

Math 102 Practice Test 1- Sets

Show your work whenever appropriate for full credit.

1. Write the following $\{0, 1, 2, \dots, 10\}$ in set-builder notation.

2. Write out the set $\{x: x \text{ is an integer less than } 4\}$ in roster notation.

3. How many subsets of $\{a, b, c, d, e, f, h, i\}$ are there? Show how you determined it.

4. Write each of the following in set builder notation.

a. $\{0, 1, 2, 3, 4, 5, 6, 7\}$ _____

b. $\{\text{January, February, March, April, May}\}$ _____

5. Given $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$, $B = \{1, 3, 4, 5, 7\}$ $C = \{7, 8\}$ find:

a. $A \cap B$ _____ b. B' _____

c. $A' \cup B'$ _____ d. $A - B$ _____

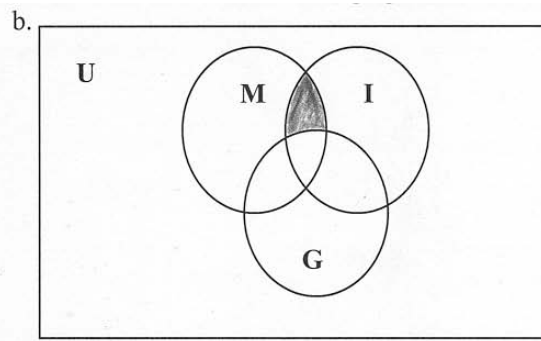
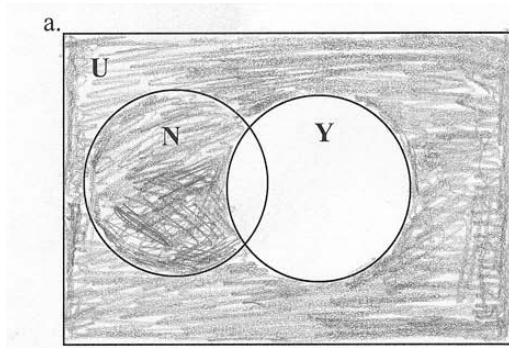
e. $(A \cap C) \cap (A \cup B)$ _____

6. List all the subsets of $\{t, i, m\}$.

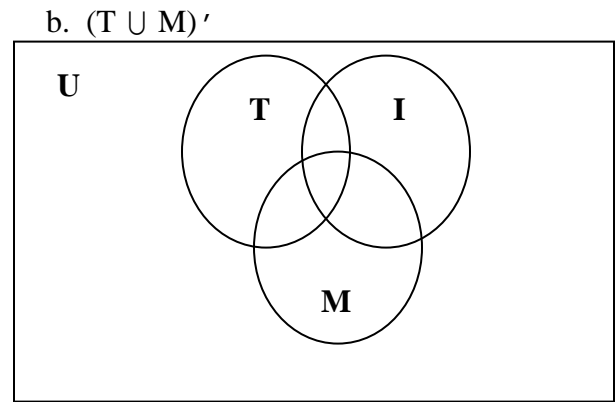
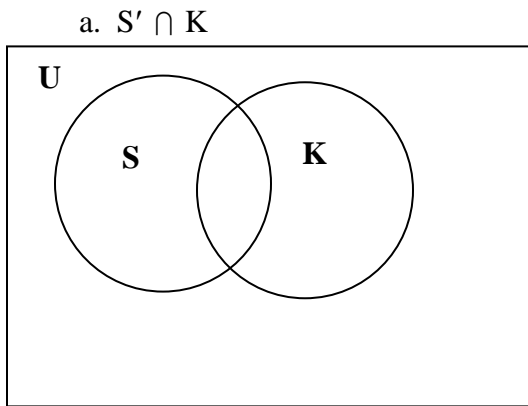
7. Show that the set of whole numbers is infinite.

7. _____

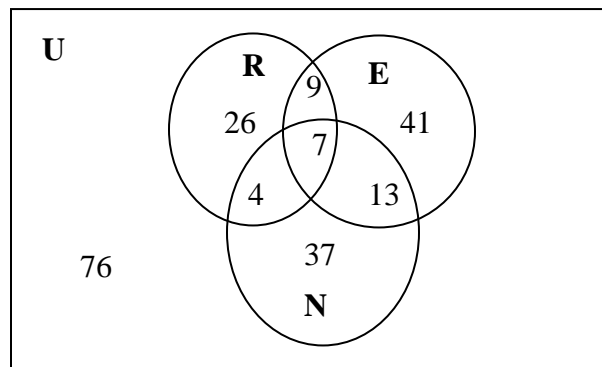
8. What does the shaded region in each figure below represent in set notation?



9. Illustrate each of the following by shading the Venn diagrams below.



10. The numbers in the regions of the given Venn diagram indicate the number of elements in each region. Find the cardinality for each problem.



a. $n(N) =$ _____ b. $n[(R \cap E) \cup N] =$ _____ c. $n(E') =$ _____

d. $n(E - R) =$ _____ e. $n(U) =$ _____ f. $n(R \cap E \cap N) =$ _____

11. Tell whether each statement is true or false, if false correct the statement to make it true.

a. All sets that are equal are also equivalent.

b. $A' \cap B' = (A \cap B)'$ (Hint: try it using the elements in problem 5 of this test)

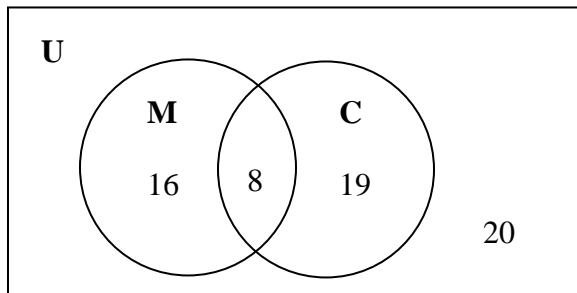
c. If set $F = \{1, 2, 3\}$ and set $G = \{2, 3, 1\}$ then $F \subset G$.

d. For any set $U' = \{ \}$.

e. The number of proper subsets of a given set is one less than the number of subsets for that same set.

f. $n(T \cup L) = n(T) + n(L)$

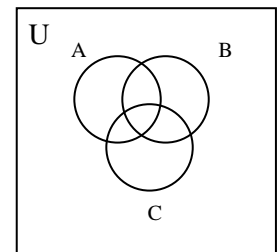
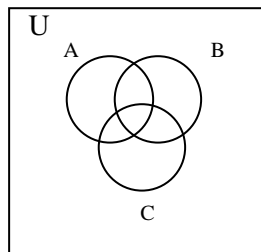
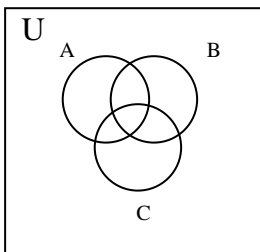
12. Use the Venn diagram below to fill in the missing statement



a. $n(M' \cup C') = \underline{\hspace{2cm}}$

b. $n(\underline{\hspace{2cm}}) = 36$

13. Use the Venn diagram to work the following problem in three steps $A' \cup (B \cap C)$.



14. Fill in the blanks with **one** of the following \in , \notin , \subseteq , $\not\subseteq$, \subset , or $\not\subset$ to make each statement true (1 pt/problem).

a. $\{ \} \underline{\hspace{1cm}}$ $\{2, 4\}$

b. Whole $\underline{\hspace{1cm}}$ Rational numbers

c. $-2 \underline{\hspace{1cm}}$ Naturals numbers

d. $-6 \underline{\hspace{1cm}}$ $\{x:x \text{ is a solution to the equation } x^2 = 36\}$

15. There were 100 students in the library who responded to how they completed their research paper.

18 students only used the periodicals

29 students used the web and books

15 students used books, the web, and periodicals

40 students used books and periodicals

20 used the web and periodicals

60 students used books

7 students did not use the web, nor books, nor the periodicals.

a. Represent this information with a Venn diagram.



b. How many students used the web in their research?

b. _____

c. How many students used books or periodicals?

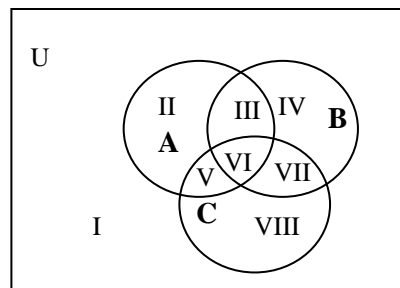
c. _____

16. Concerning the first 41 presidents of the United States we know the following facts:
 Eight held cabinet posts, 14 served as vice-president, 15 served in the U.S. Senate, 2 served in cabinet posts and as vice-president, 4 served in cabinet posts and in the U.S. Senate, 6 served in the U.S. Senate and as vice-president, and 1 served in all three positions.

How many presidents served in:

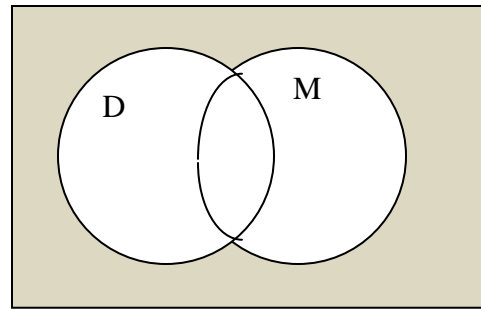
- none of these 3 positions? _____
- only in the U.S. Senate? _____
- at least one of the three position? _____
- exactly two positions? _____

17. List the numbered regions that make up the answer to each of the following:



- $A - C =$ _____
- $B' \cap A =$ _____
- $A \cup (B \cap C) =$ _____
- $C \cap (B \cup A)' =$ _____

18. Use DeMorgan's Law and set operations to write the shaded region in two different ways.



19. A pizza chain is willing to pay \$0.75 to each person interviewed about his or her likes and dislikes of types of pizza crust. Of the people interviewed, 220 liked thin crust, 270 liked thick crust, 70 liked both, and 50 did not like pizza at all. What was the total cost of this survey?

19. _____

20. In a survey of 130 people, the following data were collected: 106 people subscribed to the newspaper, 29 people subscribed to magazines, and 17 people were members of a mail CD club. Seventeen subscribed to both the newspaper and the magazines, 5 people subscribed to magazines and were members of a CD club, and 10 people subscribed to the newspaper and were members of a mail CD club. Three people subscribed to both the newspaper and magazines and were members of a mail CD club. Make and fill in a Venn diagram to illustrate this situation.

Bonus Problem: Describe a one-to-one correspondence between the set

$$\frac{1}{8}, \frac{1}{27}, \frac{1}{64}, \frac{1}{125}, \dots$$

and one of its proper subsets. Then write the general correspondence of each.