

Lecture 7, slide 11

Binomial = prob. of getting X successes in n trials

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

Die rolled 10 times. What's the prob. it shows the number 6 exactly 5 times?

$$n = 10$$

$$p = \frac{1}{6}$$

$$x = 5$$

$$P(X=5) = \binom{10}{5} \left(\frac{1}{6}\right)^5 \left(1 - \frac{1}{6}\right)^{10-5}$$

$$= .013$$

2) What is the prob. it does not show the number 1 at all?

$$P(\text{does not show a 1}) = P(X=0)$$

$$p = \frac{1}{6}, n = 10$$

$$P(X=0) = \binom{10}{0} \left(\frac{1}{6}\right)^0 \left(1 - \frac{1}{6}\right)^{10-0}$$

$$= .162$$

3) What is the prob. that it shows the no. 4 less than 2 times.

$$P(X < 2) = P(X=0) + P(X=1)$$

$$= \binom{10}{0} \left(\frac{1}{6}\right)^0 \left(1 - \frac{1}{6}\right)^{10-0} + \binom{10}{1} \left(\frac{1}{6}\right)^1 \left(1 - \frac{1}{6}\right)^{10-1}$$

$$P(X < 2) = .485$$

Q2 keep having children until you have a boy. What is the prob. a couple have $\frac{5}{9}$ children?

$$P(G), P(G), P(G), P(G), P(B) = .5^5$$

$$= .03125$$

Geometric: no. of trials until 1st success.

$$f(x) = (1-p)^{x-1} \cdot p \quad \text{for } x=5$$

$$(1-.5)^4 \cdot .5$$

$$\text{ans} = .03125$$

ii) 8 couple take their approach. What is the prob. that more than 2 of these couples have 5 children?

$$P(X > 2) = 1 - [P(X=0) + P(X=1) + P(X=2)]$$

$$= 1 - \left[\binom{8}{0} (.03125)^0 (1-.03125)^{8-0} + \binom{8}{1} (.03125)^1 (1-.03125)^{8-1} + \binom{8}{2} (.03125)^2 (1-.03125)^{8-2} \right]$$

$$= 1 - .9847$$

$$\approx .0152$$

Lecture 8 slide 4

$p = .3$ (prob. of getting disease). What is the prob. the 10th child exposed is the 4th to catch it?

X represents the no. of children exposed, $r =$ no. of children who catch it.

$$X = 10, r = 4, p = .3$$

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

$$P(X=10) = \binom{10-1}{4-1} (.3)^4 (1-.3)^{10-4}$$

$$= 84 (.0081) \cdot .1177$$

$$\text{ans} = .08$$

L8 slide 8

$$P(X=x) = \frac{\binom{M}{x} \binom{N-M}{n-x}}{\binom{N}{n}}$$

$$X = 4, N = 42$$

$$M = 6, n = 6$$

$$P(X=4) = \frac{\binom{6}{4} \binom{42-6}{6-4}}{\binom{42}{6}}$$

$$\text{ans} = .0018$$

slide 10

2 illegal tablets & 8 pills in a bottle.

Randomly select 3 pills. What's the prob. the illegal drug is selected?

$N = 10$ total tablets
 $M = 2$ total illegal
 $n = 3$ select 3

$$P(X \geq 1) = 1 - P(X=0)$$

$$= 1 - \frac{\binom{8}{3} \binom{2}{0}}{\binom{10}{3}} = 1 - .146$$

$$\text{ans} = .853$$