MORE PRACTICE WITH FUNCTION NOTATION

- Want some basic practice with functions first?
  Introduction to Functions
  Introduction to Function Notation

(more mathematical cats)

Recall from Introduction to Function Notation that a **function** is a rule that takes an input, does something to it, and gives a unique corresponding output.

There is a special notation (called 'function notation') that is used to represent this situation: if the function name is f, and the input name is x, then the unique corresponding output is called $f(x)$.
The notation ' $f(x)$ ' is read aloud as: ' f of x '.

So, what exactly ***is*** $f(x)$?
Answer: It is the output from the function f when the input is x.

This exercise gives more advanced practice with function notation.

EXAMPLES:

Question:
Let $f(x) = x^2 + 2x$.
Find and simplify: $f(-3)$
Solution:
$f(-3) = (-3)^2 + 2(-3) = 9 - 6 = 3$

Question:
Let $f(x) = x^2 + 2x$.
Find and simplify: $f(x+1)$
Solution:
$f(x+1) = (x+1)^2 + 2(x+1) = x^2 + 2x + 1 + 2x + 2 = x^2 + 4x + 3$

the 'Empty Parentheses Method'

Some people find it helpful to use the so-called 'empty parentheses method' to help with function evaluation.
For example, take the function rule $f(x) = x^2 + 2x$ and rewrite it as

$$f(\text{blah}) = (\text{blah})^2 + 2(\text{blah})$$

or, even more simply, just leave a blank space for the input—a pair of ***empty parentheses*** where the input should be:

$$f(\quad) = (\quad)^2 + 2(\quad)$$

Then, when you want to find (say) $f(x+1)$, just put the input, $x+1$, inside ***every*** set of empty parentheses:

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

Voila!

Question:
Let $f(x) = 5$.
Find and simplify: $f(x+1)$
Solution:
The function f is a constant function:
no matter ***what*** the input is, the output is 5.
That is, $f(\text{anything}) = 5$.
So, $f(x+1) = 5$.

Question:
Let $f(x) = x^2 - 2x$.
Find and simplify: $f(1) + f(3)$
Solution:

$$\begin{aligned} & f(1) + f(3) \\ & = \overbrace{(1^2 - 2\cdot 1)}^{f(1)} + \overbrace{(3^2 - 2\cdot 3)}^{f(3)} \\ & = (1-2) + (9-6) \\ & = 2 \end{aligned}$$