

# Make a copy, make a chain

## Ready-made spreadsheets to explore mathematical ideas

### Prerequisite knowledge

- Multiplication facts

### Why do this unit?

The 'Make a copy' activity (resource sheet) is a good way to maintain and extend pupil familiarity with tables. 'Make a chain' (problem sheet) offers an opportunity for pupils to pose their own challenges.

### Time

One lesson

### Resources

CD-ROM: spreadsheet, problem sheet, resource sheet

NRICH website (optional):

[www.nrich.maths.org](http://www.nrich.maths.org), November 2007, 'Make a copy'; March 2007, 'Factor-multiple chains'

### Make a copy

Resource sheet

A				
	6	15	9	12
	12	30	18	24
	18	45	27	36
	4	10	6	8

B				
	18	12	27	6
	48	32	72	16
	30	20	45	10
	36	24	54	12

C				
	28	12	32	36
	63	27	72	81
	56	24	64	72
	49	21	56	63

D				
	10		20	
		27		18
	16		32	
		18		12

E				
		18		
	8		20	
		27		72
			25	

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## Introducing the unit

Show the class the sheet 'Grid A' and ask:

- How are the numbers in the grid produced by the blue numbers at the edge? [by multiplication]
- How do the spinner buttons change the blue values? [increase or decrease]
- Can you choose particular blue numbers so that the grid on the left is the same as the grid on the right?

Allow plenty of time for pupils to share their reasoning.

Grids B to E are similar puzzles. Later puzzles need solving using less given information.

The resource sheet 'Make a copy' contains a version of the same puzzles and one blank grid for pupils to make a challenge of their own.

## Main part of the unit

Display the sheet 'Factor multiple chains'.

A complete line like  $3 \leftrightarrow 6 \leftrightarrow 30 \leftrightarrow 90$  is referred to as a 'chain' because adjacent numbers are related factor to multiple. The values in each blue box can range from 2 to 100. Check that pupils understand how the sheet works by creating other chains.

Encourage use of the terms 'factor' and 'multiple' by making statements like '30 is a multiple of 6' and inviting pupils to offer the other. [6 is a factor of 30]

Ask pupils to work in pairs on the challenges posed on the problem sheet 'Make a chain', pausing for discussion at intervals.

Invite pupils to pose and pursue similar challenges of their own.

Plenary

Discuss the reasoning used for the challenges on the problem sheet and for pupils’ own challenges.

Solution notes

Make a copy

A

	2	5	3	4
3	6	15	9	12
6	12	30	18	24
9	18	45	27	36
2	4	10	6	8

B

	6	4	9	2
3	18	12	27	6
8	48	32	72	16
5	30	20	45	10
6	36	24	54	12

C

	7	3	8	9
4	28	12	32	36
9	63	27	72	81
8	56	24	64	72
7	49	21	56	63

D

	2	3	4	2
5	10		20	
9		27		18
8	16		32	
6		18		12

E

	2	3	5	8
6		18		
4	8		20	
9		27		72
5			25	

Make a chain

$2 \leftrightarrow 4 \leftrightarrow 8 \leftrightarrow 16$  is the smallest complete chain.

The chain  $5 \leftrightarrow 25 \leftrightarrow 50 \leftrightarrow 100$  produces the largest possible number in the last three positions but  $12 \leftrightarrow 24 \leftrightarrow 48 \leftrightarrow 96$  contains the largest number possible in the first position.

26 cannot be in a chain. If it were possible, the latest it could appear would be position two with either 2 or 13 in position one but position four is limited to a number up to 100 and so cannot offer a value to make a chain. Also prime numbers must occupy position one in any chain in which they appear.

88 is the maximum difference between adjacent numbers in a chain. [ $2 \leftrightarrow 4 \leftrightarrow 8 \leftrightarrow 96$ ]

For the greatest possible range  $2 \leftrightarrow 4 \leftrightarrow 8 \leftrightarrow 96$  looks promising [94] but  $5 \leftrightarrow 25 \leftrightarrow 50 \leftrightarrow 100$  is greater still [95].

The minimum range is 14 produced by  $2 \leftrightarrow 4 \leftrightarrow 8 \leftrightarrow 16$ .