



## Problem of the Week

### Problem D and Solution

#### Power Play

#### Problem

Often a power can be rewritten as another power. For example  $9^3 = 27^2$  or  $(-5)^4 = 25^2$ .

If  $x$  and  $y$  are integers, find all ordered pairs  $(x, y)$  that satisfy the equation  $(x - 1)^{x+y} = 2^6$ .

#### Solution

The number  $2^6$  equals 64.

We can express 64 as  $a^b$  where  $a$  and  $b$  are integers in the following ways:

$64^1, 8^2, 4^3, 2^6, (-2)^6,$  and  $(-8)^2$ .

We can use these powers and the expression  $(x - 1)^{x+y}$  to find values for  $x$  and  $y$ .

Power	$x - 1$	$x + y$	$x$	$y$
$64^1$	64	1	65	-64
$8^2$	8	2	9	-7
$4^3$	4	3	5	-2
$2^6$	2	6	3	3
$(-2)^6$	-2	6	-1	7
$(-8)^2$	-8	2	-7	9

The six ordered pairs are  $(65, -64), (9, -7), (5, -2), (3, 3), (-1, 7),$  and  $(-7, 9)$ .

