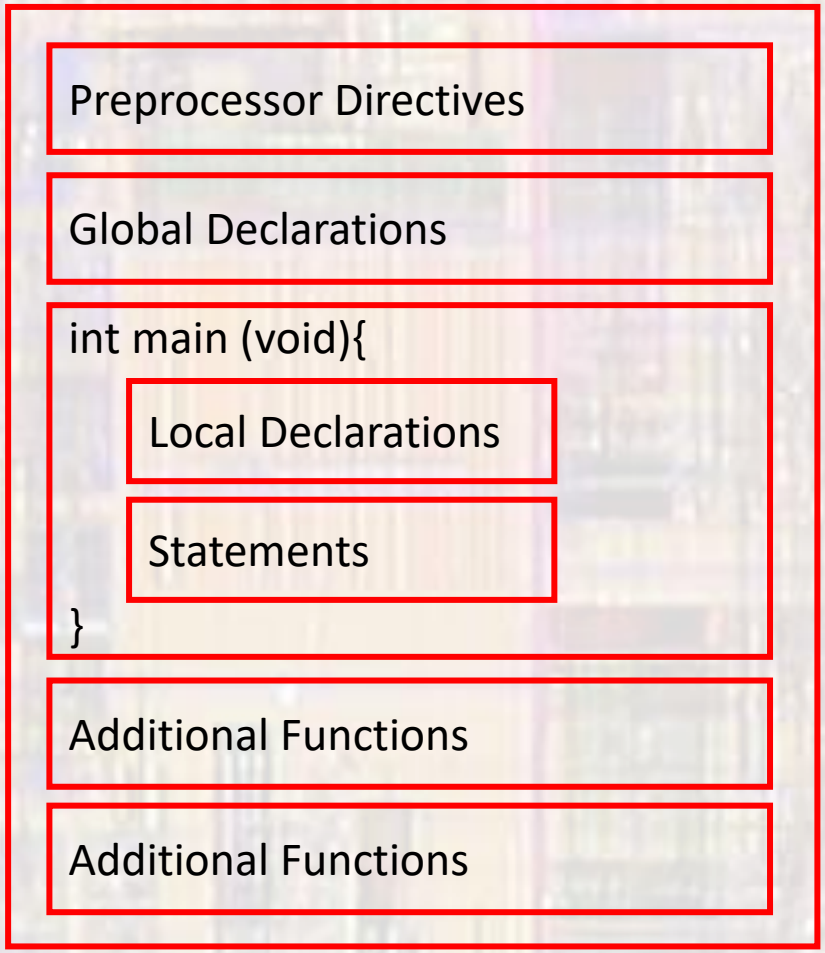
C Program Elements

Last updated 11/11/21

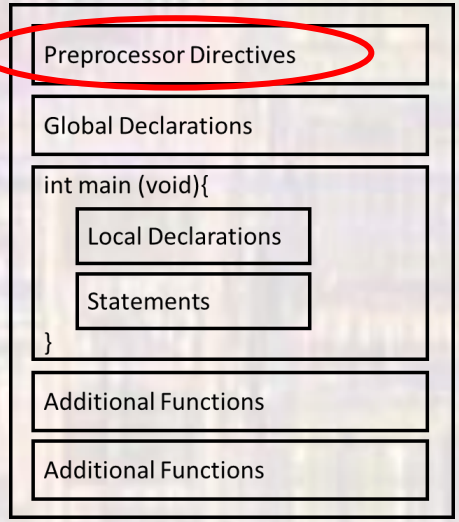
Program Elements

- C program – first look



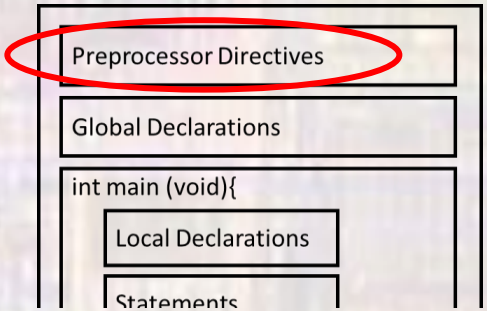
Program Elements

- Preprocessor directives
  - Provide information to the tool chain
    - Additional files to include
    - Name definitions
    - Constant definitions
    - Always start with a #



Program Elements

- Preprocessor directives
  - Examples -



#include <stdio.h>

- Include the contents of library file stdio.h along with my code

#define PI 3.14159

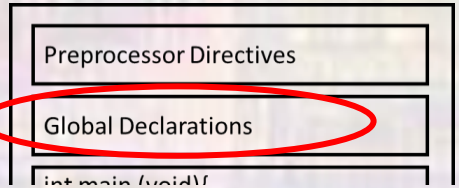
- Everywhere I used PI in my code, replace it with 3.14159

#define LEDPIN 9

- Everywhere I used LEDPIN in my code, replace it with 9
- Common to define which pin LED is attached to
- Allows changes in 1 place instead of all through the code

Program Elements

- Global Declarations
  - Global Variables
    - Define variables that can be seen throughout the program



    - Examples

int age

- Define a variable – age

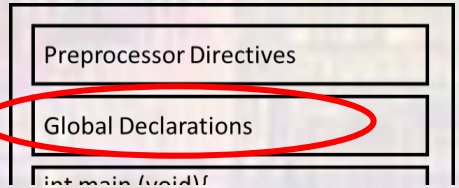
float InterestRate = 0.012

- Define a variable InterestRate and initialize it to 0.012

We will not use global variables in this class

Program Elements

- Global Declarations
  - Function Prototypes
    - Provides prototypes for functions used in the program

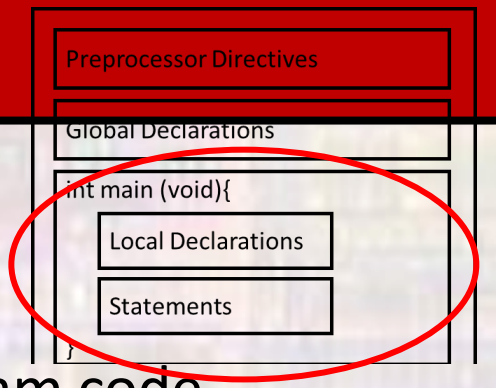


    - Examples

```
int calc_ave(int val1, int val2, int val3);

float largest_value(int * value_array);
```

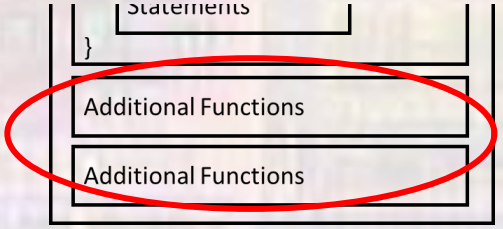

Program Elements



- Main
  - Code section containing your top-level program code
  - Program flow is controlled by main
  - Required
  - Can only be 1 main in your program (project)
  - Local Declarations
    - Define variables that can be seen inside of main
  - Statements
    - The top level program code

Program Elements

- Other functions

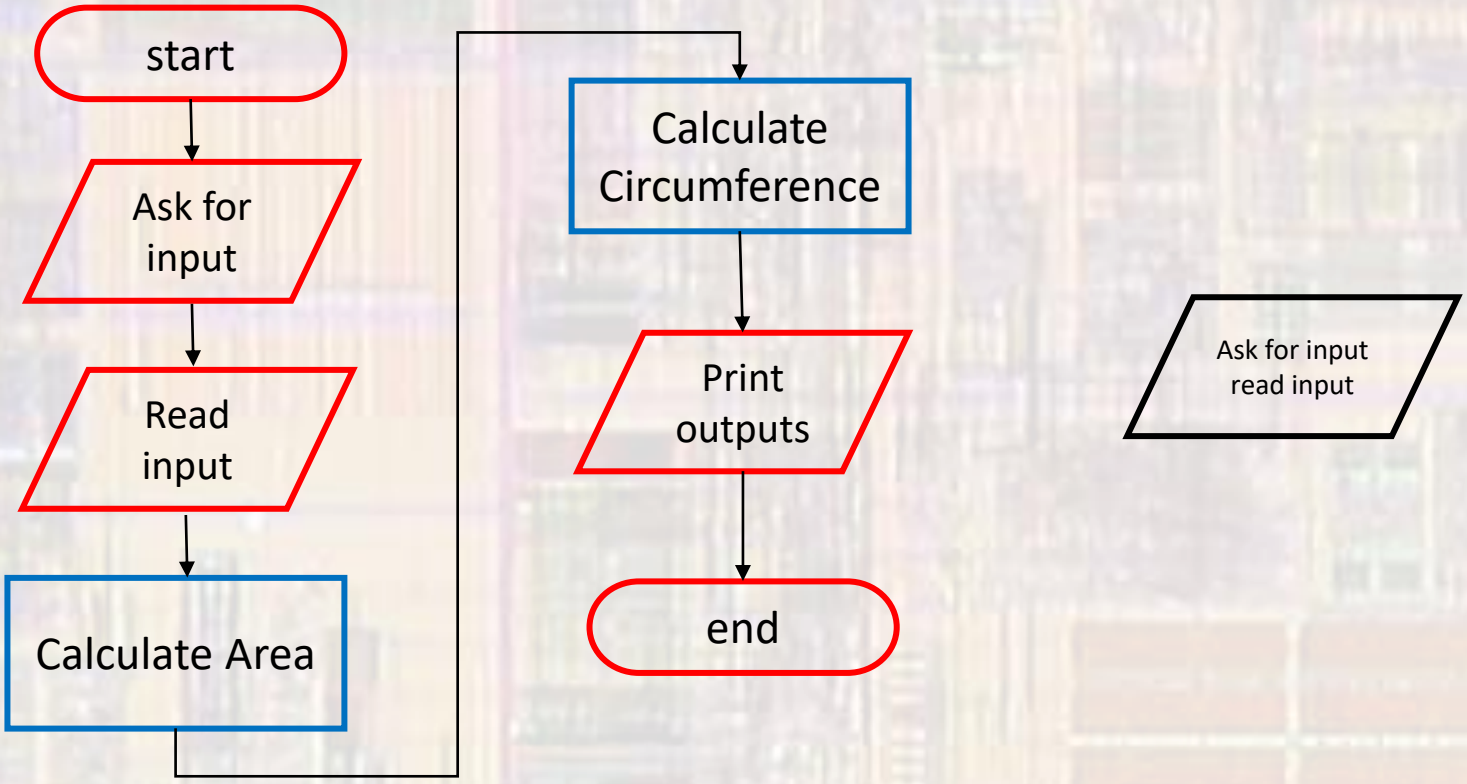


  - Functions are sections of code defined to do a specific task
  - They are called by main or other functions
  - Can take values in and provide values out

  - Good programming uses main for control and uses functions for getting things done

Program Elements

- Program to read from the keyboard and print to the console
  - Calculates the area and circumference of a circle



Program Elements

- Simple Console Program

```
/*
 * circle_w_functions.c
 *
 *  Created on: Dec 4, 2019
 *      Author: johnsontimoj
 */
////////////////////////////////
//
// This program prompts the user for
// a radius (float) and prints the
// circumference and area of the
// corresponding circle
//
// inputs: radius
// outputs: prints circumference and area
//
////////////////////////////////////

// Preprocessor Directives
#include <stdio.h>
#define PI 3.14159

// Global Declarations
    // global variables not allowed in EE1910
float calc_area(int r);
float calc_circumference(int r);
```

```
// Main
int main(void){
   setbuf(stdout, NULL);  // disable buffering

   //  Local variables
   float radius;
   float circumference;
   float area;

   //   Get input for radius
   printf("Please enter a value for radius: ");
   scanf("%f", &radius);

   //   Calculate circumference and area
   circumference = calc_circumference(radius);
   area = calc_area(radius);

   // Output results
   printf("Circumference = %f\n", circumference);
   printf("Area = %f\n", area);

   return 0;
} // end main
```

```
float calc_circumference(int r){
    float cir_cum;
    cir_cum = 2 * PI * r;
    return cir_cum;
} // end calc_circumference
```

```
float calc_area(int r){
    float a;
    a = PI * r * r;
    return a;
} // end calc_area
```

```
<terminated> (exit value: 0) Class_Project_Console.exe [C
Please enter a value for radius: 5.5
Circumference = 31.415899
Area = 78.539749
```

Program Elements

- Simple MSP Program

```
/*
 * circle_w_functions.c
 *
 *  Created on: Dec 4, 2019
 *      Author: johnsontimoj
 */
////////////////////////////////
//
// This program prompts the user for
// a radius (float) and prints the
// circumference and area of the
// corresponding circle
//
// inputs: radius
// outputs: prints circumference and area
//
////////////////////////////////////

// Preprocessor Directives
#include <stdio.h>
#include "msp.h"
#define PI 3.14159

// Global Declarations
    // global variables not allowed in EE1910
float calc_area(int r);
float calc_circumference(int r);
```

```
// Main
int main(void){
//  Local variables
   float radius;
   float circumference;
   float area;

   //   Get input for radius
   printf("Please enter a value for radius: ");
   scanf("%f", &radius);

   //   Calculate circumference and area
   circumference = calc_circumference(radius);
   area = calc_area(radius);

   // Output results
   printf("Circumference = %f\n", circumference);
   printf("Area = %f\n", area);

   return 0;
} // end main
```

```
float calc_circumference(int r){
    float cir_cum;
    cir_cum = 2 * PI * r;
    return cir_cum;
} // end calc_circumference
```

```
float calc_area(int r){
    float a;
    a = PI * r * r;
    return a;
} // end calc area
```

```
Console
Class_Project_MSP:CIO
[CORTEX_M4_0] Please enter a value for radius: 5.5
Circumference = 31.415899
Area = 78.539749
```