

Classwork 13.

Probability.

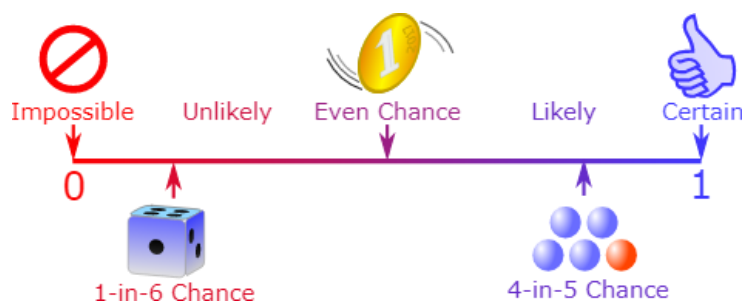
Many times a day we are saying something like

“It will probably rain today!”

“It’s impossible. Tomas got an F on the test. He is a stellar student!”

“It’s certain, we are flying to the Caribbean next Sunday.”

Words *possible*, *impossible*, *certain* help us to describe the likelihood of an event happening.



These words can only slightly quantify the likelihood. Can this “likelihood” be described in a more “precise” way? We can’t predict with total certainty that the event will occur. We can only say how **likely** the event is to occur using the idea of probability.

What will you get if you toss a coin? Obviously, there will be either head or tail. If we would toss this coin many times, how many heads and how many tails we will register? The ratio of the desired outcome to the total number of possible outcomes is the probability of desired outcome to happen. In the example of a tossed coin there are two possible outcomes, head and tail, so the probability to get a head is (if it’s a fair coin)



1 to 2, or $\frac{1}{2}$; or 0.5, or 50%.



It doesn’t mean that if you flip the coin twice you will definitely get a head.

Rather if you toss the coin 1000 times the head will appear about 500 times. More tossing, the closer the ratio is to $\frac{1}{2}$. Let’s check it!

Try	Head	Tail
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

If we roll a die (dice can be used as singular or plural, die is used only as singular), there are 6 possible outcomes, 1, 2, 3, 4, 5, and 6.

The probability to get 1 is $\frac{1}{6}$ (there is only 1 way to get desirable outcome and 6 possible outcomes).

$$\text{Probability of an event happening} = \frac{\text{Number of ways it can happen}}{\text{Total number of outcomes}}$$

What is a probability to get an even number on a die?

There are 3 possible ways to get even: 2, 4, 6. And 6 total outcomes, so this probability is

$$3:6 = 0.5$$

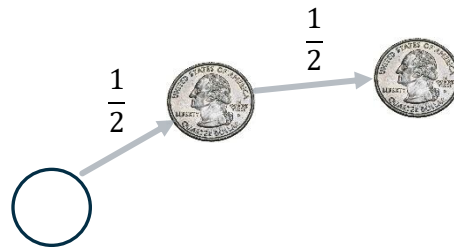
Let's toss a coin twice. What is a probability to get head both times?

Try	Head	Tail
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

We can look at this event (get head twice) in two different ways:

First:

Probability to get a head first is $\frac{1}{2}$.



The probability to get second head is also $\frac{1}{2}$. The probability to get two heads in a row is $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

Second:

There are 4 possible outcomes for two tosses: HH, HT, TH, TT and only one (HH) possibility for us to get HH.

What is a chance (probability) to get 6 heads in a row? If we got 5 heads, what is a probability that the next one will be a head?

Let's now play with dice.

What a chance to get double (same number on both dice)? Sum of the numbers equal to 5? 3? 6?

There are 7 yellow, two white and 4 brown pencils in a box. What is a probability to get a yellow pencil? A white pencil? A brown pencil? Two white pencils? Two yellow pencils?

