How do I Teach a Computer to Calculate Something?

Math in Python

CSE

How does a computer really do math?

Q: If a computer can only add bits, how does it do "regular math"?

unit 1

Task: perform the following additions:

unit 1

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$$\begin{array}{r} 1_{10} \\ +\ 1_{10} \\ \hline \end{array}$$

unit 1

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$$\begin{array}{r} 1_{10} \\ +\ 1_{10} \\ \hline \end{array}$$

$$\begin{array}{r} 5_{10} \\ +\ 9_{10} \\ \hline \end{array}$$

Task: perform the following additions:

$$\begin{array}{r} 1_{10} \\ +\ 1_{10} \\ \hline \end{array} \qquad \begin{array}{r} 00001_{2} \\ +\ 00001_{2} \\ \hline \end{array}$$

$$\begin{array}{r} 5_{10} \\ +\ 9_{10} \\ \hline \end{array}$$

Task: perform the following additions:

$$\begin{array}{r} 1_{10} \\ +\ 1_{10} \\ \hline \end{array} \qquad \begin{array}{r} 00001_{2} \\ +\ 00001_{2} \\ \hline \end{array}$$

$$\begin{array}{r} 5_{10} \\ +\ 9_{10} \\ \hline \end{array} \qquad \begin{array}{r} 00101_{2} \\ +\ 01001_{2} \\ \hline \end{array}$$

unit 1

$$\begin{array}{r} 1_{10} \\ +\ 1_{10} \\ \hline \end{array} \qquad \begin{array}{r} 00001_{2} \\ +\ 00001_{2} \\ \hline \end{array}$$

$$\begin{array}{r} 5_{10} \\ +\ 9_{10} \\ \hline \end{array} \qquad \begin{array}{r} 00101_{2} \\ +\ 01001_{2} \\ \hline \end{array}$$

Task: perform the following quick-binary conversions

$$1_{10} + 1_{10}$$

$$00001_2 + 00001_2$$

$$5_{10} + 9_{10}$$

$$00101_2 + 01001_2$$

Task: perform the following quick-binary conversions

1_{10} + 1_{10}

2_{10}

00001_{2} + 00001_{2}

5_{10} + 9_{10}

00101_{2} + 01001_{2}

Task: perform the following quick-binary conversions

1_{10}
$+ 1_{10}$
2_{10}

00001_{2}
$+ 00001_{2}$

5_{10}
$+ 9_{10}$
14_{10}

00101_{2}
$+ 01001_{2}$

Task: perform the following quick-binary conversions

1_{10} 00001_2

$+ 1_{10}$ $+ 00001_2$

2_{10} → 00010_2

5_{10} 00101_2

$+ 9_{10}$ $+ 01001_2$

14_{10} → 01110_2

unit 1

A: A computer uses the Squirrel-Girl method to convert decimal numbers to binary and then adds those.

unit 1

A: A computer uses the Squirrel-Girl method to convert decimal numbers to binary and then adds those.

To show the answer, it uses the method in reverse to convert the answer to a decimal number.

unit 1

Q: How does a computer multiply? Subtract?.

unit 1

Q: How does a computer multiply? Subtract?.

A: Multiplication is repeated addition.

unit 1

Q: How does a computer multiply? Subtract?.

A: Multiplication is repeated addition.
Subtraction is addition of a negative number.

unit 2

Notice we started unit 2!!!

Math in Python

Def: An operator is a symbol that represents an action

Here are some "human" operators:

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unit 2

Python "math" operators:

Python "math" operators:

Symbol

Python "math" operators:

Symbol	Action it tells the computer to do

unit 2

Python "math" operators:

Symbol	Action it tells the computer to do	Example

unit 2

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+		

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-		

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*		

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*	Multiply	

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*	Multiply	`print(20*5)`

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*	Multiply	`print(20*5)`
/		

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*	Multiply	`print(20*5)`
/	Divide	

Python "math" operators:

Symbol	Action it tells the computer to do	Example
+	Add	`print(2+5)`
-	Subtract	`print(3-2)`
*	Multiply	`print(20*5)`
/	Divide	`print(100/4)`

Open the following link and wait for further instructions:

`https://repl.it/languages/python3`

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