Question 18748 Hi, the topic is Probability Density Function of a random variable.

For each of the following, find the constant c so that p(x) satisfies the condition of being a probability density function of a random variable X: I. $p(x) = c(2/3)^x$, $x \in N$ II.$p(x) = cx, x \in \{1, 2, 3, 4, 5, 6\}$

I've been figuring this for couple of days. **Solution.** In fact, $p(x)$ is rarely called probability density function. It is just distribution of a r.v., $p(x) = P(X = x)$.
We are to verify two conditions: 1) $p(x) \geq 0$ and $\sum\limits_{x \in N} p(x) = 1$.So,

a) $c > 0$ and $\sum\limits_{x \in N} p(x) = c \sum\limits_{x \in N} (2/3)^x = c\dfrac{2/3}{1/3} = 2c = 1$, thus $c = 1/2$. Remark: this is the case when $0 \notin N$(2 definitions of natural numbers are used in mathematics,), if $0 \in N$, then $\sum\limits_{x \in N} p(x) = c \sum\limits_{x \in N} (2/3)^x = 3c$, thus $c = 1/3$.

b) $\sum\limits_{x \in \{1,2,3,4,5,6\}} cx = c\dfrac{6 \cdot 7}{2} = 21c$, thus $c = 1/21$.