If $\frac{1+3p}{3}$, $\frac{1-p}{4}$ and $\frac{1-2p}{2}$ are the probabilities of three mutually exclusive events, then the set of all values of p is

Let $P(A)=\frac{1+3p}{3}$, $P(B)=\frac{1-p}{4}$, $P(C)=\frac{1-2p}{2}$

As A, B and C are three mutually exclusive events

$\therefore \quad P(A)+P(B)+P(C)\le 1$

$\Rightarrow \quad \frac{1+3p}{3}+\frac{1-p}{4}+\frac{1-2p}{2}\le 1$

$\Rightarrow \quad 4+12p+3-3p+6-12p\le 12$

$\Rightarrow \quad 3p\ge 1 \Rightarrow p\ge 1/3$

Also $0\le P(A)\le 1 \Rightarrow 0\le \frac{1+3p}{3}\le 1$

$\Rightarrow \quad 0\le 1+3p\le 3$

$\Rightarrow \quad -\frac{1}{3}\le p\le \frac{2}{3}$

$$0 \le P(B) \le 1 \Rightarrow 0 \le \frac{1-p}{4} \le 1$$

$$\Rightarrow \quad 0 \le 1-p \le 4$$

$$\Rightarrow \quad -3 \le p \le 1 \qquad \ldots \text{(iii)}$$

$$0 \le P(C) \le 1 \Rightarrow 0 \le \frac{1-2p}{2} \le 1 \Rightarrow -\frac{1}{2} \le p \le \frac{1}{2} \qquad \ldots \text{(iv)}$$

Combining (i), (ii), (iii) and (iv), we get $\frac{1}{3} \le p \le \frac{1}{2}$