

# Group assignment 1 – Playing Cards

## Question 1:

1. What is the chance of getting an ace as the first card?

There are 4 aces in a deck of cards

**Event:**  $A = \{\text{club ace, spade ace, diamond ace, heart ace}\}$

**Number of occurrences:**  $N_A = 4$

**Total number of events:**  $N = 52$

**Probability:**  $Pr(A) = \frac{N_A}{N} = \frac{4}{52} = \frac{1}{13}$

## Question 2:

2. If you scored an ace as the first card, what is the chance of getting a blackjack with the second card?

**Event:**  $B = \{C10, S10, D10, H10, CJ, SJ, DJ, HJ, CQ, SQ, DQ, HQ, CK, SK, DK, HK\}$

**Number of occurrences:**  $N_B = 16$

**Total number of events:**  $N = 52 - 1 = 51$

**Probability:**  $Pr(B|A) = \frac{N_B}{N} = \frac{16}{51}$

## Question 3:

3. Write a matlab program that simulates drawing cards. Verify the probabilities from 1. and 2.

Matlab simulation → CardSim → Dropbox → Lukas and Kristian → ETSMP → Group assignment 1.

**Probability simulated from question 1:**

$Pr(Ace) = 0.769$

**Probability simulated from question 2:**

$Pr(Blackjack) =$

## Question 4:

4. What is the chance of getting a blackjack with the first two cards? Verify your results by simulation.

Possibilities:

$$Pr(B \cap A) = Pr(B|A) Pr(A)$$

$$Pr(B \cap A) = \frac{16}{51} \cdot \frac{1}{13} = 0.0241$$

Simulation:

$$\Pr(B \cap A) = 0.0244$$

### Question 5:

5. Simulate the risk of busting if the player always draws 3 cards.

- 1) Shuffling deck of cards
- 2) Add three top cards values
- 3) Check if value is more than 21 - count up variable if true
- 4) Loop through 1-3 until satisfaction
- 5) Number of values higher than 21 divided with number of simulations.

$$\Pr(Bust) = 0.3786$$

### Question 6:

6. Devise a strategy based on obtained points for the player to stop.

The strategy is to stop if the point obtained is around 15.

### Question 7:

7. Simulate the devised strategy with the matlab program, what is the chance of busting now?

$$\Pr(Bust) = 0.2278$$

### Question 8:

8. The strategy of the dealer is always to keep playing as long as his points are below the player. Simulate his strategy in the matlab program. How often does the player win?

Dealer wins 65%

Player wins 35%