Review

- What kind of statement do I use to make a computer make a decision?

- How do you make the computer ask you a question?

- What statement do you use to get an answer from the user?

- How do you make the computer do some things over, and over, and over…?

New Concepts

- Computers can do math… who knew!
- Activity: make a program to calculate your age in dog years
- Activity: make a program to ask lots of questions

Computers and Math

Now we know that computers like to use NUMBERS. Since a computer is made of millions and millions of switches, computers think in kind of funny numbers.

How do we humans count? From 1 to……… 10?   Right! Funny thing, how many fingers do humans have?
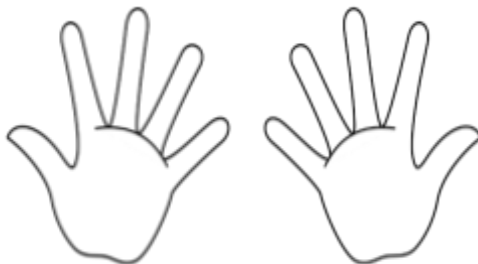
So, computers don't have hands, but they do have SWITCHES! Switches don't have fingers, but they do have positions… ON and OFF

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So, Computers only count to…. 1! We call this "base 2"

So, how does a computer count to 10? It uses a system of Bits and Bytes. Bits are the smallest unit of data that a computer can hold. When we put 8 of them together we get a byte! By assigning each bit a different value, we can use fewer bits to store more numbers.

The first four bits are 8, 4, 2, 1. In the 4 blanks by each number, put a 0 if you don't need that number and a 1 for those that you do. For example, I don't need any of those numbers to make 0, so I would write 0 0 0 0. I only need the 1 to make 1, so I write 0 0 0 1. 2 is easy as well, but how do I write 3? I don't have a 3, but if I remember my addition skills, I do have 2 numbers that I can add together to make it. See if you can figure out all the numbers up to 10.

<div align="center">8 4 2 1</div>

1 > __ __ __ __	6 > __ __ __ __
2 > __ __ __ __	7 > __ __ __ __
3 > __ __ __ __	8 > __ __ __ __
4 > __ __ __ __	9 > __ __ __ __
5 > __ __ __ __	10 > __ __ __ __

Kind of funny, but It works! Can you figure out what number the next bit stands for?

_____

Making a Computer Do Math

While 1's and 0's are cool, it's kinda hard to keep straight. Luckily, we made computer languages that let us tell the computer what we want it to do. This week we are using a language named after a snake…

<div align="center">PYTHON!</div>

In Python, we can write code to let the computer do math for us!

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Activity 1: Dog Years!

In this activity, we will be creating a python program that calculates your age in dog years for you! It will ask you what your age is in human years, then do all the math to tell you how old you are in dog years! Pretty neat, eh?

On your computer, open Mu (sometimes known as Mu Editor). This is our INTEGRATED DEVELOPMENT ENVIRONMENT, or more commonly known as an IDE. This is fancy computer/engineer language that essentially means "an application to program/write code in". When it finishes launching, you should land in a window that looks like this.


Let's make sure you are in the right mode - in the top left, click the Mode button and select Python3 in the pop-up window.
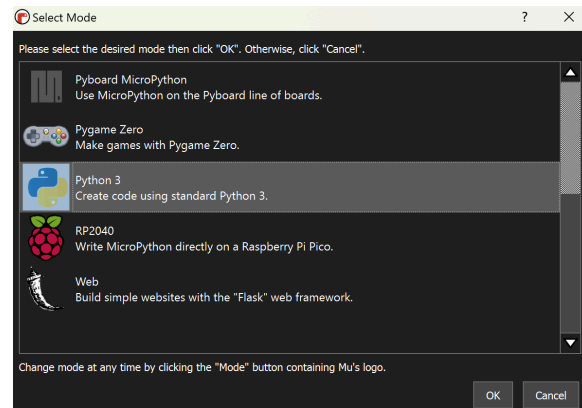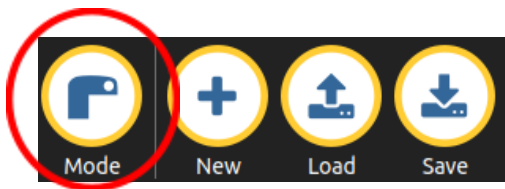
Now, type the following code! Pay special attention to spacing - python is a 'whitespace sensitive' programming language, which means that it cares a lot about how code is spaced.

```python
# My Very First Program - Dog Years
print("How old are you in human years?")
HowOld = input()
answer = int(HowOld) * 7
print("You are %s dog years old!" % answer)
```

To run your program, click the Check button (the thumbs up) to check your code for any errors. If you have a few errors, fix them up and use the Check button until you have no more errors. When there are no more errors, you are good to go!
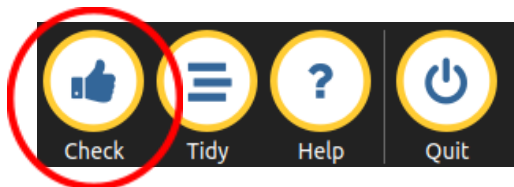
Now, click the Run button! A window should pop up, asking you to name your program. Name it something like DogYears.py. After saving, a terminal should appear and ask you for your age! Go ahead and type it in, then press enter!
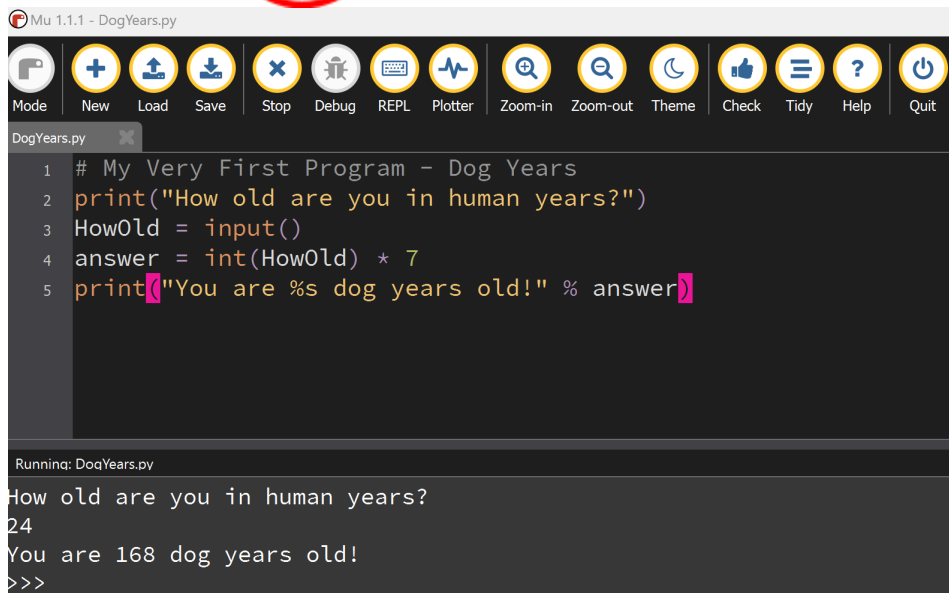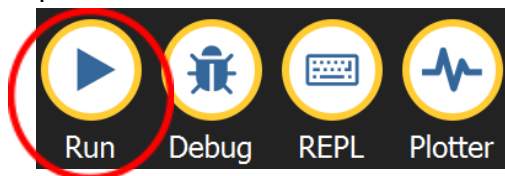
Comprehension Check
- What is #?
- What is HowOld?
- How did the computer do our math for us, if it can only do 1's and 0's?

Activity 2: Data Conditions

Our first program was a huge success! But, what if we wanted to do something based on someone's age? For example, if they are greater than 100 years old, we could call them old! Let's use an *if/else* statement in python!

Simply put, an if/else conditional statement checks if statement a is true. If it is, then we do something, else we don't do anything at all.

Back in Mu, let's revise our code to call someone old if they are greater than 100 years old, otherwise calculate their dog age.
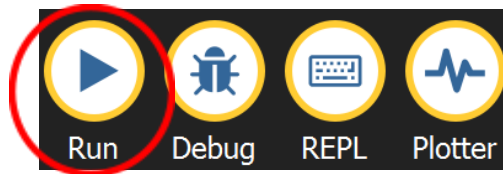
```python
# My Very First Program - Dog Years
print("How old are you in human years?")
HowOld = input()

if int(HowOld) > 100:
        print("You are really old!")
else:
        answer = int(HowOld) * 7
        print("You are %s dog years old!" % answer)
```

To run your program, click the Check button (the thumbs up) to check your code for any errors. If you have a few errors, fix them up and use the Check button until you have no more errors. When there are no more errors, you are good to go!
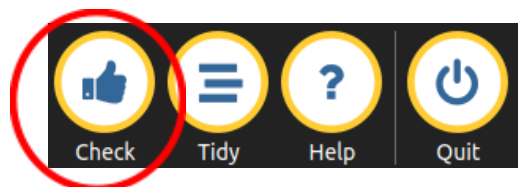
Now, click the Run button! A terminal should appear and ask you for your age! Go ahead and type it in, then press enter!


```
# My Very First Program – Dog Years
print("How old are you in human years?")
HowOld = input()

if int(HowOld) > 100:
    print("You are really old!")
else:
    answer = int(HowOld) * 7
    print("You are %s dog years old!" % answer)
```

Running: DogYears.py
```
How old are you in human years?
24
You are 168 dog years old!
>>>
```



```
# My Very First Program – Dog Years
print("How old are you in human years?")
HowOld = input()

if int(HowOld) > 100:
    print("You are really old!")
else:
    answer = int(HowOld) * 7
    print("You are %s dog years old!" % answer)
```

Running: DogYears.py
```
How old are you in human years?
110
You are really old!
>>>
```