

Lesson 9 – Operations on Numbers

Today, we'll be reviewing **operations on numbers**. While this might seem like a basic math topic, it is **critical for programming**. Understanding how numerical operations work—especially how they're implemented and what results they return in **Python**—is essential for writing accurate and efficient code.

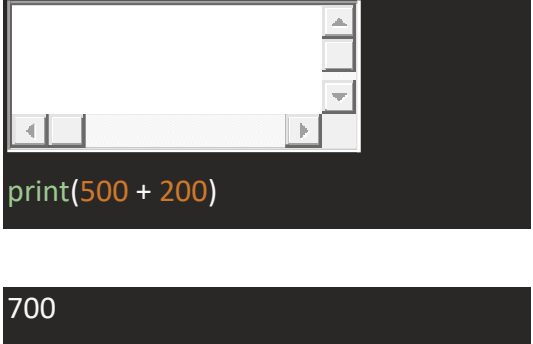
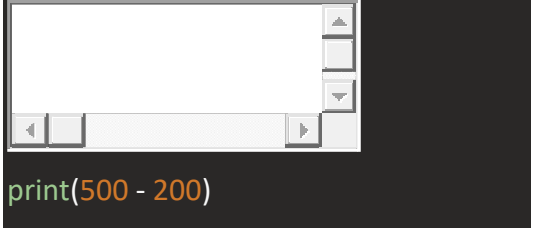
What to Do Today

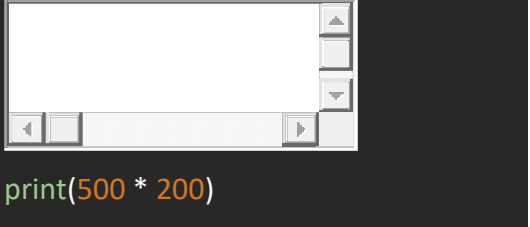
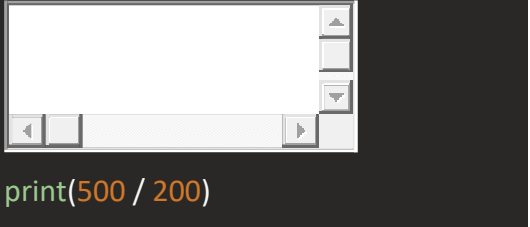
1. **Read through the document** titled *Operations on Numbers*.
2. If you encounter any unfamiliar operations, **look them up online**.
For example:
 - a. If you're unsure about `ceil()`, search **"Python ceil()"** on Google.

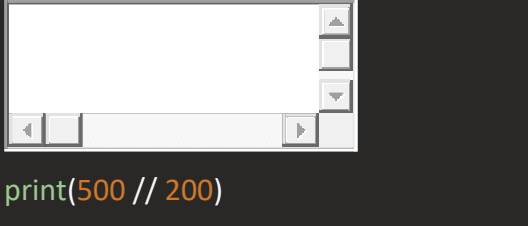
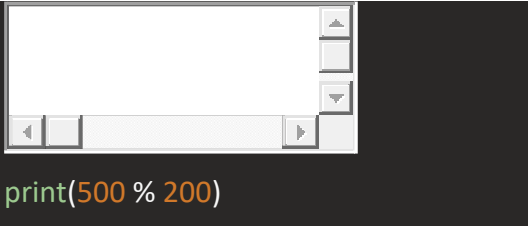
Key Concept

In Python, **all numeric types** (integers, floats, etc.) support various mathematical operations.




These operations are **ordered by ascending priority**, meaning some are executed before others if used in the same expression—just like in regular math.

Operation	Result	Example
<code>x + y</code>	Sum of x and y	 <p>A screenshot of a Python REPL window. The prompt is <code>>>></code>. The user has entered <code>print(500 + 200)</code> on the first line. The output <code>700</code> is displayed on the second line.</p>
<code>x - y</code>	Difference of x and y	 <p>A screenshot of a Python REPL window. The prompt is <code>>>></code>. The user has entered <code>print(500 - 200)</code> on the first line. The output <code>300</code> is displayed on the second line.</p>

		300
$x * y$	Product of x and y	 <pre>print(500 * 200)</pre> 100000
x / y	Quotient of x and y	 <pre>print(500 / 200)</pre> 2.5

$x // y$	Floored quotient of x and y	 <pre>print(500 // 200)</pre> 2
$x \% y$	Remainder of x / y	 <pre>print(500 % 200)</pre> 100



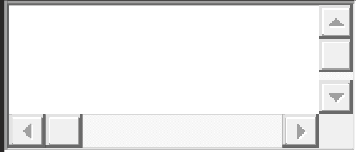

<code>-x</code>	x negated	 <pre>print(-500 + 200)</pre> <pre>-300</pre>
<code>+x</code>	x unchanged	 <pre>print(+500 + 200)</pre> <pre>700</pre>
<code>abs(x)</code>	Absolute value or magnitude of x	 <pre>print(abs(-500))</pre> <pre>500</pre>
<code>int(x)</code>	x converted to integer	 <pre>print(int(500.26))</pre> <pre>500</pre>
<code>float(x)</code>	x converted to float	 <pre>print(float(500))</pre> <pre>500.0</pre>

		<pre>print(float(500))</pre> <pre>500.0</pre>
<code>divmod(x, y)</code>	The pair (x // y, x % y)	 <pre>print(divmod(94, 21))</pre> <pre>(4, 10)</pre>
<code>pow(x, y)</code>	x to the power y	 <pre>print(pow(500, 2))</pre> <pre>250000</pre>
<code>x ** y</code>	x to the power y	 <pre>print(500 ** 2)</pre> <pre>250000</pre>

Further Operations for Integers & Floats

Floats and integers also include the following operations.

Operation	Result	Example
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<code>math.trunc(x)</code>	x truncated to Integral	 <pre>import math x = 123.56 print(math.trunc(x))</pre> 123
<code>round(x[, n])</code>	x rounded to n digits, rounding half to even. If n is omitted, it defaults to 0.	 <pre>x = 123.56 print(round(x, 1))</pre> 124.6
<code>math.floor(x)</code>	The greatest Integral $\leq x$.	 <pre>import math x = 123.56 print(math.floor(x))</pre> 123
<code>math.ceil(x)</code>	The greatest Integral $\geq x$.	 <pre>import math</pre>

		<pre>x = 123.56 print(math.ceil(x))</pre> <pre>124</pre>
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Exercise:

Try and determine the logic for each of the following:

- Write a program that defines variables X and Y and perform each operation – print the result.
 - **Challenge (A bit tricky):** Write a program that requires the user input an item cost. Calculate the Retail cost by increasing the item cost using a markup of 75%. Round the result to 2 decimal positions and adjust the retail price to the next .95 – all products are recorded to .95.
 - **Challenge (Difficult):** Write a program for the total cost of a purchase and the amount of money provided by the customer for payment. Determine the change and how it is to be divided using \$20, \$10, \$5, \$2, \$1, .25, .10, .05 and .01 (even though pennies are not used any more. Display the number of each that is required for the proper change. HINT: Convert everything to cents.
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