Arithmetic Expressions

- Operations on numerical types
- Operations:

`+`	"addition"	
`-`	"subtraction"	
`*`	"multiplication"	
`/`	"division"	(different for **`int`** vs. **`double`**)
`%`	"remainder"	

- Precedence (in order):

`()`	highest
`*`, `/`, `%`	
`+`, `-`	lowest

Operators in same precedence category evaluated left to right

Type Casting

- Treat one type as another for one operation

```
int x = 3;
double y;

y = x / 2;                  //  y = 1.0

y = (double)x / 2;          //  y = 1.5

y = 5.9;
x = (int)y;                 //  x = 5

x = 7;
y = x;                      // fine: y = 7.0
x = y;                      // error
```

Expression Short-hands

```
int x = 3;

x = x + 1;       x += 1;        x++;

x = x + 5;       x += 5;

x = x – 1;       x -= 1;        x--;

x = x * 3;       x *= 3;

x = x / 2;       x /= 2;
```

Boolean Expressions

- Boolean expression is just a ***test*** for a condition
  - Essentially, evaluates to **`true`** or **`false`**

- Value comparisons:

`==`	“equals”	(note: not single **`=`**)
`!=`	“not equals”	(cannot say **`<>`**)
`>`	“greater than”	
`<`	“less than”	
`>=`	“greater than or equal to”	
`<=`	“less than or equal to”	

More Boolean Expressions

- Boolean comparisons (in order of precedence):

`!`	"not"
`!p`	if **`p`** is true, then **`!p`** is false, and vice versa
`&&`	"and"
`p && q`	only true if **`p`** and **`q`** are both true
`||`	"or"
`p || q`	true if **`p`** or **`q`** (or both) are true

```
boolean p = (x != 1) || (x != 2);
```

`p` is always **`true`**, you really want:

```
boolean p = (x != 1) && (x != 2);
```

Short Circuit Evaluation

- Stop evaluating boolean expression as soon as we know the answer
- Consider:

```
    p = (5 > 3) || (4 <= 2);
```

The test **`(4 <= 2)`** is not performed!

- Example of useful case:

```
    p = (x != 0) && ((y / x) == 0);
```

Avoid division by 0, since **`((y / x) == 0)`** is not performed