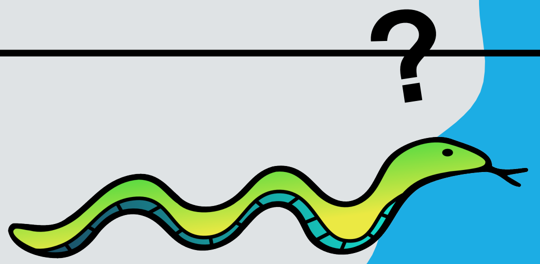
CS 116 TUTORIAL 2



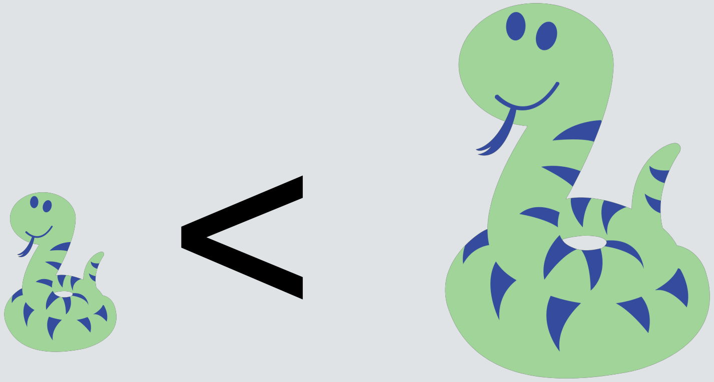
MAKING DECISIONS IN PYTHON

REMINDERS

- Assignment 2 is due on Wednesday Jan 29th at 10AM
- Midterm is on March 2nd, at 7 PM
- Come to office hours if you need help ☺

BOOLEANS (REVIEW FROM LAST WEEK)

- Values : `True, False` (Capitalization!)
- Boolean Operations:
  `and, or, not`
- Relational Operators:
  `<, >, <=, >=, ==, !=`
- Example : `5 < 6`



CONDITIONALS

- Conditions:
  - `if`: to start a condition
  - `elif`: to continue a set conditions (optional)
  - `else`: to execute something if all other conditions in the set are not true (optional)

CQ1

- What is returned if you run f(3)?

A. 3
B. 6
C. 9
D. None
E. Error

```
def f(x):
    if x > 0 and (x%2) == 0:
        return x*2
    elif (x//2) == 1 \
            and(x%2) == 0:
        return x ** 2
```

TIPS

- Always make sure that you have return statements inside your conditions, as desired.
- Double-check that your conditions are in the correct order

QUESTION 1

Ensure you understand the results of calling:

- `choices(8)`
- `choices(10)`
- `choices(100)`
- `choices(111)`
- `choices(250)`
- `choices(360)`

```
def choices(n):
    answer = 0
    if n % 2 == 0:
        answer = answer + 1
    if n % 3 == 0:
        answer = answer + 1
    elif n % 5 == 0:
        answer = answer + 1
    else:
        answer = 10  * answer
    if n % 10 == 0:
        answer = answer - 1
        if n % 4 == 0:
            answer = answer // 2
        else:
            answer =  2 * answer
    return answer
```

QUESTION 2

If you are given three sticks, you may or may not be able to arrange them in a triangle.

If any of the three lengths is greater than the sum of the other two, then you cannot form a triangle. Otherwise, you can. If the sum of two lengths equals the third, they form what is called a "degenerate triangle."

Write a function `is_triangle` that consumes three positive integers (`s1`, `s2`, and `s3`) representing the lengths of three sticks and returns one of the following:

“`No triangle exists"` if no triangle can be built with the three sticks

“`Degenerate triangle exists"` if a degenerate triangle exists for sticks of these lengths

“`Triangle exists"` if a triangle can be made from the sticks

QUESTION 3

Fermat's Last Theorem states that given positive integers a, b, and n, there exists no integer c for which $a^n + b^n = c^n$ unless n <= 2 .

Although Fermat wrote the statement of this theorem in the margin of a book in 1637, it was not proven until 1995 (and not for lack of trying – thousands of incorrect proofs of the theorem were put forward before it was finally proven).

Write a function `fermat_check` that consumes four positive integers, a, b, c, and n; n >= 2.

- If n = 2, and $a^2 + b^2 = c^2$, then your function should return “`Pythagorean triple`”.
- If n = 2, and $a^2 + b^2$ is not c^2, then your function should return “`Not a Pythagorean triple`”.
- If n > 2, and $a^n + b^n = c^n$, then your function should return “`Fermat was wrong!`”, as you have found a counterexample to Fermat’s Last Theorem.
- Otherwise, your function should return “`Not a counterexample`”.

QUESTION 4

A perfect number is a positive integer that is equal to the sum of its proper positive divisors (i.e. the sum of its positive divisors excluding the number itself).

Write a function `is_perfect_num` consumes a positive integer n. The function returns `True` if n is a perfect number, `False` otherwise.

For example, `is_perfect_num(6)` => `True`
(because 1+2+3 = 6, and1, 2, and 3 are all the proper divisors of 6).