A2.A.17: Find the composition of functions

1. 010501b, P.I. A2.A.42

   If $f(x) = -2x + 7$ and $g(x) = x^2 - 2$, then $f(g(3))$ is equal to

   [A] -7   [B] -3   [C] -1   [D] 7

2. 010621b, P.I. A2.A.42

   If $f(x) = 5x^2 - 1$ and $g(x) = 3x - 1$, find $g(f(1))$.

3. 060921b, P.I. A2.A.42

   If $f(x) = x^2 + 4$ and $g(x) = 2x + 3$, find $f(g(-2))$.

4. 060806b, P.I. A2.A.42

   If $f(x) = x^2 + 4$ and $g(x) = \sqrt{1-x}$, what is the value of f(g(-3))?

   [A] 8   [B] 2   [C] $2i\sqrt{3}$ [D] 13

5. 060322b, P.I. A2.A.42

   If $f(x) = 2^x - 1$ and $g(x) = x^2 - 1$, determine the value of $(f \circ g)(3)$.

6. 010207b, P.I. A2.A.42

   If $f(x) = 5x^2$ and $g(x) = \sqrt{2x}$, what is the value of $(f \circ g)(8)$?

   [A] 16   [B] 1,280   [C] 80   [D] $8\sqrt{10}$

7. 060725b, P.I. A2.A.42

   If $f(x) = \log_2 x$ and $g(x) = 2x^2 + 14$, determine the value of $(f \circ g)(5)$.

8. 010331b, P.I. A2.A.42

   If $f(x) = x^{\frac{2}{3}}$ and $g(x) = 8x^{-\frac{1}{2}}$, find $(f \circ g)(x)$ and $(f \circ g)(27)$.

9. 010909b, P.I. A2.A.42

   If $f(x) = 3x - 5$ and $g(x) = x - 9$, which expression is equivalent to $(f \circ g)(x)$?

   [A] $3x - 14$ [B] $3x - 32$

   [C] $3x^2 - 32x + 45$ [D] $4x - 14$

10. 080313b, P.I. A2.A.42

    If f and g are two functions defined by $f(x) = 3x + 5$ and $g(x) = x^2 + 1$, then $g(f(x))$ is

    [A] $3x^2 + 8$ [B] $9x^2 + 26$

    [C] $x^2 + 3x + 6$ [D] $9x^2 + 30x + 26$

11. 010408b, P.I. A2.A.42

    If $f(x) = \dfrac{2}{x+3}$ and $g(x) = \dfrac{1}{x}$, then $(g \circ f)(x)$ is equal to

    [A] $\dfrac{1+3x}{2x}$ [B] $\dfrac{2x}{1+3x}$

    [C] $\dfrac{x+3}{2x}$ [D] $\dfrac{x+3}{2}$

12. 060417b, P.I. A2.A.42

If $f(x) = x + 1$ and $g(x) = x^2 - 1$, the expression $(g \circ f)(x)$ equals 0 when x is equal to

[A] 0 and -2   [B] -2, only

[C] 0, only   [D] 1 and -1

13. 060210b, P.I. A2.A.42

If $f(x) = 2x^2 + 4$ and $g(x) = x - 3$, which number satisfies $f(x) = (f \circ g)(x)$?

[A] $\dfrac{3}{4}$ [B] 5   [C] 4   [D] $\dfrac{3}{2}$

14. 010812b, P.I. A2.A.42

The accompanying tables define functions f and g.

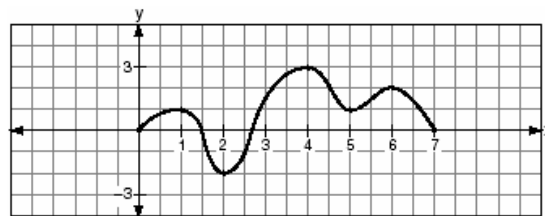| x	1	2	3	4	5
f(x)	3	4	5	6	7

x	3	4	5	6	7
g(x)	4	6	8	10	12

What is (g o f)(3)?

[A] 8   [B] 6   [C] 4   [D] 2

15. 080520b, P.I. A2.A.42

The accompanying graph is a sketch of the function $y = f(x)$ over the interval $0 \le x \le 7$.

What is the value of $(f \circ f)(6)$?

[A] 0   [B] 1   [C] 2   [D] -2

16. 060526b, P.I. A2.A.42

A certain drug raises a patient's heart rate, $h(x)$, in beats per minute, according to the function $h(x) = 70 + 0.2x$, where x is the bloodstream drug level, in milligrams. The level of the drug in the patient's bloodstream is a function of time, t, in hours, according to the formula $g(t) = 300(0.8)^t$. Find the value of h(g(4)), the patient's heart rate in beats per minute, to the *nearest whole number*.

17. 060605b, P.I. A2.A.42

The temperature generated by an electrical circuit is represented by $t = f(m) = 0.3m^2$, where m is the number of moving parts. The resistance of the same circuit is represented by $r = g(t) = 150 + 5t$, where t is the temperature. What is the resistance in a circuit that has four moving parts?

[A] 8,670   [B] 51   [C] 174   [D] 156

A2.A.17: Find the composition of functions

[1] A

[2] 11, and appropriate work is shown, such
as f(1) = 4 and g(4) = 11.
[1] Appropriate work is shown, but one
computational error is made.
or [1] Appropriate work is shown, but one
conceptual error is made, such as solving for
f(g(1)).
or [1] 11, but no work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[2] incorrect procedure.

[2] 5, and appropriate work is shown.
[1] Appropriate work is shown, but one
computational error is made.
or [1] Appropriate work is shown, but one
conceptual error is made, such as finding
or [1] 5, but no work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[3] incorrect procedure.

[4] A

[2] 255, and appropriate work is shown, such
as $g(3) = 3^2 - 1$ and $f(8) = 2^8 - 1 = 255.$
[1] Appropriate work is shown, but one
computational error is made.
or [1] One conceptual error is made, such as
evaluating $(g \circ f)(3).$
or [1] 255, but no work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[5] incorrect procedure.

[6] C

[2] 6, and appropriate work is shown.
[1] Appropriate work is shown, but one
computational error is made.
or [1] Appropriate work is shown, but one
conceptual error is made, such as evaluating
$(g \circ f)(5),$ resulting in an answer of
24.78270016.
or [1] 6, but no work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[7] incorrect procedure.

[4] $(f \circ g)(x) = 4x^{-\frac{1}{3}}$ or $(8x^{-\frac{1}{2}})^{\frac{2}{3}}$ or an
equivalent answer and $(f \circ g)(27) = \frac{4}{3}$ or an
equivalent answer, and appropriate work is
shown.

[3] Simplification is shown to at least $4x^{-\frac{1}{3}}$,
but one computational error or an error in the
Law of Exponents is made when finding
$(f \circ g)(27).$
[2] $(f \circ g)(x)$ is determined correctly, but
$(f \circ g)(27)$ is not found or is found
incorrectly.
or [2] $\frac{4}{3}$ or an equivalent answer, and
appropriate work is shown, but an expression
for $(f \circ g)(x)$ is not found or is found
incorrectly.
[1] $4x^{-\frac{1}{3}}$ and $\frac{4}{3}$ or equivalent answers, but no
work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[8] incorrect procedure.

[9] B

[10] D

[11] D

[12] A

[13] D

[14] A

[15] D

[2] 95, and appropriate work is shown.
[1] Appropriate work is shown, but one
computational or rounding error is made.
or [1] Appropriate work is shown, but one
conceptual error is made, such as calculating
g(h(4)).
or [1] 95, but no work is shown.
[0] A zero response is completely incorrect,
irrelevant, or incoherent or is a correct
response that was obtained by an obviously
[16] incorrect procedure.

[17] C