

Warm up discussion problem:*The Counterfeit Coin*

You are given eight coins and told that one of them is counterfeit. The counterfeit one is slightly heavier than the other seven. Otherwise, the coins look identical. Using a simple balance scale, how can you determine which coin is counterfeit using the scale only twice?

Workshop: *Decision Control*

1. Explain the following patterns in your own words:
 - (a) A simple decision
 - (b) A two-way decision
 - (c) A multi-way decision
2. How is exception-handling using **try/except** similar to and different from handling exceptional cases using ordinary decision structures (variations on **if**)?
3. The body mass index (BMI) is calculated as a person's weight (in pounds) times 720, divided by the square of the person's height (in inches). A BMI in the range 19-25, inclusive, is considered healthy. Write a program that calculates a person's BMI and prints a message telling whether they are above, within, or below the healthy range.
4. A person is eligible to be a US senator if they are at least 30 years old and have been a US citizen for at least 9 years. To be a US representative these numbers are 25 and 7, respectively. Write a program that accepts a person's age and years of citizenship as input and outputs their eligibility for the Senate and House.
5. A formula for computing Easter in the years 1900-2099, inclusive, is as follows: let $a = year \% 19$, $b = year \% 4$, $c = year \% 7$, $d = (19a + 24) \% 30$, $e = (2b + 4c + 6d + 5) \% 7$. The date of Easter is March $22 + d + e$ (which could be in April). The only problem is this formula does not work for the years 1954, 1981, 2049, and 2076. For these 4 years it produces a date that is one week too late. Write a program that inputs a year, verifies that it is in the proper range and takes note of the 4 exceptional dates, and then prints out the date of Easter that year.

6. Write a program that accepts a sentence, and calculates the number of number characters, uppercase letters and lowercase letters, spaces, and finally symbol characters. For example, in a string such as "FooBar\%*\&".

Hint: Consider calling `help(str)` and looking at all the string methods starting with `is*` (e.g. `isdigit`). Alternatively, what if you import, and use the `string` module, and then use membership testing against the pre-defined strings in that module (again, see `help(string)`, after importing it).

Suppose the following input is supplied to the program:

```
Hello world in 2015! Huh?
```

Then, the output should be:

```
Type a sentence: Hello world in 2015! Huh?
Number of number characters: 4
Number of uppercase characters: 2
Number of lowercase characters: 13
Number of spacing characters: 4
Number of non-alphanumeric characters: 2
```

7. Review the programs that you just wrote and identify the vulnerable sections of the code, i.e., the statement or statements that might incur in runtime errors (exceptions). How can you prevent your program from crashing? Write the exception handling code for at least two different vulnerable sections.
8. Write a Python program to convert an integer number into words. E.g., if the integer is "42", the program should output "forty-two." Your program should work for integers up to 999,999,999,999,999. Before you start writing your program, try to lay down a strategy plan. Break down the problem into smaller, simpler problems. For example, would it be helpful if you had a function that converts a number from 1 to 999 into words? How could you use such function to solve the bigger problem? How would you write this function? Can you further break down this function into smaller problems? Forewarning: This won't be an easy problem to solve!