Sept 4 Slides

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1. Opening Notes
2. Power Sets
3. Disjoint Sets
4. Set-builder Notation
5. Properties/Laws of sets

[More practice]

Other Notations

$$\mathcal{P}(X)$$
$$\mathcal{P}(X)$$
$$\mathscr{P}(X)$$
$$\wp(X)$$

$$\overline{A}$$
$$A'$$
$$\widetilde{A}$$
$$A^{\sim}$$
$$A^{\mathsf{c}}$$

Power sets

4.1.3 Power Set

The set of all the subsets of a set, A, is called the *power set*, $\text{pow}(A)$, of A. So

$$B \in \text{pow}(A) \quad \text{IFF} \quad B \subseteq A.$$

For example, the elements of $\text{pow}(\{1, 2\})$ are $\emptyset$, $\{1\}$, $\{2\}$ and $\{1, 2\}$.

Power sets -- Break-outs

1.) What is the power-set of {}? Cardinality?

2.) What is the power set of {a, b, c}? Cardinality?

3.) What is the power set of { W, X, Y, Z }? Cardinality?

Can we see a rule/pattern to determine the cardinality of a powerset?

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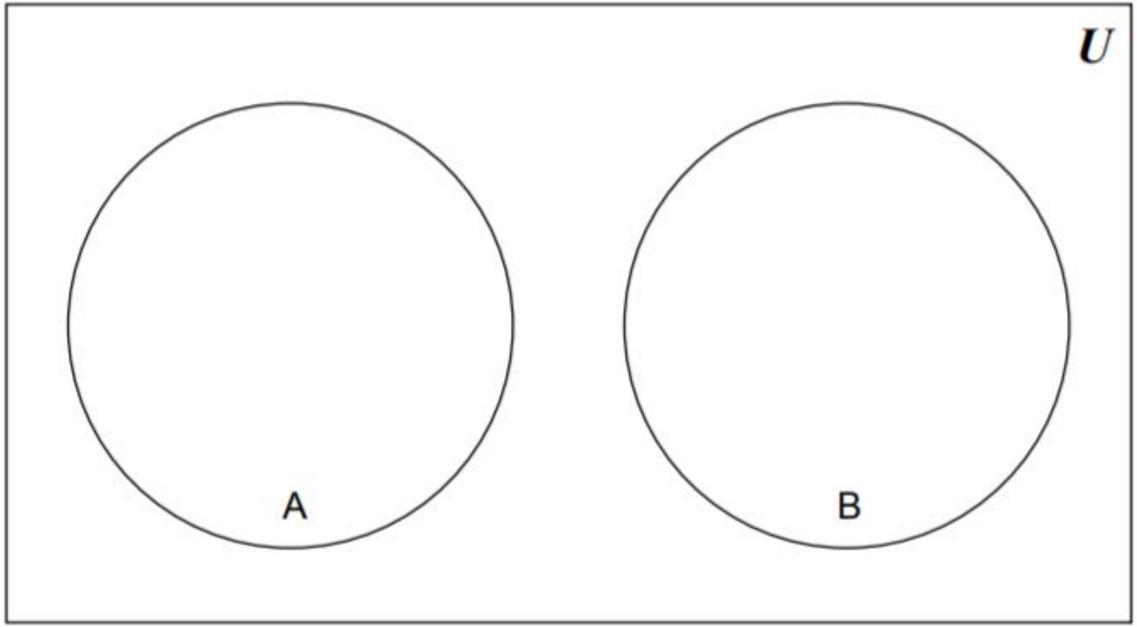
$$|\mathcal{P}(X)| = 2^{|X|}$$

Disjoint Sets



Disjoint Sets

- Formal definition for disjoint sets: *two sets are disjoint if their intersection is the empty set*
- Further examples:
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  - {New York, Washington} and {3, 4} are disjoint
  - {1, 2} and $\varnothing$ are disjoint
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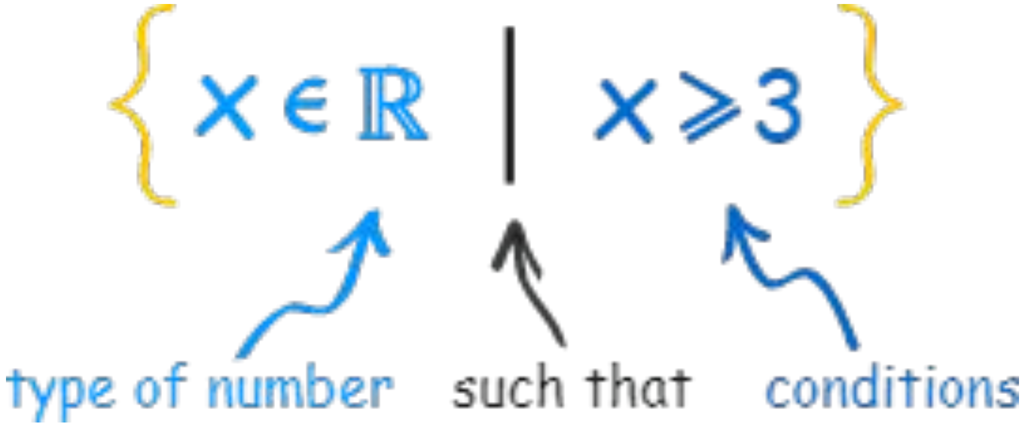
  - $\varnothing$ and $\varnothing$ are disjoint!
    - Their intersection is the empty set

Set-Builder Notation



https://www.mathsisfun.com/sets/set-builder-notation.html

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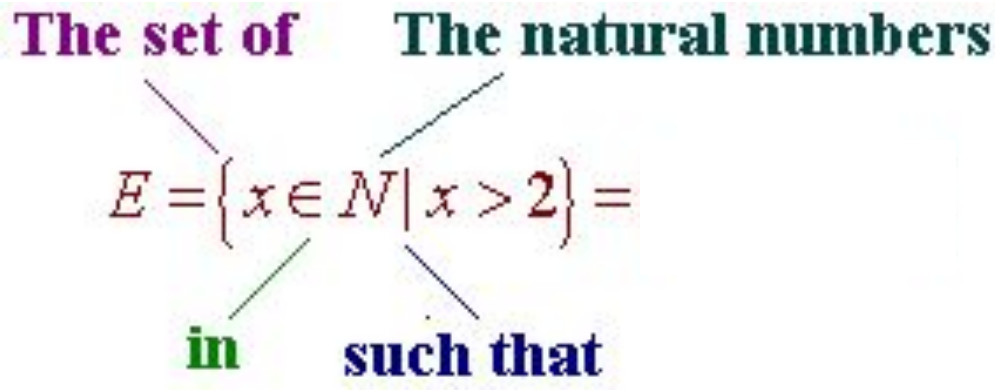
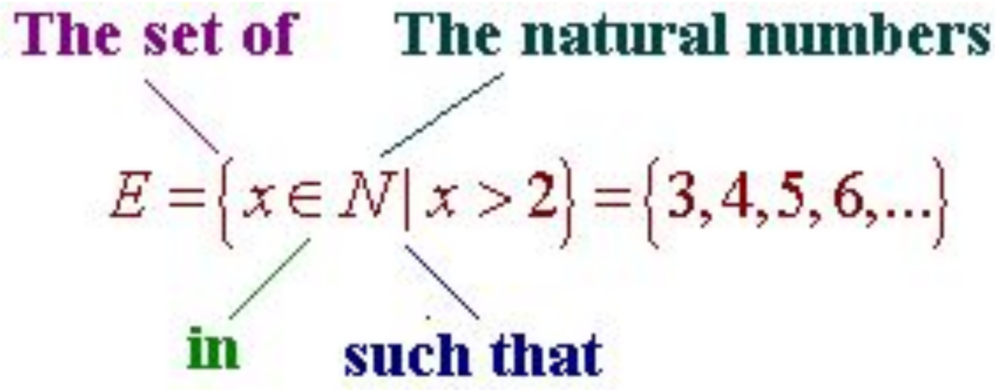


https://ltcconline.net/greenl/courses/152a/definitions/SETS.HTM

Set-Builder Notation



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Set-Builder Notation

Let’s ***formalize*** our set operators in “set-builder notation”

Quick Side-Note:

-We will need to link together multiple “conditions” with “and’s”, “not’s” and “or’s”

Special symbols:

$\vee$ is “or” (notice similarity to $\cup$)

$\wedge$ is “and” (notice similarity to $\cap$)

$\neg$ is “not”

Set-Builder Notation -- My turn!

Intersection $S \cap T$: the elements that belong both to S and to T.

$$S \cap T =$$

For Reference:

$\vee$ is "or"

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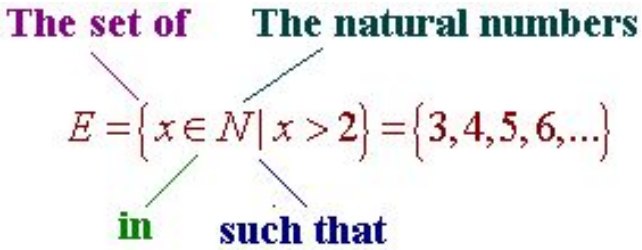

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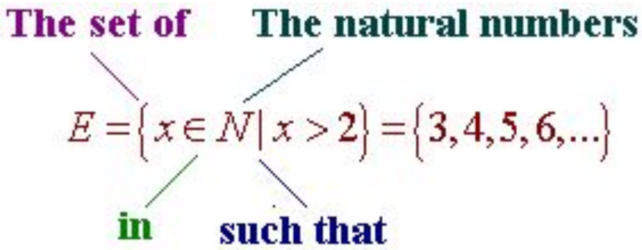

Set-Builder Notation -- My turn!

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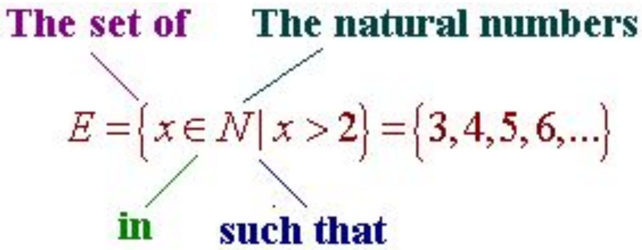

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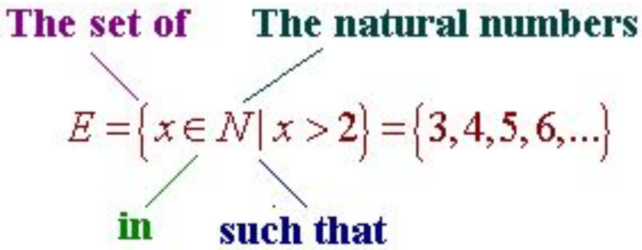

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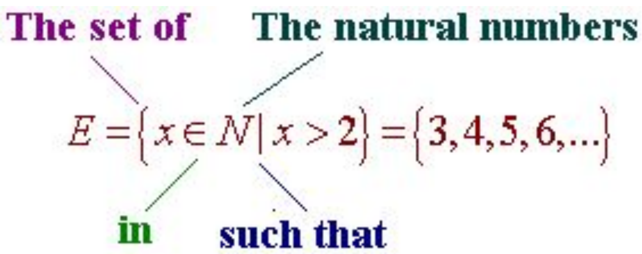

Set-Builder Notation -- My turn!

Intersection $S \cap T$: the elements that belong both to S and to T.

$$S \cap T = \{x \in U \mid x \in S \land x \in T\}$$

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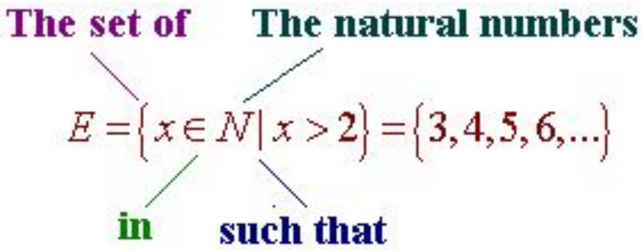

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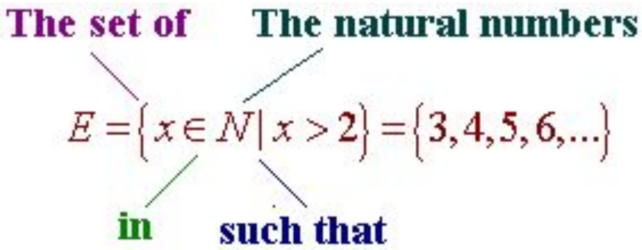

Set-Builder Notation -- Your turn!

Union $S \cup T$: the elements that belong either to S or to T (or both).

$$S \cup T =$$

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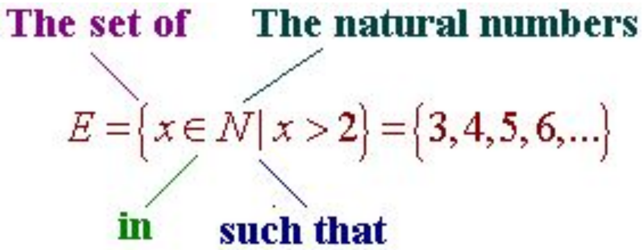

Set-Builder Notation -- Your turn!

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$$S \cup T = \{x \in U \mid x \in S \vee x \in T\}$$

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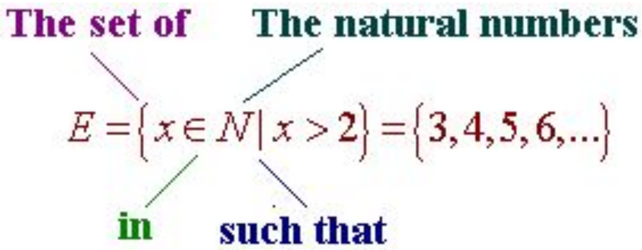

Set-Builder Notation -- Your turn!

Difference $S \setminus T$: the elements that belong to S but not to T.

$$S \setminus T =$$

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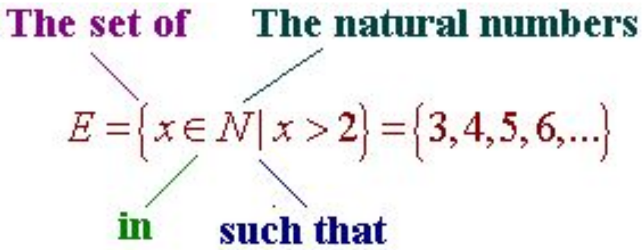

Set-Builder Notation -- Your turn!

Difference $S \setminus T$: the elements that belong to S but not to T.

$$S \setminus T = \{x \in U \mid x \in S \wedge x \notin T\}$$

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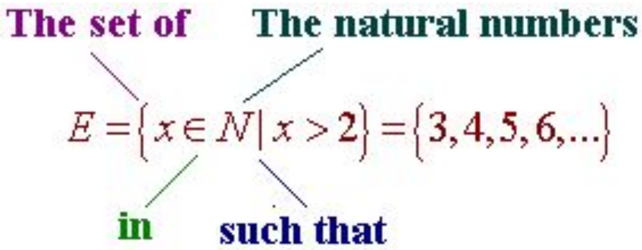

Set-Builder Notation -- Your turn!

Complement $\overline{S}$: elements (of the universe) that don't belong to S.

$$\overline{S} =$$

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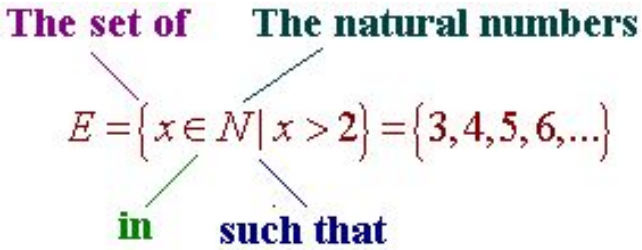

Set-Builder Notation -- Your turn!

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$$\overline{S} = \{x \in U \mid x \notin S\}$$

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