

Theoretical Probability



Quick Review

- This table shows the possible outcomes when 2 dice are rolled and the numbers are added.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

From the table:

- There are 36 possible outcomes.
- 18 outcomes are odd sums.
- 18 outcomes are even sums.

We say: The **probability** of getting an odd sum is 18 out of 36.

We write the probability of an odd sum as a fraction: $\frac{18}{36}$

This probability is a **theoretical probability**.

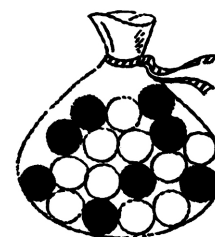
$$\text{Theoretical probability} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

The probability of an odd sum is $\frac{18}{36}$. The probability of an even sum is $\frac{18}{36}$.

Since $\frac{18}{36} = \frac{18}{36}$, the probability of getting an odd sum or an even sum is equally likely.

Try These

1. A bag contains 10 white marbles and 8 black marbles. A marble is picked at random. What is the probability that a black marble is picked? _____
2. 16 girls and 13 boys put their names in a bag. One name is drawn from the bag. What is the probability that a boys name will be drawn? _____



Practice

1. A box contains 8 red apples, 10 green apples, and 12 yellow apples. Without looking, you pick an apple from the box.

a) What are the possible outcomes?

b) How many apples are in the box? _____

c) What is the theoretical probability that the apple is:

i) red? _____ ii) green? _____ iii) yellow? _____

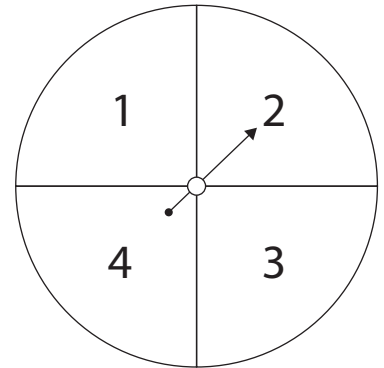
2. Suppose you spin the pointer on this spinner. What is the probability of each outcome?

a) The pointer lands on 1. _____

b) The pointer lands on 2. _____

c) The pointer lands on 3 or 4. _____

d) The pointer does not land on 3. _____



3. Rafik spins the pointer on this spinner.

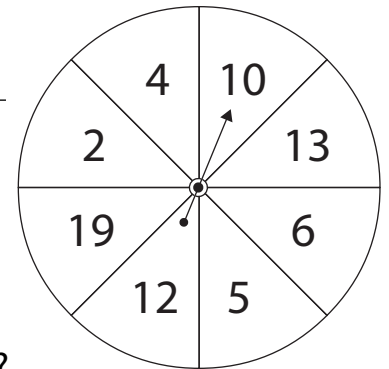
a) List the possible outcomes. _____

b) What is the probability of each outcome?

i) The pointer lands on a prime number? _____

ii) The pointer lands on a composite number? _____

iii) The pointer lands on a number greater than 10? _____



Stretch Your Thinking

Draw and colour marbles in the bag so that the probability of picking a green marble is greater than the probability of picking a red marble, but less than the probability of picking an orange marble.



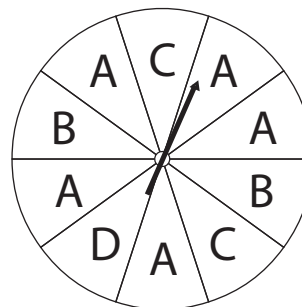
Experimental Probability



Quick Review

- Saul spun the pointer on this spinner 10 times. The theoretical probability of landing on the letter A is $\frac{5}{10}$, or $\frac{1}{2}$. Here are Saul's results.

Letter	A	B	C	D
Number of Times	6	1	2	1



The **experimental probability** is the likelihood that something occurs based on the results of an experiment.

$$\text{Experimental probability} = \frac{\text{Number of times an outcome occurs}}{\text{Number of times the experiment is conducted}}$$

The experimental probability of landing on the letter A is $\frac{6}{10}$, or $\frac{3}{5}$. This is different from the theoretical probability.

- Saul combined the results from 10 experiments.

Letter	A	B	C	D
Number of Times	51	19	8	22

The experimental probability of landing on the letter A is $\frac{51}{100}$. The experimental probability is close to the theoretical probability. The more trials we conduct, the closer the experimental probability may come to the theoretical probability.

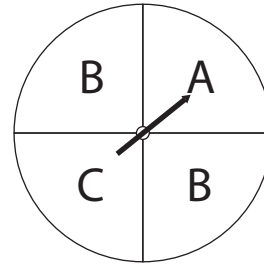
Try These

- Look at the table of Saul's individual results. What is the experimental probability of landing on:
 - i) B? _____ ii) C? _____ iii) D? _____ iv) B or C? _____ v) A or D? _____
- Look at the table of Saul's combined results. What is the experimental probability of landing on:
 - i) B? _____ ii) C? _____ iii) D? _____ iv) B or D? _____

Practice

1. Tatiana spins the pointer on this spinner several times. Here are her results.

A	B	C



- a) How many times did Tatiana spin the pointer? _____
- b) What fraction of the spins were A? _____ B? _____ C? _____
2. A coin is tossed 100 times. Heads showed 43 times and tails showed 57 times.
- a) What are the possible outcomes? _____
- b) What is the experimental probability of the tosses showing:
- i) heads? _____ ii) tails? _____
- c) What is the theoretical probability of the tosses showing:
- i) heads? _____ ii) tails? _____

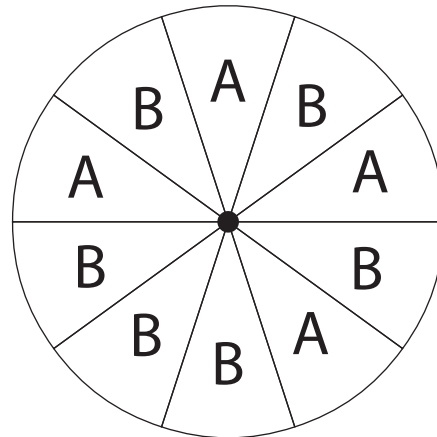
Stretch Your Thinking

- a) What is the theoretical probability of the pointer landing on:

i) A? _____ ii) B? _____

- b) Use an opened paper clip as a pointer. Spin it 100 times. Record the results.

A	B



- c) What is the experimental probability of the pointer landing on:

i) A? _____ ii) B? _____