

# Probability

Tanya Khovanova

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A colonel teaches air defence at Moscow State University, Math Department. He says "If we try to hit a B-52 with this missile, the probability of success is 5%."

A math student asks: "What if we try to miss?"

The colonel thinks for a while and answers: "Then the probability of a hit is 95%."

## Class Discussion

Probability. Equally probable outcomes.

## Warm Up

**Exercise 1.** Tanya wants to create a math team of 4 people out of her class of 10 students. As everyone is approximately the same strength, she decided to use a lottery. What is the probability that a given student will get on the team?

**Exercise 2.** If I roll two standard dice, what sum am I most likely to achieve on them?

**Exercise 3.** Simplify:

$$\left( (\sqrt[4]{p} - \sqrt[4]{q})^{-2} + (\sqrt[4]{p} + \sqrt[4]{q})^{-2} \right) / \frac{\sqrt{p} + \sqrt{q}}{p - q}.$$

## Probability

**Exercise 4.** A math team has 8 members, 5 girls and 3 boys. Two members are chosen at random for the speed counting round. What is the probability that they are both girls?

**Exercise 5.** When you pick a 7-digit number randomly, what is the probability that it is a palindrome?

**Exercise 6.** What is the probability that a random arrangement of the letters of my name Tanya will have both A's next to each other?

**Exercise 7.** You are given a random permutation of 5 letters. If you apply this permutation to my first name Tanya, then what is the probability that it stays unchanged?

**Exercise 8.** When flipping a coin 6 times, what is the probability of getting exactly 4 heads?

**Exercise 9.** Tanya decided to buy balloons for her math party. There are 7 colors of balloons at the Star Market and Tanya needs 10 balloons. In how many ways can Tanya buy her balloons?

**Exercise 10.** When picking three set cards at random, what is the probability of getting a set?

## Challenge Problems

**Exercise 11.** For drafting purposes the government made a list of all the families with two children where at least one of the children is a boy. A family from this list is picked at random. What is the probability that this family has two boys?

**Exercise 12.** To encourage Elmer's promising tennis career, his father offers him a prize if he wins two tennis sets in a row in a three-set series to be played with his father and the club champion alternately: father-champion-father, or champion-father-champion, according to Elmer's choice. The champion is a better player than Elmer's father. Which series should Elmer choose?