

ASSIGNMENT 3: REPETITION I (Loops)**Note: Implement all Codes using goto, while and for constructs**

1. Write a program to accept a character and a number, and print the character number times
Input:
Character: *
Number: 6
Output:

2. Write a program to print table of given number.
Input: 9
Output:
9 x 1 = 9
9 x 2 = 18
9 x 3 = 27
9 x 4 = 36
9 x 5 = 45
9 x 6 = 54
9 x 7 = 63
9 x 8 = 72
9 x 9 = 81
9 x 10 = 90
3. Write a program to accept a number and
 - a. Calculate sum of digits of integer
Input: 9362
Output: 2 + 6 + 3 + 9 = 20
 - b. Calculate sum of digits of integer
Input: 9362
Output: 9 + 3 + 6 + 2 = 20
 - c. Reverse the number
Input: 9362
Output: 2639
 - d. Check whether given number is numeric palindrome or not
Input: 9362
Output: 9362 is not a numeric palindrome
Input: 36963
Output: 36963 is a numeric palindrome
 - e. Check whether it is Armstrong no. (when sum of cube of all digits of equals the number then the number is called as Armstrong number)
Example: 153
 $(1 * 1 * 1) + (5 * 5 * 5) + (3 * 3 * 3) = 1 + 125 + 27 = 153$
Input: 936
Output: 936 is not an Armstrong number
Input: 153
Output: 153 is an Armstrong number

4. Write a program to find factorial of given number.
Input: 5
Output: $1 * 2 * 3 * 4 * 5 = 120$
5. Write a program to find factorial of given number.
Input: 5
Output: $5 * 4 * 3 * 2 * 1 = 120$
6. Write a program to accept a number and print all factors excluding the number
Input: 24
Output: all factors: 1, 2, 3, 4, 6, 8, 12
7. Write a program to accept a number and print unique pairs of numbers such that multiplication of the pair is given number
Input: 24
Output:
 $1 * 24 = 24$
 $2 * 12 = 24$
 $3 * 8 = 24$
 $4 * 6 = 24$
8. Write a program to accept a number and print its prime factors.
Input: 180
Output: $180 = 2 * 2 * 3 * 3 * 5$
9. Write a program to accept two numbers and find its GCD (greatest common divisor) using Euclidean algorithm. The following example explains the algorithm. GCD of 123 and 36 is 3
 $123 \% 36 = 15$
 $36 \% 15 = 6$
 $15 \% 6 = 3$
 $6 \% 3 = 0$
GCD = 3
Input:
no1: 123
no2: 36
Output:
 $123 \% 36 = 15$
 $36 \% 15 = 6$
 $15 \% 6 = 3$
GCD of 123 and 36 is 3
Note: Try comma operator to improve solution.
10. Write a program to check whether given no is perfect square or not.
11. Write a program to find factorial of given number.
12. Write a program to accept integer values of base and index and calculate power of base to index.
Input: base: 2 index: 5
Output: 32
Input: base: 8 index: 3
Output: 512

13. Write a program to display n terms of Fibonacci series
 Input: 6
 Output: 1, 1, 2, 3, 5, 8
14. Modify above program to display ratio of two consecutive Fibonacci terms F_n/F_{n-1} . Observe that advances the ratio becomes closer to the value $(1+\sqrt{5})/2$ which is golden ratio denoted by mathematical symbol ϕ . (root of equation $x^2 - x = 1$).
15. Write a program to accept a number and check whether it is Prime no.
16. Write a program to count number of '1' bits into a given number using
 - a. Arithmetic operators
 - b. bit wise operators
17. Write a program to display given number in binary format using
 - a. Arithmetic operators
 - b. bit wise operators
18. Write a program to set parity of given byte even.
19. Write a program to calculate number having reversed bit order of given number.

Do while loop

1. Modify the menu driven program for four-function calculator. Add a menu item to choose option exit. The program continues till user chooses option exit.
2. Write a program to develop a very simple version of the "guess the magic number" game. The program generates a random magic number between 1 and 1000. Ask user to guess the number. If guess is correct then print message "congrats! You won." if the guess is less than magic number print the message ** left ** otherwise print the message ** right **. Repeat the procedure, until player give accurate guess. Give maximum 10 chances to user.
Note: generates the magic number using the standard random number generator `rand()`, which returns an arbitrary number between 0 and `RAND_MAX` (which defines an integer value that is 32,767 or larger). The `rand()` function requires the header `<stdlib.h>`.

ASSIGNMENT 3: REPETITION II (Nested Loops)

1. Print following pattern


```

* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
```
2. Write a program to print the tables of the numbers from 1 to 10.
3. Modify above program (18) to accept a range i.e. two numbers and print tables of numbers within the range.

```

Input: 3 6
Output:
3   4  5  6
6   8 10 12
9   12 15 18
12  16 20 24
15  20 25 30
18  24 30 36
21  28 35 41
24  32 40 48
27  36 45 54
30  40 50 60

```

4. Write a program to display
 - a. Prime numbers between 1 to 100
 - b. Twin Prime numbers between 1 to 100
 - c. Fibonacci primes between 1 to 1000
 - d. Armstrong Numbers between 1 to 500
5. Write a program to display First 5 prime numbers after a given number.
 Input: 7
 Output: 11 13 17 19 23

6. Print Pascal Triangle

```

          1
        1 1
      1 2 1
    1 3 3 1
  1 4 6 4 1
1 5 10 10 5 1

```

Each term in Pascal triangle is binomial coefficient.

$$\frac{n!}{r! \times (n-r)!}$$

Where n is row number and r is column number.

7. Input desired delay and display 8051 assembly code to generate the delay .

8. Print following patterns

(a)

```

1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

```

(b)

```

5
5 4
5 4 3
5 4 3 2
5 4 3 2 1

```

(c)

```

1 2 3 4 5
1 2 3 4
1 2 3
1 2
1

```

(d)

```

5 4 3 2 1
5 4 3 2
5 4 3
5 4
5

```

(e)

```

1 2 3 4 5
2 3 4 5
3 4 5
4 5
5

```

(f)

```

5 4 3 2 1
4 3 2 1
3 2 1
2 1
1

```

(g)

```

1 3 5 7 9
2 4 6 8
3 5 7
4 6
5

```

(h)

```

5 4 3 2 1
16 8 4 2
27 9 3
16 4
5

```

(i)

```

1 2 4 8 16
16 8 4 2
2 4 8
8 4
4

```

(j)

```

1 1 2 3 5
8 13 21 34
55 89 144
233 377
610

```

(k)				
1	4	9	16	25
36	49	64	81	
100	121	144		
169	196			
225				

(I)				
2	3	5	7	9
11	13	17	19	
23	29	31		
37	43			
47				

(m)

					F					
				E	F	E				
		C	D	E	F	E	D	C		
A	B	C	D	E	F	E	D	C	B	A
		C	D	E	F	E	D	C		
				E	F	E				
					F					

For Those who have completed above assignments

1. Write a program to accept characters from user and encode the characters. To encode a character find the position of character from A, subtract the position from Z. For example, MENTAL is coded as NVMZO. (E is fifth letter in English alphabets. E corresponds to V as V is fifth character from right).
2. Write a program to find square root of a number using
 - a. Bisection method
 - b. Newton Method

relationship that the sum of the squares of two of the sides is equal to the square of the hypotenuse. Find all Pythagorean triples for side 1, side 2 and hypotenuse all no larger than 500. Use a triple-nested for loop that tries all possibilities. This is an example of brute force computing.

6. Calculate values using Taylor series

- $e^x = x + \frac{1}{2!} \times x^2 + \frac{1}{3!} \times x^3 + \frac{1}{4!} \times x^4 \dots = \sum_{n=0}^{\infty} \frac{1}{(2n)!} \times x^{(2n)} \quad \text{for } -\infty < x < \infty$
- $\sin(x) = x - \frac{1}{3!} \times x^3 + \frac{1}{5!} \times x^5 - \frac{1}{7!} \times x^7 \dots = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} \times x^{(2n+1)} \quad \text{for } -\infty < x < \infty$
- $\cos(x) = x - \frac{1}{2!} \times x^2 + \frac{1}{4!} \times x^4 - \frac{1}{6!} \times x^6 \dots = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} \times x^{(2n)} \quad \text{for } -\infty < x < \infty$

7. Calculate value of pi using Machin's Formula

a. Machin's Formula

$$\frac{\pi}{4} = 4 \times \tan^{-1}\left(\frac{1}{5}\right) - \tan^{-1}\left(\frac{1}{239}\right)$$

b. Euler's Formula

$$\frac{\pi}{4} = 4 \times \tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right)$$

Where series for $\tan^{-1}(x)$ is

$$\tan^{-1}(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9} \dots = \frac{(-1)^n x^{(2n+1)}}{(2n+1)} \quad \text{for } -1 < x < 1$$

Compare results with value of π (M_PI defined in math.h)

8. The reverse and add function starts with a number, reverses its digits, and adds the reverse to the original. If the sum is not a palindrome (meaning it does not give the same number read from left to right and right to left), we repeat this procedure until it does. For example, if we start with 195 as the initial number, we get 9,339 as the resulting palindrome after the fourth addition:

195	786	1,473	5,214
+	+	+	+
591	687	3,741	4,125
---	---	---	---
786	1,473	5,214	9,339

9. When sum of the digits of a number is equal to sum of the digits of the prime factors of the same number, it is called as Smith's number. Write a program to accept a number and check whether the number is Smith's number or not. (example : 4937775)

$$4937775 = 3 \cdot 5 \cdot 5 \cdot 65837$$

$$4 + 9 + 3 + 7 + 7 + 7 + 5 = 42,$$

$$3 + 5 + 5 + 6 + 5 + 8 + 3 + 7 = 42.$$

10. Write a program to accept characters from user and displays no of digits, alphanumeric, uppercase, lowercase, whitespaces, newline, tabs spaces in given set of characters.
11. Modify above program to display no of words in given character set.

ASSIGNMENT 3 LOOPS ☺

- Write an optimal program to print all combinations of i, j, k, l where $i < j < k < l$ and $l = i + j + k$ and i, j, k, l are between 1 to 1000.

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