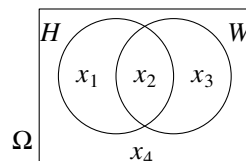


Practice Questions for Feb 12, 2019

- Assume $\text{subsetOne} = [1, 1, 0, 0, 1]$ and we are testing whether subsetTwo (which is also a 0/1-array of length $5 = \text{subsetOne.length}$) equals subsetOne or not.
 - Give the number of 0/1-arrays subsetTwo for which the first iteration of the loop (see the code given in an earlier practice question) returns the value false.
 - Repeat (a) for $k = 2, 3, \dots, 5$.
 - Compute the total number of loop-iterations for returning the value false for different subsetTwo .
 - Compute the average number of loop-iterations for returning the value false for different subsetTwo .
 - What is $\#(\text{loop-iterations for the return value true})$? What is $\#(0/1\text{-arrays } \text{subsetTwo} \text{ that give return value true})$?
 - Compute the average number of loop-iterations for the code (irrespective of the return value)
- Give the average values in Problem 1 for the general case (subsetOne is arbitrary 0/1-array of length $n \geq 1$)?
- Consider two subsets H (for things John has) and W (for things that John wants) of $\Omega \neq \emptyset$, and the four disjoint subsets $H - W$, $H \cap W$, $W - H$, and $H^c \cap W^c$ into which Ω is partitioned (see the Venn-diagram below).



We write $x_1 = \text{"yes"}$, "no" , and "?" to indicate, respectively, that $H - W \neq \emptyset$, $= \emptyset$, and we do not know (care) whether $H - W$ is empty or not. Similarly for other x_i 's. Note that $\Omega \neq \emptyset$ implies we cannot have $x_1 = x_2 = x_3 = x_4 = \text{"no"}$.

Shown below are a few cases of yes/no/? combinations of values of x_i 's, the description of the situation in ordinary English, and the description in the set notation. (A few cases are completely filled and a few are only partially filled.) In some situations, you may need a long sentence combining several other cases. Note that #9 is a special case of #1, and we need a longer English expression to describe this situation than that for #1; the set notation also shows that #9 is a special case of #1. Similar remarks hold for case #10.

Give English sentence and set-expression for each of #3, #5, #6, and #7. Do the same for some of the cases with two yes/no's and two "?". How many (total) different cases are there with all yes/no/? combinations (except all no's)? What is English description for the case "???" and what is the set-expression for this case?

Case	x_1	x_2	x_3	x_4	English description (without using set terminology)	Set notation (without use of complement)
1.	yes	?	?	?	John has some thing that he does not want.	$H \not\subseteq W$
2.	no	?	?	?	John does not have any thing that he does not want, i.e., John has only things that he wants. (It does not say whether John wants any thing or John has any thing.) Another way of expressing it without using negation: John wants everything he has.	$H \subseteq W$
3.	?	yes	?	?		
4.	?	no	?	?	John does not have any thing he wants. Another way of saying it: John does not want any thing he has.	$H \cap W = \emptyset$
5.	?	?	yes	?		
6.	?	?	no	?		
7.	?	?	?	yes		
8.	?	?	?	no	There is nothing that John does not have and does not want.	$H \cup W = \Omega$
9.	yes	yes	?	?	...	$H \not\subseteq W$ and $H \cap W \neq \emptyset$
10	yes	no	?	?		
...			