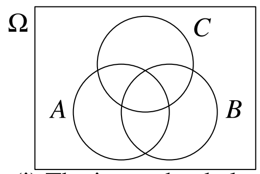
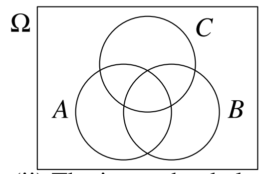
Practice Questions for Jan 22, 2019

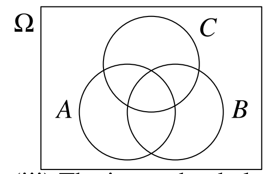
1. Shade the appropriate part of each Venn-diagram below based on its caption. For each case, show the formula to compute the corresponding cardinality in terms of $|A|$, $|B|$, $|C|$, $|A \cap B|$, $|A \cap B \cap C|$, etc. Here, Ω = Universe of Discourse (see the text-book for Universe of Discourse, if needed).



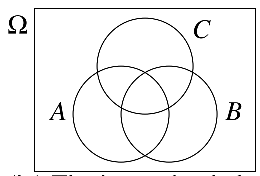
(i) The items that belong to ≥ 1 of A, B, and C.



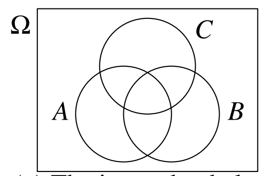
(ii) The items that belong to ≥ 2 of A, B, and C.



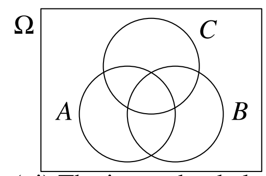
(iii) The items that belong to exactly 1 of A, B, and C.



(iv) The items that belong to ≤ 1 of A, B, and C.



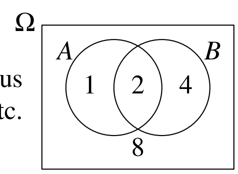
(v) The items that belong to ≤ 2 of A, B, and C.



(vi) The items that belong to exactly 2 of A, B, and C.

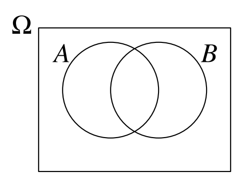
2. The Venn-diagram below shows two subsets A, $B \subseteq \Omega$ = Universe of Discourse. The numbers in the diagram show the size of the various subsets; thus, $|A - B| = 1$, $|A \cap B| = 2$, $|B - A| = 4$, and $|\Omega - (A \cup B)| = 8$. We chose these sizes so that the sizes of $16 = 2^{2^2}$ subsets X_1 to X_{16} of Ω that can be formed from A and B using union, intersection, and complement are distinct. We write the intersection $X \cap Y$ below simply as XY; thus, $AA^c = A \cap A^c = \varnothing = BB^c$.

The sizes of various subsets $A - B$, etc.

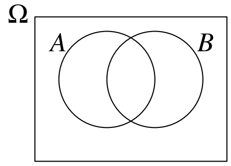


Shade the part of the venn-diagram in each of 16 cases below (continued to next page) representing the given set X_i and show the size $|X_i|$.

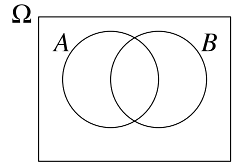
$X_1 = AA^c$
$|X_1| =$



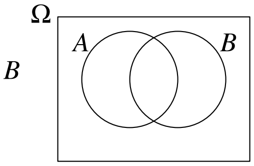
$X_2 = A$
$|X_2| =$



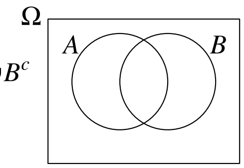
$X_9 = AB$
$|X_9| =$



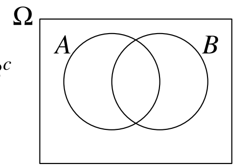
$X_{10} = A^c B$
$|X_{10}| =$



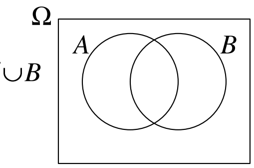
$X_{11} = A \cup B^c$
$|X_{11}| =$



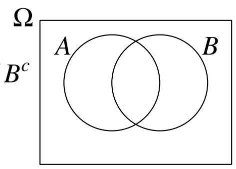
$X_{12} = A^c B^c$
$|X_{12}| =$



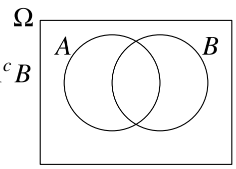
$X_{13} = A^c \cup B$
$|X_{13}| =$



$X_{14} = AB \cup A^c B^c$
$|X_{14}| =$



$X_{15} = AB^c \cup A^c B$
$|X_{15}| =$



$X_{16} = A \cup A^c$
$|X_{16}| =$