

TCEA
HIGH SCHOOL
MOCK
PROGRAMMING CONTEST

CONVENTION 2002
PROBLEM SET

**Texas Computer Education Association
High School Mock Programming Contest
Convention 2002 Problem Set**

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Problem 2.1 Coupons

General Statement: The grocery store will honor coupons as follows: triple the face value for \$0.39 or less, double the face value for more than \$0.39 up to and including \$0.50, and face value for over \$0.50. Read a list of coupon values and calculate the amount of money to be saved.

Input: The first line of the data set for this problem is an integer representing the number of collections of data that follow. There are an unknown number of values on a single line. The integer 0 is used to indicate the end of the data set.

Name of Data File: pr21.dat

Output: Output word SAVED followed by the amount of money saved. Include a dollar sign (\$) before the money amount. Round off the amount to 2 decimal places. Both decimal places are to show in the output. This means there may be trailing zeroes to fill out the 2 decimal places.

All letters are upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: The data is in the range 0.01 .. 5.99.

Sample Input: 3
0.20 0.75 0.38 0.43 0
1.09 3.15 0
0.45 0.55 0.25 0

Sample Output: SAVED \$3.35
SAVED \$4.24
SAVED \$2.20

Problem 2.2 Replacements

General Statement: Read a word and replace each occurrence of the letter L with an R. If the word does not contain the letter L, the “new” word is the same as the original word.

Input: The first line of the data set for this problem is an integer representing the number of words that follow. There is 1 word per line.

Name of Data File: pr22.dat

Output: Output the original word, followed by the word BECOMES, and then followed by the “new” word.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: All letters are upper case. There are only letters used in the words.

The maximum word length is 10.

Sample Input:

```
4
LATER
MATH
RALLY
HOLIDAY
```

Sample Output:

```
LATER BECOMES RATER
MATH BECOMES MATH
RALLY BECOMES RARRY
HOLIDAY BECOMES HORIDAY
```

Problem 2.3 The Vowels Between

General Statement: Read 2 letters and count the number of vowels that occur in the alphabet between those 2 letters.

Input: The single line of the data set begins with an integer that represents the number of pairs of letters that follow. There are no spaces between the letters.

Name of Data File: pr23.dat

Output: All letters are upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: All letters are upper case.

There are only letter pairs in the data set.

Discussion: Between two letters means not including either letter. For example, there is only 1 vowel between A and F, the E. The A does not fit the definition of "between".

Sample Input: 3 AZBDFP

Sample Output: # VOWELS = 4
VOWELS = 0
VOWELS = 2

Problem 2.4 Sale Price

General Statement: Calculate the sale price of an item given the following discount scenarios:

15% discount if the item is charged
20% discount if the item original price is over \$50.00

Input: The first line of the data set is an integer that represents the number of data pairs that follow. First on each line is a letter (N=not charged, Y=yes charged), then the original price of the item.

Name of Data File: pr24.dat

Output: All letters are upper case.

The amount of money is to have a dollar sign (\$) in front of it and it is to be rounded to 2 decimal places. Trailing zeroes are required to fill out answers to 2 decimal places.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: The data is in the range \$0.01 .. \$500.00.

Discussion: If both discounts apply to a purchase, do not round until after the second discount is applied.

Sample Input: 3
N 75.00
Y 45.00
Y 84.99

Sample Output: SALE PRICE = \$60.00
SALE PRICE = \$38.25
SALE PRICE = \$57.79

Problem 2.5 Decoder

General Statement: A word was encoded to a collection of integers with A = 1, B = 2, C = 3, ..., Y = 25, and Z = 26. Read a collection of integers and output the word the code represents.

Input: The first line of the data set for the problem is an integer representing the number of data collections that follow. There are an unknown number of integers on each line. The number 0 is used to indicate the end of the data collection.

Name of Data File: pr25.dat

Output: All letters are upper case. Each word is to be on a separate line. There are to be no spaces within the word.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: The number 0 used to indicate the end of a data collection is not part of the data for the problem.

Data is in the range 1..26.

Sample Input: 3
13 15 3 11 0
3 15 13 16 21 20 5 18 0
3 15 14 20 5 19 20 0

Sample Output: MOCK
COMPUTER
CONTEST

Problem 5.1 Concentration

General Statement: Calculate the new concentration percentage of a solution if you read the original concentration percentage (A), the original amount of solution (B), the amount of solution drained (C), and the amount of pure water added (D).

Input: The first integer in the single data set line for the problem is an integer representing the number of data collections that follow. Each collection contains four integers in order, A, B, C, D.

Name of Data File: pr51.dat

1
Output: The concentration percentage is to be rounded to the nearest whole percent. The number is to be followed by a percent sign (%).

The output is to be formatted exactly like that for the sample output given below.

Assumptions: The value of A is in the range 1..100.

Sample Input: 3 33 200 100 50 50 100 20 40 20 100 0 100

Sample Output: 22%
33%
10%

Problem 5.2 Format The String

General Statement: Read a single string and output that string according to the following format requirements:

1. The maximum number of characters per line is 15.
(This includes any spaces that may occur between words.)
2. Only whole words are to printed on a line.
3. Maximize the number of words per line to get as close to the 15-character limit as possible.

Input: The first line of the data set for the problem is an integer representing the number of strings that follow. Each string is on a separate line.

Name of Data File: pr52.dat

Output: All letters are upper case. Include some white space between outputs.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: All letters are upper case. There is only 1 space between words. The words contain only letters.

Maximum string length is 80.

Sample Input: 3
FUZZY WUZZY WAS A BEAR
TCEA HIGH SCHOOL MOCK PROGRAMMING CONTEST
JANUARY FEBRUARY MARCH

Sample Output: FUZZY WUZZY WAS
A BEAR

TCEA HIGH
SCHOOL MOCK
PROGRAMMING
CONTEST

JANUARY
FEBRUARY MARCH

Problem 5.3 Fence Cost

General Statement: Calculate the cost of purchasing a fence when given the length (L) and the width (W) of the area to be enclosed, the height (H) of the fence, and the number of gates (G).

Fence heights of 3 feet or 4 feet must be chain link. Fence heights of 6 feet or 8 feet must be wood.

The cost per linear foot is as follows:

3 feet chain link	=> \$6
4 feet chain link	=> \$8
6 feet wood	=> \$8
8 feet wood	=> \$10

Gate cost is:

3 feet chain link	=> \$25
4 feet chain link	=> \$30
6 feet wood	=> \$35
8 feet wood	=> \$40

Input: The first integer in the data set for the problem is an integer representing the number of data collections that follow. Each collection contains four integers in order, L, W, H, G.

Name of Data File: pr53.dat

Output: There must be a dollar sign (\$) in front of the amount.
The output is to be formatted exactly like that for the sample output given below.

Assumptions: Results will be in whole dollars.

Discussion: The house will serve as one side of the fenced area. This will be a length dimension.

Sample Input:

```
3
50 30 3 2
40 40 8 1
50 40 4 3
```

Sample Output:

```
$710
$1240
$1530
```

Problem 5.4 Challenges

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General Statement: Given the order of the 5 students who play second trumpet, read the names of the challenger, the current seat holder, and the winner of the challenge. Then reorder these 5 trumpeters.

```
1 SAM
2 ANDY
3 KAREN
4 PATRICK
5 ELLEN
```

Input: The first integer in the data set for the problem is an integer representing the number of data collections that follow. Each collection contains three names in the order challenger, current seat holder, and challenge winner.

Name of Data File: pr54.dat

Output: Output seats 1 through 5 after each challenge. Include some white space between each reordering.

The output is to be formatted exactly like that for the sample output given below.

Assumptions All letters are upper case.

There are exactly 3 names per line with exactly 1 space between names.

Discussion: Each challenge is to take place based on the current, not the original, ranking. These are cumulative changes.

After a challenge, the winner and loser exchange seats.

See page 2 for sample run.

Problem 5.4 Challenges

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Sample Input:

```
3
ELLEN ANDY ELLEN
ANDY KAREN KAREN
PATRICK KAREN PATRICK
```

Sample Output:

```
1 SAM
2 ELLEN
3 KAREN
4 PATRICK
5 ANDY
```

```
1 SAM
2 ELLEN
3 KAREN
4 PATRICK
5 ANDY
```

```
1 SAM
2 ELLEN
3 PATRICK
4 KAREN
5 ANDY
```

Problem 5.5 Roman Numerals

General Statement: Given an Arabic numeral, convert it to a Roman numeral.

Input: There are an unknown number of integers in a single line. The number 0 is used to indicate the end of the data set.

Name of Data File: pr55.dat

Output: All letters upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: Data is in the range 1..4999.

Discussion: I = 1
V = 5
X = 10
L = 50
C = 100
D = 500
M = 1000

No more than 3 of the same symbol are to be used consecutively in a Roman numeral. For example, VIII is 8 (5 + 3), but VIIII is not allowed. IX is 9 (10 – 1).

Sample Input: 329 156 3474 0

Sample Output: CCCXXIX
CLVI
MMMCDLXXIV

Problem 9.1 Spiral Alphabet In A Square Matrix

General Statement: For an integer X, place X letters of the alphabet into a square matrix. Start with the bottom left corner of the matrix and spiral in a counter-clockwise direction. If X is not a perfect square or if X is greater than 26, use an asterisk (*) for each non-letter matrix element.

Input: There are an unknown number of integers in a single line. The number 0 is used to indicate the end of the data set.

Name of Data File: pr91.dat

Output: All letters are upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: Maximum matrix size is 6 by 6.

Discussion: A square matrix has the same number of rows as it does columns. For example, a 3 by 3 matrix has 9 elements or locations.

Use the smallest matrix size possible to contain the given number of elements. If X is 8, use a 3 by 3 matrix. If X is 12, use a 4 by 4 matrix.

Sample Input: 8 23 4 2 0

Sample Output:

```
G F E
H * D
A B C

M L K J I
N W V U H
O * * T G
P Q R S F
A B C D E

D C
A B

* *
A B
```

Problem 9.2 Organize It

General Statement:	Read the collection of email addresses in your address book and organize it. Alphabetize first by the email service provider name. Within each provider list, alphabetize by sender name.
Input:	The first integer in the data set for the problem is an integer representing the number of addresses that follow. Each address is on a separate line.
Name of Data File:	pr92.dat
Output:	All letters are lower case. The output is to be formatted exactly like that for the sample output given below.
Assumptions:	All letters are lower case. The maximum length of a sender name is 8 characters. The maximum length of the address is 30 characters. The maximum number of addresses is 10.
Discussion:	The sender name is the part before the @ symbol. The email service provider is the part after the @.
Sample Input:	7 pete@msn.com jerry@hotmail.com donald@aol.com jerry2@hotmail.com mary@swbell.net alice@aol.com bill@aol.com
Sample Output:	alice@aol.com bill@aol.com donald@aol.com jerry@hotmail.com jerry2@hotmail.com pete@msn.com mary@swbell.net

Problem 9.3 Angled Word Patterns

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General Statement: Read a direction (L = left, R = right) and a word and output that word two times pointing in that direction. The top half of the angle is the original word. The bottom half of the angle is the word with the letters in reverse order.

Input: The first integer in the data set for the problem is an integer representing the number of data collections that follow. Each data collection consists of a direction letter followed by a word. There is not a space between the direction letter and the word.

Name of Data File: pr93.dat

Output: All letters are upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: All letters are upper case.

The maximum number of words is 5.

The maximum word length is 10.

See page 2 for sample run.

Problem 9.3 Angled Word Patterns (PAGE 2 OF 2)

Sample Input:

```
3
LDISK
RANGLE
LANGLE
```

Sample Output:

```
      D
     I
    S
   K
  K
 S
  I
   D

 A
  N
   G
    L
     E
    E
   L
  G
 N
 A

      A
     N
    G
   L
  E
 E
  L
   G
    N
     A
```

Problem 9.4 What Date Is It?

General Statement: Read a date in the form mm/dd/yyyy and an integer (N). Calculate the date N days from the original date.

Input: The first integer in the data set for the problem is an integer representing the number of data collections that follow. Each data collection contains a date followed by a space and then an integer.

Name of Data File: pr94.dat

Output: Leading zeroes are required for numbers in the range 1..9.

 The slash symbol (/) is required between the parts of the date.

 The output is to be formatted exactly like that for the sample output given below.

Assumptions: The date is in the same form as required for the output.

 The original year is in the range 1950..2002.

 N is in the range -1000..1000.

Sample Input: 4
 02/02/2000 43
 02/02/2002 -35
 06/29/1962 500
 12/31/1990 -68

Sample Output: 03/16/2000
 12/29/2001
 11/11/1963
 10/24/1989

Problem 9.5 Matrix Diagonal Sums

General Statement: Given the matrix:

5	7	3	16
6	10	21	12
8	4	20	15
2	9	11	14

Read an integer (V) and calculate the sum of the elements in the diagonals that contain V. Include V only 1 time in the sum.

Input: There are an unknown number of integers in a single line. The number 0 is used to indicate the end of the data set.

Name of Data File: pr95.dat

Output: All letters are upper case.

The output is to be formatted exactly like that for the sample output given below.

Assumptions: The value of V is a matrix element.

Each matrix element is unique.

Discussion: If V = 15, the left diagonal contains 7, 21, 15 and the right diagonal contains 11, 15. This sums to 54.

If V = 4, the left diagonal contains 6, 4, 11 and the right diagonal contains 2, 4, 21, 16. This sums to 60.

Sample Input: 21 5 4 0

Sample Output: DIAGONAL SUM = 65
DIAGONAL SUM = 49
DIAGONAL SUM = 60