

Times tables

Developing construction skills

Prerequisite knowledge

- Spreadsheets as tables
- How to create or copy formulae is not required as this is one of the anticipated outcomes of the activity

Why do this unit?

This activity focuses on number properties and precedence of numerical operations. It also develops basic spreadsheet skills. Pupils with more advanced skills can be encouraged to use absolute as well as relative referencing to create two-way tables, such as multiplication tables.

Time

Up to one lesson

Resources

CD-ROM: spreadsheet, problem sheet

Times tables

Problem sheet

Can you find at least four ways of creating the four times table using the numbers in the one and two times tables and the four operations?

How many different ways of making the four times table like this do you think there are? Justify your answer.

Which of the four operations did you use to create the four times table? Can you create the four times table using subtraction or multiplication?

When you are ready, investigate the different ways you can make the six times table. Did anything surprise you?

Can you make the six times table by multiplying, adding or subtracting columns?

Can you explain any findings?

On a new spreadsheet, create the two and three times tables as efficiently as you can.

Why do you think you were efficient?

How often did you have to write in values or formulae?

Extension

It is possible to create a full set of multiplication tables starting with the integers at the top of the rows and in the first column and by entering just one formula.

Use the spreadsheet 'Gridsheet' to start.

You might also find the idea of **absolute references** useful!

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Introducing the unit

Demonstrate how a spreadsheet can be used in the production of the one and two times table (see 'Sheet 1' on the spreadsheet).

Ask the class to re-create the one, two and then the three times tables in the same way.

Pupils who move on quickly can be encouraged to think of other ways in which they could produce the three and four times table without multiplying by 3 and 4 respectively and by only using the entries in columns A and B plus the four operations (+, −, ÷, ×) and brackets. For example, to create the three times table they could add entries in column A to themselves three times or add column A entries to column B entries. The aim is for pupils to share their ideas with the rest of the class in the main part of the activity.

Encourage groups to produce tables in different ways. Use row 3 to write the formulae they have used, for reference (see 'Sheet 2').

Main part of the unit

Once the class is making good progress and is demonstrating an ability to create and copy formulae it is time to move on.

Share ideas on how they might create the four times table using only columns A and B. (It might be useful to use groups who have already thought about this to guide the discussions.)

- How many different ways do you think you can make the four times table using columns A and B? Five ways? Ten? [as many as you like]
- Can you describe some of your methods? Let's test them and see.

Ask the group to work in pairs to create the four times (and then the six times) table in as many ways as they can just using columns A, B and C on 'Sheet 2'. Ask them to write their formulae on the board plus any surprises that they discover. The problem sheet is available to support this part of the unit.

One idea that might surprise pupils is the fact that the two times table multiplied by the three times table does not give the six times table. However, it is possible to correct the formula so that it does give the six times table, for example by dividing by column A (the one times table).

- Why does that work?

You might like to introduce some rules and a scoring system for creating the formulae. For example, rules might be:

- You cannot use an operation more than twice.
- You are not allowed to add and then subtract the same number or multiply and then divide by the same number because these are inverse operations.

A scoring system might be:

- Addition and/or subtraction 1 point
- Multiplication 2 points
- Division 3 points
- Brackets 4 points

- The use of all four operations in one formula 5 points extra

In this way you are encouraging the group to be adventurous.

Extension

If some of the pupils have a sound grasp of the process, challenge them to produce a multiplication grid up to 20 using as few formulae as possible starting with the numbers 1–20 as in ‘Gridsheet’ on the spreadsheet.

For more confident pupils ‘Sheet 4’ gives an example which utilises absolute references and requires only one formula.

Plenary

Discuss some of the more imaginative formulae and surprising outcomes. Why are they all equivalent? Some examples might lend themselves to simple algebraic manipulation to explain the equivalence.

Solution notes

See sheets 1, 2 and 3 on the spreadsheet for some ideas.

The six times table cannot be produced by multiplying the two times table by the three times table because this would mean that you

have included the multiplier twice.

For example, $5 \times 6 = 5 \times 2 \times 3$. Multiplying the two entries in the two and three times table would give you $5 \times 2 \times 5 \times 3$ – you are out by a factor of 5. This can be remedied by dividing by 5 (the value in column A).