11-3 Reteaching
Probability of Multiple Events

- If Event *A* can change the way Event *B* occurs, then the events are *dependent*.
- If Event *A* cannot change the way Event *B* occurs, then the events are *independent*.

If Event *A* and Event *B* are independent, the probability of Event *A* <u>and</u> Event *B* both occurring is the product of their individual probabilities.

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

Problem

A pet store has two cages of mice. The first cage has 10 white mice—4 females and 6 males. The second cage has 10 gray mice—6 females and 4 males. Suppose you randomly choose 1 mouse from each cage. What is the probability that you choose 2 female mice?

Cage 1		Cage 2	
F	F	F	F
F	F	F	F
M	M	F	F
M	M	M	M
M	M	M	M
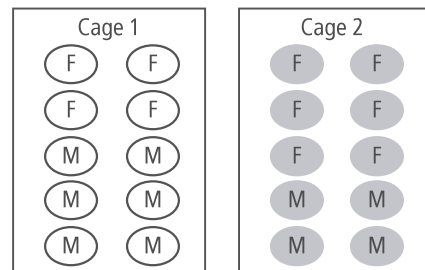
Step 1 Determine the events.
Event *A* is "you choose a white female mouse."
Event *B* is "you choose a gray female mouse."
You are looking for the probability of Event *A* <u>and</u> Event *B*.

Step 2 Decide if the events are independent.
Your choice of a white mouse does not affect your choice of a gray mouse. The events are independent.

Step 3 Use the formula.

$$P(\text{white female } \underline{\text{and}} \text{ gray female}) = P(\text{white female}) \cdot P(\text{gray female})$$
$$= \frac{4}{10} \cdot \frac{6}{10} = \frac{24}{100} = 0.24 = 24\%$$

The probability of choosing 2 female mice is 24%.

Exercises

Use the information from the problem above. You choose one mouse at random from each cage. Find each probability.

1. *P*(white male and gray male) **24%**

2. *P*(white mouse and gray male) **40%**

3. *P*(white male and gray female) **36%**

4. *P*(white male and white female) **0%**

5. *P*(white mouse and white mouse) **0%**

6. *P*(white female and gray male) **16%**

11-3 **Reteaching** (continued)
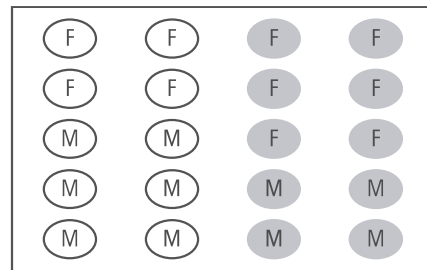
Probability of Multiple Events

The probability of Event *A* <u>or</u> Event *B* occurring is the sum of their individual probabilities, minus the probability of both events occurring.

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

- If Event *A* cannot happen at the same time as Event *B*, then the events are said to be *mutually exclusive*.
- If Event *A* and Event *B* are mutually exclusive, $P(A \text{ \underline{and} } B) = 0$.

Problem

A pet store has one cage with 20 mice. Of the 20 mice, there are 4 white females, 6 white males, 6 gray females, and 4 gray males. Suppose you randomly choose 1 mouse from the cage. What is the probability that you choose a female or a gray mouse?

Step 1 Determine the events.
Event *A* is "you choose a female."
Event *B* is "you choose a gray mouse."
You are looking for the probability of Event *A* <u>or</u> Event *B*.

Step 2 Decide if the events are mutually exclusive.
You could choose one mouse that was both female and gray at the same time. The events are not mutually exclusive.

Step 3 Use the formula.

$$P(\text{female \underline{or} gray}) = P(\text{female}) + P(\text{gray}) - P(\text{female \underline{and} gray})$$
$$= \frac{10}{20} + \frac{10}{20} - \frac{6}{20} = \frac{14}{20} = \frac{7}{10} = 0.70 = 70\%$$

The probability of choosing a female or a gray mouse is 70%.

Exercises

Use the information from the problem above. You choose one mouse at random. Find each probability.

7. $P(\text{female or white})$ **80%**

8. $P(\text{male or white})$ **70%**

9. $P(\text{male or gray})$ **80%**

10. $P(\text{white male or gray female})$ **60%**

11. $P(\text{white female or gray male})$ **40%**

12. $P(\text{white male or gray male})$ **50%**