Review session today 4:30 Sieg 134

Joint distributions.

X, Y, Z

Joint prob mass fn

$$P_{XY}(x,y) = Pr(X=x, Y=y) \qquad \sum_{x \in \Omega_X} \sum_{y \in \Omega_Y} P_{XY}(x,y) = 1$$

Joint Cumulative Distn Fn

$$F_{XY}(x,y) = Pr(X \leq x, Y \leq y) = \sum_{a \leq x} \sum_{b \leq y} P_{XY}(a,b)$$

100 random voters $\qquad R, \quad D, \quad L$

prob $\qquad p_R \quad p_D \quad p_L \qquad p_R + p_D + p_L = 1$

X_D # votes for democrats

X_R # republicans

$$P_{X_D X_R}(d,r) = Pr(X_D = d, X_R = r) = \underbrace{\frac{n!}{d!\,r!\,(n-r-d)!}}_{\binom{100}{d}\binom{100-d}{r}} p_D^{d}\, p_R^{r}\, p_L^{100-d-r}$$

$$p_D^{d}\, p_R^{r}\, p_L^{100-d-r}$$

$p_{XY}(x,y)$

$X \backslash Y$	1	2	$p_X(x)$
1	$1/13$	$4/13$	$5/13$
2	0	$7/13$	$7/13$
3	0	$1/13$	$1/13$
$p_Y(y)$	$1/13$	$12/13$	

$p_X(1)$

marginal distn of X (given $p_{XY}(x,y)$

$$p_X(x) = \sum_{y \in \Omega_Y} p_{XY}(x,y)$$

random vars X and Y are independent

if $$p_{XY}(x,y) = p_X(x)\, p_Y(y) \quad \forall x,y$$

$$Pr(X=x, Y=y) = Pr(X=x)\, Pr(Y=y)$$

g fn of 2 vars.

$$\underline{E(g(X,Y))} = \sum_{(x,y) \in \Omega_X \times \Omega_Y} g(x,y)\, p_{XY}(x,y)$$

$p_{XY}(x,y)$

$X \backslash Y$	1	2	$p_X(x)$
1	$1/13$ -2	$4/13$ -5	$5/13$
2	0	$7/13$	$7/13$
3	0	$1/13$	$1/13$
$p_Y(y)$	$1/13$	$12/13$	

$g(x,y) = x^2 - 3y$

Bag with N candies (r types)

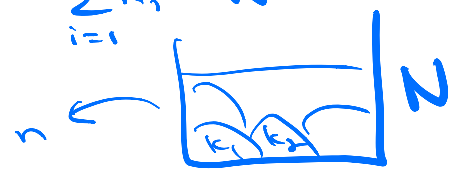
k_1 candies of type 1

k_2 2

$\vdots$

k_r of type r

$$\sum_{i=1}^{r} k_i = N$$



Reach into bag and draw n candies without replacement.

X_i: # of candies of type i drawn

$$p_{X_1,\ldots,X_r}(x_1,\ldots,x_r) = \Pr(X_1 = x_1, X_2 = x_2, \ldots, X_r = x_r)$$

$$= \frac{\binom{k_1}{x_1}\cdot\binom{k_2}{x_2}\cdots\binom{k_r}{x_r}}{\binom{N}{n}}$$