

Mathematics 1550H – Introduction to probability

TRENT UNIVERSITY, Winter 2016

Assignment #2

Hands across the deck

Due on Friday, 12 February, 2016.

Recall that a standard 52-card deck has four suits, namely \heartsuit , \diamondsuit , \clubsuit , \spadesuit , each of which has thirteen cards, namely $A, K, Q, J, 10, 9, 8, 7, 6, 5, 4, 3, 2$. We will be dealing with five-card hands drawn at random, all at once, from the deck.

1. What is the probability that any particular five-card hand will be drawn? [1]

Suppose that after a five-card hand is drawn, the cards in it are put back in the deck and another five-card hand is drawn.

2. What is the probability that the two hands have no card in common? [1]
3. What is the probability that the two hands have exactly one card in common? [1]
4. What is the probability that the two hands have at least one card in common? [1]
5. What is the probability that the two hands have at least three cards in common? [1]

A *straight* is a hand in which the cards are in consecutive order by rank. For the purposes of the following question, going around the end of the rank order is not allowed. (For example, $432AK$ would not count as a straight.)

6. Suppose you draw a five-card hand randomly from the deck and get four cards that that would make a straight if you could replace the fifth card. (e.g. $J10983$ or $K7643$). If you are allowed to discard the fifth card and draw one at random from the remaining 47 cards in the deck, what is the probability that your modified hand will be a straight? [3]

Hint: There are several cases to consider ...

A *flush* is a hand in which all the cards are from the same suit.

7. Suppose you draw a five-card hand randomly from the deck. What is the probability that this hand is a flush? [1]
8. Suppose you draw a five-card hand randomly from the deck. What is the probability that this hand is both a straight and a flush? [1]