Topic: Product of functions

Question: Find $(gh)(-3)$.

$$g(x) = x - 4$$

$$h(x) = x + 1$$

Answer choices:

A $(gh)(-3) = 6$

B $(gh)(-3) = 8$

C $(gh)(-3) = 12$

D $(gh)(-3) = 14$

Solution: D

We need to find $(gh)(-3)$, which we could rewrite as

$$g(-3) \cdot h(-3)$$

This function notation tells us that we need to evaluate each of the functions at $x = -3$, and then multiply the results.

For $g(-3)$:

$$g(x) = x - 4$$

$$g(-3) = -3 - 4$$

$$g(-3) = -7$$

For $h(-3)$:

$$h(x) = x + 1$$

$$h(-3) = -3 + 1$$

$$h(-3) = -2$$

The product of the functions is

$$(gh)(-3) = g(-3) \cdot h(-3)$$

$$(gh)(-3) = -7 \cdot -2$$

$$(gh)(-3) = 14$$

We could have also multiplied the expressions for the functions, and then evaluated their product at $x = -3$.

$$(gh)(x) = (x - 4)(x + 1)$$

$$(gh)(x) = x^2 + x - 4x - 4$$

$$(gh)(x) = x^2 - 3x - 4$$

$$(gh)(-3) = (-3)^2 - 3(-3) - 4$$

$$(gh)(-3) = 9 + 9 - 4$$

$$(gh)(-3) = 18 - 4$$

$$(gh)(-3) = 14$$

Topic: Product of functions

Question: Find $(fg)(x)$.

$$f(x) = x + 7$$

$$g(x) = x - 5$$

Answer choices:

A $\quad (fg)(x) = x^2 + 2x - 35$

B $\quad (fg)(x) = x^2 - 2x - 35$

C $\quad (fg)(x) = x^2 + 2x + 35$

D $\quad (fg)(x) = x^2 - 2x + 35$

Solution: A

We need to find $(fg)(x)$, which we could rewrite as

$$f(x) \cdot g(x)$$

This function notation tells us that we need to multiply the expressions for the functions.

$$(fg)(x) = (x + 7)(x - 5)$$

$$(fg)(x) = x^2 - 5x + 7x - 35$$

$$(fg)(x) = x^2 + 2x - 35$$

Topic: Product of functions

Question: Find $(f \cdot g)(2)$.

$$f(x) = x^2 - 6$$

$$g(x) = 3x - 5$$

Answer choices:

A $(f \cdot g)(2) = -2$

B $(f \cdot g)(2) = 2$

C $(f \cdot g)(2) = 6$

D $(f \cdot g)(2) = 10$

Solution: A

We know that

$$(f \cdot g)(x) = f(x) \cdot g(x)$$

Substituting the given expression for each function gives

$$(f \cdot g)(x) = (x^2 - 6)(3x - 5)$$

Expanding the expression gives

$$(f \cdot g)(x) = 3x^3 - 5x^2 - 18x + 30$$

Substitute $x = 2$.

$$(f \cdot g)(x) = 3(2)^3 - 5(2)^2 - 18(2) + 30$$

$$(f \cdot g)(x) = 3(8) - 5(4) - 18(2) + 30$$

$$(f \cdot g)(x) = 24 - 20 - 36 + 30$$

$$(f \cdot g)(x) = 4 - 36 + 30$$

$$(f \cdot g)(x) = -32 + 30$$

$$(f \cdot g)(x) = -2$$