Operations on Sets

(1) Union of Sets

A, B : sets

The union of A and B is the set whose elements are the elements of A and the elements of B.

Notation for the union of A and B : $A \cup B$

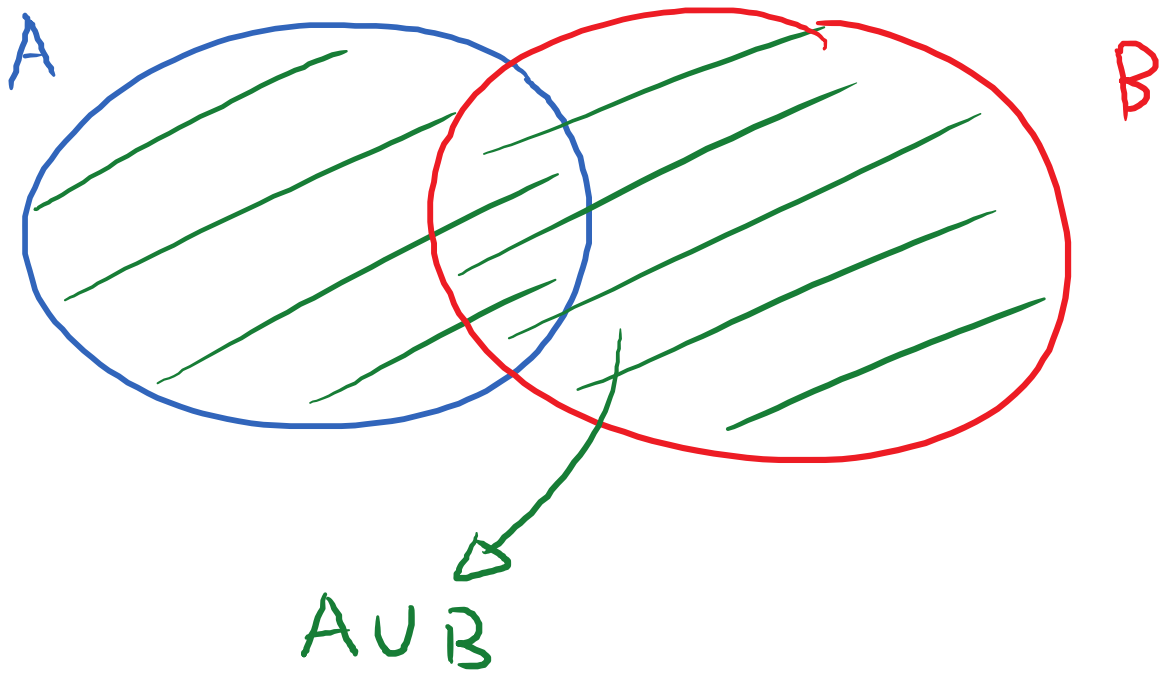
E.g. $A = \{1, 2, 3\}$, $B = \{a, b, c, d\}$

$$A \cup B = \{1, 2, 3, a, b, c, d\}$$

$X = \{2, 3, 5\}$; $Y = \{2, 5, 11\}$

$$X \cup Y = \{2, 3, 5, 11\}$$

Venn Diagram for $A \cup B$



(2) Intersections of Sets

The intersection of 2 sets A and B is the set of all elements that are common to both A and B

Notation: the intersection of A and B : $A \cap B$

E.g. $A = \{1, 2, 3, \cdots, 10\}$

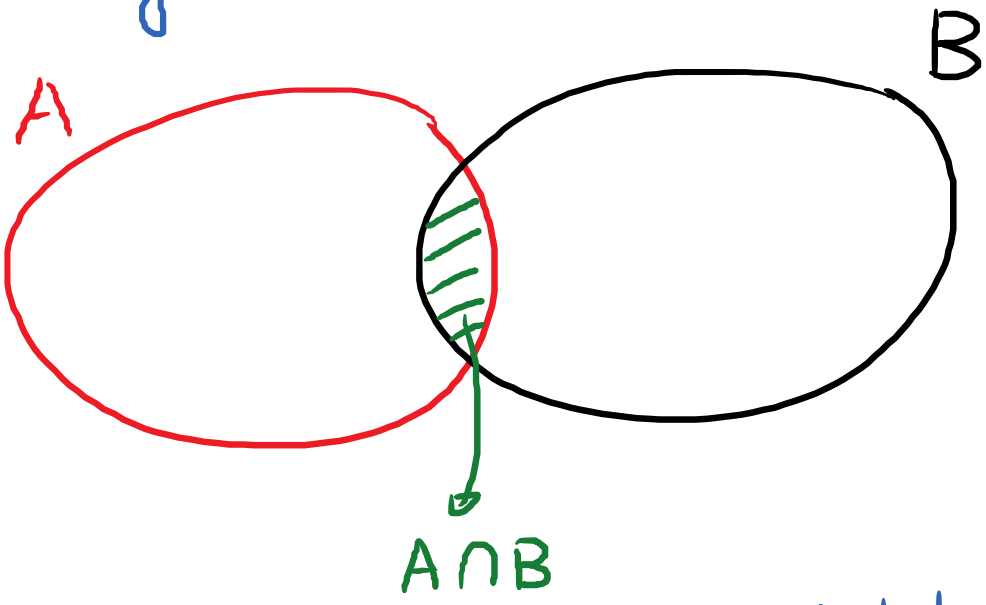
$B = \{3, 5, 7, \cdots, 17\}$

$A \cap B = \{3, 5, 7, 9\}$

$X = \{a, b, c\}$. $Y = \{1, 2, 3, 4\}$

$X \cap Y = \phi$

Venn Diagram for the intersection:



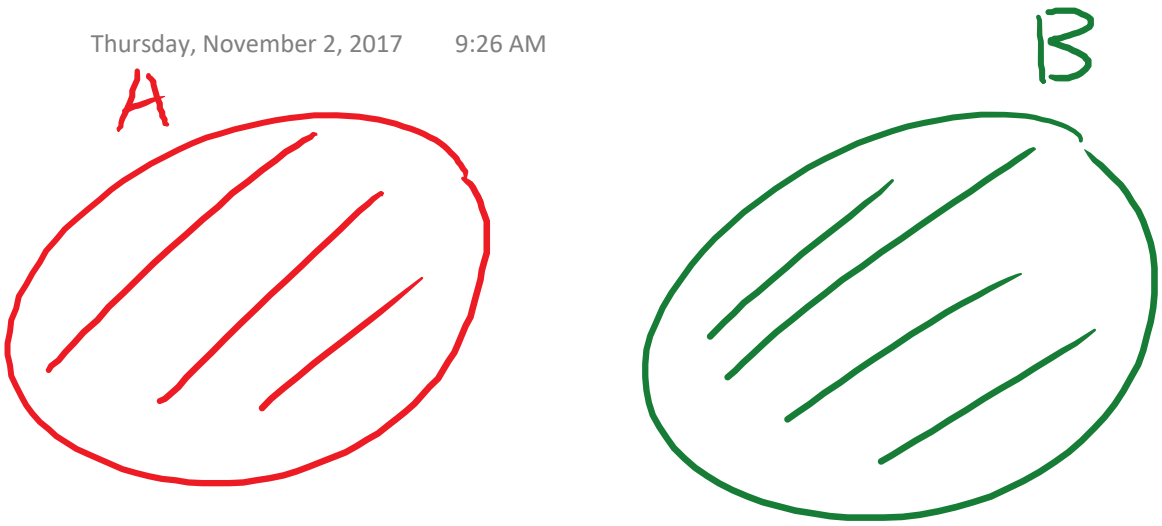
E.x. $A = \{x \mid x$ is a month that starts with a J$\}$

$B = \{x \mid x$ is a month that ends with a Y$\}$

Find $A \cup B = \{$Jan, Feb, May, June, July$\}$

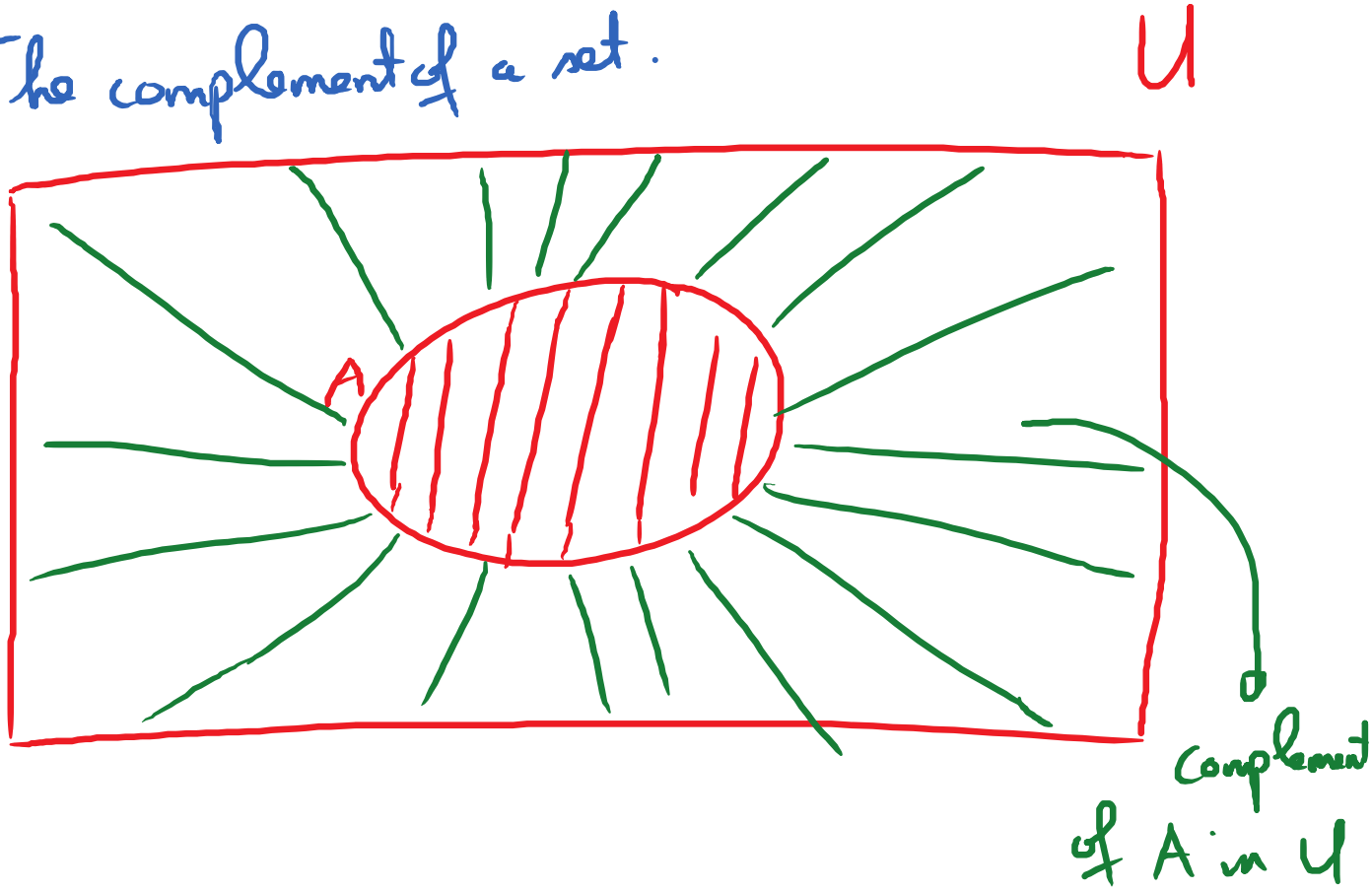
$A \cap B = \{$Jan, July$\}$

Terminology: If 2 sets have empty intersection, i.e., they have no elements in common, they are called disjoint.



$A \cap B = \phi$

(3) The complement of a set.



If A is a subset of U, the complement of A in U is the set of elements that are in U but not in A.

Notation for the complement of A in U: A'

(read as A prime)

$$A' = \{ x \mid x \in U \text{ and } x \notin A \}$$

E.g. $U = \{1, 2, \ldots, 10\}$

$A = \{ x \mid x \text{ is an even positive \# less than 10} \}$

$A' = \{1, 3, 5, 7, 9, 10\}$

E.g. $U = \{ x \mid x \text{ is a month in the year} \}$

$A = \{ x \mid x \text{ is a month that starts with a J} \}$

Find A' ? $A' = \{$Feb, Mar, Apr, May, Aug,

Sep, Oct, Nov, Dec }.

Notation: A is a set.

$n(A)$ = # of elements in A

$A = \{1, 2, 3\}$. $n(A) = 3$

$B = \{a, b, c\}$ $n(B) = 3$

$U = \{x \mid x \text{ is a month in the year}\}$. $n(U) = 12$.

Eg. $U = \{x \mid x \text{ is a state in the U.S.}\}$

$A = \{x \mid x \text{ is a state that starts with T}\}$

$n(A') = 48$.

Thursday, November 2, 2017 9:37 AM

Some applications

A marketing company did a survey of 1000 commuters. They found.

600 listen to the news

500 listen to music

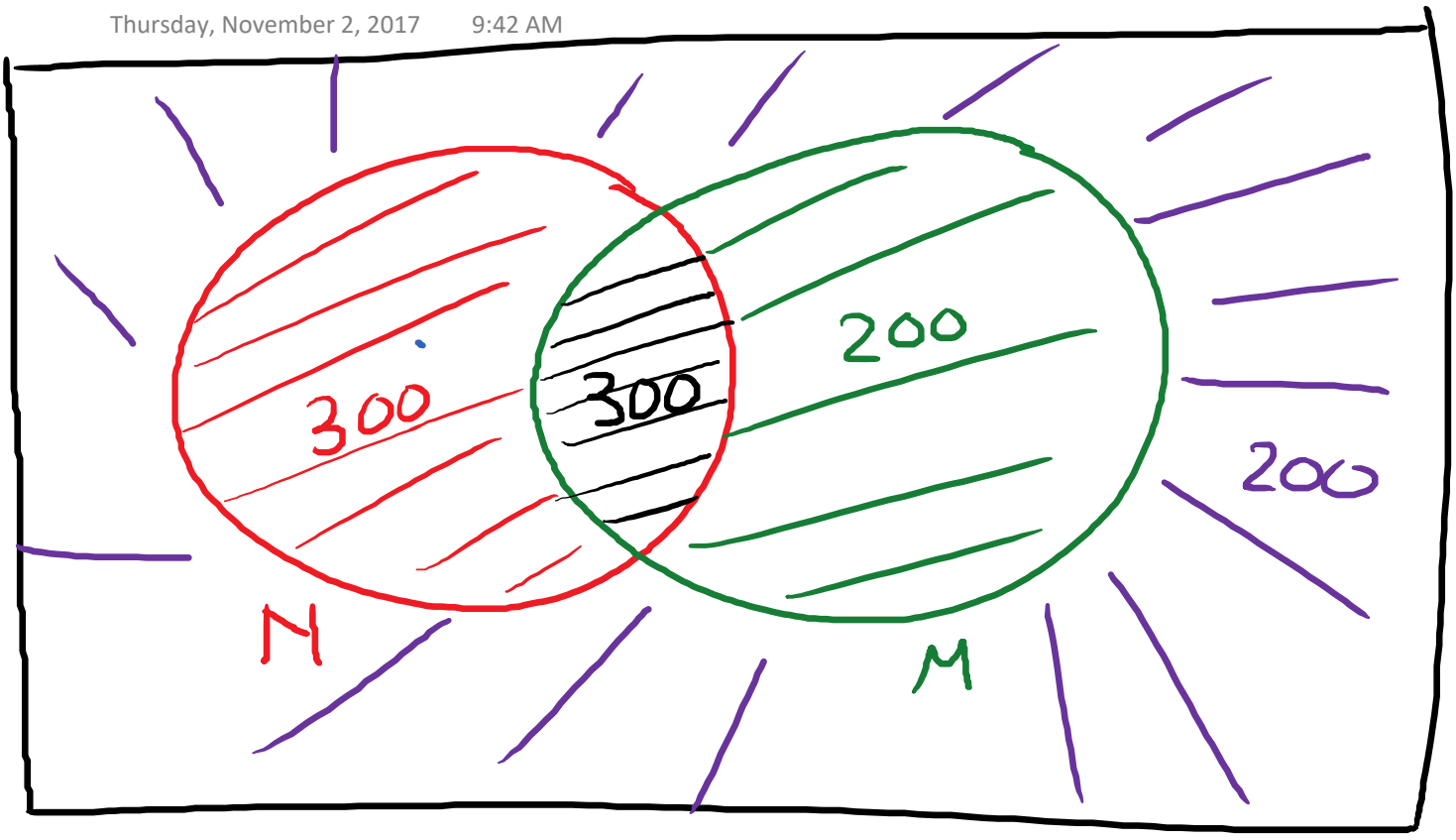
300 listen to both.

(a) Find the number of people who listen to the news but not to music

(b) Find the number of people who listen to neither news nor music.

(c) Draw a Venn Diagram to illustrate the situation.

Thursday, November 2, 2017 9:42 AM



Use set notation to describe the set of people who listen to news but not to music.

$N \cap M'$