



PowerHour

:making minutes count



BOYS & GIRLS CLUBS
OF AMERICA

ROSS®

RECHARGED FOR THE 21ST CENTURY



Activity Book:
Middle School

POWER HOUR

RECHARGED FOR THE 21ST CENTURY

LESSON GUIDE: MIDDLE SCHOOL

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Table of Contents

Introduction

- 5 Program Overview
- 6 The Power Hour Lesson Guide
- 7 Facilitating the Lessons
- 9 General Tutoring Guidelines
- [11](#) Common Core State Standards

Middle School: Reading Lessons

- 16 Text Evidence
- 21 Finding the Central Idea
- 28 Identifying Key Points, Events or Ideas
- 35 Sequencing Events or Steps
- 40 Word Meaning: Using Context Clues to Understand New Words
- 44 Using Concept Mapping to Enhance Understanding
- 50 Summarizing a Nonfiction Passage
- 57 Identifying an Author's Purpose
- 63 Previewing a Nonfiction Text
- 66 Evaluating an Author's Argument
- 71 Comparing and Contrasting Two Passages
- 77 Using Visual Imagery

Middle School: Math Lessons

- 82 Basic Expressions
- 85 Probability, Modeling, Graphing
- 88 Shapes and Solids
- 91 Ratios and Proportional Relationships
- 95 Statistics and Probability
- 98 Number System
- 101 Expressions and Equations
- 106 Modeling and Graphing
- 111 Geometry, Ratio and Proportion
- 115 Integers, Modeling and Graphing
- 119 Modeling and Graphing
- 122 Data Collection and Graphing

INTRODUCTION

Program Overview

Power Hour: Recharged for the 21st Century: Secondary Edition is designed to develop the abilities young people need most in order to be college- and career-ready in the 21st century – including skills such as collaboration, knowledge construction, accessing and analyzing information, critical thinking and problem-solving, effective written and verbal communication.

The recharged Power Hour program enables Club members to develop many of these skills through intensive homework assistance that matches the rigor of today’s homework trends. Most importantly, the new version of Power Hour embraces technology not as a tool to be used occasionally for completing homework, but as the centerpiece of engaging activities youth complete in each after-school session. Members use technology to enhance their learning and work collaboratively with their peers and Club staff to develop academically.

Power Hour also includes an extensive focus on the reading and mathematics skills that students need for success after high school, and this Lesson Guide directly addresses that need.

Based on the Common Core State Standards – a set of clear, consistent guidelines for what every student should know and be able to do in math and language arts from kindergarten through grade 12 – the lessons included here provide review, practice and reinforcement for youth in essential reading and math skills.

Through their participation in the Power Hour program, Club youth will be more prepared than ever to enter the workforce and higher-education institutions with the skills needed to compete globally and to experience success in their academic and vocational pursuits.

SECTION 1

The Power Hour Lesson Guide

The purpose of this Power Hour Lesson Guide is to give Club staff, volunteers, peer mentors and other tutors easy-to-use lessons for reinforcing essential reading and math skills in Club youth.

- ✔ Lessons can be completed in 25 to 30 minutes.
- ✔ Tutors can work with youth individually or in small groups
Each lesson can be completed with a minimum of preparation.
- ✔ Tutors do not need prior knowledge of the subject in order to facilitate a lesson.
- ✔ Individual lessons are designed for youth in grades 6-8 or in grades 9-12 and can be used with members in any of those grade levels.
- ✔ The content of a lesson may present new learning for members at the lower end of the grade spectrum, or it may offer practice and reinforcement for youth in higher grades.
- ✔ Lessons often feature an engaging game to provide skill practice or reinforcement.

SECTION 2

Facilitating the Lessons

The following are some simple guidelines for using the lessons effectively with youth.

1. Become familiar with the lesson format. Each lesson is structured for ease of use, featuring three simple steps:



Learn It! – a brief review of a specific topic youth are learning about in school



Try It! – a guided practice to give youth a chance to check their understanding



Apply It! – an independent practice in which youth apply the skill on their own

2. Select an appropriate lesson. The lessons do not have to be completed in any particular order, but because topics and skills are sequenced from basic to more advanced skills, an order is recommended. There are several options for selecting a lesson:

✔ Match the lesson to the topic or skill members

are working on currently in school.

- ✔ Talk to members about areas where they are having trouble or need help, and select a lesson that most closely fits their needs.
- ✔ Select an earlier lesson that focuses on basic skills, if you have a mixed group or are unsure about the skill level of members. Choose a lesson at a level where members can work with some success and then move gradually to the next level of difficulty.

3. Prepare for the lesson. Once you've selected a lesson, follow these steps to get started:

- ✔ Download the lesson materials.
- ✔ Complete the basic preparations (such as making copies or gathering materials).
- ✔ Read through the lesson quickly to become familiar with the content and process.

SECTION 2

Facilitating the Lessons, cont.

4. Lead the lesson. In leading the lesson, keep in mind the following:

- ✔ Keep the lesson simple, focusing on the one or two skills being reviewed.
- ✔ Allow members to complete the independent practice or game on their own.
- ✔ Encourage more advanced members to help younger peers or those who need help.

5. Check for understanding. At the end of each lesson:

- ✔ Check to make sure members understand the concepts and are able to do the skills.
- ✔ Walk them through the lesson again if they need additional reinforcement.
- ✔ Encourage them to access one of the websites listed (“Additional Resources”) so they can practice on their own through a fun game.
- ✔ Take note of where members succeed or need more practice so you can select future lessons to give them more practice or challenge.

SECTION 3

General Tutoring Guidelines

The Resource Guide for Power Hour: Recharged for the 21st Century (Secondary Edition) includes detailed guidelines for using volunteers in the program – including what to look for in volunteers, where to find volunteers, strategies for engaging volunteers, interview and assessment techniques and peer-to-peer tutoring (see “Power Hour Staff and Volunteers”).

The following general guidelines are designed to help you in preparing potential tutors to work with Club members in reading and mathematics. You may want to use these guidelines in a formal training session with tutors or have an informal conversation with them. In the “Additional Resources” section of this guide, you’ll find specific strategies to give tutors working with members: “Tips for Reading Tutors” and “Tips for Mathematics Tutors.”

Know yourself: the role of the tutor is to provide experience, guidance and encouragement, but you’re not expected to have all the answers.

✔ Have a clear idea of your own strengths and limitations and what skills or knowledge you can offer as a tutor.

✔ Don’t be afraid to show that you don’t know something. You can refer members to other sources, including their teacher. You also can model how to solve a problem – showing that you are in a learning process as well.

Know your members: by getting to know individual members, you can discover their strengths and challenges in learning.

✔ Listen closely to members so you can help them work out the real problem. Read the signals (when they are comfortable, uncomfortable, enjoying themselves) to see how engaged they are and to see if they really understand something.

✔ Take short breaks when needed. If members seem bored, it may mean they’re having a hard time and would rather do something else.

SECTION 3

General Tutoring Guidelines, cont.

Build trust and safety: if members feel safe not to succeed at first, they'll see that learning is a process that often involves unsuccessful tries.

- ✔ Be aware that all learners are different. Do not try to change the member's style; since you are the more experienced person, it is your job to adjust or adapt.
- ✔ Do not tease or make jokes at the member's expense. Your job is to support and encourage the member to do his or her best.
- ✔ Be a good listener and a positive role model.
- ✔ Give positive feedback but don't exaggerate their accomplishments. If they are incorrect, say so supportively ("No, that's not right, but it's a good guess").
- ✔ Celebrate members' achievements.

Teach members how to learn: by building confidence and competence, you help members strengthen the ability to learn on their own.

- ✔ Make things easy for members to understand. Give different examples or think of alternative

ways to explain something.

- ✔ Use reflective questions that will help them think through the problem and be self-directed (such as "How do you think we can find an answer to this?"). Partner with them to assist them in finding the answers themselves.
- ✔ Build on what members know ("What are some things you already know about this?"). Help them find a connection between new learning and something they know. If they need to repeat a lesson, do it as often as necessary – but use less support with each repetition. This provides scaffolding for members to move to the next level.
- ✔ Do not do the work for them; this does not teach or help them.

SECTION 4

Lessons Correlated to Common Core State Standards

In 2010, states across the country adopted a set of high-quality academic standards in mathematics and English language arts/literacy designed to outline skills young people should be able to master by the end of each grade. The lessons in this guide have been specifically designed to meet the more rigorous academic needs of students in Clubs across the country, and the following chart details which standard each lesson is designed to address.

Reading Standards for Informational Text (6-8): Key Ideas and Details			
CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RI.6.1 RI.7.1 RI.8.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	Lesson 1 – Details that Support an Author’s Argument	interpreting a text; citing text evidence to support an interpretation
RI.6.2 RI.7.2 RI.8.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.	Lesson 2 – Finding the Central Idea	identifying the central idea of a text
		Lesson 4 – Identifying Key Points, Events or Ideas	identifying the central idea of a text; making connections across a text; identifying key points
		Lesson 9 – Previewing a Nonfiction Text	previewing a text; determining the main idea
RI.6.3 RI.7.3 RI.8.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated and elaborated in a text (through examples or anecdotes).	Lesson 3 – Identifying Key Points, Events or Ideas	identifying the central idea of a text; making connections across a text; identifying key points
		Lesson 4 – Sequencing Events or Steps	putting events and steps in a logical order; identifying key points; reading for meaning

Reading Standards for Informational Text (6-8): Craft & Structure

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RI.6.4 RI.7.4 RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative and technical meanings.	Lesson 5 – Using Context Clues to Understand New Words	learning the meaning of new words from context
RI.6.5 RI.7.5 RI.8.5	Analyze how a sentence, paragraph, chapter or section fits into overall structure of a text and contributes to development of the ideas.	Lesson 6 – Using Concept Mapping to Enhance Understanding	connecting main idea and other information; seeing overall organization of a text
		Lesson 7 – Summarizing a Nonfiction Passage	identifying key details; relating details to main idea; summarizing
		Lesson 9 – Previewing a Nonfiction Text	previewing a text; determining the main idea
RI.6.6 RI.7.6 RI.8.6	Determine an author’s point of view or purpose in a text and explain how it is conveyed.	Lesson 8 – Identifying an Author’s Purpose	determining author’s purpose; identify words or phrases that indicate purpose

Reading Standards for Informational Text (6-8): Integration of Knowledge and Ideas

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.	Lesson 9 – Previewing a Nonfiction Text	previewing a text; determining the main idea recognizing an author’s argument; identifying an author’s supporting evidence
RI.6.8 RI.7.8 RI.8.5	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.	Lesson 10 – Evaluating an Author’s Argument	connecting main idea and other information; seeing overall organization of a text
		Lesson 11 – Comparing and Contrasting Two Passages	identifying important details; finding similarities and differences in two texts

Reading Standards for Literacy in History and Social Studies (6-8): Key Ideas and Details

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RH.6-8.3	Identify key steps in a text's description of a process related to history/social studies (how a bill becomes law, how interest rates are raised, etc.).	Lesson 4 – Sequencing Events or Steps	putting events and steps in a logical order; identifying key points; reading for meaning

Reading Standards for Literacy in History and Social Studies (6-8): Craft & Structure

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RH.6-8.4	Determine meaning of words and phrases as used in a text, including vocabulary specific to domains related to history/social studies.	Lesson 5 – Using Context Clues to Understand New Words	learning the meaning of new words from context
RH.6-8.5	Describe how a text presents information (sequentially, comparatively, and causally).	Lesson 6 – Using Concept Mapping to Enhance Understanding	connecting main idea and other information; seeing overall organization of a text
		Lesson 7 – Summarizing a Nonfiction Passage	identifying key details; relating details to main idea; summarizing

Reading Standards for Literacy in History and Social Studies(6-8): Integration of Knowledge and Ideas

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RH.6-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.	Lesson 12 – Using Visual Imagery	using visualization to increase comprehension and recall
RH.6-8.8	Distinguish among fact, opinion and reasoned judgment in a text.	Lesson 10 – Evaluating an Author's Argument	recognizing an author's argument; identifying an author's supporting evidence
RH.6-8.9	Analyze relationship between a primary and secondary source on same topic.	Lesson 11 – Comparing and Contrasting Two Passages	identifying important details; finding similarities/differences in texts
		Lesson 12 – Using Visual Imagery	using visualization to increase comprehension and recall

Reading Standards for Literacy in History and Social Studies (6-8): Range of Reading and Level of Text Complexity

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RH.6-8.10	By end of grade 8, read and comprehend history/social studies texts in the grades 6-8 text complexity band independently and proficiently.	Lesson 12 – Using Visual Imagery	using visualization to increase comprehension and recall

Reading Standards for Literacy in Science and Technical Subjects (6-8): Key Ideas and Details

CCS #	Common Core Standard	Power Hour Lesson	Lesson Content
RST.6-8.1	Cite specific textual evidence to support analysis of science/technical texts.	Lesson 1 – Details that Support an Author’s Argument	interpreting a text; citing text evidence to support an interpretation

MIDDLE SCHOOL

READING LESSONS

Text Evidence: Details that Support an Author's Argument

TIME: 25 minutes

OBJECTIVE: In order to answer questions about a text, summarize it, or draw inferences from it, readers need to be able to cite evidence to back up their interpretations. This involves more than randomly selecting sentences; readers must select and interpret the most relevant information to back up their understanding of what they've read. In this lesson, members define evidence, learn why textual evidence is important, and then practice answering questions about a text and citing evidence to support their answers.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- History, social studies or science book or article appropriate to members' grade level (from an online source, Club library, or members' current reading assignments)

VOCABULARY

Text evidence – details or facts in the text that support the author's argument

Argument – the main statement of a text or the point the author is trying to argue

Summary – the main idea and important details of a passage in a concise form

Interpretation – the way a reader understands or explains the meaning of a passage

PREPARATION

Select a brief passage from the book or article for members to use for practice during the lesson. Make a copy of "Ice Harvest" (one per member).

ADDITIONAL RESOURCE(S)

[Inferences Worksheets](#), [Use Text Evidence](#), [Use Text Evidence \(Social Studies/History\)](#), [Use Text Evidence \(Science\)](#)



LEARN IT

3 minutes

1. **ASK:** Who knows what evidence is?
How can we define evidence?
Answer: **facts, statements or physical signs that prove something happened**
2. **ASK:** What are some examples of evidence?
Answer: **fingerprints, a weapon used in a crime, DNA or a confession**
3. **SAY:** Evidence can be defined as facts, statements or physical signs that prove something or support a conclusion.
4. **ASK:** What do you think text evidence is?
Answer: **details or facts in a text that support the author's argument**
5. **SAY:** We're going to practice a simple strategy for identifying important details in a reading text – to learn how to cite text evidence that supports what the author is saying.
6. **WRITE** the following steps on the white board:
 - Read the text.
 - Review questions about the text.
 - Read the text again and think about the questions.
 - Offer possible answers.
 - Pinpoint evidence from the text to support the answers.



TRY IT

10 minutes

1. **DO:** Distribute copies of “Ice Harvest” and instruct members to read the passage.
2. **SAY:** You're going to work in pairs on a scavenger hunt to find the answers to some questions about the text you've just read.
3. **ASK** members to form pairs.
4. **DO:** Give each pair a copy of “Prove It! Scavenger Hunt.”
5. **SAY:** Follow the steps we reviewed earlier to identify text evidence to support the author's argument.



APPLY IT

12 minutes

1. **CALL** attention to the reading passage you selected in advance.
2. **GIVE** members five minutes to read the passage.
3. **ASK:** What is this passage about? What do you think the author is trying to say? What textual evidence can you find to support your interpretation?
4. **DO:** Tell members to take a minute or so to write a brief summary of the text – in no more than two sentences – and to include one or two pieces of evidence to support their summary/interpretation.
5. **CHECK FOR UNDERSTANDING:** If members have trouble citing evidence in a text, guide them through the lesson again or help them access the additional resources listed.

Ice Harvest

Edward I. Maxwell

Before refrigerators were invented to keep our food fresh, people needed to find more creative ways.

Some people would construct their houses with basements, so food could be kept cool there. Others built sheds that were used to store dried and preserved foods all year round. But there were certain items that needed to be kept cold—not cool or dry, but cold. For this reason people would harvest ice.

During the wintertime in places like Pennsylvania, freshwater lakes and streams would freeze. A one-foot thick sheet of ice would form on top of the water. Then the ice-cutters would ride their horse-drawn sleds to the lakes and streams.

Using different hand tools, including saws, picks and hooks, the harvesters would cut long sheets of ice. Using their horses, they would drag the ice onto the river or lake banks, and begin to cut the sheet into blocks. It was long and patient work. Once all the blocks had been cut, the ice harvesters would pack up their sleds and ride back to town. There, they would store the large blocks in an ice house. The ice house was usually a large, insulated building that would allow ice to be stored year-round without it melting.

Ice deliverymen, known as icemen, would make their rounds, bringing the ice to homes, stores and restaurants. Individual homes might have an icebox to store food. This icebox could be made out of wood, and would have a place to put the block of ice to keep food cold. Underneath the icebox would be a pan or pot for collecting any water that would drip down as the ice melted.

A very interesting practice for storing food with lake and river ice involved digging a very large hole. Buffalo hunters, after killing a buffalo during the winter months, would dig the hole and line it with blocks of ice. Once the hole was well lined, the meat would be lowered into it and covered up. Over the winter these cuts of meat would freeze solid and stay preserved well into the summer. During the height of the summer, the hunters would go back to these meat lockers and unearth some tender and well-preserved buffalo meat.

In the early 1900s there were many large businesses built around the harvesting, storage, and distribution of ice. There was a lot of money to be made by ice businessmen as cities grew larger and more people needed to keep food fresh in a single city block. But once the refrigerator was invented and became easier for more people to buy, there was little need for ice harvesting. Now in the United States large chunks of ice are only harvested rarely to make sculptures and other large artistic structures.

Source: ReadWords.org, <http://www.readworks.org/passages/ice-harvest>, 2013.

Supporting the Author's Arguments

Question	Response	Text Evidence
1. Why did ice used to be harvested?		
2. What is the sequence of events in an ice harvest?		
3. What did people eventually start to use instead of blocks of ice?		
4. How is ice harvesting described?		
5. What is the passage mostly about?		
6. What is an icebox?		

Finding the Central Idea

TIME: 25 minutes

OBJECTIVE: An important task of reading, particularly informational texts in subjects such as history, social studies or science, is to find the central idea. The central idea is not the same as the topic or theme. The topic is the subject, what the text is about, and this can be expressed in one word – such as birds. A theme is an idea that’s repeated through a text or collection of texts, and it might be something like “how birds communicate with each other.” The central idea is what the text (or paragraph or story) is mostly about. This can be expressed in a sentence or two and could be something like, “Although not all birds use voice as their main method of communication, many birds communicate through sounds such as calls, squeaks, warbles, trills, clicks, whistles, howls or honks.”

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Scissors
- History, social studies or science book or article appropriate to members’ grade level (from an online source, Club library, or members’ current reading assignments)

VOCABULARY

- **Topic** – the subject of a passage, what the text is about
- **Theme** – an idea that’s repeated through a text; the message that is the focus of the text
- **Central idea** – what a piece of writing is mostly about
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Select a brief passage from the book or article for members to use for practice during the lesson. Make copies of “What’s It All About? Reading Text #1,” “What’s It All About? Reading Text #2,” “What’s It All About? Reading Text #3” and “Central Idea Text Message” (one per member or pair).

ADDITIONAL RESOURCE(S)

[Quia Finding the Main Idea Quiz](#), [Determine Central Idea and Supporting Details](#), [Determine Central Idea \(Social Studies/History\)](#), [Determine Central Ideas or Conclusions \(Science\)](#)



LEARN IT

3 minutes

1. **SAY:** When you're reading a text, especially informational texts related to history, social studies or science, it's important to identify the central idea.
2. **SAY:** Knowing the central idea helps you remember important information about what you've read and gives you a context for understanding the individual details.
3. **SAY:** Here's one way to think about it. If you've read a great book or seen a good movie and you want to tell a friend about it, you are basically giving them the central idea when you tell them about it in a couple of sentences.
4. **SAY:** We're going to practice finding the central idea by following some simple steps.
5. **DO:** Write the following steps on the white board:
 - Read the text
 - Identify the "who" or "what" the text is about
 - Look for clue words that are used repeatedly
 - Find the most important thing about the "who" or "what" (this is the central idea)
 - Check it out – is this what the text is mostly about?
6. **SAY:** Remember that the central idea is the most important part of the text, and it helps readers understand what it is about. It may be stated in the first or last sentence, it may be a general statement that connects all of the details or it might not even be stated in the passage – which means you have to put together hints from the text to find it.



TRY IT

10 minutes

1. **DO:** Ask members to form pairs.
2. **DO:** Distribute a copy of “What’s It All About? Reading Text #1,” “What’s It All About? Reading Text #2,” “What’s It All About? Reading Text #3” to each pair. Also give each a copy of “Central Idea Text Message.”
3. **SAY:** You’re going to work in pairs to find the theme or central idea of the text you have. First, read the passage to yourself, and then talk to your partner about what it says. Then, try out a few sentences that you think summarize the central idea. Finally, decide on the best summary sentence and write it as a text message on “Central Idea Text Message.”
4. **DO:** Give members 10 minutes to write their text messages.
5. **ASK** pairs to exchange their text messages with others.



APPLY IT

12 minutes

1. **DO:** Call attention to the reading passage you selected in advance.
2. **DO:** Give members five minutes to read the passage.
3. **ASK:** What is this passage about? What is the central idea the author is trying to convey?
4. **DO:** Tell members to take a minute or so to write a brief summary of the text – in no more than two sentences – and to clearly explain the central idea.
5. **CHECK FOR UNDERSTANDING:** If members have trouble summarizing or finding the central theme of a text, guide them through the lesson again or help them access the additional resources listed.

What's It All About?

Reading Text #1

A penny for your thoughts? If it's a 1943 copper penny, it could be worth as much as \$50,000. In 1943, most pennies were made out of steel, since copper was needed for World War II, so the 1943 copper penny is ultra-rare. Another rarity is the 1955 double-die penny. These pennies were mistakenly double stamped, so they have overlapping dates and letters. If it's uncirculated, it would easily fetch \$25,000 at an auction. Now that's a pretty penny.

Summarize this paragraph in one sentence. **Be specific and clearly explain the main idea.**

Source: *EReadingWorksheets.com*, <http://www.ereadingworksheets.com/free-reading-worksheets/reading-comprehension-worksheets/main-idea-worksheets/>.

What's It All About?

Reading Text #2

There are many types of lethal venom in the animal kingdom, but perhaps no stranger carrier than the platypus. The platypus is one of few venomous mammals. Males carry a venom cocktail in their ankle spurs that incapacitates victims with excruciating pain. Stranger still, the platypus is the only mammal that uses electroreception. What this means is that the platypus uses its bill to sense the electricity produced by the muscular movements of its prey. The platypus neither sees, hears, nor smells its prey while hunting but, rather, pursues it through electroreception. Perhaps most odd, the platypus is the only mammal that lays eggs rather than giving birth to live young. The platypus is an odd creature indeed.

Summarize this paragraph in one sentence. **Be specific and clearly explain the main idea.**

Source: EReadingWorksheets.com, <http://www.ereadingworksheets.com/free-reading-worksheets/reading-comprehension-worksheets/main-idea-worksheets/>.

What's It All About?

Reading Text #3

Yellowstone National Park is mainly located in Wyoming, although three percent is located in the state of Montana. The Continental Divide of North America runs diagonally through the southwestern part of the park. The park sits on the Yellowstone Plateau, which is an average elevation of 8,000 feet above sea level. This plateau is bounded on nearly all sides by mountain ranges. There are 290 waterfalls in the park that are at least 15 feet high, the highest being the Lower Falls of the Yellowstone River, which falls 308 feet. .

Summarize this paragraph in one sentence. **Be specific and clearly explain the main idea.**

Source: EReadingWorksheets.com, <http://www.ereadingworksheets.com/free-reading-worksheets/reading-comprehension-worksheets/main-idea-worksheets/>.

Central Idea Text Message



Identifying Key Points, Events or Ideas

TIME: 25 minutes

OBJECTIVE: In order to understand an informational passage, readers need to analyze in detail how a key event or idea is introduced, illustrated and elaborated in the text. In this lesson, members use a process called text mapping, in which they are able to see the passage as a whole and make connections between the individual parts. By taping the pages of a passage together in a long “scroll,” members are able to see both the text in its entirety rather than flipping through multiple pages. Having the entire text visible at one time helps them make connections across a text that they normally would not be able to make; they are able to see the text as a whole instead of focusing on individual parts.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Masking tape
- Markers in five different colors (one set for each member or pair)
- History, social studies or science book or article appropriate to members’ grade level (from an online source, Club library, or members’ current reading assignments)

VOCABULARY

- **Main idea**– what a piece of writing is mostly about (same as the central idea)
- **Purpose** – the reason an author decides to write about a specific topic (usually to persuade, to inform or to entertain)

PREPARATION

Select a brief passage from the book or article for members to use for practice during the lesson. Make copies of “Is the Earth Getting Warmer?” (one per member or pair).

ADDITIONAL RESOURCE(S)

[Make-Your-Own-Comics](#), [Analyze Development of Text Elements](#), [Text Structure](#), [Analyze Text Structures](#)



LEARN IT

3 minutes

1. **SAY:** We're going to practice a simple strategy for reading an informational text closely.
2. **DO:** Write the following steps on the white board:
 - Identify important **vocabulary** words
 - Find the **question** the author is trying to answer
 - Identify the **main idea**
 - Find the author's **purpose**
 - Note three or four important **facts**
3. **SAY:** These are the steps you'll complete as you read through the text. Following these steps will help you identify the main idea, find the author's purpose and identify key points. The process also will help you understand and remember more of what you read.
4. **SAY:** You're going to work in pairs to complete these steps as you read a text. The process you'll use is called "text mapping."



TRY IT

15 minutes

1. **DO:** Distribute copies of "Is the Earth Getting Warmer?" to each member or pair. Give each member of the pair also five different colored markers.
2. **SAY:** To do the text mapping, first you make a "scroll." Scrolls are an ancient technology, but they offer an advantage over books. When you open a book, you can only see two pages at a time, but when you roll out a scroll, you see the entire length all at once.
3. **SAY:** Lay out the five pages of the passage – in order – on the floor. Tape them together to make a long "scroll." Then tape them on the wall.
4. **SAY:** Use the colored markers to highlight – or "map" – different parts of the passage. Work together, divide the work, help each other and ask each other questions.
5. **SAY:** You have 15 minutes to "map" the scroll, which means you'll look for and highlight in five different colors the five elements we just identified:
 - vocabulary words
 - question the author is trying to answer
 - the main idea
 - the author's purpose
 - important facts
6. **DO:** Give members 15 minutes to read and "map" the passage.



APPLY IT

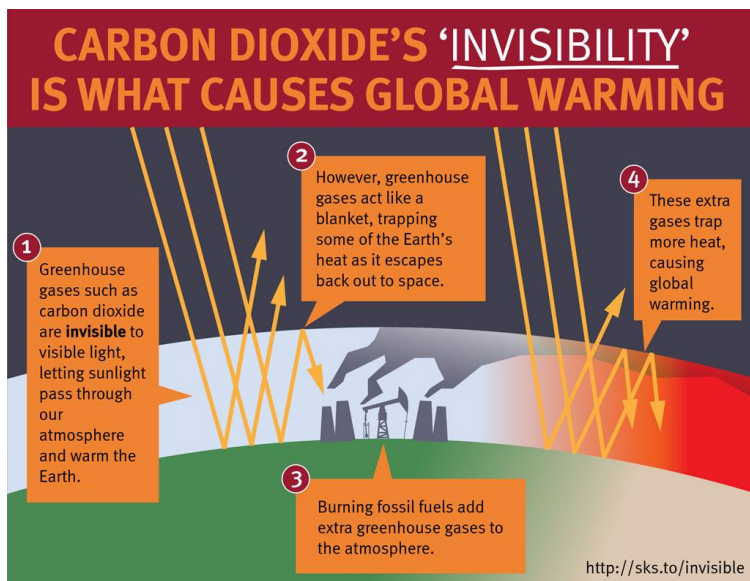
7 minutes

1. **DO:** Review the five categories members have highlighted.
2. **DO:** Tell members to take a few minutes to write a brief summary of the text – in no more than three sentences – and to include the author’s main idea, purpose and a few facts.
3. **DO:** Check for understanding. If members have trouble summarizing what they have read, guide them through the lesson again or help them access the additional resources listed.

Is the Earth Getting Warmer?

In 1975, a scientist named Wallace “Wally” Broecker wrote a paper in which he asked a simple question: was the Earth getting warmer? When the paper was published, some of Broecker’s colleagues laughed at him. Many of them believed that the world was actually cooling. Historically, there have been periods in which the Earth’s temperature has slowly risen and cooled over thousands of years. This is a natural process that can be caused by many factors, including changes in radiation from the Sun, changes in the Earth’s orbit, and volcanic activity.

However, climate change can also be caused by changes in the amount of certain gases in the atmosphere. Broecker had noticed that the amount of carbon dioxide – a colorless, odorless gas – was slowly building up. While some carbon dioxide is produced through natural processes, large quantities of it are also produced by humans. Carbon dioxide is generated in especially large amounts when we burn fossil fuels, such as oil, coal, and natural gas. This burning happens when we drive cars, use electricity, and make certain products. When released into the atmosphere, carbon dioxide traps heat. Broecker reasoned that if people produced a lot of carbon dioxide, then enough heat would be trapped that the Earth would begin to warm. He called this “global warming.”



Several decades later, many climate scientists agree with Broecker: the Earth is heating up and humans are largely responsible. This warming process is often referred to as “climate change.” More carbon dioxide is being produced than ever before. Every year, humans produce about 8 billion metric tons of carbon. 2012 was the hottest year in recorded history. Recently, scientists estimated that more carbon dioxide exists in the atmosphere than has in more than three million years.

While scientists understand how climate change works, some of its effects are still

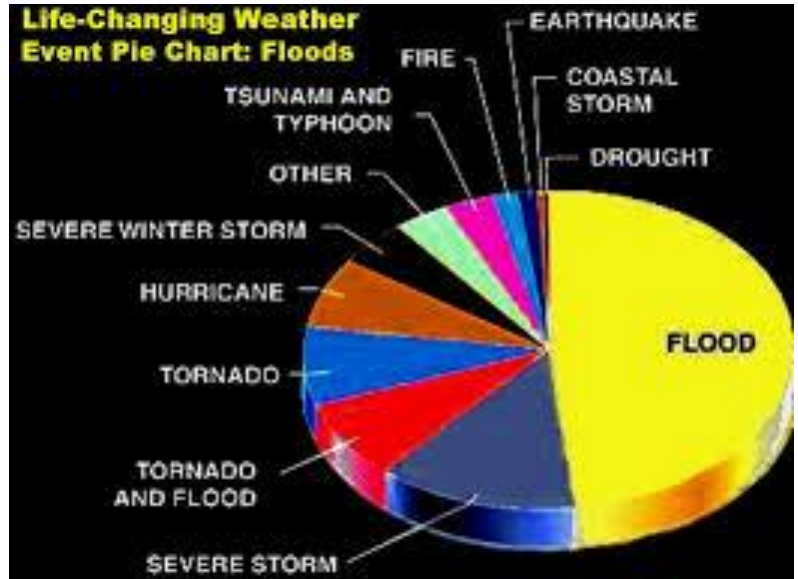
difficult to predict. Some scientists expect an increase in “extreme weather” events such as hurricanes and floods. Others foresee a rise in levels of sea water. While exactly what changes will happen are unclear, Broecker has warned that people should be prepared for some large disturbances. In an interview with the Guardian, a British newspaper, in 2008, he compared the earth’s climate to a wild animal. Sometimes, when provoked, the animal will react violently and unpredictably. “If you’re living with an angry beast, you shouldn’t poke it with a sharp stick,” he said.

Why are scientists able to understand some phenomena, like climate change, in a general way, but aren't able to predict the changes they will have on the Earth? Part of the reason is that many large Earth systems involve "feedback loops" – processes that help amplify (positive feedback loops) or diminish (negative feedback loops) certain changes. Feedback loops can occur in the climate system, too. If the temperature of the Earth rises, it can change the environment so that it produces even more heat. There are a number of different ways in which this phenomenon occurs.

Scientists who work in the Arctic, at the northern end of the Earth, have been reporting that, every year, more and more floating sea ice melts. In the last 30 years, more than one-third of the ice that appears in the Arctic during the summer has melted away.

This worries scientists because Arctic ice plays an important role in cooling the Earth – although not in the way you might think. While we add ice to our drinks to make them colder, Arctic sea ice cools the Earth in a different way. Ice, which is white colored, reflects light. This means that much of the sunlight that hits ice bounces off and is sent right back to space. Reflecting light away helps keep the Earth cool. However, as Earth heats up, ice begins to melt. As ice melts, this reveals more of the darker-colored land or ocean water, which doesn't reflect heat, but absorbs it.

So, less light is reflected back into space, causing the climate's temperature to increase. As the world gets hotter, this causes the ice to melt even faster. This increase in temperature causes still more ice to melt, which causes the world to get hotter, etc. This is an example of a positive feedback loop, in which heat produces more heat. Similarly, there are other climate systems that can get caught in feedback loops. There are many gases that, like carbon dioxide, contribute to global warming. Some of these gases are trapped in the frozen tundra across Alaska, Canada, Russia, and other northern lands.



This soil, whose temperature is below freezing, is called permafrost. When permafrost melts, much of this gas is released into the atmosphere. This causes the atmosphere to warm up, which melts more permafrost, which heats up the atmosphere, etc. Again, a feedback loop ensues, in which a warm climate leads to the creation of an even warmer climate.

A more complex example of a similar phenomenon involves the Amazon rainforest. When temperatures rise, the rainforest experiences more droughts and wildfires. This causes more trees to burn down. Just as when humans burn fossil fuels, the burning of trees causes large amounts of carbon dioxide to be released into the world. Trees play two important roles in preventing global warming: they help absorb carbon dioxide, which prevents it from trapping heat in the atmosphere, and rainforest trees help pump water into the atmosphere. When trees burn down, less water is pumped into the atmosphere, which leads to less rainfall, which leads to more trees burning – which leads to more carbon dioxide being produced.

These are both examples of positive feedback, but feedback can be negative too. When negative feedback occurs, an original effect is diminished. Both positive and negative feedback loops can occur in all kinds of Earth systems, not just in a system related to the climate. For example, the relationship between different species of animals is a kind of system as well.

Periodically, the populations of certain animals will wax and wane. In some cases, the population of a species can become stuck in a negative feedback loop. This can occur if a predator becomes too powerful and its prey becomes too weak. For example, in the early 19th century, humans began hunting a species of bird known as passenger pigeons. Soon, fewer birds existed, which made it more difficult for the species to mate. As mating declined, fewer birds were born, which made it still more difficult for the birds. This created a negative feedback loop in which the population of the birds continued to fall until they are now extinct.

While scientists understand some of how these feedback loops work, they lack a deep knowledge of them, making them extremely unpredictable. This is because, like any complex system, these feedback loops include many variables. Many of these systems are also interdependent, which means that many of these feedback loops affect each other.

For example, when permafrost melts, it makes the whole world hotter, not just the area around the permafrost. And these changes are not just limited to temperature. Changes in the amount of rainfall an area receives can lead to changes in its atmosphere. This, in turn, can affect the Earth's temperature, which can affect how much ice melts, which can affect how much rain falls, and so on.



So, a small change to a very complex system can lead to very big consequences. This makes predicting the behavior of large systems incredibly difficult.



Some skeptics about climate change point to this uncertainty as a way of casting doubt on whether the world is actually warming. However, being unable to predict the effects of climate change does not mean that it is not happening. Think back to Broecker’s analogy. If you poke a wild animal with a sharp stick, you may not be able to guess exactly how it will react. However, even if you don’t know precisely what the animal will do – it may bite you or scratch you or just growl – it’s still a very bad idea to provoke it.

Scientists continue to debate exactly what happens as the Earth’s temperature rises. Among the most popular ideas are that dry areas will become increasingly dry, while wet areas will become increasingly wet; oceans, seas, and lakes will rise; and glaciers, ice caps and snow-covered areas will become smaller. However, many climate scientists agree that a potential way of reducing the effects of climate change is to cut down the amount of carbon dioxide in the atmosphere.



Source: ReadWords.org, <http://www.readworks.org/passages/earth-getting-warmer>, 2015.

Sequencing Events or Steps

TIME: 25 minutes

OBJECTIVE: Sequencing is the process of putting events (history/social studies) and steps (a scientific process) in a logical order – one of many skills that help readers understand what they read. Through sequencing, readers are able to retell events or steps in a process in the order in which they occurred. The ability to sequence also helps readers solve problems across many subjects. In this lesson, members construct their own timelines to graphically represent the chronology of events in time. They then identify another level of information underneath the events and dates.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Large sheets of Kraft paper
- Markers

VOCABULARY

- **Sequencing** – arranging events or details in a particular order
- **Frequency table** – a graphic representation of the passage of time as a line
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Make a copy of “Mapping the West: The Journey of Lewis and Clark” (one per member).

ADDITIONAL RESOURCES

[Fun Brain: Order Me Around!](#), [Read Procedural Text](#), [Use Procedural Text](#)



LEARN IT

3 minutes

1. **SAY:** When we're reading a text, especially in history or science, we know that events or steps happen in a certain order. This is called "sequencing."
2. **SAY:** It's important to know how events or ideas in a reading are sequenced, because it helps us understand better. It also helps us remember what we've read so we can talk about it or summarize it later.
3. **SAY:** We're going to practice a simple strategy for sequencing events in a history passage.
4. **ASK:** Has anyone used a timeline before?
5. **SAY:** We're going to use a timeline that shows graphically the sequence of events in time.
6. **DO:** Demonstrate on the white board how to draw a timeline. Draw a horizontal line, indicating time periods from left to right (such as January-March 2016; April-June 2016; July-October 2016; and November-December 2016).



TRY IT

10 minutes

1. **ASK** members to form pairs.
2. **DO:** Distribute copies of "Mapping the West: The Journey of Lewis and Clark" as well as Kraft paper and markers.
3. **SAY:** You're going to work in pairs to create a timeline of the events in this passage, following these steps:
 - **Read** the text
 - Highlight the important **events**
 - Draw the **timeline**
 - Mark off the **time periods** you want to use
 - Write in the **events and dates** on the timeline
4. **DO:** Guide members if they need help. They should include these events on their timelines:
 - 1783 – Revolutionary War ends
 - 1790 – Thirteen U.S. states exist
 - February 1803 – Jefferson asks Lewis and Clark to lead an expedition
 - April 1803 – Jefferson makes "The Louisiana Purchase"
 - May 1804 – Lewis and Clark begin their journey
 - August 1804 – One of the men becomes ill and dies
 - April 1805 – Sacagawea joins the Corps of Discovery
 - November 1805 – Lewis and Clark reach the Pacific Ocean



APPLY IT

12 minutes

1. **SAY:** Now you're going to go deeper and include another layer of information your timeline. Underneath the events you've put on the timeline, add the **three goals** Jefferson had for commissioning the Lewis and Clark expedition *and* **three results** of the journey.
2. **DO:** Tell members to take a few minutes to write a brief summary of the text – in just a few sentences – mentioning the three goals and three results.
3. **DO:** Check for understanding. Members should be able to name these three goals:
 - Find a water route to the Pacific Ocean
 - Claim the northwestern portion of the country before another country did
 - Gain knowledge of the area's geography

They also should be able to name three of these results:

- They made alliances and traded with Native American tribes.
- They reached the Pacific Ocean.
- They discovered the Rocky Mountains.
- They learned about new plants and animals.
- They drew about 140 Of the first maps of the Western United States.

If members have trouble sequencing the events or finding the additional layer of information, guide them through the lesson again or help them access the additional resources listed.

Mapping the West: The Journey of Lewis and Clark

Michael Stahl

The United States of America is one of the largest countries on the planet. Much of America today is located between Canada and Mexico, stretching from the Atlantic Ocean to the Pacific Ocean. This part of the United States is called the “continental U.S.”

It did not always stretch from the Atlantic to the Pacific, though. The Revolutionary War ended in 1783, when the U.S. won its independence from England and became its own small country. Shortly after that, around 1790, there were 13 states that bordered the Atlantic Ocean. France and Spain owned a lot of the land that would eventually become the rest of the continental U.S. That changed in April of 1803 when the president of the United States at the time, Thomas Jefferson, bought a large chunk of land from France’s ruler, Napoleon Bonaparte, in what was called “The Louisiana Purchase.”

Since Americans knew very little about the land that was west of the Mississippi, earlier that same year, in February 1803, Jefferson asked two men to lead an exploration of that area. Their names were Meriwether Lewis and William Clark. Jefferson felt that Americans needed to explore their new territory for a few reasons. First, and most importantly, he wanted Lewis and Clark to find a “water route” to the Pacific Ocean from the Mississippi River. Jefferson knew that if Americans could travel by river all the way west to the ocean, they could settle there and establish trade with Native Americans in the West.

Second, Jefferson wanted to claim the northwestern portion of the continent’s midsection before another country did. Lastly, he thought that knowledge of the area’s geography would be needed for all of the other goals to come true. Jefferson knew that whomever he chose for the exploration would be in for a dangerous trip. In fact, he, along with many others, figured that the West was home to gigantic volcanoes, huge woolly mammoth animals and a mountain made of pure salt.

Jefferson chose a group of men named the “Corps of Discovery” and named Lewis, a captain in the U.S. military, its leader because he was an expert in surviving in the wilderness and was familiar with the lifestyles of Native Americans. Lewis would choose Clark, his old friend, as co-leader. In May of 1804, Lewis and Clark and the Corps of Discovery began their journey on the Missouri River, leaving St. Louis and sailing northwest. Lewis’ main job, besides leading the men, was to collect rocks, plants and animals along the route to be studied. Clark would make maps and charts of the geography of the unknown land.

Lewis and Clark headed deeper and deeper into uncharted land. Later that year in August 1804, one of their men became ill and died. They also had to do their best to find food and stay healthy

during the winter months. Lewis and Clark were worried there would be battles with many Native Americans. Some tribes were hostile toward the group. However, they were able to make alliances with many Native American tribes.

Sacagawea, a Native American woman, joined the Corps of Discovery in April of 1805. Sacagawea's knowledge of Native American cultures and her ability to speak Hidatsa and

Shoshone, two Native American languages, made her a valuable asset to the expeditionary group. She played a key role in establishing relations between the Corps of Discovery and some of the Native American tribes the Corps of Discovery encountered. Lewis and Clark would reach the Pacific Ocean in November of 1805 after traveling through several rivers, including the Clearwater, Snake and Columbia Rivers. However, they did not discover one direct water route that could lead boats straight to the Pacific from the Mississippi.

Still, the trip was incredibly beneficial. It lasted three years and covered 8,000 miles. The members of this expedition had discovered the Rocky Mountains, which were not volcanoes nor made of salt. Clark and his crew had learned about more than two hundred plants and animals that were new to the Americans, though they did not see any woolly mammoths. Lewis and Clark were the first to trade with dozens and dozens of Native American tribes that had never met the Americans before. Finally, Lewis and his men drew about 140 of the first maps of most of the western United States. It has been said that the maps provided a fill-in of what was mostly a general outline of the area. Therefore, Lewis and Clark made it much more possible for the United States to stretch all the way "from sea to shining sea."

Source: ReadWords.org, <http://www.readworks.org/passages/mapping-west-journey-lewis-and-clark>, 2015.

Word Meaning: Using Context Clues to Understand New Words

TIME: 25 minutes

OBJECTIVE: Middle-school readers must be able to determine the meaning of words and phrases as they are used in a text, including vocabulary specific to history/social studies and science. Comprehension improves when readers know what the words mean. In this lesson, members learn a simple and fun strategy for exploring new and unfamiliar terms.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Kraft paper
- Markers

VOCABULARY

- **Context** – the larger story or passage in which a word or phrase appears
- **Context clues** – hints an author gives to help define a difficult or unusual word
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Make an overhead transparency of “Let’s Meet the Renaissance” and enough copies so that each pair can have one. Post a large sheet of Kraft paper (about 10 feet long) on the wall.

ADDITIONAL RESOURCE(S)

[Sixth-Eighth Grade Context and Definition Games](#), [Determine Meaning of Words and Phrases](#), [Determine Meaning of Words and Phrases \(Social Studies/History\)](#), [Determine Meaning of Context Words, Terms and Symbols \(Science\)](#)



LEARN IT

7 minutes

1. **SAY:** It's important to have a strategy for tackling new words we come across in reading – especially specialized vocabulary in history, social studies or science.
2. **SAY:** Sometimes, if we don't have a dictionary available (or access to an online dictionary), we have to figure out the meaning of a word from the context – the sentence the word appears in as well as the sentences surrounding it. We're going to practice a simple strategy for using context clues to decode a new or unfamiliar word.
3. **DO:** Display the overhead transparency of "Let's Meet the Renaissance." Cover all except the first paragraph. Give members a minute to read the paragraph.
4. **DO:** Write the following steps on the white board and refer to them as you model the process for using context clues to decode a new or unfamiliar word:
 - **Read aloud** the middle sentence in the passage.
 - Point out any **new or unfamiliar words** in the sentence.
 - Ask yourself and the group if you know **what the word means**.
 - If not, read **the sentence that came before** and identify any clues to the meaning.
5. **SAY:** We're going to use this simple strategy for exploring and remembering new vocabulary words we encounter in a reading passage.
 - Read **the sentence that comes after** and identify any clues to the meaning.
 - Discuss what the unfamiliar word means **based on these context clues**.



TRY IT

8 minutes

1. **ASK** members to form pairs.
2. **DO**: Distribute copies of “Let’s Meet the Renaissance.” Assign each pair one passage.
3. **SAY**: You’re going to work in pairs to figure out the meaning of the unfamiliar words in your passage. Follow the steps we just completed to come to an understanding of the words.
4. **SAY**: Then, work together to create a Graffiti poster for one of the words you’ve learned:
 - Draw the **vocabulary word** using bubble letters in the center of the page
 - Write a **brief description** of the term using your own words
 - Draw at least **three images** that represent the term



APPLY IT

10 minutes

1. **SAY**: Now you’re going to share your new word with another member or pair, using your Graffiti poster as an aid while you teach someone else the new word.
2. **DO**: Give members or pairs a few minutes to teach each other their new words.
3. **DO**: Tell members to take a few minutes to write a brief summary of the text they worked on – in just one sentence – using their own words.
4. **DO**: Check for understanding. If members have trouble using their own words to paraphrase new or unfamiliar vocabulary words, guide them through the lesson again or help them access the additional resources listed.

Let's Meet the Renaissance!

The Middle Ages was a time of struggle, as the ruling class took away many freedoms from the people. The period was marked by a subjugation of individual liberties – including intellectual pursuits, religious beliefs, human rights, and property ownership. This subjugation was accomplished by the ruling class forcing people into positions of service and claiming their lands and properties, and the Church taking control of education and religious practice.

The Renaissance, which followed immediately after the Middle Ages, was marked by a flourishing culture and a renewal in all areas of life, as people broke free of the earlier restraints on their freedom. There was a focus on tremendous creative expression in the fields of music, sculpture, painting and building, as well as increased expeditions and colonization. As explorers found new continents, their discoveries in part fueled the reawakening of religion, education, inventions and scientific discoveries.

But it was primarily the pursuit of valuable possessions that set the tone. A single-syllable word fueled expeditionary rivalry and decades of land and sea confrontations: “Gold.” The main purpose of an expedition was to make money and discover new trade routes and, as a result, international trade provided the enormous fortunes that funded artistic production and creativity.

Luxury goods, including great works of art, became important means for people to display their newly acquired wealth and status. It was an urge to own, a quest for new horizons and exotic treasures, which fueled the cultural output of the Renaissance. That taste for demonstrating wealth is what characterizes the Western experience of the arts and culture to this day.

Source: Adapted from HotChalk Lesson Plans Page,
<http://lessonplanspage.com/ssrenaissanceunithandoutmeettherenaissance8-htm/>.

Using Concept Mapping to Enhance Understanding

TIME: 25 minutes

OBJECTIVE: Objective: A concept map is a visual organizer that enriches readers' understanding of a passage by helping them make meaningful connections between the main idea and other pieces of information. Through the use of a concept map, they can see the overall organization of a reading – how major sections contribute to the whole and to the development of ideas.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Kraft paper
- Masking tape
- Post-it notes
- Markers

VOCABULARY

- **Key concepts** – the most important points in a passage or text
- **Concept map**– a graphic that helps readers organize and present information in a text
- **Main idea** – a graphic that helps readers organize and present information in a text

PREPARATION

Make one copy of “Sample Concept Map” to show the group and one copy of “Prehistoric Man Concept Map Example” to refer to while creating the group concept map. Place a large piece of blank Kraft paper on the wall. Write the following steps on the white board:

1. List the **key concepts** that are essential for understanding the topic
2. Identify **important facts** that expand on and explain the key concepts
3. Show **the links between concepts** – how they relate to each other

ADDITIONAL RESOURCE(S)

[How to Mind Map](#), [Structure Within Informational Texts](#), [Text Structure](#), [Analyze Text Structure](#)



LEARN IT

5 minutes

1. **SAY:** Today, we're going to practice a strategy that will help us look at the overall organization of a reading passage – to see how the different sections relate to the whole and how the various points relate to the main idea.
2. **DO:** Show “Sample Concept Map.”
3. **ASK:** What does this map show you about the main topic of the reading?
Answer: **it's a passage about animal habitats**
4. **ASK:** What does the map tell us about the types of animal habitats?
Answer: **there are three types: desert, tundra and tropical rain forest**
5. **ASK:** What else does the map tell us?
Answer: **the characteristics of each of the different types of habitats**
6. **SAY:** You begin concept mapping by identifying the main topic of the reading passage and placing that in the center of your map. Then, you develop the map with three simple steps:
 - Step 1: List the **key concepts** that are essential for understanding the topic
 - Step 2: Identify **important facts** that expand on and explain the key concepts
 - Step 3: Show the **links between concepts** – how they relate to each other



TRY IT

10 minutes

1. **DO:** Distribute writing utensils, paper and copies of “Prehistoric Man” to all members.
2. **ASK** them to read the passage.
3. **SAY:** I'm going to ask a few questions about the passage and, as I do, jot down your answers. We'll use these to create a concept map in a few minutes.
4. **ASK** members to write down the main topic or big idea of the passage.
5. **ASK** them to list a few key concepts that are essential to understand the topic.
6. **ASK** them to write a few important facts that explain the key concepts.



APPLY IT

10 minutes

- 1. SAY:** Now we're going to create a simple concept map together. As we decide on the different parts of the map, write them on post-it notes and place them on the Kraft paper.
- 2. ASK** What is the main topic or big idea of the passage?
Answer: **prehistoric man**
- 3. ASK** What are the key concepts that are essential to understand the topic?
Answer: **a) he lived thousands of years ago; b) we don't know much about him; c) he was the great-grandfather of the human race**
- 4. ASK** What are a few important facts that explain the key concepts?
Answer: **(see "Prehistoric Man Concept Map Example" for details)**
- 5. ASK** How do these different elements relate to each other? Where should we draw lines to show the relationship among them?
Answer: **(see "Prehistoric Man Concept Map Example" for details)**
- 6. CHECK FOR UNDERSTANDING:** Let members know that learning how to make a concept map takes practice, and they will get better over time. If they have trouble understanding the basic ideas, guide them through the lesson again or help them access the additional resources listed.

Prehistoric Man

Once upon a time there was a man. He lived thousands of years ago. We only have a faint idea of what he looked like. In fact we do not know very much about him at all.

What we do know about the man we have learned from what we have found deep in the ancient soil. Archaeologists have dug up artifacts and have traveled through dark caves. They have come up with drawings, skeletons and other items they have used to help us learn a little more about that man.

Who was that man? He was the great-great-grandfather of the human race. From what we know, he looked nothing like most humans look today. In fact, some think he looked a little bit like a monkey. His fingers were thin and his hands had hair on the back of them. His skin was dark brown because of the sun that beat down on him all day. His jaw was strong and his teeth looked like the teeth of a wild animal. They were razor sharp because he had to use them to tear apart tough meat.

That man lived off the land. He ate whatever leaves, plants and fruits he could find in the forests. Sometimes he took eggs from birds or feasted on carcass of a dead animal. With sharp stick and speed, he could sometimes catch small animals, such as birds and bunnies, to eat for dinner.

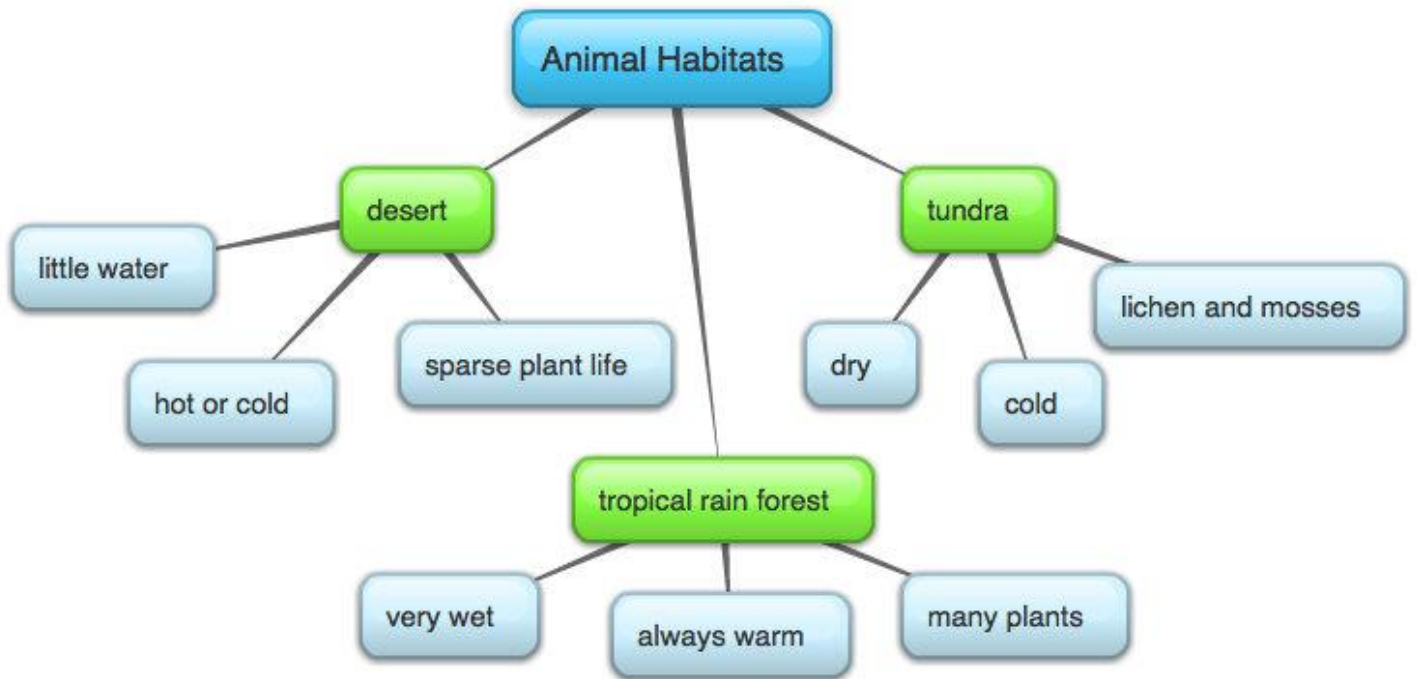
He could not cook his food. He did not know what fire was or have any other source of heat. In the winter, he braved the cold or hid in warmer caves and piles of leaves. He did not have clothes to keep him warm. He did not have a home either. Instead, he and his family moved from cave to cave or stayed in hollowed out trees.

That man could not read, write or even speak words like we do today. He made sounds to warn other men of danger and to communicate his feelings.

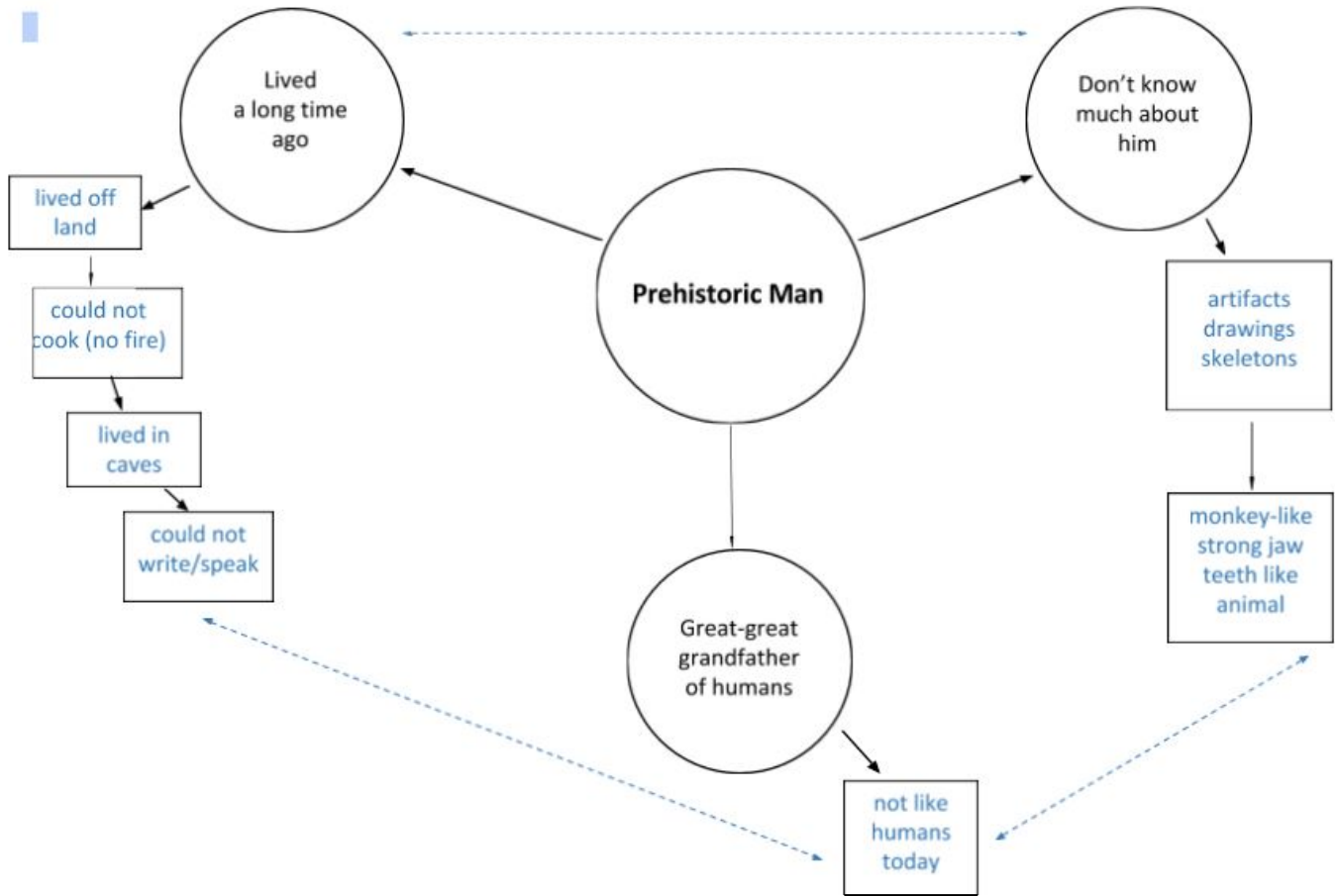
The great-great-grandfather of the human race was not at all like humans are today. He did not have the skills or knowledge to help him get by. However, he learned to survive and gradually evolved to become the humans that we know today.

Source: SoftSchools.com,
http://www.softschools.com/language_arts/reading_comprehension/7th_grade_reading_comprehension/prehistoric_man/, 2005-2017.

Sample Concept Map



Prehistoric Man Concept Map Example



Summarizing a Nonfiction Passage

TIME: 25 minutes

OBJECTIVE: Summarizing is the skill of taking a larger selection of text and reducing it to a few sentences for more concise understanding. Summarizing teaches readers how to identify the most important ideas in a text and how to integrate these ideas in a meaningful way. In this lesson, members learn to summarize by first identifying the key details in a passage, next grouping like details together and finally relating the details to the main idea. Through this process, readers are able to organize the passage’s information and details more efficiently in order to find the main idea.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper

VOCABULARY

- **Main idea** – what a piece of writing is mostly about (same as the central idea)
- **Details** – what a piece of writing is mostly about (same as the central idea)
- **Summarizing** – recapping the main idea and important details of a passage in a concise form

PREPARATION

Make copies of “An Empire Built on Paper” and “Summarizing a Nonfiction Passage” (one per member).

ADDITIONAL RESOURCE(S)

[Read Theory Online Reading Activities](#), [Structure Within Informational Texts](#), [Text Structure](#), [Analyze Text Structure](#)



LEARN IT

3 minutes

1. **SAY:** When reading complicated passages – particularly a passage related to science, history or social studies – there are several strategies you can use to help you better understand the main idea and the entire passage.
2. **SAY:** One of these strategies is summarizing – retelling the passage in such a way that someone listening can have a good understanding of what you’ve read.
3. **SAY:** You can prepare to summarize a passage by making notes about the details – and by grouping similar details into categories. For example, if you’re reading a biology lesson on people getting sick, you might group ideas like this:
 - professionals who help people when they’re sick (doctors, nurses, hospitals)
 - how people get sick (eating bad food, not dressing warmly, coughing and sneezing)
 - types of sicknesses (the flu, a cold, chicken pox, the measles)
4. **SAY:** We’re going to practice using this strategy with a social-studies reading.



TRY IT

15 minutes

1. **DO:** Distribute copies of “An Empire Built on Paper” and “Summarizing a Nonfiction Passage” to each member.
2. **SAY:** First read the passage through one time. Then, read it a second time, making notes in each of the four detail categories on the chart.
3. **DO:** Allow members eight to 10 minutes to read the passage and make notes.
4. **ASK** members to form pairs, compare their ideas and combine them into one list.
5. **ASK** pairs to share their combined lists (and add to them as necessary using “Grouping Similar Ideas Answer Key”).



APPLY IT

7 minutes

1. **ASK** members to identify the main idea of the passage by integrating the details they have noted into one or two sentences.
2. **DO:** Tell members to take a minute or so to write a brief summary of the main idea of the passage – in no more than two sentences.
3. **ASK** members to share their written summarizations.
4. **CHECK FOR UNDERSTANDING:** If members have trouble grouping details and summarizing, guide them through the lesson again or help them access the additional resources listed.

An Empire Built on Paper

W.M. Akers

Until the 8th century, paper was only produced in China and other parts of Eastern Asia. Scholars in Europe, the Middle East, and Africa had to make do with papyrus, a brittle material made only in Egypt, or parchment, a very fine sheet made from the skin of animals. Writing on papyrus and parchment was difficult. The pages were thick, fragile and expensive.

In China, however, scholars had long before discovered something far more useful: thin sheets prepared from compressed, dried-out wood pulp—also known as paper. In the 700s, during the period of Islamic dominance known as the "Islamic Golden Age," Muslim armies stormed east from Arabia and came into contact with the Chinese empire. In the Battle of Talas, in 751 A.D., armies of the Arab Abbasid Caliphate defeated the forces of the Chinese Tang Dynasty, bringing Islam to the edge of China itself.

Legend has it that two Chinese papermakers were captured during the battle and brought to Samarkand, where they were ordered to establish a paper manufacturing center in the heart of the Muslim empire. Whether or not this was wholly true, it is probable that Muslim warriors encountered papermaking during their battles with China. Seeing its usefulness immediately, they returned home with the technology to share with their scribes.

The Muslim empire was a culture that placed great importance on words. The Muslims' holy book, the Qur'an, was a great poetic work, and devout Muslims were expected to memorize parts of it to be recited during religious ceremonies. One of their most famous art forms was calligraphy, a style of decorative writing, and their great mosques were decorated not with images of people, but the words of the Qur'an itself.

It is no surprise that a society which so valued words would fall in love with paper. Compared to parchment and papyrus, even rudimentary paper—much rougher and thicker than the pages of a book today—was a great improvement. Unlike parchment, which could only be made from the skins of animals, paper could be manufactured relatively cheaply and easily. Unlike papyrus, paper did not crack when it was bent. It was also thinner, which made the binding of books much simpler than it had been before.

Perhaps most importantly, paper absorbed ink, which meant that anything written on paper could not be erased. That's not very useful when you're trying to solve a math problem, but when writing official government documents, permanence is crucial.

Just as it had been in China, paper was originally used mainly by the Arab government. At a time when Europe was broken into a number of disorganized kingdoms, the Abbasid Caliphate, which stretched from Afghanistan to North Africa, might have been the greatest power on Earth. This sprawling empire contained dozens of great cities, millions of people, and several different, often conflicting, cultures. Although the empire's official language was Arabic, its people spoke many different languages—from Persian in the East to Berber in the West. Now those disparate regions could be united by the written word.

Paper's use spread quickly. By the end of the 8th century, a paper mill had been set up in Baghdad. Over the next 200 years, the technology spread to Syria, North Africa, and even Spain—which was partially ruled by Muslims from 711 to 1492. Although the Abbasid Caliphate and other ruling houses of the Arab empire were skilled in war, they prized learning above all else. The Abbasids took inspiration from a well-known saying, "The ink of a scholar is holier than the blood of a martyr." To this end, the Abbasids did everything they could to encourage scientific achievement. As Europe languished in the Dark Ages, when even literacy was limited mainly to monks, the Muslim world entered a scientific golden age. Building on the knowledge of the ancient Greeks, Muslim scholars made great advances in geometry, astronomy, and mathematics.

As paper became more widespread, so did knowledge. The tedious process of writing books by hand was made easier by an adoption of assembly-line-style techniques, which allowed a group of scribes to produce finished books faster than ever before. Great libraries were established across the Muslim world, and in capitals like Baghdad and Cairo, booksellers flourished. Scholars and poets were supported by the government, and for perhaps the first time in history, it became possible to make a living by reading and writing alone.

Even as paper became widespread, there was one place where its dominance was resisted: religion. Because paper was less expensive than parchment, it was initially considered unfit to bear the holy words of the Qur'an. However, the demand for copies of the Qur'an grew along with the population's literacy. Eventually, that demand, along with the improved quality of the paper, made the new material considered suitable for religious use. The oldest known Qur'an written on paper dates from 971-972.

The western spread of paper didn't end in the Arab empire. From there, the technology to manufacture paper made its way through Europe. It was not until the middle of the 15th century that a German blacksmith named Johannes Gutenberg invented a printing press that allowed for mass production of the Christian Bible. Most of Gutenberg's Bibles were printed on paper, becoming one of the most famous early works on paper in history.

Source: Readworks.org, <http://www.readworks.org/passages/empire-built-paper>.

Summarizing a Nonfiction Passage

Main Idea	
DETAILS: different writing surfaces	DETAILS: advantages of paper
DETAILS: uses for paper	DETAILS: positive impact of paper

Summarizing a Nonfiction Passage (Answer Key)

Main Idea	
<p>Paper had many advantages over other materials used for writing. As the use of paper became more commonplace, it allowed for the spread of knowledge and led to great advancements in geometry, astronomy and mathematics.</p>	
DETAILS: different writing surfaces	DETAILS: advantages of paper
<ul style="list-style-type: none"> • Papyrus • Parchment • Thin sheets made from wood pulp (paper) 	<ul style="list-style-type: none"> • Cheap to make • Easy to manufacture • Did not crack when bent • Thinner than other materials • Absorbed ink • Erasable
DETAILS: uses for paper	DETAILS: positive impact of paper
<ul style="list-style-type: none"> • Religious writings (Qur'an) • Decorative art • Official government documents 	<ul style="list-style-type: none"> • United disparate regions through the written word • Great advancement in geometry, astronomy and mathematics • Spread knowledge • Great libraries established • Booksellers flourished

Identifying an Author's Purpose

TIME: 25 minutes

OBJECTIVE: Good readers need to learn to look at the overall text to determine an author's purpose in writing – to persuade (convince), to inform (teach or give facts) or to entertain (provide amusement). Readers also need to be able to identify the specific words or phrases used by the author that indicate the overall purpose.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Scissors
- Paper lunch bag

VOCABULARY

- **Author purpose** – the reason an author decides to write about a specific topic (usually to persuade, to inform or to entertain)
- **Point of view** – who is telling or narrating a story; the viewpoint the author uses to let readers know what takes place
- **Perspective** – the “lens” through which readers learn about characters, events or facts
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Make one copy of “Grab-bag Strips,” cut apart and place in a paper lunch bag. Make copies of “Author's Purpose Writing Samples” (one per member).

ADDITIONAL RESOURCE(S)

[Author's Purpose Worksheets](#), [Author's Point of View](#), [Identifying Author's Point of View or Purpose](#), [Author's Purpose \(Science\)](#)



LEARN IT

5 minutes

1. **ASK:** What do you know about the different reasons authors write? What are newspaper columnists or op-ed writers trying to do, for example, when they try to get you see their point of view on a topic?
Answer: **they are trying to persuade**
2. **ASK:** What are some other types of writing where the author tries to persuade?
Answer: **commercials, billboards, ads, opinion columns, political ads**
3. **ASK:** What about an author who wants to give you information or teach you facts, such as in regular newspaper articles, not opinion columns?
Answer: **they are trying to inform**
4. **ASK:** What are some other types of writing where the author tries to inform:
Answer: **textbooks, other non-fiction books, biographies, documentary movies**
5. **ASK:** What about authors who are trying to tell a story or provide enjoyment?
Answer: **they are trying to entertain**
6. **ASK:** What about authors who are trying to tell a story or provide enjoyment?
Answer: **fantasy stories, mysteries, comics/jokes, adventure**

7. **SAY:** These three purposes are sometimes called PIE – persuade, inform and entertain.
8. **SAY:** We're going to play a game to see how well you can identify these types of writing.



TRY IT

8 minutes

1. **DO:** Call attention to the “grab bag” you prepared in advance.
2. **SAY:** You'll take turns pulling a strip from the bag and identifying the author's purpose.
3. **ASK** a member to pull a strip, read it aloud and identify the author's purpose.
4. **DO:** Continue until all strips have been identified (refer to “Grab-bag Strips Answer Key”).



APPLY IT

12 minutes

1. **ASK:** members to form pairs.
2. **SAY:** We're going to use a strategy called "3-2-1 Summarization" to find the author's purpose in a longer writing passage:
 - 3 - What are **the three most important facts** in the passage?
 - 2 – What are **two clues** that help you determine the author's purpose?
 - 1 – What is the **author's purpose**?
3. **DO:** Distribute copies of "Author's Purpose Writing Samples" to each pair.
4. **ASK** pairs to select one sample on the sheet and read the passage.
5. **ASK** members to identify the (3) three most important facts; (2) two clues to help them determine the author's purpose; and (1) the author's purpose.
6. **DO:** Tell members to take a minute or so to write a brief summary of the author's purpose – in no more than two sentences.
7. **CHECK FOR UNDERSTANDING:** If members have trouble finding the author's purpose, guide them through the lesson again or help them access the additional resources listed.

Grab-bag Strips

1. A five paragraph essay where a student argues that people should recycle and not litter
2. An encyclopedia entry about endangered animals and efforts to protect them
3. A map of the world, showing all continents, countries, and oceans
4. A Garfield comic from the newspaper in which Garfield hates Mondays and likes lasagna
5. A brochure about how people shouldn't shop at Walmart because they hurt local businesses
6. The fourth novel in the Twilight series by Stephanie Meyer
7. A student's book report about the fourth novel in the Twilight series
8. A speech by a politician asking for 90 minutes to be added to the school day
9. The play Romeo and Juliet by William Shakespeare
10. The instructions for the board game, Monopoly.
11. The story of a young man who learns to resist the influences of drugs and gangs
12. A child's letter to Santa asking for a bicycle because the child has been good all year
13. The lyrics to a song written by popular music group, Mindful Behavior
14. A recipe explaining how to make chicken salad sandwiches
15. A note to a teacher where a student asks if her seat can be switched because of a conflict

Source: EReading Worksheets, <http://www.ereadingworksheets.com/free-reading-worksheets/authors-purpose-worksheets/>

Grab-bag Strips (Answer Key)

1. A five paragraph essay where a student argues that people should recycle and not litter **(P)**
2. An encyclopedia entry about endangered animals and efforts to protect them **(I)**
3. A map of the world, showing all continents, countries, and oceans **(I)**
4. A Garfield comic from the newspaper in which Garfield hates Mondays and likes lasagna **(E)**
5. A brochure about how people shouldn't shop at Walmart because they hurt local businesses **(P)**
6. The fourth novel in the *Twilight* series by Stephanie Meyer **(E)**
7. A student's book report about the fourth novel in the *Twilight* series **(I)**
8. A speech by a politician asking for 90 minutes to be added to the school day **(P)**
9. The play *Romeo and Juliet* by William Shakespeare **(E)**
10. The instructions for the board game, Monopoly **(I)**
11. The story of a young man who learns to resist the influences of drugs and gangs **(E)**
12. A child's letter to Santa asking for a bicycle because the child has been good all year **(P)**
13. The lyrics to a song written by popular music group **(E)**
14. A recipe explaining how to make chicken salad sandwiches **(I)**
15. A note to a teacher where a student asks if her seat can be switched because of a conflict **(P)**

Author's Purpose Writing Samples

Sample 1

Sully had always dreamed of getting a Jack Russell terrier puppy, and she reminded her mother of this frequently. On Sully's birthday one year, Sully's mother, Ms. Reyes, met her daughter after school and told her they had to pick up a few things for dinner. The market was right next to a pet store! But Ms. Reyes bought only sugar, milk, and eggs for a birthday cake, and then they drove home without so much as a glance at the pet store. When they arrived home, Ms. Reyes said, "Why don't you go play in your room? I think there might be a surprise in there for you." Sully rushed to her room and flung open the door. Sure enough, on her bed was a puppy—but it was a stuffed toy. Sully was delighted with the toy and thanked her mother, but she still longed for a real, live pet. That night after dinner, after Sully had opened presents from her sister and friends, Ms. Reyes said, "Sully, would you go into the pantry and bring me some paper towels?" Sully rose from the table and opened the pantry door. There on the floor was a tiny baby dog! "Surprise!" shouted her family from the table, and they all got up to see their new pet. Sully finally had the puppy for which she had always wished.

Sample 2

The piano as we know it today is roughly the same as it always has been. A piano is actually a string instrument, though it's played by striking keys attached to the strings. The first piano, known as a clavichord, was a version of a harp turned on its side and enclosed in a small box. You can still see examples of a clavichord, which looks like an oblong box with a keyboard running nearly the length of one long side. A clavichord would fit on your lap, while a modern piano is much larger. Since about 1450, keyboards have remained the same, except that the placement of the black and white keys was reversed. But with that single exception, there are representations of pianos as they look today dating back to the fourteenth century. The instrument works so well that there has been little reason to modify it over time.

Sample 3

America's two-party system, composed of Democrats and Republicans, is ineffective and unfair. The United States is supposed to be the "home of the free," but how can we be free if we have only two stale choices for president? Both the Republican Party and the Democratic Party have been in existence for so many years that they're out of touch with what the average American needs. It's impossible to find candidates who do not regurgitate the old ideas of the party that they belong to. With such a ridiculous system, we will never have the opportunity to elect innovative politicians who have strong ideas that will help the country. Until we break out of the two-party model, politics will remain an uninspiring arena for many citizens.

Source: Angleton Independent School District,

<http://www.angletonisd.net/site/handlers/filedownload.ashx?moduleinstanceid=8256&dataid=3901&FileName=Main%20Idea%20Details%20Purpose.doc>

Previewing a Nonfiction Text

TIME: 25 minutes

OBJECTIVE: THIEVES is a helpful non-fiction reading strategy that helps readers preview informational text readings in depth. Using a non-fiction reading strategy called THIEVES – an acronym for title, headings, introduction, every first sentence in a paragraph, visuals and vocabulary, end-of-chapter questions, and summary – readers preview text readings in depth, thereby “stealing” information from textbooks or other informational texts. The idea of THIEVES is that an in-depth preview of a text can help readers activate prior knowledge, set a purpose for reading and establish expectations for reading – so they are better able to understand the concepts they are about to encounter.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Kraft paper
- Markers
- History, social studies or science book or article appropriate to members’ grade level (from an online source, Club library or members’ current reading assignments)

VOCABULARY

- **Preview** – looking at text features before reading to get an idea of what a text is about
- **Prediction** – making an educated guess about what may happen in a text before reading it
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Select a brief passage from the book or article for members to use for practice during the lesson. Post a large piece of Kraft paper on the wall.

ADDITIONAL RESOURCE(S)

[ReadTheory: Online Reading Activities](#), [Reading Practice](#), [Integrating Information from Different Media](#), [Integrating Information from Visual Media](#), [Integrating Visual and Verbal Information](#)



LEARN IT

3 minutes

1. **SAY:** You're about to become "thieves," learning to "steal" information from texts before you actually read a chapter or article by previewing the passage.
2. **SAY:** You use previewing skills every day in all areas of your lives – when you decide what foods to eat, what clothes to buy and what movies to watch.
3. **ASK:** What does it mean to preview a text?
Answer: to look at a passage before you begin reading to get an idea of what it's about
4. **ASK:** What are some ways to preview a chapter or article before you read it?
Answer: look at the title, look at photos, read captions, review section subheads
5. **SAY:** Previewing is helpful because it helps you consider what you already know about the subject, and it helps you set a purpose for reading and have an idea of what to expect.
6. **SAY:** We're going to practice using a previewing strategy called THIEVES.



TRY IT

12 minutes

1. **DO:** Call attention to the reading passage you selected in advance.
2. **ASK** members to write the letters T, H, I, E, V, E, and S vertically down the side of a piece of paper and to jot down notes next to each letter as you guide them through the strategy.
3. **DO:** guide members through the THIEVES Strategy for previewing the passage, allowing time for members to look at each of the elements and make notes before moving on to the next:
 - **T** – read the **title**; predict what the text will be about
 - **H** – look at **headings**/subheadings; predict what you will be reading about
 - **I** – use the **introduction** and the first paragraph to predict the main idea
 - **E** – scan **every first sentence** of each paragraph to predict what the section is about
 - **V** – list important **visuals and vocabulary** words that help you understand the text
 - **E** – read **end-of-chapter** review to tell you what to look for as you read
 - **S** – review the **summary**; consider what you know and recall about the topics

4. **SAY:** You may not find every single element of THIEVES in every passage you read, but you can use many parts of the strategy for previewing any informational text.



APPLY IT

10 minutes

1. **ASK** members to now take five minutes to actually read the passage.
2. **ASK** How accurate were your predictions about the main idea of the reading?
3. **DO:** Tell members to take a minute or so to write a brief summary of the main idea of the passage – in no more than two sentences.
4. **DO:** Check for understanding. If members have trouble previewing informational texts, guide them through the lesson again or help them access the additional resources listed.

Evaluating an Author's Argument

TIME: 25 minutes

OBJECTIVE: In this lesson, members review the difference between persuasive writing – which is based primarily on emotion and is designed to change the way a reader feels – and argumentation – which includes an objective claim or assertion that the writer backs up with reasons and evidence. Members become familiar with the basic elements of an argument and analyze an evidence-based argument. By learning to recognize and evaluate an author's argument, members increase their reading comprehension.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Kraft paper
- Markers
- History, social studies or science book or article appropriate to members' grade level (from online, Club library or members' current reading assignments)

VOCABULARY

- **Persuasion** – the technique a writer uses to influence readers
- **Point of view** – who is telling or narrating a story; the viewpoint the author uses to let readers know what takes place
- **Argument** – the main statement of a text or the point the author is trying to argue
- **Claim** – statements or beliefs an author offers to support or prove the argument
- **Reason** – statement or fact an author gives to explain why something is the way it is
- **Evidence** – details or facts in the text that support the author's argument
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Select a brief passage from the book or article for members to use for practice during the lesson. Make copies of "School Suspensions Don't Work" (one per member). Write the following definitions on the white board:

- The **claim** (that typically answers the question: "What do I think?")
- The **reasons** (that typically answer the question: "Why do I think this?")
- The **evidence** (that typically answers the question: "How do I know this is the case?")

ADDITIONAL RESOURCE(S)

[Evaluate Arguments and Claims](#), [Think Critically \(History/Social Studies\)](#), Think Critically (Science)



LEARN IT

5 minutes

1. **ASK** What do you know about an author using persuasion in writing?
Answer: **persuasion is an author's attempt to convince a reader of his/her point of view**
2. **ASK:** What's the difference between persuasive writing and an evidence-based argument?
Answer: **persuasion can use personal opinion or stories or emotional appeals; evidence-based arguments use logic supported by examples and facts**
3. **ASK:** What are some examples of arguments you have made either verbally or in writing?
4. **SAY:** In writing, an argument is a text that expresses the author's position about a topic and uses evidence to prove why that position is correct. As readers, we evaluate the strength of an author's argument and decide whether we agree with it or not.
5. **DO:** Call attention to the definitions you wrote on the white board and review them with members. with it or not.
6. **SAY:** We're going to practice identifying these elements in a writing sample.



TRY IT

12 minutes

1. **ASK** members to form pairs.
2. **DO:** Distribute copies of "School Suspensions Don't Work," sheets of Kraft paper and markers to each pair.
3. **ASK** pairs to make a chart on the Kraft paper to show the claim, reasons and evidence.
4. **DO:** Call attention again to the definitions you wrote on the white board earlier.
5. **DO:** pairs to make a chart on the Kraft paper to show the claim, reasons and evidence.
6. **ASK** members to share what they identified in the article and conclude whether they found the author's argument convincing and effective.



APPLY IT

8 minutes

1. **DO:** Call attention to the reading passage you selected in advance.
2. **DO:** Allow members five minutes to read the passage.
3. **DO:** Tell members to take a minute or so to write a brief summary of the author's argument – in no more than two sentences.
4. **CHECK FOR UNDESTANDING:** If members have trouble identifying an author's argument, guide them through the lesson again or help them access the additional resource listed.

School Suspensions Don't Work

By David Bulley

Cindy sits across from me in what is now called The Justice Center at Turners Falls High School in Montague, about 20 miles north of Amherst. The room is brightly decorated with student art, there is a coffee machine and some candy on a table, and behind me on the wall is a quote from the mystic Rumi: “Out beyond ideas of wrongdoing and rightdoing, there is a field. I’ll meet you there.”

Cindy (a pseudonym) smiles, though she is painfully embarrassed. Last year she was suspended for fighting. Now she sits across from me after having thrown a cafeteria tray and several other things at two boys. She is upset — still in fight or flight mode. We just chat for a while, about the weather and her weekend, her friends. Eventually I know she is ready, and I ask a question to begin the real work of our meeting. “Cindy, what happened?”

When it comes to student misbehavior, most schools have long practiced a basic system of crime and punishment, isolating the perceived “offender” through detention or suspension. Until this school year, that’s what we did at Turners Falls. But during the summer I was trained in a system called restorative justice, an approach that focuses on nonjudgmental discussion, developing empathy, and repairing the damage done. We’ve put it into effect for all students.

Even last year we might have suspended Cindy first and done the restorative work second. Before that we would have simply suspended her without ever asking what happened. After all, it’s caught on camera: her throwing the tray. That’s all the evidence we need to make a problem disappear for at least a couple days.

Today Cindy answers my question. She tells me that the boys had been joking with her and another girl, not inappropriately exactly, but in a way that made her feel self-conscious. When the other girl left the table, the boys began whispering and laughing. When the one word she heard loud and clear was “Africa” — Cindy is black, the boys are white — Cindy erupted.

I called the boys to my room to join us. Cindy and I learned, through nonjudgmental questioning, that she did hear the word, but it was uttered in an entirely different context. The rude whispering had nothing to do with her at all. Yes, the joke was dumb, but the anger from Cindy was based on a self-conscious and fear-based misunderstanding.

Now, I don’t want to give the impression that restorative justice is some touchy-feely New Age kumbaya. We were not done!

Although the students reconciled immediately, forgave one another, and parted friends, Cindy was still responsible for her actions (no matter how understandable). She apologized profusely to the boys.

After that, we walked down to the cafeteria, where she had tough conversations with the lunch workers and cleaned up the mess she had made. We talked with the teachers who were on lunch duty, so Cindy could understand how difficult and scary it is to intervene in a physical confrontation between high school students. She apologized to them, to school administrators, and to me. Cindy spent the rest of the day in my room producing a report on how the violence of others can affect classmates and the overall school climate. Her last task was to make a plan about what to do the next time she felt angry enough to erupt.

Under the traditional system, Cindy would have been suspended immediately, even though we know that suspensions significantly contribute to the likelihood that a student will eventually drop out. She would have made an enemy of the boys and their friends for the remainder of the school year — and that antagonism would be essentially promoted and encouraged by the administration's stay-away orders and safety plans. The boys would never have known the harm they caused and how to avoid it in the future. Cindy would never have known that the boys didn't actually intend anything racist. Rather than solving a problem, everything about the traditional way of handling situations like this one only contributes to the likelihood that it will happen again.

All across the country, schools that institute restorative justice — including the Boston Public Schools — are seeing massive reductions in suspension and dropout rates; in some cases, they're even seeing improved test scores. Although our school has faced obstacles aplenty — including from some teachers and parents who firmly believe traditional punishment works best — the numbers are compelling. We had more than 50 suspension days in the first two months of the 2013-14 school year. So far this year we've had only two.

For most new practitioners, it seems astonishing what you learn when you stop punishing and start listening. When a school can help solve a student's problem, the student stops becoming the school's problem.

Source: Boston Globe, <https://www.bostonglobe.com/magazine/2014/12/21/school-suspensions-don-work-time-for-something-better/kXQMRIfBWccB8hPduwoHTK/story.html>, December 21, 2014.

Comparing and Contrasting Two Passages

TIME: 25 minutes

OBJECTIVE: Good readers need to develop the skill of comparing and contrasting. Research has shown that strategies that engage readers in comparative thinking have a positive impact on their learning. Comparing and contrasting activities strengthen readers' memories by building their ability to analyze and remember key content. These types of activities also improve comprehension by highlighting important details, making abstract ideas concrete and reducing confusion between related ideas. In this lesson, members compare and contrast passages on a similar topic, identifying distinctive ideas in each and similarities between the two.

MATERIALS

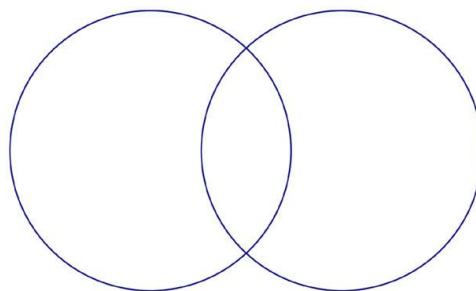
- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Kraft Paper
- Markers
- Markers
- Tape
- Scissors

VOCABULARY

- **Comparing** – looking for similarities among two or more texts
- **Contrasting** – looking for differences among two or more texts
- **Theme** – an idea that's repeated through a text; the message that is the focus of the text
- **Key concepts** – the most important points in a passage or text
- **Venn diagram** – a graphic of the relationship between objects with something in common
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Make copies of "Renewing America" and "Climbing Space" (one per member). Cut construction paper in half horizontally to form 4.25" x 11" strips. Draw a large Venn diagram on the Kraft paper and mount it on the wall:



Label the left circle "Article #1 – Key Concepts" and the right circle "Article #2 – Key Concepts." In the overlapping area, write "Similarities."

ADDITIONAL RESOURCE(S)

[Compare and Contrast Authors' Presentations](#), [Compare Primary and Secondary Sources \(Social Studies/History\)](#), [Compare Information from Reading with Information from Multimedia Sources \(Science\)](#)



LEARN IT

7 minutes

- 1. SAY:** Today, we're going to practice comparing and contrasting two passages that have similar themes and ideas. You use comparing and contrasting all the time in your lives, so calling on this skill when reading should come naturally.
- 2. ASK:** What does it mean to compare and contrast something?
Answer: **to looking at two different things and think about how they're alike and different**
- 3. ASK:** What's the first step in comparing and contrasting two things? If we want to compare and contrast a candy bar and a granola bar, for example, where would we start?
Answer: **by looking at how they are alike (rectangular, edible, sweet, give energy, etc.)**
- 4. ASK:** What would we do next?
Answer: **look at how they are different (different ingredients, purpose for eating, etc.)**
- 5. ASK:** What are some of the qualities of these two items that you could focus on?
Answer: **taste, purpose, cost, weight, color, smell, audience, etc.**
- 6. SAY:** So, when you're comparing and contrasting two reading passages, you also have to decide which attributes of the message you're going to focus on.
- 7. ASK:** If passages deal with a historical event, what might you focus on?
Answer: **the results of the event, what happened after the event**
- 8. ASK:** If passages have to do with two people, what could you focus on?
Answer: **what they do/did, what stands out about them, what makes them interesting**
- 9. ASK:** If passages describe ideas or theories, what could the focus be?
Answer: **what their central argument or claim is, what kind of evidence is offered**
- 10. SAY:** Today we're going to practice comparing and contrasting passages about ideas.



TRY IT

13 minutes

1. **DO:** Distribute copies of “Renewing America” and “Climbing Space” to each member.
2. **ASK** members to read each of the speeches and to think about what is similar about them and what is different about them.
3. **DO:** Allow five to seven minutes for members to read the speech excerpts.
4. **ASK** Allow five to seven minutes for members to read the speech excerpts.
5. **DO:** Distribute construction-paper strips and markers to each pair.
6. **ASK** members to discuss with their partners the key ideas of each article and write each of them on a separate construction-paper strip.
7. **DO:** Call attention to the Venn diagram you have posted.
8. **ASK** pairs to tape their strips with the key concepts in the appropriate circles.
9. **ASK** pairs to also write their ideas for the similarities they find between these two articles and to place those in the center overlapping section of the diagram.



APPLY IT

5 minutes

1. **ASK** members to summarize the similarities and differences between these two presidents’ ideas about America.
2. **ASK** members to take a few minutes to write a brief summary of the similarities and differences of the two passages – in no more than a few sentences.
3. **CHECK FOR UNDERSTANDING:** If members have trouble comparing and contrasting two passages, guide them through the lesson again or help them access the additional resources listed.

Renewing America

Excerpt from President Bill Clinton's First Inaugural Address (1993)

When George Washington first took the oath I have just sworn to uphold, news traveled slowly across the land by horseback and across the ocean by boat. Now, the sights and sounds of this ceremony are broadcast instantaneously to billions around the world.

Communications and commerce are global; investment is mobile; technology is almost magical; and ambition for a better life is now universal. We earn our livelihood in America today in peaceful competition with people all across the Earth.

Profound and powerful forces are shaking and remaking our world, and the urgent question of our time is whether we can make change our friend and not our enemy.

This new world has already enriched the lives of millions of Americans who are able to compete and win in it. But when most people are working harder for less; when others cannot work at all; when the cost of health care devastates families and threatens to bankrupt our enterprises, great and small; when the fear of crime robs law-abiding citizens of their freedom; and when millions of poor children cannot even imagine the lives we are calling them to lead—we have not made change our friend.

We know we have to face hard truths and take strong steps. But we have not done so. Instead, we have drifted, and that drifting has eroded our resources, fractured our economy, and shaken our confidence.

Though our challenges are fearsome, so are our strengths. Americans have ever been a restless, questing, hopeful people. And we must bring to our task today the vision and will of those who came before us.

From our Revolution to the Civil War, to the Great Depression, to the civil rights movement, our people have always mustered the determination to construct from these crises the pillars of our history. Thomas Jefferson believed that to preserve the very foundations of our Nation, we would need dramatic change from time to time. Well, my fellow Americans, this is our time. Let us embrace it.

To renew America, we must meet challenges abroad as well as at home. There is no longer a clear division between what is foreign and what is domestic—the world economy, the world environment, the world AIDS crisis, the world arms race, they affect us all. Today, as an old order passes, the new world is more free, but less stable. Communism's collapse has called forth old animosities and new dangers. Clearly America must continue to lead the world we did so much to make. While America

rebuilds at home, we will not shrink from the challenges, nor fail to seize the opportunities, of this new world. Together with our friends and allies, we will work to shape change, lest it engulf us.

But our greatest strength is the power of our ideas, which are still new in many lands. Across the world, we see them embraced—and we rejoice. Our hopes, our hearts, and our hands, are with those on every continent who are building democracy and freedom. Their cause is America’s cause.

The American people have summoned the change we celebrate today. You have raised your voices in an unmistakable chorus. You have cast your votes in historic numbers. And you have changed the face of the Congress, the Presidency, and the political process itself. Yes, you, my fellow Americans, have forced the spring. Now, we must do the work the season demands.

To that work I now turn, with all the authority of my office. I ask the Congress to join with me. But no President, no Congress, no government, can undertake this mission alone. My fellow Americans, you, too, must play your part in our renewal.

I challenge a new generation of young Americans to a season of service—to act on your idealism by helping troubled children, keeping company with those in need, reconnecting our torn communities. There is so much to be done—enough indeed for millions of others who are still young in spirit to give of themselves in service, too. In serving, we recognize a simple but powerful truth: We need each other. And we must care for one another.

Today, we do more than celebrate America; we rededicate ourselves to the very idea of America: an idea born in revolution and renewed through two centuries of challenge; an idea tempered by the knowledge that, but for fate, we—the fortunate and the unfortunate—might have been each other; an idea ennobled by the faith that our Nation can summon from its myriad diversity the deepest measure of unity; an idea infused with the conviction that America’s long heroic journey must go forever upward.

And so, my fellow Americans, as we stand at the edge of the 21st century, let us begin anew with energy and hope, with faith and discipline, and let us work until our work is done.

Source: ReadWorks.org, “Renewing America,” <http://www.readworks.org/passages/renewing-america>, 2014.

Climbing Space

Excerpt from President John F. Kennedy's Speech Given at Rice University in Houston, Texas on the United States Space Effort

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation may never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? . . .

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the office of the Presidency.

The growth of our science and education will be enriched by new knowledge of our universe and environment, by new techniques of learning and mapping and observation, by new tools and computers for industry, medicine, the home as well as the school. Technical institutions, such as Rice, will reap the harvest of these gains.

To be sure, all this costs us all a good deal of money. This year's space budget is three times what it was in January 1961, and it is greater than the space budget of the previous eight years combined. . . . But if I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experienced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth, reentering the atmosphere at speeds of over 25,000 miles per hour, causing heat about half that of the temperature of the sun . . . and do all this, and do it right, and do it first before this decade is out – then we must be bold.

Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why he wanted to climb it. He said, "Because it is there."

Well, space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked.

Thank you.

Using Visual Imagery

TIME: 25 minutes

OBJECTIVE: When readers are able to create mental images from what they are reading their comprehension improves significantly. Visual imagery encourages understanding by providing a springboard for memory recall and by making reading an active rather than a passive process. In this lesson, members first hear a passage read aloud and practice visualizing the scene, they then view a brief video of a similar setting to help them with visualization and, finally they read the passage on their own and create a drawing to represent what they imagined.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Markers
- Laptop with internet connection and projector

VOCABULARY

- **Visualize** – to form a mental image of something in the mind
- **Imagery** – the use of vivid description to create a picture in the reader’s mind
- **Scene** – the place or setting of an event or action
- **Summary** – the main idea and important details of a passage in a concise form

PREPARATION

Make copies of “Traveling West” (one per member). Download the video, [Virtual Field Trip: Moving West](#) (2:28) in preparation for showing it to the group.

ADDITIONAL RESOURCE(S)

[Reading Strategies Using Visualization](#)



LEARN IT

5 minutes

1. **ASK:** What are some movies based on books you've read?
2. **ASK:** What's the difference between reading a book (or text) and watching a movie (or documentary) or television?
Answer: *when we watch a movie, we see the action; when we read, we imagine it*
3. **SAY:** As we read, we understand better when we our imagination creates its own "brain movie" – imagining the scene, people, setting and action. By creating our own visual images, we're more involved in the reading process.
4. **SAY:** We're going to practice the skill of visualizing with a brief reading passage.



TRY IT

10 minutes

1. **ASK:** members to close their eyes and listen as you read the passage, "Traveling West," and to use their imagination to visualize what they are hearing.
2. **DO:** Read the passage slowly, with inflection and emphasis on striking language, pausing to give members time to visualize the scene.
3. **DO:** Pause when you are done to let members finish translating the text into brain movies.
4. **ASK:** for volunteers to share their favorite imagery or scenes.
5. **ASK:** members to compare their visual images.
6. **DO:** Show the brief video, "Virtual Field Trip: Moving West" (2:28).
7. **ASK:** members how the images in the video compare to those they imagined.
8. **ASK:** How does visualizing help you understand the passage?
9. **ASK:** How does reading differ when you don't visualize as compared to when you do?



APPLY IT

10 minutes

1. **DO:** Distribute copies of the passage “Traveling West” to all members.
2. **ASK:** members to read the passage themselves slowly, pausing to imagine the scene again, and then to create a drawing of the scene they recall from the reading.
3. **SAY:** Do not be concerned with the quality of your drawing – it’s just a quick sketch to try to capture the scene in your imagination.
4. **DO:** Tell members to take a minute or so to write a brief summary of the passage – including a few visual and/or sensory details they may recall.
5. **CHECK FOR UNDERSTANDING:** If members have trouble using visual imagery, guide them through the lesson again or help them access the additional resource listed.

Traveling West

Long ago, when people settled the United States, most lived in the East, and it was hard to travel west. There were no planes, trains, or automobiles. People traveled by wagon or boat, and it took many days to reach a destination. Although it was difficult, in the 1840s, many people traveled far across the United States from the East to the West. They were pioneers. They would settle in the western part of the country after a challenging journey to a new life.

Getting to the West was very difficult because there were no roads and there were many obstacles to travel. People traveled in groups, and each family would buy a covered wagon, which is a big wooden wagon with a kind of tent on it. It was small, about the size of an automobile, but it would be home for the whole family while they traveled to their new home. Each family would pack the tools and supplies they needed to build a new life in the West. They would have to fit all they took in their wagon, so they would bring only the items that were essential. It was dangerous to try to travel west without protection, so families would travel together, combining their wagons into what was called a wagon train. It was a group of wagons all going the same way. To prepare, they would meet with other families to plan their trip, choosing a route based on the travels of others.

When the families started the trip, they did not know each other, they only had in common that they were leaving the East to start a new life in the West. They met when the trip began, and they would spend more than a year together, so they got to know each other well. Sometimes they would borrow tools from each other, and sometimes they shared food. When the wagons encountered a problem, such as a storm that caused wagons to stick in muddy holes, they would solve it together. It would take more than a year to reach the West, and many things happened along the route. The families sometimes had babies along the way, which delayed the progress as the wagon train would stop for a few days to help the mother with the baby. Then they would keep going, persisting whatever the weather, because they knew they had a long way to travel and could not delay long.

When the wagon train got to the West, the families would settle there, building homes, starting farms. They would create communities, and instead of being partners in a trip they were collaborators in community. Those communities would grow into towns, and then some would expand into cities, from a wagon train to a metropolis.

In the next century, people built a railroad that crossed the United States. By 1900, there were many more people in the West, and thousands of people came west by train. A trip that had taken months now took passengers a few days of comfortable transit. The railroad brought many changes, and the pioneers became legends as the country developed into the nation of today.

Source: "One-Page Nonfiction Readings," Center for Urban Education, http://teacher.depaul.edu/Reading_NONFICTION_Grade6.html, 2005.

MIDDLE SCHOOL

MATH LESSONS

Basic Expressions

TIME: 25 minutes

OBJECTIVE: Expressions are used in many situations to describe relationships, solve problems and make communication more effective. This introductory lesson exposes members to the concept of expressions and gives them practice in using expressions to solve problems.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Calendars (any month or year, one per pair or small group)

VOCABULARY

- **Algebraic Expression** – a mathematical statement made up of three things: numbers, operations and variables
- **Variable** – a symbol (such as x or y) that stands for a number we don't yet know

PREPARATION

Draw these two separate grids on the white board before the lesson. Draw squares around the sets of numbers as indicated below:

1	2	3	4	5
8	9	10	11	12
13	14	15	16	17
21	22	23	23	24

9	10	11	12	13
16	17	18	19	20
23	24	25	26	27
30	31			

ADDITIONAL RESOURCE(S)

[Writing Basic Expressions Word Problems](#)

CAREER CONNECTION

Careers that use expressions like these include meteorologist, statistician, air traffic control analyst, environmental mathematician, engineer, programmer, cryptologist and teacher.



LEARN IT

10 minutes

1. **SAY:** Today, we're going to practice using expressions to solve problems that seem impossible. We will be mathematicians!
2. **ASK:** What is an expression? Answer: a mathematical phrase that contains numbers (and/or variables) and arithmetic operations
3. **ASK:** What is a variable? Answer: a symbol (such as x or y) that stands for a number we don't yet know; until we figure it out, we use the symbol
4. **DO:** Call attention to the first grid you've drawn on the white board.
5. **SAY:** Willard the math wizard told his friends: "Draw a square on the calendar around four dates. Tell me the total of the four dates and I'll tell you the number in the top left corner of the square."
6. **ASK:** How did he know?
7. **SAY:** Given the total of four numbers – like the ones indicated here – you can determine the smallest number by using the expression $N/4-4$ – where N is the total.
8. **DO:** Write the expression $N/4-4$ on the white board.
9. **ASK:** What is the total of the four numbers at the top left? Answer: the total is 20
10. **ASK:** If we only have the total of 20, using the expression $N/4-4$, how can we find out the smallest number in the group? Answer: $N=20$ SO $20/4=5$ AND $5-4=1$ (so 1 is the smallest number)
11. **SAY:** Let's try another one; if you look at the numbers at the bottom right, what is the total and how can we then know what the smallest number is? Answer: the total is 80 SO $80/4=20$ AND $20-4=16$ (so 16 is the smallest number)
12. **SAY:** Now we're going to try a nine-cell group, but this time we're going to start with the smallest number and determine the total. The expression to use is $(n+8) \times 9$.
13. **DO:** Write the expression on the white board: $(n+8) \times 9$.
14. **DO:** Call attention to the second grid you've drawn on the white board.



TRY IT

10 minutes

1. **ASK:** members to form pairs or small groups.
2. **SAY:** Try it in your groups using the calendar. Circle four squares and add up the numbers for a total, then use the expression $\frac{N}{4}-4$ to find out the smallest number.
3. **DO:** Give members five minutes to practice using the expression with four squares.
4. **SAY:** Now try the $(n+8) \times 9$ expression with nine squares on your calendars.
5. **DO:** Give members five minutes to practice using the expression with nine squares.



APPLY IT

5 minutes

1. **ASK:** What did you do to solve these problems? Answer: **we used the expressions provided**
2. **SAY:** Remember that mathematical expressions are an efficient way to describe a situation or an event.
3. **ASK:** Can you come up with expressions for these situations?
 - a. Thirteen less than three times a number Answer: $(3n-13)$
 - b. Twice a number, increased by fourteen Answer: $(2n+14)$
 - c. Twenty divided by five times a number Answer: $(20 \div 5n)$
 - d. An electrician charges \$55 per hour and uses \$25 for gasoline; describe this with an expression Answer: $(55n-25)$
 - e. Several kids cleaned a garage and received \$250; how much will each person get? Answer: $(250 \div n)$
4. **CHECK FOR UNDERSTANDING:** If members have trouble using expressions, guide them through the lesson again or help them access the additional resource listed.

Probability, Modeling, Graphing

TIME: 25 minutes

OBJECTIVE: What does it mean when the meteorologist says there is a 50 percent chance of rain today? It means that on past days with the same weather characteristics – such as wind, clouds and humidity – it rained about one half the time. In this lesson, members model weather conditions with a probability spinner to develop an awareness of chance and its effects.

MATERIALS

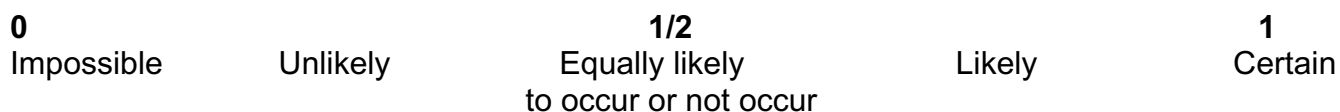
- White board
- Dry-erase markers
- Pens/pencils
- Heavy card stock
- Scissors
- Brads
- Paper clips
- Blank 30-day calendar page (one per member)

VOCABULARY

- **Probability** – a measure of how likely it is that an event will happen
- **Mathematical Model** – a created object used as a substitute for a real-life object because the model is larger, smaller or simpler than the original and therefore easier to study
- **Graph** – a picture that represents data in an organized manner

PREPARATION

Draw the following probability scale on the white board:



ADDITIONAL RESOURCE(S)

[WeatherWizKids](#), [Probability Games](#), [Probability](#), [Intro to Probability](#)

CAREER CONNECTION

Careers that use probability, modeling and graphing include meteorologist, statistician, air traffic control analyst and environmental mathematician.



TRY IT

15 minutes

1. **SAY:** Remember that 50 percent and one-half represent the same portion of a whole. So a circle representing a 50-50 chance of an event occurring is divided into two sections. A two-color spinner, then, is a model of the chances for rain.
2. **ASK:** What is a mathematical model? Answer: *it is something that is made to be like another thing; a mathematical model tries to copy how a real-world thing works*
3. **DO** show members how to make a two-color spinner by cutting a large circle from heavy card stock, attaching a brad in the center and securing a paper clip around the brad. Instruct them to draw a line down the center of the spinner and mark one half “rainy day” and the other half “dry day.”
4. **SAY:** You’re going to work individually to model the chances of rain. Each spin results in a rainy day or dry day. Spin 30 times to simulate a month, and mark the result on your calendar page each time.
5. **DO:** Allow members 10 minutes to complete their spins and fill in their calendars.
6. **ASK:** How many days did it rain, and how many days was it dry?
7. **DO:** Record each member’s rainy-day data on a simple bar graph and compare.



LEARN IT

5 minutes

1. **ASK:** Have you ever based your plans on a meteorologist’s weather report and had to change plans when the weather wasn’t what you expected? Why do you think weather situations can’t be more accurately predicted?
2. **ASK:** What does it mean when meteorologists say that there is a 50 percent chance of rain? Answer: *on past days with similar weather characteristics (such as wind, clouds and humidity), it rained about half the time*
3. **ASK:** What is probability? Answer: *it is the measure of how likely it is that an event will happen*
4. **DO:** Show the group the scale you’ve drawn on the white board.
5. **ASK:** If an event has a 75 percent chance of happening, where would it fall? Answer: *it would fall in the “likely” area of the scale*



APPLY IT

15 minutes

1. **ASK:** What do you notice from your data and the group graph? Answer: **not everyone had the exact same results but they were close**
2. **ASK:** How does the probability spinner model weather events? Answer: **it represents a 50-50 chance of rain occurring**
3. **ASK:** What does a “50-percent chance of rain” means to you? Answer: **it means that a day like this is rainy about half the time**
4. **CHECK FOR UNDERSTANDING:** If members have trouble with the concept of probability, guide them through the lesson again or help them access the additional resources listed.

Shapes and Solids

TIME: 25 minutes

OBJECTIVE: Surgeons have always needed knowledge and skills to perform successful operations. Today they also must be able to do three-dimensional surgery while looking at two-dimensional images, to interpret a physical picture of the body while looking at pictures. In this lesson, members discover the characteristics of three-dimensional solids and how they are constructed with two-dimensional shapes.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Pictures of basic shapes: triangle, square, rectangle, circles
- One set of solid wood or plastic geometric shapes

VOCABULARY

- **Solid figured** – a symbol (such as x or y) that stands for a number we don't yet know
- **Shapes**– two-dimensional objects that have a width and a height)
- **Face** – the flat surface (or side) of a three-dimensional solid object

PREPARATION

Draw or download an image of basic shapes, each on a separate piece of paper: triangle, square, rectangle and circle. Draw a chart on the white board similar to the one below:

Mystery Solid	Front View	Side View	Top View
A			
B			
C			
D			
E			
F			
G			

ADDITIONAL RESOURCE(S)

[Geometric Shapes](#), [Geometry Math Games](#)

CAREER CONNECTION

Careers that use geometry (shapes and solids) include physician, builder, map reader and video game developer.



LEARN IT

3 minutes

1. **SAY:** Today, we're going to explore shapes and solids, to see whether we can identify a three-dimensional solid from two-dimensional shapes. Surgeons need this knowledge and skill to perform successful operations – they need to be able to do three-dimensional surgery while looking at two-dimensional images.
2. **ASK:** Is this a skill you think you could learn?
3. **SAY:** We're going to use the names of two-dimensional shapes – such as triangles, squares, rectangles and circles – to describe one side of a solid object.
4. **SAY:** One side of a solid object is called a “face.” For example, one face of a book is a rectangle shape.
5. **DO:** Review the basic two-dimensional shapes by drawing them on the white board: triangle, square, rectangle and circle.



TRY IT

15 minutes

1. **ASK** members to form pairs or small groups.
2. **ASK** them to prepare a chart similar to the one you drew on the white board in advance.
3. **SAY:** For each solid, I'm going to show you a shape for the front view, the side view and the top view. As I show you each different view, you record it on your charts.
4. **DO:** Use one solid for an example, and show the front, side and top views so members can get an idea of what they look like.
5. **DO:** Present the mystery solids one at a time, by using the pictures of the two-dimensional shapes to show members the front view, side view and top view. Use the shapes indicated below to present each mystery solid. Remind members to record the shapes on their charts for each mystery solid.

Mystery Solid	Front View	Side View	Top View
A	Triangle	Triangle	Circle
B	Rectangle	Rectangle	Circle
C	Triangle	Triangle	Square
D	Square	Square	Square
E	Square	Rectangle	Square
F	Rectangle	Rectangle	Triangle
G	Circle	Circle	Circle

- ASK** members to try to guess what each mystery solid is by looking at the two-dimensional shapes that describe it.
- DO:** Coach members to discover the mystery solids:

Example	Mystery Solid
A	Cone
B	Cylinder
C	Pyramid
D	Cube
E	Rectangular Prism
F	Triangular Prism
G	Sphere



APPLY IT

7 minutes

- ASK:** What is the relationship between geometric shapes and solids? Answer: **geometric shapes make up the sides (or faces) of solids**
- DO:** Give members a chance to describe the shapes that make up the faces of other solids that are available in the room.
- CHECK FOR UNDERSTANDING:** If members have trouble understanding the relationship between shapes and solids, guide them through the lesson again or help them access the additional resources listed.

Ratios and Proportional Relationships

TIME: 25 minutes

OBJECTIVE: Websites are the newspapers and magazines of today for many teens and adults. Creating websites for advertising, relevant content or a personal blog is something that some members might already be contemplating or considering. These sites are often the extension of simpler forms of social media. In this lesson, members practice employing the principles of percentage and geometry as they interpret and create model website templates.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Rulers
- Calculators

VOCABULARY

- **Percent** – the part of a whole when 100 represents all of something (expressed as a fraction or ratio in which the numerator is the number of parts and the denominator is 100)
- **Ratio** – the comparative value of two or more amounts (may be written as 3:4 or as a fraction such as $\frac{3}{4}$)

PREPARATION

Make copies of “Sample Website Templates” (one per pair or small group).

ADDITIONAL RESOURCE(S)

[Ratios, Rates and Proportion](#)

CAREER CONNECTION

Careers that use ratios and proportional relationships include web designer, artistic director, blogger and advertising manager.



LEARN IT

5 minutes

1. **ASK:** How do you interact with the Internet? Do you use social media? Do you use it at school for projects or to check the news?
2. **DO:** Describe to the group some websites you find useful or interesting.
3. **DO:** Discuss the components of various sites such as content, art, music, advertising and space for comments or interactions.
4. **SAY:** This lesson will give you the chance to compare the relative sizes of these different components and then create your ideal web site structure.
5. **ASK:** What is a “ratio?” **Answer:** a ratio shows the relative sizes of two things
6. **SAY:** If there is one boy and three girls in a group, you could show the relative size of the boy population to the whole group as $\frac{1}{4}$ (one boy out of four people) and the relative size of the girl population as $\frac{3}{4}$ (three girls out of four people).
7. **ASK:** What does “percent” mean?
Answer: percent shows how many parts per hundred; if one out of four people are boys, that’s $\frac{25}{100}$ or 25 percent



TRY IT

8 minutes

1. **ASK** members to form pairs or small groups and give each a copy of “Sample Website Templates.”
2. **ASK** pairs or groups to use the “Sample Website Templates” to identify which sites have:
 - a. about 100 percent ads? (B)
 - b. more that 50 percent blog? (A,C,D,F)
 - c. about 25 percent photography? (A,E)
 - d. about 75 percent blog? (A,C)
 - e. about 25 percent ads? (E)
 - f. 0 percent photography? (B,D)
3. **ASK** members to share their answers to the questions (and correct them as necessary).
4. **ASK** members to estimate the percentages of blog and ad space for sites D and E. **Answer:** D – 66 percent blog space and 33 percent ad space; E – 50 percent blog space and 25 percent ad space



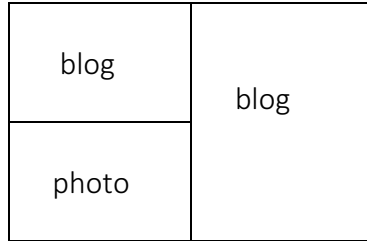
APPLY IT

12 minutes

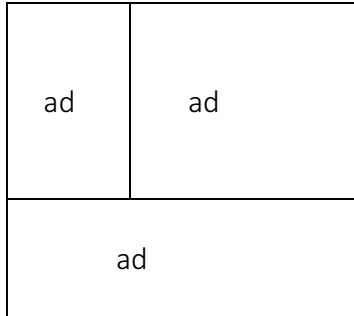
1. **ASK** members to create model website templates with the following space percentages:
 - a. 50 percent blog, 40 percent ads, 10 percent photography
 - b. 33 percent ad, 33 percent photography, 33 percent blog
2. **ASK** members to create their ideal web site design and estimate the percentage of each component (blog, photography, ads).
3. **ASK** members to share the designs they created and see if the rest of the group can estimate the percentage of each component.
4. **CHECK FOR UNDERSTANDING:**
Check for understanding. If members have trouble with ratios and proportional relationships, guide them through the lesson again or help them access the additional resource listed.

Sample Website Templates

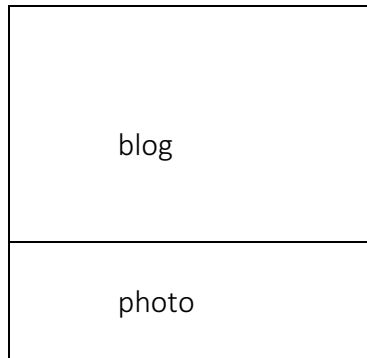
A.



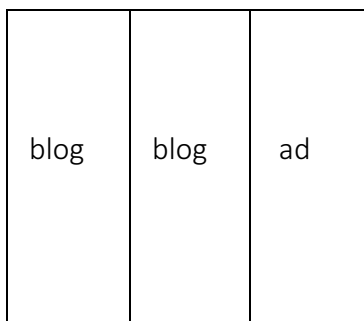
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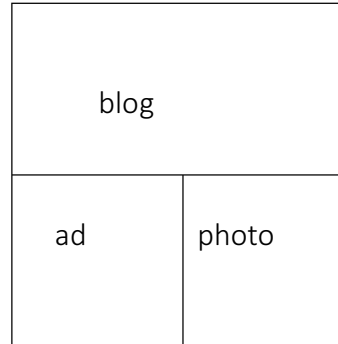
C.



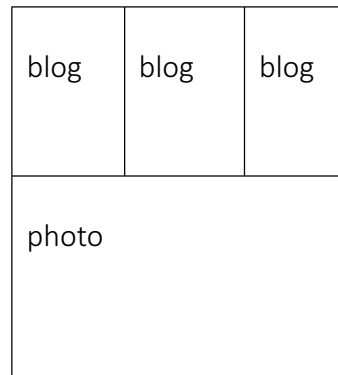
D.



E.



F.



Statistics and Probability

TIME: 25 minutes

OBJECTIVE: How many times have we wondered about what chance was of something happening – a rainy day, getting the flu or winning the lottery? It seems that we're wondering about the possibility of an event happening in a random manner, but in some situations the possibilities can be determined. Probability is the mathematical term for the chance that something will occur. It is described in a variety of ways: 0 means it can never happen, 1 means it will always happen and probabilities in between 0 and 1 are described in terms of percentage: 30 percent, a decimal fraction 0.3 or a common fraction such as $\frac{3}{10}$ or $\frac{30}{100}$. In this lesson, members learn about statistics and probability by using a variety of spinners as models for chance events. They also test and evaluate their spinners using percent and the language of probability.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Colored markers
- Heavy card stock
- Scissors
- Brads
- Paper clips

VOCABULARY

- **Probability** – a measure of how likely it is that an event will happen

ADDITIONAL RESOURCE(S)

[Probability Games](#), [Probability](#), [Intro to Probability](#)

CAREER CONNECTION

Careers that use statistics and probability include epidemiologist, traffic engineer, safety analyst, physician and meteorologist.



LEARN IT

3 minutes

1. **ASK:** Have you ever wondered about the chance of something happening? How do we talk about chance? What are the words that describe the likelihood that something will occur? Answer: **we say that there's a 50 percent chance of something happening**
2. **ASK:** What is "probability?" Answer: **the likelihood or change of a given event happening – often expressed as a fraction or decimal**
3. **SAY:** A probability tells us how likely it is for something to occur. So, when the weatherman says there's a 60 percent chance of rain, that's a probability. When you toss a coin, there's a 50-percent probability (1 out of 2) that "tails" will come up.
4. **ASK:** If today is Thursday, what is the probability that tomorrow is Friday? Answer: **this is certain, so the probability is 1**
5. **ASK:** If today is Monday, what is the probability that tomorrow is Friday? Answer: **this is impossible, so the probability is 0**
6. **ASK:** What are places or situations in real life where chance might be involved? Answers: **winning a game, drawing a certain card or getting heads when flipping a coin**



TRY IT

10 minutes

1. **DO** show members how to make a spinner by cutting a large circle from heavy card stock, attaching a brad in the center and securing a paper clip around the brad.
2. **ASK:** members to form pair or small groups
3. **DO:** Instruct them to work with the spinners to answer the following questions:
 - a. How do you create a 50-50 spinner? Answer: **Make half the circle one response and the other half another response**
 - b. How do you make a two-color spinner with more than two sections where each color is as likely to occur as the other? Answer: **have an even number of sections with the same number for each color**
 - c. How do you make a two-color spinner where one of the colors will come up a certain percent of the time? Answer: **the spinner is more likely to point to a color there is more of, so have several sections of the same color**

- d. Do the results of one spin affect the results of the next spin?
Answer: no, the result of any spin is not affected by the one before.

4. **ASK** members to share their responses (and correct them as necessary).



APPLY IT

12 minutes

1. **DO:** Review the probability equation below:

$$\text{Probability} = \frac{\text{number of ways a certain outcome can occur}}{\text{total possible outcomes}}$$

2. **SAY:** This is an equation you can use to figure the probability of something happening.
3. **DO** instruct them to make a spinner that:
- Shows a $\frac{1}{4}$ chance (or 25 percent probability) that the color red will occur. Answer: a spinner with four parts and one is red (or eight parts and two are red)
 - Shows a $\frac{3}{4}$ chance (or 75 percent probability) that the letter A will occur. Answer: a spinner with four parts and three have the letter A (or eight parts and six have the letter A)
 - Shows a $\frac{1}{3}$ chance (or 33 percent probability) that the color blue will occur. Answer: a spinner with three parts and one is blue (or six parts and two are blue)
4. **CHECK FOR UNDERSTANDING:** If members have trouble with the concept of probability, guide them through the lesson again or help them access the additional resources listed.

Number System

TIME: 25 minutes

OBJECTIVE: Mathematics is a tool for explaining events and even predicting the future. One of those tools is called a “function.” A function is an operation (+, -, x, ÷) and a number that always produces the same outcome (called output) from any number (the input). The concept of a function, a mathematical operation that produces a unique output for a single input, is an important concept in both mathematics and real-life situations. In mathematics, functions model the relationships between variables. In real life, functions control domains such as vending machines, salaries and vehicle mileage. A “function machine” is one model for working with functions. In this lesson, members practice working with function machines, creating some new function machines and using a function to solve a real-life problem.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Calculators

VOCABULARY

- **Function**– an operation (+, -, x, ÷) and a number that always produces the same outcome (called output) from any number (the input)

PREPARATION

Make copies of “Function Machine Worksheet” and “Create Your Own Function Machine” (one per pair or small group).

ADDITIONAL RESOURCE(S)

[Function Machine](#), [Equations and Functions](#)

CAREER CONNECTION

Careers that use the number system and functions include field biologist, civil engineer and economist.



LEARN IT

3 minutes

1. **ASK:** What is a “function?” **Answer:** a function is an operation (+, -, x, ÷) and a number that always produces the same outcome (called output) from any number (the input)
2. **SAY:** You’ve probably worked with a function machine before. It’s a model that takes an input (a number), applies an operation to it (like addition or subtraction) and delivers an output (the answer).
3. **SAY:** We’re going to practice using “function machines” for working with operations such as addition, subtraction, multiplication and division.
4. **SAY:** We’re going to practice using “function machines” for working with operations such as addition, subtraction, multiplication and division.
5. **DO:** Review a basic function machine such as the one below that demonstrates a simple function of “adding two.”

Input	Output
2	4
4	6
9	11
34	36
108	110



TRY IT

10 minutes

1. **ASK** members to form pairs or small groups and distribute copies of “Function Machine Worksheet.”
2. **DO:** Instruct them to discover the function used in each of the function machines.
3. **DO:** Allow 10 minutes for members to complete the function machines.
4. **ASK** members to share their solutions (and correct them as necessary, using the “Function Machine Answer Key”).



APPLY IT

12 minutes

1. **ASK** members to create their own function machines.
2. **DO:** Suggest they choose one of the following situations and create a function machine using examples from real life:
 - a. a cab company that charges \$2 per mile
 - b. a soda or vending machine
 - c. a car's miles per gallon
 - d. an hourly salary
3. **DO:** Invite each pair or group to present their real-life function situation and give others a chance to give feedback.
4. **CHECK FOR UNDERSTANDING:** If members have trouble using functions, guide them through the lesson again or help them access the additional resource listed.

Expressions and Equations

TIME: 25 minutes

OBJECTIVE: An algebraic expression is a mathematical statement that includes one or more operations, (addition, subtraction, multiplication, division) and variables represented by letters, often “x” or “n.” Mathematical expressions are the basis for equations, functions and formulas. Proficiency in using expressions makes it possible to understand abstract mathematics and mathematics in the real world. In this lesson, members connect mathematical expressions with a verbal description and create stories based upon mathematical expressions.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Scissors
- Glue sticks

VOCABULARY

- **Algebraic expressions** – a math statement made up of numbers, operations and variables
- **Operation** – a mathematical process (addition, subtraction, multiplication, division) that combines two or more numbers
- **Variable** – a symbol (such as x or y) that stands for a number we don’t yet know

PREPARATION

Make copies of “Expressions Cards” and “Expressions Recording Sheet” (one per pair or group). Write the following on the white board:

Operation	Descriptors
addition	add to, sum of, more than, increase by
subtraction	subtract by, difference, less than, decrease by
multiplication	times, twice, double, triple, product of, multiply by
division	divide by, into, ratio of, quotient of

ADDITIONAL RESOURCE(S)

[Algebra Expressions](#), [Algebraic Expressions Millionaire](#)

CAREER CONNECTION

Careers that use algebraic expressions include computer programmer, statistician and actuary.



LEARN IT

7 minutes

- ASK:** What is an “algebraic expression?”
Answer: a math statement made up of three things: numbers, operations and variables
- ASK:** What are “operations?” Answer: a mathematical process of carrying out procedures such as addition, subtraction, multiplication and division
- ASK:** What are the four basic operations that expressions include? Answer: addition, subtraction, multiplication and division
- ASK:** What are the other elements of an expression? Answer: numbers and variables
- ASK:** What are “variables?” Answer: a symbol that stands for an unknown quantity (often letters such as “x” or “n”).
- SAY:** In this lesson, we will practice relating mathematical expressions to symbols, words and real-life stories.
- DO:** Demonstrate by writing a few sample expressions on the white board:
 $3n + 5$, $x/3$, $n - 6$
- SAY:** Expressions can be found in equations such as $3x + 3 = 2x + 4$, $x + 2 = 28$ and in functions such as $f(x) = x^2 + 1$, $f(x) + 3x + 5$.
- DO:** Share an example of an expression in words, symbols and real-life stories:

In words	In symbols	In real-life stories
twelve less than a number	$x - 12$	twelve ducks were missing out of 23



TRY IT

10 minutes

1. **ASK** members to form pairs or small groups and distribute copies of “Expression Cards” and “Expression Recording Sheets” to each.
2. **DO:** Instruct them to cut out the cards and then glue together the symbols with the word descriptions that match them.
3. **ASK** members to share their match-ups (and correct them as needed).



APPLY IT

8 minutes

1. **DO:** Instruct each pair or group to now create a story that is explained by one set of symbols and words.
2. **ASK:** pairs or groups to share their real-life stories.
3. **CHECK FOR UNDERSTANDING:** If members have trouble using expressions, guide them through the lesson again or help them access the additional resource listed.

Expression Cards

$15-n$	sixteen divided by four
$18 + 16 + 12$	eight plus seven multiplied by two
$16 \div 4$	add fifteen to a number
$2 \times (8+7)$	twice as much as the number
$n + 15$	multiply twenty-eight by three
$2n$	two consecutive integers
n and $n + 1$	subtract a number from 15
$25n$	double a number
$n \times 8$	the quotient of n and 23
$n/2$	six more than two times a number
$n/4 + 2$	multiply a number by eight
28×3	the product of twenty-five and a number
$n^2 + 5$	seven times as much as nine
$n \div 10$	the ratio of a number and ten
$4 + 3$	decrease 11 by a number
7×9	the sum of four and three
$2n + 6$	add eighteen, sixteen and twelve
$11-n$	divide a number in half
$n \times n$	divide a number into 4 pieces and add two
$n/23$	square the number and add 5

Modeling and Graphing

TIME: 25 minutes

OBJECTIVE: Graphs are ways to visualize and explain information. Line graphs generally are used to demonstrate change over time; bar graphs, also called histograms, compare amounts; and circle graphs or pie charts compare parts of a whole. Most difficulties members have relate to understanding what the graphs mean, how the data relates to the real world and describing what they know in common language. In this lesson, members examine line graphs that relate to something that is common for everyone: eating popcorn at the movies. On the graphs, the vertical (y) axis represents the amount of popcorn and the horizontal (x) axis represents time.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper

VOCABULARY

- **Graph** – a picture that represents data in an organized manner
- **Bar graph** – a picture that uses bars to show quantities so they can be easily compared

PREPARATION

Make copies of “Munchie Madness Graphs” (one per pair or group).

ADDITIONAL RESOURCE(S)

[Line Graphs](#), [Math Goodies Line Graphs](#)

CAREER CONNECTION

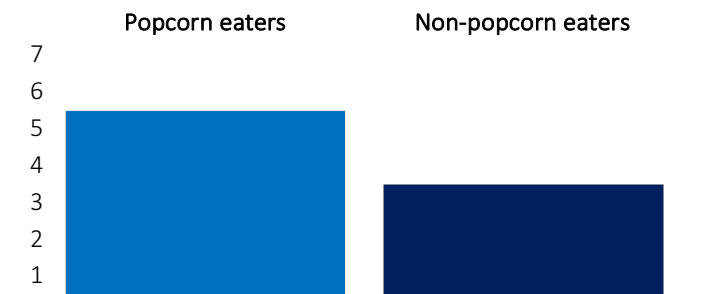
Careers that use graphing include business person, political analyst and purchasing agent.



LEARN IT

5 minutes

1. **ASK:** What is the purpose of a graph?
Answer: **to visualize something graphically that happens in the real world**
2. **ASK:** What kinds of graphs are there?
Answer: **line graphs, bar graphs and circle graphs (or pie charts)**
3. **SAY:** Bar graphs are good for comparing amounts of things. Let's look at an example of a bar graph.
4. **ASK:** How many of you have eaten popcorn while watching a movie?
5. **DO:** Create a simple bar graph showing the results on the white board.



6. **DO:** Show the “Munchie Madness Graphs” and explain that each graph describes how popcorn is eaten in each of the situations. Make sure all members understand the graphs.



TRY IT

15 minutes

1. **ASK** members to form pairs or small groups and distribute copies of “Munchie Madness Graphs” to each.
2. **ASK** each pair or group to interpret each of the graphs.
3. **ASK** pairs or groups to share their results (and correct them as necessary, using “Munchie Madness Graphs Answer Key”)

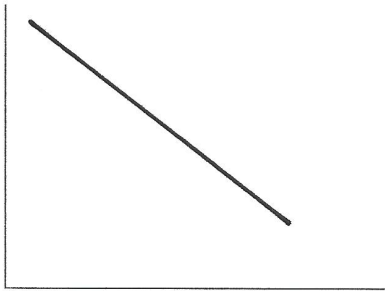


APPLY IT

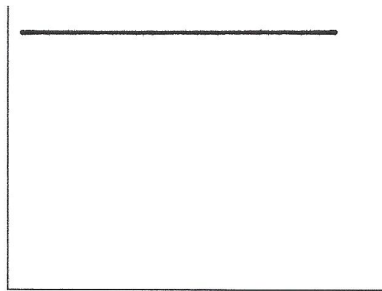
5 minutes

1. **ASK** pairs or groups to work together to create a graph on the topic of their choice and give others the opportunity to interpret it.
2. **DO:** Allow pairs or groups five minutes to create their graphs.
3. **DO:** Invite them to share with others and allow them to interpret.
4. **ASK:** What have you discovered from analyzing the graphs? What can you get from a graph that you cannot get from just the data? Answer: **a visual illustration of results, trends or patterns**
5. **CHECK FOR UNDERSTANDING:** If members have trouble using graphs, guide them through the lesson again or help them access the additional resource listed.

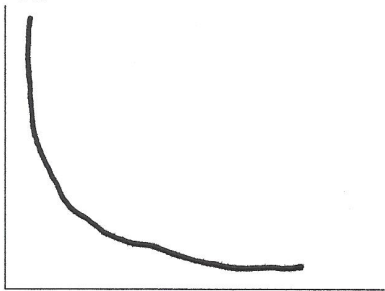
Munchie Madness Graphs



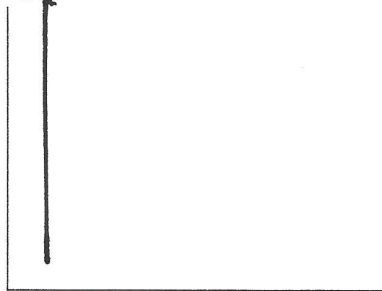
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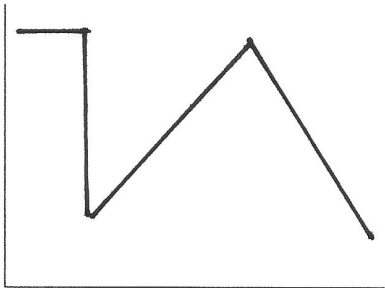
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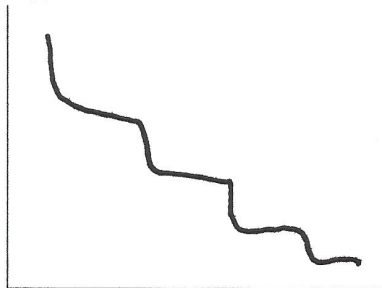
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G.



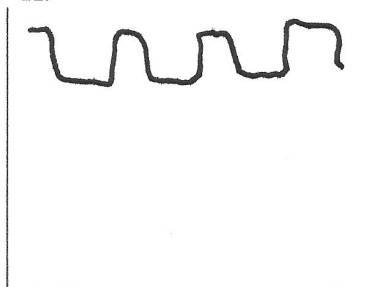
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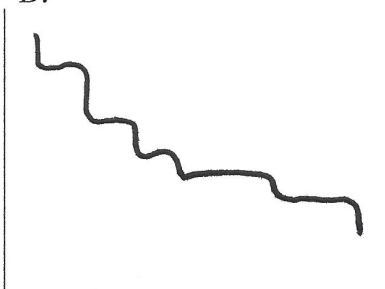
H.



D.



I.



E.



J.

Munchie Madness Graphs (Answer Key)

Possible answers (members may suggest other possible solutions):

- A. Popcorn eaten at a consistent rate
- B. Popcorn is eaten very fast and slows down as the amount of popcorn is reduced
- C. Box is dropped, then replenished, popcorn then is eaten at a consistent rate
- D. Got the box halfway through the movie, ate at a consistent rate
- E. Popcorn eaten by small handfuls
- F. Got the box, didn't eat any of it
- G. Dropped the box, didn't get any more
- H. Popcorn eaten by large handfuls
- I. Figure this out . . . it looks like popcorn is put back into the box after handfuls removed
- J. Didn't get popcorn

Geometry, Ratio and Proportion

TIME: 25 minutes

OBJECTIVE: In mathematics, there are variables that change and constants that remain the same. The constants are involved in the functions and formulas used to solve problems. One of the most famous constants is pi, which is represented by the symbol π . Pi represents the ratio of the circumference (C) to the diameter (D) of a circle. Most of us know that the ratio C/D approximates 3.1416. Pi is a decimal that does not become even or contain any patterns; it is what is called an “irrational number.” In this lesson, members collect data (measuring the circumference and diameter of a variety of circles) and calculate ratios to determine if they can duplicate the value of the mathematical constant pi (π).

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Variety of items for making circles (different-sized can lids, plastic cups)
- Heavy card stock
- Scissors
- String
- Rulers
- Calculators

VOCABULARY

- **Circumference** – the distance around a circle; the circle’s perimeter
- **Diameter** – a straight line passing through the center of a circle to touch both sides of the circumference and divide it into two equal parts
- **Pi** – the ratio of the circumference of a circle to its diameter

PREPARATION

Make one copy of “Pi: the First 400 Decimal Places.” Draw a chart like this on the white board:

Object	Circumference (C) (cm)	Diameter (D) (cm)	C/D

ADDITIONAL RESOURCE(S)

[Geometry Practice](#)

CAREER CONNECTION

Careers that use geometry, ratio and proportions include historian, mathematician and scientist.



LEARN IT

5 minutes

1. **ASK:** What does circumference mean?
Answer: **the distance around a circle; the circle's perimeter**
2. **ASK:** What is diameter?
Answer: **a line that runs through the center of a circle, dividing it into two equal parts.**
3. **SAY:** Throughout history, mathematicians have used formulas to solve problems. At the core of the equations is a constant, a number that doesn't change, called pi, symbolized by π and pronounced "pie."
4. **SAY:** Pi is a name given to the ratio of the circumference of a circle to the diameter. That means, for any circle, you can divide the circumference (the distance around the circle) by the diameter and always get exactly the same number. It doesn't matter how big or small the circle is, pi remains the same.
5. **DO:** Show the copy of "Pi: the first 400 Decimal Places."
6. **ASK:** If pi is the ratio of the circumference of a circle (C) to the diameter (D), how would you write that as a mathematical expression?
Answer: **C/D (C divided by D)**



TRY IT

10 minutes

1. **ASK** members to form pairs or small groups.
2. **SAY:** You're going to work together to see how close you can come to pi (3.1416) when measuring the ratio of the circumference of a circle to its diameter.
3. **ASK** pairs or groups to cut out several different size circles from card stock, measure the diameter and circumference of these circles and record their results on a chart similar to the one you drew on the white board.
4. **DO:** Suggest that members measure in centimeters.
5. **DO:** Demonstrate how to measure circumference by rolling the object along a ruler or measuring it with string.



APPLY IT

10 minutes

1. **ASK** each pair or group to average the C/D results of the circles they measured.
2. **DO:** Write all results on the white board and compare them with the expected 3.1416.
3. **ASK** members what they think caused the differences, if any.
4. **ASK:** Do you think you would get a precise result if you used the equation for the area of a circle: $\text{area} = \pi r^2$? Why or why not?
5. **CHECK FOR UNDERSTANDING:** If members have trouble using ratio and proportion, guide them through the lesson again or help them access the additional resource listed.

Pi: the First 400 Decimal Places

3. 1415926535 8979323846 2643383279 5028841971 6939937510
5820974944 5923078164 0628620899 8628034825 3421170679
8214808651 3282306647 0938446095 5058223172 5359408128
4811174502 8410270193 8521105559 6446229489 5493038196
4428810975 6659334461 2847564823 3786783165 2712019091
4564856692 3460348610 4543266482 1339360726 0249141273
7245870066 0631558817 4881520920 9628292540 9171536436
7892590360 0113305305 4882046652 1384146951 9415116094

Integers, Modeling and Graphing

TIME: 25 minutes

OBJECTIVE: Geographers are interested in many facts about our natural world such as landforms, natural resources, types of soil and climate. They also examine things that humans create, such as transportation systems and the organization of cities. Some geographers spend their time in the field collecting information. Creating maps, charts and graphs can also be part of the job. In this lesson, members use integers, graphs and scale drawings to compare the high and low points of the seven continents of planet Earth.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Markers
- Kraft or butcher paper
- Calculators

VOCABULARY

- **Integer** – a whole number that can be positive, negative or zero
- **Number line** – a straight line on which each point represents a number
- **Scale drawing** – an enlarged or reduced drawing of something
- **Bar graph** – a picture that uses bars to show quantities so they can be easily compared

PREPARATION

Make copies of “Continental High and Low Points Data Sheet” (one per pair or group).

ADDITIONAL RESOURCE(S)

[Integer Math Game](#)

CAREER CONNECTION

Careers that use the number system, modeling and graphing include geographer, surveyor or historian.



LEARN IT

5 minutes

- SAY:** It's taken geographers many years to survey the Earth. Now in many places of each continent, specific points have been marked so that other measurements can be made. The points, called benchmarks, often have a plaque listing the location, latitude, longitude and, in some cases, altitude above sea level. In this lesson, we'll be measuring the high and low points of the seven continents.
- ASK:** What is the definition of the word "integer?" Answer: **an integer is a whole number that can be positive, negative or zero**
- DO:** Draw a number line with zero in the center and whole numbers extending to the right and negative integers extending to the left.
- SAY:** This is called a "number line"—a straight line on which each point represents a number. It's a geometric representation of numerical values.
- SAY:** In measuring the high and low points, we'll use negative numbers to describe the distance below sea level. Negative integers also can be used to describe below-zero temperatures, debt, overweight-underweight, over-under speed limits and ocean depths.
- SAY:** We're going to be measuring in meters (m), which is approximately 3.3 feet – a little more than a yard in length.



TRY IT

15 minutes

- DO:** Distribute copies of "Continental High and Low Points Data Sheet."
- ASK** members to examine the data.
- ASK:** What do you notice: Which continent has the highest high point? Which has the lowest high point? Is there a continent with both the highest and lowest points on earth?
- ASK** members to form pairs or small groups and use the data to create a visual representation to compare the continental high and low points.
- SAY:** You can create one of the following:
 - a *number line* – like the one on the white board that compares the continental high and low points (the scales for each dimension might have to be different)
 - a *scale drawing* – a reduced drawing of the heights and depressions of the continents (using sea level as baseline and showing high and low points above and below sea level)
 - a *bar graph* – a graph with horizontal or vertical bars whose lengths proportionally represent the differences between the high and low for each continent
- DO:** Give pairs or groups Kraft paper and markers.



APPLY IT

5 minutes

1. **ASK** members to share their results.
2. **DO:** Discuss what members have learned about the earth and how integers helped them.
3. **CHECK FOR UNDERSTANDING:** If members have trouble understanding integers, guide them through the lesson again or help them access the additional resource listed.

Continental High and Low Points Data Sheet

Continent	Highest Point (m)	Lowest Point (m)
Asia	Mt. Everest* Nepal-China 8,850	Dead Sea Israel-Jordan -411
Africa	Mt. Kilimanjaro Tanzania 5,895	Lake Assal Djibouti -156
North America	Denali (Mt. McKinley) Alaska 6,194	Death Valley California -86
South America	Mt. Aconcagua Argentina 6,960	Valdes Peninsula Argentina -40
Antarctica	Vinson Massif Ellsworth Mts. 4,897	Bentley Subglacial Trench -2,538
Europe	Mt. Elbrus Russia-Georgia 5,642	Caspian Sea Russia-Kazakhstan -28
Australia	Mt. Kosciusko New South Wales 2,228	Lake Eyre South Australia -12

*Known in [Nepal](#) as Sagarmāthā and in China as Chomolungma

Modeling and Graphing

TIME: 25 minutes

OBJECTIVE: These games demonstrate some important aspects of Native American values and culture. Like most games, they involve suspense, competition or a skill challenge. In this lesson, members modify games played by Native American youth to create a fair game for children and collect and present data that demonstrate their results. They can experience some qualities of Native American life through playing these games.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Paper
- Markers
- Variety of dry beans, beads, small plastic objects, small balls of paper or other materials
- Small cups, jar lids, abalone shells or circles marked on the floor
- Basket or other container
- Meter sticks

VOCABULARY

- **Line chart or graph** – a picture that uses lines to connect individual numeric points that represent data

PREPARATION

Set up an area to demonstrate the Native American games. Mark circles on the floor or place shells or other containers to demonstrate *Ball Drop*. Mark beans, beads or small plastic objects on one side so you can demonstrate *Bean Flip*.

ADDITIONAL RESOURCE(S)

[Native American Games](#), [Graphing Linear Functions Word Problems](#), [Constructing Line Graphs](#)

CAREER CONNECTION

Careers that use modeling and graphing include anthropologist, game designer, ethnologist and historian.



LEARN IT

5 minutes

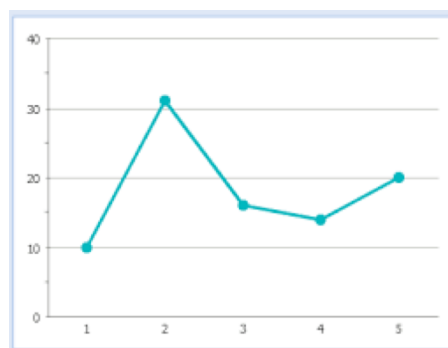
1. **SAY:** In this activity, you'll be exploring some Native American games in order to develop your own game that is fair and functional. You'll monitor the success and failure of different materials you try so you can find the most effective ones.
2. **SAY:** There are two kinds of games played by Native American youth: games of chance and games of skill. Games of chance are played with sticks, dice, or involve guessing. Skill games require physical and/or mental abilities. Games are played with natural materials.
3. **SAY:** To develop your own game, you'll choose from two Native American game, then modify the directions and present data that describe your game. The two games you'll choose from are:
 - a. **Ball Drop** (Northwest Coast)
Pebbles or beads are dropped into a seashell. Points are scored by counting the pebbles that remain in the shell after being dropped.
 - b. **Bean Flip** (Oklahoma & North Carolina)
Beans or peach pits with one side marked are placed in a basket with unmarked sides up. The basket is held and the beans flipped into the air. Points are scored by counting beans or pits whose marked sides are visible when they land.



TRY IT

15 minutes

1. **ASK** members to form pairs or small groups and select one of the games to remodel.
2. **DO:** Demonstrate both games.
3. **DO:** Suggest to members that they attempt and record at least 30 trials with different materials to make sure they are comfortable about construction and rules for their game.
4. **DO:** Suggest that pairs or groups create a simple line chart or graph to record their 30 trials to see whether the game works and is fair.
5. **SAY:** A line chart or graph connects individual numeric data points.
6. **DO:** Draw a simple line chart or graph on the white board as an example:



7. **DO:** Give pairs or groups 15 minutes to remodel their games.



APPLY IT

5 minutes

1. **ASK** pairs or groups to present their games for others and prove with the data they recorded that it is a fair and functional game experience.
2. **CHECK FOR UNDERSTANDING:** If members have trouble recording and graphing data, guide them through the lesson again or help them access the additional resource listed

Data Collection and Graphing

TIME: 25 minutes

OBJECTIVE: Polls are conducted to obtain information for decision-making in politics, medicine, education and other areas. A well-constructed poll procures data from a small selection that allows for hypotheses about the entire population in question. A poorly constructed or implemented poll leads to inaccurate information and imperfect decisions. In this lesson, members create a poll based upon a question that produces a variety of data and create graphs and/or visual representations of the results.

MATERIALS

- White board
- Dry-erase markers
- Pens/pencils
- Markers
- Paper
- Graph paper
- Rulers

VOCABULARY

- **Line chart or graph** – a picture that uses lines to connect individual numeric points that represent data
- **Bar graph** – a picture that uses bars to show quantities so they can be easily compared
- **Circle graph** – a graph displaying categories of data in the form of a circle, which is divided into a number of pie-shaped sectors to represent portions of the data (same as a pie chart)
- **Pie chart** – a graph displaying categories of data in the form of a circle, which is divided into a number of pie-shaped sectors to represent portions of the data (same as a circle graph)
- **Pictograph/Pictogram** – demonstrates data visually and compares it using picture symbols

PREPARATION

Makes copies of “Model Data Collecting Chart” (one per pair or group).

ADDITIONAL RESOURCE(S)

[Take Kids Polls](#), [Data and Graphs](#)

CAREER CONNECTION

Careers that use data collection and graphing include reporter, epidemiologist, politician, demographer and educator.



LEARN IT

5 minutes

1. **ASK:** Have you ever been asked a question as part of a survey or poll?
2. **SAY:** The best polls relate to the people being interviewed. In this lesson, we'll practice developing a poll with questions related to an interesting topic and presenting the results.
3. **SAY:** You can choose to present your data using one of the following graph types:
 - a. **Line graph:** demonstrates change in attitudes or for demonstrating attitudes as time goes by. A line graph compares two variables on a grid with time listed on the horizontal axis (x) and the quantity demonstrated on the vertical axis (y).
 - b. **Bar graph:** presents and compares data. There are two main types of bar graphs: horizontal and vertical. Bars vary in height or length by amount or frequency.
 - c. **Circle graph (pie charts):** represents categories of data. A circle graph is a circle divided into segments that demonstrate the percentage of each variable in relation to 100 percent of component studied.
 - d. **Pictograph (pictogram):** demonstrates data visually and compares it using picture symbols.



TRY IT

15 minutes

1. **SAY:** Today we'll be creating polls, collecting information and visualizing the information we collect in a graph. You can choose from a variety of poll types:
 - a. Level One: answers to question without connection to demographics
 - b. Level Two: answers based upon one variable such as gender, age, school
 - c. Level Three: answers based upon two or more variables such as gender, age, school
2. **ASK** members to form pairs or small groups.
3. **DO:** Instruct members to select questions to poll – from their own ideas or from the following topics: favorite cookie, favorite recording artist, favorite type of food, favorite TV show, favorite school subject; number of siblings, number of pets; ways members get to the Club; musical instrument you play; or sport you play.
4. **ASK** each pair or group to:
 - a. decide on how they will collect the data
 - b. develop a data collection chart similar to the model
 - c. interview other members
 - d. organize the information on a data collecting chart
 - e. create a graph to visualize the results



APPLY IT

5 minutes

1. **ASK** pairs or groups to describe their results with their graphs.
2. **DO:** Discuss the problems and benefits of conducting polls.
3. **CHECK FOR UNDERSTANDING:** If members have trouble collecting and graphing data, guide them through the lesson again or help them access the additional resource listed.

Model Data Collecting Chart

Favorites		
Girls	Cookie	chocolate chip oatmeal other
	Music	
	Food	
	Movie	
Boys	Cookie	chocolate chip oatmeal other
	Music	
	Food	
	Music	