# Exploration 9-3a: Counting Principles for "And" or "Or"

**Objective:** Calculate the number of elements in an event described by "and" or "or."

At a particular elementary school, there are 22 first-graders—12 girls and 10 boys. Suppose that one child is chosen at random from this class. Let $A$ be the event "The child is a girl," and let $B$ be the event "The child is a boy."

1. What do $n(A)$ and $n(B)$ equal, the number of ways of choosing a girl and the number of ways of choosing a boy? _____

2. What is $n(A \text{ or } B)$, the number of ways the child chosen could be a girl or a boy? _____ How does this number relate to $n(A)$ and $n(B)$?

3. Events $A$ and $B$ are said to be **mutually exclusive.** Explain what this means.

Suppose that two children are selected at random, one after the other, from this class.

4. For each way of choosing a girl, there are ten ways of choosing a boy. Find $n(A \text{ and } B)$, the number of ways of choosing a girl and a boy. How does this number relate to $n(A)$ and $n(B)$?

5. Events $A$ and $B$ are also said to be **independent.** Why do you think they are called independent?

Three of the girls and four of the boys are redheads. The figure shows Event $A$, the person chosen is a girl, and Event $C$, the person chosen is a redhead.



*A* (girls)   *C* (redheads)
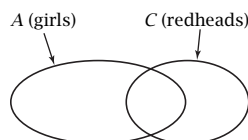
6. Write $n(C)$, the number of ways the one person chosen could be a redhead?

7. What does $n(A \text{ and } C)$ equal?

8. Events $A$ and $C$ are said to be **overlapping events.** Explain why, in this case, $n(A \text{ or } C)$ is *not* equal to $n(A) + n(C)$. How can $n(A \text{ or } C)$ be calculated from $n(A)$ and $n(C)$ for overlapping events?

9. Complete this sentence: "If $X$ and $Y$ are not mutually exclusive, then $n(X \text{ or } Y) = $ —?—."

10. Complete this sentence: "If $X$ and $Y$ are independent, then $n(X \text{ and } Y) = $ —?—."

11. What did you learn as a result of doing this Exploration that you did not know before?