

Name:

Date:

Topic:

Class:

Main Ideas/Questions	Notes/Examples	
STATEMENT	<ul style="list-style-type: none"> A statement is a sentence that is either <u>true</u> or <u>false</u>. This is called the <u>truth value</u>. Represented using letters such as <u>p</u> or <u>q</u>. 	
	<table border="1"> <tr> <td>EXAMPLE: <u>p</u>: Supplementary angles have a sum of 180°.</td> <td>Truth Value: <u>T</u></td> </tr> </table>	EXAMPLE: <u>p</u> : Supplementary angles have a sum of 180°.
EXAMPLE: <u>p</u> : Supplementary angles have a sum of 180°.	Truth Value: <u>T</u>	
NEGATION	<ul style="list-style-type: none"> A negation of a statement has the <u>opposite</u> truth value. Shown by the symbol <u>~</u>. ← Read as "not p" 	
	<table border="1"> <tr> <td>EXAMPLE: <u>~p</u>: Supplementary angles do not have a sum of 180°.</td> <td>Truth Value: <u>F</u></td> </tr> </table>	EXAMPLE: <u>~p</u> : Supplementary angles do not have a sum of 180°.
EXAMPLE: <u>~p</u> : Supplementary angles do not have a sum of 180°.	Truth Value: <u>F</u>	
COMPOUND Statements	<u>Two or more statements joined by the words "and" or "or."</u>	
CONJUNCTION	<ul style="list-style-type: none"> Statements joined by the word <u>and</u>. Written as <u>$p \wedge q$</u>. True when <u>both</u> statements are <u>true</u>. 	
DISJUNCTION	<ul style="list-style-type: none"> Statements joined by the word <u>or</u>. Written as <u>$p \vee q$</u>. True when <u>at least one</u> statement is <u>true</u>. 	

Directions: Write compound statements using the statements below and determine each truth value.
p: There are seven days in a week. q: March has exactly 30 days. r: Halloween is on October 31st.

1. $p \wedge q$: There are seven days in a week and March has exactly 30 days. Truth Value: F

2. $q \wedge r$: March has exactly 30 days and Halloween is on October 31st. Truth Value: F

3. $p \wedge r$: There are seven days in a week and Halloween is on October 31st. Truth Value: T

4. $\sim p \wedge q$: There are not seven days in a week and March has exactly 30 days. Truth Value: F

5. $p \vee r$: There are seven days in a week or Halloween is on October 31st. Truth Value: T

6. $\sim q \vee r$: March does not have exactly 30 days or Halloween is on October 31st. Truth Value: T

7. $\sim p \vee \sim r$: There are not seven days in a week or Halloween is not on October 31st. Truth Value: F

8. $\sim p \vee \sim q$: There are not seven days in a week or March does not have exactly 30 days. Truth Value: T

Write your own!

p : _____

q : _____

r : _____

9. $p \vee r$: _____
_____ Truth Value: _____

10. $\sim p \vee q$: _____
_____ Truth Value: _____

11. $\sim q \wedge r$: _____
_____ Truth Value: _____

12. $p \wedge \sim r$: _____
_____ Truth Value: _____

13. $\sim p \vee \sim q$: _____
_____ Truth Value: _____

14. $\sim r \wedge q$: _____
_____ Truth Value: _____

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TRUTH TABLES

Notes/Examples

Truth tables are a convenient way of organizing truth values of statements. Complete the following negation, conjunction, and disjunction truth tables:

Negation	
p	$\sim p$
T	F
F	T

Conjunction		
p	q	$p \wedge q$
T	T	T
T	F	F
F	T	F
F	F	F

Disjunction		
p	q	$p \vee q$
T	T	T
T	F	T
F	T	T
F	F	F

Tips for Constructing Truth Tables:

- ✓ Include columns for each statement involved. (p, q, r , etc.)
- ✓ Include columns for any negations required. ($\sim p, \sim q, \sim r$, etc.).
- ✓ Lastly, include columns for the compound statement(s).

EXAMPLES

Construct truth tables for the following compound statements.

① $p \vee \sim r$

p	r	$\sim r$	$p \vee \sim r$
T	T	F	T
T	F	T	T
F	T	F	F
F	F	T	T

② $\sim p \wedge q$

p	q	$\sim p$	$\sim p \wedge q$
T	T	F	F
T	F	F	F
F	T	T	T
F	F	T	F

③ $\sim q \vee r$

q	r	$\sim q$	$\sim q \vee r$
T	T	F	T
T	F	F	F
F	T	T	T
F	F	T	T

④ $\sim p \wedge \sim r$

p	r	$\sim p$	$\sim r$	$\sim p \wedge \sim r$
T	T	F	F	F
T	F	F	T	F
F	T	T	F	F
F	F	T	T	T

5 $\sim p \vee \sim q$

p	q	$\sim p$	$\sim q$	$\sim p \vee \sim q$
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

6 $p \vee (q \wedge r)$

p	q	r	$(q \wedge r)$	$p \vee (q \wedge r)$
T	T	T	T	T
T	T	F	F	T
T	F	T	F	T
T	F	F	F	T
F	T	T	T	T
F	T	F	F	F
F	F	T	F	F
F	F	F	F	F

7 $\sim q \wedge (p \wedge r)$

p	q	r	$\sim q$	$(p \wedge r)$	$\sim q \wedge (p \wedge r)$
T	T	T	F	T	F
T	T	F	F	F	F
T	F	T	T	T	T
T	F	F	T	F	F
F	T	T	F	F	F
F	T	F	F	F	F
F	F	T	T	F	F
F	F	F	T	F	F

8 $(\sim p \vee q) \wedge \sim r$

p	q	r	$\sim p$	$\sim r$	$(\sim p \vee q)$	$(\sim p \vee q) \wedge \sim r$
T	T	T	F	F	T	F
T	T	F	F	T	T	T
T	F	T	F	F	F	F
T	F	F	F	T	F	F
F	T	T	T	F	T	F
F	T	F	T	T	T	T
F	F	T	T	F	T	F
F	F	F	T	T	T	T