NAME: Solutions

This quiz contains 5 problems worth 30 points. You may not use books, notes, or a calculator. You have 20 minutes to take the quiz.

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1. (6 points) Let $X = \{a, b, c\}$, $Y = \{c, d, e, f\}$, $Z = \{a, d, e\}$, and let the universe $U = \{a, b, c, d, e, f, g\}$.

   (a) Find $X \cap (Y \cup Z)$.

   $Y \cup Z = \{a, c, d, e, f\}$. So $X \cap (X \cup Z) = \{a, c\}$

   (b) Find $(\overline{X \cup Y}) \cup Z$.

   Use De Morgan's Laws: $\overline{X \cup Y} = \overline{X} \cap \overline{Y} = \{d, e, f, g\} \cap \{a, b, g\} = \{g\}$

   So $(\overline{X \cup Y}) \cup Z = \{a, d, e, g\}$

   (c) Is $X \subseteq (Y \cup Z)$? Explain your answer.

   No. $b \in X$ but $b \notin Y \cup Z$.

2. (3 points) Let $A = \{0, 1, 2\}$ and $B = \{2, 4\}$. List the elements in the set $A \times B$.

   $A \times B = \{(0,2), (0,4), (1,2), (1,4), (2,2), (2,4)\}$

3. (6 points) Let $X = \{a, b, c\}$.

   (a) List all subsets of X.

   $\emptyset$, $\{a\}$, $\{b\}$, $\{c\}$, $\{a, b\}$, $\{a, c\}$, $\{b, c\}$, $\{a, b, c\}$

   (b) List all partitions of X.

   a,b,c ; ab,c ; ac,b ; a,bc ; abc .

   (I used commas to separate the parts as we did in class.)

4. (12 points) Use $A = \{\mathbb{Z}, \{\sqrt{2}, \sqrt{3}, \sqrt{5}\}, \pi, \sqrt{2}\}$ to answer questions (a) -(f) below.

(a) Find the cardinality of A.

$|A| = 4$ (See the four elements underlined in green.)

(b) Is $\sqrt{2} \in A$? Explain.

Yes $\sqrt{2}$ if fourth in the list above.

(c) Is $\sqrt{5} \in A$? Explain.

No. $\sqrt{5}$ does not appear as one of the four elements (underlined in green.)

(d) Is $\sqrt{2} \subseteq A$? Explain.

No $\sqrt{2}$ isn't a set. The statement doesn't make sense.

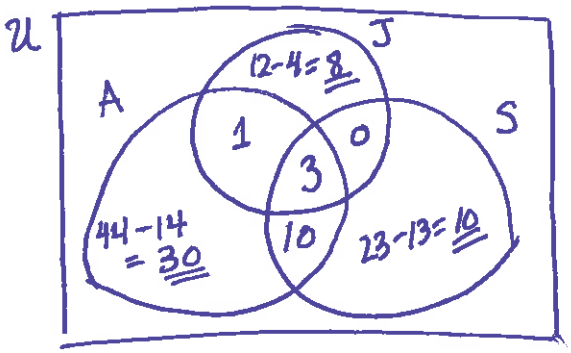
(e) Is $\{\sqrt{2}\} \subseteq A$? Explain.

Yes The set $B = \{\sqrt{2}\}$ has one element, $\sqrt{2}$. This element appears in A (in last position.) So $B \subseteq A$.

(f) Is $\{\sqrt{2}, \sqrt{3}\} \subseteq A$? Explain.

No. If $B = \{\sqrt{2}, \sqrt{3}\}$, to check if $B \subseteq A$, we must check all elements of B. The element $\sqrt{3} \notin A$. So $B \not\subseteq A$.

5. (3 points) A survey of 100 children found that
3 had visited Anchorage, Juneau, and Seward,
4 had visited Anchorage and Juneau,
13 had visited Anchorage and Seward,
3 had visited Seward and Juneau,
44 had visited Anchorage,
23 had visited Seward, and
12 had visited Juneau.
How many of the 100 children had visited none of the three towns? (Show your work to receive partial credit. A Venn diagram might be a good idea.)



Kids visiting somewhere: $30+10+8+10+3+1=62$

So # kids visiting none is:

$100 - 62 = 38$ ← answer!