MATH 166 EXAM 2 REVIEW FALL 2011

COUNTING

1. $$\underset{\text{3H and}}{C(13,3)} \cdot \underset{\text{2}H^c}{C(39,2)} + \underset{\text{or 4H and}}{C(13,4)} \cdot \underset{\text{1}H^c}{C(39,1)} + \underset{\text{or 5H and}}{C(13,5)} \cdot \underset{\text{0}H^c}{C(39,0)} = 241{,}098$$

2. $$\underset{\substack{\text{arrange}\\ \text{families}}}{3!} \cdot \underset{\text{Smith}}{3!} \cdot \underset{\text{Jones}}{4!} \cdot \underset{\text{Farmer}}{6!} = 622{,}080$$

3. $$9!\Big/\underset{\text{LB}}{1!} \cdot \underset{\text{BB}}{4!} \cdot \underset{\text{CS}}{2!} \cdot \underset{\text{Plants}}{1!1!} = 7560$$

4. a) $$\underset{\text{4Q and}}{C(6,4)} \cdot \underset{\text{0}Q^c}{C(9,0)} = 15$$

b) $$\underset{\text{no restr}}{C(15,4)} - \underset{\text{0P}}{C(5,0)}\,\underset{\text{4}P^c}{C(10,4)} = 1155$$

c) $$\underset{\text{3P and}}{C(5,3)} \cdot \underset{\text{1}P^c}{C(10,1)} + \underset{\text{or 1D and}}{C(4,1)} \cdot \underset{\text{3}D^c}{C(11,3)} - \underset{\text{3P and}}{C(5,3)} \cdot \underset{\text{1D}}{C(4,1)} = 720$$

5. $$\underset{\text{group 1 and}}{C(18,6)} \cdot \underset{\text{group 2 and}}{C(12,6)} \cdot \underset{\text{group 3}}{C(6,6)} = 17{,}153{,}136$$

COUNTING AND PROBABILITY

1. $$\frac{C(20,0)\,C(40,4)}{C(60,4)} = \frac{91390}{487{,}635} \left[= \frac{962}{5135} \approx .1874\right]$$

2. $$\frac{10 \cdot 10 \cdot 10 \cdot \overset{a7}{1} + \overset{a6}{1} \cdot 10 \cdot 10 \cdot 10 - \overset{a6}{1} \cdot 10 \cdot 10 \cdot \overset{a7}{1}}{10 \cdot 10 \cdot 10 \cdot 10} = \frac{1900}{10000} = .19$$

3. $$\underset{\text{color}}{C(18,1)} \cdot \underset{\text{pick 3}}{C(4,3)} \cdot \underset{\text{color}}{C(17,1)} \cdot C(4,2) \Big/ C(72,5) = 7344/13{,}991{,}544$$

4. $$\frac{5 \cdot 5 \cdot 5 - 5}{5 \cdot 5 \cdot 5} = \frac{120}{125} \left(= \frac{24}{25} = .95\right)$$

BINOMIAL PROBABILITY

1. success = defective, $N = 500$, $p = .01$
   a) $X = 0 \Rightarrow$ binompdf(500, .01, 0) = 0.0066
   b) $X = 0, 1, 2, 3, 4 \Rightarrow$ binomcdf(500, .01, 4) = .4396
   c) $X = 7, 8, \ldots 500 \Rightarrow$ 1 − binomcdf(500, .01, 6) = .2371
   d) $X = 4, 5, 6, 7 \Rightarrow$ binomcdf(500, .01, 7) − binomcdf(500, .01, 3) = .6041

2. success = correct, $N = 15$, $p = 1/3$
   a) $X = 6, 7, 8, 9 \Rightarrow$ binomcdf(15, 1/3, 9) − binomcdf(15, 1/3, 5) = .3731
   b) $\underbrace{\text{binompdf}(8, 1/3, 4)}_{4 \text{ of } 8} \cdot \underbrace{\text{binompdf}(7, 1/3, 3)}_{3 \text{ of } 7} = .1707 * .2561 = 0.0437$

Random Variables & Statistics

1. R.V. is # of points = $X \rightarrow L1$, Freq = # of students $\rightarrow L2$
   1-Varstats $L_1, L_2 \Rightarrow$ mean = 5.92 = μ since $N = 100$
   med = 7, $\sigma = 2.7191$, mode = 7. Q1 and Q3 divide the data into quartiles. 1/4 of the data is between min & Q_1, 1/4 Q to M, 1/4 m M to Q_3 and 1/4 from Q_3 to Max.

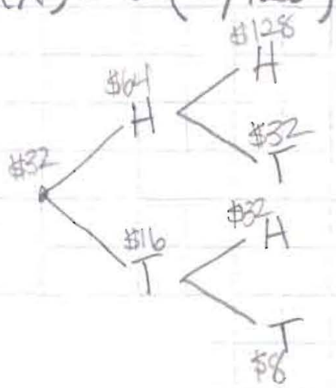
2. a) $X = 1, 2, \ldots$ Inf discrete b) $X \geq 0$ continuous
   c) $0, 1, \ldots, 100$ finite discrete

3.

EVENT	X	P(X)
2 rotten	2	C(2,2)C(8,1)/C(10,3) = 8/120
1 rotten	1	C(2,1)C(8,2)/C(10,3) = 56/120
0 rotten	0	C(2,0)C(8,3)/C(10,3) = 56/120

$E(X) = 2(8/120) + 1(56/120) + 0(56/120) = 72/120 = .6$

4.



EVENT	X	P(X)
HH	128	1/4
HT	32	1/4
TH	32	1/4
TT	8	1/4

$E(X) = 128(1/4) + 32(1/4) + 32(1/4) + 8(1/4)$

$= \$50$

5.

EVENT	X	P(X)
replace	-10,000	.01
not repl	0	.99

$E = (-10000)(.01) + (0)(.99) + \underline{120}$ premium

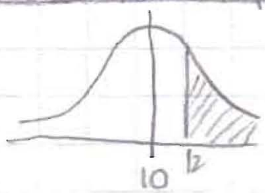
$= \$20$

6. $E(x) = \mu = N \cdot p = 500 \times .01 = 5$

$\sigma = \sqrt{N \cdot p \cdot (1-p)} = \sqrt{500 \times .01 \times (1-.01)} = \sqrt{4.95}$

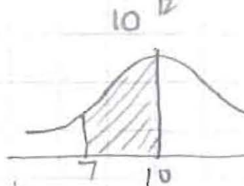
NORMAL PROBABILITY

1. a) $P(x > 12)$



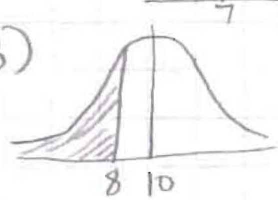
normalcdf(12, 1E99, 10, .9) = 0.0131

b) $P(7 < x < 10)$



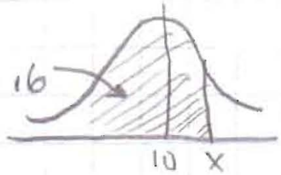
normalcdf(7, 10, 10, .9) = .4996

c) $P(x < 8)$



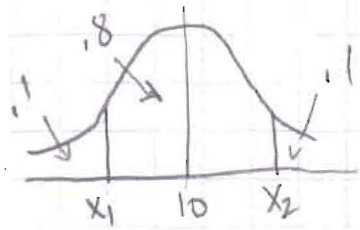
normalcdf(-1E99, 8, 10, .9) = 0.0131

d) 60^{th} percentile



invNorm(.6, 10, .9) = 10.2280 gm

e) middle 80%



x_1 = invNorm(.1, 10, .9)
= 8.8466 gm

x_2 = invNorm(.9, 10, .9)
= 11.1534 gm

f) binomial. success = over 11 gm, p = normalcdf(11, 1E99, 10, .9)
= .1333

N = 3, X = 3

binompdf(3, .1333, 3) = .0024

2. (A) k=3, so P >= 1 - 1/3^2 = 8/9 (B) 1 - 1/k^2 = .84 -> k=2.5 -> c = 2.5*1.1 = 2.75

3. mean = 500*.85 = 425, sigma = sqrt(63.75)

(A) X = 431, 432, ... 500. P = normalcdf(430.5, 500.5, 425, sqrt(63.75)) = 0.2455

(B) X = 0, 1, ..., 409. P = normalcdf(-0.5, 409.5, 425, sqrt(63.75)) = 0.0261

(C) X = 421, 422, 423, 424. P = normalcdf(420.5, 424.5, 425, sqrt(63.75)) = 0.1885