SET THEORY HOMEWORK

AUXILIARY TEXT: 1.1, 1.2, 1.3, 1.4

LAST NAME	FIRST NAME	DATE

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:

1. $G \cup L$

2. $G \cap L$

3. G'

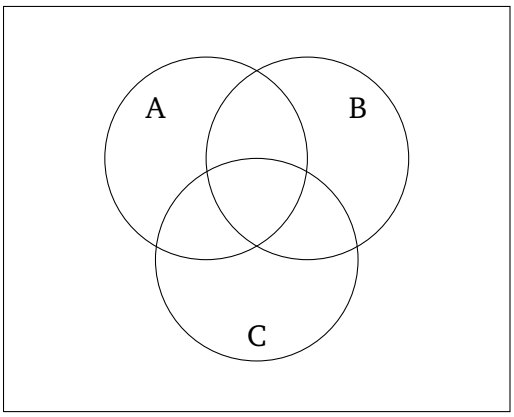
4. $G \cup M$

5. $L \cap M$

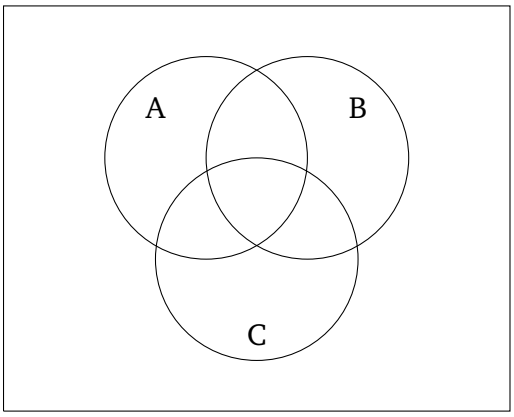
6. $(M') \cap G$

Shade the specified set:

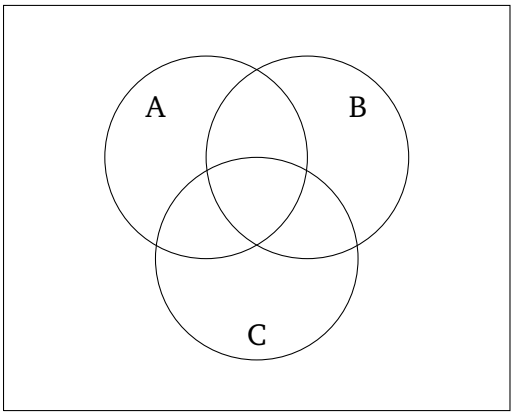
7. $(A \cup C) \cap (B')$



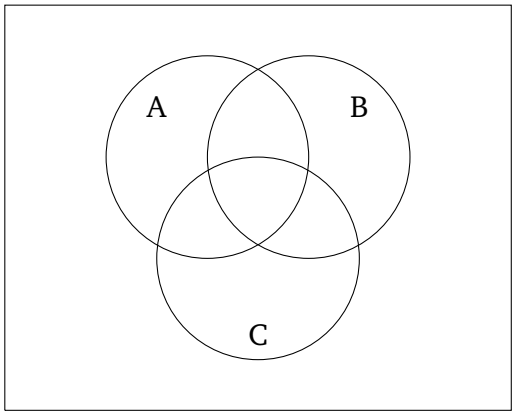
8. $((A \cup B) \cup C)'$



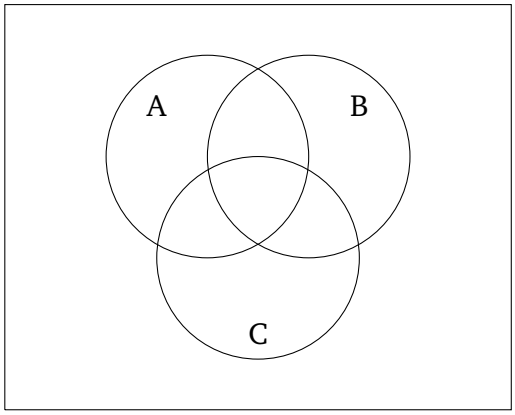
9. $(A \cap C)' \cup B$



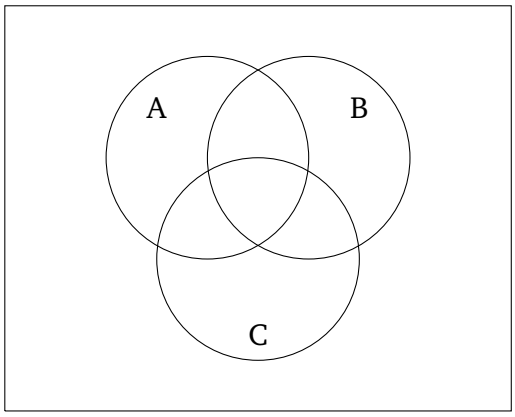
10. $(A \cup B) \cap C$



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

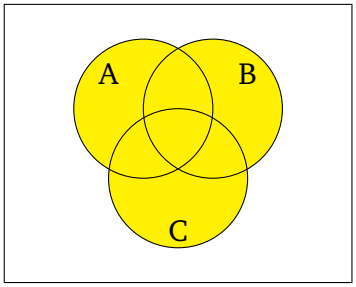


12. $\Big((C \cup (B')) \cup (B \cap (C'))\Big)'$



For each of the Venn diagrams, write an algebraic expression for the shaded set. Answers may vary.

13.



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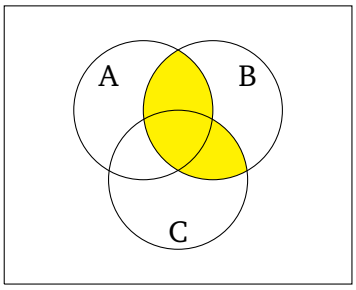

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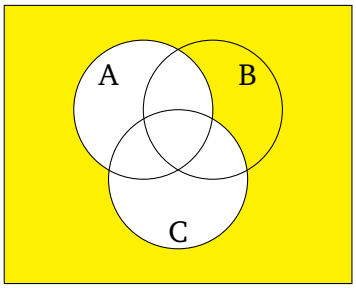
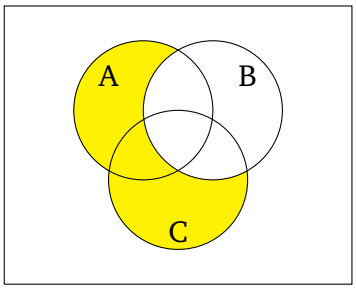
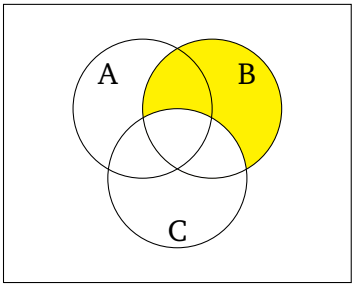


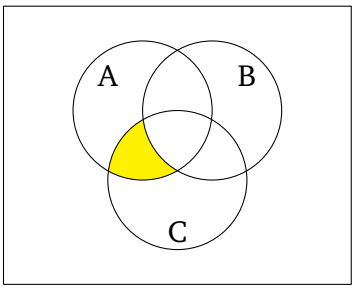
16.



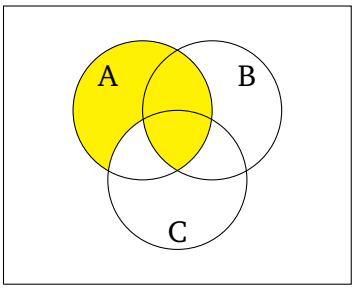
17.



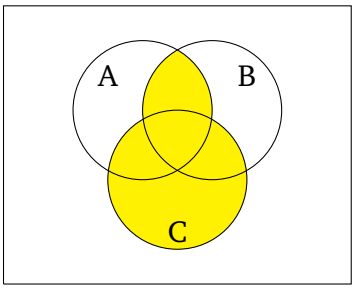
18.



19.



20.



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).

21. $A \cup B$

22. $A \cap B$

23. A'

24. $(A \cup C)'$

25. $(C') \cap B$

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

Define intervals on the real line as follows:

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

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

27. $A \cup B$

28. $A \cap B$

29. C'

30. $A \cap C$

31. $B \cup C$

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

33. $(A') \cap B$

34. $(C \cup A)'$

Answers

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

3. $(-\infty, 17)$

5. $(15, 17]$

13. $A \cup B \cup C$

15. $(A \cup C)'$

17. $B \cap (C')$

19. $\big(A \cap (C')\big) \cup (A \cap B)$

21. $\{2, 3, 4, 5, 6\}$

23. $\{1, 2, 7\}$

25. $\{2, 3, 4\}$

27. $[0, 15)$

29. $(5, \infty)$

31. $(-\infty, 15)$

33. $(10, 15)$