

Composite Inverse Functions

GCSE Maths · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

$f(x) = 3x - 4$. Find $f(5)$ and solve $f(x) = 14$.

Step 1 · Substitute 5

$$f(5) = 15 - 4 = 11$$

Step 2 · Solve $3x - 4 = 14$

$$3x = 18, x = 6$$

Answer: $f(5) = 11$; $x = 6$

Check: $f(6) = 18 - 4 = 14$ ✓

2. Now try one with the steps

$f(x) = 2x + 1$ and $g(x) = x^2$. Find $fg(3)$ and $gf(3)$.

Step 1 · $fg(3)$: g first

Step 2 · $gf(3)$: f first

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. $f(x) = 4x - 3$. Find $f(2)$. [1]

2. $f(x) = x^2 + 1$. Find $f(-3)$. [1]

3. $f(x) = 5 - 2x$. Solve $f(x) = 11$. [2]

4. $f(x) = 3x$ and $g(x) = x + 4$. Find $fg(2)$. [2]

5. With $f(x) = 3x$ and $g(x) = x + 4$, find $gf(2)$. [2]

6. With $f(x) = 3x$ and $g(x) = x + 4$, find an expression for $fg(x)$. [2]

7. With $f(x) = 3x$ and $g(x) = x + 4$, find an expression for $gf(x)$. [2]

8. $f(x) = x^2$ and $g(x) = x - 5$. Find $fg(x)$. [2]

9. With $f(x) = x^2$ and $g(x) = x - 5$, find $gf(x)$. [2]

10. Find $f^{-1}(x)$ when $f(x) = x + 7$. [1]

11. Find $f^{-1}(x)$ when $f(x) = 4x - 1$. [2]

12. Find $f^{-1}(x)$ when $f(x) = (x + 3)/2$. [2]

13. $f(x) = 2x - 5$. Find $f^{-1}(7)$. [2]

14. $f(x) = 2x + 3$ and $g(x) = x^2$. Solve $fg(x) = 21$. [3]

15. $f(x) = 3x + 1$. Solve $f(x) = f^{-1}(x)$.

[4]

4. Before you hand it in

$fg(3)$ with $f(x) = 2x + 1$, $g(x) = x^2$: $f(3) = 7$, then $g(7) = 49$

$fg(3) = f(g(3))$. The function next to the 3 acts first: $g(3) = 9$, then $f(9) = 19$.

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

f^{-1} is the inverse function, found by swapping x and y and rearranging: $(x + 1)/4$.

$fg(x) = f(x) \times g(x) = (2x + 1)x^2$

fg means one function applied to the OUTPUT of the other: $f(g(x)) = 2x^2 + 1$.

Inverse of $f(x) = 4x - 1$ written as $4x + 1$

Undo in reverse order: add 1, THEN divide by 4: $(x + 1)/4$. Check: $f(2) = 7$ and $(7 + 1)/4 = 2$.