Assignment 1 - Pseudocode

Student

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Total Points

28.78 / 40 pts

Question 1

Train Ticket **13.5** / 15 pts

1.1 **Inputs, Outputs and Error Conditions** **1.5** / 1.5 pts

✔ **+ 1.5 pts** Correct

+ 0 pts Incorrect

+ 0.5 pts inputs: age, bought ticket inside the train?

+ 0.5 pts outputs: ticket price

+ 0.5 pts error: error if age is less than 0 or greater than 120

1.2 **Algorithms** **10** / 10 pts

✔ **+ 10 pts** Correct

+ 0 pts Incorrect

+ 0.5 pts READ age

+ 0.5 pts READ does the person bought ticket inside the train?

+ 1 pt Display error for age < 0

+ 1 pt Display error for age > 120

+ 2 pts price is 5.20 for age > 70

+ 2 pts price is 11.50 for 70 >= age >=6

+ 2 pts Checks if person buys ticket inside train

+ 1 pt Display the ticket price

+ 3.5 pts Correct

+ 0 pts Incorrect

✔   **+ 0.4 pts** [negative,trueORFalse][error]

✔   **+ 0.4 pts** [<6,trueOrFalse][0]

+ 0.4 pts [6,true][11.50] OR [6,false][11.50+11.50*0.15] boundary case

✔   **+ 0.4 pts** [6<age<70,false][11.50] adult buying at station

✔   **+ 0.4 pts** [6<age<70,true][11.50+11.50*0.15] adult buying inside train

+ 0.35 pts [71,false][5.20] boundary case (senior buying at station)

+ 0.35 pts [71,true][5.20+5.20*0.15] boundary case (senior buying inside train)

+ 0.4 pts [120,true][5.2] (boundary)

✔   **+ 0.4 pts** [>120,trueORFalse][error]

Question 2

Bank   **11.28** / 13 pts

2.1   **Input, Output, Error Conditions**   **1.5** / 1.5 pts

✔ **+ 1.5 pts** Correct

     + 0.5 pts Inputs: balance

     + 0.5 pts Outputs: new balance

     + 0.5 pts Error or precondition: none

     + 0 pts Incorrect

2.2   **Algorithm**   **9.5** / 9.5 pts

✔ **+ 9.5 pts** Correct

     + 0.5 pts READ balance

     + 2 pts Check balance < 0 and update balance

     + 2 pts Check 0 >= balance < 500 and update balance

     + 2 pts Check 500 <= balance <= 1000 and update balance

     + 2 pts Check balance > 1000 and update balance

     + 1 pt Display balance

     + 5 pts Minor Mistake

     + 0 pts Incorrect

     − 0.5 pts 0 is a valid balance

2.3   **Test cases**   **0.28** / 2 pts

     + 2 pts Correct

✔ **+ 0.28 pts** [-4][balance-50] negative balance

     + 0.28 pts [0][-10] boundary

     + 0.28 pts ****[499][489] boundary

     + 0.28 pts [500][500+500*0.01] boundary

     + 0.28 pts [999][999+999*0.001] boundary

     + 0.28 pts [1000][1000+1000*0.001] boundary

     + 0.32 pts [1200][1200+1200*0.002]

     + 0 pts Incorrect

Question 3

Count Operations - WCS111 FM   **3** / 6 pts

3.1 ⎡ **Minimum**   **3** / 3 pts

     ✔ **+ 3 pts** Correct

     + 0 pts Incorrect

3.2 ⎣ **Maximum**   **0** / 3 pts

     + 3 pts Correct

     ✔ **+ 0 pts** Incorrect

Question 4

Count Operations - Lucky Twos   **1** / 6 pts

4.1 ⎣ **(no title)**   **1** / 6 pts

     + 6 pts $f(n) = 2 + 3n + x + 1 + 1$
          2 [READ, SET] +
          3n [number > 0, IF number modulus…, COMPUTE] happens n times. n times the conditional is true
          x [ADD 1 to count] where x is the number of 2s in the number 1 [when the loop conditional is false]
          1 [DISPLAY]

     + 3 pts If answer has 3n

     + 2 pts If answer has **any variable to denote the number of 2s** in the number

     ✔ **+ 1 pt** If the answer has 4

     + 0 pts incorrect

     + 0 pts Click here to replace this description.

Q1 Train Ticket
15 Points

Train Ticket for one person. Write a program that reads a person's age, then computes and displays the price the person needs to pay for the train ride according to the following rules:

- Children younger than 6 years old ride for free.
- If the ticket is bought at the train station:
  - A person over 70 years old pays $5.20
  - Everyone else pays $11.50.
- If ticket is bought inside the train, there is an extra charge of 15% compared to train station prices.

Note that a person's age is within the range of 0 to 120 years. Other inputs are considered error conditions.

Q1.1 Inputs, Outputs and Error Conditions
1.5 Points

In the space below, determine the inputs, outputs and error conditions for the problem.

inputs: age of person, where ticket was purchased
outputs: price of ticket
error conditions: if the age of the person is less than 0 or greater than 120

Q1.2 Algorithms
10 Points

In the space below, write your algorithm using pseudocode (pseudocode reference sheet under Week 1 resources at https://introcs.cs.rutgers.edu/lectures). If you detect an error condition, end your program.

```
READ age

IF age < 0 OR age > 120 THEN
 DISPLAY error
ELSE
 IF age < 6 THEN
  SET price TO 0.00
 ELSE
  IF age >= 70 THEN
   SET price TO 5.20
  ELSE
   SET price TO 11.50
  ENDIF
 ENDIF
ENDIF

READ location

IF location is inside train THEN
 COMPUTE ticket AS price*1.15
 DISPLAY price
ELSE
 DISPLAY price
ENDIF
```

Q1.3 Test cases
3.5 Points

In the space below, list a thorough set of test cases for your program. Write in the following format [inputs], where the inputs are separated by commas.
[inputs][output]

[123][error]
[5, inside][0.00]
[4, outside][0.00]
[17, inside][13.23]
[22, outside][11.50]
[82, inside][5.98]
[94, outside][5.20]
[-3][error]

Q2 Bank
13 Points

A bank charges fees and/or gives interest based on the balance of a customer. Write a program that reads the customer balance then calculates and displays the new balance after the application of fees and or interest based on the following rules:

• A negative balance incurs a $50 overdraft fee.
• A balance below $500 (but positive) incur on a $10 maintenance fee.
• A balance from $500 to $1000 (inclusive) gain 0.1% interest.
• A balance over $1000 will gain 2% interest.

Q2.1 Input, Output, Error Conditions
1.5 Points

In the space below, determine the inputs, outputs and error conditions for the problem.

inputs: customer current balance
output: customer new balance
error conditions: none

Q2.2 Algorithm
9.5 Points

In the space below, write your algorithm using pseudocode (pseudocode reference sheet under Week 1 resources at https://introcs.cs.rutgers.edu/lectures). If you detect an error condition, end your program.

```
READ oldBalance

IF oldBalance < 0 THEN
 COMPUTE newBalance TO oldBalance - 50
ELSE
 IF oldBalance >= 0 AND oldBalance < 500 THEN
  COMPUTE newBalance TO oldBalance - 10
 ELSE
  IF oldBalance >= 500 AND oldBalance <= 1000 THEN
   COMPUTE newBalance TO oldBalance*1.001
  ELSE
   COMPUTE newBalance TO oldBalance*1.02
  ENDIF
 ENDIF
ENDIF

DISPLAY newBalance
```

Q2.3 Test cases
2 Points

In the space bellow, list a thorough set of test cases for your program. Write in the following format [inputs], where the inputs are separated by commas.
[inputs][output]

```
[-50][-100]
[350][340]
[700][700.70]
[1050][1071]
```

Q3 Count Operations - WCS111 FM
6 Points

WCS111 FM, a radio station by computer scientists for computer scientists. The station runs a contest where listeners win prizes based on how many hours they spend programming in Java. The following program displays the listener prize based on the number of hours spent programming.

```
READ number of hours the listener spent programmi
IF hours IS 0 THEN
   DISPLAY no prize
ELSE
   IF hours >= 1 AND hours <= 5 THEN
      DISPLAY T-SHIRT
   ELSE
      IF hours >= 6 AND hours <= 400 THEN
         IF hours % 10 IS 9 THEN
            DISPLAY laptop
         ENDIF
         IF hours % 2 IS 0 THEN
            DISPLAY hat
         ENDIF
         IF hours % 3 IS 0 THEN
            DISPLAY TV
         ENDIF
      ELSE
         DISPLAY trip to Hawaii
      ENDIF
   ENDIF
ENDIF
```

Q3.1 Minimum
3 Points

What is the minimum number of operations that can be executed in the code? (answer just in numbers)

3

Q3.2 Maximum
3 Points

What is the maximum number of operations that can be executed in the code?
(answer just in numbers)

10

Q4 Count Operations - Lucky Twos
6 Points

Lucky Twos determines and displays the number of digits that are 2s in a whole number. For example, the number of 2s in 3487 is 0, while the number of 2s in 272521 is 3. Note: whole numbers are non-negative integers starting at zero 0, 1, 2, 3, 4.

Assume that the fractional part is discarded in the division:

10 / 4 = 2

8 / 5 = 1

20 / 3 = 6

```
READ number
SET count TO 0
WHILE number > 0
   IF number modulus 10 IS 2 THEN
      ADD 1 TO count
   ENDIF
   COMPUTE number AS number / 10
ENDWHILE
DISPLAY count
```

Q4.1
6 Points

Let n be the number of digits of the whole number. What is the number of operations that are executed in the code in terms of n?

4n + 4