

## Filling the Gaps Using Formulas

### The Problem

The scientist has a spreadsheet with experimental results. Each experiment is followed by a *variable* number of empty rows.

	A	B	C	D
1		Control	A	B
2	Experiment 1	22	33	44
3				
4				
5				
6				
7	Experiment 2	11	71	21
8				
9				
10				
11				
12				
13	Experiment 3	47	27	97
14				
15				
16				
17				
18	Experiment 4	83	-17	101
19				
20				
21				

	A	B	C	D
1		Control	A	B
2	Experiment 1	22	33	44
3	Experiment 1	22	33	44
4	Experiment 1	22	33	44
5	Experiment 1	22	33	44
6	Experiment 1	22	33	44
7	Experiment 2	11	71	21
8	Experiment 2	11	71	21
9	Experiment 2	11	71	21
10	Experiment 2	11	71	21
11	Experiment 2	11	71	21
12	Experiment 2	11	71	21
13	Experiment 3	47	27	97
14	Experiment 3	47	27	97
15	Experiment 3	47	27	97
16	Experiment 3	47	27	97
17	Experiment 3	47	27	97
18	Experiment 4	83	-17	101
19	Experiment 4	83	-17	101
20	Experiment 4	83	-17	101
21	Experiment 4	83	-17	101

The experimental information needs to be copied into the variable number of empty rows.

## The Solution

Instead of copying and pasting repetitively, use formulas to duplicate the information.

### Step 1: Find the Blank Row

The initial challenge is that each row of data is followed by a variable number of empty rows. The empty rows need to be counted. In another sheet use the following formula in cell A2.

$$=IF(ISBLANK('Initial Data'!A2),(1+'Filled Sheet'!A1),0)$$

Copy the formula down to the end of the rows in the data sheet.

	A	B	C	D	E	F	G	H	I
1			Control	A	B				
2	0	Experiment 1	22	33	44				
3	1								
4	2								
5	3								
6	4								
7	0	Experiment 2	11	71	21				
8	1								
9	2	Experiment 2	11	71	21				

In this example, the sheet holding the original data has been called “Initial Data”. The formula uses an IF function and the ISBLANK function.

### IF Function

The syntax of the IF function is:

$$IF(\text{test}, \text{value if true}, \text{value if false}).$$

### ISBLANK Function

ISBLANK tests whether the cell has any contents. The results are returned as TRUE or FALSE. Normally, a blank cell will return a value of TRUE.

### Counting the empty rows

$$=IF(ISBLANK('Initial Data'!A2),(1+'Filled Sheet'!A1),0)$$

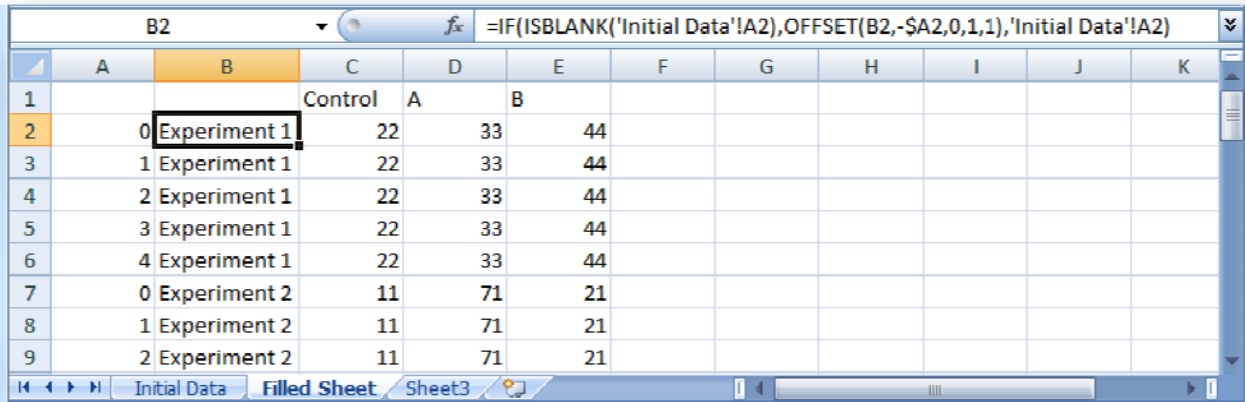
If the cell in Initial Data is blank, then add 1 to the value in the cell above (this counts the empty rows). If the cell is not blank then the value is zero (resetting the count for the next series of empty rows).

**Step 2: Fill in the Data**

Now the row counting information can be used in the following formula to fill the data in. In cell B2 enter the following formula:

```
=IF(ISBLANK('Initial Data'!A2), OFFSET(B2,-$A2,0,1,1), 'Initial Data'!A2)
```

Copy the formula to the end of the rows in the data sheet.



**OFFSET Function**

Returns a reference to a cell (or a range of cell) that is a specified number of rows and columns from the starting point. The syntax is

```
OFFSET(starting reference,rows,cols,height of range returned,width of range returned)
```

In this example, OFFSET(B3,-\$A3,0,1,1) is interpreted as follows:

From the starting point of B3 (the cell containing the formula), retrieve the value in A3 (1). Make this value negative (-1). Look in the same column (0), and retrieve a range 1 row by 1 column in size (a single cell).

In other words, from B3, go backwards to row 2, stay in column B and return the value in B2.

**The Formula**

```
=IF(ISBLANK('Initial Data'!A2), OFFSET(B2,-$A2,0,1,1), 'Initial Data'!A2)
```

If the cell in the Initial Data sheet is blank, use the offset function to calculate what previous row the data will be copied from, if it is not blank, show the value from the Initial Data sheet.

### The Finish

Convert the formulas into values by selecting the entire sheet, copying and using **Paste Special** to find the **Paste Values** option or find **Paste Values** directly under the Paste button drop-down.

