BASIC SET THEORY HOMEWORK.

LAST NAME	FIRST NAME	DATE

Let the universe $U = \{1, 2, 3, 4, 5, 6, 7\}$, and let the sets be defined as follows:

$$A = \{3, 4, 5, 6\}, \quad B = \{2, 3, 4\}, \quad C = \{1\}$$

Find the following sets, and state answers using the roster notation (use $\varnothing$ for empty set).

1. $A \cup B$
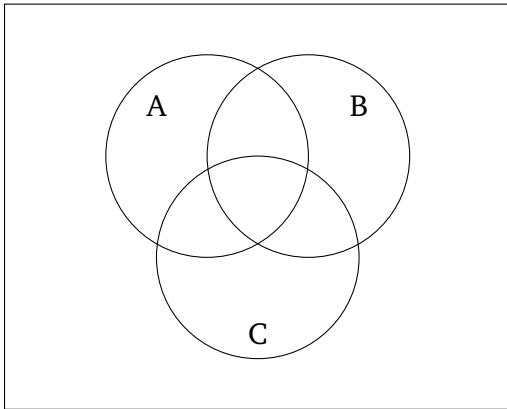
2. $A \cap B$

3. A'

4. $(A \cup C)'$

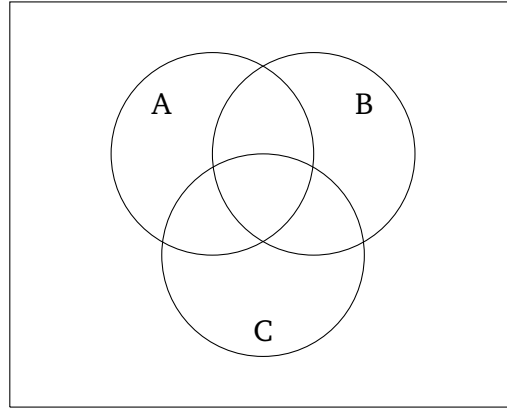**5.** $(C') \cap B$

6. $(B') \cap (A \cup C)$
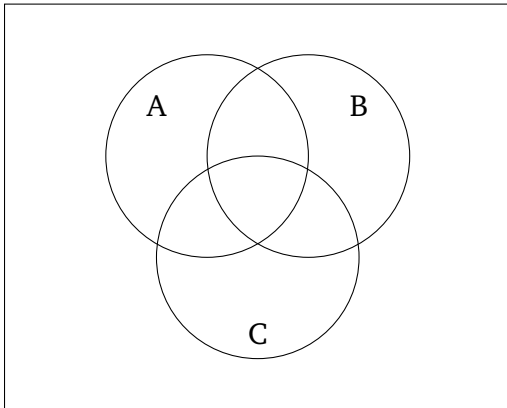
Shade the specified set:

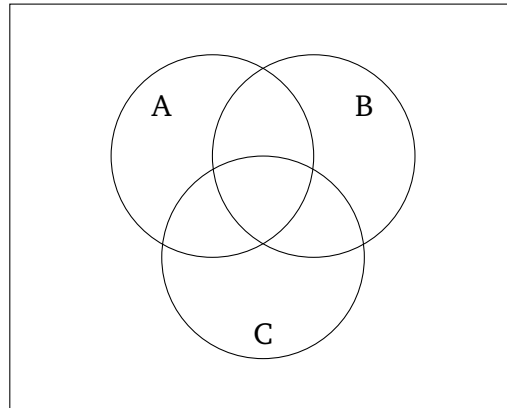**7.** $(A \cup C) \cap (B')$

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

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

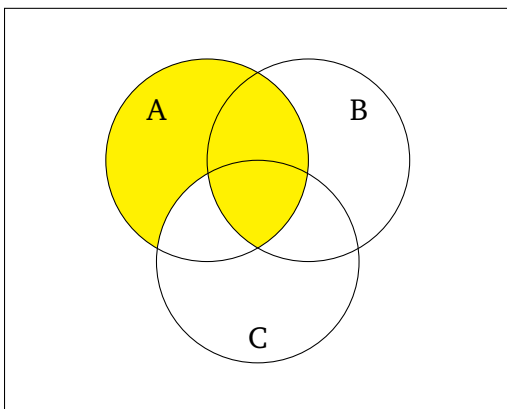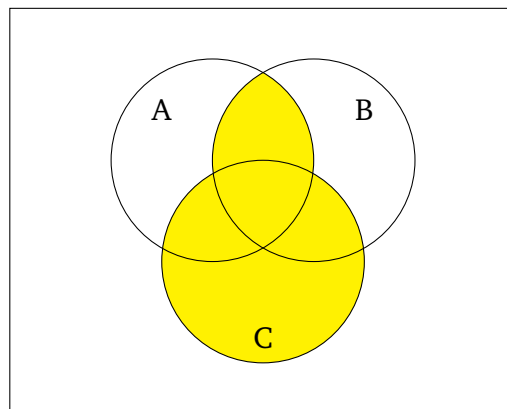**10.** $((C \cup B') \cup (B \cap C'))'$

Find an algebraic expression for the shaded set (many different correct solutions are possible):

11.

12.

Recall the interval notation for describing subsets of the points on the real number line:

(a, b) is the set of numbers x such that $a < x < b$

$[a, b]$ is the set of numbers x such that $a \leq x \leq b$

$(a, b]$ is the set of numbers x such that $a < x \leq b$

Recall also that infinity notation can be used to describe portions of the real line which extend indefenitely to the right or to the left. For example,

$[a, \infty)$ is the set of numbers x such that $x \geq a$

Let the universe U be the set of all numbers on the real number line, and let

$G = [17, \infty)$, the set of all numbers which are 17 or greater,

$M = (15, 20)$, the set of all numbers between 15 and 20, and

$L = (-\infty, 17]$, the set of all numbers which are 17 or smaller.

Describe the following sets using the interval, the roster or the $\varnothing$ notation, whichever is more appropriate:

13. $G \cup L$ **16.** $G \cup M$

14. $G \cap L$ **17.** $L \cap M$

15. G' **18.** $(M') \cap G$

Define intervals of the real line as follows:

$$A = [0, 10]$$
$$B = (5, 15)$$
$$C = (-\infty, 5]$$

Describe the following sets using the interval, the roster or the $\varnothing$ notation, whichever is more appropriate:

19. $A \cup B$

23. $B \cup C$

20. $A \cap B$

24. $B \cup \{15\}$

21. C'

25. $(A') \cap B$

22. $A \cap C$

26. $(C \cup A)'$

4

ANSWERS.

1. $\{2, 3, 4, 5, 6\}$

3. $\{1, 2, 7\}$

5. $\{2, 3, 4\}$

13. $(-\infty, \infty)$

15. $(-\infty, 17)$

17. $(15, 17]$

19. $[0, 15)$

21. $(5, \infty)$

23. $(-\infty, 15)$

25. $(10, 15)$