N.I. Lobachevsky State University
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Probability theory and mathematical statistics:

Events — Practice

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Suggest elementary outcomes and describe events with some elementary outcomes

Two cards are picked at random from a pile of 36 cards.
$A =$ ”Both cards are aces”.

Suggest elementary outcomes and describe events with some elementary outcomes

Two cards are picked at random from a pile of 36 cards.
$A =$ "Both cards are aces".
Enumerate cards (as in Lecture 2).

$$\Omega = \{\{1,2\},\{1,3\},\ldots,\{1,36\},\{2,3\},\ldots,\{35,36\}\}$$
$$= \{\omega = \{x_1,x_2\} : x_1 \in \{1,2,\ldots,36\}, x_2 \in \{1,2,\ldots,36\}, x_1 \neq x_2\},$$

Aces are cards number 1, 10, 19, and 25, so

$$A = \{\{1,10\},\{1,19\},\{1,25\},\{10,19\},\{10,25\},\{19,25\}\}.$$

Suggest elementary outcomes and describe events with some elementary outcomes

You forgot two last digits in a phone-number. All you remember they are different odd digits. You try to guess them.
$A =$ "Your guess is correct".

Suggest elementary outcomes and describe events with some elementary outcomes

You forgot two last digits in a phone-number. All you remember they are different odd digits. You try to guess them.
$A =$ "Your guess is correct".
Odd digits are 1, 3, 5, 7, 9.

$$\Omega = \{(1,3),(1,5),\ldots,(3,1),(3,5),\ldots,(9,7)\}$$
$$= \{\omega = (x_1,x_2) : x_1 \in \{1,3,5,7,9\}, x_2 \in \{1,3,5,7,9\}, x_1 \neq x_2\},$$

Assuming the correct ending is 15,

$$A = \{(1,5)\}.$$

Suggest elementary outcomes and describe events with some elementary outcomes

Three dice are rolled.
$A =$ ” the sum of numbers is 12”,
$B =$ ”the first die has even number of points”,
$C =$ ”all dice show the same number of points”.

Suggest elementary outcomes and describe events with some elementary outcomes

Three dice are rolled.
$A =$ " the sum of numbers is 12",
$B =$ "the first die has even number of points",
$C =$ "all dice show the same number of points".

$$\Omega = \{\omega = (x_1, x_2, x_3) : x_i \in \{1, 2, \ldots, 6\}, i = \overline{1,3}\},$$
$$A = \{\omega \in \Omega : x_1 + x_2 + x_3 = 12\},$$
$$B = \{\omega \in \Omega : x_1 \in \{2, 4, 6\}\},$$
$$C = \{\omega \in \Omega : x_1 = x_2 = x_3\}$$
$$= \{(1,1,1), (2,2,2), (3,3,3), (4,4,4), (5,5,5), (6,6,6)\}.$$

Suggest elementary outcomes and describe events with some elementary outcomes

Each digit of a 4-digit binary number is chosen at random.
$A =$ "the number of 1's is equal to the number of 0's",
$B =$ "the first and the last digits are zeros".
The same problem for an 8-digits number.

Suggest elementary outcomes and describe events with some elementary outcomes

There are 10 balls with numbers from 1 to 10 in an urn. Three balls are taken out.

$A =$ "The third ball has number 5",

$B =$ "The first ball has odd number",

$C =$ "Odd and even numbers on the balls follow each other".

Suggest elementary outcomes and describe events with some elementary outcomes

There are 10 balls with numbers from 1 to 10 in an urn. Three balls are taken out.
$A =$ "The third ball has number 5",
$B =$ "The first ball has odd number",
$C =$ "Odd and even numbers on the balls follow each other".

$$\Omega = \{(a_1, a_2, a_3) : a_1, a_2, a_3 = 1, 2, \ldots, 10, \\ a_1 \neq a_2,\ a_1 \neq a_3,\ a_2 \neq a_3\}$$

$$A = \{(a_1, a_2, 5) : a_1, a_2, a_3 = 1, 2, \ldots, 10, \quad a_1 \neq a_2, \}$$

$$\ldots$$

Suggest elementary outcomes and describe events with some elementary outcomes

10 apples are distributed among 5 persons.
$A =$ "Everybody gets at least one apple",
$B =$ "At least one person gets no apple",
$C =$ "One person gets all the apples",
$D =$ "Two persons get no apples".

Suggest elementary outcomes and describe events with some elementary outcomes

A family with two children is visited at random.
$A =$ "A boy opened the door".

Suggest elementary outcomes and describe events with some elementary outcomes

A family with two children is visited at random.
$A =$ "A boy opened the door".
Let a pair (x, y) denote sexes of the first and the second child in a family.

$$\Omega = \{(B, B), (B, G), (G, B), (G, G)\},$$

$$A = \{(B, B), (B, G), (G, B)\}.$$

Suggest elementary outcomes and describe events with some elementary outcomes

Three players A, B, and C take turns at a game, such as chess, according to the following rules. At start A and B play while C is out. The loser is replaced by C and at the second trial the winnoer plays against C while the loser is out. The game continues in this way until a player wins twice in succession, thus becoming the winner of the game. No ties are possibleat the individual trials.

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$$\Omega = \{AA, ACC, ACBB, ACBAA, ACBACC, ACBACBB, ACBACBA, \ldots$$
$$BB, BCC, BCAA, BCABB, BCABCC, BCABCAA, BCABCABB, \ldots$$
$$ACBACBACBACB \ldots, BCABCABCABCA \ldots\}$$