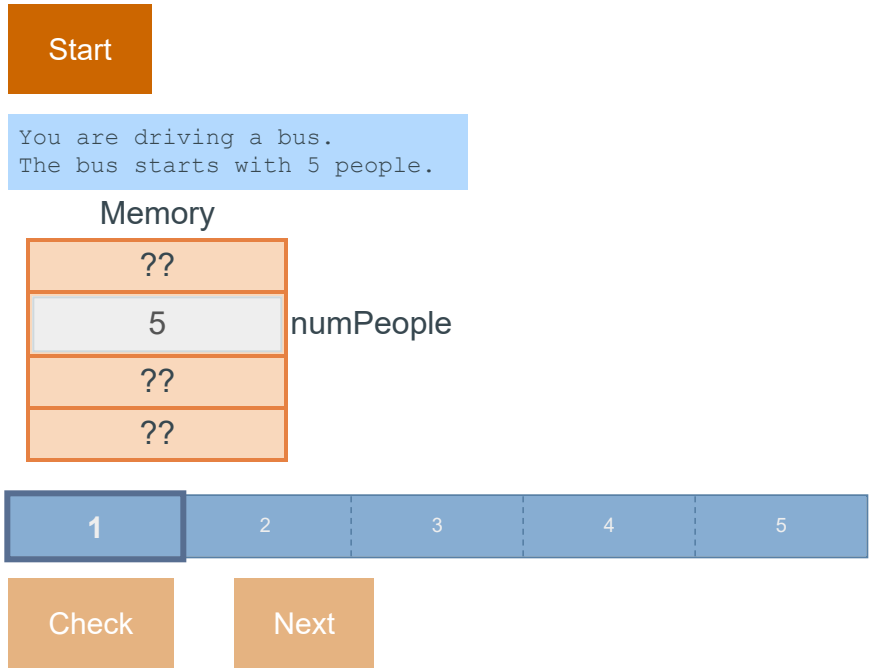
2.1 Variables and assignments (general)

Remembering a value

Here's a variation on a common schoolchild riddle.

PARTICIPATION ACTIVITY 2.1.1: People on bus.

For each step, keep track of the current number of people by typing in the numPeople box (the box is editable).



Feedback?

By the way, the real riddle's ending question is actually "What is the bus driver's name?"— the subject usually says "How should I know?" The riddler then says "I started with YOU are driving a bus."

The box above served the same purpose as a *variable* in a program, introduced below.

Variables and assignments

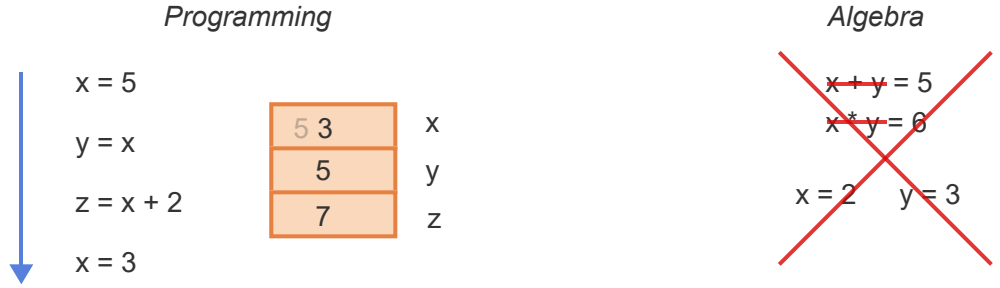
In a program, a ***variable*** is a named item, such as x or numPeople, used to hold a value.

An ***assignment*** assigns a variable with a value, such as x = 5. That assignment means x is assigned with 5, and x keeps that value during subsequent assignments, until x is assigned again.

An assignment's left side must be a variable. The right side can be an expression, so an assignment may be x = 5, y = x, or z = x + 2. The 5, x, and x + 2 are each an expression that evaluates to a value.

PARTICIPATION ACTIVITY 2.1.2: Variables and assignments.

Start 2x speed



Feedback?

= is not equals

In programming, = is an assignment of a left-side variable with a right-side value. = is NOT equality as in mathematics. Thus, x = 5 is read as "x is assigned with 5", and not as "x equals 5". When one sees x = 5, one might think of a value being put into a box.

PARTICIPATION ACTIVITY 2.1.3: Valid assignments.

Indicate which assignments are valid.

1) x = 1

- (•) Valid
- ( )

Correct

x is assigned with 1.

Invalid

2) x = y

- Valid
- Invalid

Correct

x is assigned with y's current value. If y is 9, x is assigned with 9.

3) x = y + 2

- Valid
- Invalid

Correct

x is assigned with y's current value plus 2. If y is 4, x is assigned with 4 + 2, or 6

4) x + 1 = 3

- Valid
- Invalid

Correct

The left side must be a variable, not an expression like x + 1. In programming, = does not mean equal. = means assign the left-side variable with the right-side's value. Thus, the left side MUST be a variable.

5) x + y = y + x

- Valid
- Invalid

Correct

In programming, the left side of = must be a variable, which will be assigned with the right side's value. Thus, having x + y on the left side doesn't make sense.

Feedback?

PARTICIPATION ACTIVITY 2.1.4: Variables and assignments.

Given variables x, y, and z.

1) x = 9
y = x + 1
What is y?

10

Check Show answer

Correct

10

x is currently 9, so y is assigned with 9 + 1, or 10.

2) x = 9
y = x + 1
What is x?

9

Check Show answer

Correct

9

x was assigned with 9. Then, y was assigned with x + 1, so 9 + 1, or 10. That assignment to y has no

effect on x's value, so x remains 9. Note how different assignment is from algebraic equations.

3) x = 9
y = x + 1
x = 5
What is y?

10

Check Show answer

Correct

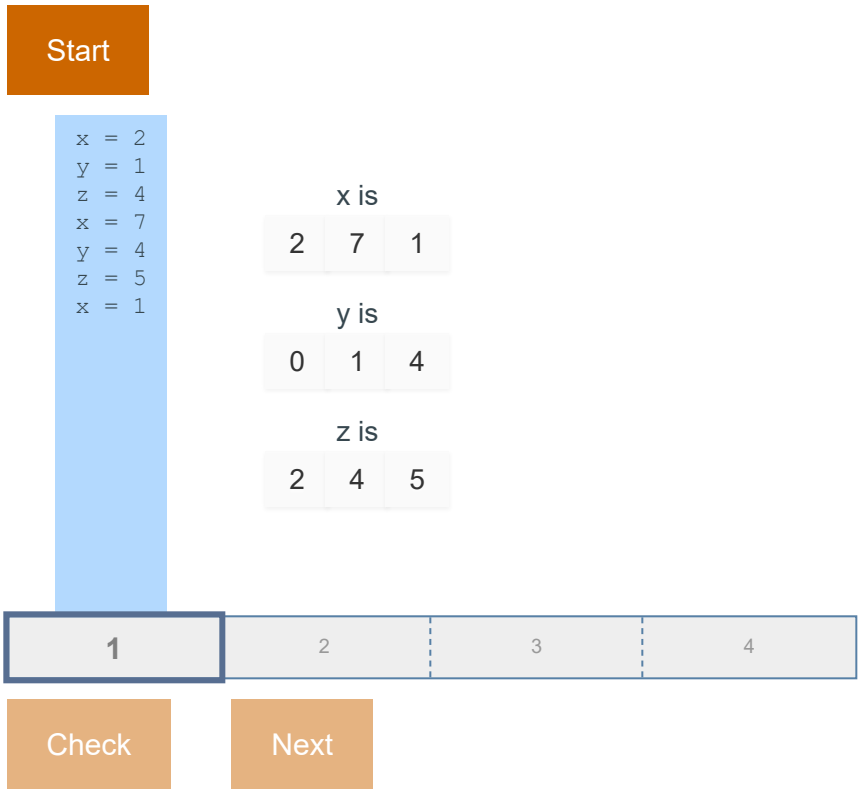
10

x was assigned with 9. Then y was assigned with 10. Then x was assigned with 5. That assignment doesn't affect y, so y is still 10.

Feedback?

PARTICIPATION ACTIVITY 2.1.5: Trace the variable value.

Select the correct value for x, y, and z after the following assignments execute.



Feedback?

Assignments with variable on left and right

Because in programming = means assignment, a variable may appear on both the left and right as in x = x + 1. If x was originally 6, x is assigned with 6 + 1, or 7. The assignment overwrites the original 6 in x.

Increasing a variable's value by 1, as in x = x + 1, is common, and known as ***incrementing*** the variable.

PARTICIPATION ACTIVITY 2.1.6: A variable may appear on the left and right of an assignment.

1 2 3 2x speed

```
x = 1
x = x * 20
x = x * 20
Put "A person with measles may cause " to output
Put x to output
Put newline to output
Put "people to be infected in two weeks." to output
```

1 20 400 x

A person with measles may cause 400 people to be infected in two weeks.

Only the latest value is held in x.
The previous values are shown greyed out above but in actuality are completely gone.

Feedback?

PARTICIPATION ACTIVITY 2.1.7: Variable on both sides.

Indicate the value of x after the assignments execute.

1) x = 5
x = x + 7

12

Check Show answer

Correct

12

x is first assigned with 5. Then x is assigned with x + 7, meaning 5 + 7, so 12. (The 12 overwrites x's previous 5). The assignment x = x + 7 confuses some new programmers who are thinking of math: If x is 5, how can 5 = 5 + 7? But = does NOT MEAN EQUAL in programming; = means ASSIGN the left-side variable with the right-side value.

2) x = 2

Correct

y = 3

x = x * y
x = x * y

18

Check Show answer

18

x is first assigned with 2. Then x is assigned with 2 * 3, or 6. Finally, x is assigned with 6 * 3, or 18.

3) y = 30
x = y + 2
x = x + 1

33

Check Show answer

Correct

33

x is first assigned with 30 + 2 or 32. Then x is assigned with 32 + 1 or 33.

4) Complete this assignment to increment y: y = _____

y+1

Check Show answer

Correct

y + 1

y's current value gets 1 added, and y is assigned with that new value. If y was 7, then y is assigned with 7 + 1 or 8.

Feedback?