

LESSON
6.2**Study Guide***For use with the lesson "Construct and Interpret Binomial Distributions"***GOAL** Study probability distributions.**Vocabulary**

A **random variable** is a variable whose value is determined by the outcomes of a random event.

A **probability distribution** is a function that gives the probability of each possible value of a random variable.

A **binomial distribution** shows the probabilities of the outcomes of a binomial experiment.

A **binomial experiment** has n independent trials, has only two outcomes (success or failure) for each trial, and the probability for success is the same for each trial.

A probability distribution is **symmetric** if a vertical line can be drawn to divide the histogram into two parts that are mirror images.

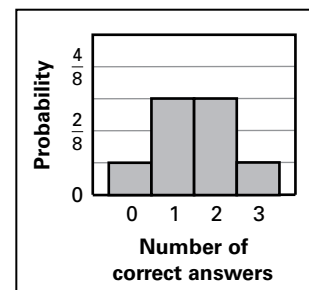
A distribution that is not symmetric is called **skewed**.

EXAMPLE 1 Construct a probability distribution

Let X be a random variable that represents the number of questions that students answered correctly on a quiz with three questions. Make a table and a histogram showing the probability distribution for X .

The possible values of X are the integers 0, 1, 2, and 3. The table shows the number of possible outcomes and $P(X)$.

X (number of correct)	0	1	2	3
Outcomes	1	3	3	1
$P(X)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

**EXAMPLE 2** Interpret a probability distribution

Use the probability distribution in Example 1 to find the probability that a student answers at least two questions correctly.

The probability that a student answers at least two questions correctly is:

$$\begin{aligned}
 P(X \geq 2) &= P(X = 2) + P(X = 3) \\
 &= \frac{3}{8} + \frac{1}{8} = \frac{4}{8} = \frac{1}{2} = 0.5
 \end{aligned}$$

LESSON
6.2**Study Guide** *continued**For use with the lesson "Construct and Interpret Binomial Distributions"***Exercises for Examples 1 and 2**

- Use the data to construct a probability distribution table and a histogram showing the probability distribution for X , a random variable that represents the number of cell phones per household.

X (number of cell phones)	0	1	2	3
Number of households	19	28	37	16

- What is the probability that a household has at least two cell phones?

EXAMPLE 3 **Construct a binomial distribution**

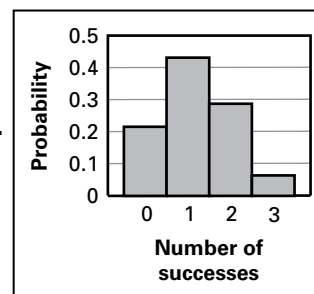
A binomial experiment consists of $n = 3$ trials with probability 0.4 of success on each trial. Draw a histogram of the binomial distribution that shows the probability of exactly k successes.

$$P(k = 0) = {}_3C_0(0.4)^0(0.6)^3 = 0.216$$

$$P(k = 1) = {}_3C_1(0.4)^1(0.6)^2 = 0.432$$

$$P(k = 2) = {}_3C_2(0.4)^2(0.6)^1 = 0.288$$

$$P(k = 3) = {}_3C_3(0.4)^3(0.6)^0 = 0.064$$

**EXAMPLE 4** **Interpret and classify a binomial distribution**

- What is the least likely outcome for the binomial distribution in Example 3?
- What is the probability when $k = 1$ in Example 3?
- Describe the shape of the binomial distribution in Example 3.

Solution

- The least likely outcome is the value of k for which $P(k)$ is smallest. This probability is smallest for $k = 3$.
- The probability when $k = 1$ is 0.432.
- The distribution is skewed because it is not symmetric about any vertical line.

Exercises for Examples 3 and 4

In Exercises 3–5 use the following information. A binomial experiment consists of $n = 4$ trials with probability 0.1 of success on each trial.

- Construct a binomial distribution that shows the probability of exactly k successes and draw a histogram of the distribution.
- Find the most likely outcome.
- Describe the shape of the binomial distribution.