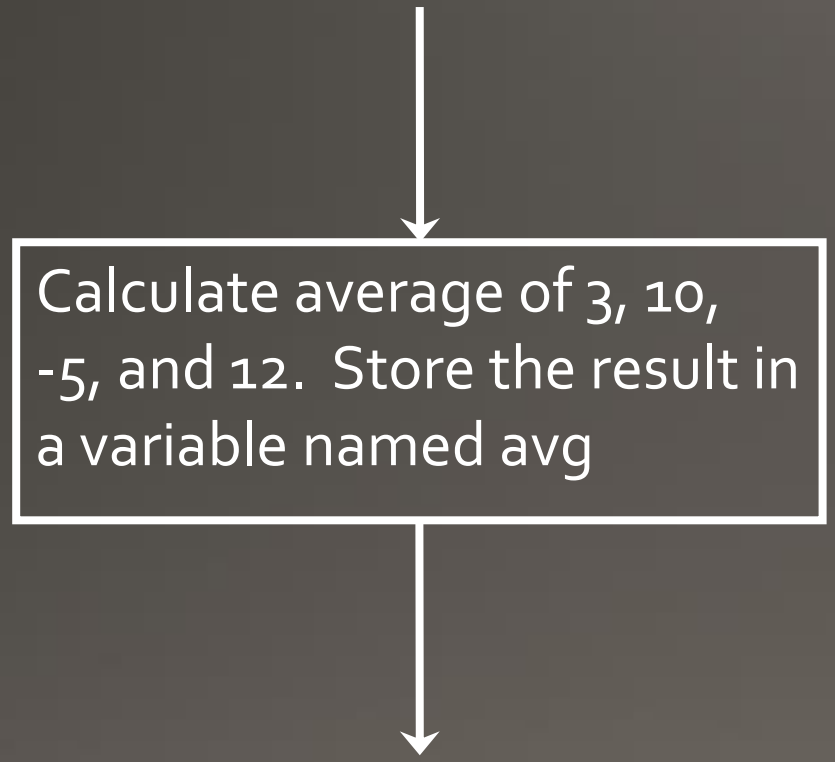
Chapter 2

Math

Design

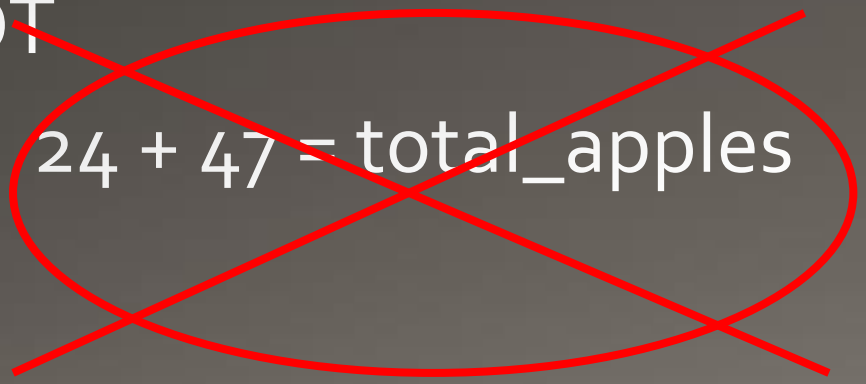

Calculate average of 3, 10, -5, and 12. Store the result in a variable named avg

Addition

- If Sally has 24 apples and Sam gives Sally 47 more apples, how many apples does Sally have?
- 24 + 47
- To store the results (integer in this case):

  total_apples = 24 + 47
- NOT

  24 + 47 = total_apples

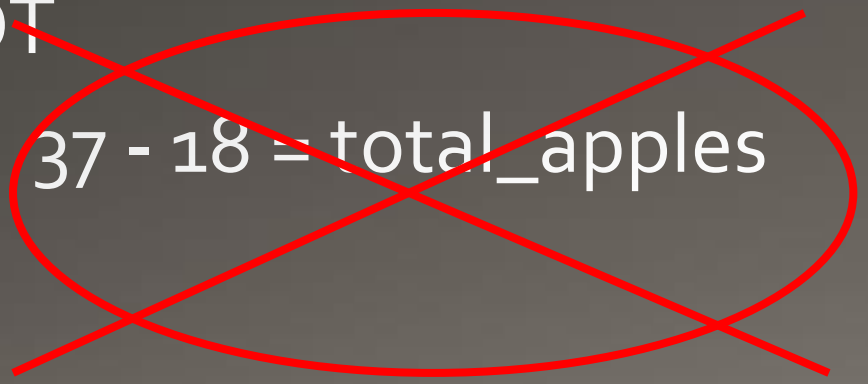


Subtraction

- If Sally has 37 apples and she gives Sam 18 of them, how many apples does Sally have?
- 37 - 18
- To store the results (integer in this case):

  total_apples = 37 – 18
- NOT

  37 - 18 = total_apples



Multiplication: *

- If a table has 3 rows and 5 columns, how many individual cells are there?
- 3 * 5
- To store the results (integer in this case):

  total_cells = 3 * 5
- NOT:

  3 * 5 = total_cells

Division: / (with floating point results)

- If you drove 365 miles on one full tank of gas, and your gas tank holds 15 gallons, how many miles per gallon does you car get?
- One or more operands must be a float
- 365 / 15
- To store the result (floating-point number in this case):

```
miles_per_gallon = 365 / 15
```

- NOT

```
365.0 / 15.0 = miles_per_gallon
```

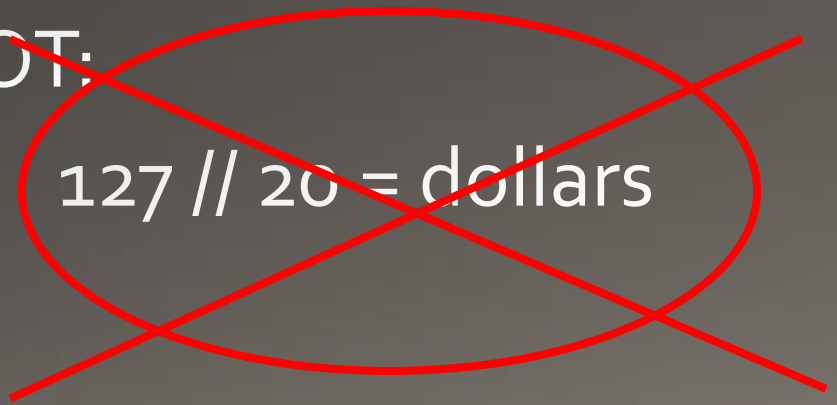
Division: // (integer division or floor division)

- How many dollar bills could you get if you had 127 nickels?
- 127 // 20
- Called truncating division or floor division
- To store the result (always an integer):

  dollars = 127 // 20

- NOT:

  127 // 20 = dollars



Remainder: %

- If you get as many dollar bills as possible for your 127 nickels, how many nickels will you have left?
- 127 % 20
- To store the result (always an integer as are operands):

  nickels = 127 % 20

- NOT:

  127 % 20 = nickels

Power: **

- How many unique decimal numbers (base 10) can be represented by a 3 digit binary number?
- 2 ** 3
- unique_numbers = 2 ** 3
- NOT:

  2 ** 3 = unique_numbers

Wrong data type?

- Explicit conversion (data type)

Example 1

- num1 = 4.9
- num2 = int(num1) #4.9 truncated and 4 is stored in num2

Example 2

- num3 = 4
- num4 = float(num3) #4.0 is stored in num4

Memory Model

- a = 3 Assigns 3 to a memory space associated with a
- b = 6 Assigns 6 to a memory space associated with b
- x = a + b Gets the number stored in the address associated with a and the number stored in the address associated with b, adds them together and stores them in a memory space associated with x

Drawing it out (board)

- a = 3
- b = 6
- x = a + b

Order of operations

Evaluate left to right

1. Multiplication, division, and remainder: *, /, %
2. Addition and subtraction: +, -

Evaluate right to left

4. Assignment

What is stored in x in the following statement?

x = 5 + 6 * 4 – 2 * 6 // 3 + 10 % 3

Problems

- Average the numbers 3, 10, -5, 12
- Calculate the hypotenuse of a right triangle whose sides are 3 and 8
- What is the kinetic energy of a 2 kg mass with a 6.5 m/sec velocity? The formula is: K.E. = ½ mv^2 where m is mass and v is velocity

Testing

- Always test your programs!
- For sequential programs, run them and check to make sure that the correct answer is given.

Watch out for …

- Typos
- Lines of code in the wrong order (using a variable before assigning a number to it, for instance)
- Incorrect order of operations
- Incorrect data types
- Truncating division (1 // 2 is 0 not .5)
- Incorrect print statements

Accumulators

Basket = 0

Combination Operators

Combination	Same as
basket += 5	basket = basket + 5
basket -= 5	basket = basket – 5
basket *= 5	basket = basket * 5
basket /= 5	basket = basket / 5
basket %= 5	basket = basket % 5