PROGRAMMING FOR ALL – SPRING 2021 - WEEK #2 – 210405 & 210407

Topics for the week:

Read in CHAPTER 2 - refresh:

- Basic calculations in programs
- Designing a program – pseudocode, flowchart
- Solving problems using a sequence structure
- Math module (read in 5.9)

Read in CHAPTER 3:

- Decision structure
- Statements: if; if-else
- Nested decision structure
- Logical operators

CALCULATIONS WITH INPUTS

- **A store price with a tax**

Write a program that asks a user for a price of an item he/she wants to buy and then displays the price to pay with a state tax (10.1%).

- **Taxi Cost**

Write a program that asks a user for a distance he/she wants to use a taxi and the displays an expected cost.

The Taxi Company charging rules are:

The service fee: $10 (doesn't depend in the distance)

The distance fee: $1.20 per mile

Moreover:

The user has to pay a state tax: 10.1% of the amount charged by Taxi Company.

The user will pay a tip to the driver: 15% of the amount charged by Taxi Company (the tip is not applied on the tax).

Program should display individual costs (Taxi cost, tax, tip) and the total cost.

CALCULATIONS WITH MATH MODULE

- **On-line shopping in a dollar store**

Write a program that calculates charges for an on-line shopping.
A customer in an on-line dollar store is buying small items. He/she provides the number of items to buy.
The store also charges for shipping and handling. Bought items are packed in boxes with maximum 10 items in one box, and a shipping charge for each box is $1.35. (If the customer buys 12 items, he/she needs to pay for two boxes.)
The customer pays also a state tax (10.1%) for items and also for the shipping.
The program should display following:

- The price for all items;
- The price for shipping;
- The state tax;
- The total price to pay.

- **Distance of a point from the origin**

Write a program that prompts a user to provide coordinates of a point (as two inputs for x and y coordinates) in a plane and then displays the distance of this point from the point (0, 0).

DECISION STRUCTURE basic

if - else

- **Even vs. odd**

Write a program that asks a user to enter an integer and displays info whether the in integer is even or odd.

- **Password Test**

Write a program verifying a password. The program asks the user to enter a password and then determines whether the string entered matches the "system" password.

- **Cost of copies**

A copy center charges 5 cents per copy for the first 100 copies and 3 cents for each additional copy.

Write a program that asks the user the number of copies and displays the total cost in dollars.

- **Buy one get one 50% off sale**

A departmental store offers a sale "buy one get one 50% off". It means, if you buy two items, for the less expensive you will pay only a half of the price.

Write a program that prompts the user to enter prices of two items and then displays the total price with the promotion applied.

- **Discount recommendation**

The user is shopping in an on-line store and he/she can decide, which type of discount would like to use.

Discount A: 15% off of the purchase plus free shipping

Discount B: 20% off of the purchase, shipping $9.95 has to be paid

Write a program that asks the user to enter the amount of purchase he/she makes and displays:

- The amount which needs to paid when using the discount A.
- The amount which needs to paid when using the discount B.
- The suggestion which discount should be used to pay less.

DECISION STRUCTURE – more options

Nested if – else, if – elif -else

- **In interval**

Write a program that prompts a user to enter a real number and displays whether the number is in the interval [0, 3]. If the number is not in the given interval, the program displays whether the number is smaller than any number in the interval, or larger.

- **Shipping Charges**

The Fast Freight Shipping Company charges the following rates:

Weight of Package	**Rate per Pound**
2 pounds or less	$1.50
Over 2 pounds but not more than 6 pounds	$3.00
Over 6 pounds but not more than 10 pounds	$4.00
Over 10 pounds	$4.75

Write a program that asks the user to enter the weight of a package and then displays the shipping charges.

DECISION STRUCTURE – logical operators

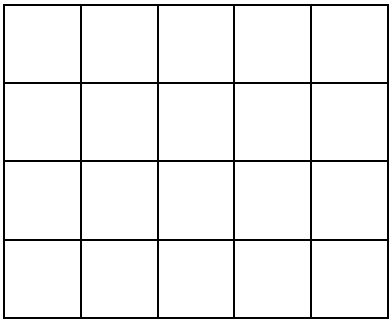
- **Chocolate bar**

A chocolate bar has the form of a rectangle divided into *n* ×*m* portions. Chocolate bar can be split into two rectangular parts by breaking it along a selected straight line on its pattern.

Write a program that prompts the user to enter the size of the chocolate (as two integer n and m) and the number of squares he/she would like to get. Program should display whether it is possible to get required number of squares by splitting the chocolate only one time.

Example:
If the size of the chocolate is 4x5 the user can get 8 squares by one split, but cannot get 9 squares by one split.

Chocolate:



- **Leap year**

Write a program that displays whether the entered year is a leap year or no.
The rules in Gregorian calendar are as follows:

- a year is a leap year if its number is exactly divisible by 4 and is not exactly divisible by 100
- a year is always a leap year if its number is exactly divisible by 400

- **Colors for numbers**

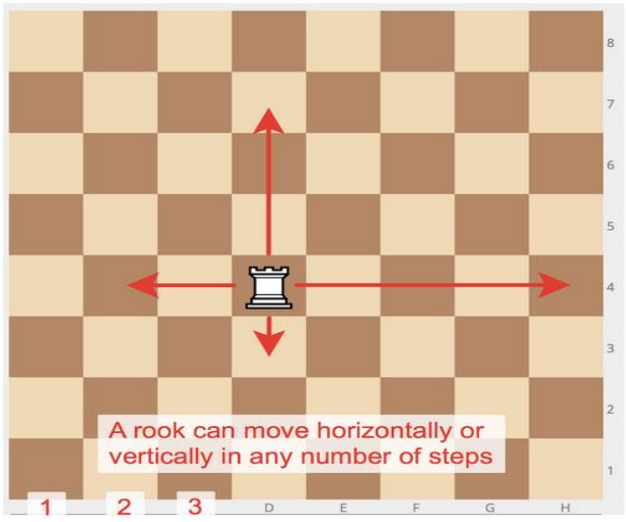
Write a program that asks a user to enter a positive integer between 1 and 100, and then displays a "color" of that integer. Colors are assigned following way:

- If the integer is at most 50 and is even, the assigned color is BLUE;
- If the integer is at most 50 and is odd, the assigned color is GREEN;
- If the integer is more than 50 and is even, the assigned color is RED;
- If the integer is more than 50 and is odd, the assigned color is PURPLE.

If the user enters an integer out of the interval 1 to 100, the program displays NO COLOR is assigned.

- **Rook move**

Chess rook moves horizontally or vertically. Write a program that asks the user to provide two different cells of the chessboard - the initial cell and the terminal cell, and then displays whether a rook can go from the first cell to the second in one move. The program should receive the input of four numbers from 1 to 8. If the input is out of the chess field, the program displays info about wrong initial and/or terminal position.



Practice Exercises

Math module

- **Herons Formula**

The area of triangle ABC (a, b, c are sides of the triangle) is given

$A = \sqrt{s * (s-a) * (s-b) * (s-c)}$, where $s = 1/2(a+b+c)$

Write a program that ask the user to enter the sides of the triangle and displays the area of the triangle.

Note: Use the function sqrt from the module math.

- **Distance of two points**

Write a program that prompts the user to enter the coordinates of two points A and B in a plane. The program should display the distance of those two points.

Note: Use the function hypot from the module math.

Decision structure

- **Cost of bagels**

A bagel shop charges 70 cents per bagel for orders of less than a half-dozen bagels and 60 cents per bagel for orders of a half-dozen or more.

Write a program that asks the user the number of bagels ordered and displays the total cost in dollars.

- **Payroll**

An owner of an auto repair business has several employees. If any employee works over 40 hours in a week, the owner pays them 1.5 times their regular hourly pay rate for all hours over 40.

Write a program that asks an employee how many hours he/she worked and then calculates the employee's gross pay, including any overtime wages.

- **Chess board - same color**

Write a program that asks the user to provide two different cells of the chessboard and displays whether they are printed in the same color, and if they are which color, black or white it is.

The program should receive the input of four numbers from 1 to 8, which represent horizontal and vertical coordinates of two cells, first two - for the first cell, and then the last two - for the second cell.

If the input is out of the chess field, the program displays info about wrong positions of the cell(s).

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