

## Reading Quiz 2

February 7, 2013

**Problem 1.** Suppose I roll a fair 6-sided die, twice. Let A denote the event that I get a 6 on the first roll, and B denote the event that I get a 6 on the second roll, and C the event that I get a 6 on at least one of the two rolls. Jim calculates that  $P(A) = 1/6$ ,  $P(B) = 1/6$ , and  $P(C) = P(A) + P(B) = 1/6 + 1/6 = 1/3$ . Is Jim correct? If yes, name the rule or axiom that he used. If no, explain which was the first step that Jim got wrong and why it was wrong. (Q1)

No, the two events are not mutually exclusive so Jim cannot simply add the probabilities.

$$\begin{aligned}P(C) &= P(\text{at least one 6 in 2 rolls}) \\ &= P(6 \text{ on first roll OR } 6 \text{ on second roll}) \\ &\neq P(6 \text{ on first roll}) + P(6 \text{ on second roll})\end{aligned}$$

because getting a 6 on the first roll does not exclude the possibility of getting a 6 on the second roll.

**Problem 2.** Suppose I shuffle a 52-card deck and then draw a card off the top. Let A denote the event that the top card is a King, and let B be the event that the top card is not a King. What is  $P(A) + P(B)$ ? What rule did you use? (Q2)

$P(A) = 4/52 = \frac{1}{13}$  since there are 4 Kings in the deck out of all 52 cards.

$P(B) = \frac{52-4}{52} = \frac{48}{52} = \frac{12}{13}$  since there are 48 non-King cards in the deck.

Then

$$P(A) + P(B) = 1$$

And we didn't use any axioms, simply counting.

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If instead we computed  $P(B) = 1 - P(A)$

Then axiom we used is "The probability of the entire outcome space is 100%." since the top card is either bea King or a non-King card.

**Q3:**

Feedback!