STA 250, Summer 2013, Test #1

10 **1** a) $S \to \{R_L R_R, R_L Y_L, R_L Y_R, R_L B_L, R_L B_R$
$R_R Y_L, R_R Y_R, R_R B_L, R_R B_R$
$N = 15 = C_2^6$ $Y_L L_R, Y_L B_L, Y_L B_R$
$Y_R B_L, Y_R B_R$
5 b) $P(\text{both L's}) = \frac{3}{15} = .20$ $B_L B_R\}$

8 **2** a) $N = C_4^{18}$ $P(3m, 1w) = \frac{C_3^{10} \times C_1^8}{C_4^{18}} = \frac{(120)(8)}{3060} \approx .314$

8 b) $P(\text{Same Gender}) = P(4m, 0w) + P(0m, 4w) = \frac{C_4^{10} \times C_0^8}{C_4^{18}} + \frac{C_0^{10} \times C_4^8}{C_4^{18}} = \frac{(210)(1)+(1)(70)}{3060} \approx .09$

10 c) $P(J, D) = \frac{C_2^2 \times C_2^{16}}{C_4^{18}} \approx \frac{(1)(120)}{3060} \approx .039$

10 **3** $N = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

$P(C????C) = \frac{3 \times 4 \times 3 \times 2 \times 1 \times 2}{6 \times 5 \times 4 \times 3 \times 2 \times 1} = .20$

10 **4** a) Tree: .45 Run → .5 I; .50 Pass → .5 I; .05 Sp → .7 I

$P(I) = .45(.5) + .50(.5) + .05(.7) = .51$

11 b) $P(\text{pass} \mid \overline{I}) = \frac{P(\text{pass} \cap \overline{I})}{P(\overline{I})} = \frac{(.5)(.5)}{.51} \approx .49$

12 **5.** $S \to \{\overset{M}{AA}, \overset{T}{AB}, \overset{M}{AC}, \overset{T}{BA}, \overset{T}{BB}, \overset{T}{BC}, \overset{T}{CA}, \overset{T}{CB}, \overset{T,M}{CC}\}$

84 $P(M) = P(\text{Same}) = \frac{3}{9}$

$P(T) = P(\text{C included}) = \frac{5}{9}$ $P(M \cap T) = \frac{1}{9} = \frac{9}{81}$

$P(M) \times P(T) = \frac{3}{9} \times \frac{5}{9} = \frac{15}{81}$ Not equal

These are not independent events

8 6 a) $Y \to$ # of successful explorations $\to$ Binomial $(n=15, p=.3)$

$P(Y=7) = C_7^{15}(.3)^7(.7)^8 \approx .084$

12 b) $E(Y) = np = 15(.3) = 4.5$

$P(Y > 4.5) = P(Y \geq 5) = 1 - P(Y < 5) = 1 - P(Y \leq 4) = 1 - .515 = .485$

12 7.

y	P(y)	"Outcome"
1	$\frac{2}{6} = \frac{5}{15}$	J
2	$\frac{4}{6}\cdot\frac{2}{5} = \frac{4}{15}$	AJ
3	$\frac{4}{6}\cdot\frac{3}{5}\cdot\frac{2}{4} = \frac{1}{5} = \frac{3}{15}$	AAJ
4	$\frac{4}{6}\cdot\frac{3}{5}\cdot\frac{2}{4}\cdot\frac{2}{3} = \frac{2}{15}$	AAAJ
5	$\frac{4}{6}\cdot\frac{3}{5}\cdot\frac{2}{4}\cdot\frac{1}{3}\cdot\frac{2}{2} = \frac{1}{15}$	AAAAJ

8 8. a) $N = C_3^6 = 20$ $\quad P(y) = \dfrac{C_y^2 \cdot C_{3-y}^4}{C_3^6}$ $\quad y = 0, 1, 2$

y	0	1	2
P(y)	$\frac{4}{20}$	$\frac{12}{20}$	$\frac{4}{20}$

8 b $\mu = E(Y) = \sum y \cdot p(y) = 0\left(\frac{4}{20}\right) + 1\left(\frac{12}{20}\right) + 2\left(\frac{4}{20}\right) = 1$ Joker

$V(Y) = E(Y^2) - \mu^2 = 0^2\left(\frac{4}{20}\right) + 1^2\left(\frac{12}{20}\right) + 2^2\left(\frac{4}{20}\right) - 1^2 = .4$

$\sigma = \sqrt{.4} \approx .63$ Jokers

10 9 $Y \to$ # of Colorblind in Sample of 50 Binomial $(n=50, p=.08)$

58 $P(Y < 3) = p(0) + p(1) + p(2)$

$= C_0^{50}(.08)^0(.92)^{50} + C_1^{50}(.08)^1(.92)^{49} + C_2^{50}(.08)^2(.92)^{48}$

$.0155 + .0672 + .1433 \approx .226$

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↳ Scaled to 150