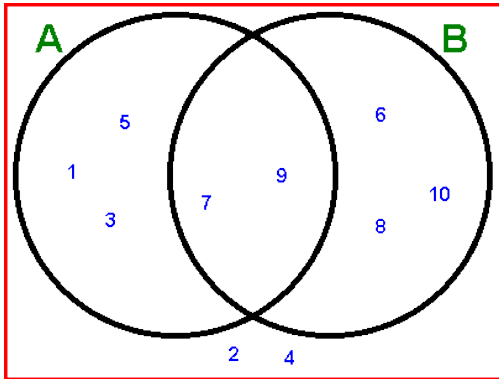


Section 1.6: Venn Diagrams and set operations

In this section we will be given Venn diagrams that have elements inside them. It is important to be able to create the sets described by a Venn diagram.

Example: Write down the elements of the sets U, A and B.



The elements of U are each number in the diagram.

$$U = \{1,2,3,4,5,6,7,8,9,10\}$$

Any number inside the A circle is considered an element in set A. Set A contains the numbers 1,3,5,7,9 (the 7 and 9 are also part of the B set)

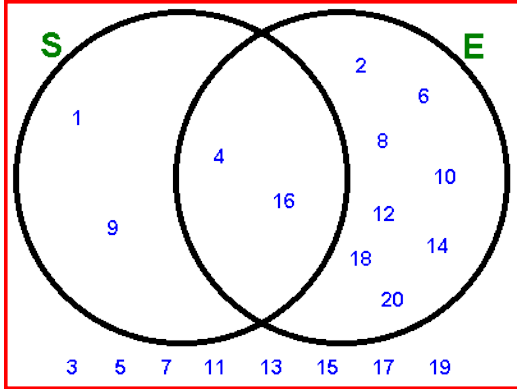
$$A = \{1,3,5,7,9\}$$

Any number inside the B circle is considered an element of set B. Set B contains the numbers 6,7,8,9,10 (the 7 and 9 are also part of set A)

$$B = \{6,7,8,9,10\}$$

Homework #1-8:

1) Here is a Venn diagram that represents sets U, S and E. Write down the elements of each set

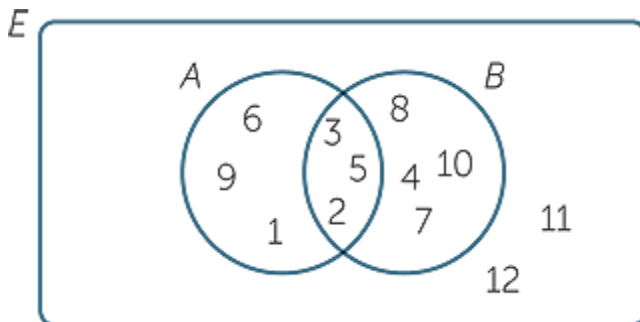


U = { }

S = { }

E = { }

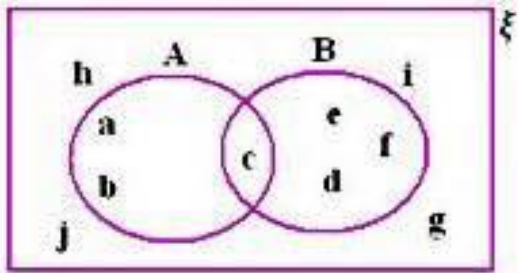
2) Here is a Venn diagram that represents the sets A, B and E (the universal set is called E in this problem, this is unusual, but not wrong). Write down the elements of each set.



E = { } A = { }

B = { }

3) Here is a Venn diagram that represents sets ξ , A and B (the universal set is called ξ (pronounced xee, instead of U). Write down the elements of each set

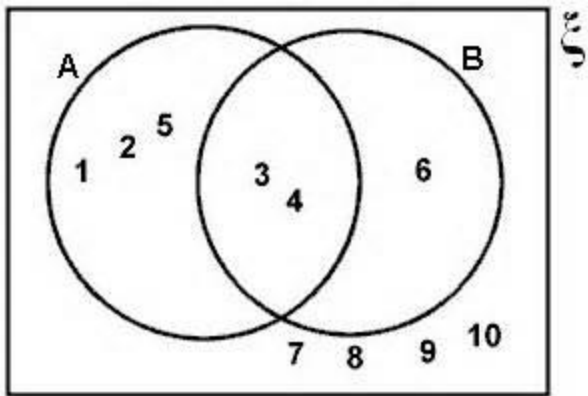


$U = \{ \quad \quad \quad \}$

$A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

4) Write down the elements of each set depicted in the Venn diagram.

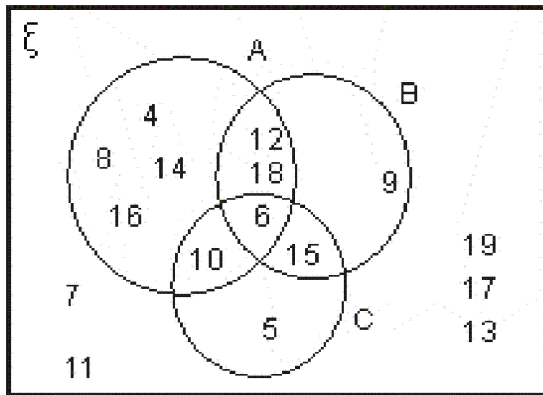


$\xi = \{ \quad \quad \quad \}$

$A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

5) Write down the elements of each set depicted in the Venn diagram.

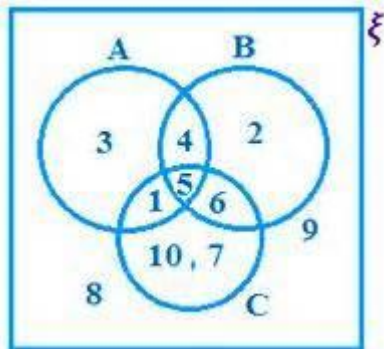


$\xi = \{ \quad \quad \quad \} \quad A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

$C = \{ \quad \quad \quad \}$

6) Write down the elements of each set depicted in the Venn diagram.

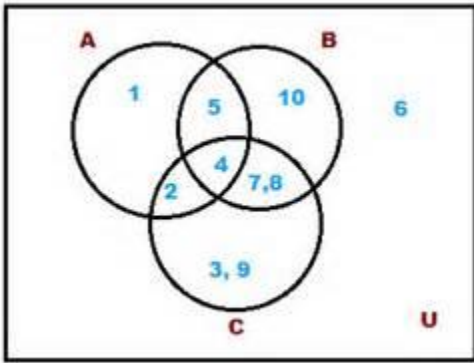


$\xi = \{ \quad \quad \quad \} \quad A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

$C = \{ \quad \quad \quad \}$

7) Write down the elements of each set depicted in the Venn diagram.

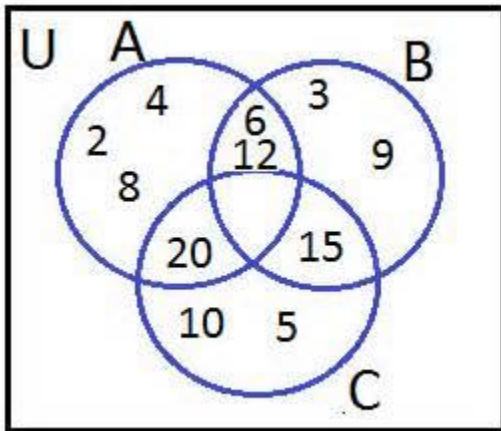


$U = \{ \quad \quad \quad \}$ $A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

$C = \{ \quad \quad \quad \}$

8) Write down the elements of each set depicted in the Venn diagram.



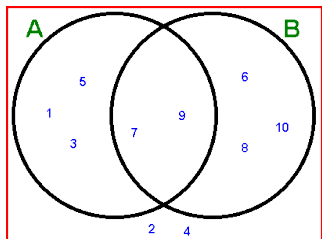
$U = \{ \quad \quad \quad \}$ $A = \{ \quad \quad \quad \}$

$B = \{ \quad \quad \quad \}$

$C = \{ \quad \quad \quad \}$

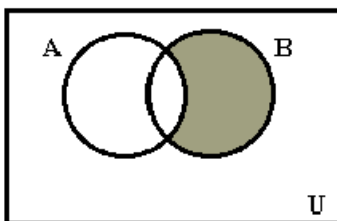
Next we need to use Venn diagrams that contain elements to answer complement, union and intersection questions.

Example: Find $A' \cap B$ for the sets A and B depicted in the diagram below.

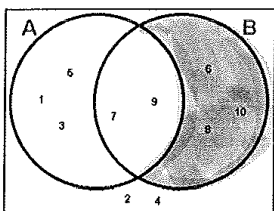


Step 1 is to shade the region described in the problem. We learned how to find this region in the last section. Here is the region we created in section 1.4. I'm not going to re-teach this skill. Please see me or review section 1.4 if you can't create a shaded Venn diagram that represents $A' \cap B$.

$$A' \cap B$$



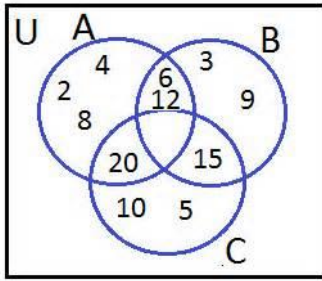
Now we apply this shading to the Venn diagram given in this problem.



The answer will be each element in the shaded region.

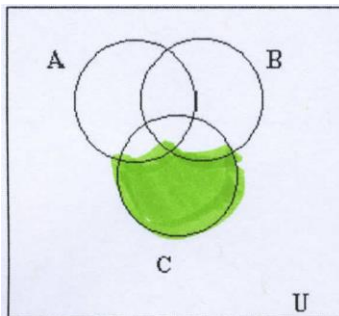
Answer: $A' \cap B = \{6,8,10\}$

Example: Find $(A \cup B)' \cap C$ for the sets A, B and C depicted below.

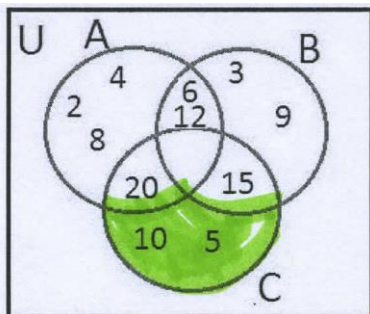


The first step is to create a Venn diagram that contains the shaded region described by $(A \cup B)' \cap C$. This is another problem from an example in section 1.4.

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



Now apply this shading to the Venn diagram given in the problem.



The answer will be each element in the shaded region.

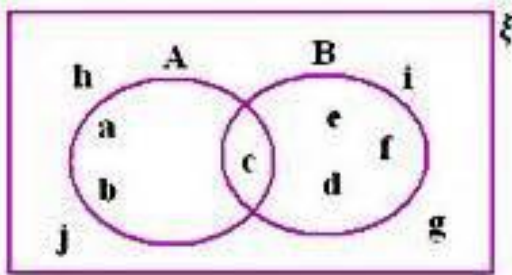
Answer: $(A \cup B)' \cap C = \{5, 10\}$

The rest of the problems in this section will involve these two steps.

- 1) Find the shaded region described in the Venn diagram
- 2) The answer to the question will be each element in the shaded region obtained in step 1.

(Hint look at your homework from section 1.4. Many of the regions you are asked to shade are the same as in section 1.4. You can use your answers to your section 1.4 homework to speed up this section.)

Homework # 9 – 17. Use the Venn diagram to find the requested sets.



9) A'

11) $A' \cup B$ (Hint see section 1.5 #3)

13) $(A \cap B)'$ (Hint see section 1.5 #5)

15) $(A' \cup B)'$ (Hint see section 1.5 #7)

17) $A' \cup B'$ (Hint see section 1.5 #9)

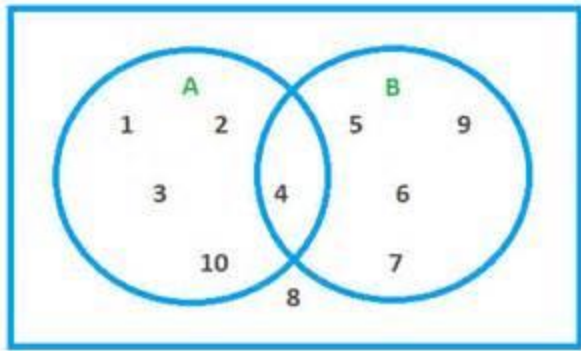
10) B'

12) $A \cup B'$

14) $(A \cap B')'$

16) $(A \cup B)'$

Homework # 18 – 25. Use the Venn diagram to find the requested sets.



18) $A \cap B'$

19) $A' \cap B'$ (Hint see section 1.5 #2)

20) $A' \cap B$

21) $A' \cap B$

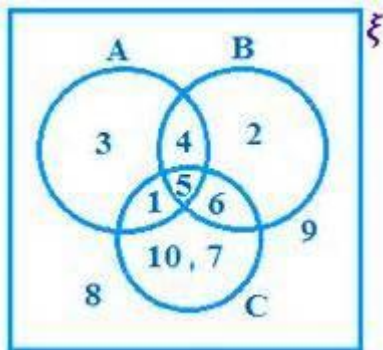
22) $(A \cap B)'$

23) $(A \cap B)'$ (Hint see section 1.5 #6)

24) $(A' \cup B)'$

25) $(A \cup B)'$ (Hint see section 1.5 #8)

Homework # 26 – 31. Use the Venn diagram to find the requested sets.



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

27) $A \cap B' \cup C$ (Hint see section 1.5 #10)

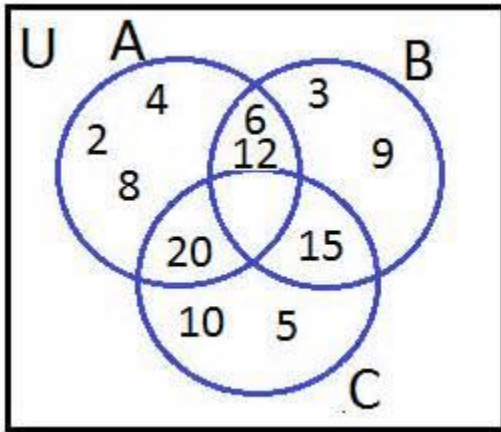
28) $A \cap B' \cap C$

29) $A \cap B \cap C'$ (Hint see section 1.5 #13)

30) $A \cup B \cup C'$

31) $A' \cup B \cup C$ (Hint see section 1.5 #15)

Homework # 32 – 39. Use the Venn diagram to find the requested sets.



32) $(A \cap C)' \cup B$

33) $(A \cap B)' \cup C$ (Hint see section 1.5 problem #17)

34) $B \cup (A \cap C)$

35) $A \cup (B \cap C)$ (Hint see section 1.5 problem #19)

36) $B \cap (A \cup C)$

37) $A \cap (B \cup C)$ (Hint see section 1.5 problem #21)

38) $B \cap (A \cup C)'$

39) $A \cap (B \cup C)'$ (Hint see section 1.5 problem #23)

Answers:

1) $S = \{1,4,9,16\}$ $E = \{2,4,6,8,10,12,14,16,18,20\}$ $U = \{1,2,3,4,\dots,18,19,20\}$

3) $A = \{a,b,c\}$ $B = \{c,d,e,f\}$ $\xi = \{a,b,c,d,e,f,g,h,i,j\}$

5) $A = \{4,6,8,10,12,14,16,18\}$ $B = \{6,9,12,15,18\}$ $C = \{5,6,10,15\}$

$\xi = \{4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19\}$

7) $A = \{1,2,4,5\}$ 9) $B = \{4,5,7,8,10\}$ $C = \{2,3,4,7,8,9\}$ $U = \{1,2,3,4,5,6,7,8,9,10\}$

9) $\{d,e,f,g,h,i,j\}$ 11) $\{c,d,e,f,g,h,l,j\}$ 13) $\{a,b,d,e,f,g,h,l,j\}$ 15) $\{a,b\}$

17) $\{a,b,d,e,f,g,h,i,j\}$ 19) $\{8\}$ 21) $\{5,6,7,9\}$ 23) $\{4,5,6,7,8,9\}$ 25) $\{5,6,7,9\}$

27) $\{1,3,5,6,7,10\}$ 29) $\{4\}$ 31) $\{1,2,4,5,6,7,8,9,10\}$ 33) $\{2,3,4,5,8,9,10,15,20\}$

35) $\{2,4,6,8,12,15,20\}$ 37) $\{6,12,20\}$ 39) $\{2,4,8\}$