

C Program Elements

Last updated 7/2/21

Program Elements

- C program – first look

Preprocessor Directives

Global Declarations

```
int main (void){
```

Local Declarations

Statements

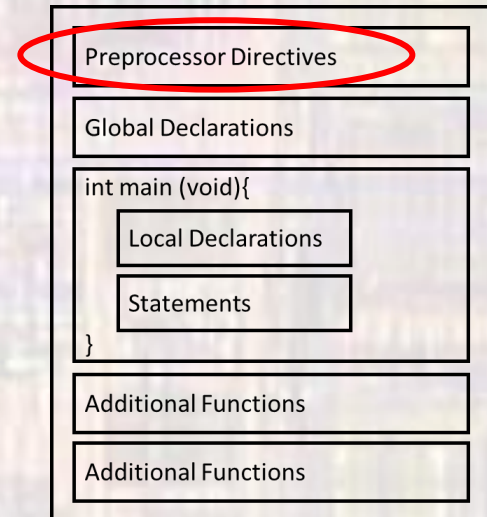
```
}
```

Additional Functions

Additional Functions

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>`

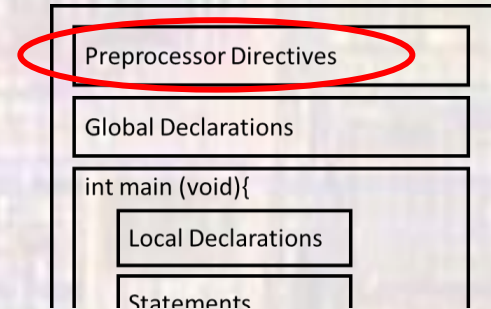
- Include the contents of library file `stdio.h` along with my code

`#define PI 3.14159`

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

`#define LEDPIN D9`

- Everywhere I used `LEDPIN` in my code, replace it with `D9`
- Common to define which pin LED is attached to
- Allows changes in 1 place instead of all through the code

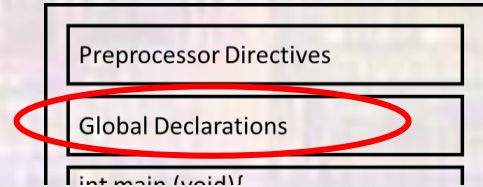


Program Elements

- Global Declarations

- Global Variables

- Define variables that can be seen throughout the program



- Examples

`int age`

- Define a variable – age

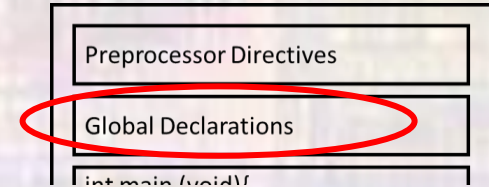
`float InterestRate = 0.012`

- Define a variable InterestRate and initialize it to 0.012

We will not use global variables in this class – except for special situations (interrupts)

Program Elements

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

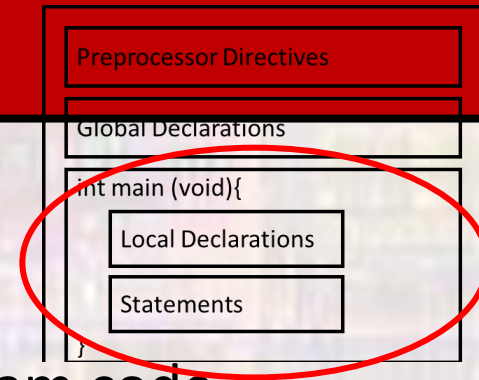


```
int calc_ave(int val1, int val2, int val3);
```

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

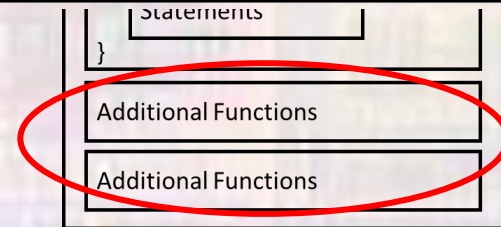
Program Elements

- 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

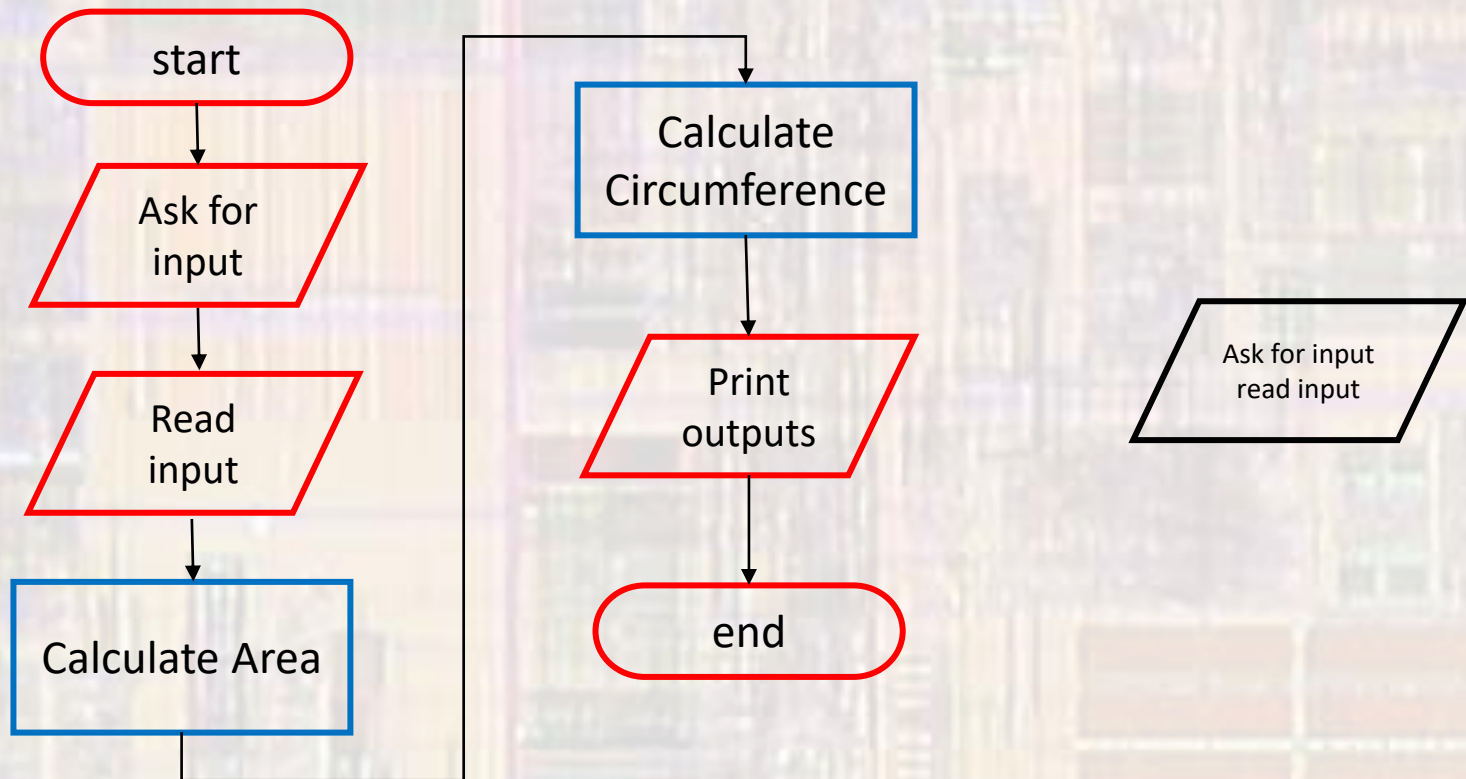
- Other functions



- 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 VS Console Program

```
////////////////////////////////////  
//  
// circle_w_functions project  
//  
// created 5/12/21 by tj  
// rev 0  
//  
////////////////////////////////////  
//  
// circle calculator for program elements slides  
//  
// 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  
////////////////////////////////////  
#include <stdio.h>  
#define PI 3.14159  
  
// Function Prototypes (Declarations)  
float calc_area(int r);  
float calc_circumference(int r);
```

```
int main(void) {  
    // Splash  
    printf("\n\ncircle_w_functions - program for EE2905\n");  
    printf("Using MS Visual Studio\n\n"),  
    printf("Prints the circumference and area for a circle of entered radius\n\n");  
  
    // 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
```

Microsoft Visual Studio Debug Console

```
circle_w_functions - program for EE2905  
Using MS Visual Studio  
  
Prints the circumference and area for a circle of entered radius  
  
Please enter a value for radius: 4.4  
Circumference = 25.132721  
Area = 50.265442
```

Program Elements

- Simple STM32 Program

```
////////////////////////////////////  
//  
// circle_w_functions project  
//  
// created 5/12/21 by tj  
// rev 0  
//  
////////////////////////////////////  
//  
// circle calculator for program elements slides  
//  
// 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  
////////////////////////////////////  
#include "mbed.h"  
#include <stdio.h>  
#define PI 3.14159
```

```
// Function Prototypes (Declarations)  
float calc_area(int r);  
float calc_circumference(int r);
```

```
int main(void){  
    // Splash  
    printf("\n\ncircle_w_functions - program for EE2905\n");  
    printf("Using Mbed OS version %d.%d.%d\n\n",  
           MBED_MAJOR_VERSION, MBED_MINOR_VERSION, MBED_PATCH_VERSION);  
    printf("Prints the circumference and area for a circle of entered radius\n\n");  
  
    // 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
```

COM5 - Tera Term VT

File Edit Setup Control Window Help

circle_w_functions - program for EE2905
Using Mbed OS version 6.12.0

Prints the circumference and area for a circle of entered radius

Please enter a value for radius: 4.4
Circumference = 25.132721
Area = 50.265442