

Functions Require Context

In this section we demonstrate that a relation requires context to be considered a function.

In the previous section we established that a relationship is a function if each input has exactly one output. This condition can be even trickier than it may initially seem though. The same equation can be a function in one setting, and not a function in another. This is because every relationship **requires** context before we can decide if it is a function or not. Consider the following example.

Explanation (A Drink Vending Machine). *You are thirsty and decide to get a drink from the vending machine nearby. After looking over your choices you see that the vending machine is setup like the following:*

	#1	#2	#3	#4	#5
A	Pepsi	Pepsi	Pepsi	Pepsi	Pepsi
B	Fanta	Fanta	Sierra Mist	Sierra Mist	Sierra Mist
C	Gatorade Blue	Gatorade Blue	Gatorade Green	Gatorade Green	Gatorade Green
D	Coke	Coke	Coke	Coke	Coke
E	Sprite	Sprite	Sprite	Sunkist	Sunkist
F	Crush	Root beer	Cream Soda	Water	Water

If you punch in a letter and number combination you know exactly what you will get; for example if you enter C5 you know you will get a green Gatorade. However, if you approach the vending machine wanting a Pepsi, then there are several options you could enter to get one; A1, A2, A3, A4, or A5.

In this example, the relationship that inputs the location of the drink you request (such as C5) and outputs the drink you get as a result (green Gatorade) would be a function. In contrast, the relation whose input is what drink you want (such as Pepsi) and outputs the location you must enter to get that drink (A1 through A5) would not be a function, because there are multiple outputs for the same input.

Note that it is perfectly natural to ask what drink is in a given location, as well as asking what location you should type in for a particular drink you want. Both of these situations are perfectly natural, and yet one is a function and one is not.

Problem 1 What is meant by context, with regards to mathematical relations?

Multiple Choice:

Learning outcomes:

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- (a) *The actual objects/ideas/etc that a symbolic input and output represent.*
✓
 - (b) *The values (eg numbers) that you can put in, or get out, of a relation.*
 - (c) *How well the mathematical relation represents the real world problem.*
 - (d) *The formulas/equations/etc that are used to symbolically represent the real world situation.*
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The context required to define a function has a special set of terminology in mathematics; the domain, codomain, and range, which we discuss in the next section.