

The exam will cover topics in Set Theory and Logic. Topics to review include:

- Set notation including $\cup, \cap, \emptyset, \{ \}, \in, \subset, A^c, -, |A|$
- Definitions such as union, intersection, empty set, mutually exclusive, subset, complement, universal set
- Translate set builder notation into listed set notation (interpreting the set elements)
- Be able to draw (shade) two- and three-set Venn Diagrams
- Identify a set notation expression that is equivalent to a two- or three-set shaded Venn diagram
- Solve application problems using Venn Diagrams
- Logic notation including $\vee, \wedge, \sim, \rightarrow, \leftrightarrow$, exclusive or
- Be able to construct truth tables
- Determine the validity of an argument
- Prove identities
- Use Logic Gates to determine the truth or falsehood based on inputs and convert to logical notation
- Take sentences in English and rewrite them in logical notation and rewrite logical notation as an English sentence.

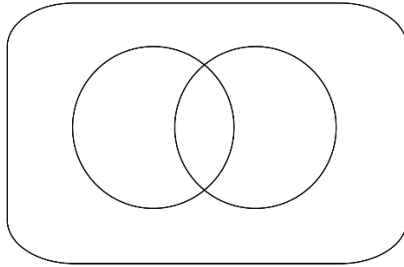
Practice Exam questions:

Instructions: Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

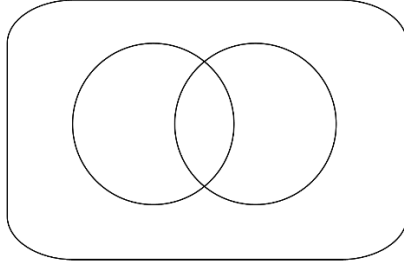
1. Let A be the set of letters in the name CAROLINGIAN and let B be set of letters in the name PERPENDICULAR.
 - a. List the elements in set A using proper set notation.
 - b. List the elements in set B using proper set notation.
 - c. Find $A \cap B$.
 - d. Find $A \cup B$.
 - e. What is the number of elements in set A , i.e. $n(A) = |A|$?
 - f. What is $|A \cup B|$?
2. Answer the following questions about sets:
 - a. List the elements in the set $C = \{x \mid x \text{ is an even counting number less than } 10\}$.
 - b. List the elements in set $D = \{x \mid x \text{ is an integer between } -1 \text{ and } 1 \text{ inclusive}\}$.
 - c. For each of the following questions, answer TRUE or FALSE.
 - i. $4 \in C$
 - ii. $C \cap D = \emptyset$
 - iii. $\emptyset \in C$
 - iv. $1 \subset D$

3. Draw a Venn Diagram that illustrates each of the following sets.

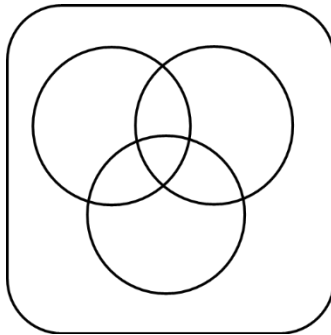
a. $A \cap B$



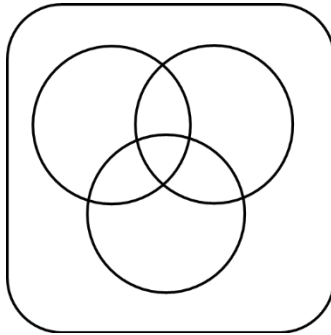
b. $A - B$



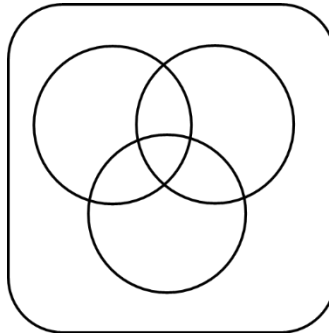
c. $(A' \cap B) \cap C$



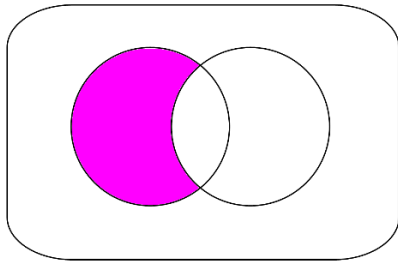
d. $(B - C) \cup A$



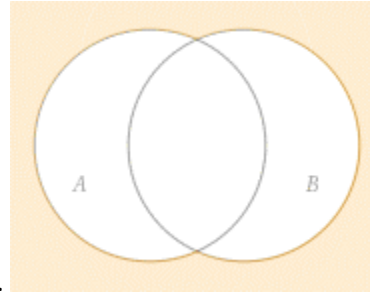
e. $(A' \cup B) - (C \cap B)$



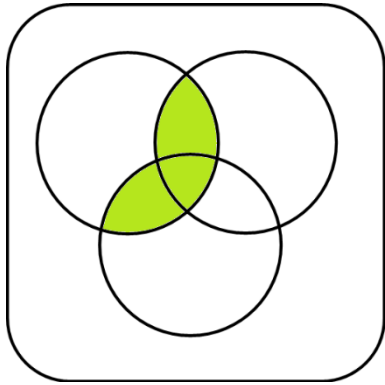
4. For each of the following Venn diagrams, write set notation that describes the indicated set.



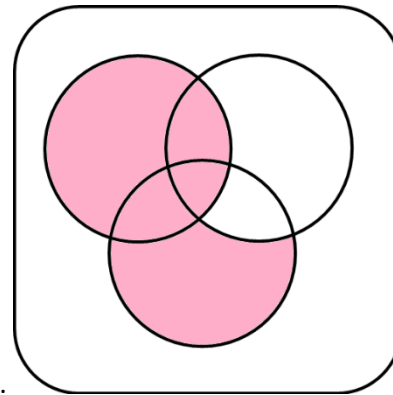
a.



c.



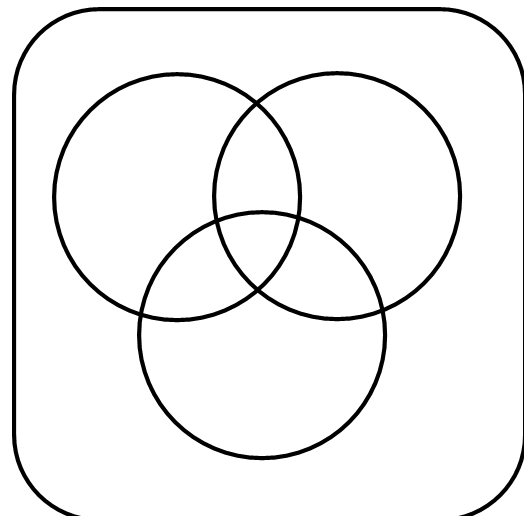
b.



d.

5. A survey was conducted among 75 patients admitted to a hospital cardiac unit during a two-week period. Let B be the set of patients with high blood pressure, C be the set of patients with high cholesterol levels, and S the set of patients that smoke cigarettes. Fill in the Venn diagram below using the following data, and then use the diagram to answer the questions that follow.
- The number of patients with high blood pressure was 47
 - The number of patients with high cholesterol was 46
 - The number of patients who smoke is 52.
 - The number of patients who smoke and have high blood pressure is 33
 - The number of patients who both have high blood pressure and high cholesterol is 31
 - The number of patients who have all three conditions is 21
 - The number of patients with at least two conditions is 51

- a. Find the number of patients who had either high blood pressure or high cholesterol, but not both.
- b. Find the number of patients who had one or none of these conditions.
- c. Find the number of patients who have none of these conditions.



6. Let p be the statement "She has green eyes," and let q be the statement "Andrew is 91 years old," and r be the statement "The cat is lonely." Use this information to translate the following symbolic statements into English sentences.

a. $p \wedge q$

b. $\sim p \rightarrow q$

c. $(p \vee \sim q) \leftrightarrow r$

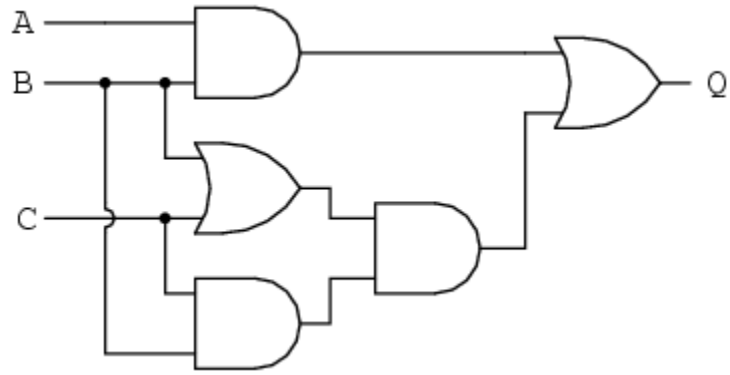
7. Construct truth tables for each of the following statements.

a. $p \wedge \sim q$

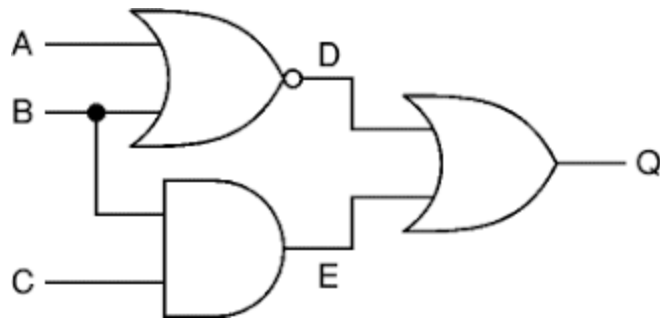
b. $(p \rightarrow q) \vee \sim r$

8. Explain in your own words the difference between "inclusive or" and "exclusive or".

9. Find the truth value of the logic gates below using the fact that A is True, B is False, and C is True.



a.



b.

10. Use determine the validity of the following argument. If the argument is invalid, explain why.
A mathematician is a device for turning coffee into theorems.
You turn coffee into theorems.
You are a mathematician.