

Chapter Three
Section one

Definitions:

1. **Statements:**

A statement is defined as a **declarative sentence** that is either **true** or **false**, but not both simultaneously.

2. **Compound Statement:**

Combining two or more statements may form a compound statement. Various **logical connectives** can be used in forming compound statements. Words such as *and*, *or*, *not*, and *if ... then* are examples of connectives.

Examples: (Page 101)

Decide whether each statement is compound.

- (a) Shakespeare wrote sonnets and poem exhibits iambic pentameter.
- (b) You can pay me now or you can pay me later.
- (c) If he said it, then it must be true.
- (d) My pistol was made by Smith and Wesson.

Negations:

The negation of true statement is false, and the negation of a false statement is true.

Examples:

Write the negation of each of following statements:

- (a) That state has a governor.
- (b) The sun is not a star.
- (c) $p < 9$
- (d) $7x + 11y \geq 77$

Symbols:

Connective	Symbol	Type of Statement
<i>and</i>	\wedge	Conjunction
<i>or</i>	\vee	Disjunction
<i>not</i>	\sim	Negation

Example:

Let p represent "It is 80° today." and let q represent "It is Tuesday." Write each symbolic statement in words.

- (a) $p \vee q$
- (b) $\sim p \wedge q$
- (c) $\sim (p \vee q)$
- (d) $\sim (p \wedge q)$

Quantifiers:

- **Universal quantifiers:** all, each, every, and none.
- **Existential quantifiers:** some, there exists, at least one.

Example:

Group I: Mary Jones, Mary Smith, Mary Jackson
 Group II: Mary Johnson, Betty Parker, Margaret Westmoreland
 Group III: Jocelyn Lowe, Fran Libretto, Cheryl Roslyn

	Group I	Group II	Group III
All girls in the group are named Mary.	True	False	False
No girls in the group are named Mary	False	False	True
All girls in the group are not named Mary.	False	False	True
Some girls in the group are not named Mary	False	True	True

Statement	Negation
All do.	Some do not. (Not all do)
Some do.	None do. (All do not)

Examples

Statement	Negation
Some cats have fleas.	No cat has fleas.
Some cats do not have fleas.	All cats have fleas.

Exercises: (Section 1)

Write a negation for each of the following statements.

- Her aunt's name is Lucia.
- The flowers are to be watered.
- Every dog has its day.
- No rain fell in southern California today.
- Some books are longer than this book.
- All students present will get another chance.
- No computer repairman can play blackjack.
- Some people have all the luck.
- Everybody loves somebody sometime.
- Everyone loves a winner.

Let p represent the statement "She has green eyes" and let q represent the statement "He is 48 years old." Translate each symbolic compound statement into words.

- | | |
|-----------------------------|----------------------------|
| 39. $\sim p$ | 40. $\sim q$ |
| 41. $p \wedge q$ | 42. $p \vee q$ |
| 43. $\sim p \vee q$ | 44. $p \wedge \sim q$ |
| 45. $\sim p \vee \sim q$ | 46. $\sim p \wedge \sim q$ |
| 47. $\sim(\sim p \wedge q)$ | 48. $\sim(p \vee \sim q)$ |

Solutions:

- | | | | | | |
|--|---|---|--|---|---|
| 23. Her aunt's name is not Lucia. | 24. The flowers are not to be watered. | 25. At least one dog does not have its day. | 26. Some rain fell in southern California today. | 27. No book is longer than this book. | 28. At least one student present will not get another chance. |
| 29. At least one computer repairman can play blackjack. | 30. No people have all the luck. | 31. Someone does not love somebody sometime. | 32. Someone does not love a winner. | 39. She does not have green eyes. | 40. He is not 48 years old. |
| 41. She has green eyes and he is 48 years old. | 42. She has green eyes or he is 48 years old. | 43. She does not have green eyes or he is 48 years old. | 44. She has green eyes and he is not 48 years old. | 45. She does not have green eyes or he is not 48 years old. | 46. She does not have green eyes and he is not 48 years old. |
| 47. It is not the case that she does not have green eyes and he is 48 years old. | 48. It is not the case that she has green eyes or he is not 48 years old. | | | | |