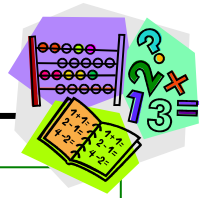


Probability



Probability is the chance of something happening or the expectation, based on past experience, that a prediction will come true.



Predicting is part of the decision-making process. For example, if the sky is blue and the sun is shining, a prediction would be that the weather will be nice for the day.

If a coin is tossed 100 times, what is the probability of tossing heads? Tails?

When 100 or more tosses occur, the probability of heads or tails is likely 50% of the time.



More likely, **equally likely** and **less likely** are terms used when discussing probability.

Example

Francesca is at the Grande Prairie fair. Her favourite game is the bottle ring toss because of the prizes. Winners at this game can win large stuffed dragons, medium stuffed panda bears, small stuffed zebras, CDs or ride coupons. Assuming she wins every time she plays, what is the probability that Francesca will win a stuffed animal?

Solution: If Francesca wins every game, she has a choice of 5 prizes. Three of these prizes are stuffed animals. Therefore, for each game, she has a $\frac{3}{5}$ chance of winning a stuffed animal.

Probability over a period of time or for many occurrences can be estimated.

$$\text{Probability} = \frac{\text{The number of times an event could occur}}{\text{Total number of occurrences}}$$

Examples

A) Consider the marbles below.



The total number of outcomes is 5.

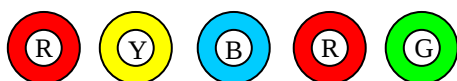
The chance of selecting a red each time is 1. The probability of selecting a red each time is $\frac{1}{5}$.

The chance of selecting a yellow each time is 2. The probability of selecting a yellow each time is $\frac{2}{5}$.

B) The table below illustrates probability including a desired or favourable outcome.

Activity	Possible outcomes	No. of possible outcomes	Desired or favourable outcome	No. of times desired or favourable outcome occurs	Probability
Toss a coin	Heads Tails	2	Heads	1	$1/2$
Pick a letter from the word "mathematics"	M A T H E M A T I C S	11	M	2	$2/11$

C) Five rings are placed in a bag. Two of the rings are red.



It can be predicted that a red ring will be drawn more often than any other colour. For every try, there is a $2/5$ chance of pulling a red ring.

Test the prediction.

1. Pull a ring from the bag.
2. Record the colour of the ring on a recording chart.
3. Return the ring to the bag.
4. Repeat the experiment 30–50 times.
5. Check the accuracy of the prediction.

Tally Chart

Red	Yellow	Green	Blue
11	5	6	8

In the trial represented by the tally chart, red rings were pulled from the bag 11/30 times, which is close to $2/5$.

Would the accuracy of the prediction increase or decrease with 50, 70 or 100 pulls from the bag? Explain your response.

Probability in Real Life



Knowledge of probability can be used to make predictions about things that happen in our daily lives.

Example

Hard work often pays off. Pedro finds this to be true with the part-time job he has. When he works extra hard and is pleasant to all the customers, one of the following happens.

Pedro's boss praises him.	Pedro is given a small bonus on his paycheck.
Pedro gets the best shifts when his boss does the scheduling.	Pedro gets a small raise on his next paycheck.
Nothing	Nothing

The probability of Pedro receiving praise is: $\frac{1}{6}$.
The probability of Pedro receiving a bonus is: $\frac{1}{6}$.
The probability of Pedro receiving better shifts is: $\frac{1}{6}$.
The probability of Pedro receiving a raise is: $\frac{1}{6}$.
The probability of nothing happening is: $\frac{2}{6} = \frac{1}{3}$.
The probability of Pedro receiving a reward is: $\frac{4}{6} = \frac{2}{3}$.



Practice: Probability

1. Obtain a 4-coloured spinner from your teacher.

Predict your results for spinning 1 of the 4 colours for 25–50 or more spins. Spin the spinner 25–50 times. Record the results on a tally chart. Examine the results and compare them to your prediction.

Because there are 4 colours, each colour will likely appear approximately $\frac{1}{4}$ (25%) of the time.

2. Predict the following.

If you have a bag of 9  marbles and select one marble each time, which colour marble are you **most likely** to pull from the bag? Which colour marble are you **least likely** to pull from the bag?

3. Respond to the following and discuss your responses with your teacher or classmates.



1. Name two things in life that you can be **certain** will happen.
2. Name two things in life that you are **uncertain** about.
3. Name two things that will **always** happen if you have your homework done for class.
4. Name two things that will **never** happen if you have your homework done for class.
5. Name two things that you believe are **possible** for you to accomplish sometime in your life.
6. Name two things that would be **impossible** for you to do.

4. Use a career information source such as the library or ALIS Web site and make a list of 10 careers you are interested in. Complete the statements using your career list.

1. I am **more likely** to become a _____ than a _____.
2. It is **equally likely** that I will become a _____ or a _____.
3. I am **less likely** to become a _____ than a _____.

5. When Margaret baby-sits, she has the children choose 1 of a selection of 6 activities: 4 outdoor and 2 indoor. What are the chances of Margaret and the children taking part in an outdoor activity?
6. With a partner, create and conduct a variety of probability activities using manipulatives and/or other strategies.
7. The following marbles are in a bag.



- a. What is the probability that a **green** marble will be pulled from the bag?
Possible Outcomes: _____
Probability: _____
- b. What is the probability that a **yellow** marble will be pulled from the bag?
Possible Outcomes: _____
Probability: _____
- c. What is the probability that a **blue** marble will be pulled from the bag?
Possible Outcomes: _____
Probability: _____
- d. What is the probability that a **purple** marble will be pulled from the bag?
Possible Outcomes: _____
Probability: _____
- e. Write an inference about your predictions.
- f. Examine and discuss factors that would change your predictions.

8. Complete the probability chart.

Activity	Possible outcomes each try	No. of possible outcomes	Desired/ favourable outcome	No. of times desired/ favourable outcome occurs	Probability
Spin a spinner	Yellow Blue Yellow Yellow		Yellow	3	
Pick a number between 1 and 10	1 6 2 7 3 8 4 9 5 10		7		
Pick a certain coloured marble	Blue Purple Red Green Purple		Red		
Pick a letter from the word "probability"			B		
Guess the correct answer on a multiple choice test	A B C D		C		
Select the winner of the 100 metre dash	Esmail Victor Sven Jacob Mohammad Pierre		Sven		