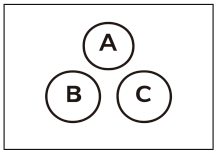
M Negative Binomial Random Variable M



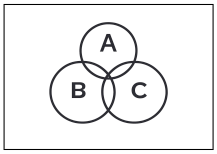
$p = 0.5$

$r = 2$

$n = 3$

$P(X = n) = \binom{n-1}{r-1} p^r (1-p)^{n-r}$

$P(X = 3) = ?$



$P(X = 3) = \binom{3-1}{2-1} (0.5)^2 (0.5)^{3-2}$

$P(X = 3) = \binom{2}{1} (0.5)^3$

$P(X = 3) = 2 \times 0.125$

$P(X = 3) = \boxed{0.25}$

$P = 0.6$

$r = 10$

$E[Y] = ?$

$\text{Var}(Y) = ?$

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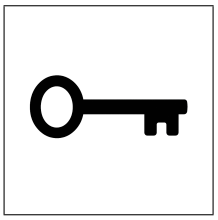

$P = 0.6$
$r = 10$
$E[Y] = ?$
$\text{Var}(Y) = ?$

$$E[Y] = \frac{r(1-p)}{p}$$

$$E[Y] = \frac{10\,(1-0.6)}{0.6}$$

$$E[Y] = \frac{10 \cdot 0.4}{0.6}$$

$$E[Y] = \frac{4}{0.6}$$

$$E[Y] = \frac{20}{3}$$

$$E[Y] \approx \boxed{6.667}$$

$$\text{Var}(Y) = \frac{r(1-p)}{p^2}$$

$$\text{Var}(Y) = \frac{10\,(1-0.6)}{0.6^2}$$

$$\text{Var}(Y) = \frac{10 \cdot 0.4}{0.36}$$

$$\text{Var}(Y) = \frac{4}{0.36}$$

$$\text{Var}(Y) = \frac{100}{9}$$

$$\text{Var}(Y) \approx \boxed{11.111}$$