**Nested Decision Structure & Ternary Operators**

**Problem 1: Food Inspection**

***EXERCISES***

A nutritionist is creating a report on the healthiness of various food items based on their calorie and fat content. They have asked you to write a program that calculates the percentage of calories that come from fat in a food item.

One gram of fat contains 9 calories, so the number of calories from fat can be calculated as: fat grams \* 9 The percentage of calories from fat can be calculated as: calories from fat/total calories

The program should take the number of calories and fat grams in a food item as input and output the percentage of calories that come from fat.

Input Validation:

The program should make sure that the number of calories and fat grams entered are not less than 0. The number of calories from fat cannot be greater than the total number of calories. If this occurs, the program should display an error message indicating that either the calories or fat grams were entered incorrectly.

Sample Input:

Enter Number of Calories: 500, Enter Fat Gram: 50

Sample Output:

45.0%

**Problem 2:**

Haris is a software engineer who works Monday to Friday at a tech company. He loves to sleep in on weekends, but sometimes he goes on vacation and gets to sleep in even on weekdays. He wants to write a program that will determine if he gets to sleep in on a given day.

Haris starts by creating a function called "sleepIn" which will take two arguments, "weekday" and "vacation". If both the weekday and vacation arguments are false, the function returns "true", meaning Haris gets to sleep in. If the weekday argument is true and the vacation argument is false, the function returns "false", meaning Haris has to wake up and go to work. If the weekday argument is false and the vacation argument is true, the function returns "true" again, meaning Haris gets to sleep in while he's on vacation.

Haris tests his function with three sets of inputs, as shown in the table below:

|  |  |  |
| --- | --- | --- |
| **weekday** | **vacation** | **sleepIn** |
| false | false | true |
| true | false | false |
| false | true | true |

**Problem 3: Coffee Machine**

You have been tasked with writing a program to simulate the operation of a coffee machine. The coffee machine can make two types of coffee: Black and White.

The program should prompt the user to choose the type of coffee (B for Black and W for White) and ask if the cup size is double. If the cup size is double, the baking time will be increased by 50 percent. The program should also ask if the coffee is manual.

Based on the user's input, the program should display the steps involved in making the coffee, along with the time required for each step, as per the following table:

|  |  |  |
| --- | --- | --- |
| **Operation** | **White Coffee** | **Black Coffee** |
| Put Water | 15 mins | 20 mins |
| Sugar | 15 mins | 20 mins |
| Mix Well | 20 mins | 25 mins |
| Add Coffee | 2 mins | 15 mins |
| Add Milk | 4 mins | 25 mins |
| Mix Well | 20 mins | 25 mins |

Example Input:

Coffee Type (B/W): W

Cup Size (Double/Single): Double Manual (Yes/No): Yes

**Note: Use switch structure to solve this problem. Problem 4: Grocery Store**

You are at a grocery store, trying to buy some groceries for the week. The store has a variety of fresh produce and pantry essentials, but for the purpose of this program, we will focus on the following items: Apples, Bananas, Carrots, and Lettuce. Each item is priced differently, and you have the option of purchasing one or two items.

The store has a unique ordering system where you can place your order using a simple menu. The menu consists of the following items and their respective prices:

* A= Apples $1
* B= Bananas $0.5
* C= Carrots $0.75
* L= Lettuce $1.5

You are tasked with writing a program that will take the number of items you wish to purchase (1 or 2) and the items you wish to purchase (represented by their letter code: A, B, C, or L) as inputs, and calculate the total cost of your order.

Your program should use nested if statements and ternary operators to determine the cost of each item based on the quantity and the price of each item.

Quantity: 1

Item 2: L

Quantity: 1

Total cost: $2.25

**Problem 5:**

Write a nested if statement for the decision diagrammed in the accompanying flowchart. Use a multiple- alternative if statements for intermediate decisions where possible.



**Problem 6:**

Implement the following decision table using a nested if statement. Assume that the grade point average is within the range 0.0 through 4.0.



**Problem 7: Car Insurance**

You work as a software developer for a car insurance company. The company wants to develop a program that will determine the premium rate for a customer based on their driving record and car type.

The premium rate is calculated as follows:

For a customer with a clean driving record, the premium rate is calculated as follows:

* If the customer drives a sedan, the premium rate is $100 per year.
* If the customer drives a sports car, the premium rate is $200 per year.
* If the customer drives a truck, the premium rate is $150 per year.

For a customer with one speeding ticket, the premium rate is calculated as follows:

* If the customer drives a sedan, the premium rate is $110 per year.
* If the customer drives a sports car, the premium rate is $220 per year.
* If the customer drives a truck, the premium rate is $165 per year.

For a customer with two speeding tickets, the premium rate is calculated as follows:

* If the customer drives a sedan, the premium rate is $120 per year.
* If the customer drives a sports car, the premium rate is $240 per year.
* If the customer drives a truck, the premium rate is $180 per year.

Your task is to write a program that will prompt the user for their driving record and car type, and then output the premium rate for the customer

Example:

A customer, Jane, has approached the car insurance company and is looking to get an insurance policy for her car. She has provided the company with information about her driving record and car type. The company's system will now use the information to determine the premium rate for her policy.

Input:

Enter driving record (0 for clean, 1 for one speeding ticket, 2 for two speeding tickets): 0 Enter car type (S for sedan, T for truck, C for sports car): S

Output:

The premium rate for Jane's policy is $100 per year.

**Problem 8: Salary Hike Decision**

You are an HR manager at a large company and are responsible for determining employee salary hikes. The company has a complex system in place where salary hikes are determined based on various factors such as the employee's performance, years of service, and education level.

Your task is to write a program that will take the employee's information as input and determine the amount of the salary hike.

John, one of your employees, has approached you to discuss his salary. You pull up his file and start to review the information to determine the amount of the salary hike he will receive.

Based on the information in John's file, the following factors will determine his salary hike: If his performance rating is 'Outstanding', he will receive a 15% salary hike.

If his performance rating is 'Very Good', he will receive a 10% salary hike.

If his performance rating is 'Good', he will receive a 5% salary hike.

If his performance rating is 'Average', he will receive a 2.5% salary hike.

If his performance rating is 'Below Average', he will receive a 1% salary hike.

Additionally, John has been with the company for 5 years. Based on his years of service, he will receive a 2% salary hike.

Finally, John has a Master's degree, so he will receive an additional 1% salary hike. Example Input:

Performance Rating: Outstanding

Years of Service: 5

Education Level: Master's Degree

Example Output:

Salary Hike: 15% (Performance) + 2% (Years of Service) + 1% (Education) = 18%.

**Problem 9: Air Traffic Control System**

You are tasked with creating a simple air traffic control system for a small airport. In this system, planes can either take off or land based on the current weather conditions.

The weather conditions are either good (G) or bad (B). If the weather conditions are good, then planes can take off (T) or land (L). If the weather conditions are bad, then planes can only land and not take off.

Your task is to write a program that will prompt the user for the weather conditions and the action of the plane (take off or land). If the conditions are bad and the plane tries to take off, the program should print an error message. If the conditions are good or bad and the plane tries to land, the program should print a message confirming that the landing is allowed.

Example:

Weather conditions (G or B): G Plane action (T or L): T Result:The take off is allowed.

Weather conditions (G or B): B Plane action (T or L): T

Result: The take off is not allowed due to bad weather conditions.