1.5 Compound Assignment Operators

Shortcuts!

Shortcuts are everywhere

- English: “et cetera” => “etc.”
- Instagram: Like Button => *Double Tap*
- Internet: Autofilling forms
- iPhone: “Hey Siri”

- What are some examples of shortcuts in your life?

Computer Scientists are… kinda lazy...

So… we LOVE shortcuts!

Arithmetic Operators (from yesterday)

Operator	Meaning	Example
+	addition	3 + x
-	subtraction	p - q
*	multiplication	6 * i
/	division	10 / 4
%	mod (remainder)	11 % 3

Arithmetic Operator Shortcuts

These shortcuts let you do **assignment** and a **math operation** in one step

Example Expression	**Shortcut form!**
`x = x + 3`	`x += 3`
`x = x - y`	`x -= y`
`x = x * 5.0`	`x *= 5.0`
`x = x / 2`	`x /= 2`
x = x % 3	`x %= 3`

These are officially called

Compound Assignment Operators

Incrementing Compound Operators

Adding 1 and Subtracting 1 to a variable are so commonly used, that Java has special expressions for these operations.

Expression	**Shortcut form**	**Even Shorter Shortcut Form**
`x = x + 1`	`x += 1`	`x++`
`y = y - 1`	`y -= 1`	`y--`

*Note: You can also do ++x or --x. This would adjust the value of x **before** doing something with it. This is not on the AP exam but here's an example:*

```
int x = 6;
int y = ++x;
System.out.println(x) // Outputs 7
System.out.println(y) // Outputs 7
```

```
int x = 6;
int y = x++;
System.out.println(x) // Outputs 7
System.out.println(y) // Outputs 6
```

Exercise: Code Tracing and Trace Tables

- Code Tracing is a technique used to simulate a dry run through code line by line by hand as if you are the computer executing the code.
- Tracing can be used for:
  - Debugging
  - Proving that your program runs correctly
  - Figuring out what the code actually does
- Trace tables help track the values of variables as they change throughout a program.
- To trace through code, write down a variable in each column or row in a table and keep track of its value throughout the program.
  - Some trace tables also keep track of the output and the line number you are currently tracing.

Exercise: Code Tracing and Trace Tables

Let’s trace through the following program together:

```
int a = 0;
int b = 0;
a = a + 1;
a--;
b += a;
b++;
b += 3;
b *= 2;
a = b % 3;
a *= a;
```

Exercise: Code Tracing and Trace Tables

Now your turn! By hand, draw out a line-by-line trace table for the following program:

```
int x = 0;
int y = 9;
int z = y;
x++;
x++;
x++;
y -= 3;
z = x + z;
x = y * z;
y %= 2;
z--;
y /= x;
```

Line	x	y	z
1			
2			
3			
4			
5			
6			
...			