Elementary Statistics: Math 080

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Summary

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1. Topics from Chapter 4: 4.1 - 4.4
   - Discrete random variables
   - Expectation values and standard deviations
   - The binomial distribution
   - The geometric distribution
2. Topics from Chapter 6: 6.1 - 6.4
   2.1 The normal and standard normal distributions
   2.2 Using normal distributions

Discrete Random Variables

Discrete Random Variables

A discrete random variable is a property of data that can be counted with integers.

Examples:

- Times a baby eats per day
- Number of students in a class
- The number of wins a team has in a season
- *The number of calories we ate yesterday* - We may think of this as discrete if we have to round to the nearest calorie

Discrete Random Variables

Bin	n	$P(x)$	$x * P(x)$	$(x - \mu)^2 P(x)$
0-10k	13			
10-20k	15			
20-30k	20			
30-40k	11			
40-50k	9			
50-60k	9			
60-70k	6			
70-80k	7			
80-90k	5			
90-100k	3			
100k+	2			
Totals	100			

Table 1: Wage data for 100 Los Angeles County workers.

Discrete Random Variables

$P(X)$ is a **Probability distribution function** of a discrete random variable. PDFs are tools for answering questions like:

1. What is the probability that a random individual in LA County earns yearly wages in the top 5 categories of Tab. 1?

2. What is the probability that a random individual in LA County earns yearly wages in the bottom 5 categories of Tab. 1?

3. What is the *expectation value* of Tab. 1?

4. What is the *standard deviation* of Tab. 1?

Discrete Random Variables

Bin	n	$P(x)$	$x * P(x)$	$(x - \mu)^2 P(x)$
0	45			
1	190			
2	410			
3	220			
4	80			
5	55			
Totals	1000			

Table 2: Number of cars owned by 1,000 California citizens.

Discrete Random Variables

Consider Tab. 2 above.

1. What is the probability that a random Californian has 2 or fewer cars, according to Tab. 2?

2. Suppose a random Californian owns 4 cars. How many standard deviations above the mean is this, according to Tab. 2?

Discrete Random Variables

Bin	n	$P(x)$	$x * P(x)$	$(x - \mu)^2 P(x)$
200-300k	110			
300-400k	130			
400-500k	140			
500-750k	270			
750-1000k	100			
1000k+	250			
Totals	1000			

Table 3: Values of 1,000 residential properties in Los Angeles County.

Discrete Random Variables

Consider Tab. 3 and Tab. 1 above.

1. Consider the wage distribution of Tab. 1, and consider the home value distribution of Tab. 3. What is the average home value divided by the average yearly wage? What statistical fact does this reveal?

2. Typically, residents of California devote 30-40 percent of their budget to housing. Take 35 percent as a good estimate, and apply it to the prior calculation. How many years must someone work for the average wage to purchase an average home?

3. For more data and interesting figures, see
   https://datausa.io/profile/geo/los-angeles-county-ca

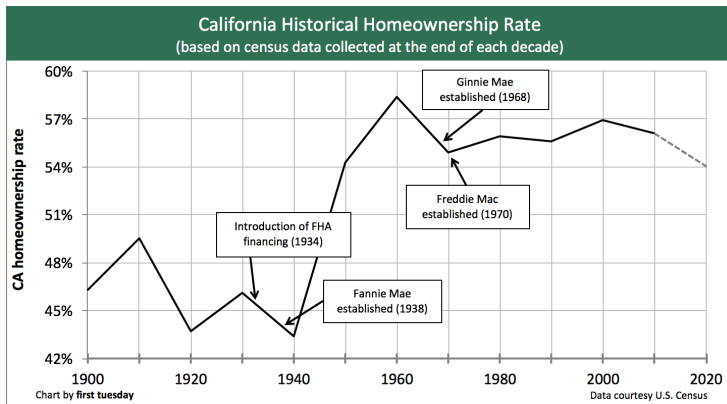# Discrete Random Variables

Figure 1: The effect of the FHA on home ownership in California across several decades.

The Binomial Distribution