Intro to CS
Variable Problems

¡Clicker!

Problems about Variables
After these Java commands are carried out by the computer, which diagram best describes what's in the computer?

```java
int x;
x = 37;
```

(A) \[ \text{X} \quad 37 \]  
name of the variable  
value stored in the variable

(B) \[ 37 \quad X \]
After these Java commands are carried out by the computer, which diagram best describes what's in the computer?

```java
int x;
x = 37;
x = 58;
```

(A) \[ \text{name of the variable} \quad \text{value stored in the variable} \]

(B) \[ \text{name of the variable} \quad \text{value stored in the variable} \]
After these Java commands are carried out by the computer, which diagram best describes what's in the computer?

```java
int x;
x = 58;
x = 37;
```

- **(A)**
  - Name of the variable: `x`  
  - Value stored in the variable: 37

- **(B)**
  - Name of the variable: `x`  
  - Value stored in the variable: 58
int X;
int Y;
X = 58;
Y = 37;

(A)  
\[
\begin{array}{c}
\text{X} \\
\text{Y}
\end{array}
\begin{array}{c}
37 \\
58
\end{array}
\]

(B)  
\[
\begin{array}{c}
\text{X} \\
\text{Y}
\end{array}
\begin{array}{c}
58 \\
37
\end{array}
\]

name of the variable

value stored in the variable
```c
int X;
int Y;
X = 58;
Y = 37;
X = Y;
```

(A)  
```
<table>
<thead>
<tr>
<th>X</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>58</td>
</tr>
</tbody>
</table>
```

(C)  
```
<table>
<thead>
<tr>
<th>X</th>
<th>37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>37</td>
</tr>
</tbody>
</table>
```

(B)  
```
<table>
<thead>
<tr>
<th>X</th>
<th>58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>37</td>
</tr>
</tbody>
</table>
```

(D)  
```
<table>
<thead>
<tr>
<th>X</th>
<th>58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>58</td>
</tr>
</tbody>
</table>
```
Other types of variables besides `int` Floating point (Java `float` and `double`) are like scientific notation. Example: Avogadro's number in chemistry, the number of molecules in a mole, is $6.023 \times 10^{+19}$

Nrs. in scientific notation are expressed with TWO numbers: The “mantissa” like 6.023 and the “exponent” like $+19$.

Floating point numbers in computers are like that except the base for the exponentiation is 2 instead of 10. Those two numbers are, like all computer numbers, stored in binary.
Another type: String

Example:

String myName;
//Declare, which means set up
//a variable that can hold
//String (reference) values.
myName = “Arthur”;
//Assign a String literal, so
//now the value of variable
//named myName is “Author”
System.out.println(myName);
//Prints Arthur (without the “”s)
Puzzles with int variables are tricky to get right and are what's important now. You can read in textbooks (or Web sources) about other types when you need to use them. The really important concepts to master now are recognizing that variables are memory cells, and (1) declaring and (2) assigning and (3) using of values of variables.
Declaring: Sets up a variable (which IS a memory cell) and gives it the name you wrote.

Assigning with =: Copies a data value from the right to an already set up variable named on the left.

Using the current value from a variable: is done when the variable's name is written in an expression or as a parameter value in a method call.
= means copy
(not “is equal” as in math class)
You must also memorize:
= copies

LEFT
name of the variable
where the copy
will be written

RIGHT
(expression of) the data
that will be copied

;
int X;
int Y;
X = 58;
Y = 37;
X = Y;

Use paper!
\[ y = 37; \]
Good Java syntax.

\[ 37 = y; \]
Illegal (bad) in Java syntax.
(DON'T CODE THIS!)
int X;
int Y;
X = 58;
Y = 37;
Y = X;

(A) X 37
    Y 58

(B) X 58
    y 37

(C) X 37
    y 37

(D) X 58
    y 58

Use paper!