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Discrete Distribution Negative Binomial

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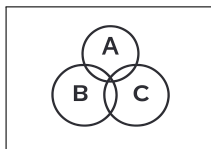
$$p = 0.5$$

$$r = 2$$

$$n = 3$$

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

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

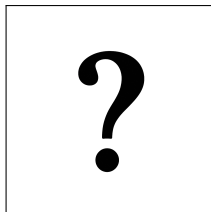


$$P(X = 3) = \binom{3-1}{2-1} (0.5)^2 (0.5)^{3-2}$$

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

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

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

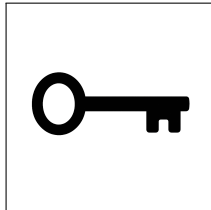


$$r = 5$$

$$p = 0.2$$

$$P(X = 15) = ?$$

23

Discrete Distribution
Negative Binomial

$$\begin{aligned} r &= 5 \\ p &= 0.2 \\ P(X = 15) &= ? \end{aligned}$$

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

$$P(X = 15) = \binom{15-1}{5-1} (0.2)^5 (0.8)^{15-5}$$

$$P(X = 15) = \binom{14}{4} (0.2)^5 (0.8)^{10}$$

$$P(X = 15) = 1001 \times (0.2)^5 \times (0.8)^{10}$$

$$P(X = 15) \approx 1001 \times 0.00032 \times 0.107374$$

$$P(X = 15) \approx \boxed{0.0344}$$