

Quiz #5 11/13/09

Name: _____

Directions: Make sure to read each problem carefully. To receive full credit, you must show all of your work.

Problem 1. (2 points) If there are 62 nonempty, proper subsets of A , then A has 6 elements.

Problem 2. (2 points) If A has cardinality 12, how many subsets have cardinality 5 or 3?
 $\binom{12}{5} + \binom{12}{3}$

Problem 3. (2 points) Is the following set empty or nonempty? empty

$$\{x \mid x \in \mathbb{R}, x^2 + 3x + 3 = 0\}$$

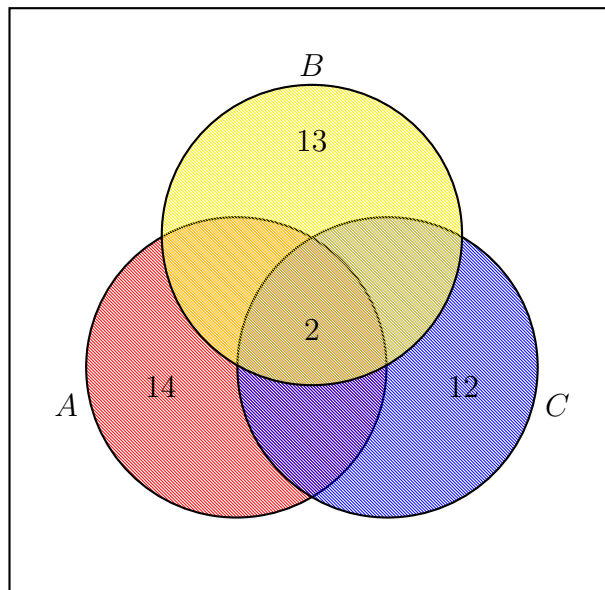
Problem 4. (5 points) Suppose that $A \subseteq B$ and $C \subseteq D$. Prove that $A \cup C \subseteq B \cup D$. (Use of a Venn diagram doesn't constitute a proof here.)

Proof. If $x \in A \cup C$, then $x \in A$ or $x \in C$. If $x \in A$, then $x \in B$ as $A \subseteq B$. If $x \in C$, then $x \in D$ as $C \subseteq D$. Thus $x \in B$ or $x \in D$. Therefore $x \in B \cup D$.

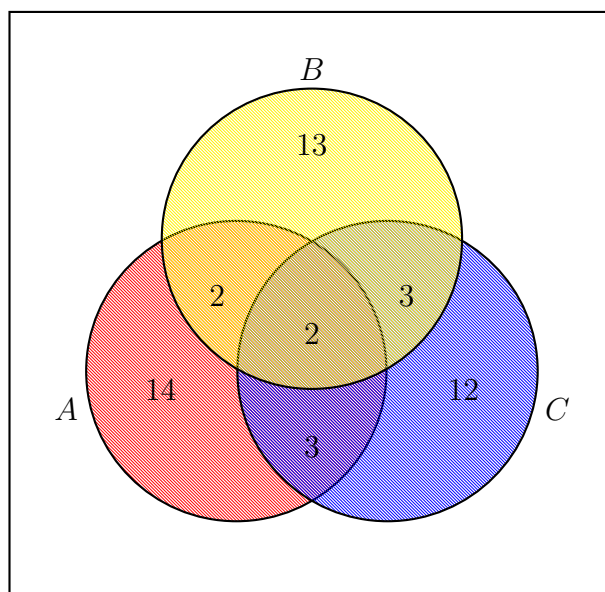
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Problem 5. (5 points) Given the information in the picture, and the fact that $|A \cap B| = 4$, $|A \cap C| = 5$, and $|B \cap C| = 5$, find

$$|A \cup B \cup C|$$



Filling out the picture we get



Adding all the regions together we get

$$2 + 2 + 3 + 3 + 12 + 13 + 14 = 49$$