MATH 110 - EXAM 3 - SOLUTIONS

1. (a) X = # of bullseyes in 10 throws

$$\Pr(X=6) = \binom{10}{6}\left(\frac{3}{5}\right)^6\left(\frac{2}{5}\right)^4$$

$$= \frac{10\cdot 9\cdot 8\cdot 7}{4\cdot 3\cdot 2}\cdot\frac{3^6}{5^6}\cdot\frac{2^4}{5^4}$$

$$= \frac{2449440}{9765625} \approx .251$$

(b) $\Pr(X=8)+\Pr(X=9)+\Pr(X=10)$

$$= \binom{10}{8}\left(\frac{3}{5}\right)^8\left(\frac{2}{5}\right)^2 + \binom{10}{9}\left(\frac{3}{5}\right)^9\left(\frac{2}{5}\right) + \binom{10}{10}\left(\frac{3}{5}\right)^{10}$$

$$= \frac{10\cdot 9}{2}(.6)^8(.4)^2 + 10(.6)^9(.4) + 1(.6)^{10}$$

$$\approx .167$$

2. (a) expected earnings

$$= (-1)\left(\frac{1}{16}\right) + \left(\frac{-1}{2}\right)\left(\frac{3}{8}\right) + 0 \cdot \frac{1}{4} + \left(\frac{1}{2}\right)\left(\frac{1}{4}\right) + (1)\left(\frac{1}{16}\right)$$

$$= \frac{-1}{16} - \frac{3}{16} + \frac{1}{8} + \frac{1}{16} = -\frac{1}{16} \text{ //}$$

(b) casino makes $500\left(\frac{1}{16}\right) \approx \$31.25$ //

3. (a) $E(X) = (-1)(.3) + 0(.4) + 1(.1) + 2(.2)$

$$= -.3 + 0 + .1 + .4 = .2 \text{ //}$$

(b) $\sigma^2 = (-1-.2)^2(.3) + (0-.2)^2(.4) + (1-.2)^2(.1) + (2-.2)^2(.2)$

$$= (-1.2)^2(.3) + (-.2)^2(.4) + (.8)^2(.1) + (1.8)^2(.2)$$

$$\approx 1.16 \text{ //}$$

$$\sigma = \sqrt{\sigma^2} = \sqrt{1.16} \approx 1.077 \text{ //}$$

(c)

X	$Y=X^2$
-1	1
0	0
1	1
2	4

k	$Pr(Y=k)$
0	$.4$
1	$.4$
4	$.2$

//

$Pr(Y=1) = Pr(X=-1)+Pr(X=1) = .4$

$Pr(Y=0) = Pr(X=0) = .4$

$Pr(Y=4) = Pr(X=2) = .2$

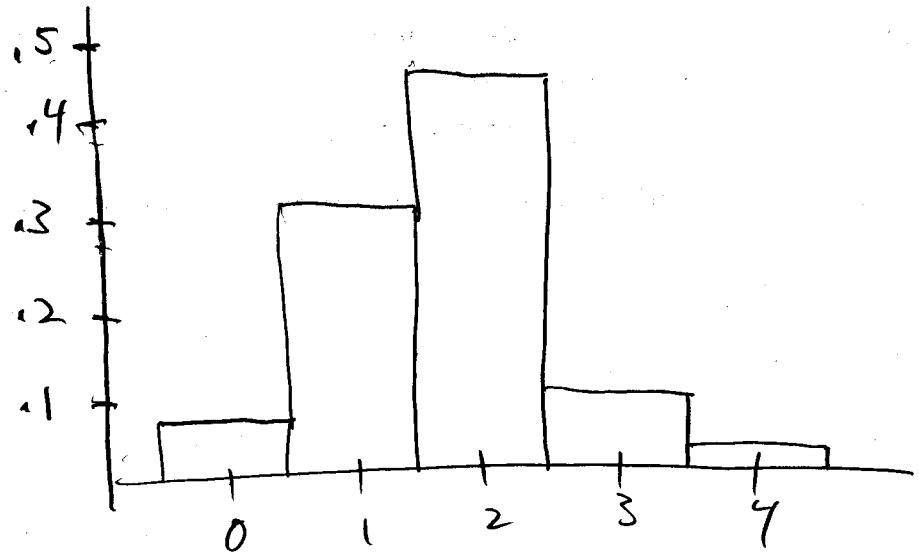
4. Total of 96 observations.

(a)

# in line	#occurrences	rel. frequency
0	8	$8/96 \approx .083$
1	28	$28/96 \approx .292$
2	46	$46/96 \approx .479$
3	11	$11/96 \approx .115$
4	3	$3/96 \approx .031$

//

(b)



(c)

$$\bar{X} = 0 \cdot \frac{8}{96} + 1 \cdot \frac{28}{96} + 2 \cdot \frac{46}{96} + 3 \cdot \frac{11}{96} + 4 \cdot \frac{3}{96}$$

$$= \frac{165}{96} \approx 1.72$$