FUNCTION

The concept of a function is extremely important in mathematics and computer science

Function

Let A and B be nonempty sets. A *function* f from A to B is an assignment of exactly one element of B to each element of A. We write $f(a) = b$ if b is the unique element of B assigned by the function f to the element a of A. If f is a function from A to B, we write $f : A \to B$.

Functions are sometimes also called **mappings** or **transformations**

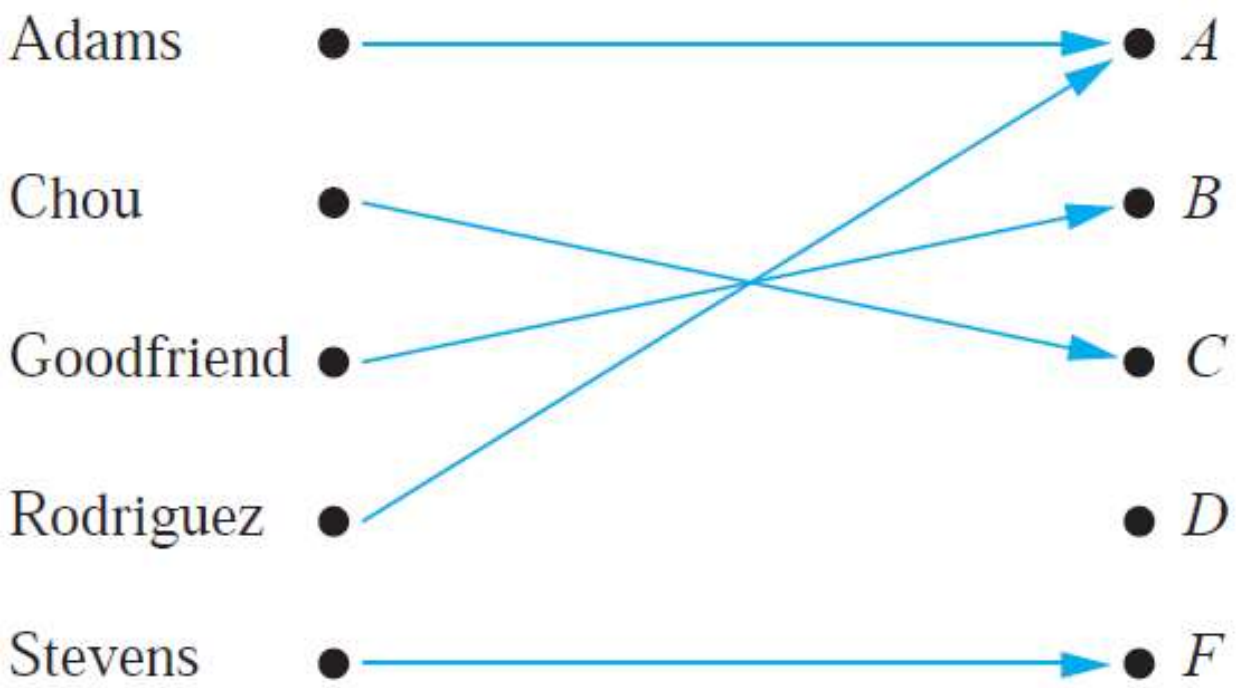
Assign to each element of a set a particular element of a second set

Functions are used to represent how long it takes a computer to solve problems of a given size.

Many computer programs and subroutines are designed to calculate values of functions.

Understanding functions

Assignment of Grades in a Discrete Mathematics Class



Functions

If f is a function from A to B, we say that A is the *domain* of f and B is the *codomain* of f. If $f(a) = b$, we say that b is the *image* of a and a is a *preimage* of b. The *range*, or *image*, of f is the set of all images of elements of A. Also, if f is a function from A to B, we say that f *maps* A to B.

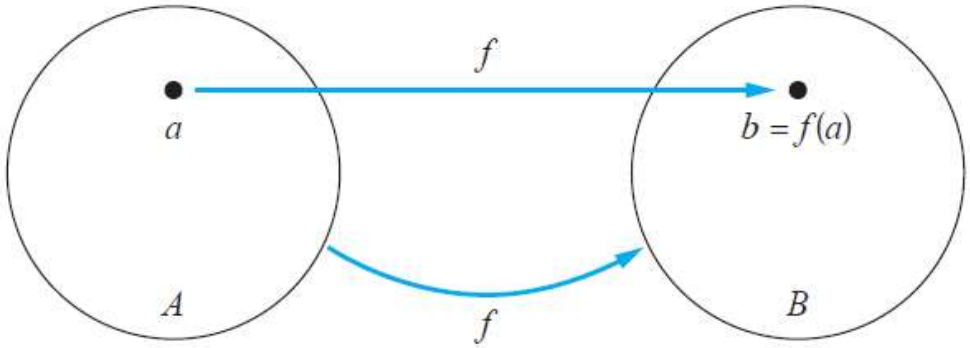


FIGURE 1 **The Function f Maps A to B.**

Let $A = \{a, b, c, d, e\}$ and $B = \{1, 2, 3, 4\}$ with $f(a) = 2$, $f(b) = 1$, $f(c) = 4$, $f(d) = 1$, and $f(e) = 1$. The image of the subset $S = \{b, c, d\}$ is the set $f(S) = \{1, 4\}$. ◀

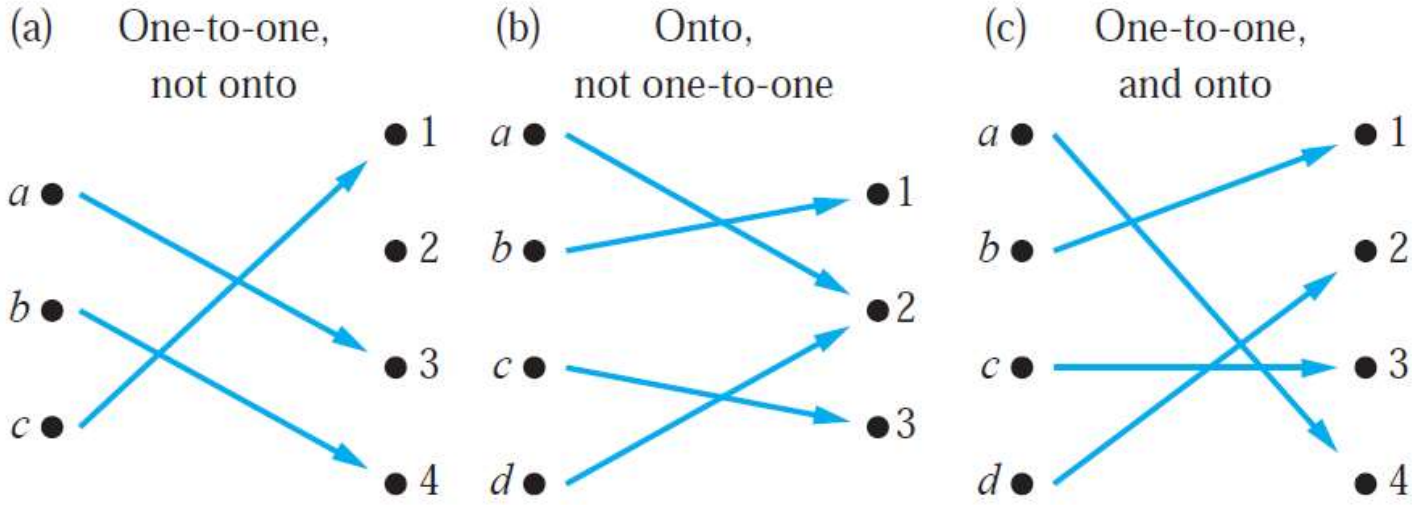
Functions often specified in programming languages

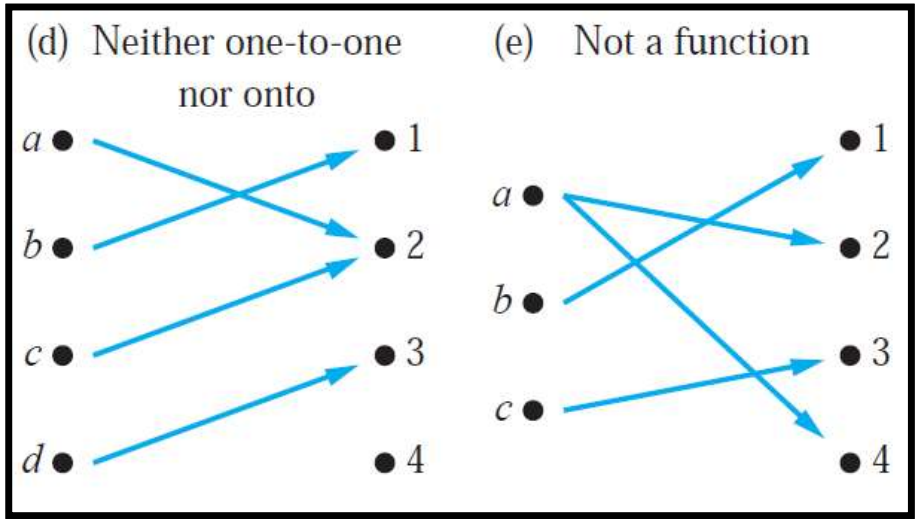
```java
import java.lang.*;

public class MathDemo {

   public static void main(String[] args) {

      // get two double numbers
      double x = 60984.1;
      double y = -497.99;

      // call floor and print the result
      System.out.println("Math.floor(" + x + ")=" + Math.floor(x));
      System.out.println("Math.floor(" + y + ")=" + Math.floor(y));
      System.out.println("Math.floor(0)=" + Math.floor(0));
   }
}
```

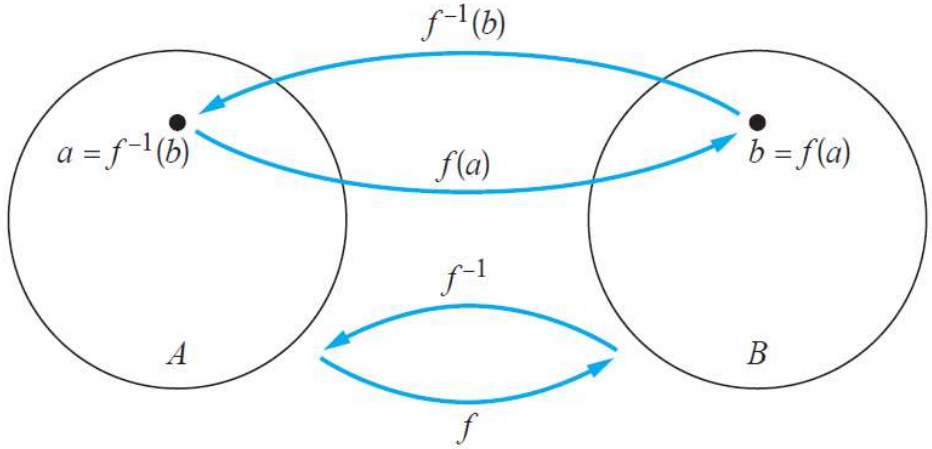
```
Math.floor(60984.1)=60984.0
Math.floor(-497.99)=-498.0
Math.floor(0)=0.0
```

int **function** (float x){. . .}

Examples of Different Types of functions







The Function f^{-1} Is the Inverse of Function f.