MTH 23 LECTURE NOTES (Ojakian)

Topic 7: Probability Distributions

OUTLINE

References (**Algebra Book**: None; **Statistics Book**: ch. 4.1, 4.2, 5.1)

1. Probability Distributions
2. Expectation and Standard Deviation of Probability Distributions

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1. Examples of Discrete Distributions

PROBLEM 1. *Write down the probability distributions for: 1) Rolling one die, and 2) Flipping 2 coins.*

Define: Probability Distribution

PROBLEM 2. *Let's make up an unfair die (non-uniform distribution). Then represent it as a relative frequency histogram.*

Definition 1. *A* ***Random Variable*** *is a probability distribution on a quantitative variable.*

PROBLEM 3. *From section 6.1 (5th edition), do: 3*

2. Discrete versus Continuous

PROBLEM 4. *Suppose a quantitiative variable's values can be any positive integer. Make it a Random Variable by assigning probabilities as follows:*

$$Pr(2) = 1/2 \quad Pr(4) = 1/4 \quad Pr(8) = 1/8 \quad \ldots,$$

*and the probability of the rest of the positive integers is 0. Think about why this might be a probability distribution? (***full understanding of this problem is beyond the scope of this class***)*

PROBLEM 5. *Describe the uniform distribution for real numbers choosen at random between 0 and 2. Describe the difference between a discrete and continuous probability distribution.*

Definition 2. *From section 6.1 (5th edition), do: 1*

3. Expected Value and Standard Deviation

Like the mean, except that now instead of dividing at the end, we multiply each outcome by its probability. If you repeatedly carry out the random experiment and find the average, it "should be" close to the expectation.

PROBLEM 6. *Consider the above biased die. What is the expectation? Now simulate 15 rolls of this die and find the average (using RANDBETWEEN in Excel). Is the average close to the expectation?*

(a) Expected value (of a probability distribution): Generalizes the mean

(b) Standard deviation (of a probability distribution): Generalizes the standard deviation

PROBLEM 7. *From section 6.1 (5th edition), do: 6*