Ten Maths Activities with a Spreadsheet – Teacher's Notes

These ten activities can be tackled by pupils using a spreadsheet. The activity sheets do not teach them specific spreadsheet features or skills; it is assumed that the pupils will already have the necessary ICT capability to use a spreadsheet effectively. The purpose of these activities is to provide opportunities to use and apply both maths and ICT skills that have been taught on earlier occasions.

It is also assumed that the teacher will introduce and discuss each activity by interacting with the whole class at the start of the lesson, rather than simply hand out the sheets with no explanation. The plenary can be used to discuss the outcomes of the activity, reinforce the key points and reflect on the lesson's learning objectives.

The Milkman's Round

A milkman delivers to twelve houses in a small village. You can make up names for the twelve families or simply use the letters A to L. He delivers three types of milk; full cream, semi-skimmed and skimmed.

(a) Create a spreadsheet that can be used to display how many bottles of each type of milk are delivered to each family. It might look like something like this.

	A	B	C	D	E	F
1	Family	Full Cream	Semi-Skimmed	Skimmed		
2	A					
3	B					
4	C					
5	D					
6	E					
7	F					
8	G					
9	H					
10	I					
11	J					
12	K					
13	L					
14						

(b) Type in some made up quantities for each family in columns B, C and D.

(c) Type formulae into appropriate cells so that they provide the milkman with the following information:

- The total number of bottles ordered by each family (TIP: Use column E).
- The total number of bottles of each type of milk needed for the village (TIP: Use row 14).
- The total number of bottles needed for the village (TIP: Use cell E14).

(d) Full cream milk costs 35p per bottle, semi-skimmed costs 31p and skimmed costs 29p. Extend your spreadsheet so that it calculates and displays:

- The total cost of the milk for each family
- The total cost of the milk delivered to the village

Planning a Party

You are planning a party and want to use your local hotel as the venue. The hotel offers two tariffs for you to choose from:

Tariff A - £25 room hire charge plus £12 per person.
Tariff B - £200 room hire charge plus £7 per person.

(a) Create a spreadsheet that automatically works out the total cost of booking the hotel using each tariff when you to type in the number of guests. It could look like something like this:

	A	B	C	D	E	F
1	**Tariff**	**No. of Guests**	**Room Charge**	**Charge per Guest**	**Total Guest Charge**	**Total Cost**
2	Tariff A					
3	Tariff B					
4						

Column B is used to enter the number of guests that are coming to the party.
Column C contains the room hire charge (£25 and £200).
Column D contains the charge per guest (£12 and £7).
Column E contains a formula which works out the total guest charge (i.e. number of guests multiplied by the charge per guest).
Column F contains a formula which works out the total cost (i.e. the room charge plus the total guest charge).

(b) If you had 20 guests which tariff would be the cheapest?

(c) Which tariff would be the cheapest if you had 50 guests?

(d) At what point (i.e. how many guests) would you change from one tariff to the other?

(e) Suppose the hotel increased the charge per guest to £13 for tariff A and £8 and for tariff B. At what point (i.e. how many guests) would you change from one tariff to the other now?

Producing a 100-Square on a Spreadsheet

Here is a 100 square:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Try to produce a 100-square which occupies the first ten rows and first ten columns of a spreadsheet.

You must try to do this by typing in as few of the numbers as possible.

Instead of typing the numbers into the cells you must try to use formulae that will work out the numbers for you.

What is the fewest number of numbers you need to type into the cells?

Producing a Multiplication Tables Grid on a Spreadsheet

Here is a multiplication tables grid:

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

Try to produce a multiplication tables grid which occupies the first twelve rows and first twelve columns of a spreadsheet.

You must try to do this by typing in as few of the numbers as possible.

Instead of typing the numbers into the cells you must try to use formulae that will work out the numbers for you.

What is the fewest number of numbers you need to type into the cells?

Fibonacci and Other Adding Sequences

Enter the number 1 into cell A1 and also into cell A2.

The number in cell A3 must be the sum of the two numbers above.
Type the appropriate formula into cell A3.

Copy this formula down the column so that each number is the sum of the two numbers immediately above (copy down as far as row 12).

The sequence produced in column A should be

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, …

This is a special sequence and is called the *Fibonacci Sequence*.

Into cell C2 type the formula =**A2/A1** (remember, the slash denotes division).
The result (i.e. 1) should be displayed in the cell.
Copy this formula down the column as far as row 12.
The numbers in column C are the ratios of consecutive *Fibonacci* numbers (i.e. they tell you how many times bigger a number is than the previous number).
What do you notice?

Try changing the first two numbers in the sequence (the ones in A1 and A2). The sequence in column A is no longer the *Fibonacci Sequence* but each number is still worked out by adding the previous two numbers.
What effect does this have on the ratios in column C?

Repeated Halving

Enter any number into cell A1.
Click on cell A2 and type the formula =**A1/2**.
The number in cell A2 should be half of the number in cell A1.
Use the copy and paste facility to copy this formula into cells A3 to A15.

Click on cell A17 and type the formula =**SUM(A2:A15)**.
The cell should display the total of the numbers in cells A2 to A15 (but should not include the starting number in cell E1).

Try entering a different starting number into cell E1 and watch how all the other numbers change, particularly the total in cell A17.

Can you see the connection between the starting number in cell A1 and the total in cell A17?
Explain this in your own words.

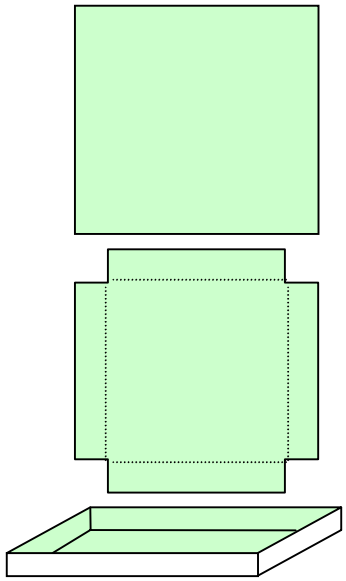
In cell C1 enter any number.
Type a formula into cell C2 which works out one-third of the number above.
Copy this formula down the column as far as row 15 so that each number is one-third of the number above.
Type a formula into cell C 17 which works out the sum of all the answers (but not including the starting number in cell C1).

Again, try different starting numbers in cell C1. Can you see the connection between the number in cell C1 and the total in cell C17?
Explain this in your own words.

Use column E to investigate repeated quartering.
What total do you get this time?

Can you predict what total you will get if you do repeated division by five?
Use column G to do this to see if your prediction was right.

Maxbox



Start with a square piece of paper, 20cm by 20cm.

Cut a small square, 1cm by 1cm, from each corner.

Fold up the edges of the paper to get a shallow open-topped box.

What is the volume of the box in cubic centimetres?

What if you had cut a 2cm by 2cm square from each corner and folded up the edges of the paper? What would the volume of the box be this time?

What if you had cut a 3cm by 3cm square from each corner, or a 4cm by 4cm square, or a 5cm by 5cm square, and so on.

What is the maximum volume you can get by cutting squares like this from the corners of the paper?

Now model this problem using a spreadsheet with five columns:
Column A: The size of the cut-out (you type in this value)
Column B: The length of the box (use a formula to work this out)
Column C: The width of the box (use a formula to work this out)
Column D: The height of the box (use a formula to work this out)
Column E: The volume of the box (use a formula to work this out)

Then all you need to do is type values in column A (i.e. the size of the cut-out) and everything else will be worked out for you automatically.

Extension Activity
So far you have been cutting out squares from each corner which are whole number sizes. Now you are allowed to use decimals. So if you want to, you can cut a square from each corner which measures 2.7cm by 2.7cm, or any other size you want.
What is the maximum volume you can get now?

Activity 9: Choose Your Prize

You have won first prize in the National Digest Prize Draw.
You can have *either*

A lump sum of £100,000

or £200 per week for the rest of your life

or £1000 per month for the next 15 years

or 1p in the first year, 2p in the second, 4p in the third, 8p in the fourth, 16p in the fifth, and so on for the rest of your life.

Which prize would you choose?

Produce a spreadsheet to model this situation.

Here is one possible way of organising your spreadsheet:

- The first column could identify the year (i.e. type the heading 'Year' into cell A1 and then type 1, 2, 3, … in the cells below).
- The second column could display the total amount of money you would have if you opted for the lump sum.
- The third column could display how much money you would get each year if you opted for £200 per week.
- The fourth column could display a running total of the money you would have if you opted for £200 per week.
- The fifth column could display how much money you would get each year if you opted for £1000 per month (but only for the first 15 years).
- The sixth column could display a running total of the money you would have if you opted for £1000 per month.
- The seventh column could display the total amount of money you would get each year if you went for the final option.
- The eighth column could display a running total of the money you would have if you went for the final option.

What are the critical numbers of years after which it would be better to switch from one option to another?

Probability on a Spreadsheet

Type the heading **Red Dice** into cell A1.
Enter the following formula into cell A2

= **INT(RAND()*6)+1** and press ENTER.

A random number in the range 1 to 6 should be displayed in the cell.

Copy the formula down column A as far as you like e.g. as far as cell A21.
These random numbers can be used to simulate the rolling of a dice twenty times.
Every time you press F9 the random numbers are re-calculated.
Try it for yourself.

Type a formula into cell F1 which will work out the average dice score (what do you expect the average score to be? – think about it before you actually try it!).

Type the heading **Blue Dice** into cell B1 and make this column simulate the rolling of a dice the same number of times as the red dice.
Also, type a formula into cell F2 which will work out the average score for the blue dice.

Suppose a red dice and a blue dice are being rolled together. Type a formula into cell C2 which will work out the total score. Copy the formula down the column.
Again, every time you press F9 the random numbers are re-calculated to give new values for each dice and new total scores.

Type a formula into cell F3 which will work out the average total score for the two dice (what do you expect the average total score to be? – think about it before you actually try it!).

Use column D to work out the difference between the red and blue dice.
Type a formula into cell F4 which will work out the average difference.

An Interesting Activity

A bank offers a savings account with an annual interest rate of 12.5%. The interest is calculated and added to the account on the 31st December each year.

A building society offers a savings account with a **monthly** interest rate of 1%. The interest is calculated and added to the account on the last day of each month. Interest is paid on all money in the account, not just on the original amount paid in. So at the end of February you get 1% interest on all of the money in the account.

Use a spreadsheet to investigate the following question:
Suppose you had £100 to invest in a savings account. If you invested the money on the 1st January and wanted to keep it invested for one full year, which account should you go for? BY how much would you be better off?

If you opted for the building society, how many months would it take for your money to double?