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

$$50 * 49 * 48 * 47 * 46 = 254,251,200$$

$$\text{or} \quad 50P5$$

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

$$5P5 = 120$$

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)**

$$P(A) = \sum_{i=1}^{n} P(B_i) P(A/B_i)$$

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

$$0.12 = (0.2)(0.05) + (0.5)(0.1) + (0.3) P(reject/rapid)$$

$$P(reject/rapid) = 0.2 \quad \text{or} \quad 20\%$$

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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)**

$S = 20$

$H\text{-only} = 20 - 16 = 4$
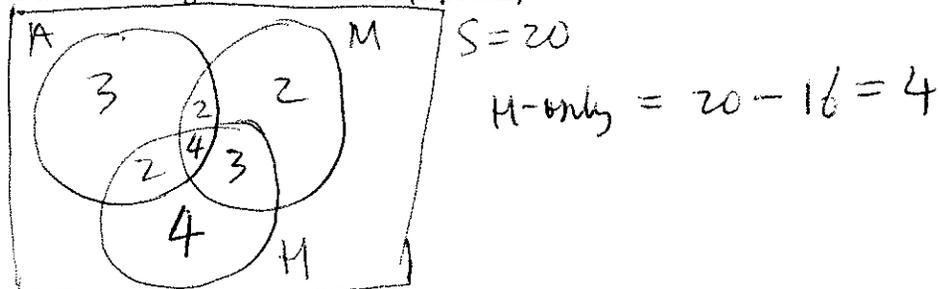
A lottery plays five winning numbers from 10 through 99. A number can only be played once. To win the jackpot a ticket must have all five numbers that were played.

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

$$90 * 89 * 88 * 87 * 86 \quad or \quad 90P5 = 5,273,912,160$$

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

$$\# \text{ of winning ticket} = 5P5 = 120$$

$$P(win) = \frac{120}{5,273,912,160} =$$

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)**

$$P(A) = \sum_{i=1}^{n} P(B_i) \cdot P(A/B_i)$$

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

$$= (0.2)(0.05) + (0.5)(0.1) + (0.3)(0.20)$$

$$= 0.12 \quad or \quad 12\% .$$