Basic Math Operations in Python

Introduction

Welcome back, young coders! Today we're going to learn how to use Python as a super-powered calculator. Python can perform all kinds of math operations - from simple addition to complex calculations. By the end of this lesson, you'll be able to solve math problems with just a few lines of code!

Basic Math Operators

Python uses symbols called "operators" to perform calculations:

Operator	Name	Example	Result
`+`	Addition	`5 + 3`	`8`
`-`	Subtraction	`10 - 4`	`6`
`*`	Multiplication	`6 * 7`	`42`
`/`	Division	`20 / 5`	`4.0`
`**`	Exponent (Power)	`2 ** 3`	`8`
`//`	Integer Division	`7 // 2`	`3`
`%`	Modulo (Remainder)	`7 % 2`	`1`

Let's try these operations in Python:

```
# Addition
sum_result = 5 + 3
print("5 + 3 =", sum_result)

# Subtraction
difference = 10 - 4
print("10 - 4 =", difference)

# Multiplication
product = 6 * 7
print("6 * 7 =", product)

# Division
quotient = 20 / 5
print("20 / 5 =", quotient)

# Exponents (Powers)
power = 2 ** 3  # 2³ (2 cubed)
print("2 ** 3 =", power)

# Integer Division (divides and rounds down)
int_div = 7 // 2
print("7 // 2 =", int_div)

# Modulo (remainder after division)
remainder = 7 % 2
print("7 % 2 =", remainder)
```

Order of Operations

Just like in math class, Python follows the order of operations (sometimes remembered as PEMDAS):

1. **P**arentheses `( )`
2. **E**xponents `**`
3. **M**ultiplication `*` and **D**ivision `/` (from left to right)
4. **A**ddition `+` and **S**ubtraction `-` (from left to right)

```
# Without parentheses
result1 = 2 + 3 * 4
print("2 + 3 * 4 =", result1)  # 14, not 20

# With parentheses
result2 = (2 + 3) * 4
print("(2 + 3) * 4 =", result2)  # 20
```

Math with Variables

The real power comes when we use variables in our calculations:

```
# Set up some variables
length = 5
width = 3
height = 2

# Calculate area and volume
area = length * width
volume = length * width * height

print("Rectangle area:", area)
print("Box volume:", volume)
```

Updating Variables

You can change the value of a variable using math operations:

```
# Start with a score of 0
score = 0
print("Initial score:", score)

# Add 10 points
score = score + 10
print("After adding 10:", score)

# Add 5 more points
score = score + 5
print("After adding 5 more:", score)
```

Shorthand Operators

Python has shorthand operators to make updating variables easier:

Shorthand	Long Form	Example
+=	x = x + y	score += 10
-=	x = x - y	lives -= 1
*=	x = x * y	money *= 2
/=	x = x / y	points /= 2

```
# Starting values
score = 0
lives = 3
money = 100

# Update using shorthand operators
score += 10  # Add 10 to score
lives -= 1   # Subtract 1 from lives
money *= 2   # Double the money

print("Score:", score)
print("Lives:", lives)
print("Money:", money)
```

Hands-on Activities

Activity 1: Math Quiz Generator

```
import random

# Generate two random numbers
num1 = random.randint(1, 10)
num2 = random.randint(1, 10)

# Calculate the answer
correct_answer = num1 * num2

# Ask the question
print("What is", num1, "×", num2, "?")
user_answer = input("Your answer: ")

# Convert user's answer to an integer
user_answer = int(user_answer)

# Check if the answer is correct
if user_answer == correct_answer:
    print("Correct! Great job!")
else:
    print("Not quite. The answer is", correct_answer)
```

Activity 2: Temperature Converter

```
# Ask for temperature in Fahrenheit
fahrenheit = input("Enter temperature in Fahrenheit: ")
fahrenheit = float(fahrenheit)

# Convert to Celsius
celsius = (fahrenheit - 32) * 5/9
```

```
# Show the result
print(fahrenheit, "°F =", round(celsius, 1), "°C")
```

Activity 3: Rectangle Calculator

```
# Get rectangle dimensions
length = float(input("Enter rectangle length: "))
width = float(input("Enter rectangle width: "))

# Calculate area and perimeter
area = length * width
perimeter = 2 * (length + width)

# Display results
print("Area:", area)
print("Perimeter:", perimeter)
```

Real-world Applications

Math operations in Python are used everywhere:

- Game development (calculating scores, positions, collisions)
- Science projects (formulas, data analysis)
- Finance apps (calculating interest, investments)
- Graphics programs (scaling, rotating objects)

Wrap-up

You now know how to perform basic math operations in Python! These skills will help you create all kinds of programs, from games to scientific calculations.

Challenge: Piggy Bank

Create a program that:

1. Asks how many pennies, nickels, dimes, and quarters you have
2. Calculates the total value in dollars
3. Shows how much more money you need to reach $10

Remember:

- 1 penny = $0.01
- 1 nickel = $0.05
- 1 dime = $0.10
- 1 quarter = $0.25

Bonus: Add a feature that tells you how many days it will take to reach $10 if you save a certain amount per day.