12-3 Probability

Main Ideas

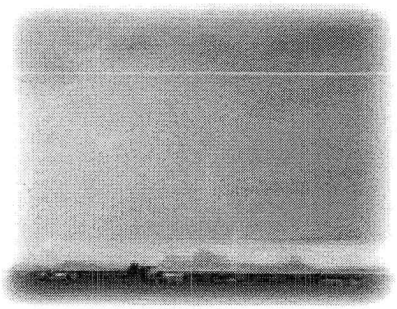
- Use combinations and permutations to find probability.
- Create and use graphs of probability distributions.

New Vocabulary

probability
success
failure
random
random variable
probability distribution
uniform distribution
relative-frequency histogram

GET READY for the Lesson

The risk of getting struck by lightning in any given year is 1 in 750,000. The chances of surviving a lightning strike are 3 in 4. These risks and chances are a way of describing the probability of an event. The **probability** of an event is a ratio that measures the chances of the event occurring.



Probability and Odds Mathematicians often use tossing of coins and rolling of dice to illustrate probability. When you toss a coin, there are only two possible outcomes—heads or tails. A desired outcome is called a **success**. Any other outcome is called a **failure**.

Reading Math

Notation When P is followed by an event in parentheses, P stands for *probability.* When there are two numbers in parentheses, P stands for *permutations.*

KEY CONCEPT *Probability of Success and Failure*

If an event can succeed in s ways and fail in f ways, then the probabilities of success, $P(S)$, and of failure, $P(F)$, are as follows.

$$P(S) = \frac{s}{s+f} \qquad P(F) = \frac{f}{s+f}$$

The probability of an event occurring is always between 0 and 1, inclusive. The closer the probability of an event is to 1, the more likely the event is to occur. The closer the probability of an event is to 0, the less likely the event is to occur. When all outcomes have an equally likely chance of occurring, we say that the outcomes occur at **random**.

EXAMPLE **Probability with Combinations**

1 **Monifa has a collection of 32 CDs—18 R&B and 14 rap. As she is leaving for a trip, she randomly chooses 6 CDs to take with her. What is the probability that she selects 3 R&B and 3 rap?**

Step 1 Determine how many 6-CD selections meet the conditions.
$C(18, 3)$ Select 3 R&B CDs. Their order does not matter.
$C(14, 3)$ Select 3 rap CDs.

Step 2 Use the Fundamental Counting Principle to find s, the number of successes.

$$C(18, 3) \cdot C(14, 3) = \frac{18!}{15!3!} \cdot \frac{14!}{11!3!} \text{ or } 297{,}024$$

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