

TOPIC: SUBSETS

Intro to Venn Diagrams

◆ A **Venn diagram** uses ovals to represent _____ and visualizes set _____.

► The **universal set**, U , contains _____ relevant to the situation or problem.

New

Venn Diagrams

Lions $[\in | \notin]$ Land Animals
Whales $[\in | \notin]$ Land Animals
Otters $[\in | \notin]$ Land Animals
Otters $[\in | \notin]$ Water Animals
 $U =$ _____
Turtles $[\in | \notin] U, 16[\in | \notin] U$

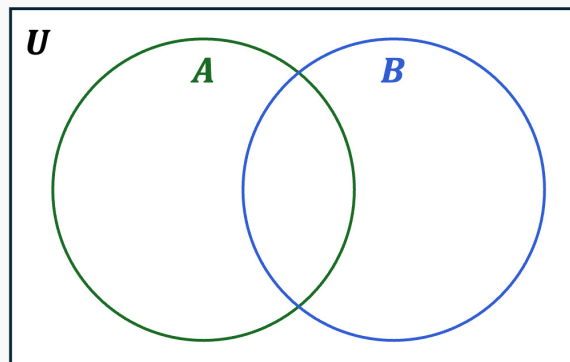
Land Animals

Water Animals

PRACTICE

Label the Venn diagram with the elements that belong in each set using

$U = \{0, 1, 2, \dots, 9\}$, $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 6, 8\}$



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EXAMPLE

Determine an appropriate universal set which contains all elements in the given sets. Multiple answers can be correct.

(A) $W = \{\text{red, yellow, orange}\}$
 $C = \{\text{blue, green, purple}\}$

$U =$ _____

(B) $E = \{\text{London, Paris, Milan}\}$
 $A = \{\text{Tokyo, Beijing, Seoul}\}$

$U =$ _____

(C) $P = \{2, 3, 5, 7, 11, \dots\}$
 $T = \{10, 20, 30, 40, \dots\}$

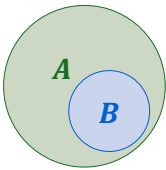
$U =$ _____

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Subsets & Proper Subsets

◆ A set, **B**, is a **Subset** (____) of set **A**, if **B** only contains _____ that are also in **A**.

► The empty set is a subset of _____.



EXAMPLE Determine if the second set is a subset of the first. If so, determine if it is a *proper* subset.

(A) $A = \text{The set of odd numbers}$ $B = \{107, 613, 45\}$ Subset? ☐ Proper Subset? ☐	(B) $E = \text{The set of European Countries}$ $F = \{\text{Poland, Spain, Mexico}\}$ Subset? ☐ Proper Subset? ☐	(C) $G = \{1, 2, 3, 4\}$ $H = \{1, 2, 3, 4\}$ Subset? ☐ Proper Subset? ☐	(D) $G = \{1, 2, 3, 4\}$ $N = \emptyset$ Subset? ☐ Proper Subset? ☐
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◆ A **Proper** Subset (____) is any subset of *A* that is not equal to *A* itself.

PRACTICE Determine if each statement is true or false. If false, make it true using one of the symbols: $\subset$, $\subseteq$, $\not\subseteq$.

(A) $\{2, 4\} \subseteq \{1, 2, 3, 4, 5\}$ [TRUE FALSE]	(B) $\{a, b, c\} \subseteq \{a, c, d\}$ [TRUE FALSE]	(C) $\{3, 6, 9\} \not\subseteq \{3, 6, 9, 12, 18\}$ [TRUE FALSE]	(D) $\{p, q, r, s\} \subseteq \{p, q, t, u\}$ [TRUE FALSE]
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PRACTICE

For each of the following, list all subsets & proper subsets.

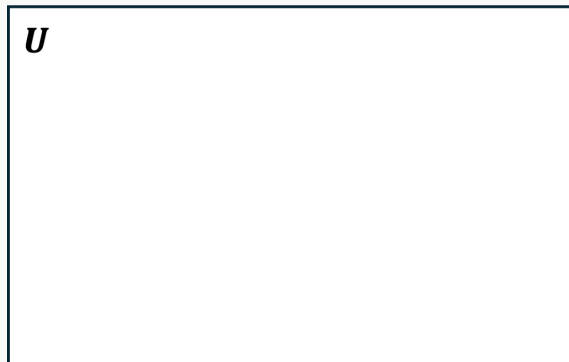
(**A**) $A = \{\text{red, blue}\}$

(**B**) $B = \{\text{apple, banana, orange}\}$

(**C**) $C = \{2, 5, 8, 11\}$

PRACTICE

Create a Venn diagram with the elements that belong in each set using $U = \{0, 1, 2, \dots, 9\}$, $A = \{1, 2, 3, 4, 5\}$, $B = \{2, 4, 3\}$. 💡 Hint: $B \subseteq A$



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EXAMPLE

Use the Venn Diagram to answer the following true or false questions. If true, explain. If false, make the statement true.

(A) $\{\text{dolphins, whales}\} \subseteq \text{Fish}$
[TRUE | FALSE]

(B) The set of **Animals with Fur** is a proper subset of **Mammals**.
[TRUE | FALSE]

(C) **Reptiles**, **Mammals**, & **Fish** are subsets of the universal set.
[TRUE | FALSE]

(D) **Mammals** $\subset \emptyset$
[TRUE | FALSE]

