

Valencia College  
 Division of Engineering, Computer Programming and Technology  
 EGN 2440 Probability and Statistics for Engineers  
 Spring 2015  
 Instructor: Dr. Kwabena Ofose, P.E.

Quiz 4A

Name: \_\_\_\_\_

You will receive credit for showing your steps even if your final answers are incorrect.

An industrial production line has a probability of 15% of producing a defective product. A random sample of 15 products are selected for a quality control check.

1. What is the probability that 3 out of the sample of 15 will be defective? (3 points)

Binomial Distribution,  $P(X=x) = n C_x P^x (1-P)^{n-x}$   
 $n=15, p=0.15$   
 $P(X=3) = {}^{15}C_3 (0.15)^3 (0.85)^{15-3} = 0.2184$

The number of cars entering a toll booth that do not pay follows a Poisson distribution with mean of 20 per day.

2. What is the probability that less than 2 cars entering the toll booth on a given day will not pay the toll? (3 points)

$P(X=x) = \frac{\lambda^x e^{-\lambda}}{x!}, \lambda = 20$   
 $P(X < 2) = P(X=0) + P(X=1) = \frac{20^0 e^{-20}}{0!} + \frac{20^1 e^{-20}}{1!}$   
 $= 4.328 \times 10^{-8}$

3) What is the probability that at least 3 cars on a given day will not pay the tolls? (4 points)

$P(X \geq 3) = P(X=3) + P(X=4) + \dots \quad \text{OK}$   
 $= 1 - P(X < 3)$   
 $= 1 - [P(X=0) + P(X=1) + P(X=2)]$   
 $= 1 - \left[ \frac{20^0 e^{-20}}{0!} + \frac{20^1 e^{-20}}{1!} + \frac{20^2 e^{-20}}{2!} \right] = 0.9999$

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Quiz 4B

Name: \_\_\_\_\_

You will receive credit for showing your steps even if your final answers are incorrect.

An industrial production line has a probability of 15% of producing a defective product. A random sample of 15 products is selected for a quality control check.

1. What is the probability that less than 3 out of the sample of 15 will be defective? (3 points)

Binomial Dist.  $P(X=x) = {}^n C_x p^x (1-p)^{n-x}$   $n=15$   
 $p=0.15$

$$P(X < 3) = P(X=0) + P(X=1) + P(X=2)$$

$$= {}^{15}C_0 (0.15)^0 (0.85)^{15-0} + {}^{15}C_1 (0.15)^1 (0.85)^{15-1} + {}^{15}C_2 (0.15)^2 (0.85)^{15-2}$$

$$= 0.6042$$

2. What is the probability that more than 4 out of the sample of 15 will be defective? (4 points)

$$P(X > 4) = P(X=5) + P(X=6) + \dots + P(X=15) \quad \text{OR}$$

$$= 1 - P(X \leq 4)$$

$$= 1 - [P(X=0) + P(X=1) + P(X=2) + P(X=3) + P(X=4)]$$

$$= 1 - [{}^{15}C_0 (0.15)^0 (0.85)^{15} + {}^{15}C_1 (0.15)^1 (0.85)^{14} + {}^{15}C_2 (0.15)^2 (0.85)^{13} + {}^{15}C_3 (0.15)^3 (0.85)^{12} + {}^{15}C_4 (0.15)^4 (0.85)^{11}]$$

$$= 1 - 0.9382 = 0.0617$$

The number of cars entering a toll booth during the rush hour follows a Poisson distribution with a mean of 25 per hour.

3. What is the probability that exactly 15 cars enter the toll booth in the hour? (3 points)

$$\lambda = 25$$

$$P(X=x) = \frac{\lambda^x e^{-\lambda}}{x!} \Rightarrow 25$$

$$P(X=15) = \frac{25^{15} e^{-25}}{15!} = 0.00989$$