



ACHIEVE ACADEMY

GCSE Maths — Higher Tier

Functions · Practice Booklet

NAME: _____

CLASS: _____

DATE: _____

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Functions

Total marks available: 116

● Functions

$$\checkmark 20x - 5$$

Q1 · ● Developing · 3 marks

METHOD

$$\begin{aligned}fg(x) &= f(5x - 2) \\&= 4(5x - 2) + 3 \\&= 45x - 8 + 3 \\&= 20x - 5\end{aligned}$$

$$\checkmark (t - 8)/4$$

Q2 · ● Developing · 3 marks

METHOD

$$\begin{aligned}y &= 4t + 8 \\y - 8 &= 4t \\t &= (y - 8)/4 \\f^{-1}(t) &= (t - 8)/4\end{aligned}$$

$$\checkmark (n + 2)/2$$

Q3 · ● Developing · 3 marks

METHOD

$$\begin{aligned}y &= 2n - 2 \\y + 2 &= 2n \\n &= (y + 2)/2 \\f^{-1}(n) &= (n + 2)/2\end{aligned}$$

$$\checkmark (t + 4)/7$$

Q4 · ● Developing · 3 marks

METHOD

$$\begin{aligned}y &= 7t - 4 \\y + 4 &= 7t \\t &= (y + 4)/7 \\f^{-1}(t) &= (t + 4)/7\end{aligned}$$

$$\checkmark (t + 6)/7$$

Q5 · ● Developing · 3 marks

METHOD

$$y = 7t - 6$$

$$y + 6 = 7t$$

$$t = (y + 6)/7$$

$$f^{-1}(t) = (t + 6)/7$$

$$\checkmark 30n - 3$$

Q6 · ● Developing · 3 marks

METHOD

$$fg(n) = f(6n + 1)$$

$$= 5(6n + 1) - 8$$

$$= 56n + 5 - 8$$

$$= 30n - 3$$

$$\checkmark 36t + 24$$

Q7 · ● Developing · 3 marks

METHOD

$$fg(t) = f(6t + 5)$$

$$= 6(6t + 5) - 6$$

$$= 66t + 30 - 6$$

$$= 36t + 24$$

$$\checkmark (x - 7)/8$$

Q8 · ● Developing · 3 marks

METHOD

$$y = 8x + 7$$

$$y - 7 = 8x$$

$$x = (y - 7)/8$$

$$f^{-1}(x) = (x - 7)/8$$

$$\checkmark (x + 9)/3$$

Q9 · ● Developing · 3 marks

METHOD

$$y = 3x - 9$$

$$y + 9 = 3x$$

$$x = (y + 9)/3$$

$$f^{-1}(x) = (x + 9)/3$$

$$\checkmark 20t + 22$$

Q10 · ● Developing · 3 marks

METHOD

$$fg(t) = f(5t + 6)$$

$$= 4(5t + 6) - 2$$

$$= 45t + 24 - 2$$

$$= 20t + 22$$

$$\checkmark 4n^2 + 27$$

Q11 · ● Secure · 4 marks

METHOD

$$fg(n) = f(n^2 + 5)$$

$$= 4(n^2 + 5) + 7$$

$$= 4n^2 + 20 + 7$$

$$= 4n^2 + 27$$

$$\checkmark x = 1 \text{ or } x = 6$$

Q12 · ● Secure · 4 marks

METHOD

$$x^2 - 7x + 5 = -1$$

$$x^2 - 7x + 6 = 0$$

$$(x - 1)(x - 6) = 0$$

$$x = 1 \text{ or } x = 6$$

$$\checkmark 3t^2 - 4$$

Q13 · ● Secure · 4 marks

METHOD

$$\begin{aligned}fg(t) &= f(t^2) \\&= 3(t^2) - 4 \\&= 3t^2 - 4\end{aligned}$$

$$\checkmark 2n^2 - 6$$

Q14 · ● Secure · 4 marks

METHOD

$$\begin{aligned}fg(n) &= f(n^2 + 1) \\&= 2(n^2 + 1) - 8 \\&= 2n^2 + 2 - 8 \\&= 2n^2 - 6\end{aligned}$$

$$\checkmark 6x^2 - 20$$

Q15 · ● Secure · 4 marks

METHOD

$$\begin{aligned}fg(x) &= f(x^2 - 3) \\&= 6(x^2 - 3) - 2 \\&= 6x^2 - 18 - 2 \\&= 6x^2 - 20\end{aligned}$$

$$\checkmark t = 4 \text{ or } t = 8$$

Q16 · ● Secure · 4 marks

METHOD

$$\begin{aligned}t^2 - 12t + 32 &= 0 \\(t - 4)(t - 8) &= 0 \\t &= 4 \text{ or } t = 8\end{aligned}$$

✓ $x = 7$ or $x = 8$

Q17 · ● Secure · 4 marks

METHOD

$$x^2 - 15x + 51 = -5$$

$$x^2 - 15x + 56 = 0$$

$$(x - 7)(x - 8) = 0$$

$$x = 7 \text{ or } x = 8$$

✓ $3x^2 - 5$

Q18 · ● Secure · 4 marks

METHOD

$$fg(x) = f(x^2)$$

$$= 3(x^2) - 5$$

$$= 3x^2 - 5$$

✓ $t = 2$ or $t = 3$

Q19 · ● Secure · 4 marks

METHOD

$$t^2 - 5t = -6$$

$$t^2 - 5t + 6 = 0$$

$$(t - 2)(t - 3) = 0$$

$$t = 2 \text{ or } t = 3$$

✓ $2n^2 - 10$

Q20 · ● Secure · 4 marks

METHOD

$$fg(n) = f(n^2 - 2)$$

$$= 2(n^2 - 2) - 6$$

$$= 2n^2 - 4 - 6$$

$$= 2n^2 - 10$$

$$\checkmark (2x - 6)/4$$

Q21 · ● Greater Depth · 4 marks

METHOD

$$y = (4x + 6)/2$$

$$2y = 4x + 6$$

$$2y - 6 = 4x$$

$$x = (2y - 6)/4$$

$$f^{-1}(x) = (2x - 6)/4$$

$$\checkmark (3x + 6)/6$$

Q22 · ● Greater Depth · 4 marks

METHOD

$$y = (6x - 6)/3$$

$$3y = 6x - 6$$

$$3y + 6 = 6x$$

$$x = (3y + 6)/6$$

$$f^{-1}(x) = (3x + 6)/6$$

$$\checkmark 2$$

Q23 · ● Greater Depth · 5 marks

METHOD

$$fg(n) = 3(2n) - 10 = 6n - 10$$

$$6n - 10 = n$$

$$5n = 10$$

$$n = 2$$

$$\checkmark (4t - 1)/2$$

Q24 · ● Greater Depth · 4 marks

METHOD

$$y = (2t + 1)/4$$

$$4y = 2t + 1$$

$$4y - 1 = 2t$$

$$t = (4y - 1)/2$$

$$f^{-1}(t) = (4t - 1)/2$$

✓1

Q25 · ● Greater Depth · 5 marks

METHOD

$$fg(n) = 5(2n + 2) - 19 = 10n - 9$$

$$10n - 9 = n$$

$$9n = 9$$

$$n = 1$$

✓-4

Q26 · ● Greater Depth · 5 marks

METHOD

$$fg(n) = 2(3n + 5) + 10 = 6n + 20$$

$$6n + 20 = n$$

$$5n = -20$$

$$n = -4$$

✓ $(4x + 8)/4$

Q27 · ● Greater Depth · 4 marks

METHOD

$$y = (4x - 8)/4$$

$$4y = 4x - 8$$

$$4y + 8 = 4x$$

$$x = (4y + 8)/4$$

$$f^{-1}(x) = (4x + 8)/4$$

✓-2

Q28 · ● Greater Depth · 5 marks

METHOD

$$fg(t) = 2(3t + 2) + 6 = 6t + 10$$

$$6t + 10 = t$$

$$5t = -10$$

$$t = -2$$

✓ -2

Q29 · ● Greater Depth · 5 marks

METHOD

$$fg(x) = 5(3x - 1) + 33 = 15x + 28$$

$$15x + 28 = x$$

$$14x = -28$$

$$x = -2$$

✓ -4

Q30 · ● Greater Depth · 5 marks

METHOD

$$fg(n) = 5(3n - 6) + 86 = 15n + 56$$

$$15n + 56 = n$$

$$14n = -56$$

$$n = -4$$