How do I calculate geometric probabilities?

Dead Batteries - This is not a binomial probability because the trials are not independent.

Sampling W/O Replacement

We can use a binomial setting if the sample is less than or = to 10% of population.

B.I.T.S. → Geometric

↓

Goal: Count # of trials until we get a success.

Monopoly

Y = # of attempts it takes to roll doubles once

$P(Y=1)$ → Probability I roll doubles on 1st roll.

$$P(Y=1) = \frac{1}{6}$$

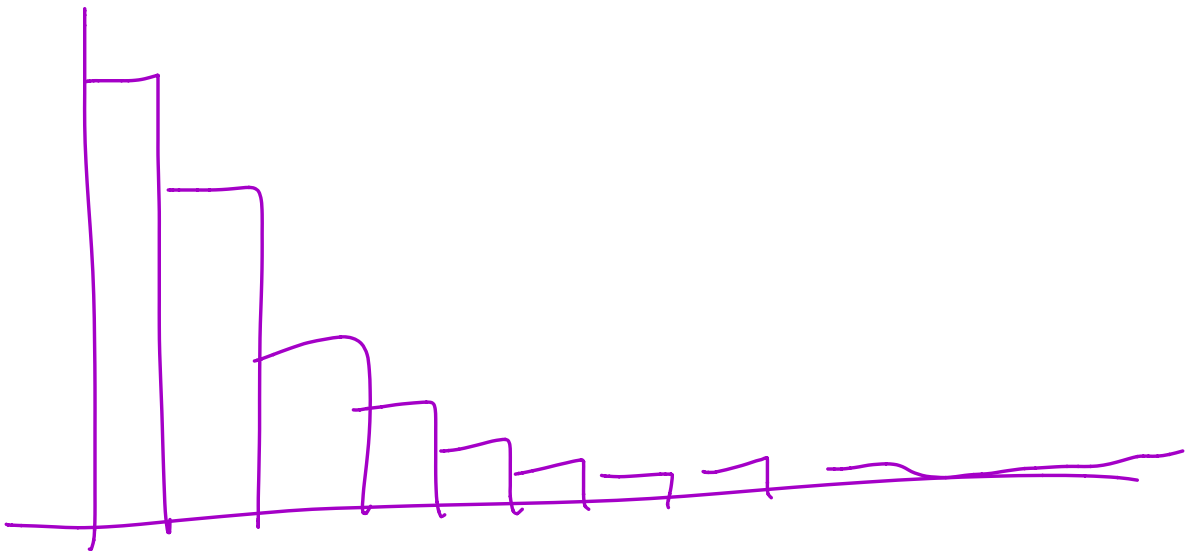
$$P(Y=2) = \frac{5}{6} \cdot \frac{1}{6} = \frac{5}{36}$$

$$P(Y=3) = \frac{5}{6} \cdot \frac{5}{6} \cdot \frac{1}{6} = \frac{25}{216}$$

$$\left(\frac{5}{6}\right)^2 \cdot \left(\frac{1}{6}\right)^1$$

$$P(Y=4) = \left(\frac{5}{6}\right)^3 \left(\frac{1}{6}\right)^1 = \frac{125}{1296}$$

$$P(Y=10) = \left(\frac{5}{6}\right)^9 \left(\frac{1}{6}\right)^1 = \frac{5^9}{6^{10}}$$



Overall pattern

$$P(Y=a) = (1-P)^{a-1} \cdot P$$

Mean of geometric random variable (Expected Value)

$$\mu_Y = \frac{1}{P}$$

(b) $P(Y>3) = 1 - [P(Y=3) + P(Y=2) + P(Y=1)]$

$$= 1 - \left(\frac{5}{6}\right)^2 \cdot \left(\frac{1}{6}\right) - \frac{5}{6} \cdot \frac{1}{6} - \frac{1}{6}$$

$$= \frac{125}{216} \approx 0.5787$$

If a player tried to get out of jail many, many times by rolling doubles, about 58% of the time it would take her more than 3 attempts.

83/84

p. 400

NSpire

A14

p. 405: 87, 93, 94, 95, 98

Quiz 6.3

2a. $0.76^4 \cdot 0.24^1 \approx 0.0801$

2b. $P(X \geq 5) = 1 - P(X \leq 4)$

0.3336

3a. binomial $n = 15$ $p = 0.20$

$$_{15}C_3 (0.2)^3 (0.8)^{12}$$

3b. $P(X=0) + P(X=1) + P(X=2) + P(X=3)$

$_{15}C_0 \cdot .2^0 \cdot .8^{15} + {}_{15}C_1 \cdot .2^1 \cdot .8^{14} + {}_{15}C_2 \cdot .2^2 \cdot .8^{13} +$

$_{15}C_3 \cdot .2^3 \cdot .8^{12} \approx 0.6482$

3c. $\mu = np \rightarrow 15(.2) = 3$

$\sigma = \sqrt{15 \cdot .2 \cdot .8} = 1.55$