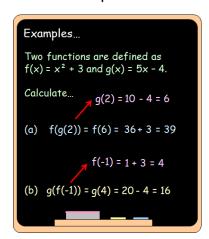
# Outcome 1 - Type 1 'f(g(x))'

### Bronze examples



### Bronze questions

Two functions are defined as  $f(x) = x^2 - 8$ and g(x) = 6x + 1. Calculate...



g(f(-1))

Two functions are defined as  $h(x) = 5x^2 + 8$ and k(x) = 4x + 1. Calculate...

h(k(-2))

k(h(1))

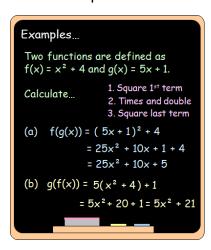
Two functions are defined as  $f(a) = a^2 + 2$ and g(a) = 4a - 1. Calculate...

 $f(g(\frac{1}{2}))$ 

 $g(f(\frac{1}{8}))$ 

### Outcome 2 - Type 2 'f(g(number))'

#### Silver examples



#### Silver questions

Two functions are defined as  $f(x) = x^2 - 7$ and g(x) = 2x - 3. Calculate...



f(g(x))

g(f(x))

Two functions are defined as  $h(x) = x^2 + 1$ and k(x) = 8x - 5. Calculate...



h(k(x))

 $\triangleq$  k(h(x))

Two functions are defined as  $f(a) = a^2 + 3a$ and g(a) = 9a - 1. Calculate...



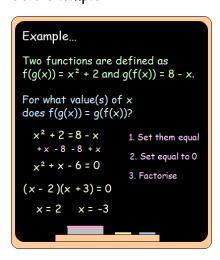
g(g(a))



#### f(g(a))

## Outcome 3 - Working backwards (finding 'x')

#### Gold example



#### Gold questions



Two functions are defined as f(g(x)) = 4x - 5 and g(f(x)) = x + 19.

For what value(s) of x does f(g(x)) = g(f(x))?

Two functions are defined as  $h(k(x)) = x^2 + 10$  and k(h(x)) = 7x + 40.

For what value(s) of x does h(k(x)) = k(h(x))?

Two functions are defined as  $f(g(a)) = 2a^2 + 9a$  and  $g(f(a)) = 1 + 5a - 3a^2$ .

For what value(s) of x does f(g(a)) = g(f(a))?

Bronze Answers

- 1. 617 2. -41
- 3. 253 4. 53
- 5. 3 6. 113/16

Silver Answers

- 1.  $4x^2 12x + 2$  2.  $2x^2 17$
- 3.  $64x^2 80x + 26$  4.  $8x^2 + 3$
- 5. 81a 10 6. 81a<sup>2</sup> + 9a 2

Gold Answers

- 1. x = 8
- 2. x = 10, x = -3
- 3. a = 1/5, a = -1