

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

Quiz 3A

Name: _____

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

A bridge engineer has to select a bridge design based on the following factors

Type: Reinforced concrete, pre-tension, steel, post-tension, composite

Cost: low, moderate, high

Traffic: less than 20,000 vehicles per day (vpd), 20,000 to 50,000 vpd, 50,000 to 100,000 vpd, greater than 100,000 vpd

Construction method: cast-in-place, prefabricated, prefab-modular

1. How many possible design scenarios are there? (2 points)

$$5 * 3 * 4 * 3 = 180$$

A lottery plays five winning numbers from 1 through 50. A number can only be played once. To win the jackpot a ticket must have all five numbers that were played.

2. What is the total number of possible tickets? (2 points)

$$50 P_5 = 254251200$$

3. For any given draw what is the number of possible winning tickets? (2 point)

$$5 P_5 = 120$$

A chemical plant manufactures an industrial solvent under three production settings, namely "slow", "medium", and "rapid". The plant runs on "slow" 20% of the time, "medium" 50% of the time, and "rapid" 30% of the time. Based on the production setting, there will always be some percentage of product that is sub-standard and will be rejected by the regulators. Overall 12% of the product is sub-standard. The engineer has data to show that 5% of product will be rejected given the plant is on "slow", and 10% will be rejected given the plant is on "medium".

4. What is the percentage of product that will be rejected given the plant is on the "rapid" setting? (4 points)

$$P(\text{reject}) = P(\text{rapid}) \cdot P(\text{reject/rapid}) + P(\text{medium}) \cdot P(\text{reject/medium}) \\ + P(\text{slow}) \cdot P(\text{reject/slow})$$

$$0.12 = 0.3 P(\text{reject/rapid}) + 0.5(0.1) + 0.2(0.05)$$

$$P(\text{reject/rapid}) = 0.2$$

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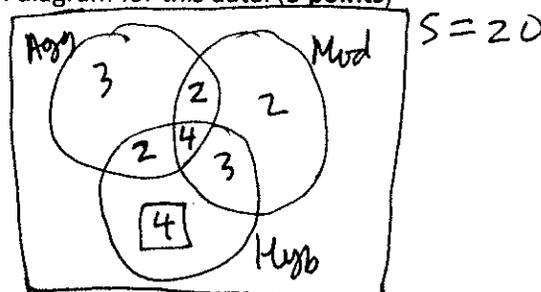
Quiz 3B

Name: _____

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

A manufacturer produces 20 styles of bolt connections for petroleum pipelines, that can be used in 3 environments, namely aggressive, moderate, and hybrid. 4 of them can be used in all 3 environments, whereas 2 can be used in aggressive and moderate only, 2 in aggressive and hybrid only, 3 in hybrid and moderate only, 3 in aggressive only, and 2 in moderate only.

1. Draw and complete the Venn diagram for this data. (3 points)



A lottery plays five winning numbers from 10 through 99. A number can only be played once. To win the jackpot a ticket must have all five numbers that were played.

2. What is the total number of possible tickets? (1 points)

$$90P_5 = 5273912160$$

3. For any given draw, what is the probability of winning this lottery? (2 point)

$$\frac{5P_5}{90P_5} = \frac{120}{5273912160}$$

A plant manufactures auto parts under three production settings, namely "slow", "medium", and "fast". The plant runs on "slow" 20% of the time, "medium" 50% of the time, and "fast" 30% of the time. Based on the production setting, there will always be some probability of a product being sub-standard and rejected by the quality assurance inspectors. The engineer has data to show that there is a 5% probability that a part will be rejected when the plant is on "slow", a 10% probability that a part will be rejected when the plant is on "medium", and a 20% probability that a part will be rejected when the plant is on "fast".

4. What is the probability that a part manufactured by this plant will fail the quality assurance test and be rejected?

(4 points)

$$\begin{aligned}
 P(\text{reject}) &= P(\text{slow})P(\text{reject}/\text{slow}) + P(\text{medium})P(\text{reject}/\text{medium}) \\
 &\quad + P(\text{fast})P(\text{reject}/\text{fast}) \\
 &= 0.2(0.05) + 0.5(0.1) + 0.3(0.2) = 0.12
 \end{aligned}$$