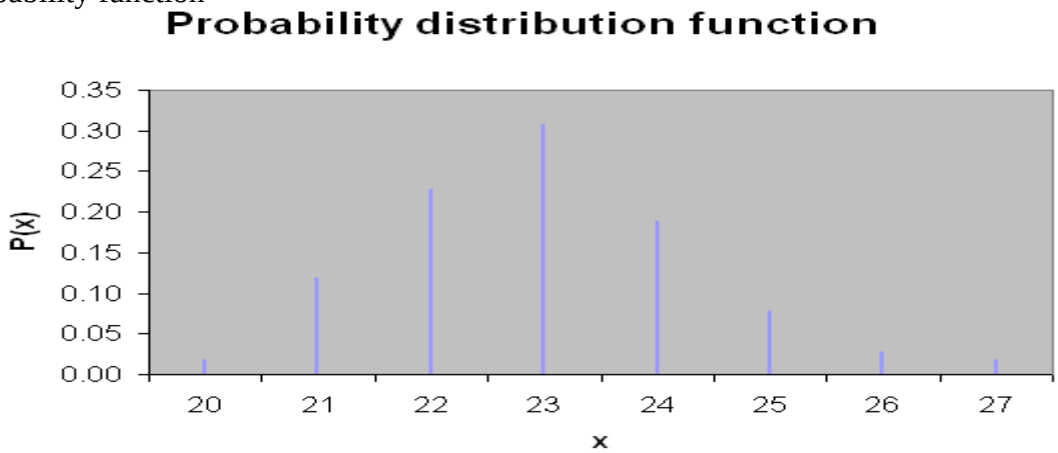
Econ 311: Problem Set #3
Suggested Solutions

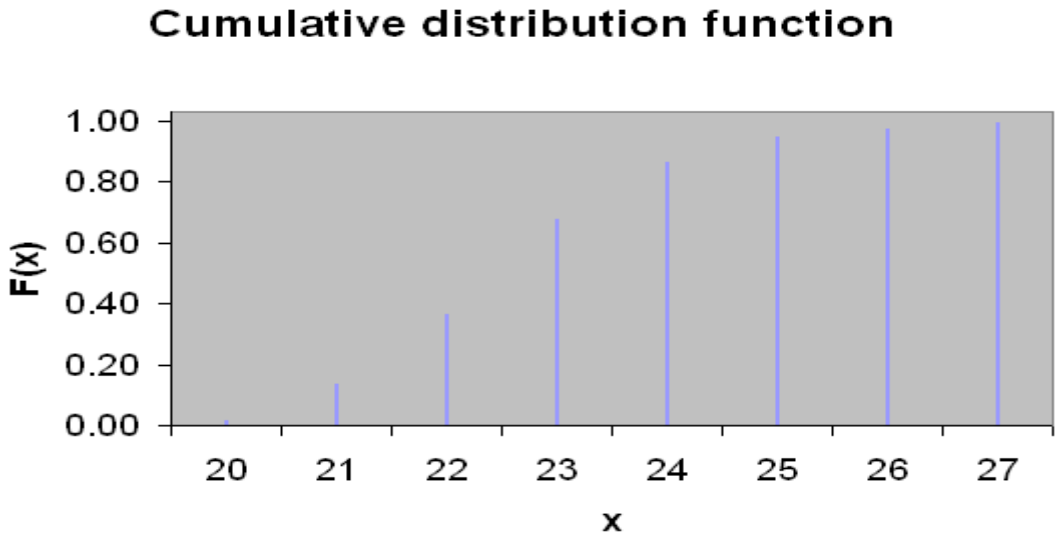
Question.1

a. Probability function



b. Cumulative probability function

x	F(x)
20	0.02
21	0.02 + 0.12 = 0.14
22	0.14 + 0.23 = 0.37
23	0.37 + 0.31 = 0.68
24	0.68 + 0.19 = 0.87
25	0.87 + 0.08 = 0.95
26	0.95 + 0.03 = 0.98
27	0.98 + 0.02 = 1.00



c. $P(x \geq 24)$ = 0.19 + 0.08 + 0.03 + 0.02 = 0.32

d. $[P(x < 23)]^2 = [P(x \leq 22)]^2 = (0.37)^2 = 0.1369$

e. μ = 22.99 riders σ^2 = 1.9899 σ = 1.4106 riders

Bus Riders	P(x)	F(x)	Mean	Variance
20	0.02	0.02	0.40	0.17880200
21	0.12	0.14	2.52	0.47521200
22	0.23	0.37	5.06	0.22542300
23	0.31	0.68	7.13	0.00003100
24	0.19	0.87	4.56	0.19381900
25	0.08	0.95	2.00	0.32320800
26	0.03	0.98	0.78	0.27180300
27	0.02	1.00	0.54	0.32160200
	1.00		22.99	1.98990000
			S.D.	1.41063815

f. Let revenue $r = 1.50x$.
$E(r) = 1.50(22.99) = 34.485$
$\sigma_r = |1.5|(1.4106) = 2.1159$

Question 2.

Binomial with n = 5 and p = 0.500000

a. P(x = 5) = .0312

b. P(x ≥ 3) = P(x =3)+P(x=4)+P(x=5) =.5

Binomial with n = 4 and p = 0.500000

c. P(x ≥ 2) =P(x=2)+P(x=3)+P(x=4) = 0.6875

d. $E(X) = np =$ 5(.5) = 2.5 wins

e. $E(X) = \mu = 1 + np =$ 1 + 4(.5) = 3 wins

Question 3.

Hypergeometric with N = 10, S= 5, and n = 6

P(x ≤ 2) = P(x=0)+P(x=1)+P(x=2)=.2619

Question 4.

a. P(x < 2) = P(x=0)+P(x =1) = .2674

b. P(x > 3) = 1 – (P(x=0)+P(x=1)+P(x=2)+ P(x = 3)) = 1 - .7360 = .2640

Poisson with mu = 2.60000

Question 5.

a. Compute marginal probability distributions for X and Y

Exercise_4.76			X_4.76				
Y_4.76		1	2	P(y)	Mean of Y	Var of Y	StDev of Y
	0	0.3	0.2	0.5	0	0.125	
	1	0.25	0.25	0.5	0.5	0.125	
P(x)		0.55	0.45	1	0.5	0.25	0.5
Mean of X		0.55	0.9	1.45			
Var of X		0.55	1.8	0.2475			
StDev of X				0.497494			
xyP(x)		0.25	0.5	0.75			
Cov(x,y) =							
sum xyP(x)-muxmuy		0.025					

b. Compute the covariance and correlation for X and Y

$$Cov(X,Y) = \sum_x \sum_y xyP(x,y) - \mu_x\mu_y = .75 - (1.45)(.5) = 0.025$$

$$\rho = Corr(X,Y) = \frac{Cov(X,Y)}{\sigma_x\sigma_y} = 0.025/(0.497)(.5) = 0.1$$

c. Compute the mean and variance for the linear function W = 2X + Y

$$\mu_W = a\mu_x + b\mu_y = (2)1.45 + (1).5$$

Var(W)=a²Var(X)+b²Var(Y)+2abCov(X,Y)=4(0.2475)+0.25+2(2)(1)(0.025)=1.34