

Discovering Math: Prediction and Probability

Teacher's Guide

Grade Level: K–2

Curriculum Focus: Mathematics

Lesson Duration: Two class periods

Program Description

Discovering Math: Prediction and Probability – From likelihood to frequency to prediction, introduce young students to the basic concepts of probability.

Lesson Plan

Student Objectives

- Explain how some events are more likely to happen than others.
- Describe how some events can be predicted based on given information.

Materials

- *Discovering Math: Prediction and Probability* video
- Likelihood Chart (see below)
- Experiment Worksheet (see below)
- Mystery Object Clue Cards (see below)
- Brown bag for each student
- Colored objects (marbles, centimeter cubes, etc.) 47 red, 44 green, and 29 blue

Procedures

1. Display the word “likelihood”. Ask students what they know about likelihood. Explain that it refers to the chance that something is going to happen.

Display thee words: certain, likely, unlikely. Discuss their meanings; a certain event is one that will definitely happen; a likely event is one that will probably happen; and an unlikely event is one that will probably not happen.

- Give each student a Likelihood Chart. With the whole class, identify events that fall into each category. Remind them of events from the video that can be used as preliminary examples (certain event: the sun rising; likely event: a ball will bounce after it hits the ground; unlikely event: it won't rain on a sunny, cloudless day).
 - Once the students have a firm understanding of the three types of events, have them work in pairs or small groups to identify other events that fit in each category.
 - Ask students to share their examples, and record each one on a class Likelihood Chart.
2. Tell the students they will conduct an experiment to explore certain, likely, and unlikely events. Show them four containers of colored objects (marbles, counting cubes, colored markers, etc.). Container #1 should have 30 red objects. Container #2 should have 15 red and 15 green objects. Container #3 should have 2 red, 14 green, and 14 blue objects. Container #4 should have 15 green and 15 blue objects. Have students predict the likelihood of pulling a red object out of each container. They should record their predictions on the Experiment Worksheet using the words certain, likely, and unlikely to describe the likelihood.
- Ask students to share and explain their predictions. Students should infer that they are certain to pick a red object from Container #1, likely to pick a red object from Container #2, and unlikely to pick a red object from Container #3 and Container #4. Discuss how the given information about the contents of each container helped them predict the likelihood of an event.
 - Have student volunteers pick objects from each container, being sure to replace the object after it has been recorded. Record the picks on the Experiment Worksheet. Make as many picks as time allows.
 - Once the students have finished picking objects, look at the results. Students should see that the more red objects in a container, the greater the likelihood of picking a red object. Have students write about what they learned on the Experiment Worksheet. Ask them how they can use this information when making real-world decisions that will affect the likelihood of an event happening.
3. Prior to class put an object in a brown bag and write five clues about it on the Mystery Object Clue Cards. Ask students to predict the identity of the mystery object without using the clue cards. Discuss the likelihood of a correct prediction. Since they have no information about the object, students should understand that it is unlikely they will correctly identify it.

Tell students that each of the five clue cards for the mystery object has information about its identity. Ask how the likelihood of identifying the object will change as they receive more information. Students should infer that their predictions will become more accurate as they receive more information.

Read the clue cards one at a time, stopping after each clue to elicit predictions about the object's identity. When the students have figured out the object's identity, emphasize the importance of information in making accurate predictions. Refer to the video's examples of doctors predicting a patient's health and meteorologists predicting weather based on known information.

As an extension activity, have students work in pairs to create their own mystery bags. They can choose an object and write five clues about its identity. They should take turns giving clues about the object until their partners have enough information to make an accurate prediction.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students produced complete charts and mystery clues, including all the requested information; clearly demonstrated an understanding that some events are more likely to happen than others; and clearly demonstrated an understanding that accurate predictions are dependent on the amount of known information.
- **2 points:** Students produced adequate charts and mystery clues, including most of the requested information; satisfactorily demonstrated an understanding that some events are more likely to happen than others; satisfactorily demonstrated an understanding that accurate predictions are dependent on the amount of known information.
- **1 point:** Students created incomplete charts and mystery clues with little or none of the requested information; were not able to demonstrate an understanding that some events are more likely to happen than others; and did not clearly demonstrate an understanding that accurate predictions are dependent on the amount of known information.

Vocabulary

likelihood

Definition: The chance that an event will happen; certain, likely, or unlikely

Context: The students predicted the likelihood of rain on Saturday was unlikely because the meteorologist forecasted a sunny day with no clouds.

prediction

Definition: A statement that tells what might happen in the future based upon given information

Context: Students made predictions about a mystery object's identity based on the information from the teacher.

Academic Standards

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following benchmarks:

- Mathematics: Understands and applies basic and advanced concepts of probability.

National Council of Teachers of Mathematics (NCTM)

The National Council of Teachers of Mathematics (NCTM) has developed national standards to provide guidelines for teaching mathematics. To view the standards online, go to <http://standards.nctm.org>.

This lesson plan addresses the following standards:

- Understand and apply basic concepts of probability.
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How to Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index – Here the video is divided into chapters indicated by title. Each chapter is then divided into four sections indicated by video thumbnail icons; brief descriptions are noted for each section. To play a particular segment, press Enter on the remote for TV playback; on a computer,



click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Quiz – Each chapter has four interactive quiz questions correlated to each of the chapter's four sections.

Standards Link – Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources – This screen gives the technical support number and Web site address.

Video Index

I. Likelihood (6 min.)

Likelihood: Introduction

We often consider the likelihood of events. Some events are likely, some are not, and the likelihood of others varies. Examples show jumping rope, throwing a ball, and weather.

Example 1: Likely Events

Many events are likely, and some are so likely we call them certain. These include the sun rising and setting, and healthy whales surfacing to breathe every few minutes.

Example 2: Likely and Unlikely Events

The likelihood of an event often depends on the conditions under which it takes place. An example shows how the relative numbers of toys in a box affect the likelihood of choosing each kind randomly.

Example 3: Degrees of Likelihood

A deck of 20 colored and numbered cards shows how the likelihood of picking a particular card depends on the number of that kind compared to the number of other kinds.

II. Prediction: What Do You Know? (6 min.)

Prediction: Introduction

Information helps us make more accurate predictions. A mystery box illustrates how what we know affects predicting what we would find in the box.

Example 1: Predictable Events

Many events in nature are predictable because we know what affects them. The sun rising and setting and ocean waves are examples of predictable events.

Example 2: Predicting Health and Illness

Information about a person can help a doctor predict health or illness. Some problems develop without prediction because some information may not be available. Information can sometimes prevent health problems.

Example 3: Information Helps Us Predict

The more information meteorologists have about what affects the weather, the better they can predict it. But uncertainty always exists because some information is unavailable.

Quiz

I. Likelihood

1. What is NOT likely to happen when you throw a baseball into the air?
 - A. The ball is caught
 - B. The ball falls to the ground
 - C. The ball bounces on the ground
 - D. The ball stays in place above your head

Answer: D

2. What type of event is sure to happen?
 - A. unusual event
 - B. certain event
 - C. strange event
 - D. unlikely event

Answer: B

3. Inside your bag are ten green balls and two red balls. What color ball are you most likely to pull out of the bag?
 - A. a red ball
 - B. a green ball
 - C. a yellow ball
 - D. a purple ball

Answer: B

4. Your deck of cards has ten green cards, two yellow cards, ten blue cards, and eight red cards. Which two colors are you equally likely to choose?
 - A. red and green
 - B. green and blue
 - C. yellow and red
 - D. yellow and blue

Answer: B

II. Prediction: What Do You Know?

1. You have a mystery box. What do you need to make a good prediction about what is inside the box?
 - A. the length of the box
 - B. a picture of the box
 - C. the height of the box
 - D. information about what is inside the box

Answer: D

2. We know that heavy winds cause waves. What could you predict on a windy day?
 - A. waves will be larger
 - B. waves will be smaller
 - C. it will be sunny
 - D. people will not be surfing

Answer: A

3. Sally stays away from sick people, eats healthful foods, and exercises every day. What could you predict about Sally?
 - A. she is a healthy person
 - B. she gets sick all the time
 - C. she always has a runny nose
 - D. she eats a lot of junk food

Answer: A

4. What does a meteorologist predict?
 - A. health
 - B. weather
 - C. who will win a baseball game
 - D. who will win an election

Answer: B

Likelihood Chart

Certain Events	Likely Events	Unlikely Events

Experiment Worksheet

Prediction

What is the *likelihood* of pulling a red object out of each of the four containers?

	Likelihood
Container #1	
Container #2	
Container #3	
Container #4	

Record the results as students pick objects out of each container.

	Container #1	Container #2	Container #3	Container #4
Red				
Green				
Blue				

What did you learn about the *likelihood* of picking a red object out of each of the four containers?

Mystery Object Clue Cards

Clue #1

Clue #2

Clue #3

Clue #4

Clue #5