

Math History for Precalculus

Augustus de Morgan

1. When did Augustus de Morgan live? *1806–1871*
2. Where was he from? *India (Madura, southwest of Madras)*
3. Why was he born in India? *His family was there with the East India Company of Britain.*
4. What important book on logic did de Morgan write? *Formal Logic*
5. When was it published? *1847*

His important work on logic resulted in de Morgan’s laws.

6. Rewrite the following sentence using two complete sentences and a conjunction. “The price of the new car was neither reasonable nor affordable.” *The price of the new car was not reasonable, and the price of the new car was not affordable.*
7. On a sunny but cold day Ben said, “It is not a warm and sunny day.” Restate Ben’s sentence using a compound statement. *It is not a warm day, or it is not a sunny day.*
8. Generalize questions 6–7 using symbols. Write equations to show the relationship.

sign meaning

~ not $\sim(A \vee B) = \sim A \wedge \sim B$

\vee or $\sim(A \wedge B) = \sim A \vee \sim B$

\wedge and

De Morgan’s laws apply, not just in logic, but also to sets. Remember that the complement (A') of a set A is the set of elements not in A .

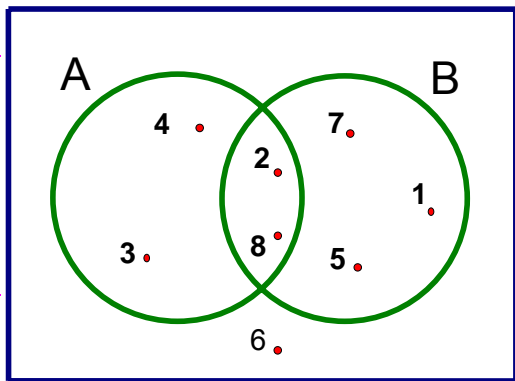
9. Use the Venn diagram to find $A', B', A \cap B, A \cup B, (A \cap B)', (A \cup B)', A' \cap B', A' \cup B'$

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

$$A \cap B = \{2, 8\}, A \cup B = \{1, 2, 3, 4, 5, 7, 8\},$$

$$(A \cap B)' = \{1, 3, 4, 5, 6, 7\}, (A \cup B)' = \{6\},$$

$$A' \cap B' = \{6\}, A' \cup B' = \{1, 3, 4, 5, 6, 7\}$$



10. Write de Morgan’s law for sets. $(A \cup B)' = A' \cap B'; (A \cap B)' = A' \cup B'$

11. Are you surprised that the same equations work for sets and for sentences? What does it show?

Answers may vary; it shows the order and harmony that God created in the universe.