

C Program Structure

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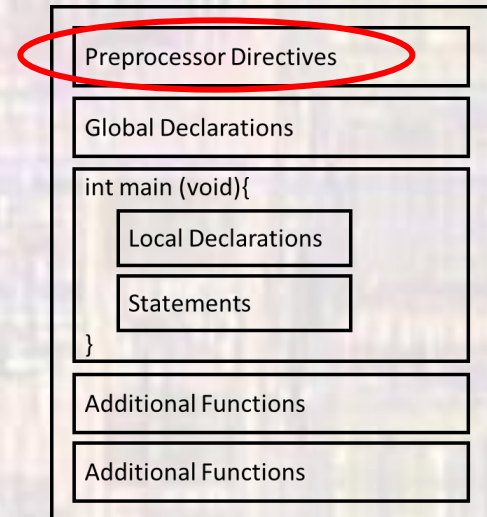
C Program Structure

- Single file structure



C Program Structure

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



C Program Structure

- Preprocessor directives
 - Examples -

`#include <stdio.h>`

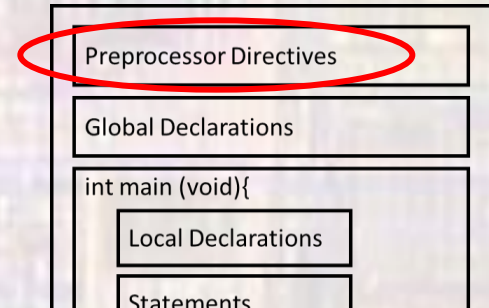
- Include the contents of library file `stdio.h` along with my code

`#define PI 3.14159`

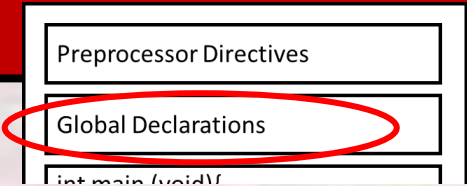
- Everywhere I used `PI` in my code, replace it with `3.14159`

`#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



C Program Structure



- 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

C Program Structure

Preprocessor Directives

Global Declarations

int main(void)

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

- Examples

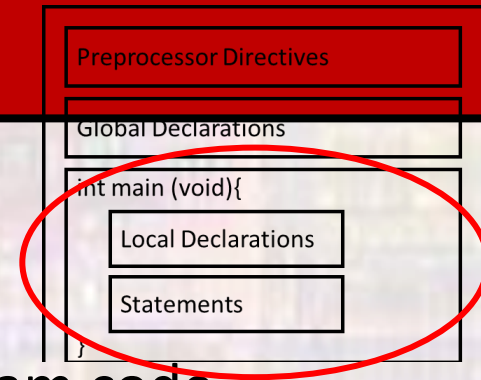
```
int calc_ave(int val1, int val2, int val3);
```

```
float largest_value(int * value_array);
```

C Program Structure

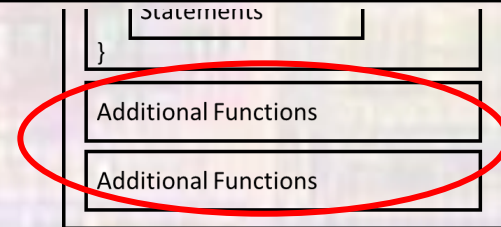
- Main

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



C Program Structure

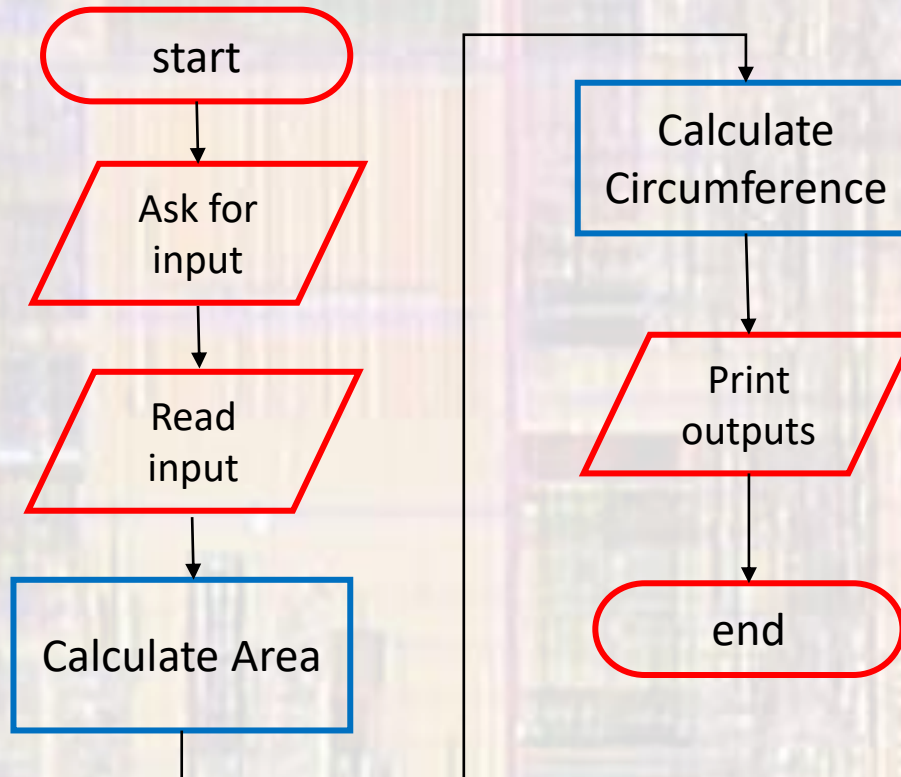
- Other functions



- 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**

C Program Structure

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



Program Elements

• Circle Program

```
/*
 * circle_with_functions.c
 *
 * Created on: Dec 4, 2019
 * Author: johnsontimoi
 */
// 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 ELE1601
void splash(void);
float calc_area(int r);
float calc_circumference(int r);
```

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

    splash();

    // 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
```

```
////////////////////////////////////
// calc_circumference()
//
// calculates the circumference of a circle
//
// inputs: radius
// outputs: returns the circumference
////////////////////////////////////
float calc_circumference(int r){
    float cir_cum;
    cir_cum = 2 * PI * r;
    return cir_cum;
} // end calc_circumference

////////////////////////////////////
// calc_area()
//
// calculates the area of a circle
//
// inputs: radius
// outputs: returns the area
////////////////////////////////////
float calc_area(int r){
    float a;
    a = PI * r * r;
    return a;
} // end calc_area

////////////////////////////////////
// splash()
//
// print program info for the user
//
// inputs: none
// outputs: void return - prints message
////////////////////////////////////
void splash(void){
    printf("////////////////////////////////////\n");
    printf("// Dr. Johnson's circle program\n");
    printf("// Prints the circumference and area of circles\n");
    printf("////////////////////////////////////\n");

    return;
} // end splash
```



```
<terminated> (exit value: 0) Class_Notes_Project.exe [C
////////////////////////////////////
// Dr. Johnson's circle program
// Prints the circumference and area of circles
////////////////////////////////////
Please enter a value for radius: 3.3
Circumference = 18.849541
Area = 28.274309
```