

Probability

Equally Likely Outcomes

Assuming all outcomes are equally likely, the chance of an event A is:

$$P(A) = \frac{\text{number of outcomes that make A happen}}{\text{total number of outcomes}}$$

Discussion Question

I have three cards: red, blue and green.

What is the chance that I choose a card at random and it is green, then **without putting it back**, I choose another random card and it is red?

- A. $1/9$
- B. $1/6$
- C. $1/3$
- D. $2/3$
- E. None of the above

Multiplication Rule

Chance that two events A and B both happen

= $P(A \text{ happens}) \times P(B \text{ happens given that } A \text{ has happened})$

- The answer is *less than or equal to* each of the two chances being multiplied
 - The more conditions you have to satisfy, the less likely you are to satisfy them all
-

Discussion Question

I have three cards: red, blue and green. I pick one card, then without putting it back, I pick a second card. What is the probability that I pick one red and one green?

- A. $1/6$
 - B. $1/3$
 - C. $5/6$
 - D. None of the above
-

Addition Rule

If event A can happen in ***exactly one*** of two ways, then

$$P(A) = P(\text{first way}) + P(\text{second way})$$

- The answer is *greater than or equal to* the chance of each individual way
 - The more different ways an event can happen, the more likely it is to occur
-

Discussion: At Least One Head

I have a fair coin.

Find the probability of at least one head in 3 tosses.

Discussion: At Least One Head

I have a fair coin.

Find the probability of at least one head in 3 tosses.

- Any outcome *except* TTT
 - $P(\text{TTT}) = (\frac{1}{2}) \times (\frac{1}{2}) \times (\frac{1}{2}) = \frac{1}{8}$
 - $P(\text{at least one head}) = 1 - P(\text{TTT}) = \frac{7}{8} = 87.5\%$
-

Discussion Question

Every time I call my Grandma, the probability that she answers her phone is $\frac{1}{3}$. If I call my Grandma **two** times today, what is the chance that I will talk to her?

- A. $\frac{1}{3}$
 - B. $\frac{2}{3}$
 - C. $\frac{1}{2}$
 - D. 1
 - E. None of the above
-

Discussion Question

Every time I call my Grandma, the probability that she answers her phone is $\frac{1}{3}$. If I call my Grandma **three** times today, what is the chance that I will talk to her?

- A. $\frac{1}{3}$
 - B. $\frac{2}{3}$
 - C. $\frac{1}{2}$
 - D. 1
 - E. None of the above
-