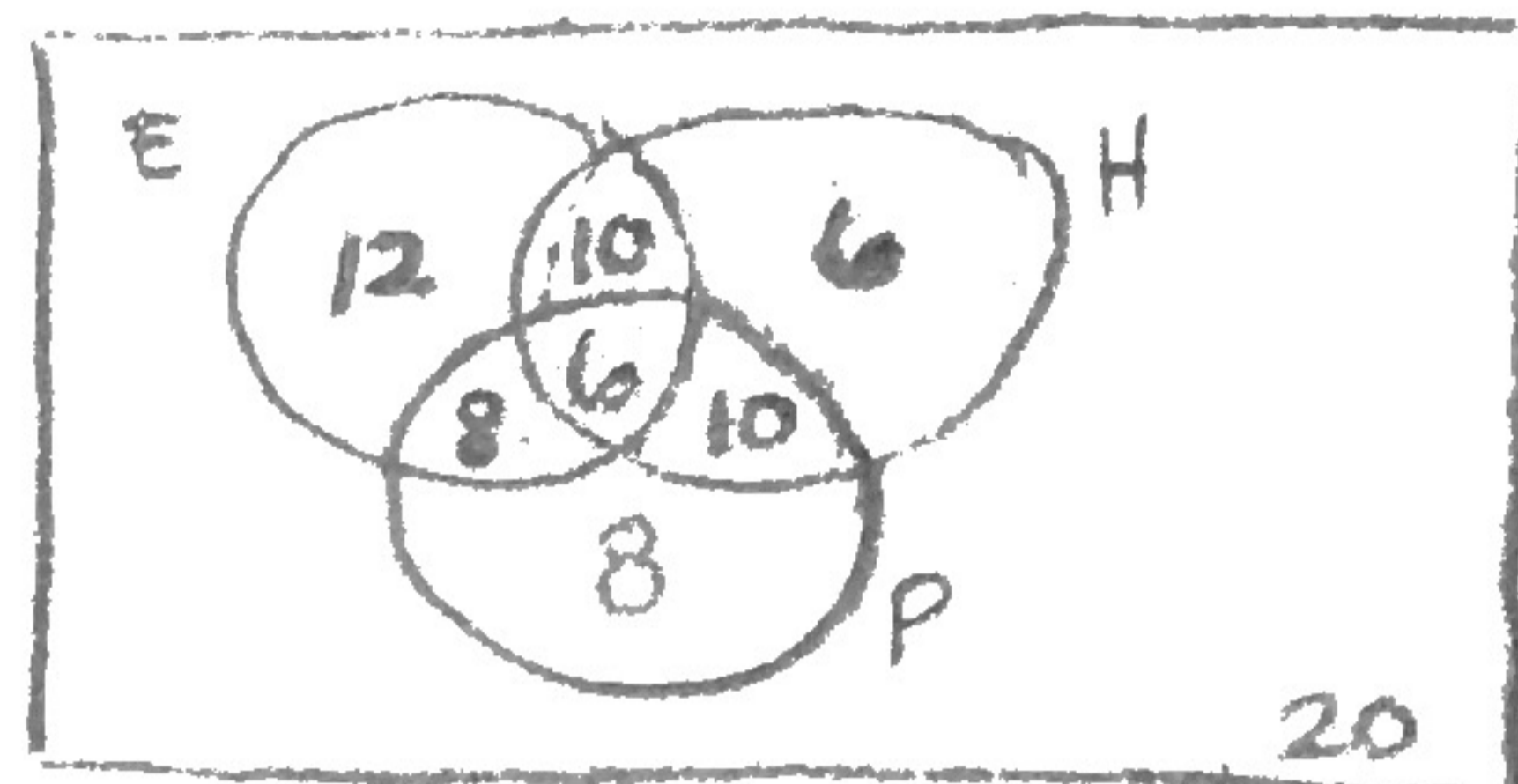


8AB Venn Diagrams & Sets

CW / HW

1. A survey of 80 sophomores at a certain western college showed the following:

- 36 take English
- 32 take History
- 32 take Poli.Sci.
- 6 take all three
- 16 take History and English
- 16 take Political Science and History
- 14 take Political Science and English



Draw and fill in Venn Diagram to represent the situation:

For each, determine how many students are in the set and write the subset in symbols.

- (a) take English and neither of the other two?
 $12, E \cap (\overline{H \cup P})$
- (b) take History, but neither of the other two?
 $6, H \cap (\overline{E \cup P})$
- (c) take Political Science and History but not English?
 $10, H \cap P \cap \overline{E}$
- (d) take none of the three courses?
 $20, \overline{E \cup H \cup P}$
- (e) do not take Political Science?
 $48, \overline{P}$

2. Find $n(A)$ for the following sets. $n(A)$ = the number of elements in set A

- a. $A = \{-1, 0, 1, 2, 3, 4, 5\}$
 $n(A) = 7$
- b. $\{1, 2, 3, \dots, 1000\}$
 $n(A) = 1,000$
- c. $A = \{x : x \text{ is a state in the U.S.}\}$
 $n(A) = 50$
- d. $\{x : x \text{ is a natural number less than } 6\}$
 $n(A) = 5$
- e. $\{\text{all prime numbers less than } 30\}$
 $n(A) = 10$

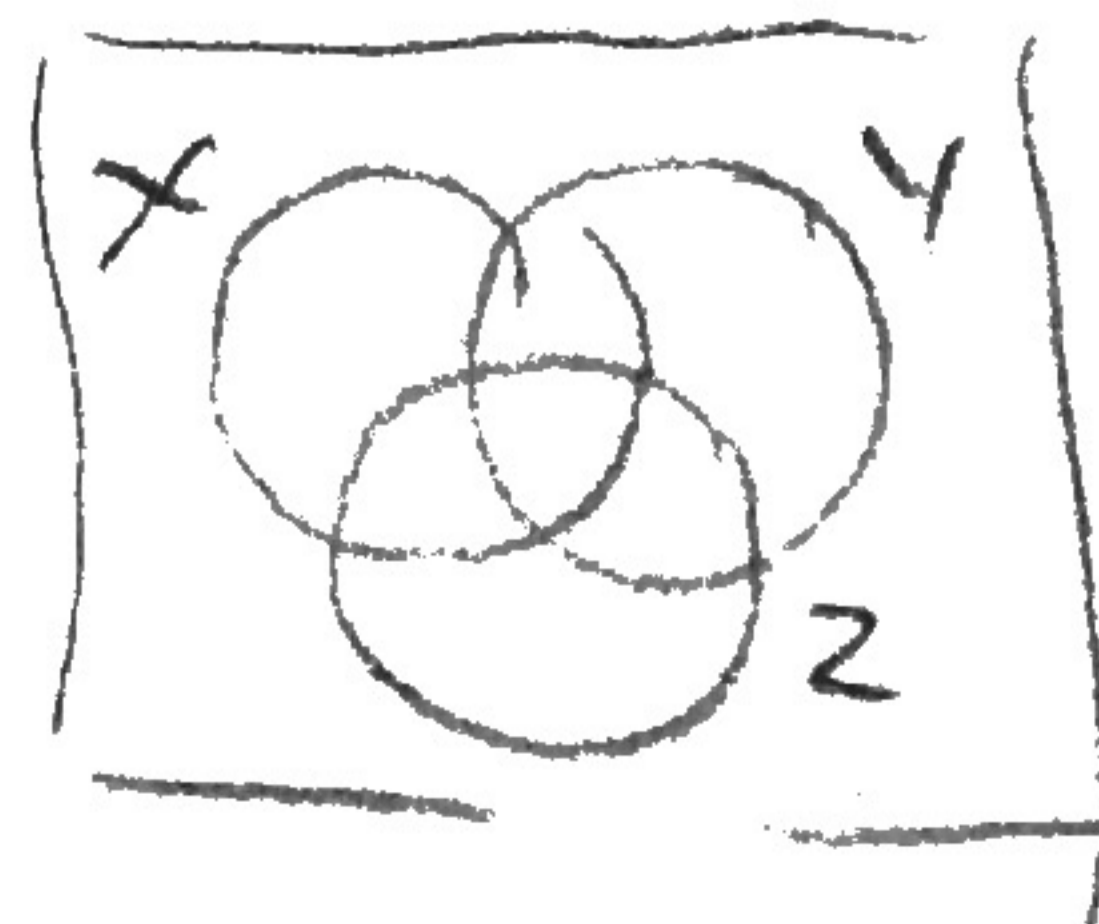
4. Perform the indicated operations.

Let $U = \{2, 3, 4, 5, 7, 9\}$ $X = \{2, 3, 4, 5\}$ $Y = \{3, 5, 7, 9\}$ $Z = \{2, 4, 5, 7, 9\}$

- 1. $X \cap Y$ 2. $X \cup Y$ 3. $Y \cup Z$ 4. $Y \cap Z$ 5. $X \cup U$
- $\{3, 5\}$ $\{2, 3, 4, 5, 7, 9\}$ $\{2, 3, 4, 5, 7, 9\}$ $\{5, 7, 9\}$ $\{2, 3, 4, 5, 7, 9\}$

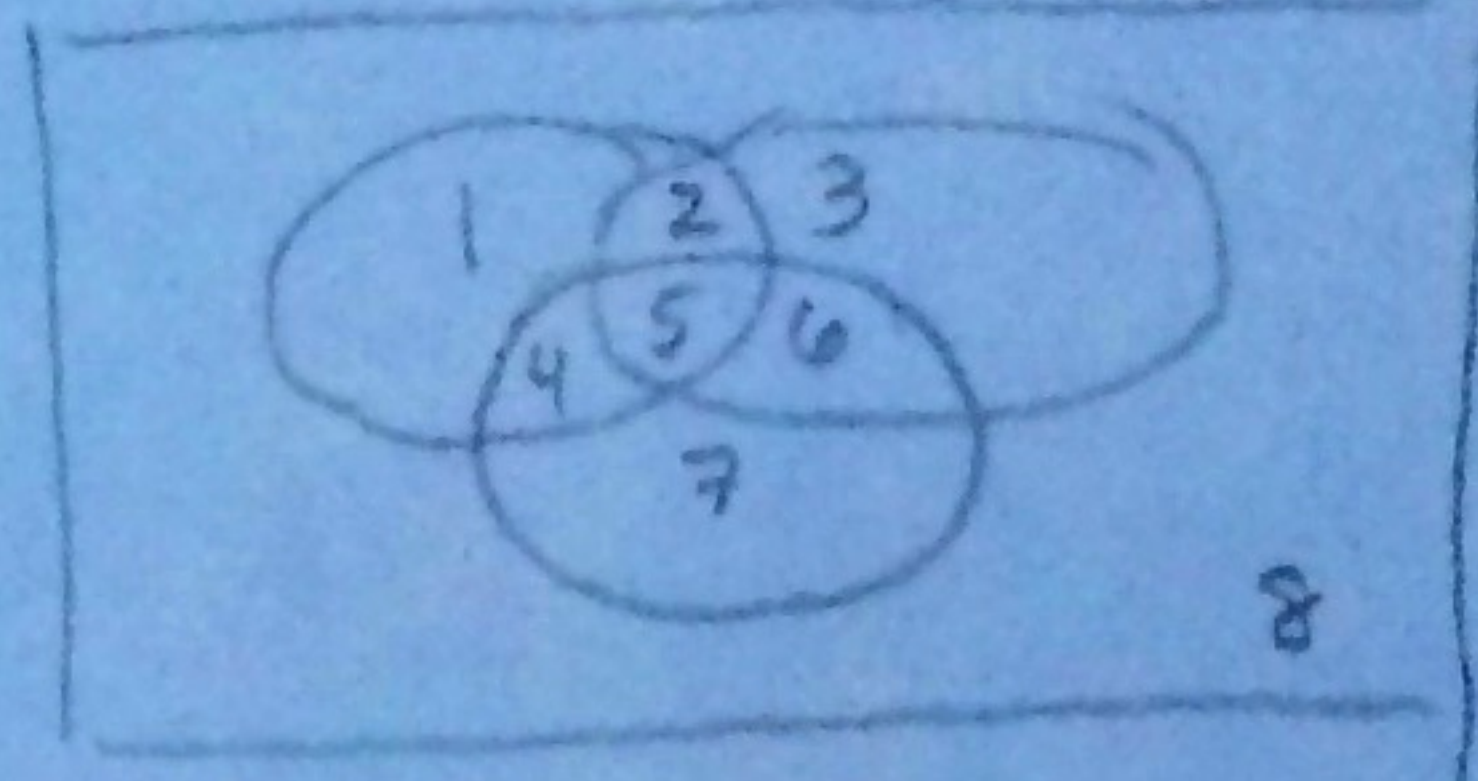
- 6. $Y \cap U$ 7. X' 8. Y' 9. $X' \cap Y'$ 10. $X' \cap Z$
- $\{3, 5, 7, 9\}$ $\{7, 9\}$ $\{2, 4\}$ \emptyset $\{7, 9\}$

- 11. $X \cup (Y \cap Z)$ 14. $Y \cap (X \cup Z)$ 15. $(Y \cup Z') \cup X$ 16. $(X' \cup Y') \cup Z$
- $\{2, 3, 4, 5, 7, 9\}$ $\{3, 5, 7, 9\}$ $\{2, 3, 4, 5, 7, 9\}$ $\{2, 4, 5, 7, 9\}$



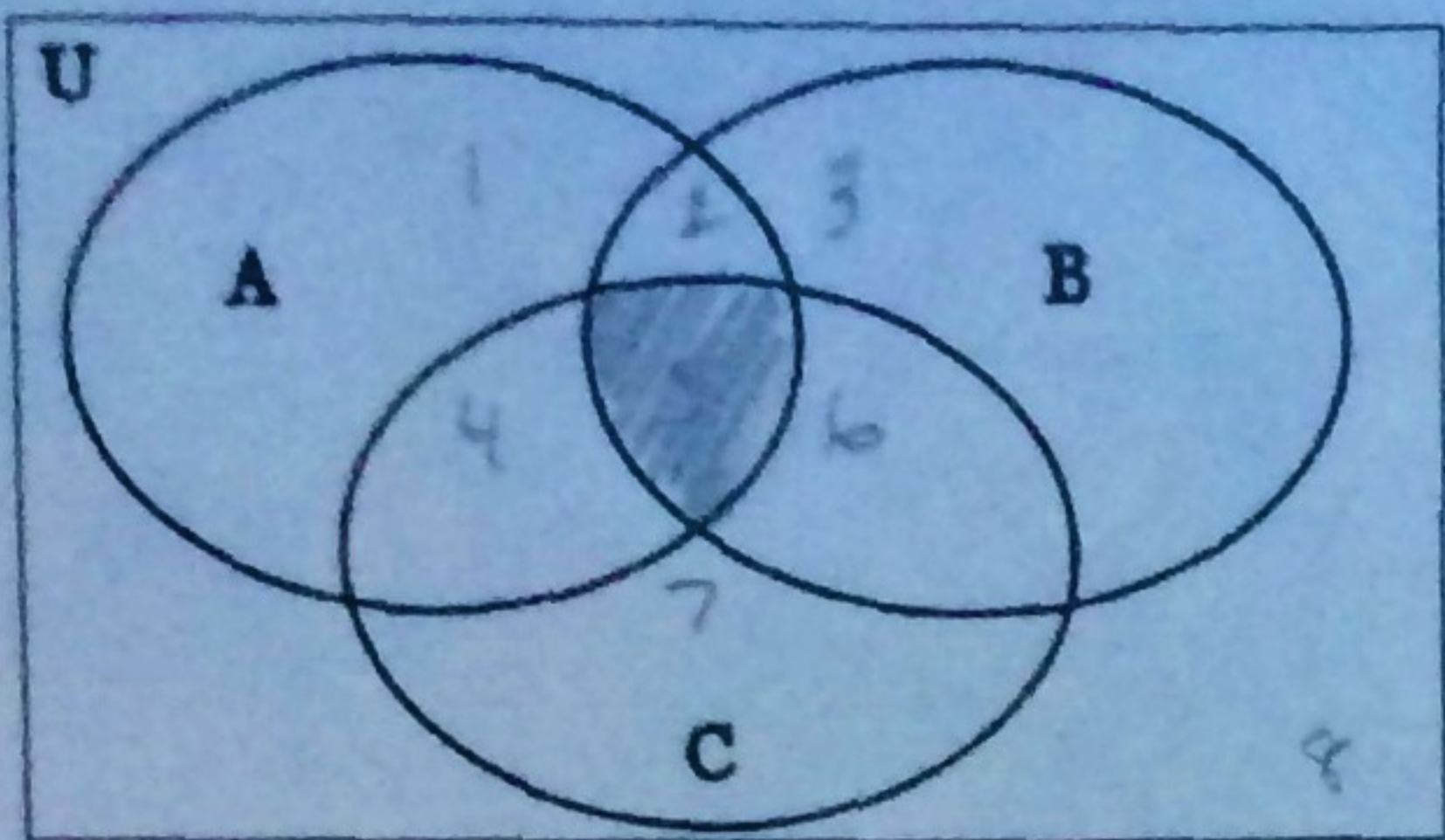
Shade the following sets:

Hint: number the regions!
AUB



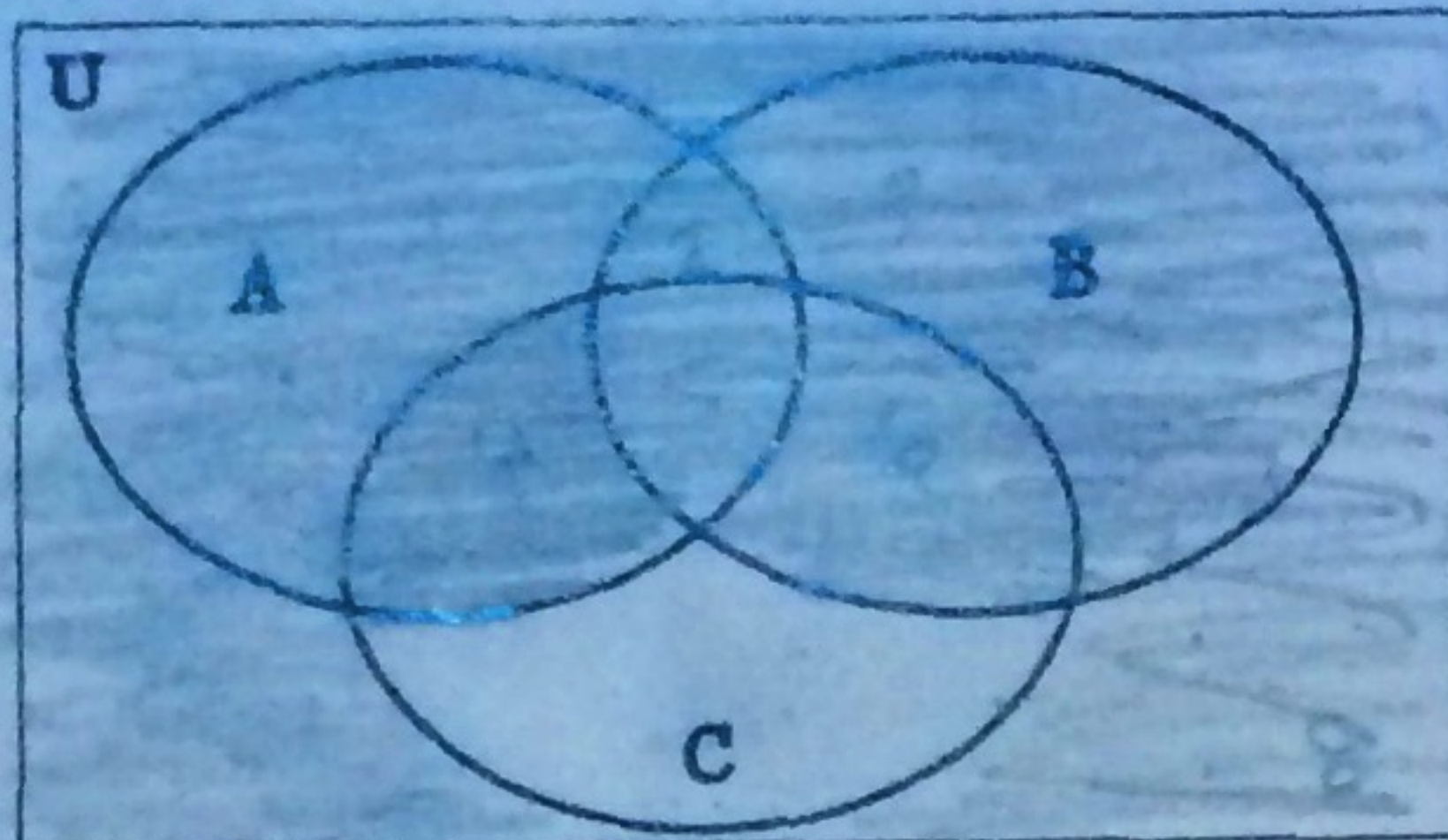
1. $(A \cap B) \cap C$

{5}



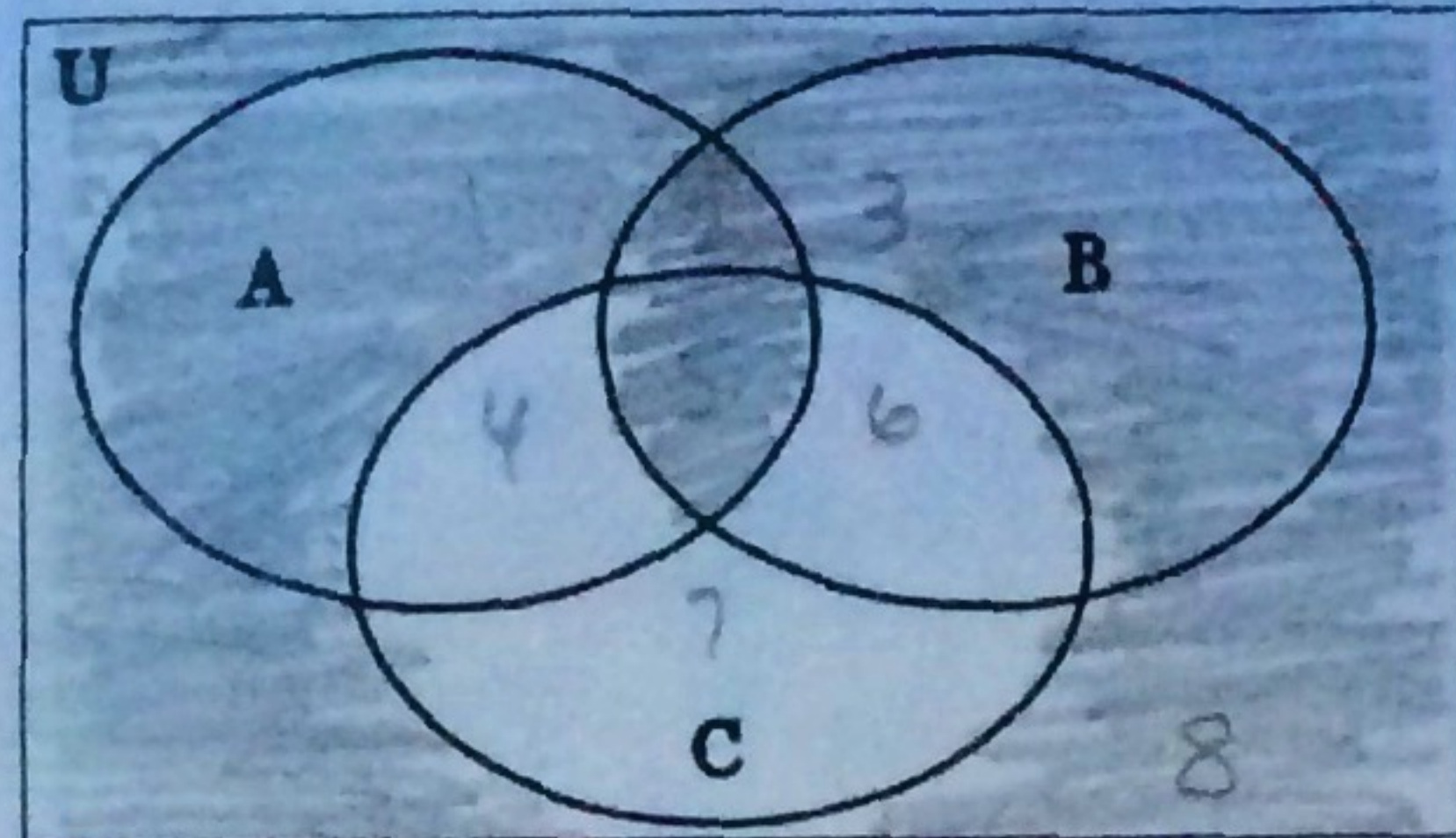
2. $(A \cup C) \cup B$

{1, 2, 3, 4, 5, 6, 8}



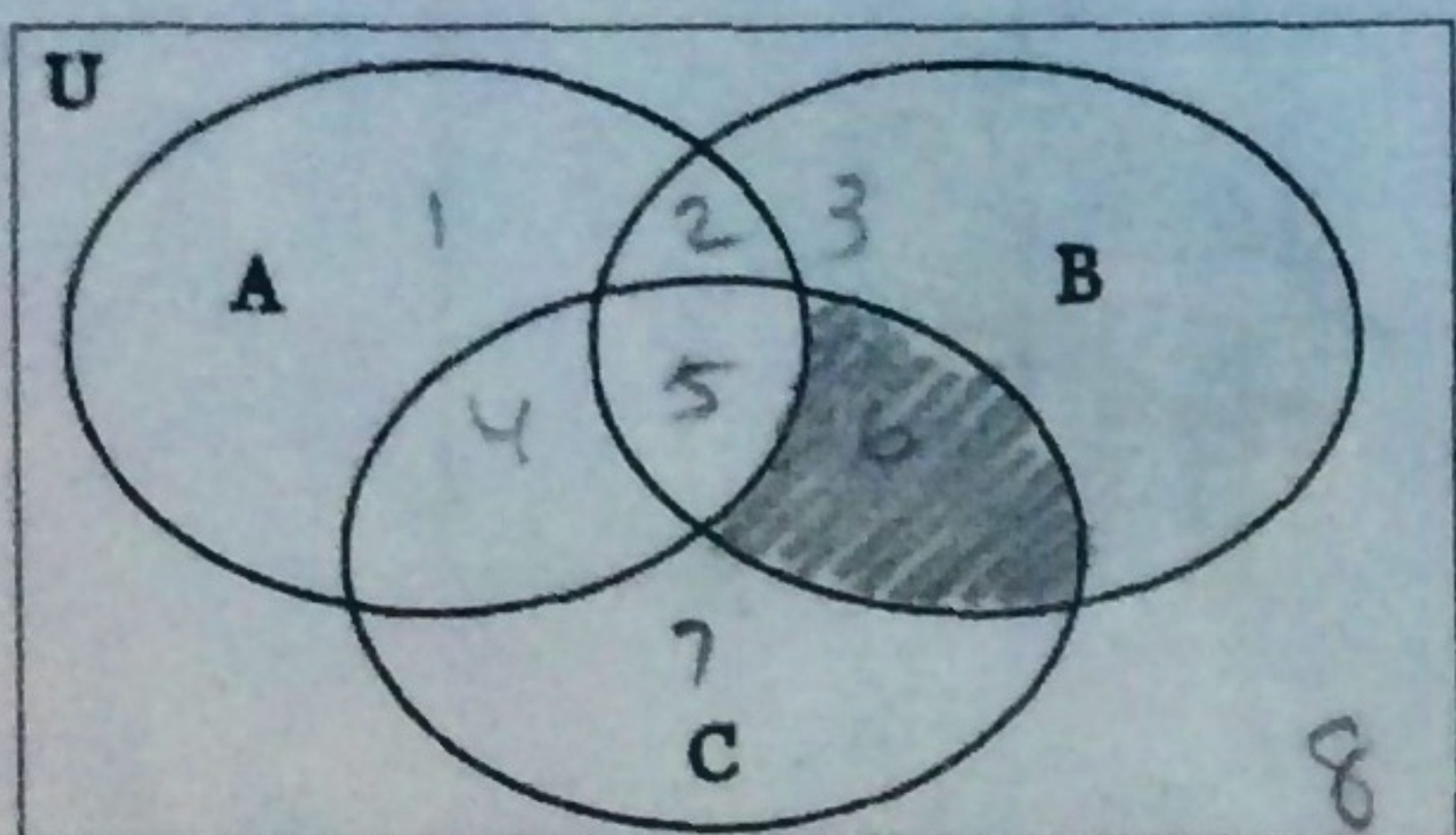
3. $(A \cap B) \cup C'$

{1, 2, 3, 5, 8}



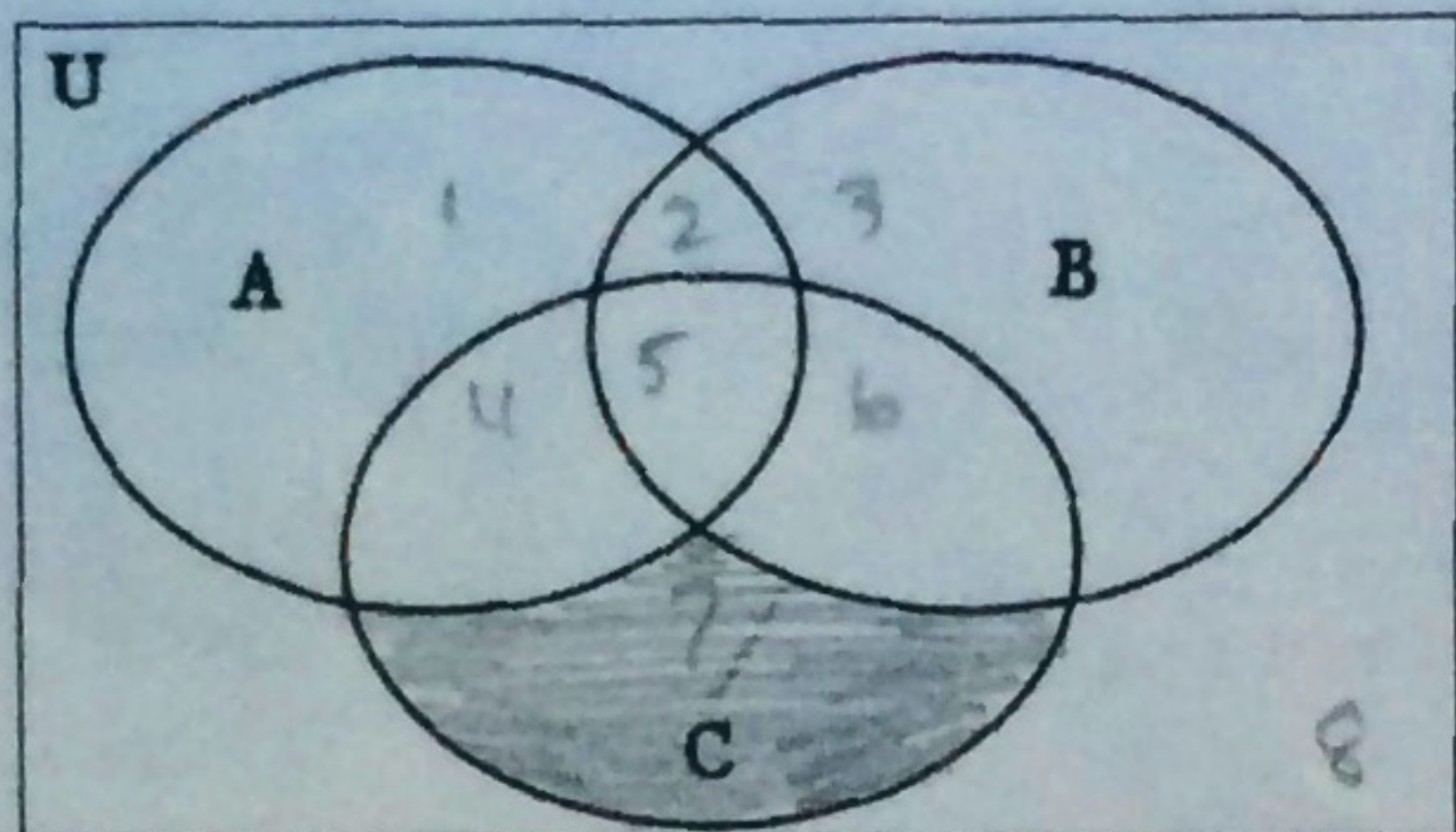
4. $(A' \cap B) \cap C$

{6}



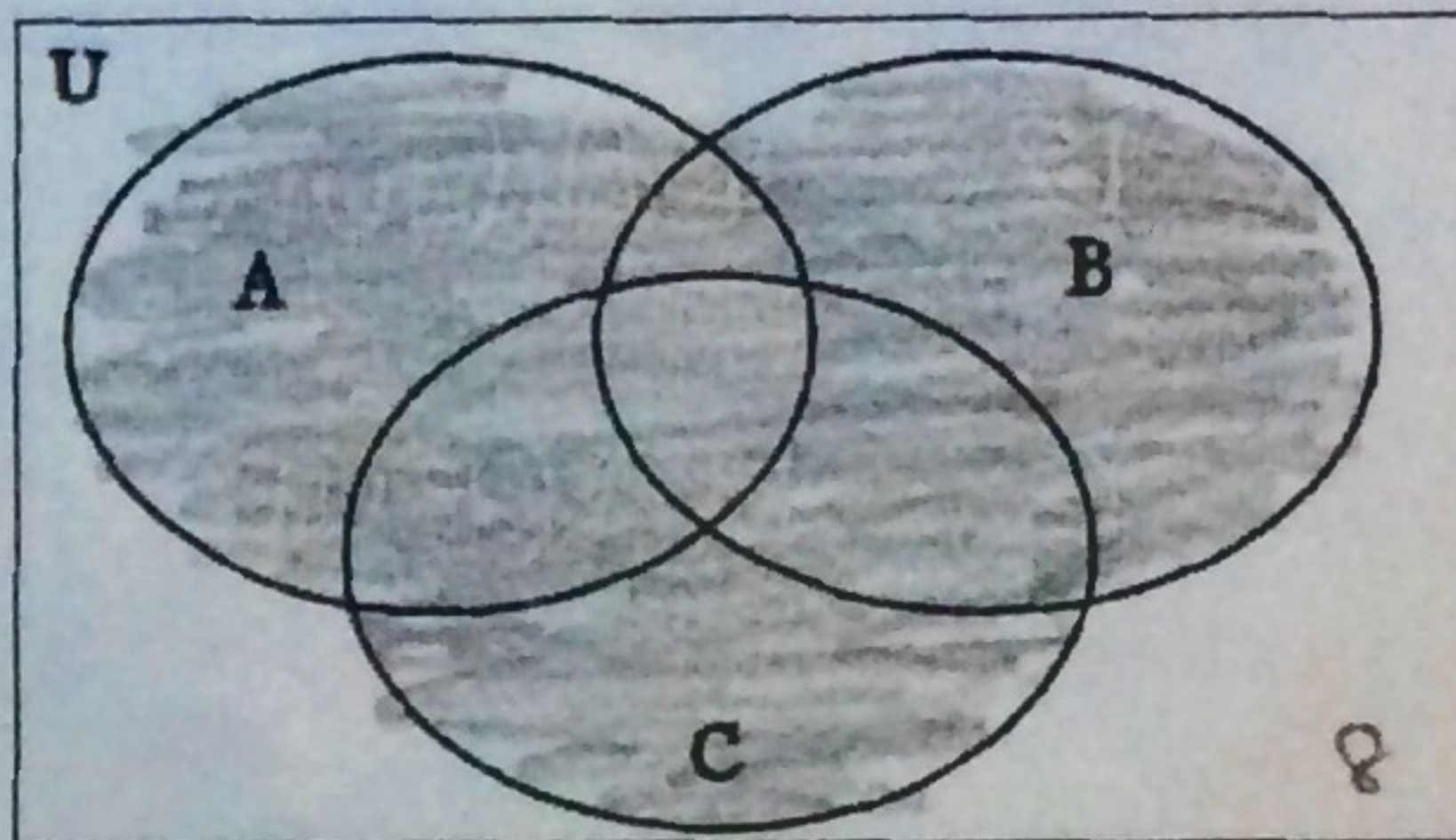
5. $(A' \cap B') \cap C$

{7}



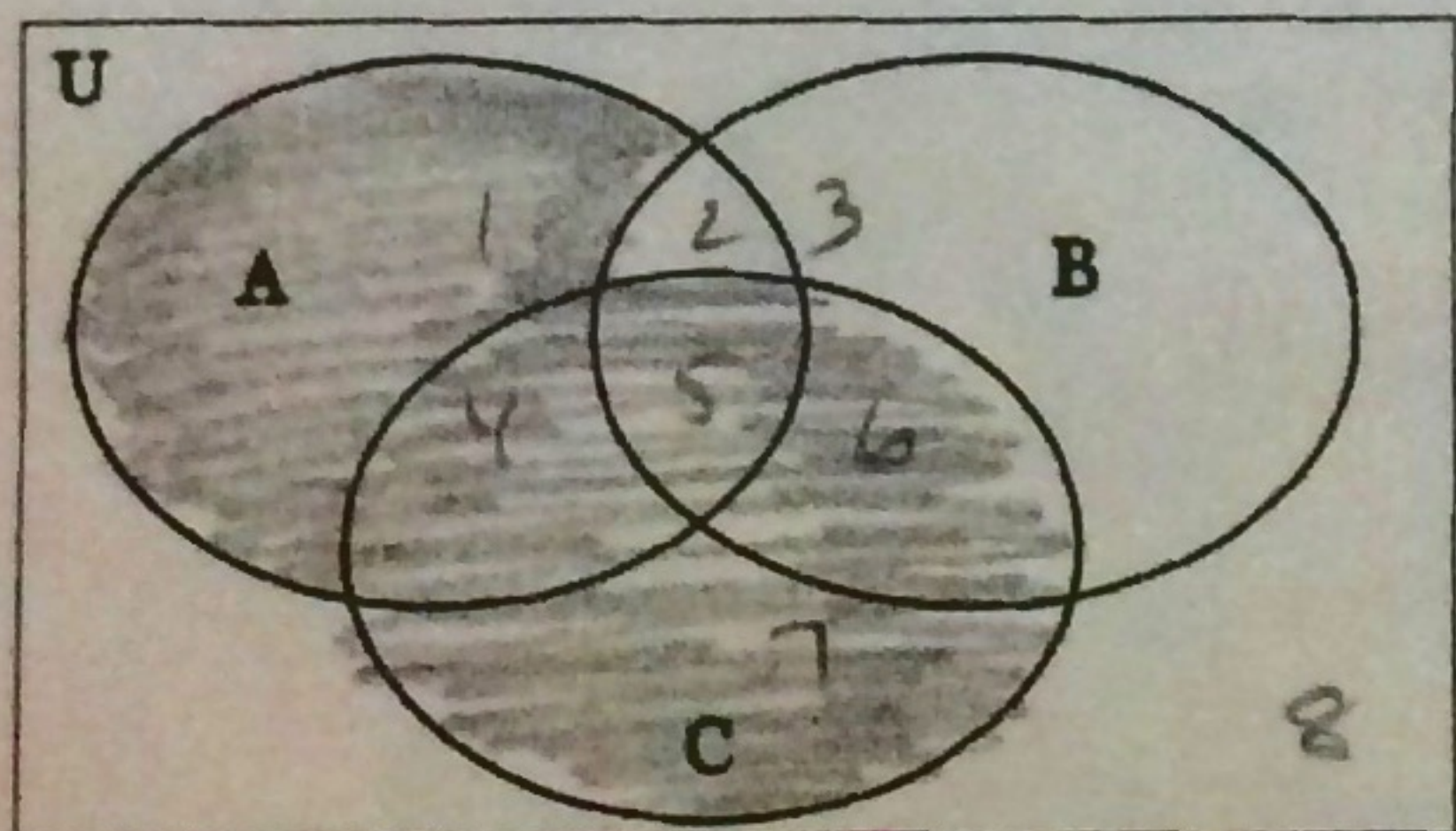
6. $(A \cup B) \cup C$

{1, 2, 3, 4, 5, 6, 7}



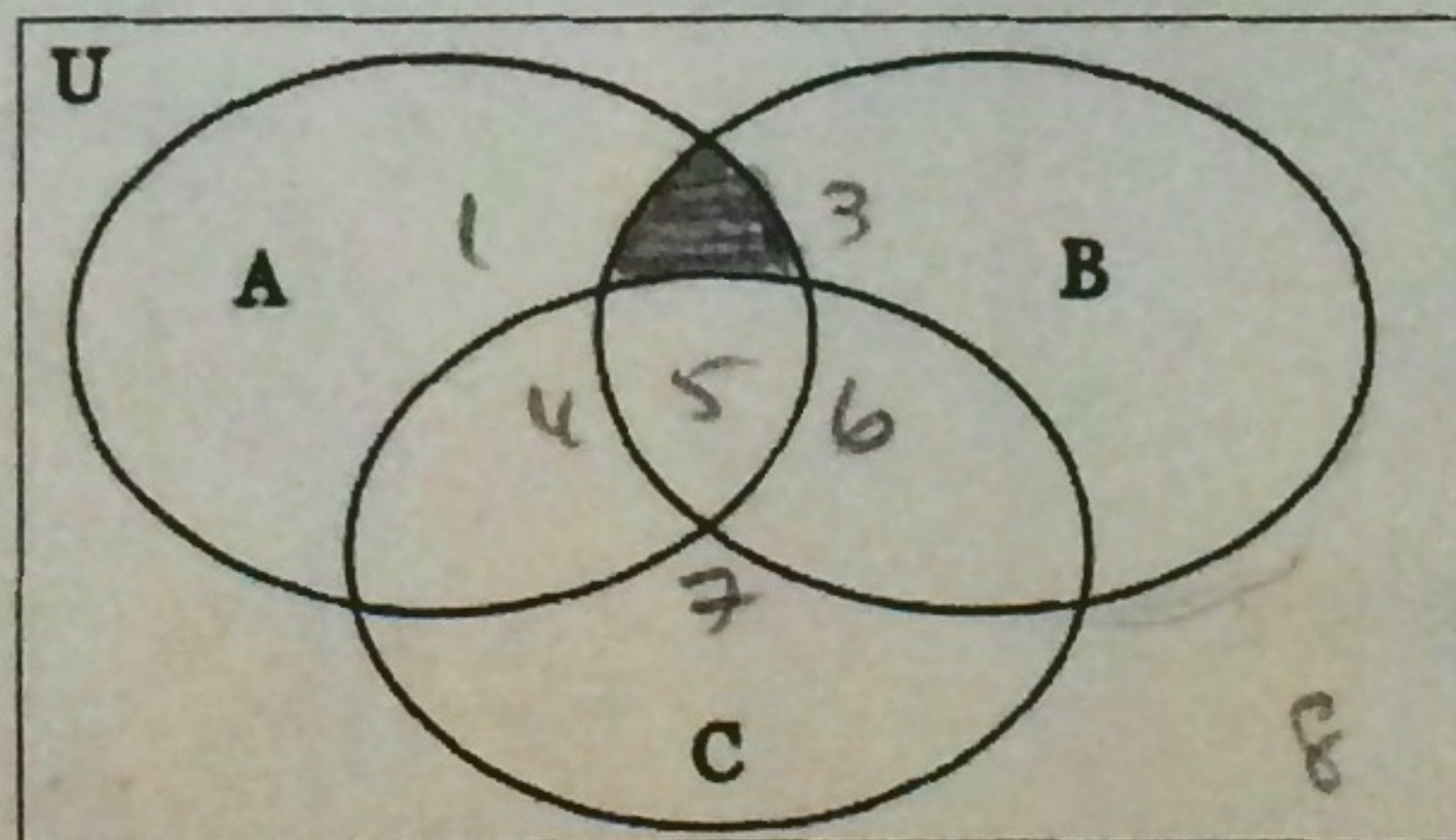
7. $(A \cap B') \cup C$

{1, 4, 5, 6, 7}



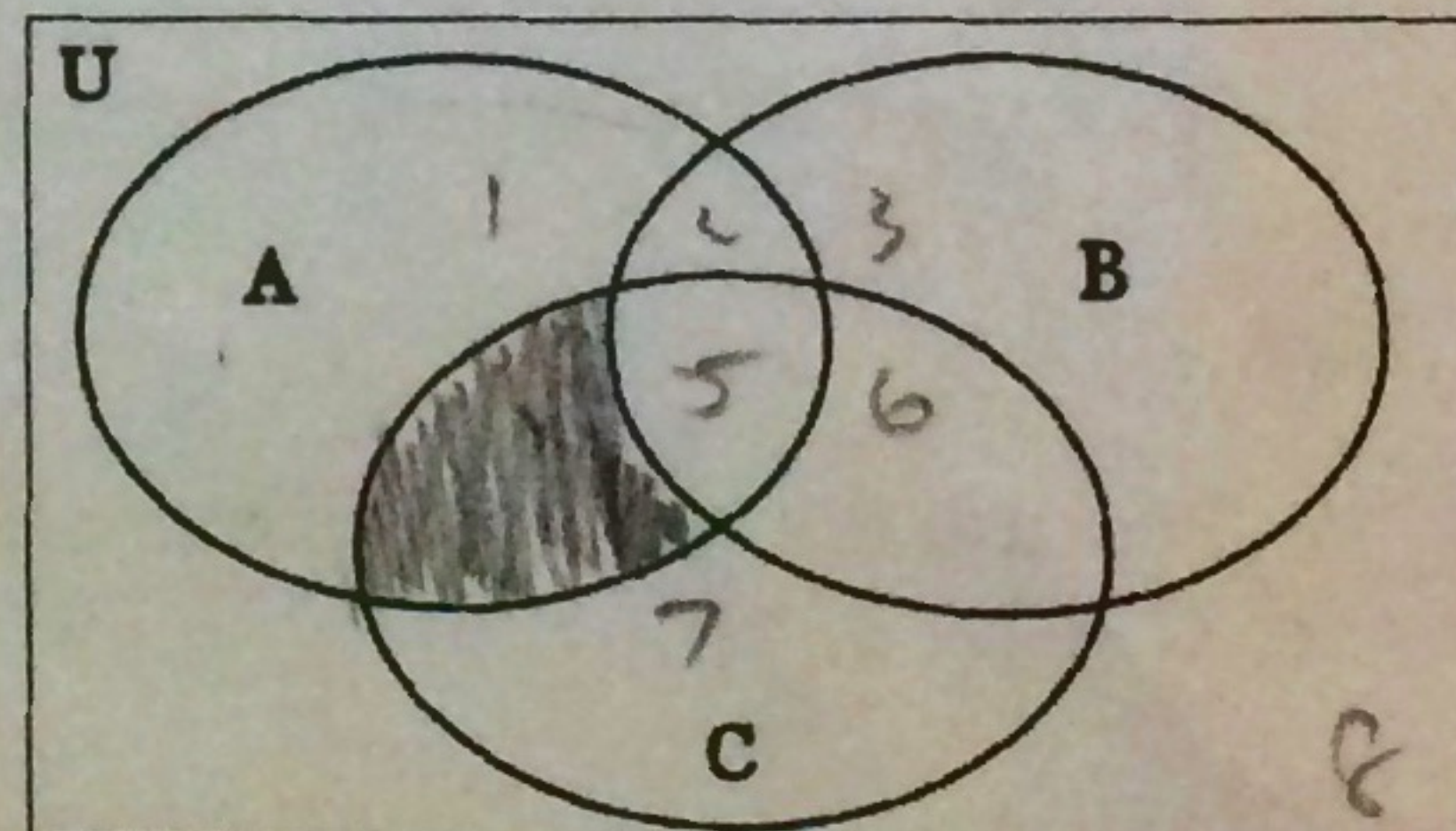
8. $(A \cap C') \cap B$

{2}



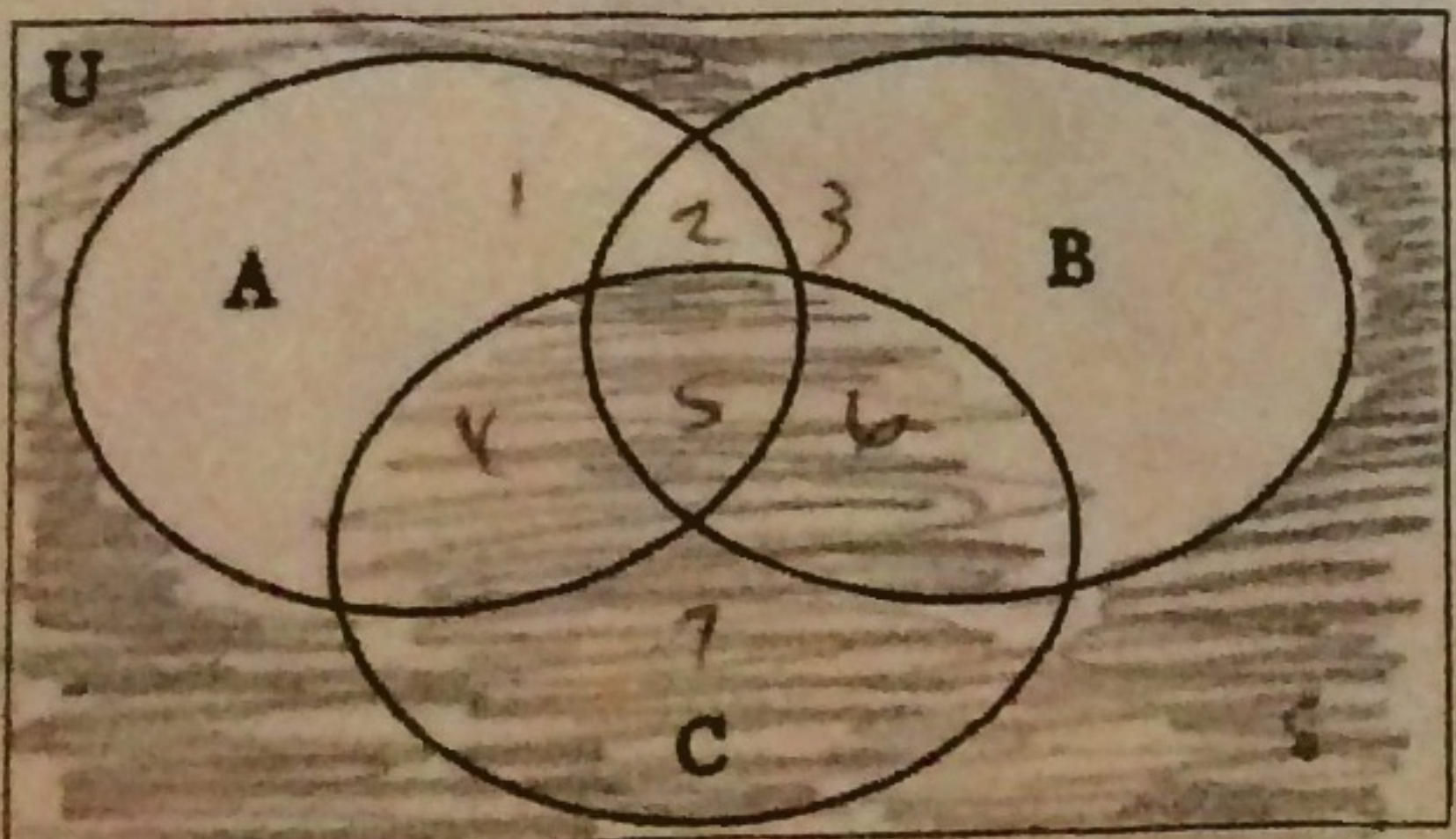
9. $(A \cap B') \cap C$

{4}



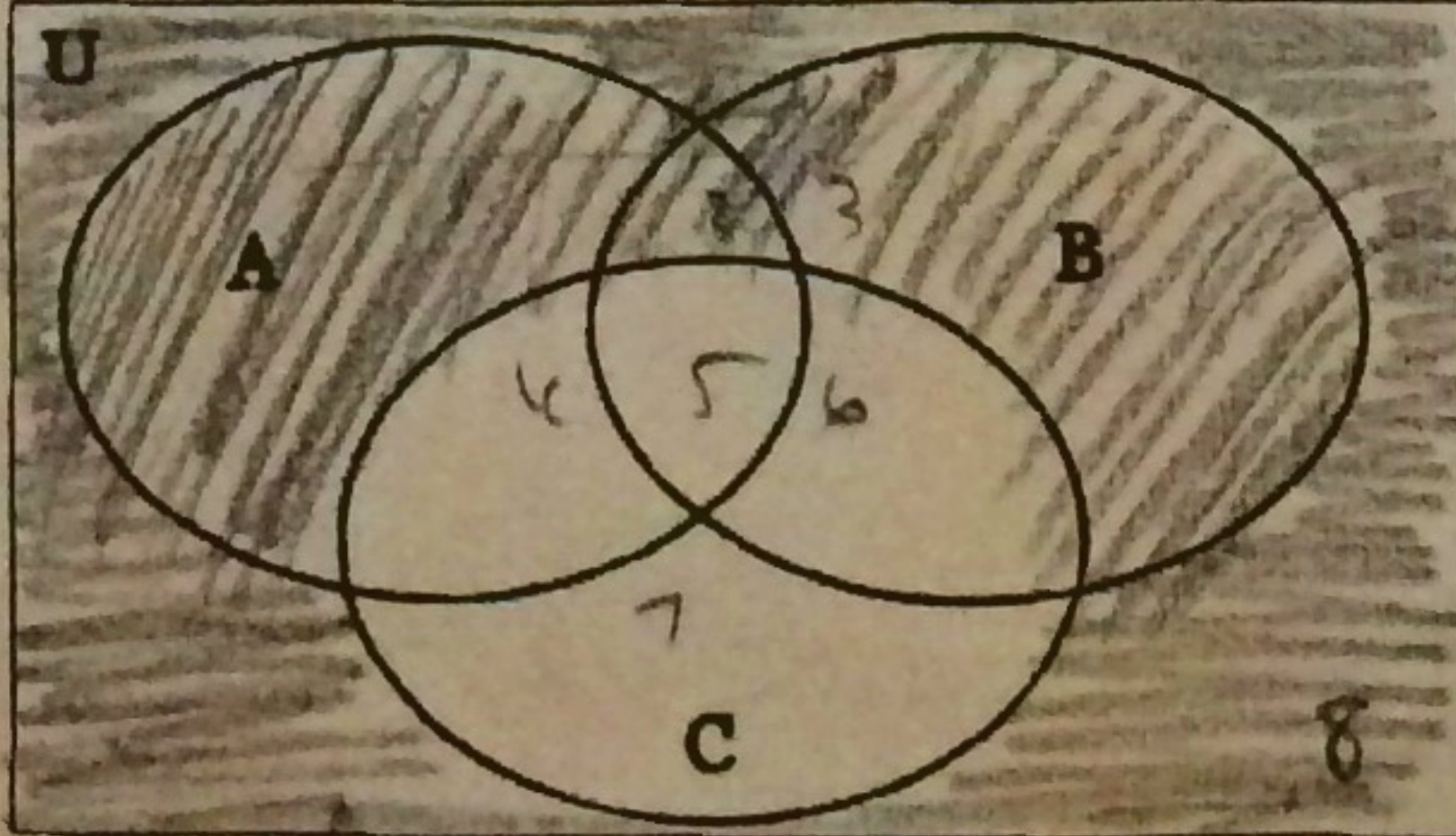
10. $(A' \cap B') \cup C$

{4, 5, 6, 7, 8}



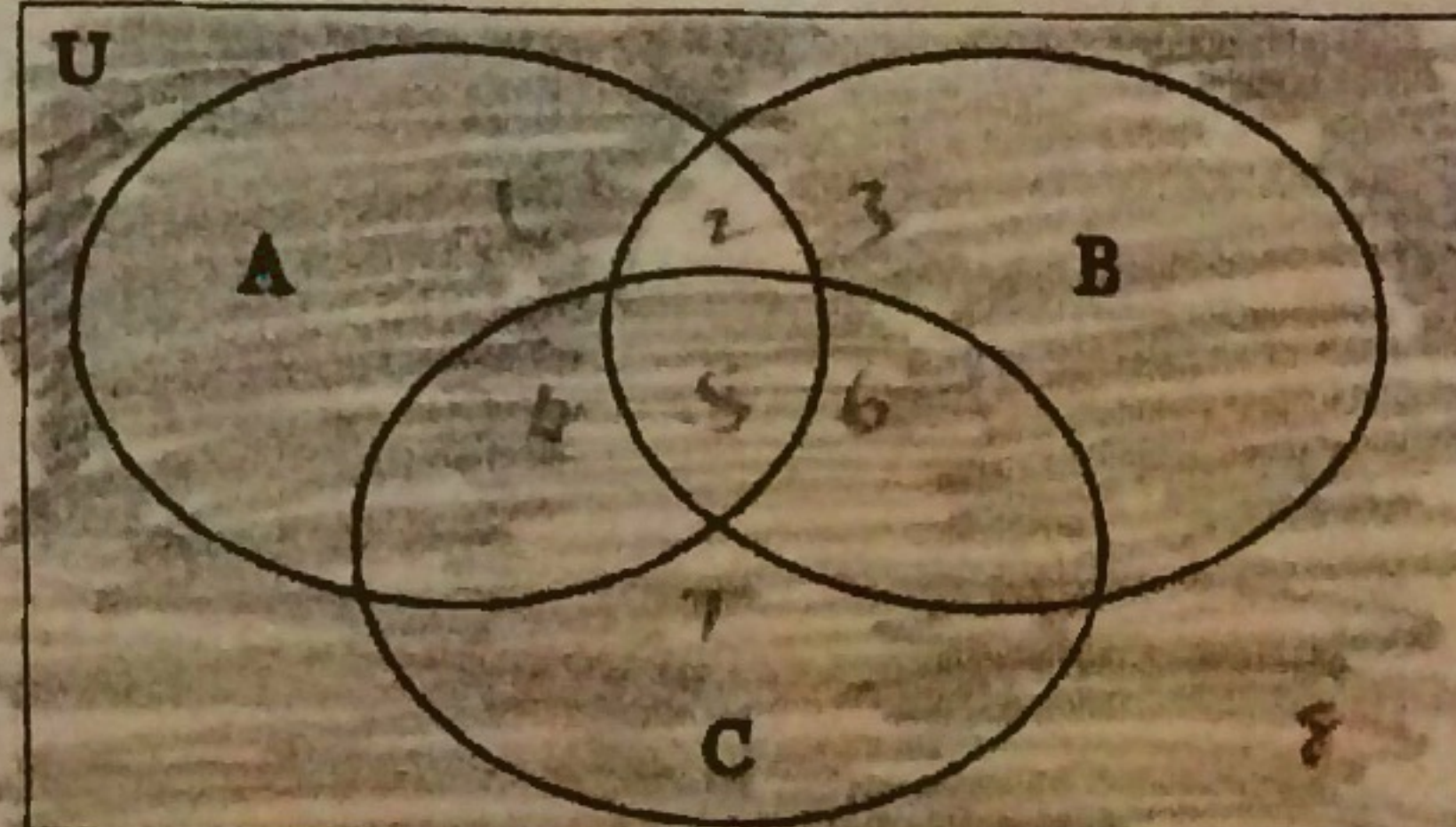
11. $(A' \cap B) \cup C'$

{4, 5, 6, 7}



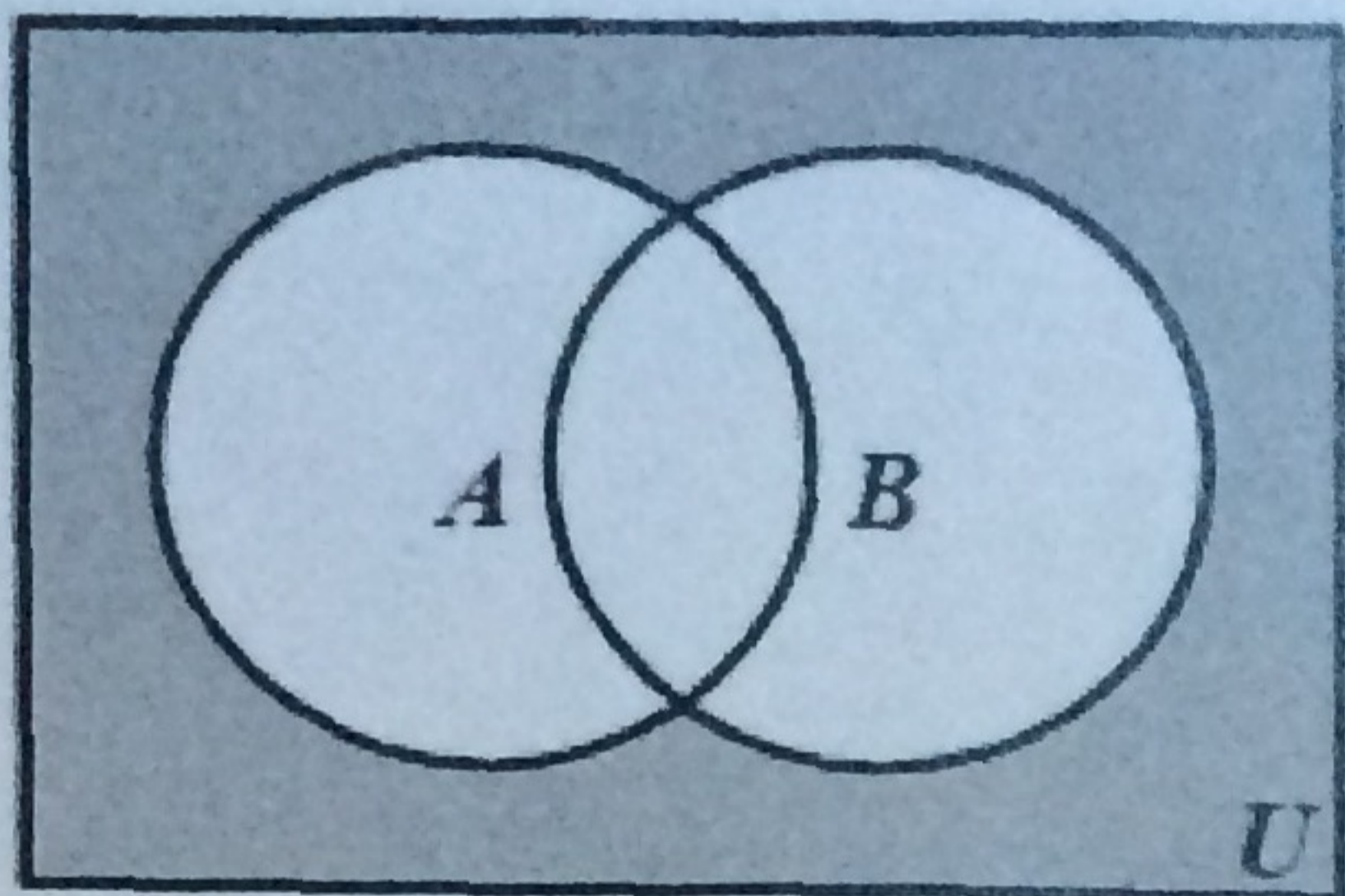
12. $(A \cap B)' \cup C$

{1, 3, 4, 5, 6, 7, 8}

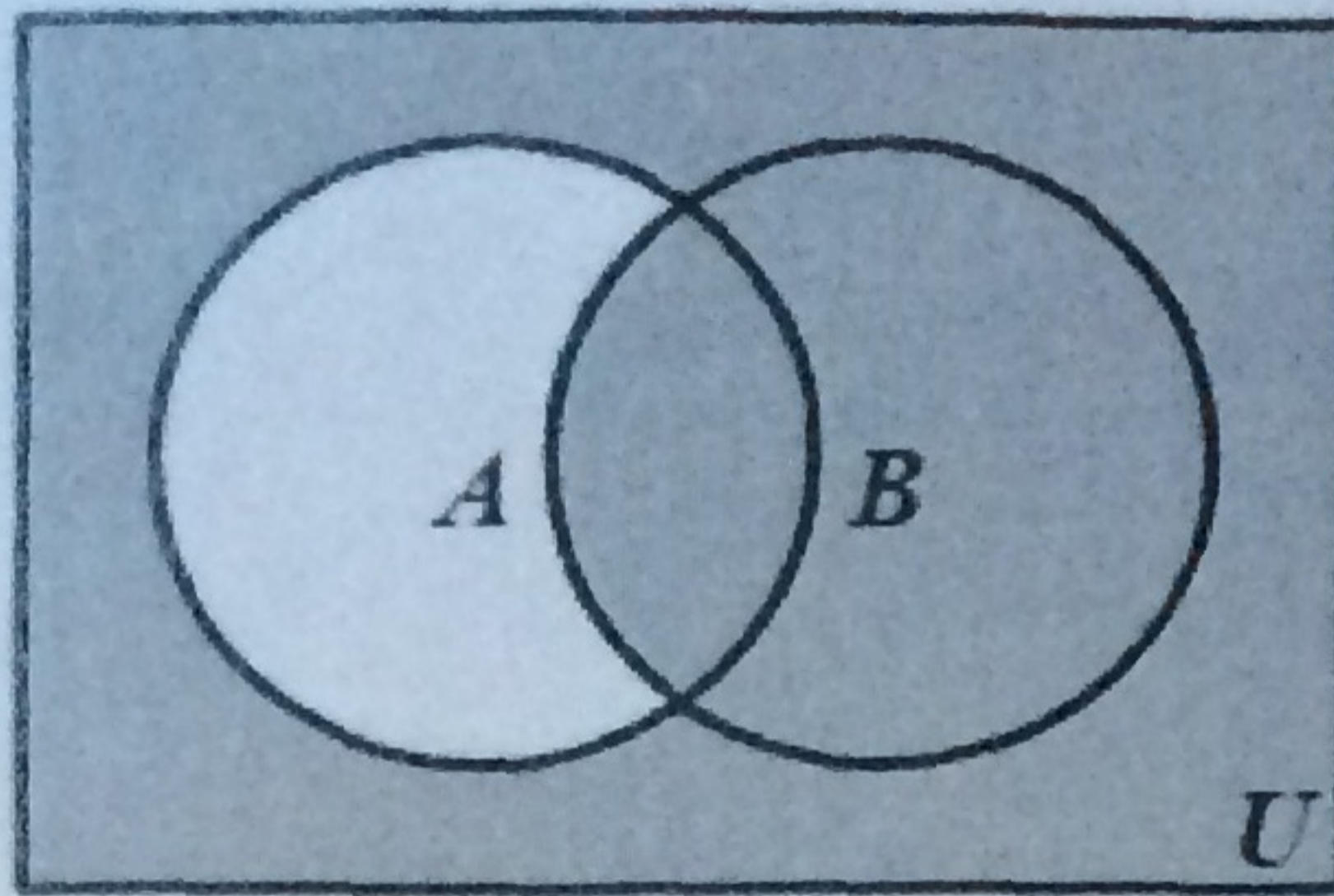


Write the description of the shaded area:

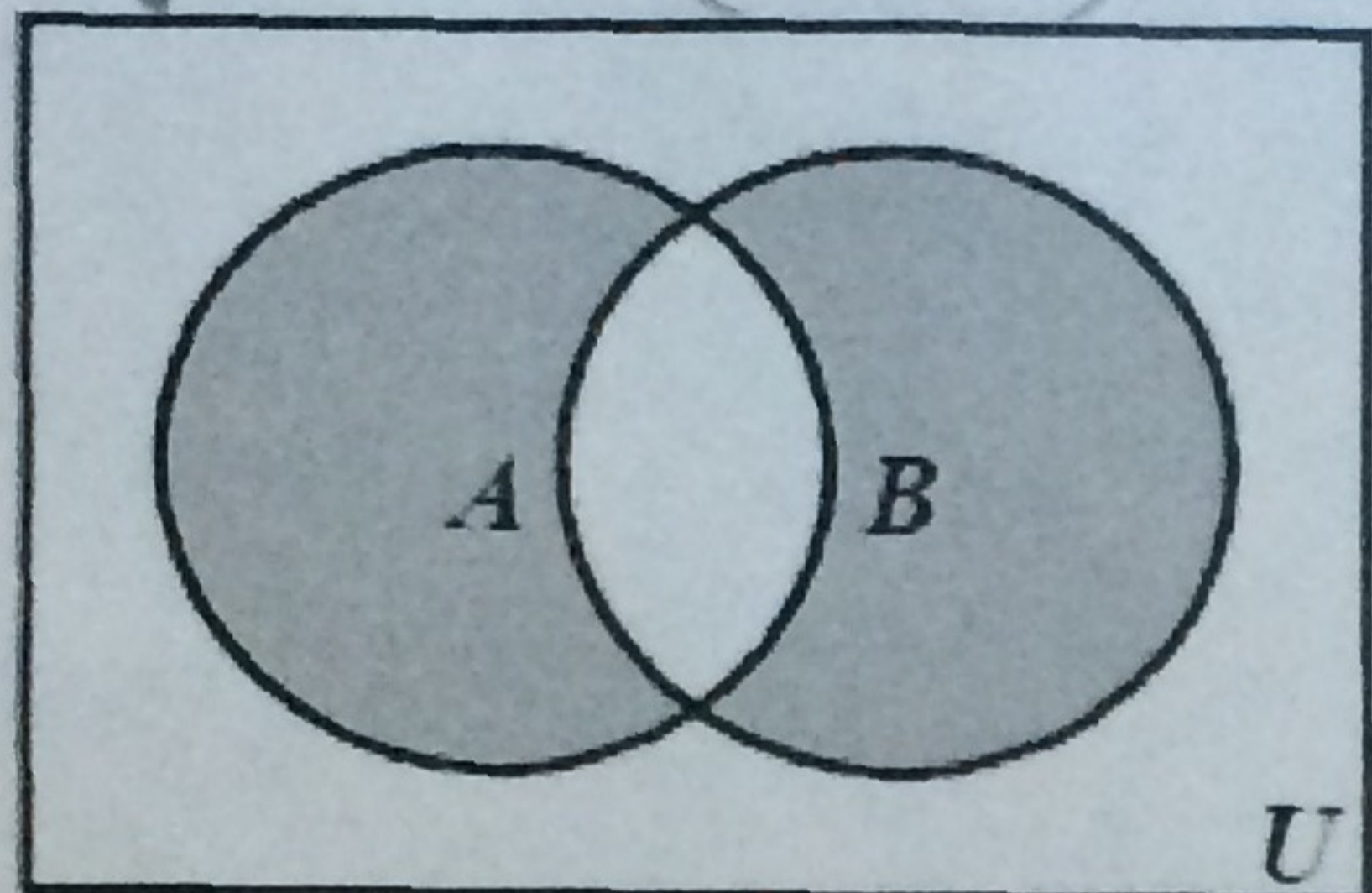
1. $\overline{A \cup B}$ or $\overline{A} \cap \overline{B}$



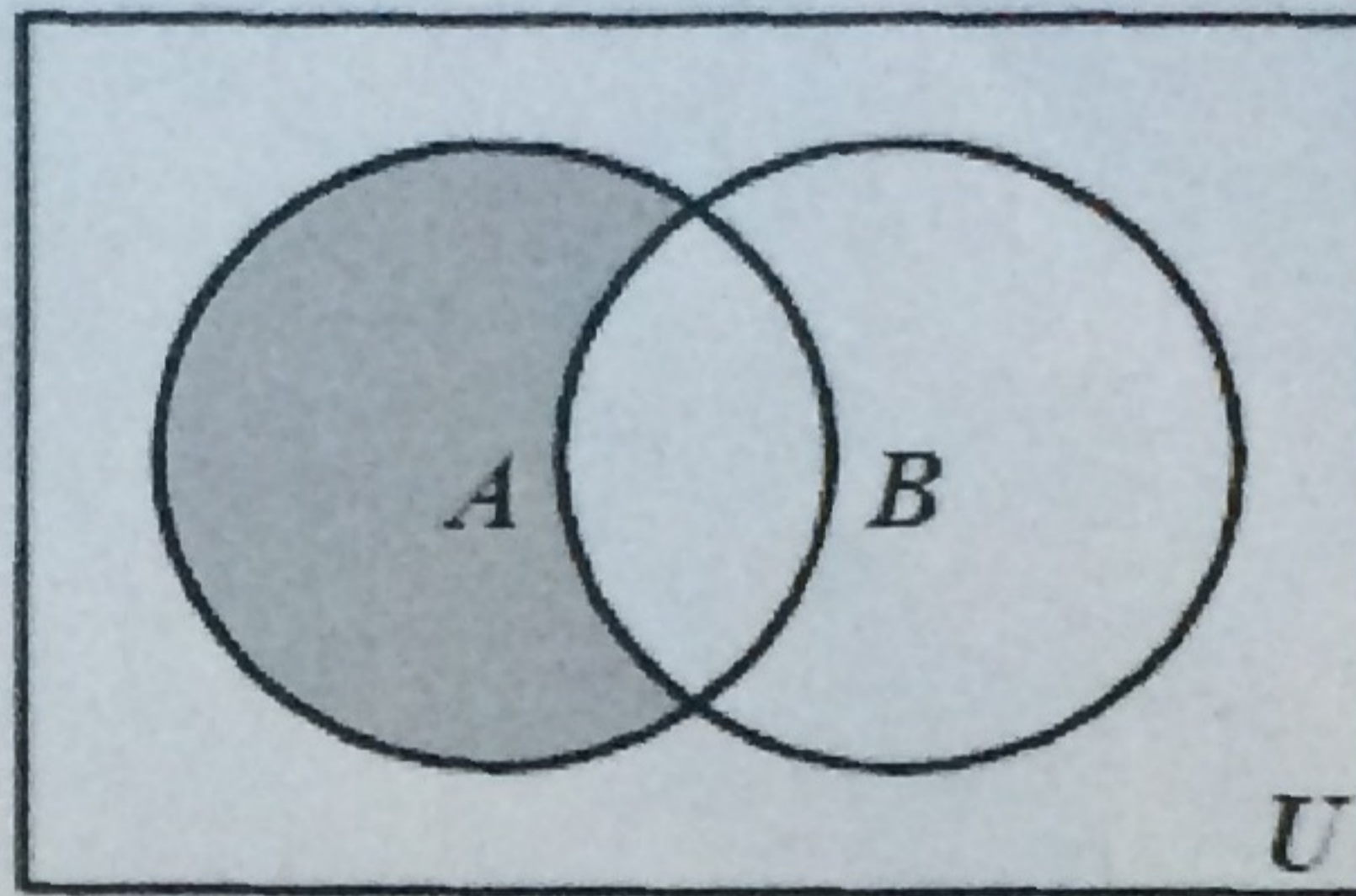
2. $B \cup \overline{A}$



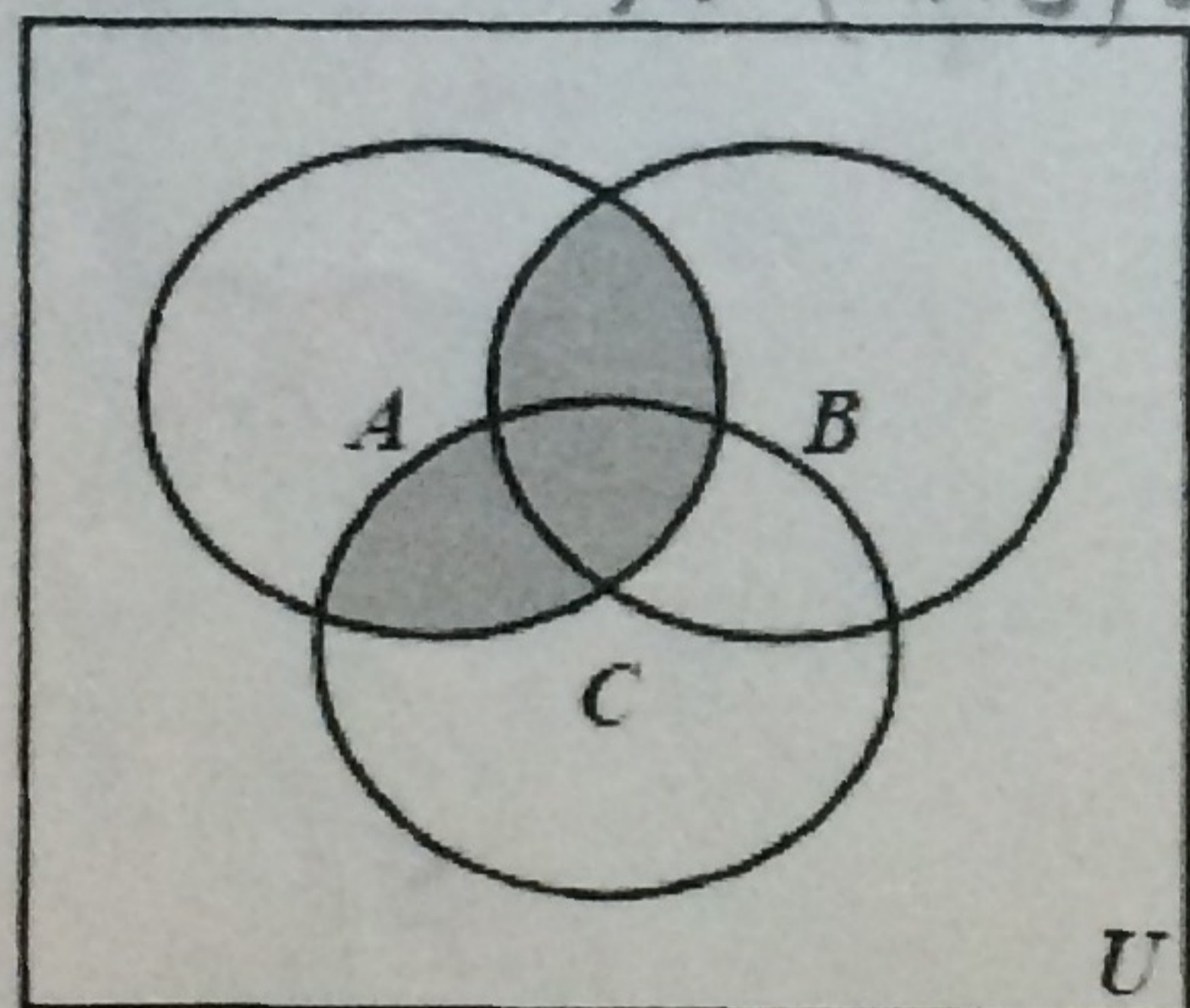
3 ★ Tricky! $(A \cup B) \cap \overline{(A \cap B)}$



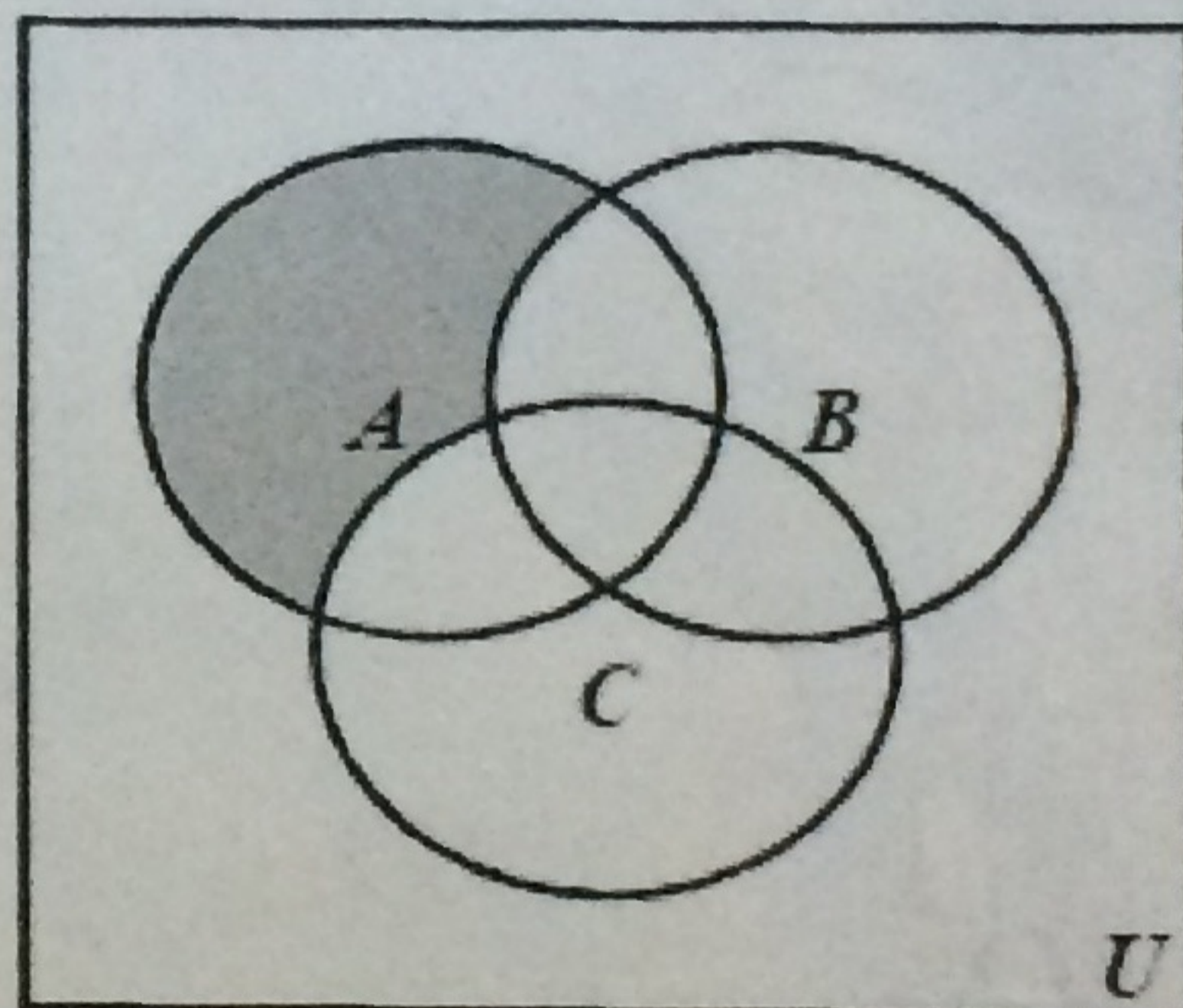
4. $A \cap \overline{B}$



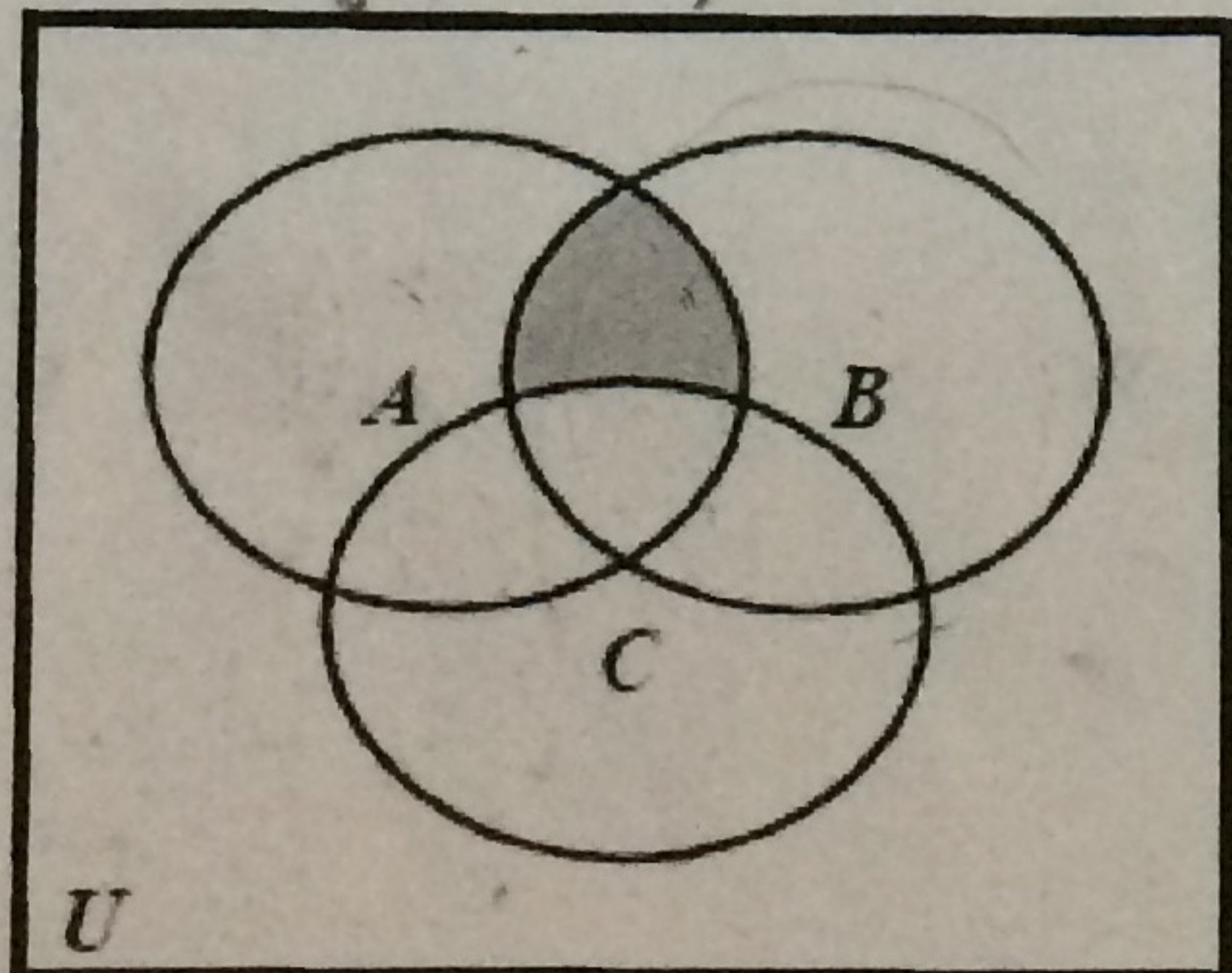
5. $A \cap (B \cup C)$ or $(A \cap B) \cup (A \cap C)$



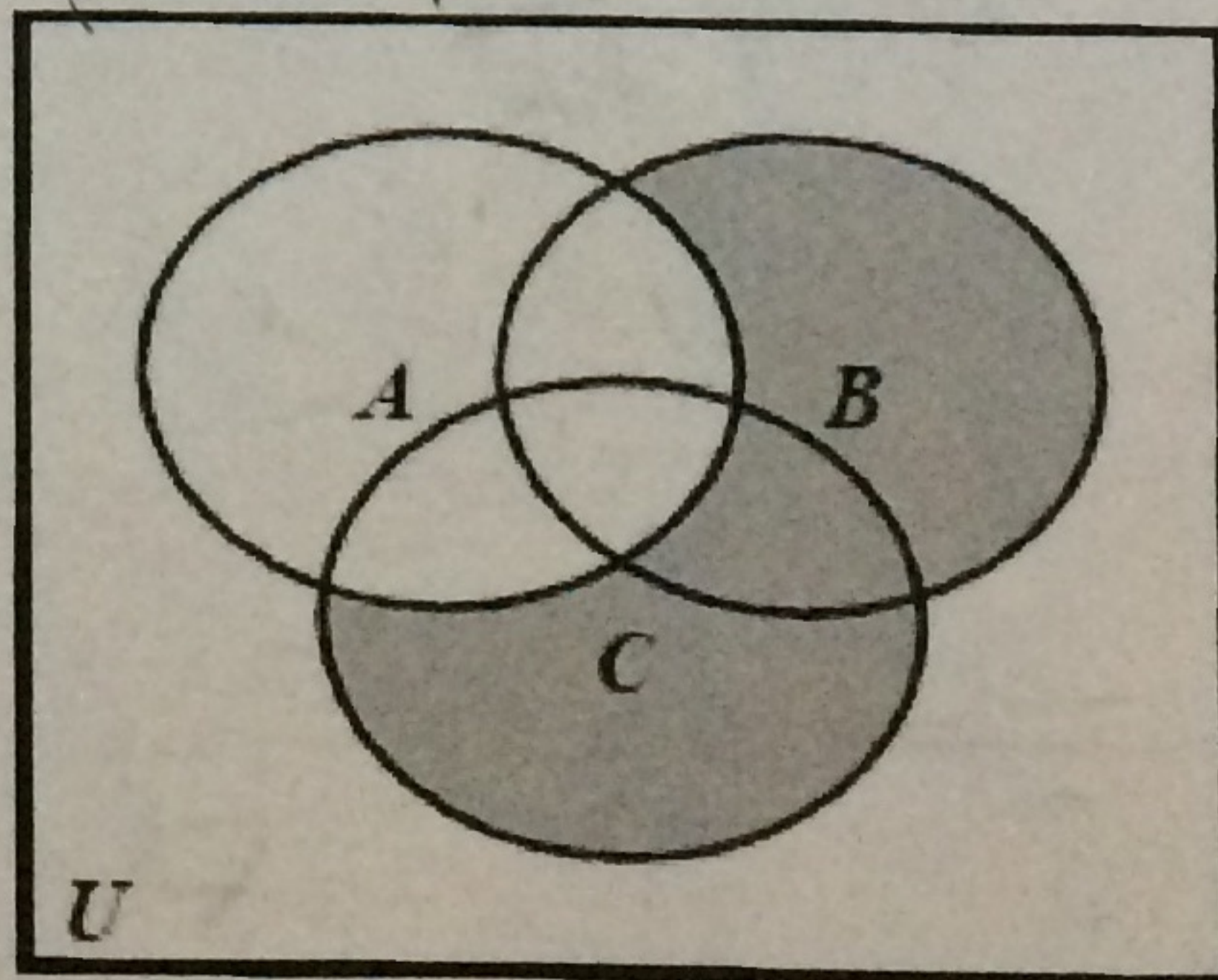
6. $A \cap \overline{B \cup C}$



7. $B \cap (A \cap \overline{C})$



8. $(B \cup C) \cap \overline{A}$



$(A \cap B) \cap \overline{C}$

1. Given that $U = \{1, 2, 3, \dots, 10\}$, list the elements in the following sets.

- a. $A = \{x : 5x > 37\}$ $\{8, 9, 10\}$
- b. $B = \{x : x + 5 < 12\}$ $\{1, 2, 3, 4, 5, 6\}$
- c. $C = \{x : 6 < 2x < 17\}$ $\{4, 5, 6, 7, 8\}$
- d. $D = \{x : x^2 < 37\}$ $\{1, 2, 3, 4, 5, 6\}$

- e. $B \cap C = \{4, 5, 6\}$
- f. $B \cap D = \{1, 2, 3, 4, 5, 6\}$

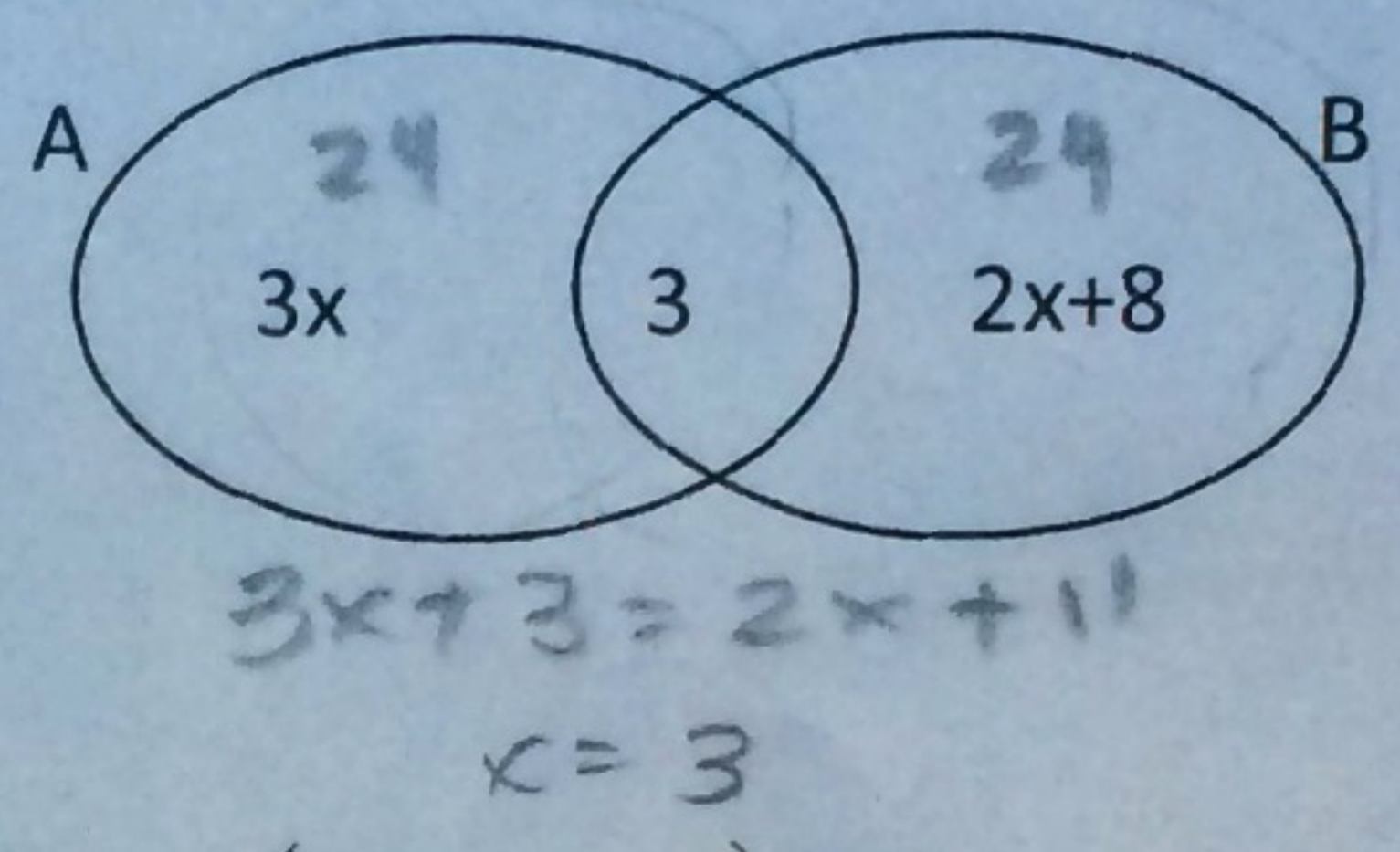
2. Given that $U = \{1 \leq x \leq 20\}$, list the elements of the following sets.

- a. $A = \{x : x \text{ is a multiple of } 2\}$
 $A = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20\}$
- b. $B = \{x : x \text{ is a multiple of } 5\}$
 $B = \{5, 10, 15, 20\}$
- c. $C = \{x : x \text{ is a multiple of } 10\}$
 $C = \{10, 20\}$

- d. State whether each of the following is true or false
 - i. C is a subset of A **true**
 - ii. B is a subset of A **false**
 - iii. C is a subset of B **true**

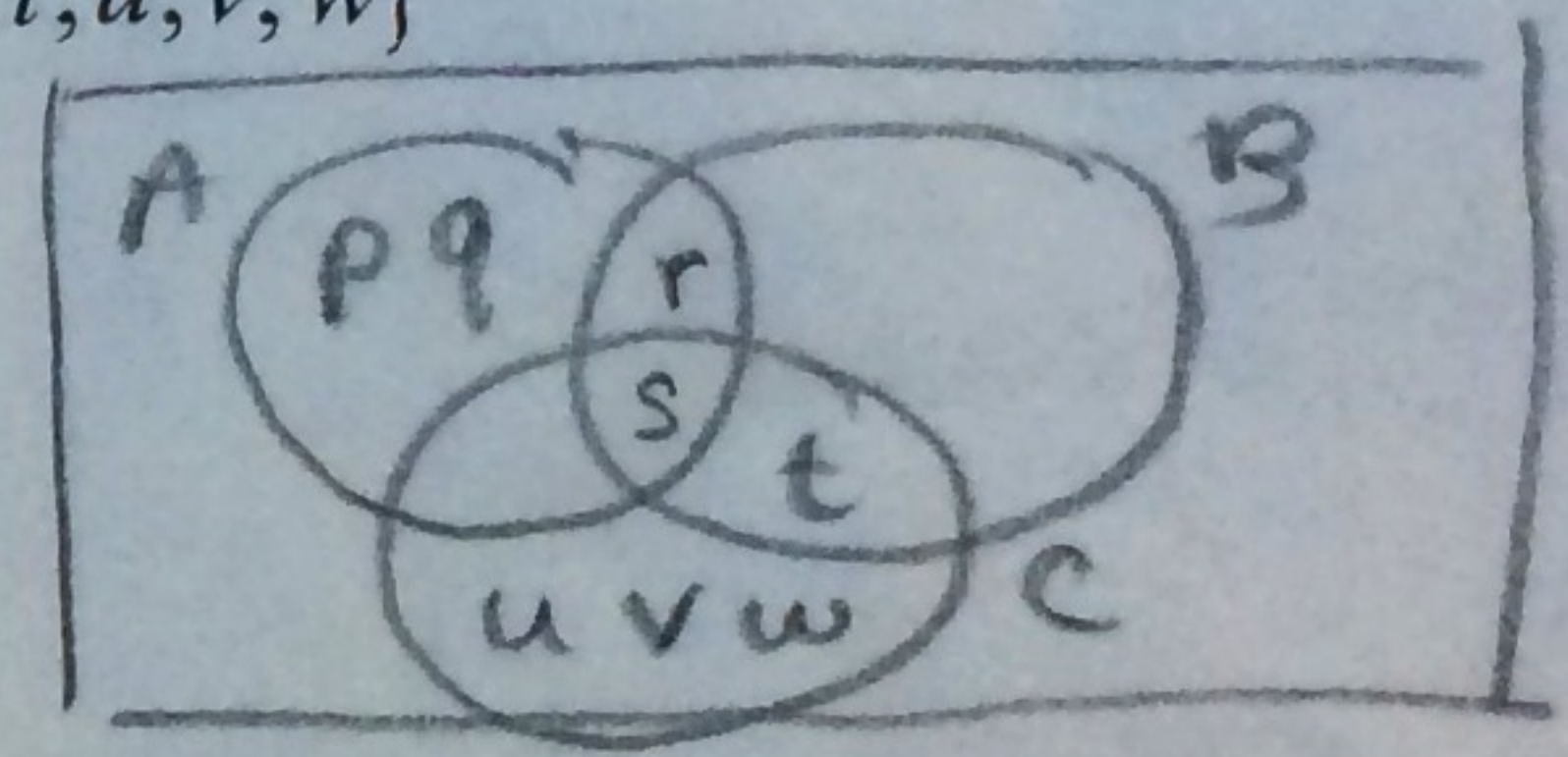
3. Given that $n(A) = n(B)$, calculate,

- a. $x = 8$
- b. $n(A) \quad n(A \cup B) \quad n(A \cap \overline{B})$
 $27 \quad 51 \quad 24$



4. $U = \{p, q, r, s, t, u, v, w\}$, $A = \{p, q, r, s\}$, $B = \{r, s, t\}$, and $C = \{s, t, u, v, w\}$

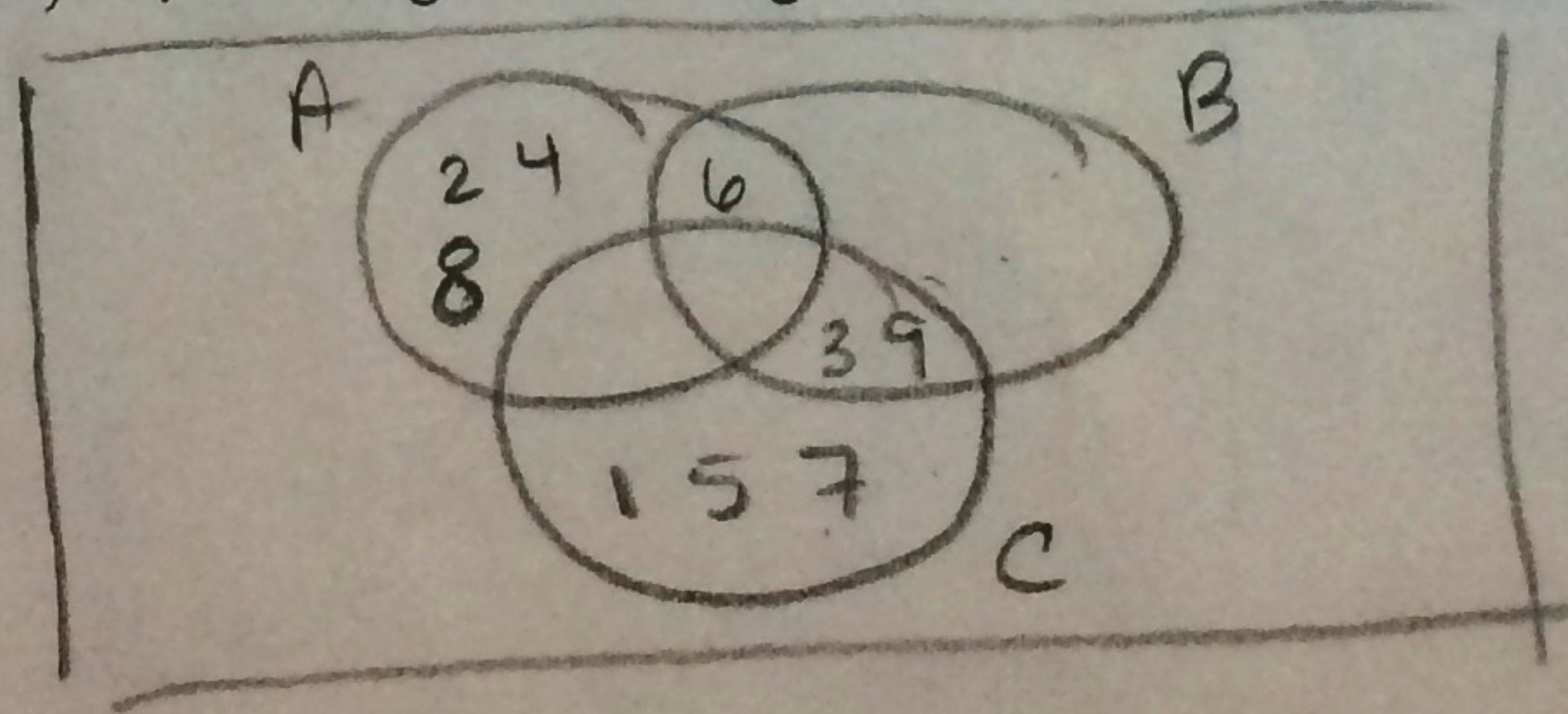
- a. Draw a Venn Diagram
- b. List the elements of $A \cap B$, $B \cap C$, $C \cap A$
- c. List the elements of $A \cap B \cap C$



5. Given that U is the universal set and $A \cap B$ is not empty, draw and shade the following Venn diagrams.

- a. $A \cap B$
- b. $\overline{A \cap B}$
- c. $\overline{A \cap B}$
- d. $\overline{A \cap B}$

6. Given that $U = \{1, 2, \dots, 9\}$, $A = \{x : x \text{ is a multiple of } 2\}$, $B = \{x : x \text{ is a multiple of } 3\}$, and $C = \{x : x \text{ is odd}\}$. By drawing a Venn diagram, list the elements of the following sets.



- $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
- $A = \{2, 4, 6, 8\}$
- $B = \{3, 6, 9\}$
- $C = \{1, 3, 5, 7, 9\}$

- a. $A \cup B$
- b. $A \cup B \cup C$
- c. $B \cup C$
- d. $\overline{B \cup C}$

- a) $\{2, 3, 4, 6, 8, 9\}$
- b) $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
- c) $\{1, 3, 5, 6, 7, 9\}$
- d) $\{2, 4, 8\}$