

## Week in Review # 2

MATH 365

1.4 through 2.2

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Created and compiled by Sherry Scarborough with thanks to Zach Barcevac, Lynnette Cardenas, Greg Klein, David Manuel, Jane Schielack, and Jenn Whitfield.

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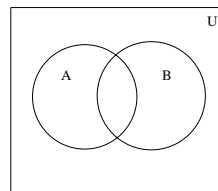
1. An underwater basket-weaving student cannot figure out how to pass his/her first basket project. Since the student has been faithfully attending class, the instructor gives the student a choice. The student's teacher says, "If you tell the truth, you will get an F on the project, but will remain in the course. If you tell a lie, you will be dropped from the course. The student is allowed to make one statement. The student makes a statement, and consequently, the instructor gives the student a passing grade on the project and the student remains in the course. What did the student say?"
2. Complete the table below.

Type	Statement	True or False
Conditional	If $m$ is odd, then $2m + 1$ is odd.	
Converse		
Contrapositive		
Inverse		

3. True or False

a. Einstein was a scientist or  $|-5| = -5$ .

b.  $\overline{A \cap B} = \overline{A} \cup \overline{B}$



c. If  $A \subseteq B$ , then  $A \subset B$ .

d. If set P and set R are equivalent, then P and R must have the same elements.

e. If  $p \wedge q$  is false, the p can be false.

f. For every set A,  $A \subseteq A$ .

g. Two sets with 5 elements each have  $2^5$  possible one to one correspondences.

h.  $\emptyset \subseteq A$  for all sets A.

i.  $3 \in \mathbb{N}$

4. Given the following Venn diagram, use set notation to identify the shaded region.

5. Let  $R = \{a, b\}$ ,  $S = \{b, 2, \$\}$ , and  $T = \{a, 8\}$ . Find the following.

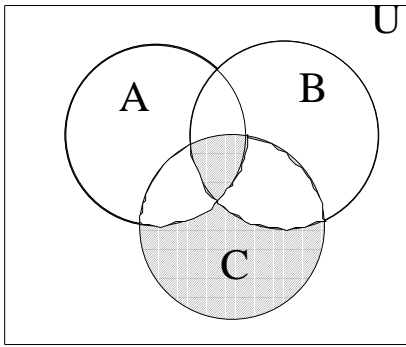
a.  $R \cap T =$

b. If  $U = R \cup S \cup T$ , the  $\overline{S} =$

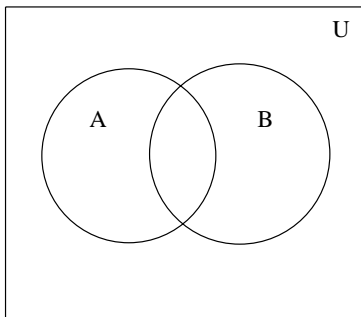
c. If  $U = R \cup S \cup T$ , then  $\overline{R \cup T} =$

d.  $n(S) =$

e. List all the subsets of S.



6. Use set ideas to define the number 3.
7. Write "No dogs are purple" in if-then form.
8. In a classroom of 30 students, 20 had brown hair, 15 had brown eyes, and 9 had neither brown hair nor brown eyes. How many students had brown hair and brown eyes?



9. The original statement is "If  $mn$  is even, then at least one of  $m$  or  $n$  is even." A student shows that if  $m$  and  $n$  are both odd, then  $mn$  is odd. Have they proven the original statement? Why or why not?
10. Let  $P$  and  $Q$  be equivalent sets and  $n(P) = 6$ .
  - a. How many elements are in  $Q$ ?
  - b. What is the fewest possible number of elements in  $P \cap Q$ ?
  - c. What is the most possible number of elements in  $P \cap Q$ ?
  - d. What is the fewest possible number of elements in  $\overline{P}$ ?
11. True or false; justify your answer: If  $n(A) < n(B)$ , then  $A \subset B$ .
12. Sharky, a leader of the underworld, was killed by one of his own band of four henchmen. Detective Sharp interviewed the men and determined that all were lying except one. She deduced who killed Sharky on the basis of the following statements.
 

Socko: Lefty killed Sharky.

Fats: Muscles did not kill Sharky.

Lefty: Muscles was shooting craps (playing dice) with Socko when Sharky was knocked off.

Muscles: Lefty did not kill Sharky.

Who killed Sharky? Justify your answer.

13. Negate each of the following:
- "Spinach is a vegetable and 9 is an even number."
  - "All turtles are reptiles."
14. Suppose  $(p \vee q) \rightarrow r$  is false and  $q$  is false. What can you conclude about the truth values of  $p$  and  $r$
15. Prove or disprove:  $(A \cap B) \cup C = A \cap (B \cup C)$
16. By using a truth table, prove  $p \rightarrow q$  is equivalent to its contrapositive.
17. Given the statement, "Ryan is Natalie's brother if, and only if, Natalie is Ryan's sister." Write two statements, which together are equivalent to the given statement.
18. Make up a problem where the Fundamental Counting Principle is used in the solution, and then solve your problem.
19.  $G$  is the set of all good students. Is  $G$  well defined? If  $G$  is not well defined, use set builder notation with a better description to make it well defined.
20. Give two examples of a
- finite set
  - infinite set