Breaking Lorenz

1. First of all, work out the answers to these fiendishly difficult calculations:

0 + 0 = __ 0 + 1 = __ 1 + 0 = __ 1 + 1 = __

2. Now, using column addition, complete these:

10100 + 10001 _____	01101 + 11101 _____	01100 + 00101 _____	11110 + 10111 _____	10011 + 10000 _____

3. If you finish before everyone else, have a look at the "Teleprinter Code" table on the board and answer these:

- Can you match up your answers with letters from this table? What do they spell?
- Have a go at writing your own name in teleprinter code at the top of this page!
- How would you work out what " F + N " is? What about " F + E "?
- What do you notice, in comparison with the previous two sums, about " N + E "?

⊕	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	9	8	+	4	3	/
A	/	G	F	R	4	C	B	Q	S	3	N	Z	8	K	+	Y	H	D	I	W	9	X	T	V	P	L	U	M	O	E	J	A
B	G	/	Q	T	O	H	A	F	8	L	P	J	S	Y	E	K	C	W	M	D	V	U	R	9	N	3	X	I	4	+	Z	B
C	F	Q	/	U	K	A	H	G	3	S	E	M	L	4	P	O	B	9	J	V	D	T	X	W	+	8	R	Z	Y	N	I	C
D	R	T	U	/	3	9	W	X	K	4	I	+	Y	S	Z	8	V	A	N	B	C	Q	G	H	M	O	F	P	L	J	E	D
E	4	O	K	3	/	N	+	Y	U	R	C	W	X	F	B	Q	P	J	9	Z	I	8	L	M	H	T	S	V	G	A	D	E
F	C	H	A	9	N	/	Q	B	J	I	4	8	Z	E	Y	+	G	U	3	X	R	W	V	T	O	M	D	L	P	K	S	F
G	B	A	H	W	+	Q	/	C	M	Z	Y	3	I	P	4	N	F	T	8	R	X	9	D	U	K	J	V	S	E	O	L	G
H	Q	F	G	X	Y	B	C	/	L	8	+	I	3	O	N	4	A	V	Z	9	W	R	U	D	E	S	T	J	K	P	M	H
I	S	8	3	K	U	J	M	L	/	F	D	H	G	R	V	T	Z	N	A	P	E	O	Y	+	W	Q	4	B	X	9	C	I
J	3	L	S	4	R	I	Z	8	F	/	9	B	Q	U	W	X	M	E	C	+	N	Y	O	P	V	G	K	H	T	D	A	J
K	N	P	E	I	C	4	Y	+	D	9	/	X	W	A	Q	B	O	S	R	8	3	Z	M	L	G	V	J	T	H	F	U	K
L	Z	J	M	+	W	8	3	I	H	B	X	/	C	V	R	9	S	O	Q	4	Y	N	E	K	U	A	P	F	D	T	G	L
M	8	S	L	Y	X	Z	I	3	G	Q	W	C	/	T	9	R	J	P	B	N	+	4	K	E	D	F	O	A	U	V	H	M
N	K	Y	4	S	F	E	P	O	R	U	A	V	T	/	H	G	+	I	D	M	J	L	8	Z	B	X	3	W	Q	C	9	N
O	+	E	P	Z	B	Y	4	N	V	W	Q	R	9	H	/	C	K	L	X	3	8	I	J	S	F	D	M	U	A	G	T	O
P	Y	K	O	8	Q	+	N	4	T	X	B	9	R	G	C	/	E	M	W	I	Z	3	S	J	A	U	L	D	F	H	V	P
Q	H	C	B	V	P	G	F	A	Z	M	O	S	J	+	K	E	/	X	L	U	T	D	9	R	4	I	W	3	N	Y	8	Q
R	D	W	9	A	J	U	T	V	N	E	S	O	P	I	L	M	X	/	K	G	F	H	B	Q	8	+	C	Y	Z	3	4	R
S	I	M	J	N	9	3	8	Z	A	C	R	Q	B	D	X	W	L	K	/	Y	4	+	P	O	T	H	E	G	V	U	F	S
T	W	D	V	B	Z	X	R	9	P	+	8	4	N	M	3	I	U	G	Y	/	Q	C	A	F	S	E	H	K	J	L	O	T
U	9	V	D	C	I	R	X	W	E	N	3	Y	+	J	8	Z	T	F	4	Q	/	B	H	G	L	P	A	O	M	S	K	U
V	X	U	T	Q	8	W	9	R	O	Y	Z	N	4	L	I	3	D	H	+	C	B	/	F	A	J	K	G	E	S	M	P	V
W	T	R	X	G	L	V	D	U	Y	O	M	E	K	8	J	S	9	B	P	A	H	F	/	C	I	4	Q	N	3	Z	+	W
X	V	9	W	H	M	T	U	D	+	P	L	K	E	Z	S	J	R	Q	O	F	G	A	C	/	3	N	B	4	I	8	Y	X
Y	P	N	+	M	H	O	K	E	W	V	G	U	D	B	F	A	4	8	T	S	L	J	I	3	/	9	Z	R	C	Q	X	Y
Z	L	3	8	O	T	M	J	S	Q	G	V	A	F	X	D	U	I	+	H	E	P	K	4	N	9	/	Y	C	R	W	B	Z
9	U	X	R	F	S	D	V	T	4	K	J	P	O	3	M	L	W	C	E	H	A	G	Q	B	Z	Y	/	+	8	I	N	9
8	M	I	Z	P	V	L	S	J	B	H	T	F	A	W	U	D	3	Y	G	K	O	E	N	4	R	C	+	/	9	X	Q	8
+	O	4	Y	L	G	P	E	K	X	T	H	D	U	Q	A	F	N	Z	V	J	M	S	3	I	C	R	8	9	/	B	W	+
4	E	+	N	J	A	K	O	P	9	D	F	T	V	C	G	H	Y	3	U	L	S	M	Z	8	Q	W	I	X	B	/	R	4
3	J	Z	I	E	D	S	L	M	C	A	U	G	H	9	T	V	8	4	F	O	K	P	+	Y	X	B	N	Q	W	R	/	3
/	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	9	8	+	4	3	/

The table on the previous page is a Teleprinter Addition Table. You'll need this later! It might look confusing but it's just a way of listing all the possible results of adding together two letters using teleprinter code so that you can look them up without having to do the calculations:

If you want to work out what " S + Z " is, find the column headed by " S " and the row the starts with " Z " and see where they cross. It's " H " (just like it was when you worked it out at the beginning of the session).

Some things to notice:

- There are more than just the 26 letters of the alphabet represented in the table! How many characters are represented altogether? Why this many? Why not more? Why not fewer?

- There's no space character! The character " 9 " was often used to stand in for a space.

- What's special about the " / " character?

- To encrypt a message you need a "key". This is like a password, and is just a string of seemingly random letters. The letters in your message are encrypted one by one, by adding the next letter of the key.

4. Have a go at encrypting these messages with the given key

Message 1:	B L E T C H L E Y
Key:	T 4 9 R Z S P Q N
Ciphertext1:	_____

Message 2:	B A C K S P A C E
Key:	T 4 9 R Z S P Q N
Ciphertext2:	_____

5. Now, just for the fun of it, try…

a) … adding the original messages together:

Message 1:	B L E T C H L E Y
Message 2:	B A C K S P A C E
	_____

b) … adding the two ciphertexts you got:

Ciphertext1:	
Ciphertext2:	_____
	_____

- What do you notice?

6. What have you learnt today that you didn't know before?	7. What (or who) do you want to find out more about?
Use this space to make any notes about anything else:	