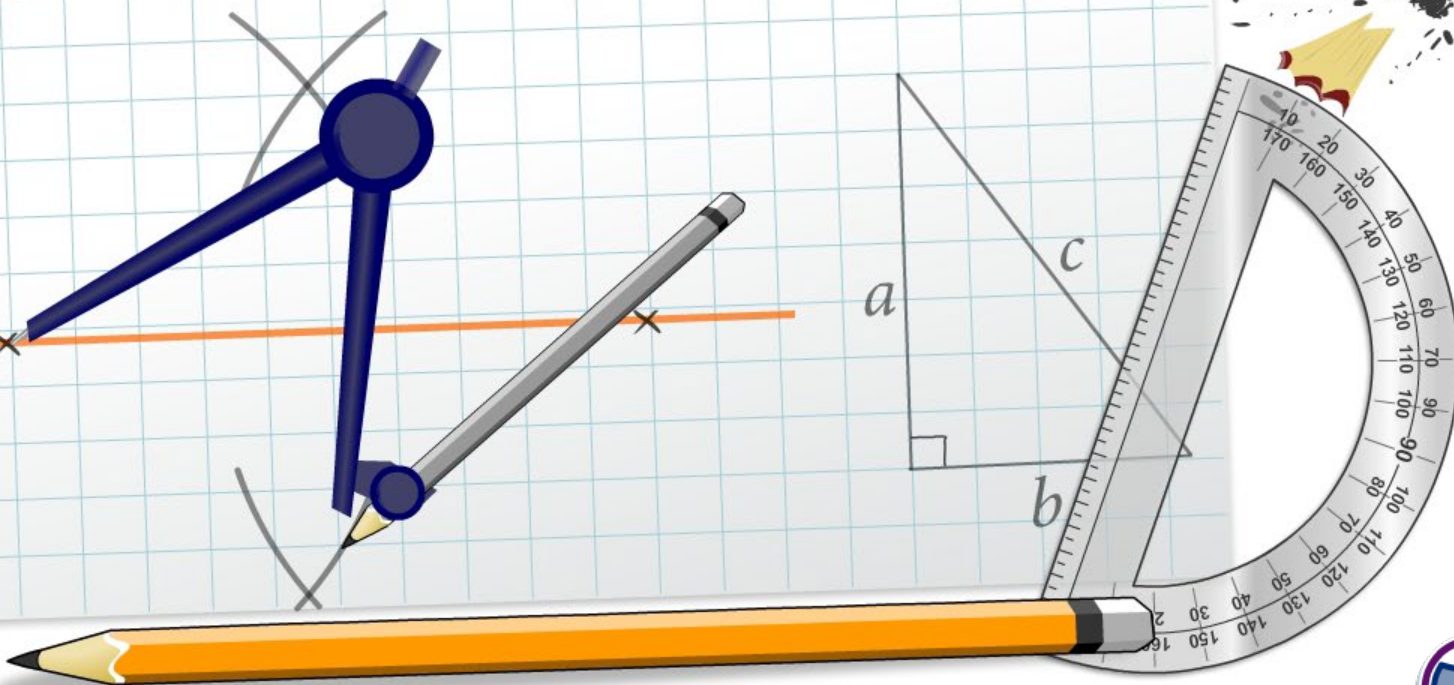


## Set Theory



## Common core icons



This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.



Slides containing examples of mathematical modeling are marked with this stamp.



This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

- 1) **Make sense of problems and persevere in solving them.**
- 2) **Reason abstractly and quantitatively.**
- 3) **Construct viable arguments and critique the reasoning of others.**
- 4) **Model with mathematics.**
- 5) **Use appropriate tools strategically.**
- 6) **Attend to precision.**
- 7) **Look for and make use of structure.**
- 8) **Look for and express regularity in repeated reasoning.**



This icon indicates that the slide contains activities created in Flash. These activities are not editable.

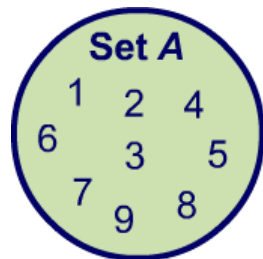


This icon indicates teacher's notes in the Notes field.



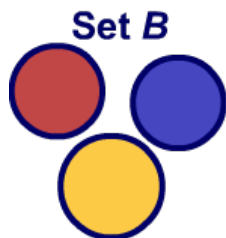
A **set** consists of objects or elements. The elements can be numbers, letters, etc. Elements are listed inside curly brackets.

Sets can have a finite or infinite number of elements, or they can be empty. Empty sets, called the null set, have no elements and are denoted by the symbol  $\emptyset$ .



$$A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

is a set of single digit positive numbers.



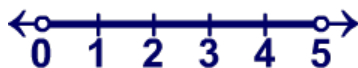
$$B = \{\text{red, yellow, blue}\}$$

is the set of primary colors

Set C

$$C = \{x | 0 < x < 5\}$$

is the set of numbers between 0 and 5



What is the set of possible outcomes from rolling a die?

$$A = \{1, 2, 3, 4, 5, 6\}$$

What is the set of possible even outcomes?

$$A_e = \{2, 4, 6\}$$



The **universal set** is the largest possible set for a given scenario. For this example,  $A$  is the universal set.

$A_e$  is a **subset** of all the possible outcomes,  $A$ , because it contains some of the elements of  $A$ . The null set is a subset of every set.

Subsets are denoted using the  $\subseteq$  symbol.  $A_e \subseteq A$



The **complement** of a set is all of the elements in the universal set but **not** in the set of interest.

Complements of sets are denoted using a prime symbol '.

**What is the complement of the set of even outcomes when rolling a die?**

universal set:  $A = \{1, 2, 3, 4, 5, 6\}$

set of even outcomes:  $A_e = \{2, 4, 6\}$

complement of set:  $A_e' = \{1, 3, 5\}$ , the set of possible odd numbers.



The **union** of two or more sets contains all the elements in all the sets.

The union of sets  $A$  and  $B$  is the elements in either set  $A$  **or**  $B$  **or** both.

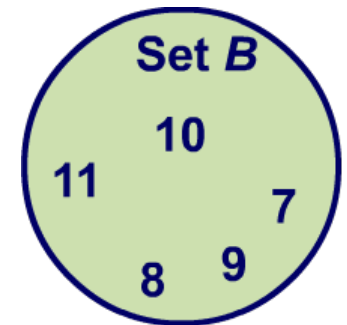
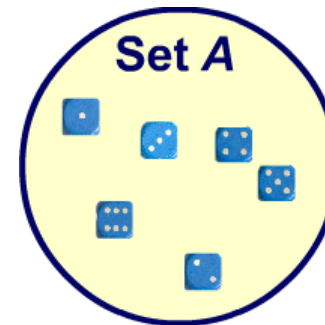
Unions of sets are denoted by the symbol  $\cup$ .

**What is the union of set  $A$ , the outcomes of rolling a dice, and set  $B$ , all positive integers between 7 and 11?**

$$\text{set } A = \{1, 2, 3, 4, 5, 6\}$$

$$\text{set } B = \{7, 8, 9, 10, 11\}$$

$$A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\}$$



The **intersection** of two or more sets contains all the elements that are in all sets.

For example, all the elements in set  $A$  and  $B$ .

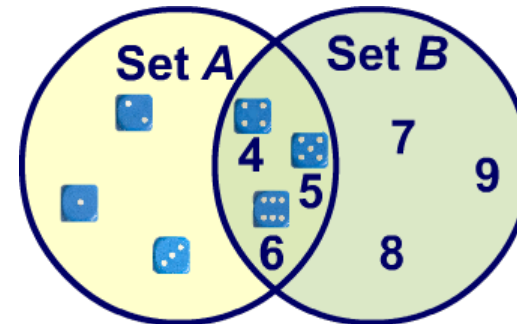
Intersections of sets are denoted by the symbol  $\cap$ .

**What is the intersection of set  $A$ , the outcomes of rolling a dice, and set  $B$ , all positive integers between and inclusive of 4 and 9?**

$$\text{set } A = \{1, 2, 3, 4, 5, 6\}$$

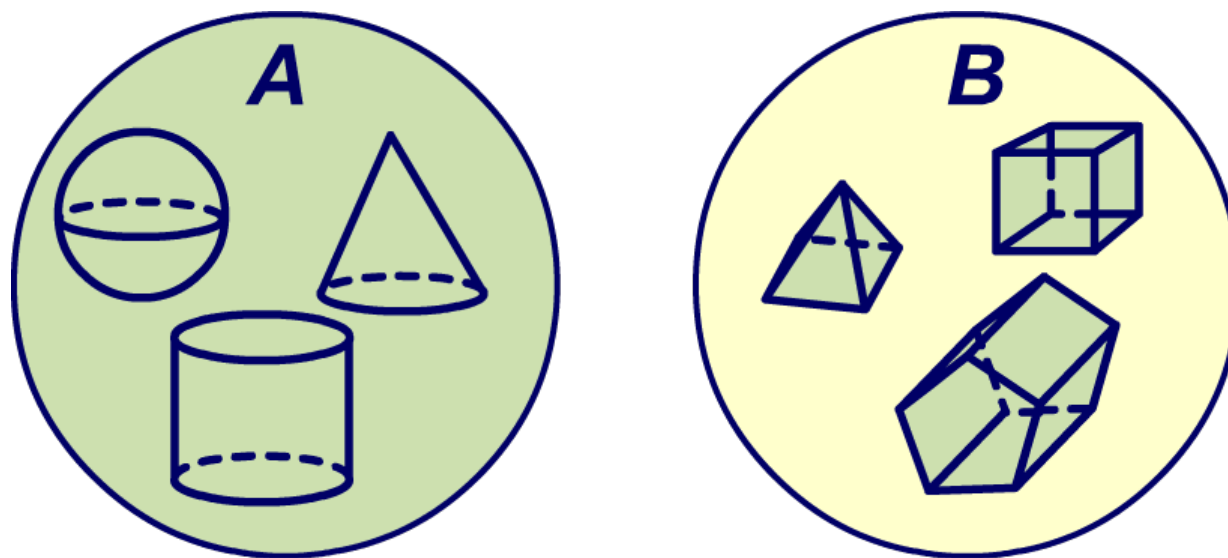
$$\text{set } B = \{4, 5, 6, 7, 8, 9\}$$

$$A \cap B = \{4, 5, 6\}$$



**Disjoint sets** are two or more sets that have no elements in common, therefore the intersection is an empty set.

For example: a set of all 3D shapes with a curved surfaces, and  $B$ , a set of all polyhedrons, are disjoint sets.




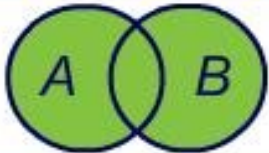
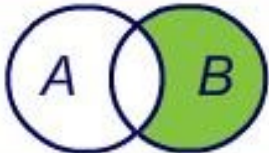
The intersection of disjoint sets is the empty set:

$$A \cap B = \emptyset$$





Arrange the words, symbols, and images into the correct rows

	notation	key word	venn diagram
union	$A'$	NOT	
intersection	$A \cup B$	AND	
complement	$A \cap B$	OR	



Venn diagrams are useful tools in showing the relationships between sets.  
Press **start** to find out more.

**start**



Let  $A$  be the set of all letters in the alphabet.  $A = \{A, B, C, \dots\}$

Let  $B$  be the set of all vowels in the alphabet.  $B = \{A, E, I, O, U\}$

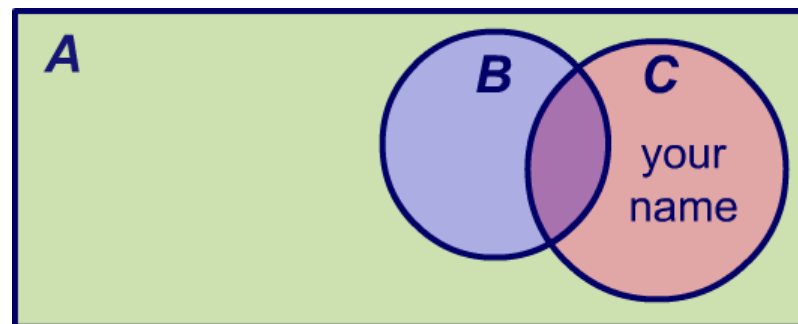
Let  $C$  be the set of all letters in your name.

**Draw a Venn diagram to represent these sets. What is the universal set and which are subsets?**

$A$  is the universal set in this scenario.

$B$  is a subset of  $A$ .

$C$  is a subset of  $A$ .



**Describe  $B'$ .**

$B'$  is the set of all consonants in the English alphabet.

**List the elements in  $B \cap C$  and  $B \cup C$ ?**



# Multiple sets

$$A = \{x \mid x = 2n\}$$

$$B = \{x \mid x = 3n\}$$

Drag the numbers into the correct sections in the Venn diagram.

Press **start** to begin.

**start**

$$C = \{x \mid 20 < x < 30\}$$

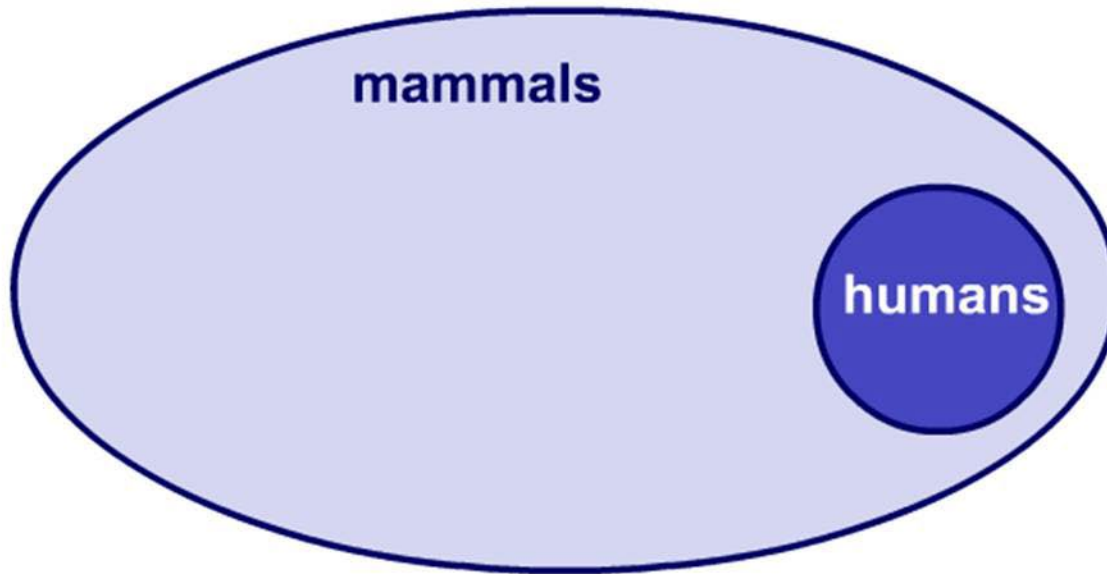
number  
section of  
the Venn diagram.



## Set theory quiz

Question: 1/7

All **humans** are **mammals**. Describe the set of humans in relation to mammals.



subset

union

intersection

complement

disjoint set

