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Storing numbers

Microsoft

Susan Ibach | Technical Evangelist
Christopher Harrison | Content Developer

Many problems we have to solve involve math

- How much will I pay monthly on a mortgage?
- How much will this cost when I add taxes?
- How much milk do I need to use in this recipe if I want to double the recipe?

So it’s important to be able to store and manipulate numbers as well as strings

```
age = 42
print(age)
```

You can perform math operations on numeric values or on variables containing numeric values

```
width = 20
height = 5

area = width * height

perimeter = 2*width + 2*height

perimeter = 2*(width+height)
```

These are the most common math operations

Symbol	Operation	Example
+	Addition	5+2 = 7
-	Subtraction	5-2 = 3
*	Multiplication	5*2 = 10
/	Division	5/2 = 2.5
**	Exponent	5**2 = 25
%	Modulo	5%2 = 1

Math rules haven’t changed since school

Order of operations

```
( ) parentheses
**  exponent (e.g. **2 squared **3 cubed)
*/  multiplication and division
+ - addition and subtraction
```

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DEMO

Getting a computer to do your math homework

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Formatting numbers

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Sometimes you will need to format the numbers when you display them to users

Syntax	Output
`print('I have %d cats' % 6)`	I have 6 cats
`print('I have %3d cats' % 6)`	I have 6 cats
`print('I have %03d cats' % 6)`	I have 006 cats
`print('I have %f cats' % 6)`	I have 6.000000 cats
`print('I have %.2f cats' % 6)`	I have 6.00 cats

You can also use a format method to format numeric values

Syntax	Output
`print("I have {0:d} cats".format(6))`	I have 6 cats
`print("I have {0:3d} cats".format(6))`	I have 6 cats
`print("I have {0:03d} cats".format(6))`	I have 006 cats
`print("I have {0:f} cats".format(6))`	I have 6.000000 cats
`print("I have {0:.2f} cats".format(6))`	I have 6.00 cats

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Formatting numeric values

Geek Tip!

- Sometimes commands are too long to fit on a single line
- You can use a "\" to indicate a command continues on the next line

```
total = 5 + 6 + 8 \
     + 6 + 2
```

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Inputting numbers

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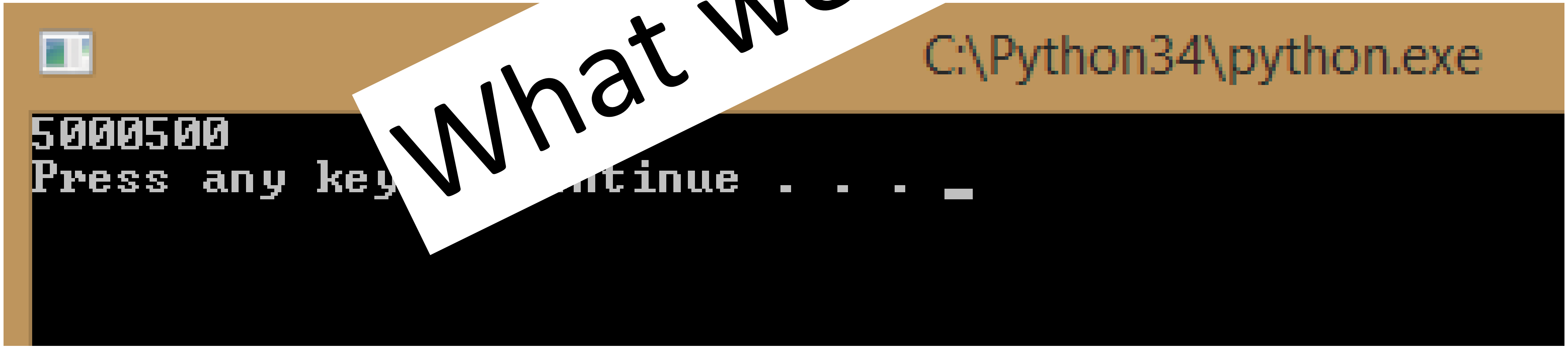
Asking a user to enter the numbers

Why did we get the wrong answer when we ask the user to enter their bonus and salary values?

```python
salary = input("Please enter your sal
bonus = input("Please enter your
payCheck = salary + bonus
print(payCheck)
```

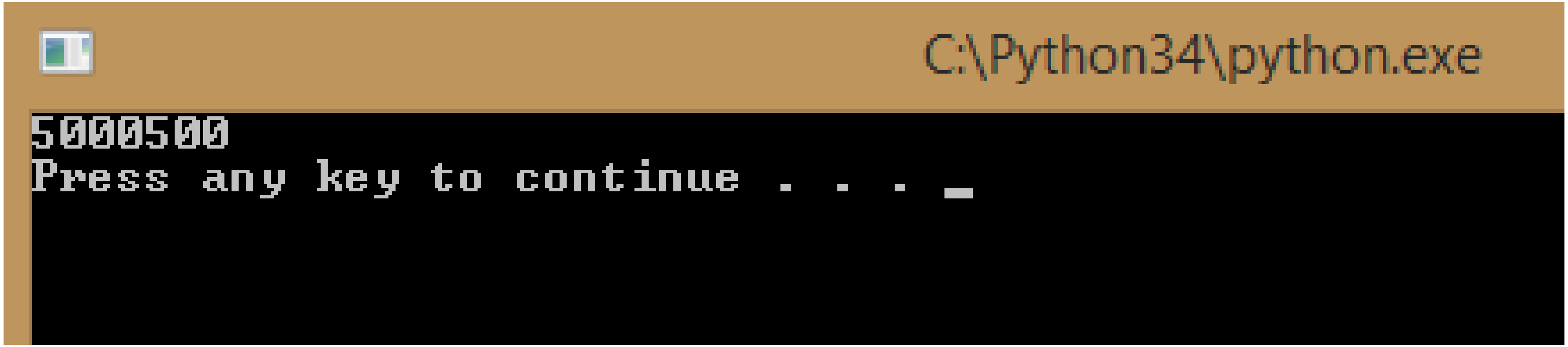


```
5000500
Press any key      ntinue . . . _
```

What went wrong?

Here is a hint: The input statement returns strings

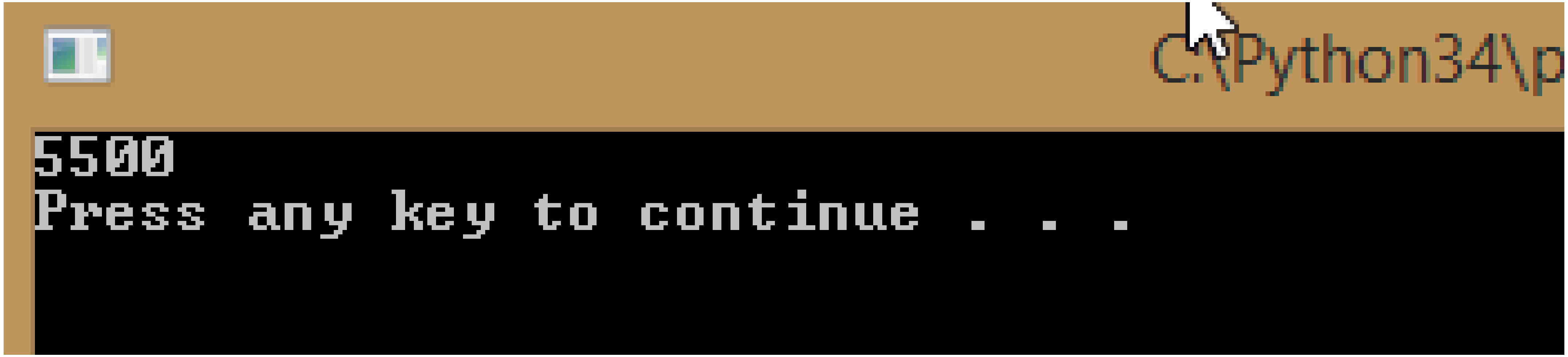
```python
salary = '5000'
bonus = '500'
payCheck = salary + bonus
print(payCheck)
```



```
5000500
Press any key to continue . . . _
```

The program thought salary and bonus were strings so it concatenated instead of adding

```
salary = 5000
bonus = 500
payCheck = salary + bonus
print(payCheck)
```



```
5500
Press any key to continue . . .
```

We need a way to tell our program we want to treat values as a number instead of a string

There are functions to convert from one datatype to another.

```
int(value)    converts to an integer
long(value)   converts to a long integer
float(value)  converts to a floating number
     (i.e. a number that can hold decimal places)
str(value)    converts to a string
```

Which function should we use to fix our code?

If we convert the string to a float we get the desired result

```
salary = input("Please enter your salary: ")
bonus = input("Please enter your bonus: ")
payCheck = salary + bonus
payCheck = float(salary) + float(bonus)
print(payCheck)
```

What do you think will happen if someone types “BOB” as their salary?

The code crashes because we can’t convert the string “BOB” into a numeric value. We will learn how to handle errors later!

DEMO

Changing the datatype

Your Challenge – create a loan calculator

- Have the user enter the cost of the loan, the interest rate, and the number of years for the loan
- Calculate monthly payments with the following formula

$$M = L[i(1+i)n] / [(1+i)n-1]$$

- M = monthly payment
- L = Loan amount
- i = interest rate (for an interest rate of 5%, $i = 0.05$)
- n = number of payments

Congratulations!

- You can now solve mathematical problems with code!

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