**Homework2**

Q1: The New Telephone Company has the following rate structure for long distance calls:

Any call started at or after 6:00 p.m. (1800 hours) but before 8:00 a.m. (0800 hours) is discounted 50%.

Any call started at or after 8:00 a.m. (0800 hours) but before 6:00 p.m. (1800 hours) is charged full price.

All calls are subject to a 4% Federal tax.

The regular rate for a call is $0.40 per minute.

Any call longer than 60 minutes receives a 15% discount on its cost (after any other discount is subtracted but before tax is added).

A computer program reads the start time for a call based on a 24-hour clock and the length of the call. The gross cost (before any discounts or tax) is printed followed by the net cost (after discounts are deducted and tax is added).

The program will assume only whole number values are input, that the duration is non-negative and the start time represents a real clock time. Results are rounded to the nearest cent.

Exercise: Write a complete set of Black Box test cases (including equivalence classes and boundary value analysis) for testing of the program which solves the problem above.

After equivalence classes and boundary value analysis, please create a table like the one below. Include a complete description field for the purpose of the each test case.

**Valid equivalence classes：**

**A1={ 8:00 <= st < 18:00 }**

**A2={ st < 8:00 or st >= 18:00 }**

**B1={ 0 <= len <= 60 }**

**B2={ len > 60 }**

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| --- | --- | --- | --- |
| Case # | Description | Input Values | Expected Output |
| 1 | A1,B1 | 9:00, 3 | 1.20, 1.25 |
| 2 | A1,B2 | 15:00, 70 | 28.00, 24.75 |
| 3 | A2,B1 | 3:00, 5 | 2.00, 1.04 |
| 4 | A2,B2 | 21:00, 80 | 32.00, 14.14 |

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| --- | --- | --- | --- |
| Case # | Description | Input Values | Expected Output |
| 5 | A1, B1 | 8:00, 0 | 0.00, 0.00 |
| 6 | A1, B1 | 8;00, 1 | 0.4., 0.42 |
| 7 | A1, B1 | 8:00, 59 | 23.60, 24.54 |
| 8 | A1, B1 | 8:00, 60 | 24.00, 24.96 |
| 9 | A1, B2 | 8:00, 61 | 24.40, 21.57 |
| 10 | A2, B1 | 18;00, 0 | 0, 0 |
| 11 | A2, B1 | 18:00, 1 | 0.4, 0.18 |
| 12 | A2, B1 | 18:00, 59 | 23.60, 12.27 |
| 13 | A2, B1 | 18:00, 60 | 24.00, 12.48 |
| 14 | A2, B2 | 18:00, 61 | 24.40, 10.78 |
| 15 | A2, B1 | 7:59, 0 | 0, 0 |
| 16 | A2, B1 | 7:59, 1 | 0.4, 0.18 |
| 17 | A2, B1 | 7:59, 59 | 23.60, 12.27 |
| 18 | A2, B1 | 7:59, 60 | 24.00, 12.48 |
| 19 | A2, B2 | 7:59, 61 | 24.40, 10.78 |
| 20 | A1, B1 | 17:59, 0 | 0.00, 0.00 |
| 21 | A1, B1 | 17:59, 1 | 0.4., 0.42 |
| 22 | A1, B1 | 17:59, 59 | 23.60, 24.54 |
| 23 | A1, B1 | 17:59, 60 | 24.00, 24.96 |
| 24 | A1, B2 | 17:59, 61 | 24.40, 21.57 |
| 25 | A1, B1 | 8:01, 0 | 0.00, 0.00 |
| 26 | A1, B1 | 8;01, 1 | 0.4., 0.42 |
| 27 | A1, B1 | 8:01, 59 | 23.60, 24.54 |
| 28 | A1, B1 | 8:01, 60 | 24.00, 24.96 |
| 29 | A1, B2 | 8:01, 61 | 24.40, 21.57 |
| 30 | A2, B1 | 18;01, 0 | 0, 0 |
| 31 | A2, B1 | 18:01, 1 | 0.4, 0.18 |
| 32 | A2, B1 | 18:01, 59 | 23.60, 12.27 |
| 33 | A2, B1 | 18:01, 60 | 24.00, 12.48 |
| 34 | A2, B2 | 18:01, 61 | 24.40, 10.78 |

Q2: Imagine a program which reads in the length of three sides of a triangle and outputs a message naming the kind of triangle: EQUILATERAL, ISOSCELES, or SCALENE.

Length not in range 1 - 99 cause error message INVALID INPUT.

If lengths don't make a triangle, output NOT A TRIANGLE.

Assumptions (pre-conditions for your program)

Three lengths are entered separated by blanks or returns.

Input of decimals or characters causes unpredictable results.

Input from keyboard, simple text output to display.

Even though equilateral triangle is also isosceles, only print EQUILATERAL.

Exercise: Write a complete set of Black Box test cases (including equivalence classes and boundary value analysis) for testing of the program which solves the problem above.

After equivalence classes and boundary value analysis, please create a table like the one below. Include a complete description field for the purpose of the each test case.

1. **Equivalence Partitioning:**

**valid equivalence class：1≤a≤99 (1) 1≤b≤99 (2) 1≤c≤99 (3) a<b+ c (4)**

**b<a+ c (5) c<a+ b (6) a=b (13) b=c (14) c=a (15) (a=b)and(b=c)and(c=a) （17）Invalid valid equivalence class：(a<1)(7) (b<1)(8) (c<1)(9) (a>100) a>=b+ c (10) b>=a+ c (11) c>=a+ b (12) (a!=b)and(b!=c)and(c!=a) (16) (a!=b) (18) (b!=c) (19) (c!=a) (20) (a>99) (21) (b>99) (22) (c>99) (23)**

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| --- | --- | --- | --- |
| Case # | Description | Input Values | Expected Output |
| 1 | 1，2，3，4，5，6 | 3，4，5 | SCALENE |
| 2 | 1，2，3，4，5，6，13 | 3，3，4 | ISOSCELES |
| 3 | 1，2，3，4，5，6，15 | 3，4，3 | ISOSCELES |
| 4 | 1，2，3，4，5，6，14 | 4，3，3 | ISOSCELES |
| 5 | 1， 2，3，4，5，6，17 | 3，3，3 | EQUILATERAL |
| 6 | 7 | 0，1，2 | INVALID INPUT |
| 7 | 21 | 100，1，2 | INVALID INPUT |
| 8 | 9 | 1，2，0 | INVALID INPUT |
| 9 | 23 | 1，2，101 | INVALID INPUT |
| 10 |  | ，，， | Unpredictable results |
| 11 |  | @，1,2 | Unpredictable results |
| 12 |  | 2.2, 4.6, 6.4 | Unpredictable results |

1. **Boundary Value Analysis**

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| --- | --- | --- | --- |
| Case # | Description | Input Values | Expected Output |
| 13 | 7 | 0，1，2 | INVALID INPUT |
| 14 | 21 | 100，1，2 | INVALID INPUT |
| 15 | 9 | 1，2，0 | INVALID INPUT |
| 16 | 23 | 1，2，100 | INVALID INPUT |
| 17 | 8 | 1，0，2 | INVALID INPUT |
| 18 | 22 | 1,100,2 | INVALID INPUT |
| 19 | 1,2,3 | 1,99,99 | ISOSCELES |
| 20 | 2 | 2,99,98 | SCALENE |
| 21 | 3 | 3，3，1 | ISOSCELES |