Introduction to Logic
Exercises: Square of Opposition Answers

1 Contrary

Directions: State the contrary of each of the following statements. First, state the resultant truth value if the given statement is assumed true; second, state the resultant truth value if the given statement is assumed false.

1. All voters are citizens.
   Answer:
   All voters are citizens. \( \text{true} \) contrary \( \Rightarrow \) No voters are citizens. \( \text{false} \)
   All voters are citizens. \( \text{false} \) contrary \( \Rightarrow \) No voters are citizens. \( \text{undetermined} \)

2. No kinetic arts are mass cults.
   Answer:
   No kinetic arts are mass cults. \( \text{true} \) contrary \( \Rightarrow \) All kinetic arts are mass cults. \( \text{false} \)
   No kinetic arts are mass cults. \( \text{false} \) contrary \( \Rightarrow \) All kinetic arts are mass cults. \( \text{undetermined} \)

2 Subcontrary

Directions: State the subcontrary of the following statements. First, state the resultant truth value if the given statement is assumed true; second, state the resultant truth value if the given statement is assumed false.

1. Some microbes are marine organisms.
   Answer:
   Some microbes are marine organisms. \( \text{true} \) subcontrary \( \Rightarrow \) Some microbes are not marine organisms. \( \text{undetermined} \)
   Some microbes are marine organisms. \( \text{false} \) subcontrary \( \Rightarrow \) Some microbes are

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not marine organisms. true

2. Some shales are not compressed sandstone.
   Answer:
   Some shales are not compressed sandstone. true subcontrary Some shales are compressed sandstone. undetermined
   Some shales are not compressed sandstone. false subcontrary Some shales are compressed sandstone. true

3 Subalternation

Directions: Use subalternation for the following statements. First, state the resultant truth value if the given statement is assumed true; second, state the resultant truth value if the given statement is assumed false.

1. All Zurich gnomes are bankers.
   Answer:
   All Zurich gnomes are bankers. true subalternation Some Zurich gnomes are bankers. true
   All Zurich gnomes are bankers. false subalternation Some Zurich gnomes are bankers. undetermined

2. No ribosomes are genes.
   Answer:
   No ribosomes are genes. true subalternation Some ribosomes are not genes. true
   No ribosomes are genes. false subalternation Some ribosomes are not genes. undetermined

3. Some foreign pipelines are safe investments.
   Answer:
   Some foreign pipelines are safe investments. true subalternation All foreign pipelines are safe investments. undetermined
   Some foreign pipelines are safe investments. false subalternation All foreign pipelines are safe investments false

4. Some Presidents are not smilers.
   Answer:
   Some Presidents are not smilers. true subalternation No Presidents are smilers. undetermined
   Some Presidents are not smilers. false subalternation No Presidents are smilers. true
4 Contradiction

Directions: Use contradiction for the following statements. First, state the resultant truth value if the given statement is assumed true; second, state the resultant truth value if the given statement is assumed false.

1. All scientists are curious persons.
   Answer:
   All scientists are curious persons. \( \text{true} \) \( \leftrightarrow \) Some scientists are not curious persons. \( \text{false} \)
   All scientists are curious persons. \( \text{false} \) \( \leftrightarrow \) Some scientists are not curious persons. \( \text{true} \)

2. No artists are analysts.
   Answer:
   No artists are analysts. \( \text{true} \) \( \leftrightarrow \) Some artists are analysts. \( \text{false} \)
   No artists are analysts. \( \text{false} \) \( \leftrightarrow \) Some artists are analysts. \( \text{true} \)

3. Some historians are narrators.
   Answer:
   Some historians are narrators. \( \text{true} \) \( \leftrightarrow \) No historians are narrators. \( \text{false} \)
   Some historians are narrators. \( \text{false} \) \( \leftrightarrow \) No historians are narrators. \( \text{true} \)

4. Some citizens are not state employees.
   Answer:
   Some citizens are not state employees. \( \text{true} \) \( \leftrightarrow \) All citizens are state employees. \( \text{false} \)
   Some citizens are not state employees. \( \text{false} \) \( \leftrightarrow \) All citizens are state employees. \( \text{true} \)

Be sure you have given the resultant truth values. Name ______________________________