01- Variables and Datatypes Notes

To humans these all mean a value of 1:

```
1
1.0
one
01
```

```
           word + number
How much is One + 1.0?   Human: 2 or 2.0  Java: ERROR!
```

In Java:

```
1    - decimal integer whole number value of 1 (no decimals)
1.0  - double value of 1 (has decimals)
1.0f - float value of 1 (has decimals)
one  - variable name (not a number / NaN)
"1"  - String containing the character 1 (not a number / NaN)
'1'  - char value containing the character 1 (not a number / NaN)
01   - octal (base 8) value of 1
```

Know datatypes of the data when performing any operation, especially arithmetic:

```
        7 / 4
integer 7 / integer 4
```

Java does an integer divide
integer divide produces an integer quotient and integer remainder

```
7 / 4 = quotient 1, remainder 3

double x = 7 / 4 (result is integer 1 (quotient))
double x = integer 1
double x = convert the integer 1 to a double 1.0
double x = 1.0

(5 / 2) * 4
  (2)   * 4
        8



(5 % 2) * 4 (% - remainder of integer divide)
  (1)   * 4
          4
```

/ = quotient of integer divide
% = remainder of integer divide

double x = 7.0 / 4
double / int
double / double (java converts the int to a double)
7.0 / 4.0 (double arithmetic - like a calculator)
double 1.75
double x = 1.75;

casting tells Java to treat a value as a specific type to this expression only
(programmer specified data convesion)

cast to a double - tell java to treat value as double for this statement only

```
double x =   (double) 7  / 4
                   double / int
                   double / double (java converts the int to a double)
                     7.0  / 4.0
                   double 1.75
double x = 1.75;


double x =   7    / 4.0
              int   / double
              7.0   / 4.0
            double / double
double x = 1.75;
```

Hierarchy of data types (Java converts to higher data type):

```
double (high)
float
long
int
short
byte (low)
```

```
int x = (int) ((5 / (double) 2) * 4);

  a. (5 / (double) 2)
  b. (5.0 / 2.0)
  c. (2.5 * 4)
  d. 10.0 (java will convert to datatype of left side if required
  e. x = 10
```

cast (int) or result is necessary because the result is a double (10.0)
and Java won't automatically convert to a lower type.