You are given that the probability generating function of a random variable $X$ is

$$P_X(z) = \frac{1}{4-3z} = (4-3z)^{-1}$$

Find the second raw moment of $X$.

A. 3 B. 9 C. 12 D. 18 E. 21

$P'(1) = EX$, $P''(1) = E[X(X-1)] = E(X^2) - EX$

so $E(X^2) = P''(1) + P'(1)$

$P'(z) = 3(4-3z)^{-2}$ $\quad P''(z) = 18(4-3z)^{-3}$

$P'(1) = 3(4-3)^{-2}$ $\quad P''(1) = 18(1)$

$= 3$

$E(X^2) = 18 + 3 = 21$