Chapter 12 Probability

- 12.1 Sample Spaces and Probability
- 12.2 Independent and Dependent Events
- 12.3 Two-Way Tables and Probability
- 12.4 Probability of Disjoint and Overlapping Events
- 12.5 Permutations and Combinations
- **12.6 Binomial Distributions**



Probability Distribution

• **Definition** - a function that gives the probability of each possible value of a random variable. The sum of all the probabilities in a probability distribution must equal 1.

Experiment: The sum when rolling two 6-sided dice.

x (sum)	2	3	4	5	6	7	8	9	10	11	12
Outcomes	1	2	3	4	5	6	5	4	3	2	1
P(x)	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{5}{36}$	$\frac{1}{6}$	<u>5</u> 36	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{18}$	$\frac{1}{36}$

Random Variable x: A variable whose value is determined by the outcomes of a probability experiment.

Probability Distribution

x (sum)	2	3	4	5	6	7	8	9	10	11	12
Outcomes	1	2	3	4	5	6	5	4	3	2	1
P(x)	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	<u>5</u> 36	$\frac{1}{6}$	<u>5</u> 36	$\frac{1}{9}$	$\frac{1}{12}$	$\frac{1}{18}$	$\frac{1}{36}$

Histogram Representation of Distribution



- a) What is the most likely sum?
- b) What is the probability that the sum will be at least 10?

12.6 Binomial Distributions Binomial Distribution

• **Definition** - The probabilities of the outcomes of a *binomial experiment*.

Binomial Experiment

- There are n independent trials.
- Each trial has only two possible outcomes: **success** and **failure**.
- The probability of success is the same for each trial. This probability is denoted by p. The probability of failure is 1 – p.

For a binomial experiment, the probability of exactly k successes in n trials is:

$$P(k \text{ successes}) = {}_{n}C_{k}p^{k}(1-p)^{(n-k)}$$

Constructing a Binomial Distribution

Experiment: According to a survey, about 33% of people ages 16 and older in the U.S. own an electronic book reading device, or e-reader. You ask 6 randomly chosen people (ages 16 and older) whether they own an e-reader. Draw a histogram of the binomial distribution for your survey.

Answer: The probability that a randomly selected person has an e-reader is p = 0.33. Because you survey 6 people, n = 6. You vary k from 0 to 6 people. **Binomial Distribution for Your Survey**

$$P(k=0) = {}_{6}C_{0}(0.33)^{0}(0.67)^{6} \approx 0.090$$

$$P(k = 1) = {}_{6}C_{1}(0.33)^{1}(0.67)^{5} \approx 0.267$$

$$P(k = 2) = {}_{6}C_{2}(0.33)^{2}(0.67)^{4} \approx 0.329$$

$$P(k = 3) = {}_{6}C_{3}(0.33)^{3}(0.67)^{3} \approx 0.216$$

P(k successes) = ${}_{n}C_{k}p^{k}(1-p)^{(n-k)}$



SONY

- CHAPTER ONE -

The Boy Who Lived

Mr and Mrs Dursley, of number four, Privet Drive, wer id to say that they were perfectly normal, thank you much. They were the last people you'd expect to be red in anything strange or mysterious, because they

Mr Dursley was the director of a firm called Grunning ch made drills. He was a big, beefy man with hardly neck, although he did have a very large moustache s Dursley was thin and blonde and had nearly twice usual amount of neck, which came in very useful as spent so much of her time craning over garden

s, spying on the neighbours. The Dursleys had a son called Dudley and in their opinion there was

The Dursleys had everything they wanted, but they

o had a secret, and their greatest fear was that ver it. They didn't think the

•

t didn't hold with such nonse

o finer boy anywhere.

Constructing a Binomial Distribution





- a) What is the most likely outcome of the survey?
- b) What is the probabilitythat at most 2 people owne-readers?

 $P(k \text{ successes}) = {}_{n}C_{k}p^{k}(1-p)^{(n-k)}$