# Number Challenges: Factors [[1]](#footnote-1)

## Multiplication Squares

The nine digits 1, 2, 3, 4, 5, 6, 7, 8, 9 are entered into the cells of these 3 x 3 square grids exactly once each.

For each square the results of multiplying the three numbers in each row or column together are given. The challenge is to find the only possible way of assigning the digits to each of the grids.

A.

**48**

**54**

**140**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**120**

**48**

**63**

B.

**56**

**48**

**135**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**35**

**96**

**108**

C.

**96**

**27**

**140**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

**126**

**72**

**40**

## Magic Multiplication Squares

In these magic squares, the numbers in each of the rows, columns and diagonals multiply together to give the same result. Complete the remaining seven empty squares without repeating any numbers.

The product of rows, columns and diagonals is 216

|  |  |  |
| --- | --- | --- |
|  | **1** |  |
|  | **6** |  |
|  |  |  |

The product of rows, columns and diagonals is 2744

|  |  |  |
| --- | --- | --- |
|  | **1** |  |
|  | **14** |  |
|  |  |  |

The product of rows, columns and diagonals is 3375

|  |  |  |
| --- | --- | --- |
|  | **1** |  |
|  | **15** |  |
|  |  |  |

## Twelve Factors

There are only five numbers under 100 that have exactly twelve factors (including 1 and themselves).

List the factors of these nmbers in the grid below.

Numbers in ascending order

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Factors in ascending order

## Shared Factors

These four-digit numbers all share the same two-digit factor. FIll in the squares below to show what it is.

|  |  |
| --- | --- |
|  |  |

**1608 =** **×**

|  |  |
| --- | --- |
|  |  |

|  |  |
| --- | --- |
|  |  |

**3015 = ×**

|  |  |
| --- | --- |
|  |  |

**4690 = ×**

These five-digit numbers all share the same thtree-digit factor. FIll in the squares below to show what it is.

|  |  |  |
| --- | --- | --- |
|  |  |  |

**58338 = ×**

|  |  |  |
| --- | --- | --- |
|  |  |  |

**64820 = ×**

|  |  |  |
| --- | --- | --- |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  |  |  |

**76395 = ×**

|  |  |  |
| --- | --- | --- |
|  |  |  |

**97230 = ×**

## Large and Small Factors

Each of the four numbers below is larger than a million. Interestingly they al have one four-digit prime factor and lots of one-digit ones. The challenge is to discover the larger factor in each case.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**1336860**

**1073016**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**1607025**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

**1560762**

1. Gerald Jenkins and Magdalen Bear. Tarquin Number Challenges. Tarquin Publications. 2002. [↑](#footnote-ref-1)