

# UNIT 11 *Transposition*

# Teacher Resource Material

**Key Stage:** 2 and 3

**Target:** Mainstream Year 7, or able Year 5 or 6

**Teaching Notes**

Here we cover transposition. The material could be useful with topics such as lowest common multiple and factorisation. It includes an introduction to keys and the problems associated with key distribution.

**Solutions and Notes**

- Exercise 1*
- a) There are 24 letters.
  - b) Possible grids: 4 rows, 6 columns; 6 rows, 4 columns; 2 rows, 12 columns; 12 rows, 2 columns; 3 rows, 8 columns; 8 rows, 3 columns.
  - c) Rather than just trying all possible shapes of the grid to see if they work, students could be encouraged to think about what the first word in the message could be – is it more likely to start TT ... TE ... TS ... TH ...? etc. This should lead them to the correct answer (8 rows, 3 columns) more quickly:  
 'THE CUSTOMER IS ALWAYS RIGHT '.

- Activity 1*
- a) For 38 letters, we have  $2 \times 19$  or  $19 \times 2$ , so not much choice.
  - b) For 39 letters, we have  $3 \times 13$  or  $13 \times 3$ ; again, not much choice.
- So neither is a good choice as they would be easily guessed by anyone trying to unscramble a message.

- Exercise 2* This has 36 letters but there are 3 'X's at the end of the message 3 letters apart. Hence it looks likely that it has been scrambled by using 3 R (row) by 12 C (column) grid. This gives
- 'BLETCHLEY PARK IS OPEN NOW AND TOMORROW'

- Exercise 3*
- a) 'IFW' is the most likely (IF W..)
  - b) 'IF WE WANT THINGS TO STAY AS THEY ARE THINGS WILL HAVE TO CHANGE'

- Activity 2* There are 48 letters, so there are a number of possibilities.  
 (8 R by 6 C 6 R by 8 C, 12 R by 4 C, 4 R by 12 C, 16 R by 3 C, 3 R by 16 C, 24 R by 2 C, 2 R by 24 C)

The intervals for the Xs are 12, 18, 6 so it seems likely to be 6 R by 8 C.

This gives the grid:

E	L	E	H	I	N	G	T
R	U	A	H	S	E	B	S
E	O	H	T	N	Y	D	Y
A	T	H	T	I	V	E	O
O	P	T	E	O	B	E	M
E	X	T	I	X	X	X	L

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## Teacher Resource Material (continued)

We now need to find the key, i.e. the sequence of the columns.

The first letters for the first four columns are

E E H T (in any order)

and, for the last four columns (ending in X),

L I N G

What sequence will make words? It seems likely that the top line of the first four columns is

T H E E

and, after looking at the next row, the top line continues as

N G L I

(eventually making ENGLISH). Putting the columns in order gives

T H E E N G L I  
 S H A R E B U S  
 Y T H E Y D O N  
 O T H A V E T I  
 M E T O B E P O  
 L I T E X X X X

and the message is,

'The English are busy. They do not have time to be polite'