**3.3 Intersection and Union of Two Sets**

**By the end of the lesson you will be able to:**

1. Define intersection and union of sets.
2. Use Principle of Inclusion and Exclusion

|  |  |  |  |
| --- | --- | --- | --- |
| **Intersection** | | **Union** | |
| “A B” reads “intersection of A and B” and represents the elements that are common to A and B, the area where the sets overlap on a Venn Diagram. | | “A B” reads “union of A and B” and represents all elements that belong to A or B, the red region on the Venn Diagram. | |
| “**A/B**” reads “A minus B” and denotes that the elements that are in set A are not in set B. This is represented by the red region in each Venn Diagram. | | | |
|  |  | |  |

**Example 1**

The athletics department at a large high school offers 16 different sports:

|  |  |  |  |
| --- | --- | --- | --- |
| Badminton  Basketball  Cross-country running  Curling | Football  Golf  Hockey  Lacrosse | Rugby  Skiing  Soccer  Softball | Tennis  Ultimate  Volleyball  Wrestling |

Determine the number of sports that require the following equipment:

1. a ball and an implement such as a stick, a club or a racquet
2. only a ball
3. an implement but not a ball
4. either a ball or an implement
5. neither a ball or an implement

|  |  |  |  |
| --- | --- | --- | --- |
| Badminton  Basketball  Cross-country running  Curling | Football  Golf  Hockey  Lacrosse | Rugby  Skiing  Soccer  Softball | Tennis  Ultimate  Volleyball  Wrestling |



**Venn Diagram**



1. a ball and an implement such as a stick, a club or a racquet

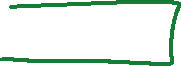


1. only a ball

**Principle of Inclusion and Exclusion**

The number of elements in a **union** between two sets is equal to the sum of the elements in each set less the number of elements in both sets (intersections).

We write this as:



1. an implement but not a ball



1. either a ball or an implement



1. neither a ball or an implement



**Example 2**

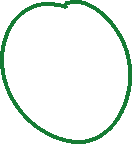
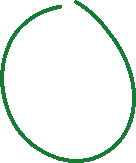
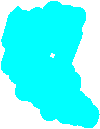
Morgan surveyed the 30 students in her mathematics class about their eating habits.

* 18 of these students eat breakfast
* 5 of the 18 students also eat a healthy lunch



* 3 students do not eat breakfast or a healthy lunch

How many students eat a healthy lunch?



**Assignment: page 69 #1-10**

**Quiz Wednesday 3.1 and 3.2**