

# 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 counted 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**

$$A \cup B = A. \text{ Either } A = B, \text{ or } B = \emptyset.$$

**b**

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

**c**

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

**d**

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

**e**

$$A \cap B = B \cap A. \text{ Always true}$$

**f**

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

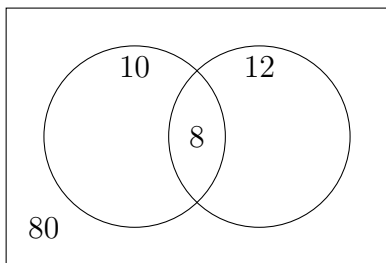
**g**

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

**h**

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

**4**



**a**

$$|U| = 110$$

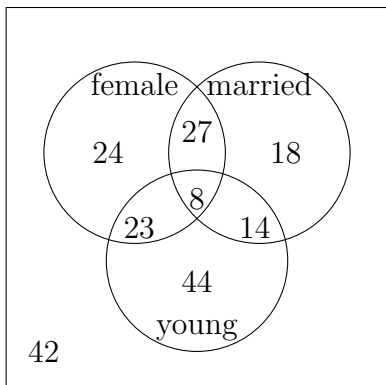
**b**

$$|A| = 18$$

**c**

$$|A \cap B| = 8$$

**5**



**5.1 a**

47 policyholders.

## 5.2 b

14 policyholders.

## 5.3 c

42 policyholders.

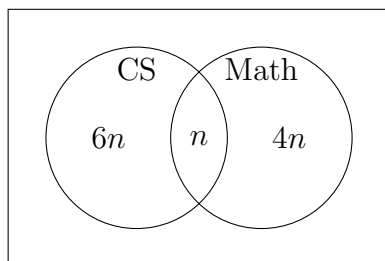
## 5.4 d

27 policyholders.

## 5.5 e

66 policyholders.

## 6



$$\frac{5}{11} = 45.45\%$$