

1 ICS 104 - Introduction to Programming in Python and C

1.1 Overview of C - Lab 1

2 Lab Learning Outcomes

- To properly use data types in C.
- To write assignment statements in C.
- To evaluate arithmetic expressions in C.

3 Examples

- **Example # 1:** Correct the syntax errors in the following program. What does each statement of your corrected program do? What output does it display?

```
/*
 * Calculate and display the difference of two input values
 */
#include <stdio.h>
int
main (void) { int X, /* first input value */ x, /* second
input value */
sum; /*sum of inputs */
scanf("%i%i", X; x); X + x = sum;
printf("%d + %d = %d\n", X; x; sum); return (0);}
```

In []:

```
1 /* Corrected Example # 1 */
```

- **Example # 2:** What is the output of the following program fragment?

```
#include <stdio.h>
int main (void)
{
    int p, l;

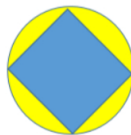
    p = 0;
    l = 5;

    p = 4 * l;
    l++;
    printf("Value of p = %d\n", p);
    return (0);
}
```

- The output of Example # 2:

4 Exercises

- **Exercise # 1:** A square is inscribed inside a circle. Write an interactive C program that prompts for and reads the radius of the circle in centimeters, it then calculates and prints the side length of the square, the area of the square and the area of the yellow part in the diagram below, each in square centimeters.



- Print each output value with two digits after the decimal point.
- Note: Define the value of π (3.141592) as a constant.
- Following is a sample run:

```
Enter the radius value [cm]: 4.5
```

```
Square side = 6.36 cm
Square area = 40.50 square cm
Yellow area = 23.12 square cm
```

In []:

```
1 /* Exercise # 1 - Source Code */
2
3 #include <stdio.h>
4 #include <math.h>
5 #define PI 3.141592
6 int main()
7 {
```

```

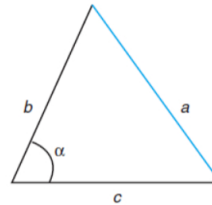
8 double radius1 , sideLength, AreaSq , AreaCr, yellow;
9
10 printf("Enter the radius value [cm]: ");
11 scanf("%lf", &radius1);
12 sideLength = (radius1 * 2) / sqrt(2);
13 AreaSq = sideLength * sideLength;
14 AreaCr = PI * (radius1 * radius1);
15 yellow = AreaCr - AreaSq;
16 printf("Square side = %.2f cm\n", sideLength);
17 printf("Square area = %.2f Square cm\n", AreaSq);
18 printf("Yellow area = %.2f Square cm\n", yellow);
19
20 return 0;
21 }

```

Slide Type Slide

- **Exercise # 2:** If we know the lengths of two sides (b and c) of a triangle and the angle between them in degrees (α), we can compute the length of the third side (a) using the following formula:

$$a^2 = b^2 + c^2 - 2bc \cos(\alpha)$$



- Heron's formula to calculate the area of a triangle with sides a , b , and c is:

$$S = \frac{a + b + c}{2}$$

$$Area = \sqrt{S(S - a)(S - b)(S - c)}$$

- Write a C program that reads the length of two sides and the angle between them (in degrees). Then, it computes and displays the length of the third side followed by the area of the triangle formed by the three sides using the formula shown above.
- Notes:
 - π radians = 180 degrees
 - Define the value of π (3.141592) as a constant.
 - Use math functions defined above like `sqrt`, `cos`, and `pow`
- Following are sample runs:

Slide Type

```

Enter side1 in cm: 3.0
Enter side2 in cm: 4.0
Enter angle in degrees: 90
side3= 5.00 cm
Area of the triangle = 6.00 cm^2

```

Slide Type

```

Enter side1 in cm: 10.6
Enter side2 in cm: 8.65
Enter angle in degrees: 35.7
side3= 6.19 cm
Area of the triangle = 26.75 cm^2

```

In []:

Slide Type Fragment

```

1 /* Exercise # 2 - Source Code */
2 #include <stdio.h>
3 #include <math.h>
4
5 int main()
6 {
7     const double PI = 3.141592;
8     double side1 ,side2, side3 , area, angleD, angleR , S;
9     printf("Enter side 1 in cm: ");
10    scanf("%lf", &side1);
11    printf("Enter side 2 in cm: ");
12    scanf("%lf", &side2);
13    printf("\nEnter angle in degrees: ");
14    scanf("%lf", &angleD);
15    angleR = (angleD * PI) / 180;
16    side3 = sqrt(pow(side1,2) + pow(side2,2) - (2 * side1 * side2 * cos(angleR)));
17    S = (side1 + side2 + side3) / 2 ;
18    area = sqrt(S*(S-side1)*(S-side2)*(S-side3));
19    printf("\nside 3 = %.2f cm", side3);
20    printf("\nArea of the triangle = %.2f cm^2",area);
21    return 0;
22 }

```