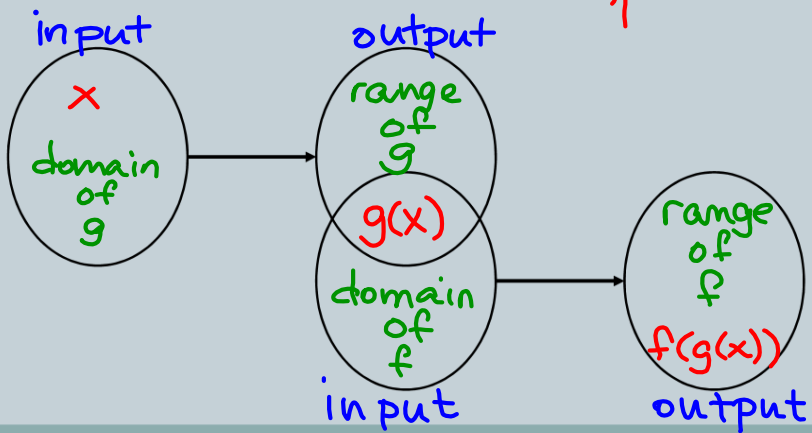
Composition of Functions

The COMPOSITION of f with g is

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



Ex. Given: $f(x) = 2x$, $g(x) = 8x - 6$

$f(g(x)) =$ $f(8x-6) = 2(8x-6) = 16x-12$

Now, evaluate $f(g(5))$ two ways ...

$g(5) = 8(5)-6 = 40-6 = 34$

$f(34) = 2(34) = \boxed{68}$

OR $f(g(x)) = 16x-12$

$f(g(5)) = 16(5)-12 = 80-12 = \boxed{68}$

Ex. Given: $f(x) = 2x$, $g(x) = 8x - 6$

substitute

$g(f(x)) = g(2x) = 8(2x) - 6$

$= 16x - 6$

$f(f(x)) = f(2x) = 2(2x) = 4x$

Ex. Given: $f(x) = x^2 - 2x - 15$, $g(x) = x + 3$

$f(g(x)) = f(x+3) = (x+3)^2 - 2(x+3) - 15$

$= x^2 + 6x + 9 - 2x - 6 - 15$

$= x^2 + 4x - 12$

$g(f(x)) = g(x^2 - 2x - 15) = x^2 - 2x - 15 + 3$

$= x^2 - 2x - 12$

★ Composition is NOT commutative!