

I. Self Evaluation Exercises

1. How many * will be printed on screen?

```
x = -1
y = 4
while y > x :
    print ("*", end=" ")
    y -= 1
```

2. How many characters will be printed on screen?

```
a = 5
while a <= 20 :
    print ('$ ', end=" ")
    a += 1
```

3. Write a program that will display the even numbers from 1 to 100.
4. Write a program that will compute for and display the sum of the numbers divisible by 3, ranging from 1 to 100.
5. Write a program that will compute and display the sum of the powers of 2 from the first power to the n^{th} power, where n is a nonnegative integer given by the user.
- if $n = 4$, compute $2^1 + 2^2 + 2^3 + 2^4 = 30$; thus display 30.
 - if $n = 5$, compute $2^1 + 2^2 + 2^3 + 2^4 + 2^5 = 62$; thus display 62.
6. Write a program that will compute for the following given n and x :

$$\frac{x^1}{1} + \frac{x^2}{2} + \frac{x^3}{3} + \dots + \frac{x^n}{n}$$

7. Given an input
- n
- assumed one-digit, display a pattern.

example: If $n = 5$, display

```
____1
___1_2
__1_2_3
_1_2_3_4
1_2_3_4_5
```

8. Write a program that will display a pattern depending on the value of
- n
- entered by the user.

<p>If $n = 3$, display</p> <pre>* _ _ * * _ * _ _ *</pre>	<p>If $n = 4$, display</p> <pre>* _ _ _ _ _ * * _ _ _ _ _ * _ _ * _ _ _ _ _ _ * _ _ _ _ _ _ * _ _ _ _ _ _ *</pre>
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9. Write a program to display all combinations of A and B (from 1 to 100) that will make the expression **false**:

$$(5 \times A) - (3 \times B) > 30$$

10. Answer the questions that follow the code

```
s = int (input('Input:'))
x = s
y = s
while s >= 0 :
    if s > x :
        x = s
    if s < y :
        y = s
    s = int (input('Input:'))
if s < 0 :
    print (x, y)
else:
    print ("none")
```

- (a.) What does the program segment do?
- (b.) What value is being assigned to x ? y ?
- (c.) What value must be entered for s for the loop to stop?
11. Write a program that reverses an input number.
12. Write a program that gets as input a binary number and outputs its corresponding decimal equivalent. A binary number consists of only 1's and 0's.

Example 1:	Notes
Enter a binary number: 1101	To compute the decimal equivalent of 1101:
Decimal equivalent: 13	$1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$
Example 2:	
Enter a binary number: 11011	To compute the decimal equivalent of 11011:
Decimal equivalent: 27	$1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

II. Exercises

1. How many times will **Hello** be displayed?

```
a = 3
i = -1
while i <= 4 - a:
    print ("Hello")
    i += 1
```

2. Show the screen output of the given program segment.

```

m = 6
n = 0
h = 1
while h <= m :
    z = 2 * h
    n = n + z
    print ("H_=", h, "Z_=", z, "N_=", n)
    h += 1

```

3. How many characters will be printed on screen?

```

b = 71
while b < 91 :
    print (b, end=" ")
    b += 1

```

4. Show the screen output of the given program segment.

```

i = 2
while i <= 4 :
    j = 5
    while j >= 3 :
        print (i + j)
        j -= 1
    i += 1

```

5. Show the screen output of the given program segment.

```

i = 1
while i <= 5 :
    j = 1
    while j < i :
        print ("*", end=" ")
        j += 1
    print ()
    i += 1

```

6. Given the value of n from the user, write a program that will display the first n even numbers. Example, if $n = 5$, then display the first 5 even integers which are 2, 4, 6, 8, 10.
7. Write a program that accepts a number n and displays the sum of even numbers and the sum of odd numbers from 1 to n .
8. Write a program that will computer for $n!$ which is the product of all numbers from 1 to n .
9. Write a program that will compute for a^x given real value a and positive integer x .
10. Write a program that reads in a number n and outputs the sum of the squares of the numbers from 1 to n . E.g. if $n = 3$, display 14 because $1^2 + 2^2 + 3^2 = 14$.

11. Write a program that asks for the start month and end month and compute for the total number of days from the start month to the end month. Do not use `if-else`, use `switch` statement.
Example: If start month = 2 and end month = 5, then $Total = 28 + 31 + 30 + 31 = 120$. Display 120.
12. Write a program that will display the following: **4, 8, 12, 16, ..., 496**.
13. Write a program that reads in a number n , and then reads in n numbers. The numbers will be alternately added and subtracted.
Example: If $n = 5$ and the numbers entered are 4, 14, 5, 6, 1, then compute for $4 + 14 - 5 + 6 - 1 = 18$. Display 18.
14. Write a program that will ask the user to enter 10 numbers and display the largest number entered.
15. Write a program that will ask the user to enter 20 numbers and display on the screen the highest and lowest of these numbers.
16. Write a program that will ask the user for a number and display all the factors of the number.
17. Write a program that will ask the user for a number and display a message specifying whether the number is prime or composite.
18. Read any two numbers that represent an amount of money to be deposited and the annual interest rate. Compute and print the annual balances for the first 10 years.
19. Write a program that will ask the user for a number n and display the n^{th} Fibonacci number F_n . F_n defined as follows:

$$\begin{aligned}
 F_0 &= 0 \\
 F_1 &= 1 \\
 F_2 &= 0 + 1 = 1 \\
 F_3 &= 1 + 1 = 2 \\
 F_4 &= 1 + 2 = 3 \\
 F_5 &= 2 + 3 = 5 \\
 &\dots \\
 F_n &= F_{n-1} + F_{n-2}
 \end{aligned}$$

20. Construct a program to tell whether an input number is a palindrome. A palindrome is something that the same read backwards and forwards, such as 12321.
21. Many banks and savings and loan institutions compute interest on a daily basis. On a balance of 1000 with an interest rate of 6%, the interest earned in one day is 0.06 multiplied by 1000 and then divided by 365, because it is only for one day of a 365 day year. This yields 0.16 in interest and so the resulting balance is 1000.16. The interest for the second day will be 0.06 multiplied by 1000.16 and then divided by 365. Design a program that takes three inputs: the amount of deposit, the interest rate, and a duration in weeks. The algorithm then calculates the account balance at the end of the duration specified.

22. Write a program that will compute and display the sum of the factorials of the numbers from 1 to n , where n is a nonnegative integer given by the user.
- If $n = 3$, compute $1! + 2! + 3! = 9$; thus display 9.
 - If $n = 4$, then compute $1! + 2! + 3! + 4! = 33$; thus display 33.
23. Write a program that will compute and display the sum of the powers of x from the first power to the n^{th} power, where x and n are nonnegative integers given by the user.
- If $x = 3$ and $n = 4$, then compute $3^1 + 3^2 + 3^3 + 3^4 = 120$, thus display 120.
 - If $x = 2$ and $n = 5$, then compute $2^1 + 2^2 + 2^3 + 2^4 + 2^5 = 62$, thus display 62.
24. Write a program that will compute for the following given n :

$$\frac{1}{2^1} + \frac{2}{2^2} + \frac{3}{2^3} + \frac{4}{2^4} + \dots + \frac{n}{2^n}$$

25. Write a program that will compute for the following given n and x :

$$\frac{x^0}{0!} + \frac{x^1}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^n}{n!}$$

26. Show the screen output of the following program.

```

num1 = 7
num2 = 4
x = 1
while x <= num2 :
    y = 1
    while y <= num2 - x :
        print (y, end = "")
        y += 1
    y = 1
    while y <= x :
        print (num1, end = "")
        num1 = (num1 + 1) % 10
        y += 1
    print ()
    x += 1

```

27. What will be the result given this program segment?

```

x = 1
y = 0
while x != 10 :
    x += 2
    y += x
    print (x, y)

```

28. Show the screen output of the following program.

```

num = 341
n = 3
i = 0
while i - 1 <= n :
    if i == n + 1 :
        m = n - 1
    else :
        m = n
    if i > 0 and i <= n :
        print ("*", end="")
        h = num
        j = 1
        while j <= n :
            print (h % 10 , end = "")
            h = h // 10
            j += 1
        print ("*")
    if i != 0 :
        x = num // 100
        y = num % 100
        num = y * 10 + x
    if i == 0 or i == n + 1 :
        j = -1
        while j != m + 2 :
            j = j + 1
            print ("*", end = "")
        print ()
    i += 1

```

29. What does the following program do?

```

n = int (input ("Input:"))
i = 0
while i < n :
    j = (i + 1) * 2
    print (j)
    i += 1

```

30. Write a program that will perform prime factorization.

- Enter number: 24
Prime factorization: 2, 2, 2, 3
- Enter number: 7
Prime factorization: 7

31. A *perfect number* is a positive integer that is equal to the sum of all those positive integers (excluding itself) that divide it evenly. The first perfect number is 6 because its divisors

- (excluding itself) are 1, 2, and 3, and because $6 = 1 + 2 + 3$. Write a program to find the first three perfect numbers (include 6 as one of the three).
32. Write a program to read in a real value x and output the integer n closest to the cube root of x . The value of x is assumed positive. You are not allowed to use the `cbrt()` method of the `Math` class.
33. Write a program that finds the lowest odd integer among the values entered by the user. Stop asking values when a value less than 1 has been entered.
- If the values entered by the user are 3, 8, 1, 6, 3, 4, -5, then display **1**.
 - If the values entered by the user are 6, 4, 8, 0, then display **No odd integer**.
34. Write a program that will ask for a number and count how many digits are there in the number.
Enter num: 10854
Output: 5
35. Write a program that takes one real value as input and computes the first integer n such that $2n$ is greater than or equal to the input value. The program should output both n and $2n$.
36. Write a program that will ask for a long number and count how many digits in the number are even and how many are odd.
Enter num: 80572
Output: 3 digits are even, 2 digits are odd
37. Write a program that will ask for a value for num and display the product of its even positioned digits (i.e., digits at the tens unit, thousands unit,...).
- If $num = 412473$, then compute for $7 \times 2 \times 4 = 56$; thus display 56.
 - If $num = 15678$, then compute for $7 \times 5 = 35$; thus display 35.
 - If $num = 3$, then display 0.