

ECOO 2001

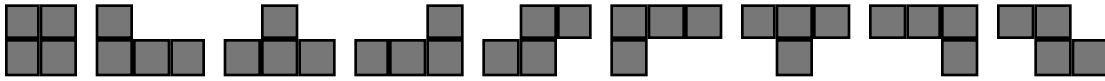
Programming Contest

Part 1

Board wide Contest

**to be written
after March 19th**

Problem 1: Quadrominoes



These quadrominoes represent the digits from 1 to 9

The input data file DATA11 (DATA12 for the second try) contains 5 sets of data.

Each set of data is in the form of two lines of no more than 80 characters. The two lines contain the shapes depicted above, where the squares are represented by **X**'s and the spaces in between by the - sign. See the sample input.

Write a program that will translate the quadromino code into numeric code. Print the data on a cleared screen.

sample input:

(for clarity, each set of two lines is here is separated by a space. Your data file will contain exactly 10 lines and no spaces)

```
-- XX- - - - - X- - - - - XXX- - - - - XXX- - X- - - - - XX- - - - - XXX- -
-- XX- - - - - XXX- - - - - X- - - - - X- XXX- - - - - XX- - - - - X- - -
```

```
-- XXX- - XX- - - - X- - - - X- - - - - -
-- X- - - - XX- XXX- - - XXX- - - - - -
```

```
XXX- XXX- XXX- - XX- - - X- -
-- X- - X- - X- - - XX- - XXX- -
```

```
-- - XXX- - XXX- - - - XXX- - - - XXX- - - - XXX- - - - XXX- - - -
-- - X- - - X- - - - X- - - - X- - - - X- - - - X- - - -
```

```
XXX- - - XX- - - - - - - - - - - X- - - - X
-- X- - XX- - - - - - - - - - - XXX- XXX
```

sample output:

```
1478357
6942
8765
777777
8524
```

Problem 2: Cipher

Consider the following way of encoding a message:

- 1 group all the characters of your message in sets of two, adding a final space at the end if necessary:
e.g. "How do you do?" becomes: [Ho][w][do][y][ou][d][o?]
- 2 Convert them to their corresponding ascii code:
[72,111][119,32][100,111][32,121][111,117][32,100][111,63]
- 3 By multiplying the first number by 128 and adding the second of the pair we get:
[9327], [15264], [12911], [4217], [14325], [4196], [14271]
- 4 These numbers in turn may be expressed in base 26, where the capital letters of the alphabet are the digits: respectively 0=A, 1=B, ...25=Z
And since $9327 = 13 \cdot 26^2 + 20 \cdot 26^1 + 19$ for example,
The message then becomes:
[13-20-19][22-15-2][19-2-15][6-6-5][21-4-25][6-5-10][21-2-23]
and from there:
NUTWPCTCPGGFVEZGFKVCX

DATA21 (DATA22 for the second try) contains 5 lines of code, each line is less than 256 characters, each character is one of the capital letters of the alphabet. Write a program that will translate them into normal code and print the decoded messages on the screen, each separated by a blank line.

Sample Input:

(for clarity, each line is here represented by a paragraph, and the lines are separated by a space. Your data file will contain exactly 5 lines and no spaces)

MMEUMYSNYVEZUZKGGATVXGFTWI ESSJVTQWYYSSZVYEGETVXGFTVESUKRWYYSXKSNZTHCGGATVXGGDTGZV
YBUNMGEUTVXGFTVESUKRWYWDCEZTRCWAHOMWRPVVKSNSUMYUBEGFMWI GITSPI DVGRGFNVEJVVKWDCTE
MWRTSNZTHKITS

MJGVJHUZUWYYTMLVQMSKUVYMETUMYVEKGGATWKTGZTAAGEBGFWTHMVAFGFMVEWGFHGFUTHDTCMTFAGEUT
VTWAPVVKWDCTEMRPWYWDCTEMUUXUZLWYYTRJTHRITSPI DVGRGFNVEJVVKWDCTEMRWRTSNZTHKITS

QGUGFHUZKGFVFBUWUWDCTEMMVXWDTGESVEFTAAGEJUWUSNUSZOVEZWAI VEKGGATVXGEFSNNUPPI JWQBOS
OAHOLGGATVXGGDSOFGGATVXGFTVESTHXGFNVEJVYGEQVEUGHSTRJTHRGGATVXGGDTGZVYBUNM

NUFUPQGFHGFWEZUZKGFVTJKWDPVJSTHMUZLWYYVTHSXHI JWNUFUPQGFHGFWEZUZKGFVTJKWDMTGZSXOT
EYGENUBOGFPWAIWIIGFHUZKGFTSNRTEMUBKGFUATTEYGEQVEUGHSTRJTHRGGATVXGGDTGZVYBUNM

PDCSZOJHUZNGEDVEQTEMQQBVKSKUUUNVTQWYYVEQSZOVLWI EIJWMMGSZOSKUUUNVTQWYYVEQSZOVLW
IEGGDSNZGFOTFNGEITEMSXDUPWTHCGFMVEWGFUOUBJGFWUBGTEYGEBUZKGFOTEMSXDUPWTHCGFMVEWGFUOUB
JGFI VFBUNKGEBUZKGFOTEMSXDUPWTHCGFMVEWGFUOUBJGFMAUTCMTHQVVKWDCVTDTF

Sample Output:

All around the mulberry bush The monkey chased the weasel. The monkey thought 'twas all in fun.
Pop! goes the weasel.

A penny for a spool of thread, A penny for a needle. That's the way the money goes. Pop! goes the
weasel.

Up and down the City Road, In and out of the Eagle, That's the way the money goes. Pop! goes the
weasel.

Half a pound of tuppenny rice, Half a pound of treacle, Mix it up and make it nice, Pop! goes the
weasel.

Old King Cole Was a merry old soul, And a merry old soul was he; He called for his pipe, And he
called for his bowl, And he called for his fiddlers three.

Problem #3: Symbiosis

Imagine a paradise, containing monkeys and trees. The monkeys obtain all what they need from the trees, and the trees need the monkeys to survive.

Paradise is depicted by a 20x20 grid of text on your screen, where each monkey is represented by the symbol **&** and the tree by the letter **T**. The upper left corner is called (1,1), the bottom left (1,20).

Monkeys who occupy a space adjacent to a tree are called gardener monkeys. Even a newborn monkey may be a gardener.

Note that **adjacent** means any of the 8 spaces surrounding the given spot on the grid.

T				T
		T		
T				T

The trees are immortal, but they will die within the year if they are not taken care of by a gardener monkey. The gardener monkey will plant up to four seedlings from its tree at the corners of a 5x5 square, where the tree itself is the centre, provided those spaces are free. A new seedling must be at least one year old, before it produces seed and offspring.

Any two monkeys may become parents and have offspring, provided they are 2 or 3 years of age, and one of them is a gardener. If they share an adjacent space, a new monkey will be born there.

Monkeys are not immortal: they die at the age of 4

In any given year (which starts with the Spring and ends in the Winter) events evolve as follows:

Springtime: new seedlings are planted

Summertime: new monkeys are born

Fall time: monkeys, in their 4th year, die

Wintertime: Trees, without a gardener die

DATA31 (DATA32 on the second try) contains 5 sets of 9 integers. The first 2 integers represent the x and y values of the original tree of paradise.

the next set of 6 integers represent the x and y values of three monkeys all at the age of 3. The final integer, n, is the number of years that will elapse from the first planting of the monkeys and the tree.

Write a program that will read the data from the text file and from it, generate a paradise as it would look after n years. Since there are 5 separate paradises, allow each one to be viewed after pressing any key.

See in the following example the progression of a paradise viewed at the end of each year for 8 years.
The numbers represent the ages of the monkeys:

At the start of the first year, there are only the three monkeys aged 3 (that is, they will have their 3rd birthday this year) and the one tree at (1,1)

end year 1 end year 2 end year 3 end year 4 end year 5 end year 6 end year 7 end year 8

T 30 33T 00	T 1 T 11 T	T 2 00T 22 T0	T 3 11T 33 T1	T 0 22T 0 T2	T 10 33T 001 T3	T 21 T 112 T	T0 32 00T 23 T00
----------------------	------------------------	---------------------------	---------------------------	--------------------------	-----------------------------	--------------------------	------------------------------

Sample Input:

(In the actual text file each single number occupies one separate line: 45 lines)

```
1 1 1 3 1 2 2 3 1
1 1 1 3 1 2 2 3 2
1 1 1 3 1 2 2 3 3
1 1 1 3 1 2 2 3 4
17 13 16 12 15 10 18 11 7
```

Sample Output:

T && &&T &&	T & T && T	T & &&T && T&	T & &&T && T&	&T & T&& T & & T
----------------------	------------------------	---------------------------	---------------------------	--------------------------------

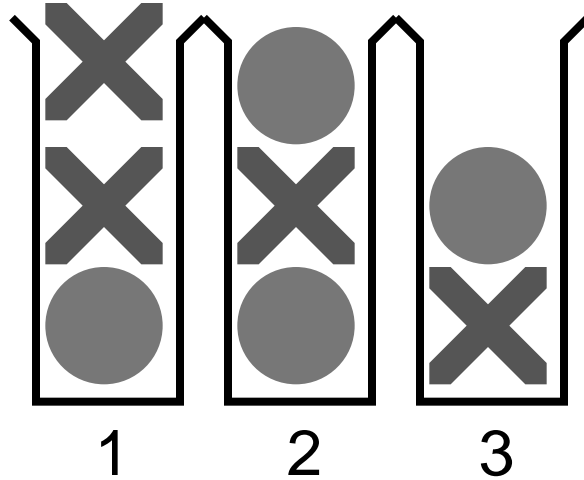
Problem 4: Tic Tac To

Imagine the game of Tic tac to with the usual rules:

Two players, having markers X and O place these markers in turn on a 3x3 field. if any player gets "3 in a row", vertically, horizontally or diagonally, that player wins.

(In the example on the left, X wins)

This modified game has one extra rule: players only have a choice of placing the marker in bin 1,2 or 3. The marker will go to the bottom, if it is the first marker in the bin; it will go the the middle, if there is one marker in the bin; it will go to the top if there are already 2 markers in the bin; and it will go nowhere, if the bin is already full.



DATA41 (DATA42 for the second try) contains 5 lines of 9 digits (no spaces or any other characters). each digit is either 1,2 or 3 and represents the move of the two players: O and X. In each case, O plays first.

Write a program that will read the 5 sets and will print the results graphically as shown in the example below, and state the winner:

Sample Input:

```
321232323
233231211
211312332
111332212
11222333
```

Sample Output:

```

X
XO
OXO  wi nner  =  X

000
XXO
XOX  wi nner  =  0

0 X
OXO
XOX  wi nner  =  X

00
X00
OXX  there are no wi nners

0
XX
000  wi nner  =  0
```

ECOO 2001
Programming Contest

Regional Contest
Saturday April 7

Problem 1: Hyper Box Markup

Read text in the following markup language that constructs a screen containing boxes:

A given field (box) of length x and width y may contain up to two new fields (boxes) arranged vertically or horizontally. If they are arranged vertically they are called NzC (north) or SzC (south) where z is a measure of its size and C is the colour of the box: one of R(red), W(white), B(blue), G(green), Y(yellow), N(black). If they are arranged horizontally, they are called EzC (east) or WzC (west). z is a one-digit number which indicates the percentage of the field the new box will occupy: 0=10%, 1=20%, ..., 9=100%. One or the other box or both may be omitted.

Each box is defined by brace brackets as in the following examples:

eg. `{N4R}{S3B}`

would fill the top 50% of the field with red and the bottom 40% with blue. The remaining 10% would not change colour.

`{S3B}{N4R}`

same as above.

`{S7Y}`

would fill the bottom 80% of the field with yellow and leave the rest unchanged.

`{E9B{N1R}{S1R}}`

would first fill the entire field with blue, and paint the top and bottom 20% with red, leaving the remaining 60% blue.

`{E5B{N1R}{S1R}}{W3Y}`

would first fill the right 60% of the original field with blue and the left 40% with yellow. It would also paint the top and bottom 20% of the blue field only, with red, leaving the remaining 60% blue.

Write a program that reads 5 lines of data from the textfile DATA11 (DATA12 for the second try). Each line describes boxes using the rules above. For each of the five cases draw an initial square box in black, that occupies most of the available screen. Allow each solution to be seen after pressing any key.

Sample input:

`{N4R}{S3B}`

`{S3B}{N4R}`

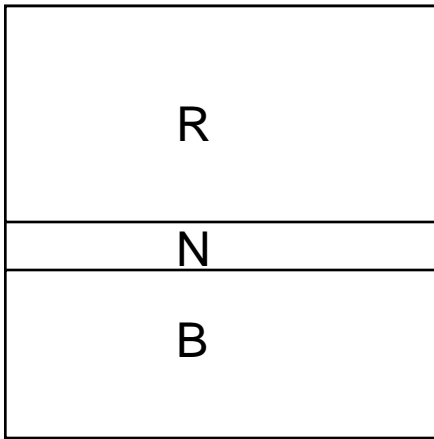
`{E9B{N1R}{S1R}}`

`{E5B{N1R}{S1R}}{W2Y}`

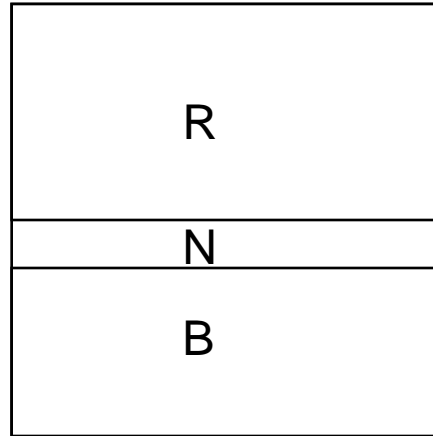
`{E5B{N1R}{W3Y}{E2Y}}{S1R{W3Y}}{W2Y}`

Sample Output

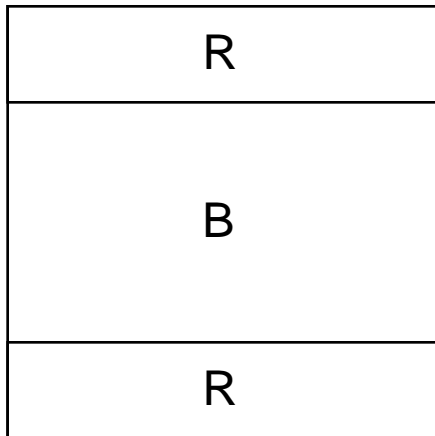
(do not print the input line and colour the sections appropriately)



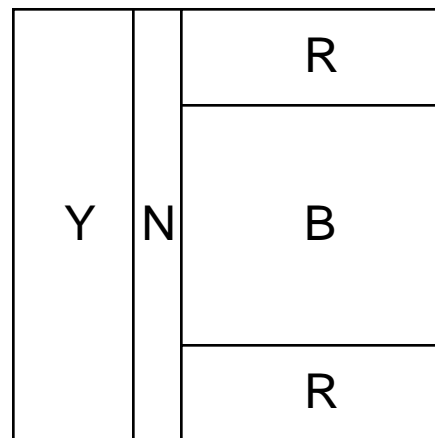
{N4R}{S3B}



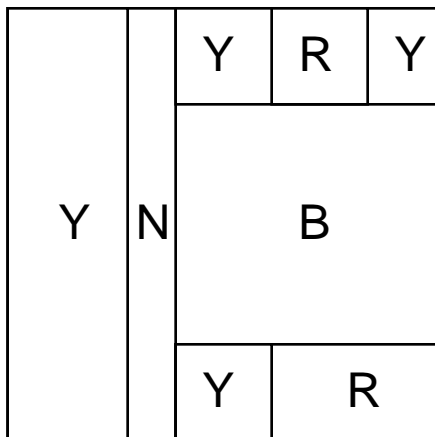
{S3B}{N4R}



{E9B{N1R}{S1R}}



{E5B{N1R}{S1R}}{W2Y}



{E5B{N1R{W3Y}{E2Y}}{S1R{W3Y}}}{W2Y}

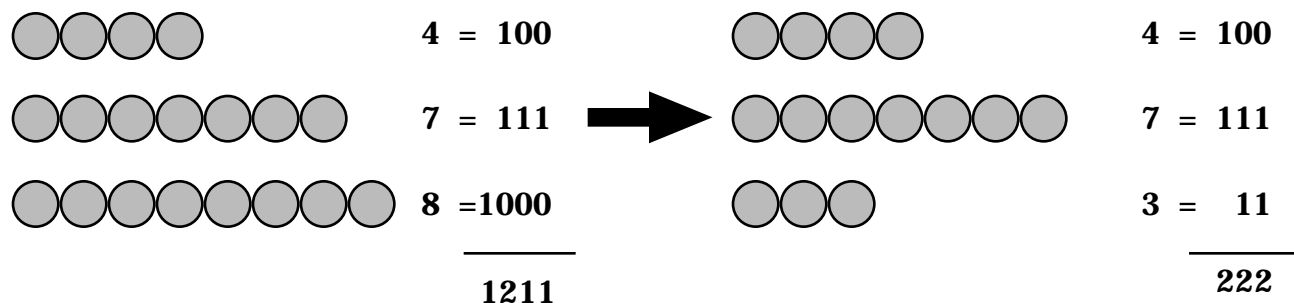
Problem #2 Winning at NIM

NIM is a strategy game involving 3 lines of pennies and two players. Each player may remove alternately any number of pennies from one row at a time.

The object of the game is to take the last penny. The winner therefore is the one who makes the last move.

A player can win if he or she keeps the pennies in the following arrangement:

- 1) express the number of pennies in each row in binary form
- 2) treat the binary numbers as decimal and add them
- 3) if the resulting sum contains only the digits 0 or 2 after your move, you are in a winning position.



DATA21 contains 15 lines each containing one integer representing one row of coins in a game of Nim (DATA22 for the second try). These 15 numbers represent 5 positions in games of Nim.

Write a program that reads this data from DATA21 (or DATA22) and that prints out the winning strategy. If there is no winning strategy, let the program say so.

There often are more than one moves towards a winning position. If so, any winning move will do.

Print out the original 3 numbers in decimal and binary and state the winning move. (See the sample output)

Sample Input:

11
39
3
42
25
13
6
25
46
25
4
10
38
5
35

Sample Output:

11 1011
39 100111
3 11
take 31 from line 2
42 101010
25 11001
13 1101
take 22 from line 1
6 110
25 11001
46 101110
take 15 from line 3
25 11001
4 100
10 1010
take 11 from line 1
38 100110
5 101
35 100011
there is no winning strategy

Problem #3: Scrambled Phrases

A certain puzzle consists of line fragments.

The line fragments are out of order and a key letter is added to the start and end of each phrase, to give you a cue on what phrase follows the next:

The phrase that ends with the key letter "x" for example must be followed by the phrase that starts with the key letter "x". One phrase starts with a key letter that does not match with a starting key: the first phrase; and one phrase ends with a key that does not have a match: the final phrase.

Write a program that reads from a data file DATA31 (DATA32 for the second try) 5 sets of data. The first line of each set contains the number (n) of phrases that follow.

Print out the phrases in the proper order on one or more output lines, each output line must contain a maximum number of words to fill 60 columns: If there are two or more spaces between words, leave these spaces in the text. All internal spaces are to be counted towards the 60 columns. Only spaces that may occur at the start or end of your output line are not to be printed or counted towards the 60.

See the sample input and output below:

Sample input:

```
7
x the lamb was sure
dtle lamf
qs white as snow anr
b Mary had a litd
rd everywhere that Mary went,x
ee to gos
fb his fleece waq
```

would become:

```
b Mary had a litddtle lamff b his fleece waqqqs white as snow anrr d
everywhere that Mary went,xx the lamb was suree e to gos
```

and the output:

**Mary had a little lamb his fleece was white as snow and
everywhere that Mary went, the lamb was sure to go**

Problem #4: Minimum Multiples

A set of between 2 and 15 integers inclusive are to be divided into two sets according to the following criteria: the sum of the lowest common multiple for each set is minimum.

Write a program that reads from DATA41 (DATA42 for the second try) five sets of numbers, and that prints out for each set, the numbers with their two LCMs (Lowest Common Multiples).

All the numbers are between 1 and 99 inclusive and the sum of the two LCMs are always 9 digits or less.

Each set of numbers end in a 0 (which is not counted) and each number is on a separate line.

Sample Input

(note, each number is on a separate line and without the comma):

16, 2, 12, 16, 18, 39, 46, 30, 39, 45, 0
27, 34, 4, 13, 24, 7, 0
25, 44, 11, 27, 10, 23, 4, 33, 34, 0
8, 20, 35, 13, 35, 6, 26, 49, 13, 17, 11, 38, 1, 0
34, 27, 34, 35, 14, 27, 44, 30, 0

Sample output:

16 2 12 16 18 39 46 30 39 45
1104 1170 sum= 2274

27 34 4 13 24 7
1512 442 sum= 1954

25 44 11 27 10 23 4 33 34
19550 1188 sum= 20738

8 20 35 13 35 6 26 49 13 17 11 38 1
21560 25194 sum= 46754

34 27 34 35 14 27 44 30
748 1890 sum= 2638

ECOO 2001

Programming Contest

Final Contest
Wednesday May 2

Problem 1: Fractured Text

A message has been ripped into several pieces, and it is your task to assemble it again. The only clue is the shape of the pieces. Write a program that will read 5 messages from the file DATA11 (DATA12 for the second try). The first line of each message contains an integer that represents the number of lines of the message.

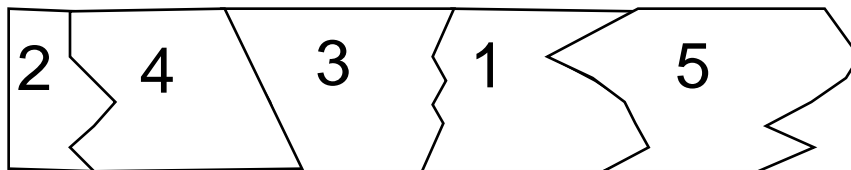
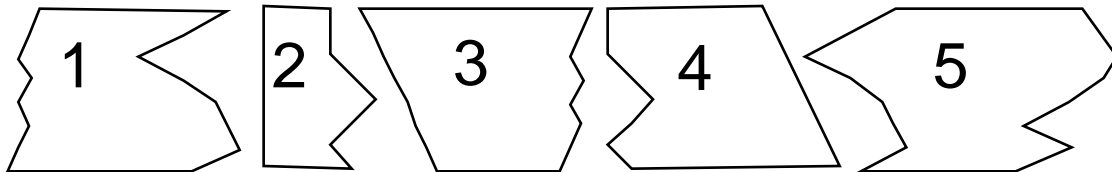
The number of lines for each message is between 2 and 10 and the maximum number of characters in each line is 128. There are at least two fragments and the maximum number of fragments (pieces of the message) is 5. Each rip extends to the bottom as is shown in the examples that follow. All correctly assembled output will contain lines that are less than 80 characters in length.

Print out each message (correctly assembled) on a cleared screen, and allow the user to proceed to the next message after pressing any key.

For clarity, the spaces between the rips are filled with the "=" sign. Note then that blanks (spaces) are part of the text. Note further that all lines of a given message are equal in length.

```

8
. I don't know w I kno who swallowed a fly w an old lady hy she swallowed
n old lady wh the f e'll die. I know a ly. Perhaps sh o swallowed a spider
inside he that gled and tickled wiggled and jig r. She swallowed the spider
e swallowed t to catc on't know why sh h the fly. I d he fly. Perhaps she'll
d a bird. How abs die. I kn y who swallow ow an old lad urd to swallow a
the spider that bird. S bird to catch he swallowed the wiggled and
swallowed the spide jiggl de her. She ed and tickled insi r to catch the
the fly. Perhap fly. I swallowed don't know why she s she'll die.
    
```



Sample Input
(only 2 of 5 messages)

Sample Output

```
4 of water===== the hill to fetch a pail=====Jack and Jill went up=====
 umbling after=====roke his crown and Jill came t=====Jack fell down and b=====
  paper=====me did trot as fast as he could c=====Up Jack got and ho=====
  and brown paper=====d plastered his head with vinegar a=====Went to bed an=====
8 =====. I don't know w===== who swallowed a fly=====an old lady=====hy she swallowed=====
  n old lady wh=====the f=====e'll die. I know a=====ly. Perhaps sh=====o swallowed a spider=====
  inside he=====that =====gled and tickled=====iggled and jig=====. She swallowed the spider
  e swallowed t=====to catc=====on't know why sh=====h the fly. I d=====he fly. Perhaps she'll=
  ed a bird. How abs=====die. I kn=====y who swallowe=====ow an old lad=====urd to swallow a=====
  the spider that =====bird. S=====he swallowed the=====he swallowed and=====iggled and=====
  swallowed the spide=jiggl=====de her. She =====ed and tickled insi=====er to catch the=====
  = the fly. Perhap=====fly. I ===== swallowed=====don't know why she=====s she'll die.=====
```

```
Jack and Jill went up the hill to fetch a pail of water
Jack fell down and broke his crown and Jill came tumbling after
Up Jack got and home did trot as fast as he could caper
Went to bed and plastered his head with vinegar and brown paper

press any key to continue..
```

```
I know an old lady who swallowed a fly. I don't know why she swallowed
the fly. Perhaps she'll die. I know an old lady who swallowed a spider
that wiggled and jiggled and tickled inside her. She swallowed the spider
to catch the fly. I don't know why she swallowed the fly. Perhaps she'll
die. I know an old lady who swallowed a bird. How absurd to swallow a
bird. She swallowed the bird to catch the spider that wiggled and
jiggled and tickled inside her. She swallowed the spider to catch the
fly. I don't know why she swallowed the fly. Perhaps she'll die.
```

Problem 2: Friday 13th

Maggie is the owner of a games store, and on every Friday 13th, she will give each customer, whenever possible, 13 coins in change. She uses the following coins:

Twoonies (\$2)
Dimes (10 c)

Loonies (\$1)
Nickels (5 c)

Quarters (25 c)
Pennies (1 c)

You are asked to write a program that will convert any amount of money to 13 coins, if possible. If no combination of 13 coins will form the given sum, then declare this. If there are more than one possible combination, use the set of coins that contains a larger set of larger coins:

Although in the following example there are 5 valid solutions, only the first one is acceptable for full points.

\$1.56 = 1 loonies 1 quarters 5 nickels 6 pennies
\$1.56 = 1 loonies 4 dimes 2 nickels 6 pennies
\$1.56 = 1 loonies 11 nickels 1 pennies
\$1.56 = 4 quarters 3 dimes 5 nickels 1 pennies
\$1.56 = 3 quarters 7 dimes 2 nickels 1 pennies

Sample input:

12.45

1.56

0.55

9.99

11.00

Sample output

\$12.45 = 6 twoonies 2 dimes 5 nickels

\$1.56 = 1 loonies 1 quarters 5 nickels 6 pennies

\$0.55 = 1 quarters 2 dimes 10 pennies

\$9.99 cannot be expressed in 13 coins

\$11.00 = 5 twoonies 3 quarters 5 nickels

Problem 3:Crossword

Four words have to be fitted into a crossword in such a way that each word crosses two other words (as shown). The two words that are parallel may not occupy two consecutive rows or two consecutive columns. The interior of the rectagle so defined must therefore contain at least one blank space.

DATA31 (DATA32 for the second try) contains 5 sets of four words in 20 consecutive lines. Each word has a minimum of 3 letters and a maximum of 10 and all words contain only upper case letters.

Write a program that will read these 5 sets of words and print out a solution for each case.

There will be a solution for each case, and in most cases there will be several possible solutions: Any one solution is acceptable: Print each solution on a cleared screen, and allow the user to proceed to the next solution after pressing any key.

Sample Input:

QUADRANGLE
TRIANGLE
PENTAGON
HEXAGON
TED
TOM
DALE
MEL
BLUE
YELLOW
REDDER
GOLD
MENTORING
PLATFORM
MORNING
STATEMENT
SUMMERTIME
GREENS
SPRINGTIME
FLOWERS

Y
E R
BLUE
L D
GOLD
W E
R

TED
O A
MEL
E

S
P
R
I F
N L
G O
T W

SUMMERTIME
M R
GREENS

P
E H
TRIANGLE
T X
QUADRANGLE
G G
O O
N N

S
T
PLATFORM
T O
E R
M N
E I
N N
MENTORING

