

N

Negative Binomial Random Variable

N



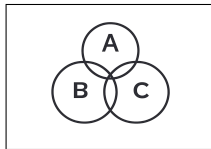
$$p = 0.5$$

$$r = 2$$

$$n = 3$$

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

$$P(X = 3) = ?$$

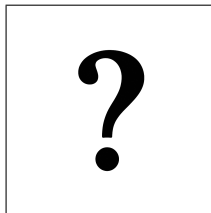


$$P(X = 3) = \binom{3-1}{2-1} (0.5)^2 (0.5)^{3-2}$$

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

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

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



$$p = 0.2$$

$$n = 7$$

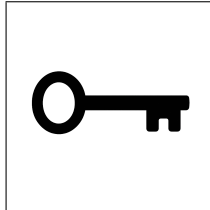
$$r = 3$$

$$P(X = n) = ?$$

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$$\begin{aligned}p &= 0.2 \\n &= 7 \\r &= 3 \\P(X = n) &= ?\end{aligned}$$

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

$$P(X = 7) = \binom{7-1}{3-1} (0.2)^3 (0.8)^{7-3}$$

$$P(X = 7) = \binom{6}{2} (0.2)^3 (0.8)^4$$

$$P(X = 7) = 15 \times (0.2)^3 \times (0.8)^4$$

$$P(X = 7) = 15 \times 0.008 \times 0.4096$$

$$P(X = 7) \approx \boxed{0.04915}$$