So it's $= \dfrac{\frac{1}{4}}{1-\frac{1}{2}} = \dfrac{1}{2}$

The first series $= \displaystyle\sum_{n=1}^{\infty} \frac{n}{2^n} = \sum_{n=0}^{\infty} \frac{n}{2^n} = \sum_{n=0}^{\infty} n\left(\frac{1}{2}\right)^n$

We can use $\displaystyle\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$ for $|x| < 1$

Differentiate both sides to get

$$\sum_{n=0}^{\infty} n x^{n-1} = \frac{1}{(1-x)^2}$$

Multiply both sides by x :

$$\sum_{n=0}^{\infty} n x^{n} = \frac{x}{(1-x)^2} \qquad \text{converges for } |x| < 1$$

Letting $x = \frac{1}{2}$, we get

$$\sum_{n=0}^{\infty} n\left(\frac{1}{2}\right)^n = \frac{\frac{1}{2}}{\left(1-\frac{1}{2}\right)^2} = \frac{\frac{1}{2}}{\frac{1}{4}} = 2$$

$\therefore \quad E(X) = 2 + 0.5 = 2.5$ //