Statistical mathematics Assignment 2 (Thursday 20/1)

Group 1 (10–12), Group 2 (12–14), Group 3 (14–16)

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1. Let us start with counting the elements of sets. We denote the size (= number of elements) of a set A by $|A|$.

(a) If $|A| = 100$, $|B| = 75$, and $|A \cap B| = 40$, what is $|A \cup B|$?
(b) If $|A| = 200$, $|B| = 100$, and $|A \cup B| = 250$, what is $|A \cap B|$?
(c) If $|A| = 100$, $|A \cap B| = 20$, and $|A \cup B| = 150$, what is $|B|$?
(d) If $|B| = 100$, $|A \cup B| = 175$, and $|A \cap B| = 40$, what is $|A|$?
(e) If $|A| = 100$ and $|A \cap B| = 40$, what is $|A - B|$?

2. Suppose that A and B are events such that $B \subseteq A$. We know that $P(A) = 0.6$ and $P(B) = 0.4$. What are the following probabilities?

(a) $P(A \cup B)$
(b) $P(A \cap B)$
(c) $P(A - B)$
(d) $P(B - A)$

3. Two 6-sided dices are rolled.

(a) Describe the *sample space*.
(b) What is the probability that the sum of dices is 10, 11 or 12?
(c) The sum is an even number?
(d) The sum is 12?
(e) The sum is 1?

4. A fair coin is tossed **10 times**. *Heads* refers to the side of the coin that features a portrait, or head, while *Tails* refers to the opposite side.

(a) Describe the *sample space*.
(b) What is the probability that you get *Heads* every time?
(c) There is exactly one *Tails*?
(d) There are exactly two *Tails*?

5. Consider the normal deck of cards. What are the following probabilities?

(a) We pick *Jack of Diamonds*?
(b) A picked card is *Heart*?
(c) We pick a *Queen*?
(d) We pick a *Queen* after we picked a *Queen* as the first card?