Basic Set Terminology:

A is the set of students registered for this class. *(Word Description method)*

$B = \{1, 2, 3, 4, 5\}$ *(Roster method)*

$C = \{2, 4, 6, 8\}$ *(Roster method)*

$D = \{x \mid x \text{ is a counting number less than } 6\}$ *(Set-builder notation)*

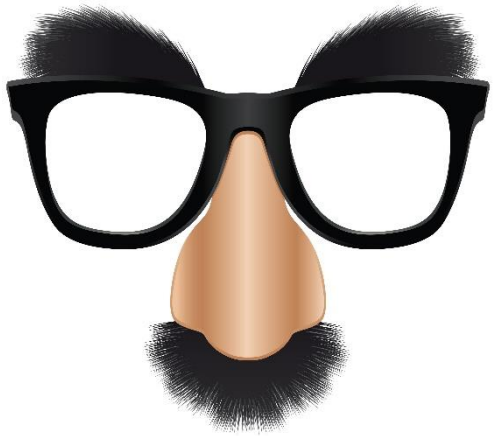
$E = \{x \mid x \text{ is an even counting number less than } 10\}$ *(Set-builder notation)*

Convert $F = \{1, 2, 3, \ldots, 19\}$ **into set-builder notation.**

<u>There is a special set with no elements called the empty set.</u>

Notation: $\{\ \}$ or ϕ.

Sometimes the empty set is in disguise.



$$A = \{x \mid x \text{ is greater than 5 and less than 2}\}$$

<u>Set membership:</u>

$\in$ means is a member or element of

$\notin$ means is not a member or element of

Fill-in the blanks with either $\in$ or $\notin$.

$$3 \square \{3,5,7\}$$

$$6 \square \{3,5,7\}$$

$$15 \square \{1,2,3,\ldots,20\}$$

$$3 \square \{x \mid x \text{ is a counting number with } 4 \le x \le 9\}$$

$$8 \square \phi$$

There's a special abbreviation for the Counting Numbers or Natural numbers:

$$\mathrm{N} = \{1,2,3,4,5,6,\ldots\}$$

Cardinal Number and Cardinality:

The cardinal number or cardinality of a set, *A*, is the number of elements in the set *A*.

Notation: $n(A)$

Determine the following cardinal numbers:

$n(\{2,4,6,8\}) =$

$n(\{x \mid x \in \mathrm{N} \text{ with } 4 \le x \le 12\}) =$

$n(\{x \mid x \in \mathrm{N} \text{ with } x \le 4 \text{ and } x > 7\}) =$

$n(\{2,2,4,6,8\}) =$

Equivalent Sets:

Sets are equivalent if they have the same cardinality*(number of elements)*.

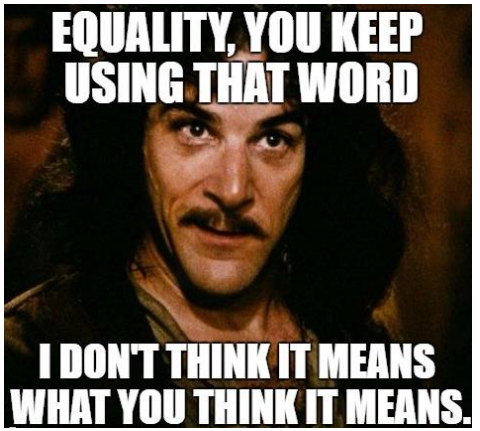
Determine if the following pairs of sets are equivalent sets:

$\{1,2,3,4,5\}$ and $\{a,b,c,d,e\}$

$\{x \mid x \in \mathrm{N} \text{ with } 3 \le x \le 8\}$ and $\{1,2,3,4,5\}$

$\{x \mid x \in \mathrm{N} \text{ with } x \le 2 \text{ and } x \ge 11\}$ and ϕ

$\{1,2,3,4\}$ and $\{1,2,3,4\}$



Equality of Sets:

Sets are equal if they have the same elements.

Notation: =

Determine if the following pairs of sets are equal:

$\{1,2,3,4,5\}$ and $\{a,b,c,d,e\}$

$\{x \mid x \in \mathrm{N} \text{ with } 3 \le x \le 8\}$ and $\{3,4,5,6,7,8\}$

$\{x \mid x \in \mathrm{N} \text{ with } x \le 2 \text{ and } x \ge 11\}$ and ϕ

$\{1,2,3,4,5,6,7,8\}$ and $\{1,2,3,\ldots,8\}$

Subsets:

A set *A* is a subset of the set *B* if each element of *A* is also an element of *B*.

Notation: $A \subseteq B$ *{Think of B as a menu and a subset A as an order from the menu.}*

Fill-in the blanks with either $\subseteq$ or $\not\subseteq$.

$\{3,7\} \square \{3,5,7\}$

$\{3,6\} \square \{3,5,7\}$

$\{4,5,6,\ldots,13\} \square \{1,2,3,\ldots,20\}$

$\{1,2,3,4,5\} \square \phi$

$\phi \square \{a,b,c\}$

$\{1,2,3\} \square \{1,2,3\}$

$\phi \square \phi$

Proper Subsets:

A set *A* is a proper subset of the set *B* if each element of *A* is also an element of *B*, but $A \neq B$.

Notation: $A \subset B$

Fill-in the blanks with either $\subset$ or $\not\subset$.

$$\{3,7\} \square \{3,5,7\}$$

$$\{3,5,7\} \square \{3,5,7\}$$

$$\{4,5,6,\ldots,13\} \square \{1,2,3,\ldots,20\}$$

$$\{1,2,3,4,5,6,7\} \square \{1,2,3,\ldots,7\}$$

$$\phi \square \{a,b,c\}$$

$$\phi \square \phi$$

How many subsets or proper subsets does a set have?

Set *A*	$n(A)$	**Subsets of *A***	**Proper Subsets of *A***	**# of subsets**	**# of proper subsets**
ϕ	**0**	ϕ	**none**	**1**	**0**
$\{a\}$	**1**	$\phi, \{a\}$	ϕ	**2**	**1**
$\{a,b\}$	**2**	$\phi, \{a\}, \{b\}, \{a,b\}$	$\phi, \{a\}, \{b\}$		
$\{a,b,c\}$	**3**	$\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}$	$\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}$		

Use inductive reasoning to complete the following:

If a set has *n* elements, then it has _____ subsets.

If a set has *n* elements, then it has _____ proper subsets.

How many subsets are there of the set $\{a,b,c,d,e\}$?

How many proper subsets are there of the set $\{a,b,c,d,e\}$?

A pizza can be ordered with some, none, or all of the following toppings:

$\{pepperoni, sausage, mushroom, onion, peppers, black\ olives, green\ olives, hamburger\}$.

How many different pizzas are possible?

In this example, what would correspond to the empty set?