

Integers with $x > y > 0$ satisfy

$$x + y + xy = 80$$

What is x ?

$$(x + xy) + y = 80$$

$$\Rightarrow x(1+y) + y = 80$$

$$\Rightarrow x(1+y) + y + 1 - 1 = 80$$

$$\Rightarrow x(1+y) + (1+y) = 81$$

$$\Rightarrow (y+1)(x+1) = 81$$

We have $1 \times 81 = 81$ ①

$$3 \times 27 = 81$$
 ②

$$9 \times 9 = 81$$
 ③

$$x > y \Rightarrow x+1 > y+1$$

If ① then $y+1 = 1 \Rightarrow y = 0$

If ② then $y+1 = 3 \Rightarrow y = 2$

$$x+1 = 27 \Rightarrow x = 26$$

Impossible
since $y > 0$

Yes

IF ③ then $y+1 = 9$
 $x+1 = 9 \Rightarrow x=y=8$ impossible
since
 $x \neq y$

So $x = 26$