



Multiplication Squares 1134

4	7	28
6	5	30
24	35	

In the top square the boxes at the end of each row and the foot of each column give the result of multiplying the two numbers in that row or column.

Can you find 4 consecutive numbers to complete the second multiplication square in the same way?

MAKE UP YOUR OWN PUZZLES Put 4 consecutive numbers into a 2 by 2 square, work out the products. Then give your friends the products (not the 4 consecutive numbers). Can they find 4 consecutive numbers and put them in the right places to get your products?

		35
		48
40	42	

The 3x3 multiplication square works in the same way. The boxes at the end of each row and the foot of each column give the result of multiplying the three numbers in that row or column. Can you use the digits 1 to 9, each once and only once, to give the correct products of the 3 numbers for each row and column?

			15
			108
			224
144	8	315	

MAKE UP YOUR OWN PUZZLES For the 3 by 3 multiplication puzzle, put the numbers 1 to 9 into a 3 by 3 square in any order, then work out the products, then give your friends just the products and challenge them to put the digits 1 to 9 in the right places.

Solutions

In the 2 by 2 square, the product 35 must give the factors 5 x 7 and the 5 must go above the 40 so the top row is 5 7 and the bottom row is 8 6. The consecutive numbers are 5, 6, 7, 8.

Multiplication Squares

3	1	5	15
6	2	9	108
8	4	7	224
144	8	315	

$$\begin{aligned}
 144 &= 2 \times 72 \\
 &= 2 \times 2 \times 36 \\
 &= 2 \times 2 \times 2 \times 18 \\
 &= 2 \times 2 \times 2 \times 2 \times 9 \\
 &= 2 \times 2 \times 2 \times 2 \times 3 \times 3 \\
 &= 2^4 \times 3^2
 \end{aligned}$$

$$15 = 1 \times 3 \times 5$$

$$\begin{aligned}
 108 &= 2 \times 54 \\
 &= 2 \times 2 \times 27 \\
 &= 2 \times 2 \times 3 \times 9 \\
 &= 2 \times 2 \times 3 \times 3 \times 3 \\
 &= 2^2 \times 3^3
 \end{aligned}$$

$$\begin{aligned}
 224 &= 2 \times 112 \\
 &= 2 \times 2 \times 56 \\
 &= 2 \times 2 \times 2 \times 28 \\
 &= 2 \times 2 \times 2 \times 2 \times 14 \\
 &= 2 \times 2 \times 2 \times 2 \times 2 \times 7 \\
 &= 2^5 \times 7
 \end{aligned}$$

- First factorise each of the numbers into prime factors.
- The factors of 15 can be placed immediately as 5 must go above the 315 and 3 above the 144.
- Then you can put the 9 and the 7 in the column for 315.
- Then you can put the 8 and the 4 in the row for 224.
- Finally you can put the 6 and the 2 in the row for 108.

Notes for Teaching

Why do this problem

This problem helps learners to develop a better understanding of how prime numbers form the building blocks of all whole numbers. We teach learners how to find prime factors often without a follow-up task where learners can apply what they have learnt so this problem provides a follow-up task.

The 2 by 2 table gives an easy introduction to help learners to understand what they are supposed to do.

Suggestions for teaching:

Start with some work on the 2 by 2 squares. Learners should solve the puzzle given and then make their own puzzles and exchange them.

Then explain the 3 by 3 challenge. Give learners the hint that it will help them if they write the numbers 15, 108, 224, 144, 8

and 315 as products of prime factors. You can write table given on the next page on the board or print the worksheet.

Multiplication Squares

The boxes at the end of each row and the foot of each column give the result of multiplying the 3 numbers in that row or column. Write each of the numbers 15, 108, 22, 144, 8 and 315 as a product of prime factors in the spaces provided. Write the digits 1 to 9 in the shaded squares, each once and only once, to give the correct products of the 3 numbers for each row and column?

			15	15=
			108	108=
			224	224=
144	8	315		
144=	8=	315=		

Key Questions

1. What are the factors of that number.
2. What are the prime factors of that number.
3. Which of these products are multiples of that number.

Possible Support

For learners who are struggling you could give them the numbers 1 to 9 on bits of paper to put in the 3 by 3 square and move around until they find the right places.

Don't offer hints to everyone but only to the learners who really need support. The teachers role is to try to help the learners to be more independent and not to 'spoon feed' them.

Possible Extension

Try the problem One to Eight <http://nrich.maths.org/757>