UCS 2265 Fundamentals and Practice of Software Development
A1: Practicing Basic Programming Constructs of C

Batch 2023-2027
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Learning Outcome: You will be able to make use of the following basic features of C
1. Data type declarations
2. I/O statements
3. Operators and expressions
4. Conditional statements

Best Practices:
• Proper naming conventions for variables should be followed.
• Proper Indentation should be used.
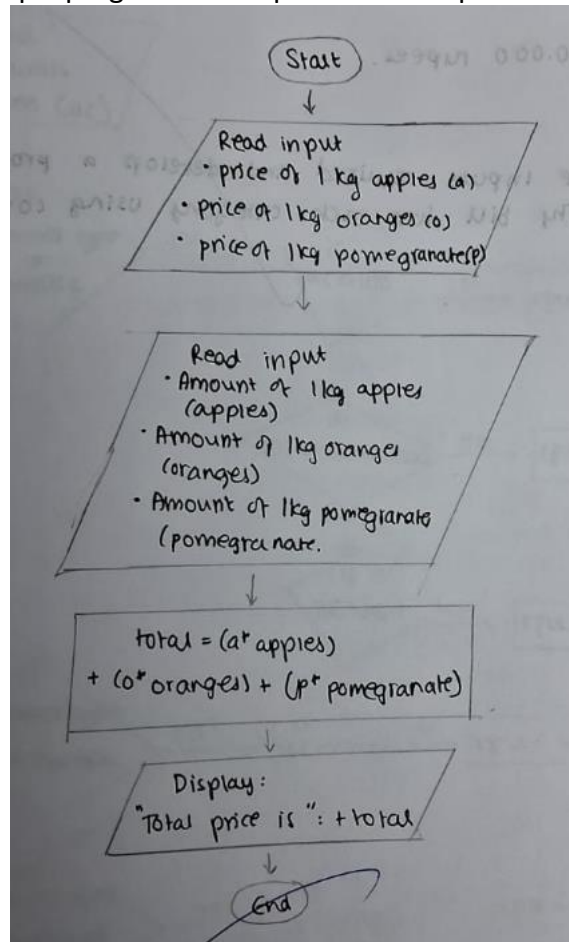• Appropriate read and print statements should be used.

Assignment:
Solve the following problems by implementing in C. (CO7, K3, 1.3.1, 1.4.1, 2.1.2, 2.1.3, 4.2.1, 14.2.1, 14.2.2)

1. A person is buying 3 fruits. Namely, apple, orange and pomegranate of X kg, Y kg and Z kg respectively. The prices corresponding to 1kg of apple, orange and pomegranate are Rs.P1, Rs.P2 and Rs.P3 respectively. Find the total price to be paid by the person for purchasing these fruits.
a. Identify the inputs required to solve the problem.
b. Devise a solution and represent the same using a flowchart.

c. Develop a program to compute the total price of the fruits.

Start

Read input
• price of 1 kg apples (a)
• price of 1 kg oranges (o)
• price of 1kg pomegranate(p)

Read input
• Amount of 1kg apples (apples)
• Amount of 1kg orange (oranges)
• Amount of 1kg pomegranate (pomegranate.

total = (a* apples)
+ (o* oranges) + (p* pomegranate)

Display:
"Total price is ": + total

End

```c
1 #include<stdio.h>
2 int main()
3 {
4         int x,y,z,p1,p2,p3, totalcost;
5         printf("Enter x");
6         scanf("%d",&x);
7         printf("Enter y");
8         scanf("%d",&y);
9         printf("Enter z");
10         scanf("%d",&z);
11         printf("Enter p1");
12         scanf("%d",&p1);
13         printf("Enter p2");
14         scanf("%d",&p2);
15         printf("Enter p3");
16         scanf("%d",&p3);
17         totalcost=(x*p1)+(y*p2)+(z*p3);
18         printf("The total cost is : Rs.%d",totalcost);
19 }
```

```
Enter x4
Enter y5
Enter z2
Enter p1100
Enter p2500
Enter p3300
The total cost is : Rs.3500
```
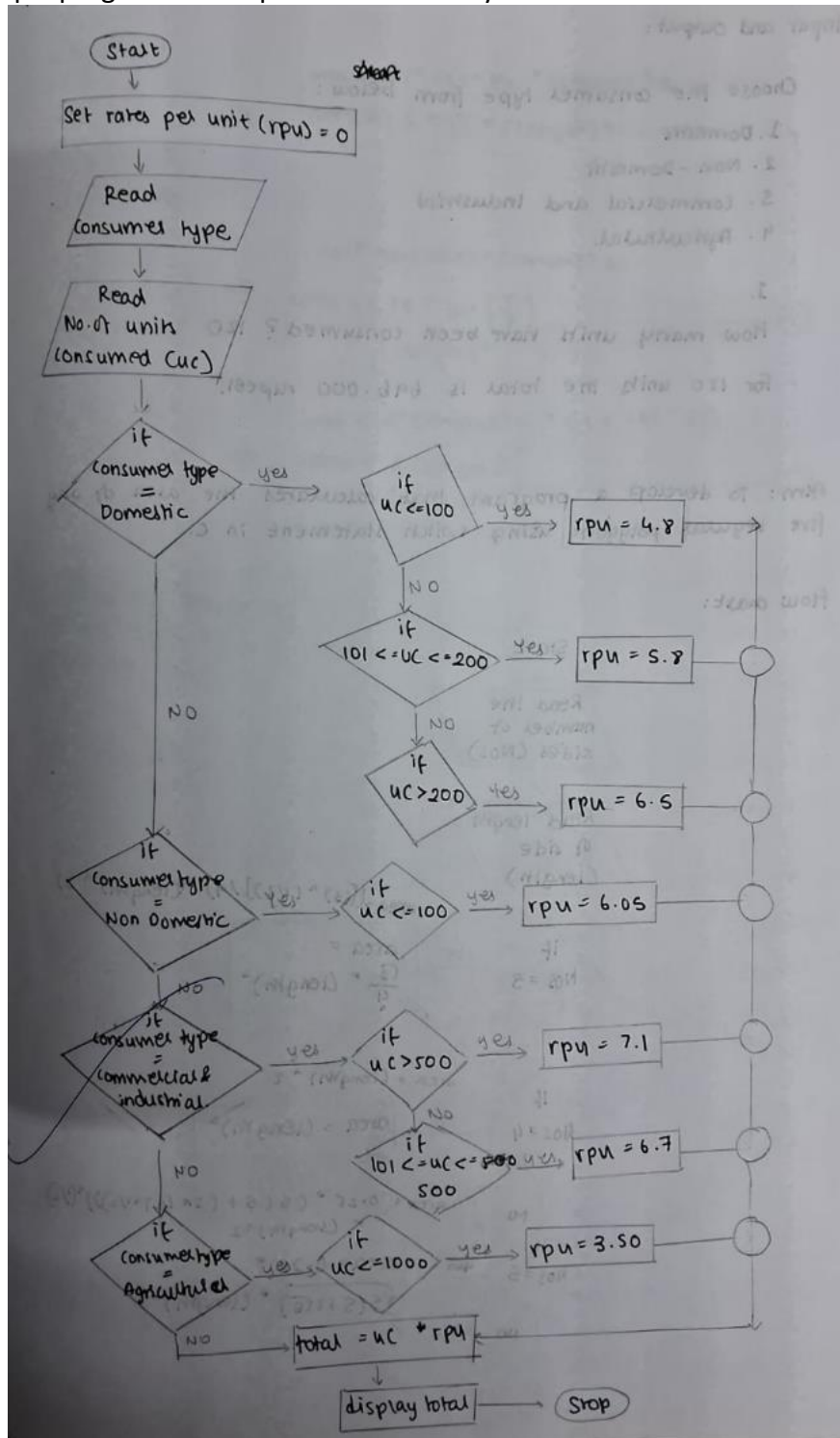
2. Consider the cost of the electricity power in Tamilnadu for different categories as shown below. Compute the electricity bill for the given category.

Consumer Type	Usage Slab (Units)	Rate per Unit (in Rs.)
Domestic	Up to 100	4.80
	101 – 200	5.80
	Above 200	6.50
Non-Domestic	Up to 100	6.05
(Commercial & Industrial)	101 – 500	6.70
	Above 500	7.10
Agricultural	Up to 1000	3.50

a. Identify the inputs required to solve the problem.
b. Devise a solution and represent the same using a flowchart.

c. Develop a program to compute the electricity bill for each of the above categories.

Start

Set rates per unit (rpu) = 0

Read Consumer type

Read No. of units consumed (uc)

if Consumer type = Domestic — yes →
  if uc<=100 — yes → rpu = 4.8
  NO
  if 101 <= uc <= 200 — Yes → rpu = 5.8
  NO
  if uc > 200 — Yes → rpu = 6.5

NO

if Consumer type = Non Domestic — Yes →
  if uc<=100 — yes → rpu = 6.05

NO

if Consumer type = Commercial & Industrial — yes →
  if uc > 500 — yes → rpu = 7.1
  NO
  if 101 <= uc <= 500 — yes → rpu = 6.7

NO

if Consumer type = Agricultural — yes →
  if uc<=1000 — yes → rpu = 3.50

NO

total = uc * rpu

display total → Stop

```c
1 #include<stdio.h>
2 int main()
3 {
4       int choice;
5       float rate, slab;
6       printf("Enter 1 for domestic, 2 for non domestic, 3 for commericial and industrial, 4 for agriculture");
7       scanf("%d",&choice);
8       printf("Enter usage slab");
9       scanf("%f",&slab);
10      if (choice==1)
11      {
12              if (slab<=100)
13              {
14                      rate=slab*4.80;
15              }
16              if (slab>100 && slab<=200)
17              {
18                      rate=slab*5.8;
19              }
20              if (slab>200)
21              {
22                      rate=slab*6.5;
23              }
24      }
25      if (choice==2)
26      {
27              if (slab<=100)
28              {
29                      rate=slab*6.05;
30              }
31      }
32      if (choice==3)
33      {
34              if (slab>=101 && slab<=500)
35              {
36                      rate=slab*6.70;
37              }
```

```c
15              }
16              if (slab>100 && slab<=200)
17              {
18                      rate=slab*5.8;
19              }
20              if (slab>200)
21              {
22                      rate=slab*6.5;
23              }
24      }
25      if (choice==2)
26      {
27              if (slab<=100)
28              {
29                      rate=slab*6.05;
30              }
31      }
32      if (choice==3)
33      {
34              if (slab>=101 && slab<=500)
35              {
36                      rate=slab*6.70;
37              }
38              if (slab>500)
39              {
40                      rate=slab*7.10;
41              }
42      }
43      if (choice==4)
44      {
45              if(slab<=1000)
46              {
47                      rate=slab*3.50;
48              }
49      }
50      printf("The total cost : Rs %f",rate);
51 }
```
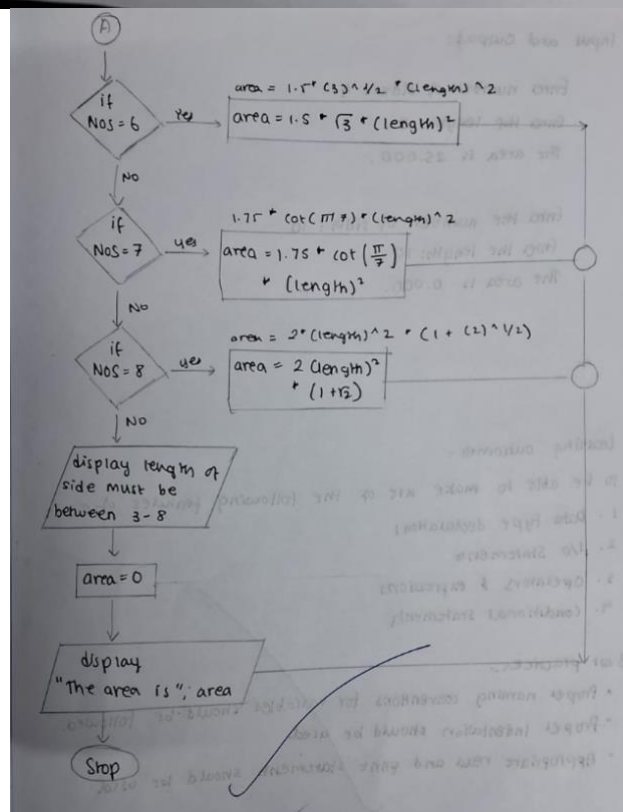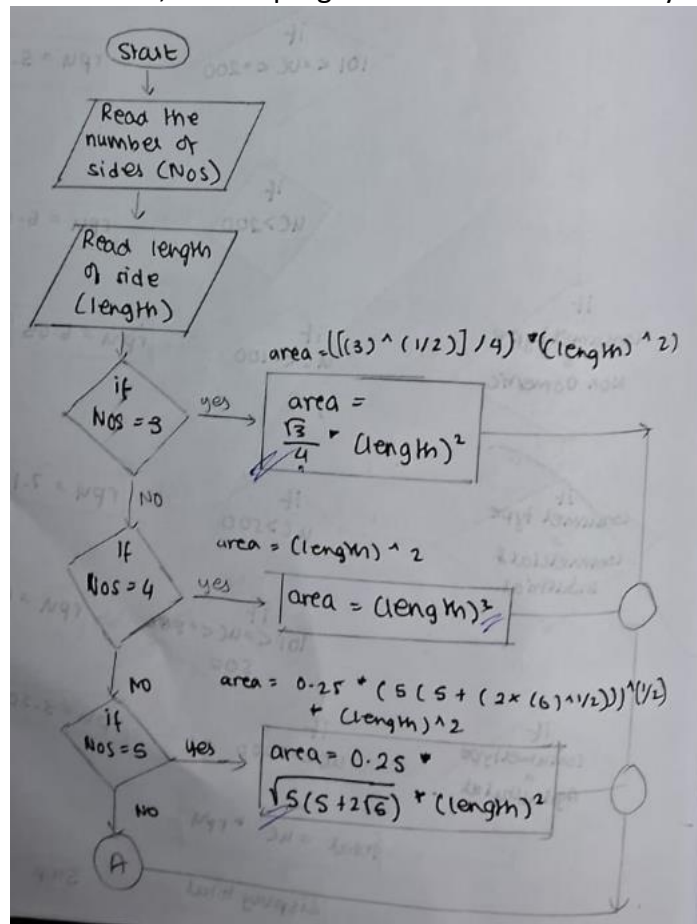
```
Enter 1 for domestic, 2 for non domestic, 3 for commericial and industrial, 4 fo
r agriculture4
Enter usage slab100
The total cost : Rs 350.0000002B@spl-30:~/shivaanee$ []
```

3. A polygon with equal angles and sides is known as a regular polygon. Given the number of sides and length of each side, write a program to find the area of any 5 regular polygons.

Start

Read the number of sides (Nos)

Read length of side (length)

if Nos = 3 — yes →

area = $[[(3)^{(1/2)}]/4] * (length)^{2}$

$area = \frac{\sqrt{3}}{4} * (length)^{2}$

NO

If Nos = 4 — yes →

area = $(length)^{2}$

$area = (length)^{2}$

NO

if Nos = 5 — yes →

area = $0.25 * (5(5 + (2 \times (6)^{1/2}))^{(1/2)} * (length)^{2}$

$area = 0.25 * \sqrt{5(5+2\sqrt{6})} * (length)^{2}$

NO

A

A

if Nos = 6 — yes →

area = $1.5 * (3)^{1/2} * (length)^{2}$

$area = 1.5 * \sqrt{3} * (length)^{2}$

NO

if Nos = 7 — yes →

$1.75 * cot(\pi 7) * (length)^{2}$

$area = 1.75 * cot\left(\frac{\pi}{7}\right) * (length)^{2}$

NO

if Nos = 8 — yes →

$area = 2 * (length)^{2} * (1 + (2)^{1/2})$

$area = 2 (length)^{2} * (1 + \sqrt{2})$

NO

display length of side must be between 3 - 8

area = 0

display "The area is", area

Stop

```c
1   #include <stdio.h>
2   #include <math.h>
3
4   int main() {
5       int sides[5] = {3, 4, 5, 6, 8}; // Number of sides of the polygons
6       float lengths[5] = {5.0, 6.0, 7.0, 8.0, 9.0}; // Length of each side
7
8       int num_polygons = 5; // Number of polygons
9
10      // Calculate and print the area of each regular polygon
11      for (int i = 0; i < num_polygons; i++) {
12          float area;
13
14          // Calculate the area using the formula: (n * length^2) / (4 * tan
                (pi / n))
15          area = (sides[i] * lengths[i] * lengths[i]) / (4 * tan(M_PI /
                sides[i]));
16
17          printf("Area of a regular polygon with %d sides and length %.2f is:
                %.2f\n", sides[i], lengths[i], area);
18      }
19
20      return 0;
21  }
22
/tmp/fYfdHRUX98.o
Area of a regular polygon with 3 sides and length 5.00 is: 10.83
Area of a regular polygon with 4 sides and length 6.00 is: 36.00
Area of a regular polygon with 5 sides and length 7.00 is: 84.30
Area of a regular polygon with 6 sides and length 8.00 is: 166.28
Area of a regular polygon with 8 sides and length 9.00 is: 391.10
```

Additional problems:
1. Input the numerator and denominator of improper fraction and convert it to mixed fraction

```c
1 #include<stdio.h>
2 int main()
3 {
4         int n,d,q,r;
5         printf("Enter numerator");
6         scanf("%d",&n);
7         printf("Enter denominator");
8         scanf("%d",&d);
9         q=n/d;
10        r=n-(q*d);
11        printf("Mixed fraction : %d %d/%d", q,r,d);
12 }
13
```

```
Enter numerator7
Enter denominator2
Mixed fraction : 3 1/2
```

2. Input Quotient, Reminder and divisor of a mixed fraction and calculate the floating point value of the equivalent improper fraction.

```c
1 #include<stdio.h>
2 int main()
3 {
4         int q,r,d;
5         float f;
6         printf("Enter quotient");
7         scanf("%d",&q);
8         printf("Enter remainder");
9         scanf("%d",&r);
10        printf("Enter denominator");
11        scanf("%d",&d);
12        f=((d*q)+r)/d;
13        printf("Floating point equivalent : %f",f);
14        printf("Improper fraction : %d/%d",((d*q)+r),d);
15 }
```

```
Enter quotient3
Enter remainder1
Enter denominator2
Floating point equivalent : 3.000000Improper fraction : 7/2
```

3. Modify the solutions for Q1 and Q2 by adding constraints that denominator should not be 0, otherwise print a customized error message "This will lead to div by zero error. Hence quitting the program"

```c
1 #include<stdio.h>
2 int main()
3 {
4         int n,d,q,r;
5         printf("Enter numerator");
6         scanf("%d",&n);
7         printf("Enter denominator");
8         scanf("%d",&d);
9         if (d==0)
10        {
11                printf("This will lead to division by zero error");
12        }
13        else
14        {
15                q=n/d;
16                r=n-(q*d);
17                printf("Mixed fraction : %d %d/%d", q,r,d);
18        }
19 }
```

```
Enter numerator4
Enter denominator0
This will lead to division by zero error
```

4. Given three integers, find the second smallest number among them

```c
1 #include<stdio.h>
2 int main()
3 {
4         int a,b,c,min;
5         printf("Enter number 1");
6         scanf("%d",&a);
7         printf("Enter number 2");
8         scanf("%d",&b);
9         printf("Enter number 3");
10        scanf("%d",&c);
11        if (a>b && a<c)
12        {
13                min=a;
14        }
15        else if (b>a && b<c)
16        {
17                min=b;
18        }
19        else
20        {
21                min=c;
22        }
23        printf("The minimum number is %d",min);
24 }
25
```

```
Enter number 16
Enter number 25
Enter number 37
The minimum number is 6
```

5. Using Switch case, design a currency convertor application to convert INR to USD, EUR, SGD and JPY

```c
1 #include<stdio.h>
2 int main()
3 {
4         int ch;
5         float change,inr;
6         printf("1.INR->USD \n 2.INR ->EUR \n 3.INR->SGD \n 4.INR->JPY");
7         printf("Enter choice");
8         scanf("%d", &ch);
9         printf("Enter INR");
10        scanf("%f",&inr);
11        switch (ch)
12        {
13                case 1:
14                change=inr*0.012;
15                break;
16                case 2:
17                change=inr*0.011;
18                break;
19                case 3:
20                change=inr*0.016;
21                break;
22                case 4:
23                change=inr*1.81;
24                break;
25                default:
26                printf("Invalid choice!");
27                break;
28        }
29        printf("The changed currency : %f",change);
30 }
```

```
1.INR->USD
 2.INR ->EUR
 3.INR->SGD
 4.INR->JPYEnter choice3
Enter INR100
The changed currency : 1.600000
```

6. Input entry and exit times of the day as two timestamps in 12-hours format and calculate the difference between them (A timestamp is defined as HH:MM:SS AM/PM)

```c
#include <stdio.h>
struct Time {
    int hours;
    int minutes;
    int seconds;
    char meridian[3];
};
int main() {
    struct Time start, end, diff;
    printf("Enter start time (HH:MM:SS AM/PM): ");
    scanf("%d:%d:%d %s", &start.hours, &start.minutes, &start.seconds,
        start.meridian);
    printf("Enter end time (HH:MM:SS AM/PM): ");
    scanf("%d:%d:%d %s", &end.hours, &end.minutes, &end.seconds, end
        .meridian);
    if (start.hours == 12)
        start.hours = 0;
    if (start.meridian[0] == 'P')
        start.hours += 12;
    if (end.hours == 12)
        end.hours = 0;
    if (end.meridian[0] == 'P')
        end.hours += 12;
    int startTimeInSeconds = start.hours * 3600 + start.minutes * 60 +
        start.seconds;
    int endTimeInSeconds = end.hours * 3600 + end.minutes * 60 + end
        .seconds;
    int timeDiffInSeconds = endTimeInSeconds - startTimeInSeconds;
    if (timeDiffInSeconds < 0)
        timeDiffInSeconds += 24 * 3600;
    diff.hours = timeDiffInSeconds / 3600;
    timeDiffInSeconds %= 3600;
    diff.minutes = timeDiffInSeconds / 60;
    diff.seconds = timeDiffInSeconds % 60;
    printf("Time difference: %d hours, %d minutes, %d seconds\n", diff
        .hours, diff.minutes, diff.seconds);
    return 0;
}
```

```
Enter start time (HH:MM:SS AM/PM): 06:47:34 PM
Enter end time (HH:MM:SS AM/PM): 02:47:34 PM
Time difference: 20 hours, 0 minutes, 0 seconds
```