

**Example 1** Two dice are rolled. How many ways can they land?  $\frac{6}{1st} \cdot \frac{6}{2nd} = 36$

(a) Find the probability that the sum of the dice is 6 or 7.

6: 1,5 5,1 2,4 4,2 3,3

7: 3,4 4,3 5,2 2,5 6,1 1,6

$$\frac{11}{36} = \frac{5}{36} + \frac{6}{36}$$

$P(6) \quad P(7)$

Two events are **mutually exclusive** if they have no common elements.

For mutually exclusive events,  $P(A \text{ or } B) = P(A) + P(B)$ .

(b) Find the probability that the sum of the dice is 8 or both numbers are equal.

8: 2,6 6,2 5,3 3,5 4,4

$$P(8 \text{ or } =) = \frac{10}{36} = \frac{5}{18}$$

$\frac{5}{36} + \frac{6}{36} - \frac{1}{36}$   
 $P(8) \quad P(=) \quad P(\text{both})$

If two events are not mutually exclusive,  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ .

**Example 2** Out of 200 pet owners, 103 owned dogs, 88 owned cats, 25 owned birds, and 18 owned reptiles.

(a) If 52 pet owners owned both a cat and a dog, find the probability that a randomly selected pet owner owns a cat or a dog.

$$P(\text{cat or dog}) = P(\text{cat}) + P(\text{dog}) - P(\text{both})$$

$$\frac{88}{200} + \frac{103}{200} - \frac{52}{200} = \frac{139}{200}$$

(b) Find the probability that the pet owner did not own a reptile.

$$\frac{200}{200} - \frac{18}{200} = 1 - \frac{18}{200} = \frac{182}{200} = \frac{91}{100}$$

$P(\text{pet}) \quad P(\text{reptile})$

The complement of event A (A') consists of all outcomes not in A.  $P(A') = 1 - P(A)$ .

**Example 3**  $P(A) = .3$ ,  $P(B) = .55$ , and  $P(A \text{ or } B) = .65$ . "A prime"

(a) Find  $P(A \text{ and } B)$ . Are A and B mutually exclusive events? (NO)

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$.65 = .3 + .55 - P(A \text{ and } B)$$

(b) Find  $P(B')$ .  $P(\text{Complement of } B) = 1 - P(B) = 1 - .55 = .45$