Review problems for chapters 1, 2, and 3, Fall 2021

Note: I created a list of twenty problems covering the material; I put ten on the actual exam and ten on this list of practice problems. So you shouldn't expect that the exam problems will be of the exact same type as the problems below. Also note that homework #6 will have more problems that come from chapter 3, so doing those problems would be another good way to review the material.

1. Determine the set $\{n \in \mathbb{N} \mid n^2 > 10\} \cap \{n \in \mathbb{N} \mid n^3 < 1000\}$.

2. Given the universe $U = \{1, 2, 3, 4, 5\}$ and subsets $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$ of U, determine $A \cup B$, $(A \cap B)^c$, and $A - B$.

3. Let $A = \{1, 2\}$ and $B = \{2, 3\}$. What is $A \times B$? How many elements does $\mathcal{P}(A \cup B)$ have? How many elements does $\mathcal{P}(A) \cup \mathcal{P}(B)$ have?

4. What decimal number is represented by 110111 in binary?

5. How many triples (a, b, c) are there with $1 \leq a \leq 2$, $2 \leq b \leq 4$, and $3 \leq c \leq 6$?

6. How many permutations of the word REPEATED are there? Give your answer as a number.

7. Suppose A and B are subsets of U, with $|U| = 10$, $|A| = 6$, $|B| = 5$, and $|A \cap B| = 4$. Find $|(A \cup B)^c|$.

8. In how many different ways can you choose 3 people from a committee of 6 people to form a subcommittee?

9. Write the truth table for the proposition $p \to (q \to p)$ (including a column for the subexpression $q \to p$). Is it a tautology, a contradiction, or neither? Do the same for $(p \to q) \to p$ (with a column for the subexpression $p \to q$).

10. Translate the following proposition into English:

$$(\forall n)_{\mathbb{Z}}\ ((n \geq 17 \wedge n \leq 19) \rightarrow n \text{ is prime})$$

Is it true or false? Why?