

### F.BF.A.1: Compositions of Functions 3

- 1 If  $f(x) = 2x - 1$  and  $g(x) = 3x + 5$ , then  $(f \circ g)(x)$  is equal to
  - 1)  $5x + 4$
  - 2)  $6x + 2$
  - 3)  $6x + 9$
  - 4)  $6x^2 + 7x - 5$
- 2 If  $f(x) = 3x - 5$  and  $g(x) = x - 9$ , which expression is equivalent to  $(f \circ g)(x)$ ?
  - 1)  $4x - 14$
  - 2)  $3x - 14$
  - 3)  $3x - 32$
  - 4)  $3x^2 - 32x + 45$
- 3 If  $f(x) = x^2 - 5$  and  $g(x) = 6x$ , then  $g(f(x))$  is equal to
  - 1)  $6x^3 - 30x$
  - 2)  $6x^2 - 30$
  - 3)  $36x^2 - 5$
  - 4)  $x^2 + 6x - 5$
- 4 If  $f(x) = x^2$  and  $g(x) = 2x + 1$ , which expression is equivalent to  $(f \circ g)(x)$ ?
  - 1)  $2x^2 + 1$
  - 2)  $2(x + 1)^2$
  - 3)  $4x^2 + 1$
  - 4)  $4x^2 + 4x + 1$
- 5 If  $f$  and  $g$  are two functions defined by  $f(x) = 3x + 5$  and  $g(x) = x^2 + 1$ , then  $g(f(x))$  is
  - 1)  $x^2 + 3x + 6$
  - 2)  $9x^2 + 30x + 26$
  - 3)  $3x^2 + 8$
  - 4)  $9x^2 + 26$
- 6 If  $f(x) = 2x^2 - 3x + 1$  and  $g(x) = x + 5$ , what is  $f(g(x))$ ?
  - 1)  $2x^2 + 17x + 36$
  - 2)  $2x^2 + 17x + 66$
  - 3)  $2x^2 - 3x + 6$
  - 4)  $2x^2 - 3x + 36$
- 7 If  $f(x) = \frac{2}{x+3}$  and  $g(x) = \frac{1}{x}$ , then  $(g \circ f)(x)$  is equal to
  - 1)  $\frac{1+3x}{2x}$
  - 2)  $\frac{2x}{1+3x}$
  - 3)  $\frac{x+3}{2}$
  - 4)  $\frac{x+3}{2x}$
- 8 If  $f(x) = x^2 - x$  and  $g(x) = x + 1$ , determine  $f(g(x))$  in simplest form.
- 9 Given:  $f(x) = \sqrt{2x+5}$  and  $g(x) = 6x - 3$ , find  $g(f(10))$  and  $(f \circ g)(x)$ .
- 10 If  $f(x) = x^{\frac{2}{3}}$  and  $g(x) = 8x^{-\frac{1}{2}}$ , find  $(f \circ g)(x)$  and  $(f \circ g)(27)$ .
- 11 Given  $f(x) = x^2$  and  $g(x) = x - 3$ , express  $g(f(x+2))$  as a polynomial in simplest form.
- 12 Which expression is equivalent to  $(n \circ m \circ p)(x)$ , given  $m(x) = \sin x$ ,  $n(x) = 3x$ , and  $p(x) = x^2$ ?
  - 1)  $\sin(3x)^2$
  - 2)  $3 \sin x^2$
  - 3)  $\sin^2(3x)$
  - 4)  $3 \sin^2 x$

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#### Answer Section

1 ANS: 3

$$2(3x + 5) - 1 = 6x + 10 - 1 = 6x + 9$$

REF: 061015b

2 ANS: 3

$$(f \circ g)(x) = 3(x - 9) - 5 = 3x - 27 - 5 = 3x - 32$$

REF: 010909b

3 ANS: 2

$$6(x^2 - 5) = 6x^2 - 30$$

REF: 011109a2

4 ANS: 4

$$\begin{aligned} (f \circ g)(x) &= (2x + 1)^2 \\ &= 4x^2 + 2x + 2x + 1 \\ &= 4x^2 + 4x + 1 \end{aligned}$$

REF: 080917b

5 ANS: 2

$$f(x) = 3x + 5$$

$$\begin{aligned} g(3x + 5) &= (3x + 5)^2 + 1 \\ &= 9x^2 + 30x + 26 \end{aligned}$$

REF: 080313b

6 ANS: 1

$$f(g(x)) = 2(x + 5)^2 - 3(x + 5) + 1 = 2(x^2 + 10x + 25) - 3x - 15 + 1 = 2x^2 + 17x + 36$$

REF: 061419a2

7 ANS: 3

$$\begin{aligned} f(x) &= \frac{2}{x + 3} \\ g\left(\frac{2}{x + 3}\right) &= \frac{1}{\frac{2}{x + 3}} = \frac{x + 3}{2} \end{aligned}$$

REF: 010408b

8 ANS:

$$(x + 1)^2 - (x + 1) = x^2 + 2x + 1 - x - 1 = x^2 + x$$

REF: 081530a2

9 ANS:  
 $27, \sqrt{12x-1}$

REF: 080341siii

10 ANS:

$$g(x) = 8x^{-\frac{1}{2}}$$

$$4x^{-\frac{1}{3}}, \frac{4}{3}, f(8x^{-\frac{1}{2}}) = (8x^{-\frac{1}{2}})^{\frac{2}{3}} = 4x^{-\frac{1}{3}}$$

$$g(27) = 8(27)^{-\frac{1}{2}}$$

$$f(8(27)^{-\frac{1}{2}}) = (8(27)^{-\frac{1}{2}})^{\frac{2}{3}} = 4(27)^{-\frac{1}{3}} = \frac{4}{3}$$

REF: 010331b

11 ANS:

$$f(x+2) = (x+2)^2 = x^2 + 4x + 4 \quad g(f(x+2)) = x^2 + 4x + 4 - 3 = x^2 + 4x + 1$$

REF: 011733a2

12 ANS: 2

REF: 061216a2