

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. (3 points)

$$A = \{C, A, R, O, L, I, N, G\}$$

- b. List the elements in set B using proper set notation. (3 points)

$$B = \{P, E, R, N, D, I, C, U, L, A\}$$

- c. Find $A \cap B$. (3 points)

$$\{A, C, I, L, N, R\}$$

- d. Find $A \cup B$. (3 points)

$$\{A, C, D, E, G, I, L, N, O, P, R, U\}$$

- e. What is the cardinality of set A , i.e. $n(A) = |A|$? (2 points)

$$8$$

- f. What is the cardinality of set $A \cup B$? (2 points)

$$12$$

- g. What is the cardinality of $A \times B$? (Do not attempt to list all the elements, just say how big the set is.) (3 points)

$$8 \times 10 = 80$$

2. Answer the following questions about sets:

a. List the elements in the set $C = \{x \mid x \text{ is an even counting number less than } 10\}$. (3 points)

$$\{2, 4, 6, 8\}$$

b. List the elements in set $D = \{x \mid x \text{ is an integer between } -1 \text{ and } 1 \text{ inclusive}\}$. (3 points)

$$\{-1, 0, 1\}$$

c. List the elements in $C \times D$. (4 points)

$$\{(2, -1), (2, 0), (2, 1), (4, -1), (4, 0), (4, 1), (6, -1), (6, 0), (6, 1), (8, -1), (8, 0), (8, 1)\}$$

d. How many elements are in $C \times C \times C = C^3$? (3 points)

$$4^3 = 64$$

e. For each of the following questions, answer TRUE or FALSE. (1 point each)

i. $4 \in C$

true

ii. $C \cap D = \emptyset$

true

iii. $\emptyset \in C$

false

iv. $1 \subset D$

false

v. $\{(2, 1), (2, 0), (2, -1)\} \subset C \times D$

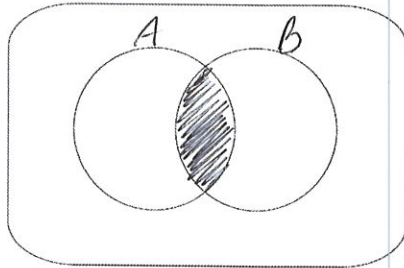
true

f. List all the subsets of D . [Hint: there are 8 of them.] (6 points)

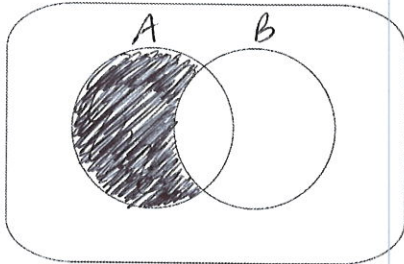
$$\{-1, 0, 1\}, \{-1, 0\}, \{-1, 1\}, \{0, 1\}, \\ \{-1\}, \{0\}, \{1\}, \emptyset$$

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

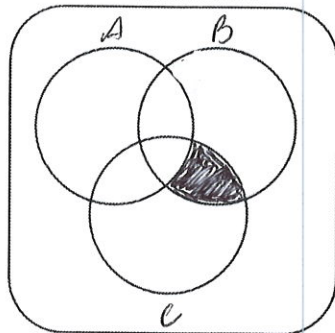
a. $A \cap B$



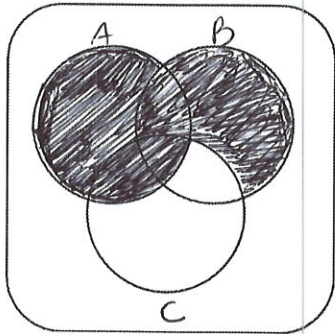
b. $A - B$



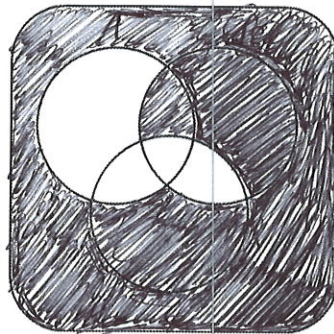
c. $(A' \cap B) \cap C$



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



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



6. 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. (16 points)

- 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 exactly two conditions is 51

a. Find the number of patients who had either high blood pressure or high cholesterol, but not both.

$$4 + 7 = 11$$

b. Find the number of patients who had one or none of these conditions.

$$2 + 11 + 4 + 7 = 24$$

c. Find the number of patients who have none of these conditions.

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