# Example 1

## $f \circ g\ (x)$

1. $f(x) = 6x$ and $g(x) = \frac{x}{6}$ — Notice the equation assigned to *f* and the equation assigned to *g*.
2. $f \circ g(x) = f(g(x))$ — The composition of *f* of *g* of *x* is equivalently written as *g* (*x*) into *f* (*x*).
3. $f(x) = 6x$ — Since *f* (*x*) equals 6*x*...
4. $f(g(x)) = 6[g(x)]$ — When you substitute *g* (*x*) for *x*, *g* (*x*) appears in every place there is an *x* in *f*.
5. $f(\frac{x}{6}) = 6[\frac{x}{6}]$ — Replace *g* (*x*) with *x* divided by 6.
6. $= \frac{\cancel{6}}{1}(\frac{x}{\cancel{6}})$ — Since 6 divided by 6 equals 1, the 6's cancel out.
7. $= \frac{x}{1}$ — Which leaves *x* divided by 1.
8. $f \circ g(x) = x$ — Which simplifies to *x*.

## $g \circ f\ (x)$

1. $f(x) = 6x$ and $g(x) = \frac{x}{6}$ — Notice the equation assigned to *f* and the equation assigned to *g*.
2. $g \circ f(x) = g(f(x))$ — The composition of *g* of *f* of *x* is equivalently written as *f* (*x*) into *g* (*x*).
3. $g(x) = \frac{x}{6}$ — Since *g* (*x*) equals *x* divided by 6...
4. $g(f(x)) = \frac{[f(x)]}{6}$ — When you substitute *f* (*x*) for *x*, *f* (*x*) appears in every place there is an *x* in *g*.
5. $g(6\text{x}) = \frac{[6x]}{6}$ — Replace *f* (*x*) with 6*x*.
6. $= \frac{(\cancel{6}x)}{\cancel{6}}$ — Since 6 divided by 6 equals 1, the 6's cancel out.
7. $= \frac{x}{1}$ — Which leaves *x* divided by 1.
8. $g \circ f(x) = x$ — Which simplifies to *x*.

**Notice the difference in writing $f \circ g\ (x)$ and $g \circ f\ (x)$ in Step 5 of both cases. Although they both result in the same answer, it is **important** to plug the corresponding equation in the appropriate place.**

# Example 2

## $p \circ q\ (x)$

1. $p(x)=x^2+3x+1$ and $q(x)=x-1$ — Notice the equation assigned to *p* and the equation assigned to *q*.

2. $p \circ q(x)=p(q(x))$ — The composition of *p* of *q* of *x* is equivalently written as *q* (*x*) into *p* (*x*).

3. $p(x)=x^2+3x+1$ — Since *p* (*x*) equals *x* squared plus 3*x* plus 1...

4. $p(q(x))=[q(x)]^2+3[q(x)]+1$ — When you substitute *q* (*x*) for *x*, *q* (*x*) appears in every place there is an *x* in *p*.

5. $p(x-1)=(x-1)^2+3(x-1)+1$ — Replace *q* (*x*) with *x* minus 1.

6. $= x^2-2x+1+3x-3+1$ — Simply the equation...

7. $p \circ q(x)=x^2+x-1$ — Which becomes *x* squared plus *x* minus 1.

## $q \circ p\ (x)$

1. $p(x)=x^2+3x+1$ and $q(x)=x-1$ — Notice the equation assigned to *p* and the equation assigned to *q*.

2. $q \circ p(x)=q(p(x))$ — The composition of *q* of *p* of *x* is equivalently written as *p* (*x*) into *q* (*x*).

3. $q(x)=x-1$ — Since *q* (*x*) equals *x* minus 1...

4. $q(p(x))=[p(x)]-1$ — When you substitute *p* (*x*) for *x*, *p* (*x*) appears in every place there is an *x* in *q*.

5. $q(x^2+3x+1)=[x^2+3x+1]-1$ — Replace *p* (*x*) with *x* squared plus 3*x* plus 1.

6. $= (x^2+3x+1)-1$ — Simplify the equation.

7. $q \circ p(x)=x^2+3x$ — Which becomes *x* squared plus 3*x*.