DSE 210: Worksheet #1 - Sets and Counting

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Problem 1

a) A = {a, b, c, d, e}

b) $A^3 = A \times A \times A$

c) $5^3 = 5 \times 5 \times 5 = \boxed{125}$

Problem 2

There are $\boxed{2^{500}}$ binary sequences of length 500.

Problem 3

Given: A and B are sets with $|A| = 3$ and $|B| = 4$.

a) $|A \cup B| = \boxed{7}$ if $A \cap B = \varnothing$

b) $|A \cup B| = \boxed{4}$ if $A \subset B$

c) $|A \cap B| = \boxed{3}$ if $A \subset B$, and $|A \cap B| = \boxed{0}$ if $A \cap B = \varnothing$

Problem 4

There are $4! = 4 \times 3 \times 2 \times 1 = \boxed{24}$ different orderings.

Problem 5

$${}_{26}P_5 = \frac{26!}{(26-5)!} = \frac{26!}{21!} = 26 \times 25 \times 24 \times 23 \times 22 = \boxed{7,893,600}$$

Problem 6

$${}_{10}C_3 = \frac{10!}{(10-3)!3!} = \frac{10!}{7!3!} = \frac{10 \times 9 \times 8}{3 \times 2 \times 1} = \frac{720}{6} = \boxed{120}$$

Problem 7

$${}_{10}P_5 = \frac{10!}{(10-5)!} = \frac{10!}{5!} = 10 \times 9 \times 8 \times 7 \times 6 = \boxed{30,240}$$