How many ordered pairs, (x, y), of positive integers satisfy the equation $xy = 144$?

Solution:

Since both x, y are positive integers, x and y are both divisors of 144. Since 144 is a perfect square we would expect an odd number of positive divisors.

$144 = 12^2 = (4 \cdot 3)^2 = (2^2 \cdot 3)^2 = 2^4 \cdot 3^2$

$t(144) = t(2^4 \cdot 3^2) = (4+1)(2+1) = (5)(3) = 15$

144, 1
72, 2
48, 3
36, 4
24, 6
18, 8
16, 9
12, 12

} 8 pairs if we do not require the integers to be different.