

# Variables

zyBook Chap 2.3, 2.4

# Variable

A variable is a **memory location** with a **name** and a **type** that stores a **value**.

- E.g., a variable `year` of type `int` and a value of `2023`

`year`

`2023`

# Steps for Using a Variable

1. **Declare** variable
  - Specify its **type** and **name**
2. **Initialize** variable
  - Store a **value** into it
3. **Use** variable
  - Use it as part of an expression/argument

# Step 1 – Declare Variable

- The variable declaration sets aside memory for storing a value
- Syntax: **<type> <varName>;** (stores no value yet)

```
int year;  
boolean isHappy;
```

A diagram showing a green rounded rectangle representing memory. Inside, the variable 'year' is associated with a white rectangular box, and the variable 'isHappy' is associated with a light orange rectangular box.

year  
isHappy

- Naming convention:
  - Start with lowercase letters, capitalize the first letter of the attached words

# Step 2 – Assign Value to Variable

- Variable assignment **stores a value** into a variable
  - The value can be a **number** or an **expression**
  - The **first time** a value is assigned to a variable is also known as **initializing** the variable
- Syntax: **<name> = expression;**
  - read as "<name> **gets** expression" OR "<name> is **assigned** expression"
  - The **=** sign is the command for **assignment**.

```
year = 2023;  
isHappy = true;
```

year	2023
isHappy	true

# Combine Declaration & Initialization

- You can declare and initialize a variable in a single statement

**<type> <name> = expression;**

```
// Approach 1  
int year;      // Declare  
year = 2023;   // Initialize
```

```
// Approach 2 – Usually preferred  
int year = 2023;    // Declare and initialize
```

# Step 3 – Use Variable

- Once given a value, a variable can be used in expressions:

```
int x = 4;  
System.out.println("The value of x is: " + x); // The value of x is: 4
```

- We can assign a value to a variable more than once:

```
int x = 4;    // x = 4  
x = 4 + 5;    // x = 9
```

- We can reassign the value based on the variable's current value:

```
int x = 4;    // x = 4  
x = x + 4;    // x = 8
```

The **right-hand side** expression is **evaluated first**, and then its result is **assigned** to the variable **on left**.

Q: Find out the values of the integers, a, b, c, and d.

#### ➤ JAVA

```
1      int a = 2;
2      int b = 3;
3      int c = 4;
4      int d = a + b + c;    // d = 2 + 3 + 4 = 9
5
6      a = d - a - b;        // a = 9 - 2 - 3 = 4
7      b = d - b - c;        // b = 9 - 3 - 4 = 2
8      c = d - a - c;        // c = 9 - 4 - 4 = 1
9
10     System.out.println("a: " + a);
11     System.out.println("b: " + b);
12     System.out.println("c: " + c);
13     System.out.println("d: " + d);
```