More Selection Control Structures

Objective

* Define the problem by constructing an algorithm using pseudocode
* Create an IPO diagram showing **input, output,**and**processing steps**
* What control structures (sequence, selection and repetition) are required?
* What variables are required?
* Show a check of your solution with test data for at least two valid test cases

1. Process customer record

A program is required to read a customer’s name, a purchase amount and a tax code.   
The tax code has been validated and will be one of the following:  
    0  tax exempt (0%)  
    1  state sales tax only (3%)  
    2  federal and state sales tax (5%)  
    3  special sales tax (7%)  
The program must then compute the sales tax and the total amount due, and print the customer’s name, purchase amount, sales tax and total amount due.

**Answer for algorithm using pseudocode:**

Declare String customerName as customer’s name

Declare Double purchaseAmount as a purchase amount

Declare Int taxcode as a tax code

Declare Double tax as a tax

Read a customerName, purchaseAmount, taxCode

IF taxCode is invalid

THEN

Print the error for invalid taxCode

ELSE

                   IF taxCode is tax exempt

           THEN

                   tax = 0%

         ENDIF

IF the state tax only is true

                THEN

  tax =   purchaseAmount \* 3%

       ELSE

IF federal and state sales tax is true and special sales tax is false

                    THEN

tax =   purchaseAmount \* 5%

       ELSE

IF federal and state sales tax is true and special sales tax is true

                    THEN

tax =   purchaseAmount \* (7%)

               ENDIF

ENDIF

Print the customer’s name, purchase amount, sales tax and total amount due

**Answer for Create an IPO diagram showing input, output, and processing steps:**

|  |  |  |
| --- | --- | --- |
| **Input** | **Processing** | **Output** |
| customerName | receive customerName |  |
| purchaseAmount | receive purchaseAmount |  |
| taxCode | receive taxCode |  |
|  | validate taxCode | print the error for invalid taxCode |
|  | IF taxCode is tax exempt, tax = 0% |  |
|  | IF the state tax only is true, tax = purchaseAmount \* 3% |  |
|  | IF federal and state sales tax is true and special sales tax is false, tax = purchaseAmount \* 5% |  |
|  | IF federal and state sales tax is true and special sales tax is true, tax = purchaseAmount \* (7%) |  |
|  |  | print the customer’s name, purchase amount, sales tax and total amount due |

**What control structures (sequence, selection and repetition) are required?**

Sequence and Selection.

**What variables are required?**

Declare String customerName as customer’s name

Declare Double purchaseAmount as a purchase amount

Declare Int taxcode as a tax code

Declare Double tax as a tax

**Show a check of your solution with test data for at least two valid test cases**

|  |  |  |
| --- | --- | --- |
| **Test Case 1** |  |  |
| **Input** | **Processing** | **Output** |
| taxCode | receive taxCode |  |
|  | validate taxCode and it is invalid | print the error for invalid taxCode |
|  |  |  |
| **Test Case 2** |  |  |
| **Input** | **Processing** | **Output** |
| customerName | receive customerName |  |
| purchaseAmount | receive purchaseAmount |  |
| taxCode | receive taxCode |  |
|  | validate taxCode and it is valid |  |
|  | IF taxCode is not tax exempt, tax != 0% |  |
|  | IF the state tax only is true, tax = purchaseAmount \* 3% | print the customer’s name, purchase amount, sales tax and total amount due if the state tax only is true |

2. Calculate employee's pay

A program is required by a company to read an employee’s number, pay rate and the number of hours worked in a week. The program is then to validate the pay rate field and the hours worked field and, if valid, compute the employee’s weekly pay and then print it and the input data.

Validation: According to the company’s rules, the maximum hours an employee can work per week is 60 hours, and the maximum hourly rate is $25.00 per hour. If the hours worked field or the hourly rate field is out of range, the input data and an appropriate message are to be printed and the employee’s weekly pay is not to be calculated.

Weekly pay calculation: Weekly pay is calculated as hours worked times pay rate. If more than 35 hours are worked, payment for the overtime hours worked is calculated at time-and-a-half.

**Answer for algorithm using pseudocode:**

Declare Int employeeNumber as employee’s number

Declare Double payRate as pay rate

Declare Double hoursWorked as the number of hours worked in a week

Constant Real MAX\_HR\_RATE = 25.00

Constant Real MAX\_HR\_ALLOWED = 60

Input the payRate and hoursWorked

IF payRate OR hoursWorked is invalid

THEN

Print the error for invalid payRate or hoursWorked

ELSE

 IF hoursWorked <= MAX\_HR\_ALLOWED AND payRate <= MAX\_HR\_RATE

           THEN

IF hoursWorked <= 35

           THEN

                   WeeklyPay = payRate \* hoursWorked

ELSE

                   WeeklyPay = payRate \* 35 + 1.5 \* payRate\*(hoursWorked – 35)

Print the WeeklyPay

ENDIF

ELSE

Print the error as hoursWorked > MAX\_HR\_ALLOWED or payRate > MAX\_HR\_RATE and the employee’s weekly pay is not to be calculated

ENDIF

ENDIF

**Create an IPO diagram showing input, output, and processing steps**

|  |  |  |
| --- | --- | --- |
| **Input** | **Processing** | **Output** |
| employeeNumber |  |  |
| payRate |  |  |
| hoursWorked  Constant Real MAX\_HR\_RATE = 25.00  Constant Real MAX\_HR\_ALLOWED = 60 | IF payRate OR hoursWorked is invalid | Print the error for invalid payRate or hoursWorked |
|  | IF hoursWorked <= MAX\_HR\_ALLOWED AND payRate <= MAX\_HR\_RATE |  |
|  | IF hoursWorked <= 35, WeeklyPay = payRate \* hoursWorked |  |
|  | Otherwise, WeeklyPay = payRate \* 35 + 1.5 \* payRate \* (hoursWorked – 35) |  |
|  |  | Print the WeeklyPay |
|  | IF hoursWorked > MAX\_HR\_ALLOWED OR payRate > MAX\_HR\_RATE | Print the error as hoursWorked > MAX\_HR\_ALLOWED or payRate > MAX\_HR\_RATE and the employee’s weekly pay is not to be calculated |

**What control structures (sequence, selection and repetition) are required?**

Sequence and Selection.

**What variables are required?**

Declare int employeeNumber as employee’s number

Declare Double payRate as pay rate

Declare Double hoursWorked as the number of hours worked in a week

**Show a check of your solution with test data for at least two valid test cases**

|  |  |  |
| --- | --- | --- |
| **Test Case 1** |  |  |
| **Input** | **Processing** | **Output** |
| employeeNumber | receive employeeNumber |  |
| payRate | receive payRate |  |
| hoursWorked | receive hoursWorked |  |
|  | IF payRate OR hoursWorked is invalid | Print the error for invalid payRate or hoursWorked |
| **Test Case 2** |  |  |
| **Input** | **Processing** | **Output** |
| employeeNumber | receive employeeNumber |  |
| payRate | receive payRate |  |
| hoursWorked | receive hoursWorked |  |
|  | IF payRate OR hoursWorked is valid | Not print the error for invalid payRate or hoursWorked |
|  | IF hoursWorked <= 60 AND payRate <= 25 |  |
|  | IF hoursWorked <= 35, WeeklyPay = payRate \* hoursWorked | Print the WeeklyPay |