FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

A7: Functions

Reason with function notation, inverse and composite functions

20 marks · 25 minutes · Non-calculator

1) f(x) = 2x + 3. Show that f(4) = 11

[Question 1: 1 marks]

2) f(x) = x + 1 and g(x) = 2x. Use these functions to explain why fg(x) and gf(x) are usually different.

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[Question 2: 3 marks]

3) $f(x) = \frac{x-1}{4}$. Show that $f^{-1}(x) = 4x + 1$

[Question 3: 2 marks]

4) Using question 3, show that $f(f^{-1}(3)) = 3$

[Question 4: 2 marks]

5) $f(x) = x^2$ for all values of x. Explain why f does not have an inverse.

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[Question 5: 2 marks]

6) $g(x) = 3x - 2$. Ben says $g^{-1}(x) = \frac{1}{3x-2}$. Explain his mistake.

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[Question 6: 2 marks]

7) $f(x) = 2x + 1$. Show that $ff(x) = 4x + 3$

[Question 7: 2 marks]

8) $f(x) = x^2 + 1$ and $g(x) = x - 3$. Show that $fg(5) = 5$ and $gf(5) = 23$

[Question 8: 2 marks]

9) $f(x) = 3x - 4$. Solve $f(x) = f^{-1}(x)$, showing your reasoning.

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[Question 9: 2 marks]

10) Explain why $x = 0$ cannot be an input for $f(x) = \frac{1}{x}$.

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[Question 10: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Shown	$8 + 3$ (C1).
2	Explanation	$fg(x) = 2x + 1$ (B1); $gf(x) = 2x + 2$ (B1); the order of applying the functions matters (C1).
3	Shown	$y = \frac{x - 1}{4}$, rearrange (M1); C1.
4	Shown	$f^{-1}(3) = 13$ (M1); $f(13) = 3$ (C1).
5	Explanation	Two inputs give the same output, e.g. $\pm 2 \rightarrow 4$ (C2).
6	$\frac{x + 2}{3}$	Inverse function is not the reciprocal (C1); correct inverse (B1).
7	Shown	$2(2x + 1) + 1$ (M1); C1.
8	Shown	$g(5) = 2$, $f(2) = 5$ (M1); $f(5) = 26$, $g(26) = 23$ (C1).
9	2	$3x - 4 = \frac{x + 4}{3}$ (M1); $x = 2$ (C1).
10	Explanation	Division by zero is undefined (C2).