CS394 R Homework 1

attachments and source available at
https://github.com/alexskc/cs394r

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1

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

a

$\bar{A} \cap C = \{2, 6, 8\}, |\bar{A} \cap C| = 3$

b

$B - \bar{C} = \{2, 4\}, |B - \bar{C}| = 2$

c

$B \cup A = \{1, 2, 3, 4, 5, 7, 10\}, |B \cup A| = 7$

d

$\bar{B} \cap (A - C) = \{1\}, |\bar{B} \cap (A - C)| = 1$

e

$(A - B) \cap (B - C) = \emptyset, |(A - B) \cap (B - C)| = 0$

2

a

$|A \cup B| = |A| + |B|$
No. If there's any intersection between A and B, that will be counted twice.

b

$|A \cup B| = |A| + |B| + |A \cap B|$
No. If there's any intersection between A and B, that will be counte thrice.

c

$|A \cup B| = |A| + |B| - |A \cap B|$
Yes. This accounts for any overlap between A and B.

d

$|A \cup B \cup C| = |A| + |B| + |C|$
No. Once again, this doesn't account for overlap.

e

$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$
Yes. The intersection between each set is erased once, which means that the intersection between all three is replaced thrice, leaving a "hole." The $|A \cap B \cap C|$ compensates for this.

f

$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C|$
No, as mentioned above, this leaves a "hole" in the middle.

g

$|A \cup B \cup C| = |A| + |B| + |C|$
No, this is the same as (d)

3

a

$A \cup B = A$. Either $A = B$, or $B = \emptyset$.

b

$B - A = B$. Either $A \cap B = \emptyset$, or $A = \emptyset$.

c

$A - B = B - A$. $A = B$

d

$A \cap B = A$. $A = B$

e

$A \cap B = B \cap A$. Always true

f

$\bar{A} \cap U = \emptyset$. $A = U$

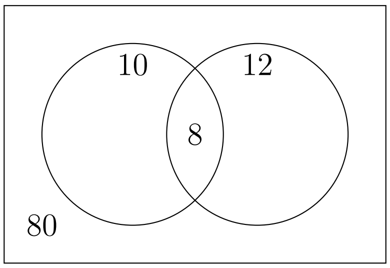
g

$A - B = \emptyset$. $A \subset B$

h

$A \cap B = A - B$. $A = \emptyset$

4



a

$|U| = 110$

b

$|A| = 18$

c

$|A \cap B| = 8$