Jukebox

simple images and sound, text, Booleans, conditionals, more functions

Variables vs. Functions

Variables

- Used to store *data* (i.e. some value)
- Needs to be *declared* and *assigned* before it can be *used*
- Reasons to use them:
  - Avoid repetition
  - Make code more readable
  - Allow for a change in values over time
  - Store values not known until the program runs

Functions

- Used to store *code that does something*
- Needs to be *defined* before it can be *called/used*
- Reasons to use them:
  - Avoid repetition
  - Make code more readable
  - Make code more portable
  - Allow for abstraction

Jukebox!

Creating a Plan…

1. Load and draw an image of a jukebox, make window size same as image size
2. Load three songs
3. Draw three buttons labelled 1, 2, 3
4. Determine which button was clicked.
5. Play or stop song when an image is clicked.
   - Also stop any other songs playing when a new song plays.
6. Flash buttons when song is playing.

Step 1

Load and draw an image of a jukebox, make window size same as image size

Step 2

Load three songs using the minim library

Sketch > Import Library... > minim

Step 3

Draw three buttons labelled 1, 2, 3

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

function becomes a new command

function (command) name

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

function (command) parameters

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

parameters are variables that get assigned when the function is called, and can be used inside the function

function returns this type, where void means it returns nothing

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

```
void drawButton(int x, int y, int buttonNumber)
{
  fill(240);
  rect(x, y, buttonWidth, buttonHeight);

  fill(0);
  text(buttonNumber, x, y);
}
```

function body (what the command will do when you call it)

```
void draw()
{
  // Put the jukebox in the background
  image(backgroundImage, 0, 0);

  // Draw three buttons across the top...
  drawButton(leftButtonX, buttonY, 1);
  drawButton(middleButtonX, buttonY, 2);
  drawButton(rightButtonX, buttonY, 3);
}
```

```
void draw()
{
  // Put the jukebox in the background
  image(backgroundImage, 0, 0);

  // Draw three buttons across the top...
  drawButton(leftButtonX, buttonY, 1);
  drawButton(middleButtonX, buttonY, 2);
  drawButton(rightButtonX, buttonY, 3);
}
```

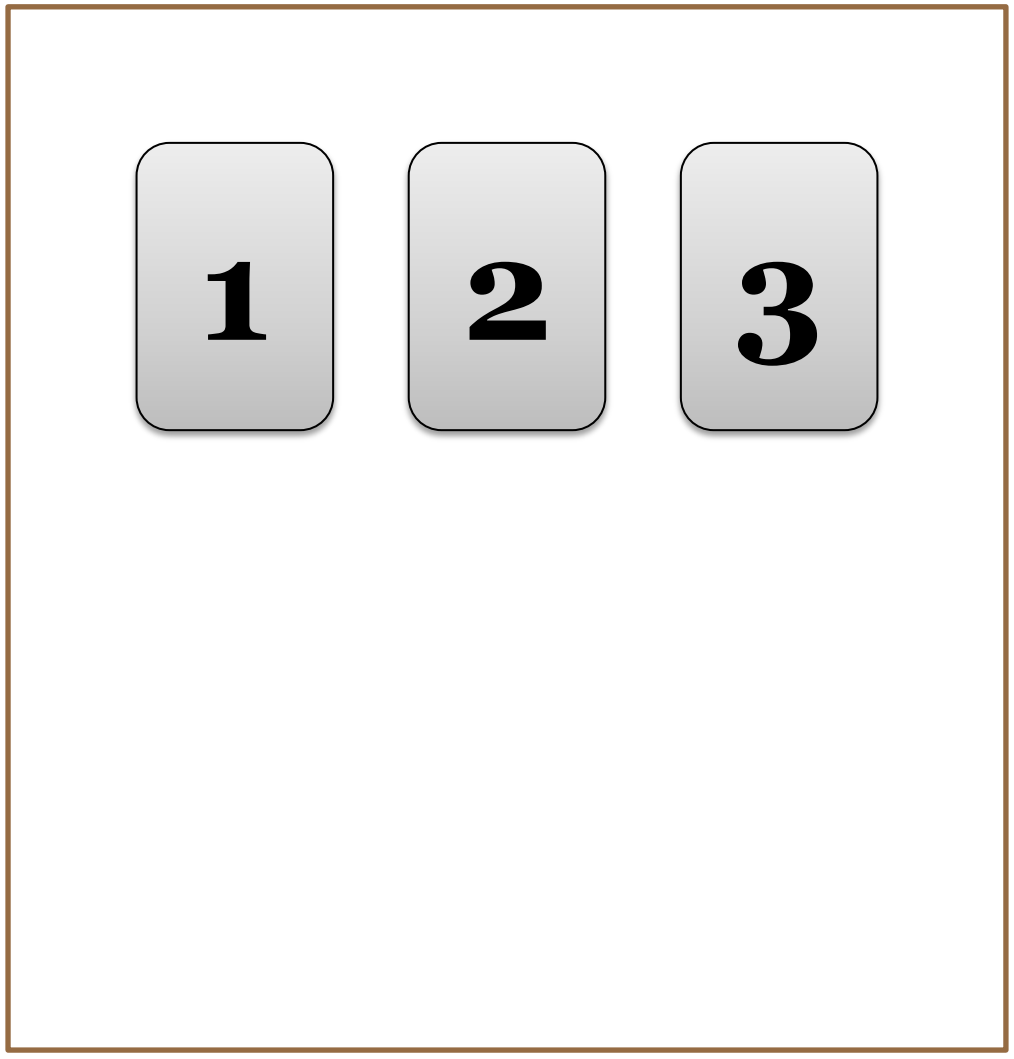
calling our function like it was a built in command

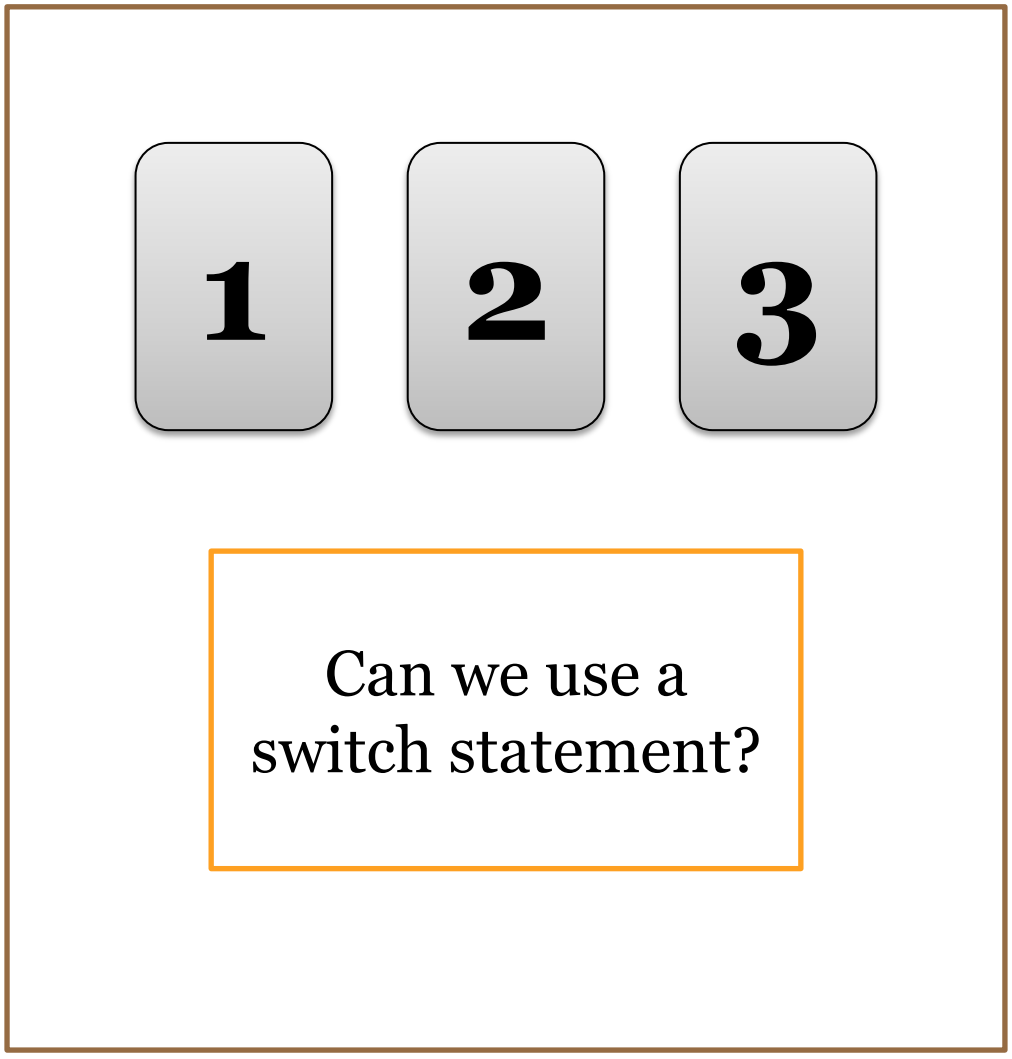
```
void draw()
{
  // Put the jukebox in the background
  image(backgroundImage, 0, 0);

  // Draw three buttons across the top...
  drawButton(leftButtonX, buttonY, 1);
  drawButton(middleButtonX, buttonY, 2);
  drawButton(rightButtonX, buttonY, 3);
}
```

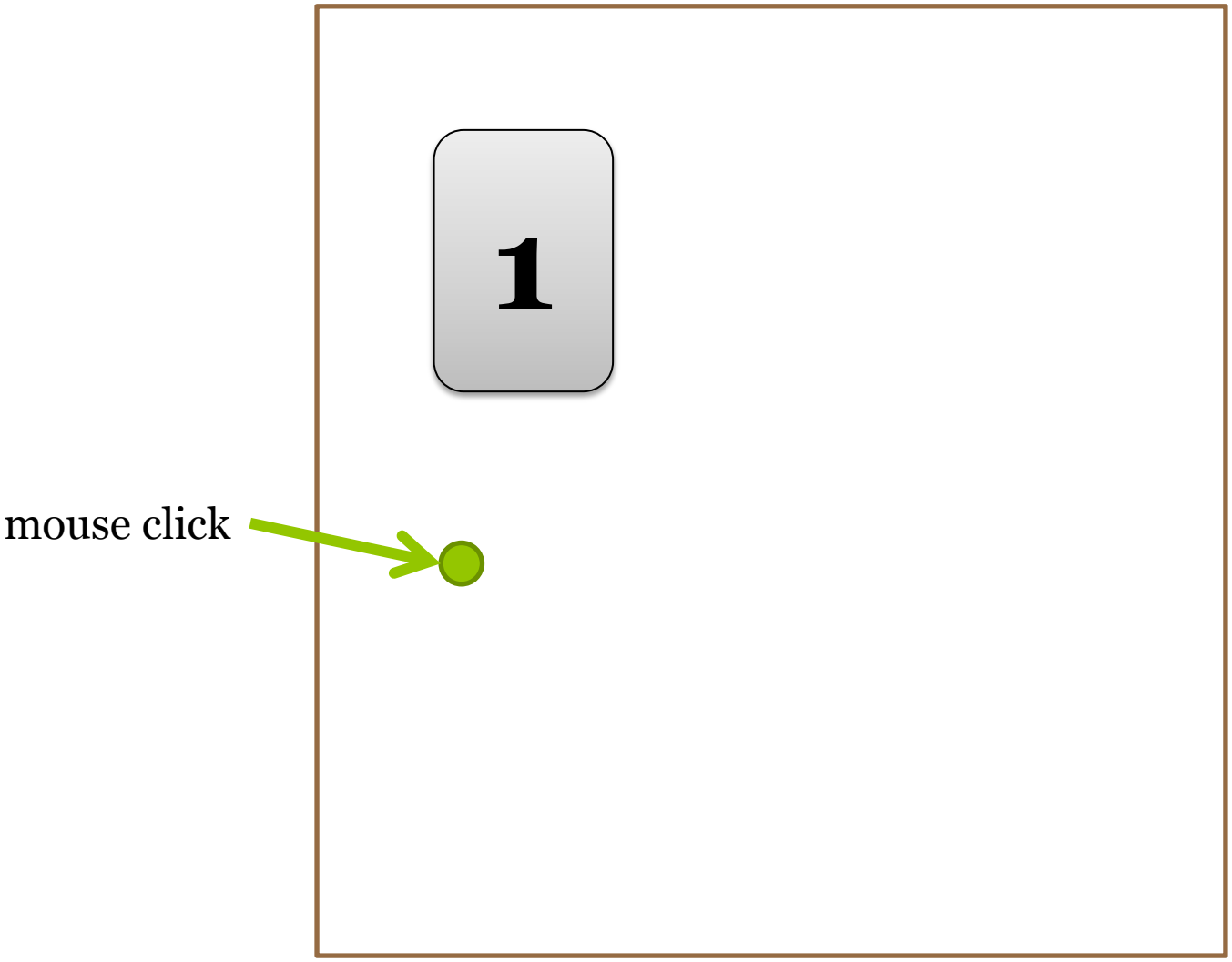
for this call to drawButton, the parameter x is assigned the value taken from leftButtonX

Step 4

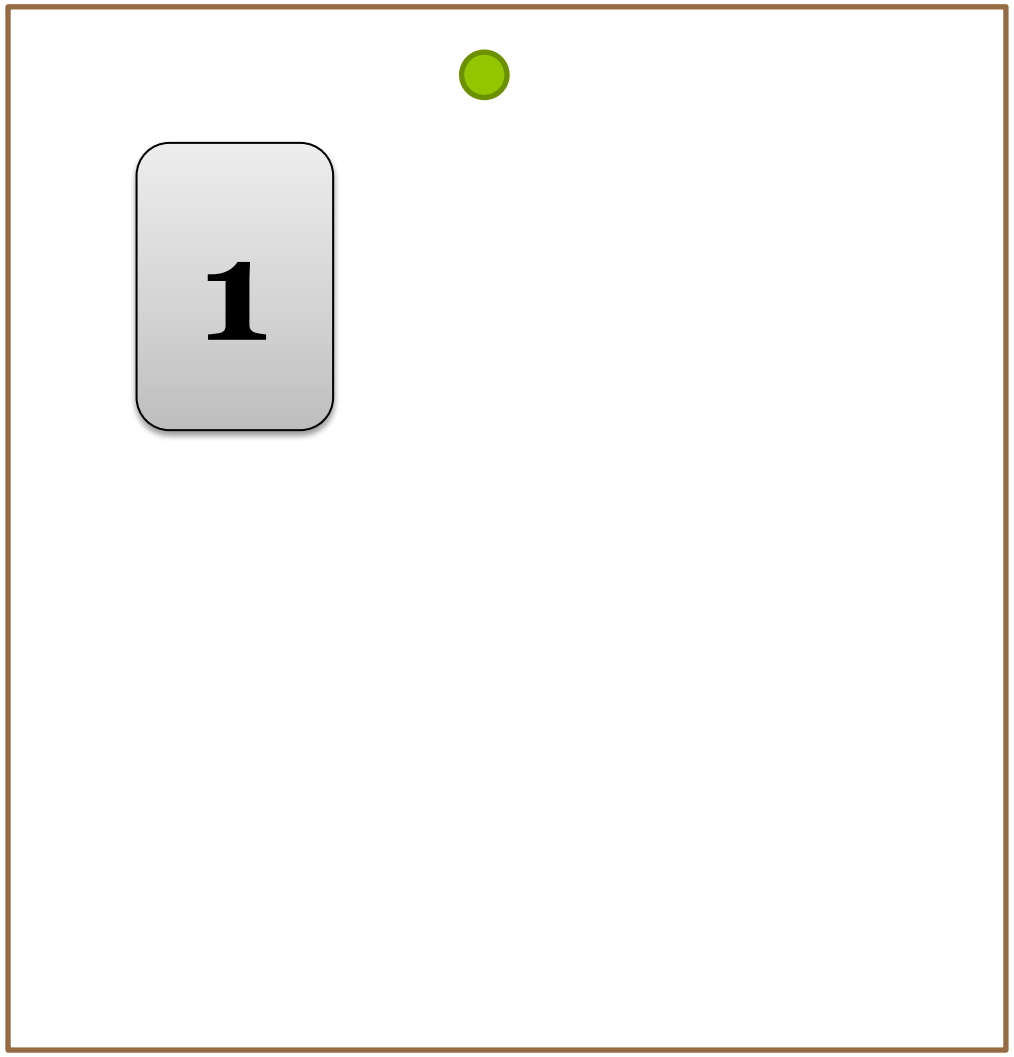
Determine which button was clicked.

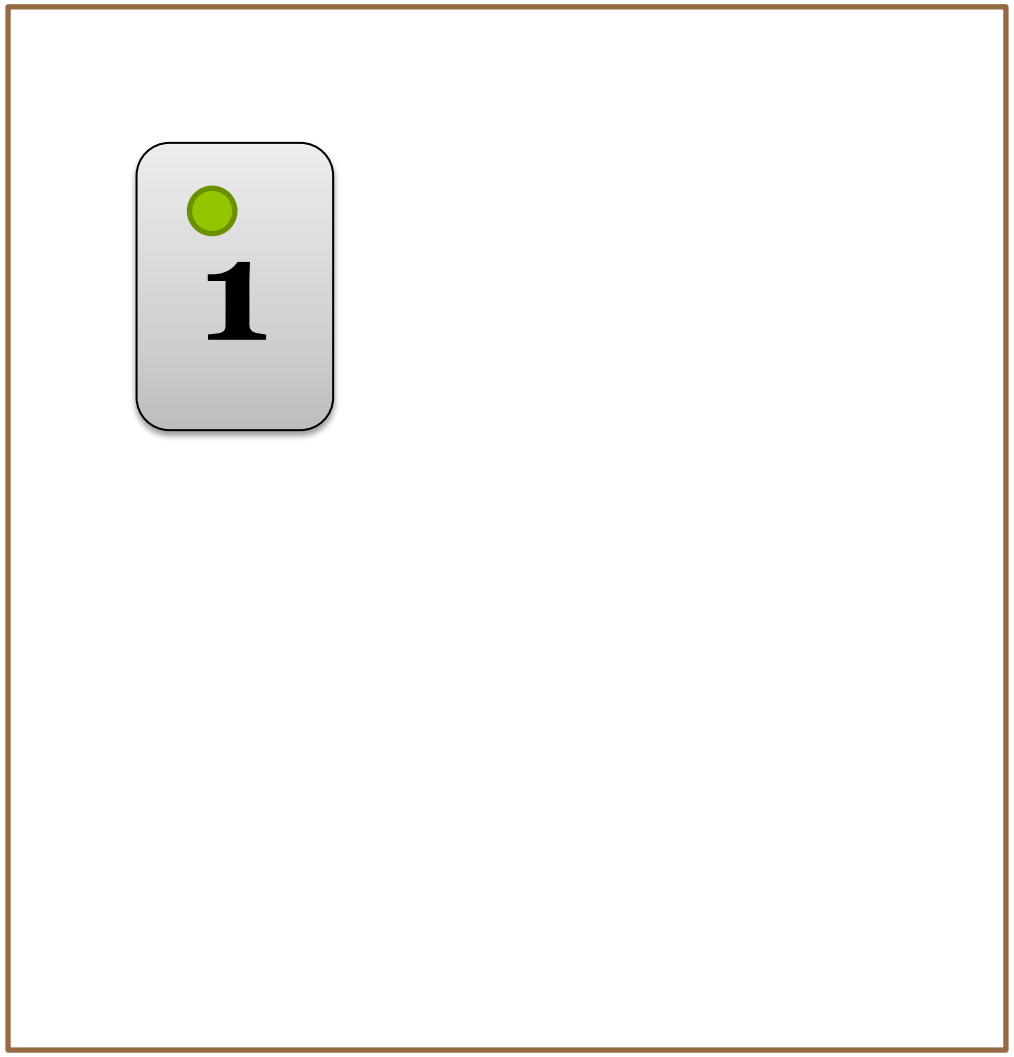

1
2
3


1
2
3
Can we use a
switch statement?


1
mouse click


1


1


1

Both

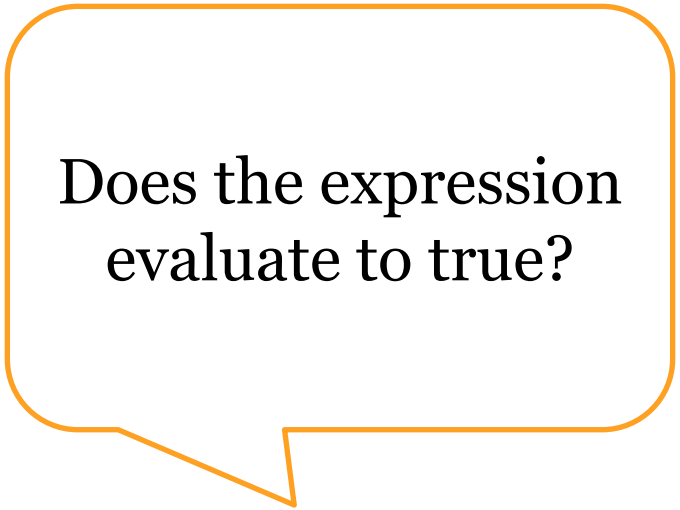
```
(mouseX >= leftButtonX - (buttonWidth/2)
```

and

```
(mouseX <= leftButtonX + (buttonWidth/2)
```

have to be true

If Statements



YES:
Run the code
in the body.

NO:
Skip past the
if statement.

if It is raining

then Wear a raincoat

if Grade is at least 50

then Pass the class

and

Everything has to be true

and

true and **true** = **true**

true and **false** and **true** = **false**

false and **false** = **false**

or

Only one thing has to be true

or

true or **true** = **true**

true or **false** or **true** = **true**

false or **false** = **false**

not

Flips a Boolean value

not

not **true** = **false**
not **false** = **true**

not

not (**a** and **b**) = (not **a**) or (not **b**)
not (**a** or **b**) = (not **a**) and (not **b**)

de Morgan's Law

if not married and not engaged and like her:

    should put a ring on it

if not (married or engaged) and like her:

    should put a ring on it

if

I am buying a movie ticket *and* I am a student

then

I will get a discount on the price

if My percentage is at least 77 *and* my percentage is at most 79

then My grade is B+

if

The battery is dead *or* there is no gas

then

The car will not start

if

(mouseX >= leftButtonX - (buttonWidth/2)
and
(mouseX <= leftButtonX + (buttonWidth/2)

then

Toggle song and button flashing for left button

Exercise:

What will the result of this expression be?

```
(true and not
  (false or
    (true and not false)))
```

Logical Operators in Processing

and: &&
or: ||
not: !

equals: ==
less than: <
less than or equal: <=
greater than: >
greater than or equal: >=

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // play song if button was clicked
}
```

if statement

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // play song if button was clicked
}
```

Expression that results in a Boolean value (true or false)

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // play song if button was clicked
}
```

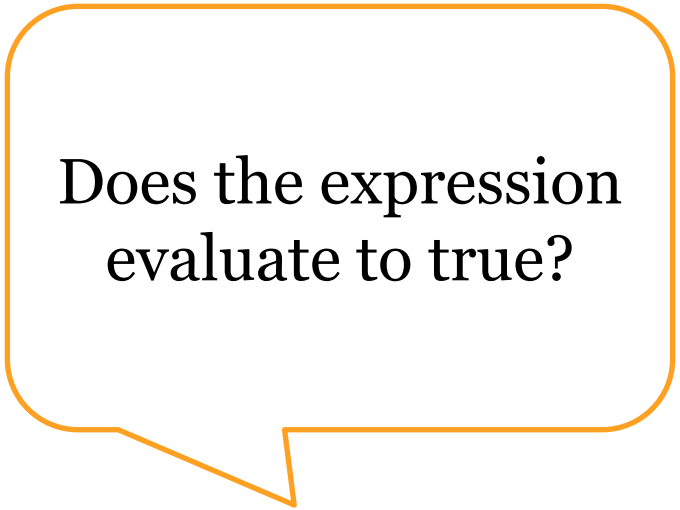
"and" – allows for more complex logic

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // play song if button was clicked
}
```

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // play song if button was clicked
}
```

body of if statement: what to do when the Boolean expression is true

If-Else Statements



YES:
Run the code
in the body.

NO:
Run the code
in the else.

Else-If Statements

Does the expression evaluate to true?

YES:
Run the code in the body.

NO:
Check the next expression.

Does the expression evaluate to true?

YES:
Run the code in the else-if body.

NO:
Run the code in the else, or done.

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // Left button clicked
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
   // Middle button clicked
}
else if (mouseX >= rightButtonX - (buttonWidth/2) &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
   // Right button clicked
}
```

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
    // Left
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
    // Middle button clicked
}
else if (mouseX >= rightButtonX - (buttonWidth/2) &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
    // Right button clicked
}
```

If this expression is true...

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // Left button clicked
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
   // Middle button clicked
}
else if (mouseX >= rightButtonX - (buttonWidth/2) &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
   // Right button clicked
}
```

... then run the body, and we're done.

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // Left b
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
   // Middle button clicked
}
else if (mouseX >= rightButtonX - (buttonWidth/2) &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
   // Right button clicked
}
```

But if this is false...

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // Left button clicked
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
   // Middle button
}
else if (mouseX >=                                  &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
   // Right button clicked
}
```

...check the next expression.

```
if (mouseX >= leftButtonX - (buttonWidth/2) &&
    mouseX <= leftButtonX + (buttonWidth/2))
{
   // Left button clicked
}
else if (mouseX >= middleButtonX - (buttonWidth/2) &&
         mouseX <= middleButtonX + (buttonWidth/2))
{
   // Middle button clicked
}
else if (mouseX >= rightButtonX - (buttonWidth/2) &&
         mouseX <= rightButtonX + (buttonWidth/2))
{
   // Right button clicked
}
```

Either zero or one if/else-if/else body will run.

Poll Everywhere Question

What is the output?

```
int x = 5;
if (x < 15)
{
   if (x < 8)
      println("one");
   else if (true)
      println("two");
   else
      println("three");
}
else
{
   println("four");
}
```

Text 37607

548436: one
548437: two
548438: three
548477: four
548439: (more than one of the above)
548440: (none of the above)

Step 5

Play or stop song when an image is clicked.

Also stop any other songs playing when a new song plays.

Step 6

Flash buttons when song is playing.

```
if (buttonNumber != songPlaying ||
    buttonCounter < timeBetweenButtonChange)
{
   // button drawing code here
}
```

```
if (buttonNumber != songPlaying ||
    buttonCounter < timeBetweenButtonChange)
{
   // button drawing code here
}
```

check whether to draw button or hide when flashing

```
if (buttonNumber != songPlaying ||
     buttonCounter < timeBetweenButtonChange)
{
    // button dra
}
```

always true when button's song is not playing

```
if (buttonNumber != songPlaying ||
    buttonCounter < timeBetweenButtonChange)
{
    // button dra
}
```

only tested when this button's song *is* playing