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Subject: DSA 5400 Stat found

**1. Given the following joint probability distribution. Please evaluate**

**X Y fXY (x, y)**

**-1 -2 1/4**

**-0.5 -1 1/8**

**0.5 1 1/2**

**1 2 1/8**

Sol:

1. P(X < 0.5, Y < 1.5) = P(X=-1,Y=-2) + P(X=-0.5,Y=-1)

= 1/4 + 1/8

= 3/8

**= 0.375**

1. P(X < 0.5) = P(X = -0.5 , Y=-1) +P(X= -1 , Y=-2)

= 1/8 + 1/4 = 3/8

**= 0.375**

(c ) P(Y < 1.5) = P(Y=1, X=0.5) + P(Y=-1,X=-0.5) + P(Y=-2,X=-1)

= 1/2 +1/8 + 1/4 = 7/8

**= 0.875**

( d) P(X > 0.25, Y < 4.5) = P(X=0.5 , Y=1)+P(X=1 , Y=2)

= 1/2 + 1/8 = 5/8

**= 0.625**

(e ) E(X) = (-1)(1/4) + (-0.5)(1/8) + (0.5)(1/2) +(1)(1/8)

= -1/4 – 1/16 +1/4 +1/8

**= 0.0625**

(f) V(X) =

= 0.2822 + 0.0395 + 0.0957 + 0.1098

**= 0.5272**

**2. Determine the covariance and correlation for the following joint probability distribution.**

**X Y fXY (x, y)**

**1 3 1/4**

**1 4 1/2**

**2 5 1/8**

**4 6 1/8**

Sol:

**E(X)** = (1)\*(3/4) + (2)\*(1/8) + (4)\*(1/8) = 3/2 = 1.5

V(X) =

= 0.1875 + 0.0312 + 0.7812 = 0.999

E(Y) = (3)\*(1/4) + (4)\*(1/2) + (5)\*(1/8) + (6)\*(1/8) = 4.125

V(Y) =

=0.3164 + 0.0078 + 0.0957 + 0.4394

**V(Y) = 0.8593**

**Covariance:**

= (1)(3)(1/4) + (1)(4)(1/2) + (2)(5)(1/8) + (4)(6)(1/8) –(1.5)(4.125)

= 7 – 6.18 = 0.82

**Correlation :**

=

**3. Assume that the weights of individuals are independent and normally distributed with a mean of 165 pounds and a standard deviation of 25 pounds.**

**Suppose that 25 people squeeze into an elevator that is designed to hold 4300 pounds.**

Sol:

Given that Normal distribution

Individual , mean = 165 , Standard deviation = 25

For 25 people ,

E(Y) = (25)\* (165) = 4125

V(Y) =

**S.D** = = 125

(a) What is the probability that the load (total weight) exceeds the design limit?

Design limit = 4300 pounds

Using R statements for normal distribution ,

**P(X>4300) = 1 – pnorm(4300 , 4125 , 125)**

= 0.0807

( b ) What design limit is exceeded by 25 occupants with probability 0.001?

Using R statements for normal distribution ,

P(X>x ) = 0.001

**x = qnorm(0.999 , 4125 , 125)**

= 4511.279

**4. The weight of a small candy is normally distributed**

**with a mean of 0.2 ounce and a standard deviation of 0.01 ounce. Suppose that 20 candies are placed**

**in a package and that the weights are independent.**

Sol:

Given is a Normal distribution,

For Individual , mean = 0.2 ounce , Standard deviation = 0.01 ounce

For 20 candies ,

E(Y) = E(X1) + E(X2) +…..+ E(X20)

= (20)\* (0.2) = 4

V(Y) =

**S.D = = 0.0447**

(a) What is the probability that the net weight of a package is less than 3.5 ounces?

**Using R statements for normal distribution ,**

**P(X< 3.5) = pnorm( 3.5 , 4 , 0.0447)**

= 2.396026e-29

(b) What value will the mean weight exceed with probability 0.98?,

Using R statements for normal distribution ,

**= qnorm(0.02, 4 , 0.0447)**

**= 3.908197**