

Quiz 3 (February 8, 2017)

Statistics for Social Science (201-401-DW)
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NAME: SOLUTIONS

[QUESTION 1] (4 MARKS)

Consider a container with 75 marbles numbered 1-75. Numbers 1-24 are green and numbers 62-75 are blue. You pay \$1 to select a marble at random from the container. If the marble you select is blue or even you win and double your money otherwise you lose your \$1. Compute the probability of losing your 1\$.

B = selecting blue marble

E = selecting even number

$$P(B) = 14/75$$

$$P(E) = 37/75$$

$$P(B \cap E) = 7/75$$

$$P(\text{win}) = P(B \cup E) = P(B) + P(E) - P(B \cap E) = 14/75 + 37/75 - 7/75 = 44/75$$

$$P(\text{losing}) = 1 - 44/75 = \underline{31/75}$$

[QUESTION 3] (3 MARKS)

Give a brief definition of **probability**. Explain the difference between the two interpretations of probability, the **classical** interpretation and **frequentist** interpretation.

Probability is a measure of **how likely an event is to occur**. The measure ranges from 0 to 1 with 0 meaning the event will not occur and 1 meaning the event will occur.

The classical interpretation of probability states that if there is a procedure with n equally possible outcomes and a certain event occurs in k of those outcomes then the probability of the event occurring is the ratio **k/n** .

The frequentist interpretation of probability states that if a chance procedure can be repeated, the probability of an event is the **proportion of trials of the procedure where the event occurs as the number of trials tends towards infinity**.

[QUESTION 3] (3 MARKS)

A card is selected at random from a standard deck of cards. The following events are defined:

A = "the card is a face card"

B = "the card is a diamond"

C = "the card is black"

Compute the probabilities:

$$P(A \cap B)$$

$$P(A|C)$$

$$P(A \cap C)$$

$$P(A \cup B)$$

$$P(A|B \cup C)$$

Solutions

$$P(A \cap B) = \# \text{ of diamond, face card} / \# \text{ cards} = \underline{\underline{3/52}}$$

$$P(A|C) = \# \text{ black face cards} / \# \text{ black cards} = \underline{\underline{6/26}}$$

$$P(A \cap C) = \# \text{ black face cards} / \# \text{ cards} = \underline{\underline{6/52}}$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 12/52 + 13/52 - 3/52 = \underline{\underline{22/52}}$$

$$\begin{aligned} P(A|B \cup C) &= \# \text{ black or diamond face cards} / \# \text{ black or diamond cards} \\ &= \underline{\underline{9/39}} \end{aligned}$$