

# Chapter 12: Functions

November 3, 2021

## 1 Relations and Functions

**Definition** A function is a relation that assigns to each member of the domain exactly one member of the range.

$$f(x) \text{ f of } x \tag{1}$$

### 1.1 Understanding: Functions

1. Simple understanding: you have one apple seed  $x$  (input/ingredient), you plant it (operation) - add water, fertilizer, etc, then you have an apple to eat in a few years later (output).
2. **Definition of Function** : what something or somebody **does**
3. input vs output
4. Domain vs range
5. A relation is a set of ordered pairs.
6. On Graph: Coordinates - (x-Domain, y-Range)
7. **one/multiple inputs – exactly one output**
8. a function can also be an input for another function: nested functions

### 1.2 Three Keys Points

1. input
2. function - operation
3. output

### 1.3 Graph

Try 2 or a few simple pairs:  $(0, y)$ ;  $(x, 0)$ ;  $(1, y)$ ,  $(2, y)$

### 1.4 Relating math and graph

**Q 1.** Use the functions  $f(x) = 3x$  and  $g(x) = -4x^2$  to find the following:  
 $g(-3) \cdot f(-8) + 16$

**Q 2.** Describe the graph of any functions of the form  $g(x) = a|x| + b$

## 2 Inequalities

**Q 1.** For the function defined by  $g(x) = a|x| + b$ , what effect does changing the value of  $a$  have on the graph? What effect does changing the value of  $b$  have on the graph?

**Q 2.** Sketch an absolute value graph that is not a function

### 3 Word Problems: The Wheel Shop

**Q 1.** The Wheel Shop sells other kinds of vehicles. There are bicycles and go-carts in a different room of the shop. Each bicycle has only one seat and two wheels, and each go-cart has only one seat and four wheels. There are a total of 21 seats and 54 wheels in that room. How many are bicycles and how many are go-carts?

**Q 2.** Three months later some vehicles have sold and new models have been brought into the Wheel Shop. Now, there are a different number of bicycles, tandem bicycles (each with 2 seats and 2 wheels), and tricycles (each with 1 seat and 3 wheels) in the shop. There are a total of 135 seats, 118 front handlebars (that steer the bike), and 269 wheels. How many bicycles, tandem bicycles, and tricycles are there?

**Q 3.** In the back stockroom at the Wheel Shop, the number of seats and horns equaled the number of wheels. The number of seats and handlebars equaled the number of horns. Twice the number of wheels is equal to three times of handlebars. **Determine the relationship of horns to seats.**

**Q 4.** The repair department of the bicycle shop repairs three things: flat tires, bent handle bars, and ripped seats. Today in the repair department, 25% of the bikes had flat tires only, 5% had bent handlebars only, 10% had ripped seats only. Just  $\frac{1}{12}$  of the bikes had all three repairs to do: flat tires, bent handlebars, and ripped seats. No bikes were completely fixed and there are a total of 101 repairs to be made. How many bikes are in the repair department? How many bikes need two repairs? If less than half of all the bikes have a ripped seat, what is the range of bikes that need both the tires and handlebars repaired without needing to fix the seat?

1. [Answer](#) 2. [Question Sheet and Hints](#) :