COMPLEMENTS The event $\overline{A}$, called the *complement* of event A, consists of all outcomes that are not in A. The notation $\overline{A}$ is read as "A bar."

> **KEY CONCEPT** *For Your Notebook*
>
> **Probability of the Complement of an Event**
>
> The probability of the complement of A is $P(\overline{A}) = 1 - P(A)$.

EXAMPLE 4 **Find probabilities of complements**

DICE When two six-sided dice are rolled, there are 36 possible outcomes, as shown. Find the probability of the given event.

a. The sum is not 6.

b. The sum is less than or equal to 9.
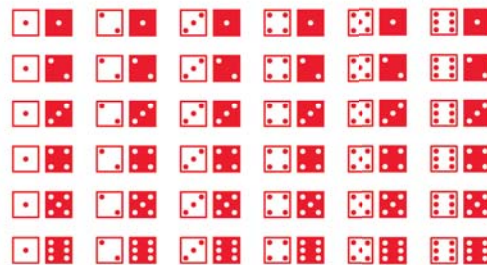
Solution

a. $P(\text{sum is not 6}) = 1 - P(\text{sum is 6}) = 1 - \dfrac{5}{36} = \dfrac{31}{36} \approx 0.861$

b. $P(\text{sum} \leq 9) = 1 - P(\text{sum} > 9) = 1 - \dfrac{6}{36} = \dfrac{30}{36} = \dfrac{5}{6} \approx 0.833$

EXAMPLE 5 **Use a complement in real life**

FORTUNE COOKIES A restaurant gives a free fortune cookie to every guest. The restaurant claims there are 500 different messages hidden inside the fortune cookies. What is the probability that a group of 5 people receive at least 2 fortune cookies with the same message inside?

Solution

The number of ways to give messages to the 5 people is 500^5. The number of ways to give *different* messages to the 5 people is $500 \cdot 499 \cdot 498 \cdot 497 \cdot 496$. So, the probability that at least 2 of the 5 people have the same message is:

$P(\text{at least 2 are the same}) = 1 - P(\text{none are the same})$

$$= 1 - \dfrac{500 \cdot 499 \cdot 498 \cdot 497 \cdot 496}{500^5}$$

$$\approx 0.0199$$

✓ **GUIDED PRACTICE** for Examples 4 and 5

Find $P(\overline{A})$.

4. $P(A) = 0.45$ **5.** $P(A) = \dfrac{1}{4}$ **6.** $P(A) = 1$ **7.** $P(A) = 0.03$

8. WHAT IF? In Example 5, how does the answer change if there are only 100 different messages hidden inside the fortune cookies?