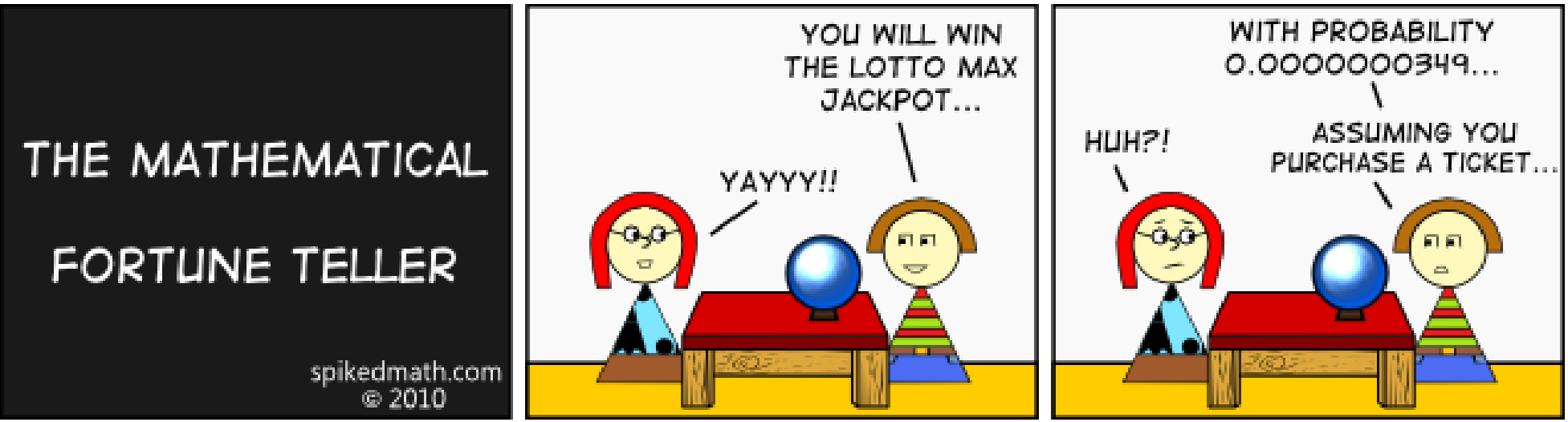
Coincidence and Uncertainty in Daily Life

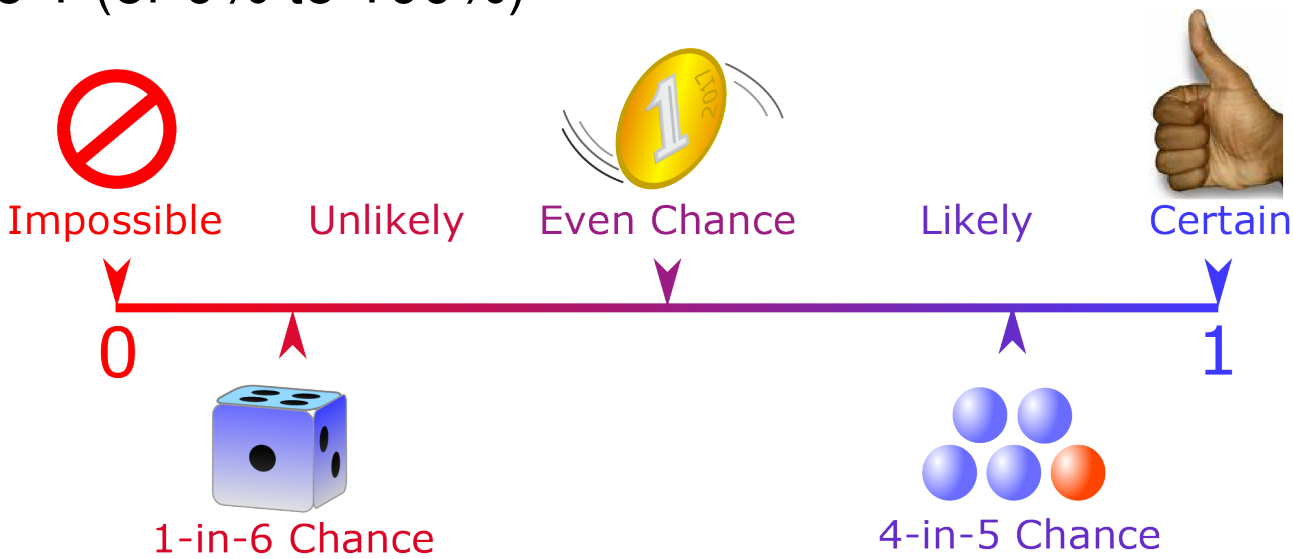
- many events in our daily lives arise in terms of probabilities and statistics—even the basic interactions of molecules and subatomic particles
- we can use probability to move beyond a vague sense of disordered randomness and describe possible outcomes



Picture credit: `http://spikedmath.com/355.html`

Probability

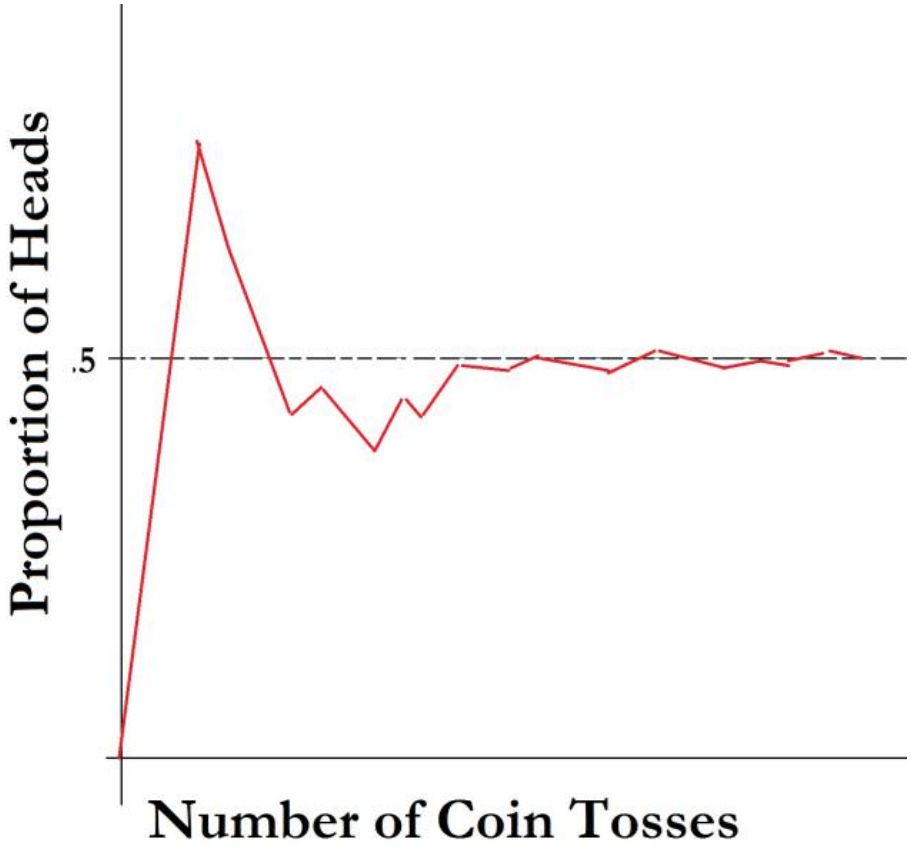
- quantitative measure of the likelihood of an event
- mathematical foundation of common sense and good judgment
- 0 to 1 (or 0% to 100%)



Picture credit: `https://www.mathsisfun.com/data/probability.html`

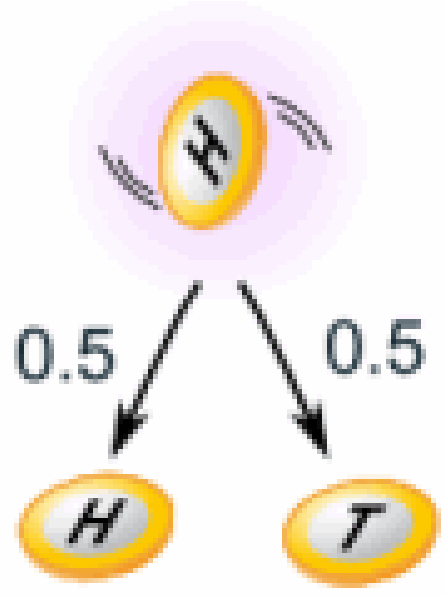
Law of Large Numbers

- small number of experiments can have random fluctuations
- repeat an experiment a large number of times: outcome tends to the probability with much greater certainty



Picture credit: `http://0.tqn.com/d/statistics/1/S/T/0/-/-/lawoflargenumbers.jpg`

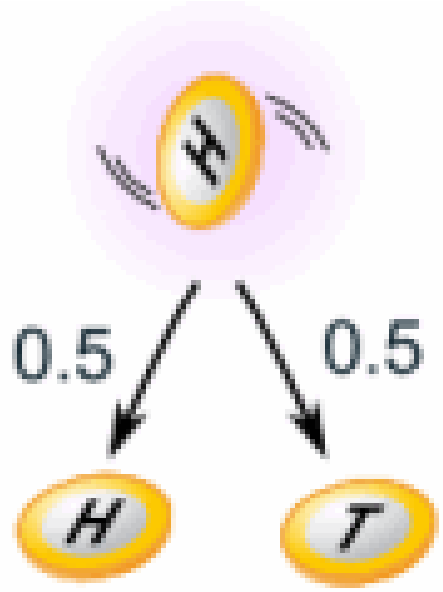
If It Either Happens or It Doesn't (Independent Events)



Picture credit: `http://lriser03.blogspot.com/`

- probability that an event will happen =
  1 - probability it won't happen
- What is the probability of NOT rolling a 6 on a dice?

If It Either Happens or It Doesn't (Independent Events)



Picture credit: `http://lriser03.blogspot.com/`

- probability that an event will happen = 1 - probability it won't happen
- What is the probability of NOT rolling a 6 on a dice?
  $1 - \frac{1}{6} = \frac{5}{6} = \frac{\text{number of different outcomes}}{\text{total number of equally likely outcomes}} =$ probability of rolling 1, 2, 3, 4 or 5.

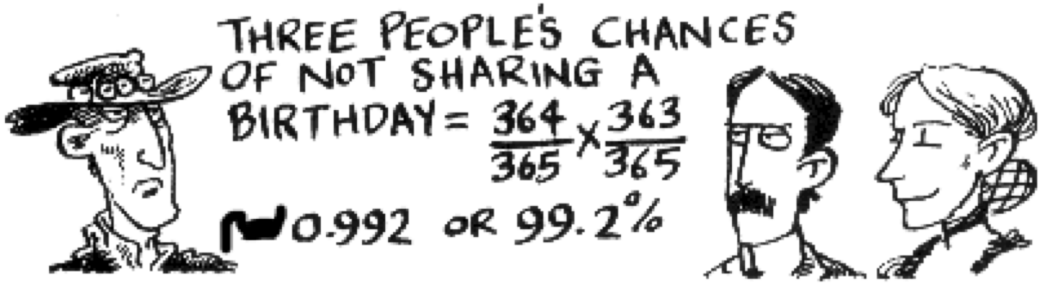
Multiplication Rule for Independent Events

- If the probability of a person being left-handed is $\frac{1}{10}$, and the probability of being blue-eyed is $\frac{1}{3}$, then what is the probability of being left-handed and blue-eyed (assuming these are independent of each other)?

Multiplication Rule for Independent Events

- If the probability of a person being left-handed is $\frac{1}{10}$, and the probability of being blue-eyed is $\frac{1}{3}$, then what is the probability of being left-handed and blue-eyed (assuming these are independent of each other)?
- If independent, then the proportion of blue-eyed people among the left-handed people is the same as the proportion of blue-eyed people among the whole population, so
  left-handed and blue-eyed = $\frac{1}{3}$ of $\frac{1}{10}$ = $\frac{1}{3 \times 10} = \frac{1}{30}$

Happy Birthday to You and You!



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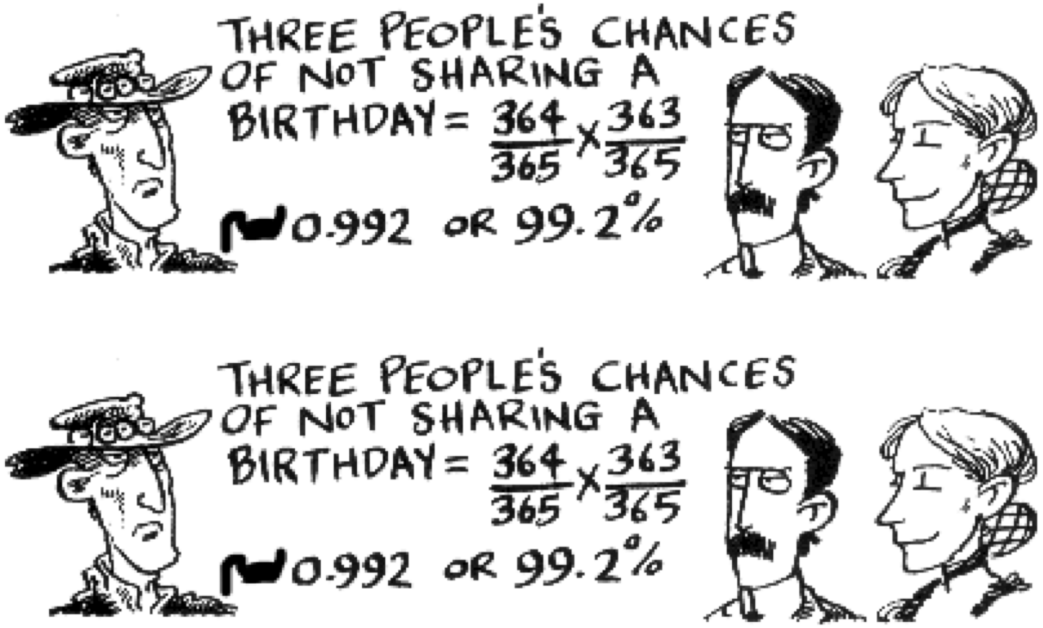

Picture credits: `http://www.murderousmaths.co.uk/books/366bday.htm`

# people on the floor	probability of two people with same birthday
2	.0027...
3	.0082...
5	.0271...
20	.4114...
25	.5687...
50	.9704...