

Probability

Probability

Name _____

The mathematics of probability was originally developed by persons interested in gambling – games of chance. The solution of genetics problems involves the use of probability. We are asking what the chances are that a particular event will occur. Based on the genotypes of two heterozygous brown-eyed parents (a monohybrid cross) it is possible to predict that there is one chance in four (1:4) that such parents may produce a blue-eyed child. It is not possible to say that they will produce such a child.

Probability is defined as: **P = number of favorable cases ÷ total number of cases**

If an event is certain to happen, its probability is 1; if the event is impossible, its probability is 0. Other probabilities are expressed as ratios. For example the probability of drawing a king from a deck of cards is 4:52 or 1:13, since there are four kings in the deck of 52 cards. The probability of throwing heads in one toss of a coin is 1:2.

To determine probability, ask what is the number of favorable cases or chances of a particular event occurring. The answer to this question in the case of the kings in the deck was four. (in the introduction discussion)

Also, ask what is the total number of cases. The total cases in the deck of cards was 52.

Put the results of these two steps in the form of a ratio or fraction. In the case under consideration, the results are 4:52 or 4/52 which can be reduced to 1:13 or 1/13. Reduce ratios or fractions by dividing by a common number or by dividing the top into the bottom—with the new top number becoming one and the new bottom number becomes the answer from dividing. Therefore, the probability that a king would be drawn from a shuffled deck of cards is 1 in 13 or 1/13.

Another point to consider in such problems is that the probability that **one or** the other of two (or more) mutually exclusive events will occur is the **sum** of the separate probabilities. For example, the probability of drawing either an ace or a king from a standard deck of cards is $4/52 + 4/52 = 8/52$ reduced to $2/13$.

The probability that **both** of two independent events will occur together is the **product** of the two separate probabilities. This can be extended to any number of different events. For example, the probability of drawing first an ace followed by a king from a standard deck of cards is $4/52 \times 4/52 = 16/2652$ reduced to $1/166$.

Keep in mind that these calculations are for one person drawing from one deck. When you get into the probabilities involving multiple participants from the same deck, the probabilities get much more complicated and we will not go into the mathematics involved in this.

Answer the following probability questions:

1. What is the probability of rolling a six in one roll of a die?
2. What is the probability of rolling two sixes in a row?
3. What is the probability of rolling five sixes in a row?
4. What are the chances of the first baby being a boy?
5. What are the chances of a family having four boys in a row?
6. What is the probability of drawing a face card?
7. What is the probability of drawing a queen or a king?
8. What is the probability of drawing a ten or a black jack?
9. What is the probability of drawing three aces in a row?
10. What is the probability of drawing four aces in a row?
11. What is the probability of drawing a Royal flush?
12. What is the probability of getting all the numbers in the Powerball?