

- listing
  - set builder notation
  - venn diagrams
  - ★ interval notation
  - ★ graph
-

Unit 3: Operations on Sets: Union, Intersection, Difference, and the Complement of Sets

$\rightarrow$  will give you a set as an answer.

" $\cap$ "  $\rightarrow$  the elements that A and B share.

Intersection of set A and B

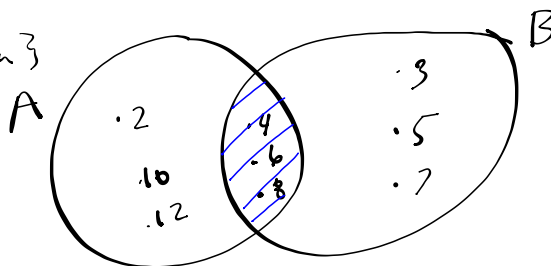
ex.  $A \cap B = \{4, 6, 8\}$   $\rightarrow$  where the sets overlap

$A = \{2, 4, 6, 8, 10, 12\}$

$A = \{x \in \mathbb{N} \mid 2 \leq x \leq 12 \text{ and } x \text{ is even}\}$

$B = \{3, 4, 5, 6, 7, 8\}$

$B = \{x \in \mathbb{Z} \mid 3 \leq x \leq 8\}$



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

$$B = \{0, 1, 3, 4, 7\}$$

$$C = \{1, 2, 4, 6\}$$

What's

$$A \cap B ?$$

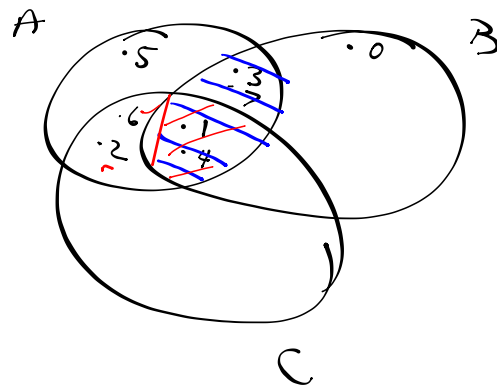
$$= \{1, 3, 4, 7\}$$

$$(A \cap B) \cap C = \{1, 4\}$$

The order of operation is still

B  
∩  
D  
∩  
A  
S

1/3



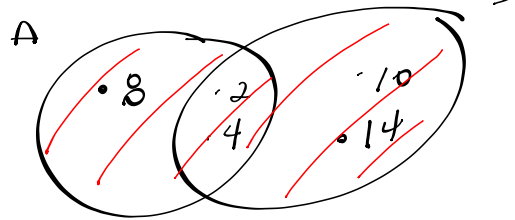
" $\cup$ "  
Union of Set A and B

$A \cup B = \{2, 4, 8, 10, 14\}$  all of the elements from both sets, no repetition.

"all of me loves all of you"

$$A = \{2, 4, 8\}$$

$$B = \{2, 4, 10, 14\}$$



$$A = \{2, 4, 8, 20\}$$

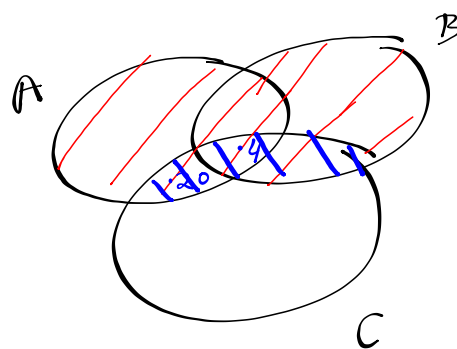
$$B = \{2, 4, 10, 14\}$$

$$C = \{4, 6, 20\}$$

$$A \cup B = \{2, 4, 8, 10, 14, 20\}$$

$$C \cap (A \cup B) = \{4, 20\}$$

$$C \cap (A \cup B)$$



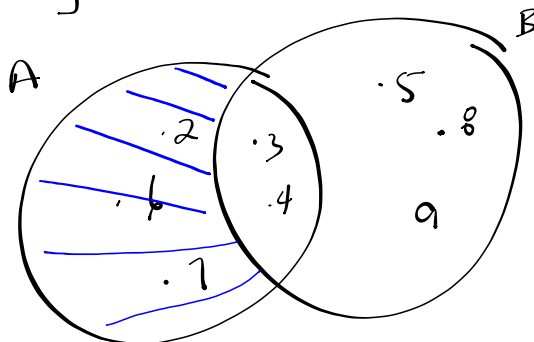
$\rightarrow$  all the elements of A that doesn't  
 Difference between A and B, over-  
 lap is B.  
 cuz order matters  
 $A \setminus B \neq B \setminus A$

$$A = \{2, 3, 4, 6, 7\}$$

$$B = \{3, 4, 5, 8, 9\}$$

$$A \setminus B = \{2, 6, 7\}$$

$$B \setminus A = \{5, 8, 9\}$$



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

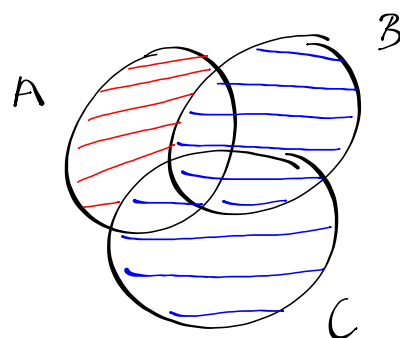
$$B = \{2, 4\}$$

$$C = \{1, 3, 5, 8\}$$

$$A \setminus (C \cup B)$$

$$C \cup B = \{1, 2, 3, 4, 5, 8\}$$

$$A \setminus (C \cup B) = \{6, 7\}$$



The Complement of A :  $A^c$

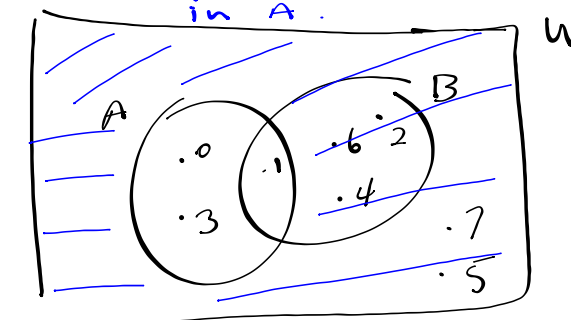
$U = \{ \cancel{0}, \cancel{1}, 2, \cancel{3}, 4, 5, 6, 7 \}$

$A = \{ 0, 1, 3 \}$

$B = \{ 1, 2, 4, 6 \}$

↳ the universe minus A  
↳ all the possible elements that aren't in A.

$$A^c = \{ 6, 2, 4, 5, 7 \}$$



$\emptyset$   $\emptyset^c$



$$\begin{aligned}
 & \bullet U = \{0, 1, 2, 3, \dots, 9, 10\} \\
 & \quad u = \{x \in \mathbb{N} \mid 0 \leq x \leq 10\} \\
 \star \star A &= \{0, 2, 3, 6\} \\
 B &= \{1, 2, 5, 7\} \\
 \star C &= \{0, 2, 5, 8, 9\}
 \end{aligned}$$

B:  
 E:  
 D:  
 M:  
 A:  
 S:

$$\begin{aligned}
 & (C \cap B') \setminus A \\
 \star B' &= \{0, 3, 4, 6, 8, 9, 10\} \\
 \star \star C \cap B' &= \{0, 8, 9\} \\
 (C \cap B') \setminus A &= \{8, 9\}
 \end{aligned}$$

$$\begin{aligned}
 & (C \cap B)' \setminus A \\
 (C \cap B) &= \{2, 5\} \\
 (C \cap B)' &= \{0, 1, 3, 4, 6, 7, 8, 9, 10\} \\
 (C \cap B)' \setminus A &= \{1, 4, 7, 8, 9, 10\}
 \end{aligned}$$

## Unit 4: Operations on Set ~~cont'd~~

plus two new ways to represent sets.

### Interval Notation: (a way to represent a set)

$[ \quad ]$   $\rightarrow$  all the numbers between the two numbers noted.

lowest # in the interval  
e.x.  $A = [1, 2]$  highest # in interval

(interval notation)  
• infinite set

$$B = \{1, 2\}$$

(listing)

• finite set  
(2 elements)

$$A = \{x \in \mathbb{R} \mid 1 \leq x \leq 2\} \quad C = \{1, 2, 3\}$$

- 
- $D = ]1, 2]$  =  ~~$\emptyset$~~  open bracket backwards means 1 is excluded from the interval  $1 \notin D$  closed bracket
  - $D = \{x \in \mathbb{R} \mid 1 < x \leq 2\}$

Convert to interval notation

$$A = \{x \in \mathbb{R} \mid 2 < x < 5\} \quad B = \{x \in \mathbb{R} \mid x \leq 1\}$$

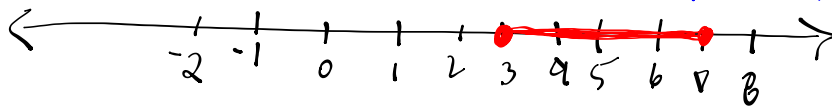
$$A = ]2, 5[$$

$$B = ]-\infty, 1]$$

Graphing (a way to represent a set)

↳ use the number line!

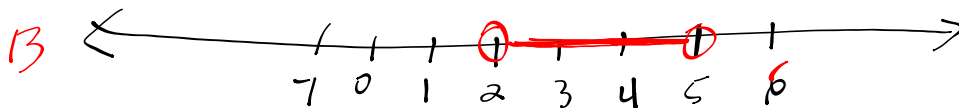
$A = [3, 7]$  ↳ the bolded part of the # line represents the set.



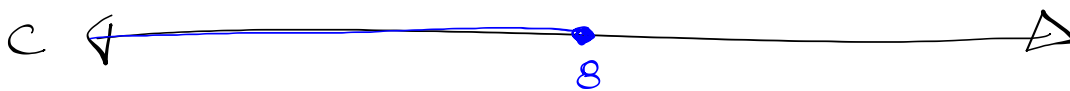
how to represent open brackets on the # line

$$\text{ex. } B = ]2, 5[$$

↳ use an open dot!



$$C = ]-\infty, 1[ \quad 2 \& B \quad 5 \& B$$



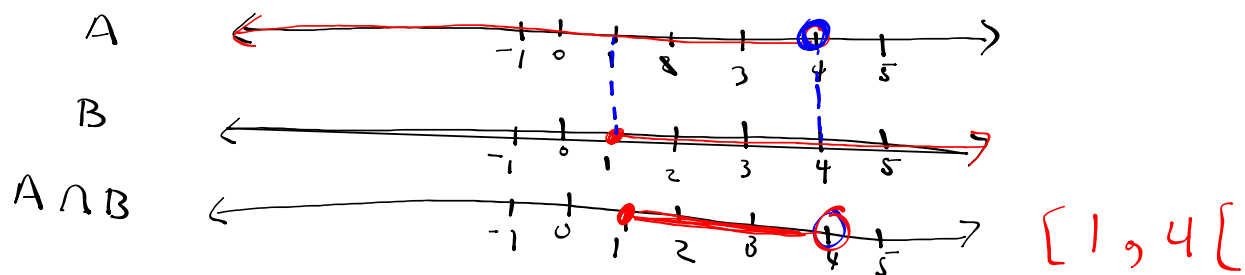
$$D = ]-\infty, 8]$$

$$D = [-\infty, 8]$$

$$A = ]-\infty, 4[$$

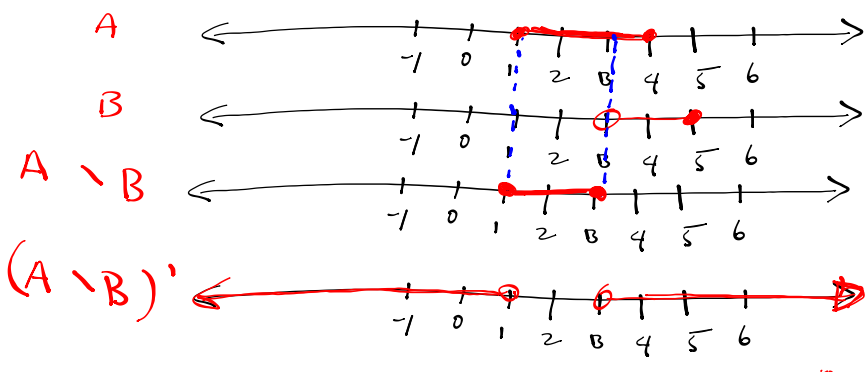
$$B = [1, \infty[$$

$$\text{Find } A \cap B = [1, 4[$$



$A = [1, 4]$   
 $B = [3, 5]$   
 Find  $(A \setminus B)'$

$\mathbb{R} \setminus S$



"and"

$\} -\infty, 1 [ \cup ] 3, \infty \{$