

Math, Random, and Conditionals – if Statements

You must get checked out by your lab CA prior to leaving early. **If you leave without being checked out, you will receive 0 credits for the lab.**

Restrictions

The Python structures that you use in this lab should be restricted to those you have learned in lecture so far. Please check with your teaching assistants in case you are unsure whether something is or is not allowed!

Create a new python file for each of the following problems.

Your files should be named *lab[num]_q[num].py* similar to homework naming conventions.

For Problem 1, write your answers on paper or in a text editor on your computer.

Problem 1: What Does It Print?

Solve this problem by hand.

(a) What would be printed if $x = 7$?

```
x = 7
if 10 > x ≥ 5:
    x -= 4
if 10 > x ≥ 5:
    print(x)
else:
    print(x + 10)
```

(b) What would be printed if $x = 7$?

```
x = 7
if 10 > x ≥ 5:
    x -= 4
    print(x)
elif 10 > x ≥ 5:
    print(x)
else:
    print(x + 10)
```

(c) What would be printed if $y = 15$?

```
y = 15
if y > 7:
    y += 1
elif y > 10:
    y += 1
elif y > 15:
```

```
y += 1  
print(y)
```

(d) What would be printed if y = 15?

```
y = 15  
if y > 7:  
    y += 1  
if y > 10:  
    y += 1  
if y > 15:  
    y += 1  
print(y)
```

Problem 2: Let's Do It In One Line

This problem will test your ability to create conditional expressions. **Every sub-question should be able to be written in one line.**

- A. Given a string variable `grade`, write a conditional expression that prints "Access Granted" if the grade is "Admin", or "Access Denied" if otherwise.
- B. Given an integer variable `num`, write a conditional expression that prints "Even" or "odd" depending on the value of `num`.
- C. Given an integer variable `exam_score`, write a conditional expression that prints "A" if the grade is above a 90, "B" if it's above an 80, "C" if it's above a 70, or "F" otherwise.

Problem 3: Test Your Luck

This problem will help you work on making your own advanced expressions as well as testing how lucky you are. **For this problem, you are not allowed to use conditionals (“if” statements).** For simplicity’s sake, 0 can represent Heads and 1 can represent Tails.

1. Ask the user of the program whether they believe the coin will land on 0 (Heads) or 1 (Tails)
2. Generate a random integer between 0 and 1 (inclusive)
3. Print what side they landed on
4. Print if the user was able to correctly guess

Here are some *possible* outcomes for this problem:

```
Will the coin land on 0 (heads) or 1 (Tails)? 0
Coin Flip result: 0
User guessed correctly: True
```

```
Will the coin land on 0 (heads) or 1 (Tails)? 1
Coin Flip result: 0
User guessed correctly: False
```

Take a look through the random module documentation to find the functions you need for the problem.

Problem 4: The Bell Curve

In statistics, a normal distribution (sometimes called a “bell curve”) is observed in many situations. For example, the scores of all students who take the SAT exam are expected to fall in a normal distribution where most of the students score the mean value or close to the mean value. Smaller numbers of students will score above and below the mean.

The standard normal distribution is a simple case of the normal distribution in which the mean = 0 and the standard deviation = 1.

It is described by the probability density function given below:

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{\frac{-1}{2}x^2}$$

Figure 1: Probability Density Function

Create a new file and write code to check the value of the probability density function at $x = 0$, $x = 1$, and $x = -1$. You do **not** need to read in user input for this problem. Print the value of the probability density function for each value of x . Your output should be formatted as follows:

```
The value of the pdf at x = 0.0 is 0.3989422804014327
The value of the pdf at x = 1.0 is 0.24197072451914337
The value of the pdf at x = -1.0 is 0.24197072451914337
```

Take a look through the [math module documentation](#) to find the functions you need for the problem.

Problem 5: Doctor's appointment

This problem will focus on using the random module and ranges to create a date for a doctor's appointment. Learning and understanding range now will be super helpful in the upcoming weeks.

You are a receptionist who is trying to make an appointment for an upcoming patient. The doctor is quite the busy person, so you have to create the appointment with the following constraints.

The appointment must:

1. Be on a month between (and including) September and December
2. Be on a day of the month that is divisible by 3 (assume for this question that every month has 31 days)

The examples below are sample solutions to the question. Note: Remember to use the random module!

```
Hello! Welcome to the Doctor's office!  
Your appointment is on November 3rd! Have a great day!
```

```
Hello! Welcome to the Doctor's office!  
Your appointment is on September 9th! Have a great day!
```

Problem 6: Single Use Calculator

This problem will focus on using conditionals to create a single use four operation calculator.

You should take in user input for the first number, second number, and the operation. You should handle addition, subtraction, multiplication, division. **For the sake of this question, assume you will NOT be dividing by 0.**

For all successful operations provide the following message:

```
first_number operation second_number = answer
```

For all invalid operations provide the following message:

```
first_number operation second_number is an invalid operation.
```

Here is an example of the expected output.

```
Enter your first number: 2.3
Enter the operation (+, -, *, /): *
Enter your second number: 4.1
2.3 * 4.1 = 9.429999999999998
```