**Student Name:**

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**Section:**

Experiment No. 02

*Lab 02 –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

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**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)

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**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

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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:**

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**Section:**

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**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:**

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**1.4 Python Logical Operators**

Logical operators are used to combine conditional statements:

**Operator Description Example**

**and** Returns True if both statements are true

**or** Returns True if one of the statements is true

**not** Reverse the result, returns False if the result is true

x < 5 and x < 10 x < 5 or x < 4

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

**is not** Returns true if both variables are not the same object

x is y

x is not y

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**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:**

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**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

**not in** Returns True if a sequence with the specified value is not present in the object

x in y

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:**

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**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:**

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**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

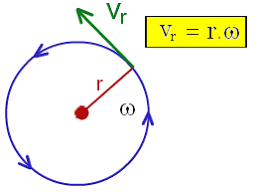
(b) 1 meter from the center

(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

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**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/hr2. 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/s2). Formula: v2 – u2 = 2as