

HW07 - More Probability

Stat 20 & 131A, Spring 2017, Prof. Sanchez

Due Mar-9

1) True or false, and explain: *0.4pts*

- a. If a die is rolled three times, the chance of getting at least one ace is $1/6 + 1/6 + 1/6 = 1/2$.
- b. If a coin is tossed twice, the chance of getting at least one head is 100%.

2) The chance of A is $1/3$; the chance of B is $1/10$. True or False, and explain. *0.4pts*

- a. If A and B are independent, they must also be mutually exclusive.
- b. If A and B are mutually exclusive, they cannot be independent.

3) One event has chance $1/2$, another has chance $1/3$. Fill in the blanks using one phrase from each pair below, to make up two true sentences. Write out both sentences. *0.6pts*

“If you want to find the chance that (i) will happen, check to see if they are (ii). If so, you can (iii) the chances.”

- i. at least one of the two events, both events.
- ii. independent, mutually exclusive.
- iii. add, multiply.

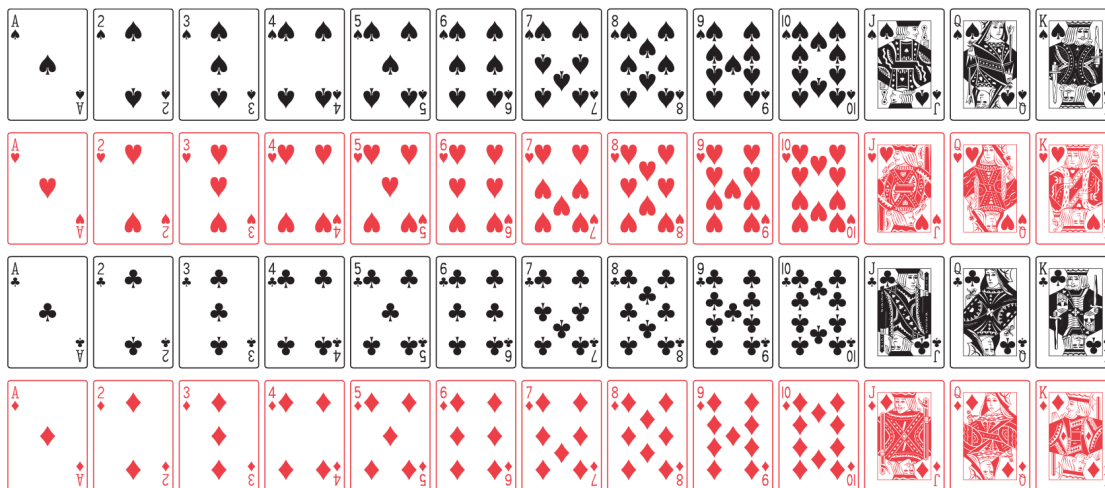
4) One ticket will be drawn at random from each of the two boxes shown below:

- A. [1, 2, 3]
- B. [1, 2, 3, 4]

Find the chance that: *0.6pts*

- a. The number drawn from A is larger than the one from B.
- b. The number drawn from A equals the one from B.
- c. The number drawn from A is smaller than the one from B.

5) Consider a standard deck of 52 cards, as displayed in the following figure.



Consider the following events when a card is randomly selected. 1.5pts

- A: card selected is a king.
- B: card selected is a heart.
- C: card selected is a face card (i.e. J, Q, K)
- D: card selected is not a face.

Find the probabilities of:

- a. $P(A)$
- b. $P(B)$
- c. $P(C)$
- d. $P(D)$
- e. $P(A \text{ and } B)$
- f. $P(A|B)$
- g. $P(B|A)$
- h. $P(B^c|D)$
- i. $P((C \text{ and } B)^c)$
- j. $P(A \text{ or } B)$
- k. $P(B \text{ or } C)$
- l. $P(A^c \text{ or } B^c)$
- m. Are A and B independent?
- n. Are B and C independent?
- o. Among all pairwise composite events “A and B”, “A and C”, “A and D”, “B and C”, “B and D”, and “C and D”, which ones are mutually exclusive?

6) Two fair dice are tossed. *1.6pts*

- a. What is the probability of a sum of six?
- b. What is the probability of a sum of five?
- c. What is the probability of a sum of five or a sum of six?
- d. What is the probability of doubles?
- e. What is the probability of a sum of six or doubles?
- f. What is the probability of a sum of six and doubles?
- g. What is the probability of a sum of five or doubles?
- h. What is the probability of a sum of five and doubles?

7) Donald is taking a statistics course. He intends to rely on luck to pass the next quiz. The quiz consists of 10 multiple-choice questions. Each question has 5 possible answers, only one of which is correct. Donald plans to guess the answer to each question. *1.4pts*

- a. What is the probability that Donald gets no answers correct?
- b. What is the probability that Donald gets two answers correct?
- c. Find the probability that Donald fails the quiz. A mark is considered a failure if it is less than 50%.
- d. Plot the probability distribution of the number k of correct answers ($k = 0, 1, \dots, 10$).

8) Silicon chips are tested at the completion of the fabrication process. Chips either pass or fail the inspection, and if they fail they are destroyed. The probability that a chip fails an inspection is 0.02. *0.9pts*

- a. What is the probability that for a manufacturing run of 250, only 5 will fail the inspection?
- b. What is the probability that for a manufacturing run of 250, at most 7 chips will fail the inspection?
- c. What is the probability that for a manufacturing run of 250, at least 10 chips will fail the inspection?

9) Eight decks of 52 playing cards are shuffled and the top card on each deck is turned up. *0.9pts*

- a. What is the probability all eight are face cards (King, Queen, and Jack)?
- b. What is the probability all eight are face cards of the same suit (all hearts, diamonds, spades, or clubs)?
- c. What is the probability of exactly four face cards among the 8 cards turned up?

10) A regional community is trying to ensure that their local water supply has fluoride added to it, as a medical officer found that a large number of children aged between eight and twelve have at least one filling in their teeth. In order to push their cause, the community representatives have asked a local dentist to check the teeth of ten 8-12-year-old children from the community. Let X be the random variable for the number of 8-12-year-old children who have at least one filling in their teeth. Find the value of p , correct to 3 decimal places, if $P(X \leq 8) = 0.9$. *0.2pts*