Student Name: _____   **Roll No:** _____   **Section:** _____

Experiment No. 03

Lab 03 –Python Operators.

Lab Objectives:

1. Python Operators

1. Python Operators

Operators are used to perform operations on variables and values. Python divides the operators in the following groups:

1. Arithmetic operators
2. Assignment operators
3. Comparison operators
4. Logical operators
5. Identity operators
6. Membership operators
7. Bitwise operators

1.1   Python Arithmetic Operators

Arithmetic operators are used with numeric values to perform common mathematical operations:

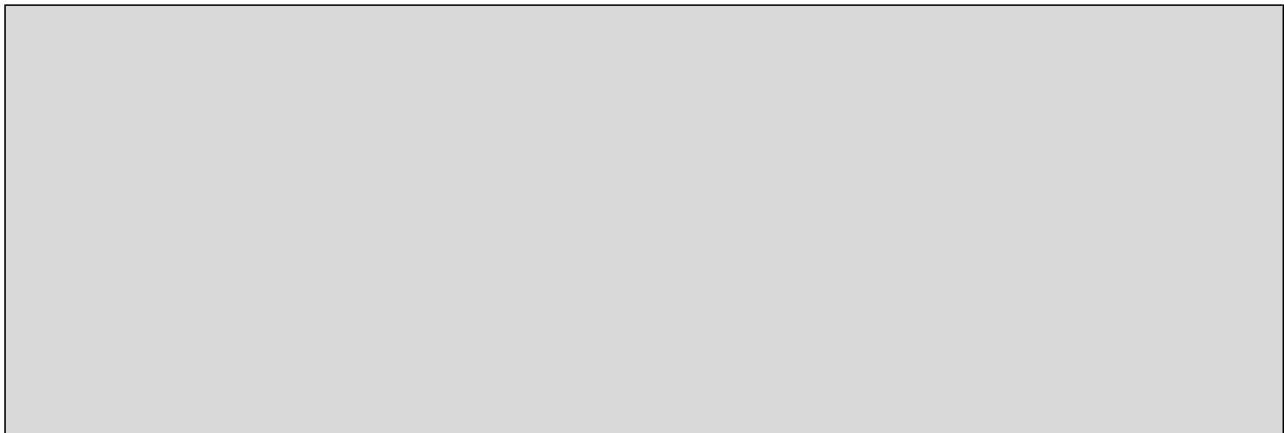| Operator	Name	Example
+	Addition	x + y
-	Subtraction	x - y
*	Multiplication	x * y
/	Division	x / y
%	Modulus	x % y
**	Exponentiation	x ** y
//	Floor division or Integer division	x // y

Student Name: _____   **Roll No:** _____   **Section:** _____

Program 1: Practicing with math operators

```
# Math Operators in Python
# taking two values

a = 10
b = 22

# Using sum operator
print ("Sum is:", a+b)
# Using subtract operator
print ("Difference is:", a-b)
# Using multiplication operator
print ("Product is:", a*b)
# Using division operator
print ("Division is:" a/b)
# Using integer division operator
print ("Integer Division is:" a//b)
# Using power operator
print ("Raised to the Power is:", a**b)
# Using modulo operator
print ("Remainder is:", a%b)
```

Output:

1.2   Python Assignment Operators

Assignment operators are used to assign values to variables:

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x - 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
//=	x //= 3	x = x // 3
**=	x **= 3	x = x ** 3
&=	x &= 3	x = x & 3
|=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Program 2: Write a program to use assignment operators

```
x = 5
x += 3
print(x)


x = 5
x -= 3
print(x)


x = 5
x *= 3
print(x)


x = 5 x
/= 3
print(x)


x = 5
x%=3
print(x)


x = 5
x//=3
```
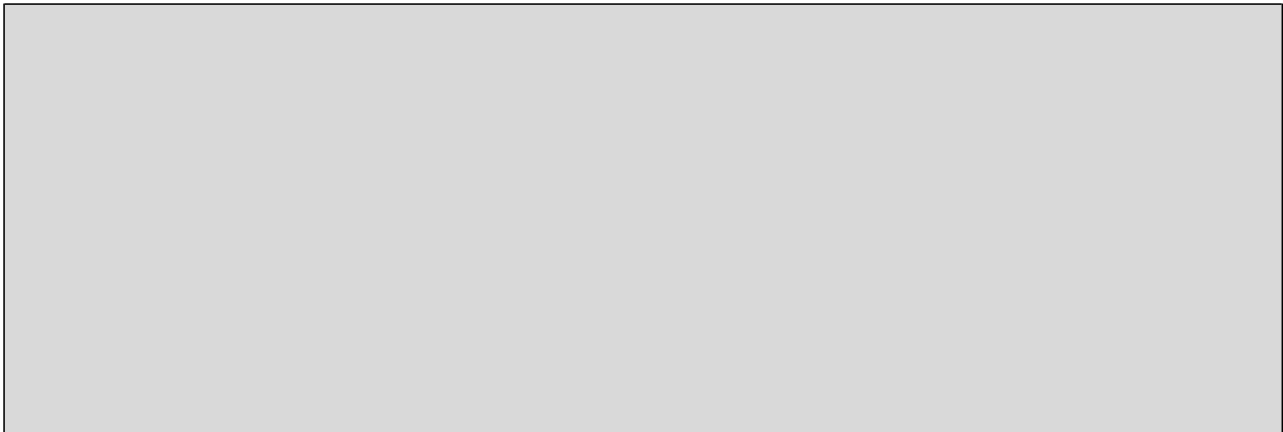
```
print(x)


x = 5
x **= 3
print(x)


x = 5
x &= 3
print(x)


x = 5 x
|= 3
print(x)


x = 5
x ^= 3
print(x)



x = 5
x >>= 3
print(x)



x = 5
x <<= 3
print(x)
```

Output:

1.3   Python Comparison Operators

Comparison operators are used to compare two values:

==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

Program 3: Write a program to perform comparison operators.

x = 20
y = 15

print("X is equal to Y:", x == y)
print("X is not equal to Y:", x != y)
print("X is Greater than Y:",x > y)
print("X is Less than Y:",x < y)
print("X is Greater than or equal to Y:",x >= y)
print("X is Less than or equal to Y:",x <= y)

Output:

1.4   Python Logical Operators

Logical operators are used to combine conditional statements:

Operator	Description	Example
and	Returns True if both statements are true	$x < 5$ and $x < 10$
or	Returns True if one of the statements is true	$x < 5$ or $x < 4$
not	Reverse the result, returns False if the result is true	not($x < 5$ and $x < 10$)

Program 4: Write a program to perform logical operators.

x = 15
print(x > 13 and x < 20)

x = 25
print(x > 23 or x < 24)

x = 35
print(not(x > 33 and x < 40))

Output:

1.5   Python Identity Operators

Identity operators are used to compare the objects, not if they are equal, but if they are actually the same object, with the same memory location:

Operator	Description	Example
is	Returns true if both variables are the same object	x is y
is not	Returns true if both variables are not the same object	x is not y

Program 5: Write a program to perform identity operator.

x = ["ahmed", "bashir"]
y = ["ahmed", "bashir"]
z = x

print(x is z)
print(x is y)
print(x == y)

Output:

Program 6: Performing is not identity operation.

x = ["ahmed", "bashir"]
y = ["ahmed", "bashir"]
z = x

print(x is not z)
print(x is not y)
print(x <> y)

Output:

1.6   Python Membership Operators

Membership operators are used to test if a sequence is presented in an object:

Operator	Description	Example
in	Returns True if a sequence with the specified value is present in the object	x in y
not in	Returns True if a sequence with the specified value is not present in the object	x not in y

Program 7: Performing 'in' membership operation.

x = ["wasim", "lubaid", "shahroz", "usman", "faisal", "farhan"]
print("faisal" in x)

Output:

Program 8: Performing 'not in' membership operation.
x = ["wasim", "lubaid", "shahroz", "usman", "faisal", "farhan"]

print("parkash" not in x)

Output:

Program 9: You are planning to throw a small bird at a distance d, with time t, and height h to some structure. Write a code in which you will use the physical quantities such as initial velocity, final velocity, angle in radians, gravity, height, sling shot etc.
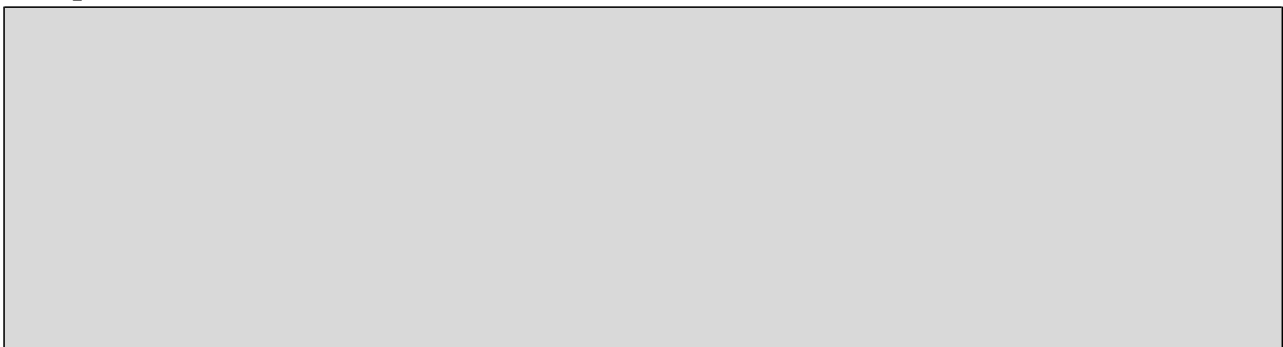
```
import math
# User inputs
velocity = float(input('Give me a velocity to fire at (in m/s): '))
angle = float(input('Give me an angle to fire at: '))
distance = float(input('Give me how far away you are from the structure: '))
height = float(input('Give me the height of the structure (in meters): '))
slingshot = 5 #Height of slingshot in meters
gravity = 9.8 #Earth gravity

# Converting angles to radians
angleRad = math.radians(angle)

# Computing our x and y coordinate
x = math.cos(angleRad)
y = math.sin(angleRad)

# Calculations
time = distance/(velocity * x)
vx = x
vy = y + (-9.8 * time)
finalVelocity = math.sqrt((vx ** 2) + (vy ** 2))
```

**Output:**

Programming Exercise

Solving real world problems of physics. Today we will focus on how we can solve the real world problems by using Python programming language. So for this, I am giving you the formulas of physics and you have to write the code to find the answers.

Question 1. A ball at the end of a string is revolving uniformly in a horizontal circle of radius 2 meters at constant angular speed 10 rad/s. Determine the magnitude of the linear velocity of a point located:
(a) 0.5 meters from the center
(b) 1 meter from the center
(c) 2 meters from the center
Known: Radius (r) = 0.5 meters, 1 meter, 3 meters, The angular speed = 10 radians/second
Wanted: The linear velocity
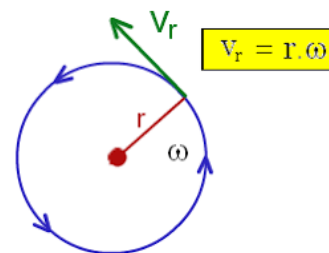
Formula: v = r ω

Question 2. The blades in a blender rotate at a rate of 5000 rpm. Determine the magnitude of the linear velocity:
(a) a point located 5 cm from the center
(b) a point located 10 cm from the center
Known: Radius (r) = 5 cm and 10 cm
The angular speed (ω) = 5000 revolutions / 60 seconds = 83.3 revolutions / second = (83.3)(6.28 radian) / second = 523.3 radians / second
Wanted: The magnitude of the linear velocity
Formula: v = r ω

Question 3. A point on the edge of a wheel 30 cm in radius, around a circle at constant speed 10 meters/second.
What is the magnitude of the angular velocity?
Known: Radius (r) = 30 cm = 0.3 meters, The linear velocity (v) = 10 meters/second
Wanted: the angular velocity
Formula: v = r ω

Question 4. A car with tires 50 cm in diameter travels 10 meters in 1 second. What is the angular speed?

Known:

Radius (r) = 0.25 meter, The linear speed of a point on the edge of tires (v) = 10 meters/second

Wanted: The angular speed

Formula: v = r ω

Question 5. The angular speed of wheel 20 cm in radians is 120 rpm. What is the distance if the car travels in 10 seconds.

Known: Radius (r) = 20 cm = 0.2 meters

The angular speed = 120 rev / 60 seconds = 2 rev / second = (2)(6.28) radians / second = 12.56 radians / second

Wanted: distance

Formula: v = r ω

Question 6: A car is running at a velocity of 50 miles per hour and the driver accelerates the car by 10 miles/hr^2. How far the car travels from this point in the next 2 hours, if the acceleration is constant. Formula: v = u + at

Question 7: A Stone is dropped freely from a height of 100 feet. With what velocity will it hit the ground? (Neglect the air resistance and assume the acceleration due to gravity is 32ft/s^2). Formula: $v^2 - u^2 = 2as$