

# Primes back to front

In base twelve, and in base eight, "15" is a prime, and so is its 'reversal' "51".

There are more prime pairs such as 15 and 51 (base eight or twelve) in an odd-number base than in an even-number base. In an even-number base any prime beginning with an even digit, (such as 23 in base eight), cannot be a prime when it is reversed.

Here (for example) is a list of some primes in base eleven and their prime reversals:

(7 stands for ten in base eleven)

Table A

12	21	16	61	18	81	27	72
29	92	34	43	37	73	49	94
56	65	67	76	89	98	97	79

Reversed primes - with "Two-Way" Notation

In base eight, "15" is a prime, and so is its reversal "51". If we express these in two-way notation, base eight, however, these are written  $2\bar{3}$  and  $1\bar{3}1$  and are not reversals. In base ten we have the pair of primes 79 and 97; in two-way notation these become  $1\bar{2}\bar{1}$  and  $10\bar{3}$ .

Table B shows the primes from table A in two-way notation:

Table B

12	21	2 $\bar{5}$	1 $\bar{5}1$	2 $\bar{3}$	1 $\bar{3}1$	3 $\bar{4}$	1 $\bar{4}2$
3 $\bar{2}$	1 $\bar{2}2$	34	43	4 $\bar{1}$	1 $\bar{1}3$	5 $\bar{2}$	1 $\bar{2}4$
1 $\bar{5}\bar{5}$	1 $\bar{5}5$	1 $\bar{4}\bar{4}$	1 $\bar{3}\bar{5}$	1 $\bar{2}\bar{2}$	1 $\bar{1}\bar{3}$	1 $\bar{1}\bar{1}$	10 $\bar{2}$

Which begs the question - are there primes (in two-way notation) which when reversed give us other primes?

Here's one example (apart from the obvious, palindromic,  $1\bar{3}1$ ):

$1\bar{1}3$  is a prime in base eleven, and so is its reversal,  $3\bar{1}1$ .

Notes:

The Dozenal Society of Great Britain uses symbols suggested by Sir Isaac Pitman for ten and eleven in bases greater than ten. These are 7 for ten and 8 for eleven.

Two-Way notation, created by J.Halcro Johnston, uses negative digits, such as  $\bar{2}$ , with positional notation. In base ten, for example,  $1\bar{2}$  stands for "ten less two units" i.e. 8. See other articles on the DSGB site; <http://www.dozenalsociety.org.uk>