MTH 23.5 LECTURE NOTES (Ojakian)

Topic 16: Discrete 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

1. Examples of Discrete Distributions

Later: Continuous

Show how to make histogram/bar graph of distribution and read histogram.

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. Expected Value

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

The mean, except that now instead of dividing at the end, we multiply each outcome by its probability.

(b) If you repeatedly carry out the random experiment and find the average, it "should be" close to the expectation.

PROBLEM 4. *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? If not, try more rolls.*

3. Standard Deviation (of probability distribution)

How spread out the value are.

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

(b) Consider formula:

i. Find mean.
ii. Subtract mean from each value.
iii. Thn square each result.
iv. And multiply by the probality of the value.
v. Sum it all (that is the variance)
vi. Square root to get the standard deviation.

(c)

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