

GCSE Maths: Composite functions (Higher): answers

GCSE Maths - Functions and Advanced Graphs - Higher - Lesson 25.3

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/composite-functions/

Exercise 25C Composite functions

Non-calculator

1 $f(x) = 2x + 1$ and $g(x) = x^2$. Work out

(a) $fg(3)$

Answer: 19

(b) $gf(3)$

Answer: 49

(c) $ff(2)$

Answer: 11

(d) $gg(-2)$

Answer: 16

2 $f(x) = x - 4$ and $g(x) = 3x$. Find, in its simplest form,

(a) $fg(x)$

Answer: $3x - 4$

(b) $gf(x)$

Answer: $3x - 12$

3 $f(x) = x + 5$ and $g(x) = x^2 - 1$. Find, in its simplest form,

(a) $fg(x)$

Answer: $x^2 + 4$

(b) $gf(x)$

Answer: $x^2 + 10x + 24$

4 $f(x) = 3x - 2$ and $g(x) = \frac{x}{2}$. Find

(a) $fg(x)$

Answer: $\frac{3x}{2} - 2$

(b) $gf(x)$

Answer: $\frac{3x}{2} - 1$

5 Find $ff(x)$ and $gg(x)$ in each case.

(a) $f(x) = 2x + 3$: $ff(x)$

Answer: $4x + 9$

(b) $g(x) = x^2$: $gg(x)$

Answer: x^4

(c) $h(x) = 1 - 2x$: $hh(x)$

Answer: $4x - 1$

6 $f(x) = 2x + 1$ and $g(x) = x - 3$. Solve $fg(x) = 9$.

Answer: $x = 7$

7 $f(x) = x + 1$ and $g(x) = x^2 - 1$. Solve $gf(x) = 15$.

Answer: $x = -5$ or $x = 3$

8 (a) $f(x) = x + 3$ and $g(x) = x - 5$. Show that $fg(x) = gf(x)$. (b) $p(x) = 2x$ and $q(x) = x + 1$. Show that $pq(x) \neq qp(x)$.

Answer: (a) both are $x - 2$; (b) $pq(x) = 2x + 2$ but $qp(x) = 2x + 1$

9 A shop reduces all prices by 20% and then a 20% tax is added. Let p be the original price in pounds. (a) Write the reduction as $f(x) = 0.8x$ and the tax as $g(x) = 1.2x$. Find $gf(x)$. (b) Is the final price the same as the original price? Work out the final price of an item that originally cost £50.

Answer: $gf(x) = 0.96x$; the final price is 96% of the original, £48

10 $f(x) = 1 \div x$ and $g(x) = x + 2$. Find, as simply as possible,

(a) $fg(x)$

Answer: $\frac{1}{x + 2}$

(b) $gf(x)$

Answer: $\frac{1}{x} + 2$

11 $f(x) = \sqrt{x}$ and $g(x) = x - 4$.

(a) Work out $fg(13)$.

Answer: 3

(b) Work out $fg(20)$.

Answer: 4

(c) Find $fg(x)$.

Answer: $\sqrt{x - 4}$

12 $f(x) = 2x + 1$ and $fg(x) = 6x + 7$. Find $g(x)$.

Answer: $g(x) = 3x + 3$

13 Aisha says: " $fg(2)$ means $f(2) \times g(2)$." With $f(x) = x + 3$ and $g(x) = x^2$, work out $fg(2)$ and $f(2) \times g(2)$ to show that Aisha is wrong.

Answer: $fg(2) = 7$ but $f(2) \times g(2) = 20$

14 $f(x) = 3x + 2$ and $g(x) = x^2 + k$, where k is a constant. Given that $fg(1) = 20$, find the value of k .

Answer: $k = 5$

15 $f(x) = 2x + a$ and $g(x) = 3x + 4$. Given that $fg(x) = gf(x)$ for all x , find the value of a .

Answer: $a = 2$

16 $f(x) = x + 1$, $g(x) = 2x$ and $h(x) = x^2$. Find $hgf(x)$, giving your answer in its simplest expanded form.

Answer: $4x^2 + 8x + 4$