the given criteria,<br>eg. (R =) 10, (S =) 20, (T =) 14 | |
| | | P1 | for process to sum 3 algebraic expressions and equating to 54,<br>eg. $n$ + "$2n$" + "$2n - 6$" = 54<br>**or** for finding the correct sum of their values<br>eg. "10" + "20" + "14" = 44 | |
| | | P1 | for start of process to solve the correct linear equation,<br>eg. $5n = 54 + 6$ ($n = 12$)<br>**or** for 12, 24, 18 | |
| | | P1 | for "12" : 2 × "12" – 6 oe eg 12 : 18 oe or 18 : 12 linked to T, R | |
| | | A1 | for 1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$ | Accept 1 : 1.5 etc as answer |

# A24 Types of Sequences

## Question 15

November 2021 · Paper 3 · Q5

**3 marks**

| | | | | |
|---|---|---|---|---|
| 5 | 12 | P1 | for a process to find the fifth term, eg $3a + 5a$ (= 8a) | |
| | | P1 | for setting up the equation eg $a + 2a + 3a + 5a + [8a] = 228$ | [8a] allow use of what is clearly indicated as the missing term<br>$\frac{228}{19}$ or $\frac{228}{1+2+3+5+8}$ scores P1 P1<br>$\frac{228}{1+2+3+5+[8]}$ scores P0P1 |
| | | A1 | cao | |

## A25 The nth Term

### Question 16

November 2020 · Paper 1 · Q1

**2 marks**

| | | | | |
|---|---|---|---|---|
| 1 | $3n - 2$ | B2 | for $3n - 2$ oe | Accept a different variable, eg. $3x - 2$ |
| | | (B1 | for $3n + k$ where $k \neq -2$ or is absent unambiguously shown) | $n = 3n - 2$ gets B1 only<br>$n + 3$ gets NO marks |

### Question 17

November 2022 · Paper 2 · Q3

**4 marks**

| | | | | | |
|---|---|---|---|---|---|
| 3 | (a) | $6n + 1$ | B2 | oe | |
| | | | (B1 | for $6n + c$ where $c$ is an integer $\neq 1$ or is missing) | |
| | (b) | Shown with supportive working | M1 | for $8 - 6n = -58$ or $8 - 6 \times 11 (= -58)$<br>**or** starts to list terms of the sequence, with at least 3 correct or any other valid method. | 2, −4, −10, −16, −22, −28, −34, −40, −46, −52 |
| | | | A1 | shown with working or an explanation , eg Yes and 11<br>or 2, –4, –10, –16, ....., –52, –58 | May stop at −58 or ring if sequence continues |

## A19.1 Simultaneous Equations: Linear and Linear

### Question 18

June 2017 · Paper 3 · Q2

**3 marks**

| | | | | |
|---|---|---|---|---|
| 2 | | $x = -\frac{2}{3}$ | M1 | for a method to eliminate one variable (condone one arithmetic error) |
| | | $y = -2$ | M1 | (dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error) |
| | | | A1 | $x = -\frac{2}{3}$ oe and $y = -2$ |

## A22.1 Linear Inequalities

### Question 19

November 2023 · Paper 3 · Q4

**4 marks**

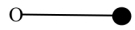
| | | | | | |
|---|---|---|---|---|---|
| 4 | (a) | Explanations | C2 | for two different correct explanations<br><br>**Acceptable examples**<br>She should have a solid/full/shaded/coloured circle at 4<br>It does not show that $x$ could be equal to 4<br>She should have marked/drawn a (clear/empty) circle at −3<br>The line should be drawn to –3<br>Jenna started from –2 not –3<br><br>**Not acceptable examples**<br>Both circles should be black<br>One circle should be filled in (needs to say which circle)<br>She shouldn't have to reach number 4<br>Jenna has made no mistakes | Any incorrect statement as part of a correct response can be ignored unless it contradicts the statement, |
| | | | (C1 | for one correct mistake described) | |

| | | | | |
|---|---|---|---|---|
| (b) | 4 | M1 | for a correct first step,<br>eg for adding 7 to both sides $5y - 7 + 7 < 16 + 7$<br>or for dividing throughout by 5 eg $\frac{5y}{5} - \frac{7}{5} < \frac{16}{5}$<br>**or** for showing 4.6 (oe) as the critical value<br>**or** for $5 \times 4 - 7$ with 13 seen as answer | Allow use of any inequality or as an equation for the first mark<br>Award 1 mark for 4.6 oe, eg $y = \frac{23}{5}$ or $y < 4.6$ |
| | | A1 | for 4 or $y = 4$ with no incorrect working | An answer of 4 from incorrect working can score 1 mark at most. |

## Question 20

June 2019 · Paper 2 · Q1

**5 marks**

| | | | | | |
|---|---|---|---|---|---|
| 1 | (a) | $n > 2$ | M1 | for a method to isolate terms in $n$ in any inequality or equation<br>eg $14n - 11n > 6$ or $n = 2$ | Ignore incorrect inequality sign and accept "=" sign |
| | | | A1 | cao | |
| | (b) |  <br> | M1 | for $-2 - 3 < x \leq 4 - 3$ $(-5 < x \leq 1)$ | A circle around −5 and 1 implies M1 |
| | | | M1 | for drawing a line from −5 to 1<br>**or** (indep) for an open circle at either −2 or −5<br>**or** (indep) for a closed circle at 4 or 1 | A line from −5 to 1 implies M2 if no working shown |
| | | | A1 | cao | |