2. **In this question you should show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

Given

$$\frac{9^{x-1}}{3^{y+2}} = 81$$

express y in terms of x, writing your answer in simplest form. 2021

(3)

The trick here is to notice that 9 and 81 are all powers of 3. $9 = 3^2$ $81 = 3^4$.

So we can write

$$\frac{9^{x-1}}{3^{y+2}} = 8 \Rightarrow \frac{(3^2)^{x+1}}{3^{y+2}} = 3^4 \qquad (x^m)^n = x^{mn}$$

$$\Rightarrow \frac{3^{2x-2}}{3^{y+2}} = 3^4 \qquad \frac{x^a}{x^b} = x^{a-b}$$

$$\Rightarrow 3^{(2x-2)-(y+2)} = 3^4$$

$$\Rightarrow 3^{(2x-y-4)} = 3^4$$

But we can equate power of 3 on both sides

$$2x - y - 4 = 4$$

$$\Rightarrow \underline{y = 2x - 8}$$