Section A
Unit #2
Functions

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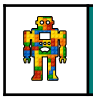
Section A Unit #2 Functions

Introduction to Unit #2 Functions

Segmenting code into functions allows a programmer to create modular pieces of code that perform a defined task and then return to the area of code from which the function was "called". The typical case for creating a function is when one needs to perform the same action multiple times in a program.



Sketch A2.1 a blinking function (part 1)

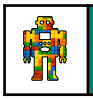
We have a function called `void setup()`, and a function called `void loop()` and now we are going to create one called `void blink()`. This is made up function where we are going to put our code for blinking.

```
int delayPeriod = 250;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  for (int i = 0; i < 10; i++)
  {
    digitalWrite(11, HIGH);
    delay(delayPeriod);
    digitalWrite(11, LOW);
    delay(delayPeriod);
  }
  delay(2000);
}

void blink()
{

}
```

Code Explanation:
`void blink()` We have created a new function called blink()

Notes

We can put the function anywhere but it does start at the beginning and work its way down



a blinking function (part 2)

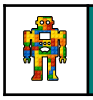
Now we are going to call it from inside the `for()` loop. This a cut and paste job, taking the code out and replacing it with the `blink()` function.

```
int delayPeriod = 250;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  for (int i = 0; i < 10; i++)
  {
    blink();
  }
  delay(2000);
}

void blink()
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
}
```

Code Explanation:
`blink();` This blink() function is called ten times in the for() loop

Notes

This can be useful for keeping the code neat and tidy, especially where you want to use the same bit of code repeatedly. One of the targets that coders try to achieve is to write as few lines as possible to achieve the same result. It is considered bad form to repeat lines of code unnecessarily.



Sketch A2.2 is this an argument? (Part 1)

Here we will combine functions and arguments. Using the above sketch we can rationalise it even more by using the two arguments in the function itself. We will start with just one and then add the other afterwards. We will also change the `delayPeriod` to `100`

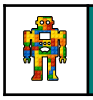
Remove the line of code: `int delayPeriod = 250;`

```
void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  for (int i = 0; i < 10; i++)
  {
    blink(100);
  }
  delay(2000);
}

void blink(int delayPeriod)
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
}
```

Code Explanation:
`void blink(int delayPeriod)` This is a variable inside a function, you can call it an argument. It will hold that value when it is called from somewhere else, in this case 100

Notes

You will notice that it blinks much faster (or should do)



Sketch A2.2 is this an argument? (Part 1)

We can go one step further by adding in the count value of 10, there is a bit of cutting and pasting so work through the sketch to see how and why it is doing exactly what it does. We will change the rate of blinking so you can see a change.

Remove the `for()` loop from `void loop()` and put it in `void blink()` if in doubt just retype the whole thing, it is good practice anyway!

```
void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  blink(100, 10);
  delay(2000);
}

void blink(int delayPeriod, int count)
{
  for (int i = 0; i < count; i++)
  {
    digitalWrite(11, HIGH);
    delay(delayPeriod);
    digitalWrite(11, LOW);
    delay(delayPeriod);
  }
}
```

Code Explanation:
`void blink(int delayPeriod, int count)` Both are variables (`delayPeriod` and `count`) that are also arguments. They each take on the values of 100 and 10 respectively

Notes

You have initialised them inside the function brackets. You draw their values from the `void loop()` function.

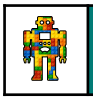
Challenge

Change the values in `blink(100, 10);`

Sketch A2.3 a blinking stop (part 1)

Start a completely new sketch (or cut and paste). In this next sketch we will use the += operator to slow the blink down. First this is our starting sketch

```
int delayPeriod = 1000;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
}
```



a blinking stop (part 2)

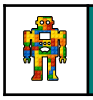
Changing the starting delay period to something much shorter 10 milliseconds and increasing it by 20 milliseconds on each blink (iteration).

```
int delayPeriod = 10;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
  delayPeriod += 20;
}
```

Code Explanation:
`delayPeriod += 20;`
We add 10 to the variable delayPeriod on every iteration

Challenge

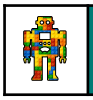
Try replacing `delayPeriod += 20;` with `delayPeriod *= 2;`



a blinking stop (part 3)

If we wanted to stop the blinking at 1000 milliseconds we would need to first introduce another variable. We will call this increment and make it much bigger i.e. 50

```
int delayPeriod = 10;
int increment = 50;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
  delayPeriod += increment;
}
```



a blinking stop (part 4)

Stopping at 1 second (1000 milliseconds), so that when the delay is one second it then blinks at a constant rate

```
int delayPeriod = 10;
int increment = 50;

void setup()
{
  pinMode(11, OUTPUT);
}

void loop()
{
  digitalWrite(11, HIGH);
  delay(delayPeriod);
  digitalWrite(11, LOW);
  delay(delayPeriod);
  delayPeriod += increment;
  if (delayPeriod > 1000)
  {
    increment = 0;
  }
}
```

Challenges

Try the following:

1. Replace `increment = 0;` with `delayPeriod = 0;`
2. Replace `increment = 0;` with `increment = -increment;`