

2020

Erie Rise Leadership
Academy Charter School

Parent Lesson Plan

[PARENT LESSON PLAN]

6th Grade Week 2 March 30-April 3

Contents

INTRODUCTION	1
HELPFUL INFORMATION	3
Distribution Sites/Information	3
Leadership Team	3
DIGITAL LESSON PACING GUIDE	4
ConnectED Instructions	4
USATestPrep Instructions	4
Pacing Guide	4
ELA PRINT MATERIAL	5
MATH PRINT MATERIALS	6
SCIENCE/SOCIAL STUDIES PRINT MATERIAL	7
ADDITIONAL RESOURCES (EDUCATIONAL)	8

INTRODUCTION

Hello Parents!

Included in this packet is a week's worth of printed ELA, Mathematics, and Science/Social Studies work for your students while they are at home. Each day is separated into the 3 content areas for the printed material. If you have access to the digital curriculum, a pacing guide is also provided outlining the digital component assigned for each specific day. If you need technology, please contact the school and we can make it available to you. Also remember, USATestPrep is always an option!

We know some of this material maybe be challenging, but try your best to complete it! Hopefully we will see you back in the classroom soon and will be able to go over all the information.

Printed materials may be turned into to the distribution centers once completed, but it is not a requirement.

Mrs. Will will be available on Youtube Live every day from 10AM-11AM to assist with curriculum questions and/or any resource questions for parents or students.

Stay safe and healthy everyone!

Missing seeing everyone's smiling face! Remember to wash your hands!

Educationally Yours ,
Mrs. Veronica Will

HELPFUL INFORMATION

Distribution Sites/Information

Food/Curriculum distribution will take place at:

Erie Rise Leadership Academy Charter School
1006 West 10th Street
Erie, PA 16502

Monday and Wednesday from 9AM until 12PM

Leadership Team

Mr. Terry Lang, CEO: 814 812-0503
Mrs. Veronica Will, Principal: 814 873-5158
Mr. Aubrey Favors, HR: 814 812-3026
Mr. Kirk Paskell, Transportation: 814 566-0002
Mr. Homer Smith, PR: 814 392-3413
Mrs. Pearl Jeffries, Social Services: 814 722-5056

DIGITAL LESSON PACING GUIDE

ConnectED Instructions

Please see attached instructions for accessing the digital curriculum.

USATestPrep Instructions

Please see attached instructions for accessing this test-prep site.

If you have access to high speed internet, below are the assignments the teachers have assigned for the various content areas:

Digital Pacing Guide

	Monday	Tuesday	Wednesday	Thursday	Friday
ELA/Writing	ConnectEd StudySync Assignment: Monday March 30	ConnectEd StudySync Assignment: Monday March 31	ConnectEd StudySync Assignment: Monday April 1	ConnectEd StudySync Assignment: Monday April 2	ConnectEd StudySync Assignment : Monday April 3
Math	Lesson: Pearson Chapter 5 Lesson 2: Equivalent Ratios	Lesson: Pearson Chapter 5 Lesson 2: Equivalent Ratios	Lesson: Pearson Chapter 5 Lesson 2: Equivalent Ratios	Lesson: Pearson Chapter 5 Lesson 2: Equivalent Ratios	Lesson: Pearson Chapter 5 Lesson 2: Equivalent Ratios
Science	Pearson Lesson: Chapter 3 Lesson 2 (printed) USATestPrep	Pearson Lesson: Chapter 3 Lesson 2 (printed) USATestPrep	Pearson Lesson: Chapter 3 Lesson 2 (printed) USATestPrep	Pearson Lesson: Chapter 3 Lesson 2 (printed) USATestPrep	Pearson Lesson: Chapter 3 Lesson 2 (printed) USATestPrep
Social Studies	Lesson: Chapter 13: Intro to Chapter USA Test Prep	Lesson: Chapter 13: Place and Time USA Test Prep	Lesson: Chapter 13: Lesson 1 USA Test Prep	Lesson: Chapter 13 Lesson 2 USA Test Prep	Lesson: Chapter 13 Lesson 3 USA Test Prep

ELA PRINT MATERIAL

Writing: Spelling Words Packet

- Students can complete the packet at their own pace throughout the week.

Packet Includes:

- 20 Word Spelling List
- Spelling Bee Packet (see below for more information)
- Word scramble
- Alphabetical Order
- Finding the missing letter
- Find the correct spelling
- Create Sentences
- Define each word

The spelling bee packet gives the correct spellings and the definitions for the words on their list. Students may use this to complete their work, they will need to search for each word in the packet. Students may want to keep the spelling bee packet for future use.

Students may go on TypingClub or USATest Prep for more ELA practice.

Reading:

- Go to <https://connected.mcgraw-hill.com/connected/login.do>
- Login in using personal username and password
 - 6th Grade: Launch Study Sync
 - Launch Study Sync AGAIN
 - Click assignments in top/center of screen
 - Complete assignments daily by DATE
 - Don't forget to click SUBMIT when you've completed it

MATH PRINT MATERIALS

Day 1:

1. Complete Basic Facts - Create Flashcards, time how many they get correct in 5 mins
 - a. Your student will know what basic facts s/he is working on.
2. Read and work through the first two examples in the printed **Coach Book Lesson**
 - a. It should walk you step by step how to work each problem.
3. Work on Pearsonrealize.com
 - a. This will align with the Coach Book Lessons
4. Complete the online **USATestPrep** material
5. Play Prodigy
 - a. These questions always deal with what is done in class, what is ahead, and what your student needs work on.

Day 2:

6. Complete Basic Facts - Create Flashcards, time how many they get correct in 5 mins
 - a. Your student will know what basic facts s/he is working on.
7. Read and work through the first two examples in the printed **Coach Book Lesson**
 - a. It should walk you step by step how to work each problem.
8. Work on Pearsonrealize.com
 - a. This will align with the Coach Book Lessons
9. Complete the online **USATestPrep** material
10. Play Prodigy
 - a. These questions always deal with what is done in class, what is ahead, and what your student needs work on.

Day 3:

11. Complete Basic Facts - Create Flashcards, time how many they get correct in 5 mins
 - a. Your student will know what basic facts s/he is working on.
12. Read and work through the problems.
 - a. Frustrated? STOP! Try again tomorrow.
13. Work on Pearsonrealize.com
 - a. This will align with the Coach Book Lessons
14. Complete the online **USATestPrep** material
15. Play Prodigy
 - a. These questions always deal with what is done in class, what is ahead, and what your student needs work on.

Day 4:

16. Complete Basic Facts - Create Flashcards, time how many they get correct in 5 mins
 - a. Your student will know what basic facts s/he is working on.
17. Read and work through the problems.
 - a. Frustrated? STOP! Try again tomorrow.
18. Work on Pearsonrealize.com
 - a. This will align with the Coach Book Lessons
19. Complete the online **USATestPrep** material
20. Play Prodigy
 - a. These questions always deal with what is done in class, what is ahead, and what your student needs work on.

Day 5:

21. Complete Basic Facts - Create Flashcards, time how many they get correct in 5 mins
 - a. Your student will know what basic facts s/he is working on.
22. Read and work through the problems.
 - a. Frustrated? STOP! Try again tomorrow.
23. Work on Pearsonrealize.com
 - a. This will align with the Coach Book Lessons
24. Complete the online **USATestPrep** material
25. Play Prodigy
 - a. These questions always deal with what is done in class, what is ahead, and what your student needs work on.

SCIENCE/SOCIAL STUDIES PRINT MATERIAL

Science: Chapter 3 Lesson 2: Understanding Machines (pages 76-83, printed)

- **Day 1:**
 - Read pages 76-78
 - Highlight or underline important information and vocabulary words
 - Answer interactive questions while reading
- **Day 2:**
 - Read pages 79-81
 - Highlight or underline important information and vocabulary words
 - Answer interactive questions while reading
- **Day 3:**
 - Read pages 82-83
 - Highlight or underline important information and vocabulary words
 - Answer interactive questions while reading
- **Day 4:**
 - Use the lesson pages to help complete the worksheet titled 'Review and Reinforce Understanding Machines'
- **Day 5:**
 - Use the lesson pages to help complete the worksheet titled 'Lesson Quiz Understanding Machines'

Social Studies:

The textbook used in class is available online to use.

- **Day 1:**
 - Using either the online or print material, complete the Chapter Introduction.
 - USA Test Prep assignments are due on Wednesday April 1st
 - Course material is also available online.
- **Day 2:**
 - Using either the online or print material, complete the Chapter: Place and Time material.
 - USA Test Prep assignments are due tomorrow, April 1st.
 - Course material is also available online.

- **Day 3:**
 - Using either the online or print material, complete the Chapter 12: Lesson 1 Material.
 - USA Test Prep assignments are due Friday, April 3rd.
 - Course material is also available online.

- **Day 4:**
 - Using either the online or print material, complete the Chapter 12: Lesson 2 Material.
 - USA Test Prep assignments are due tomorrow, April 3rd.
 - Course material is also available online.

- **Day 5:**
 - Using either the online or print material, complete Chapter 12: Lesson 3 Material.
 - USA Test Prep assignments are due today!
 - Course material is also available online.

ADDITIONAL RESOURCES (EDUCATIONAL)

Included are a list of hand selected resources for students with internet to use at home.

<https://my.mheducation.com/login>

<https://www.usatestprep.com/>

<https://www.cdc.gov/flu/pandemic-resources/1918-commemoration/pandemic-timeline-1918.htm>

Spelling Bee Study Guide

Ms. Ritz

*Test date April 3, 2020

1. Brought
2. Certain
3. Transit
4. Garnet
5. Plaid
6. Cottage
7. Profound
8. Generation
9. Incident
10. Mason
11. Batteries
12. Exhibits
13. Series
14. Closet
15. Channel
16. Domain
17. Nervous
18. Solar
19. Fault
20. Episode

Unscramble each of the words.

Brought	Certain	Transit	Garnet
Plaid	Cottage	Profound	Generation
Incident	Mason	Batteries	Exhibits
Series	Closet	Channel	Domain
Nerious	Solar	Fault	Episode

Answers

- 1) aittnsr _____
- 2) eacnnhl _____
- 3) ertstieab _____
- 4) sthbeixi _____
- 5) rsisee _____
- 6) lutaf _____
- 7) snoam _____
- 8) dicinten _____
- 9) pdfuorno _____
- 10) actoget _____
- 11) eposedio _____
- 12) amonid _____
- 13) uobghtr _____
- 14) ilpda _____
- 15) alsro _____
- 16) argtne _____
- 17) lcteso _____
- 18) oitegenrna _____
- 19) unsorev _____
- 20) cnetari _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Find each word.

Brought
Plaid
Incident
Series
NervousCertian
Cottage
Mason
Closes
SolarTransit
Profound
Batteries
Channel
VaultGarnet
Generation
Exhibits
Domain
Episode

G N E R V O U S X S V E R F C
 D C E R T I A N E T E Y M A M
 B R O U G H T I H C X U A A K
 S E R I E S R E W E H P S V A
 S O L A R E P P G G I Y O I N
 T G N L T S R I X E B V N Q I
 R M T T B G O S J N I N G Z N
 A G A C O I F O L E T F A J C
 N B D O C T O D F R S A R O I
 S U O T H N U E A A C U N X D
 I V M T A H N Y A T L L E Z E
 T B A A N E D K Z I O T T N N
 R C I G N O Q T K O S D S P T
 R O N E E T S K N N E X B W Z
 P U H T L P L A I D T E R O C



Order the words from A to Z.

Generation	Exhibits	Nervous	Incident
Batteries	Mason	Plaid	Channel
Garnet	Brought	Fault	Series
Transit	Domain	Episode	Certain
Profound	Solar	Cottage	Closet

Answers

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____
- 14) _____
- 15) _____
- 16) _____
- 17) _____
- 18) _____
- 19) _____
- 20) _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____



Fill in the missing letters to create words from your spelling list.

Brought	Certain	Transit	Garnet
Plaid	Cottage	Profound	Generation
Incident	Mason	Batteries	Exhibits
Series	Closet	Channel	Domain
Nervous	Solar	Fault	Episode

Answers

1) d o _ a _ n _____

2) _ e _ t _ _ n _____

3) _ e _ _ r _ _ i o n _____

4) _ _ a _ d _____

5) _ _ r v _ _ s _____

6) e p _ _ o _ _ _____

7) e _ h _ b _ t _ _____

8) _ _ u _ t _____

9) t r _ _ s _ _ _____

10) b _ _ u g _ _ _____

11) s _ _ a _ _____

12) i n c _ _ e n _ _____

13) p r o _ o _ _ d _____

14) c _ t _ _ _ e _____

15) c l _ s _ t _____

16) b _ t t e r _ _ _ _____

17) _ e r i e _ _____

18) m _ _ o n _____

19) _ a r n _ t _____

20) c h a _ _ e _ _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Use the word listed in a sentence.

Brought
Plaid
Incident
Series
Nervous

Certian
Cottage
Mason
Closet
Solar

Transit
Profound
Batteries
Channel
Fault

Garnet
Generation
Exhibits
Domain
Episode

1) Transit

2) Incident

3) Closet

4) Channel

5) Garnet

6) Cottage

7) Nervous

8) Fault

9) Series

10) Mason

11) Solar

12) Profound

13) Plaid

14) Brought

15) Generation

16) Batteries

17) Domain

18) Exhibits

19) Episode

20) Certian

Define each word.

Brought	Certain	Transit	Garnet
Plaid	Cottage	Profound	Generation
Incident	Mason	Batteries	Exhibits
Series	Closet	Channel	Domain
Nervous	Solar	Fault	Episode

- 1) Domain (Part of Speech) _____

- 2) Solar (Part of Speech) _____

- 3) Exhibits (Part of Speech) _____

- 4) Nervous (Part of Speech) _____

- 5) Channel (Part of Speech) _____

- 6) Generation (Part of Speech) _____

- 7) Garnet (Part of Speech) _____

- 8) Batteries (Part of Speech) _____

- 9) Series (Part of Speech) _____

- 10) Plaid (Part of Speech) _____

- 11) Cottage (Part of Speech) _____

- 12) Certian (Part of Speech) _____

- 13) Fault (Part of Speech) _____

- 14) Closet (Part of Speech) _____

- 15) Episode (Part of Speech) _____

- 16) Profound (Part of Speech) _____

- 17) Brought (Part of Speech) _____

- 18) Mason (Part of Speech) _____

- 19) Transit (Part of Speech) _____

- 20) Incident (Part of Speech) _____

Write each word 4 times (twice lowercase, twice UPPERCASE).

Brought
Plaid
Incident
Series
NervousCertian
Cottage
Mason
Closet
SolarTransit
Profound
Batteries
Channel
FaultGarnet
Generation
Exhibits
Domain
Episode

1) Exhibits

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

2) Nervous

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

3) Incident

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

4) Cottage

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

5) Domain

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

6) Brought

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

7) Profound

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

8) Episode

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

9) Solar

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

10) Plaid

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

11) Batteries

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

12) Transit

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

13) Closet

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

14) Series

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

15) Mason

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

16) Channel

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

17) Certian

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

18) Generation

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

19) Garnet

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

20) Fault

_____	_____	_____	_____
-----	-----	-----	-----
_____	_____	_____	_____

Western Europe

Lesson 3: Life in Western Europe, *continued*



Sequencing

2. Make a time line showing the dates and agencies that led to the formation of the European Union.



Marking the Text

3. Read the text on the right. Highlight the names of the 12 original nations that formed the European Union in 1993.



Summarizing

4. How do the nations of the European Union work together?



Defining

5. What are the *Indo-European* languages?

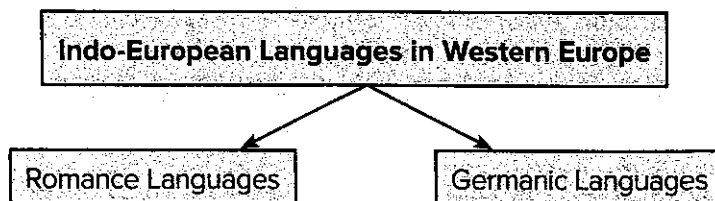
In 1967 these countries came together to form the European Commission. In 1971 they were joined by the United Kingdom and Ireland. Denmark, Greece, Spain, and Portugal joined the Commission by the late 1980s.

Those 12 nations formed the European Union, or EU, in 1993. The goal of the EU is to strengthen trade between the countries of Europe. Member nations control their own political and economic decisions. However, they follow EU laws on the use of natural resources and release of pollutants. They also have agreements on law enforcement and security.

The European Union now has 27 members. Eight of those nations are in Western Europe: Austria, Belgium, France, Germany, Ireland, Luxembourg, the Netherlands, and the United Kingdom. East and West Germany reunited when the Soviet Union lost control in the 1980s. Germany is now a strong voice in the EU.

Celts, Saxons, Romans, Vikings, Visigoths, and others fought for control in ancient Western Europe. Those groups faded as the modern nations of Europe began to take shape. Ethnic groups such as the French and Germans now rule entire countries. Their languages are the main languages of those nations. Most of those countries are home to members of other ethnic minority groups. Many of these are immigrants. They often speak the language of their homeland and keep their own culture.

The Indo-European languages are a group of related languages. They are spoken in most of Europe, parts of the world that were colonized by Europeans, and India and other parts of Asia. Two major divisions of Indo-European languages spoken in Western Europe are Romance and Germanic. Romance languages are based on Latin, the language of the Roman Empire.



Although English is a Germanic language, about half of its words come from the Romance languages. Not all Western European languages are Indo-European, however. For example, Basque is spoken in the Pyrenees region of France and Spain. It is not related to any other language spoken today. Many Western Europeans speak more than one language—their native language plus English, French, or German.

Western Europe**Lesson 3: Life in Western Europe, *continued***

Christianity continues to be the major religion in Europe. Today, most Western Europeans are either Catholic or Protestant. The Roman Catholic faith is strongest in France, Ireland, and Belgium. Protestant churches are strongest in the United Kingdom and Germany. Many Muslims have immigrated to Western Europe. They follow the religion of Islam. The Holocaust nearly wiped out Europe's Jewish population. Today, Jewish communities are growing in Western Europe, especially in France, the United Kingdom, and Germany.

For centuries, Western Europe has been a world leader in culture and the arts. European explorers spread European culture to other parts of the globe. The arts are an important part of Western European culture. Museums and cultural institutions celebrate each nation's art and history, and national governments support the arts. Western European culture has had a major influence on the rest of the world.

The most important team sport in Western Europe is soccer. Cricket and rugby are popular in the United Kingdom. Mountain climbing, skating, and skiing are popular in the rugged Alps of Switzerland and Austria.

Much of the population of Western Europe lives in cities, so roads are crowded. To relieve traffic congestion and control pollution, much of Europe has turned to high-speed rail lines. The first of these were built in France in 1981. In the 1990s, French rail lines began connecting to other high-speed rail lines. A well-developed highway system also links Europe's major cities. Germany's superhighways, called autobahns, are among Europe's best roads.

Western Europe is one of the wealthiest, most urban, and well-educated regions in the world. Many students go on to attend college. The region contains some of the oldest and most famous universities. Oxford University in England and the University of Paris opened before 1200. Originally, universities were founded to educate the clergy.

Current Challenges

Guiding Question *Why is Western Europe considered a postindustrial region?*

Since the Industrial Revolution, improvements in agriculture have made it possible for fewer people to cultivate larger areas of land. Today, more than half the population of Western Europe lives and works in cities. Even in France, the region's leading agricultural nation, less than 4 percent of the workforce works in agriculture.

 **Marking the Text**

6. Read the text on the left. Highlight the names of major religions that are practiced in Western Europe today.

 **Activating Prior Knowledge**

7. What was the Holocaust?

 **Identifying**

8. What was the original purpose of universities?

 **Reading Progress Check**

9. In what ways do nations of Western Europe support art and culture?

Western Europe

Lesson 3: Life in Western Europe, *continued*

? Explaining

10. What is the source of population growth in Western Europe today?

✓ Reading Progress Check

11. What challenges do the nations of Western Europe face?

In the past few decades, the number of industrial workers has also declined. The industrial, or secondary, sector of the economy employs only about 25 percent of the people. Many more people work in the tertiary sector, or service industries. Service jobs include government, education, health care, financial services, retail, computing, and repair. Every nation in Europe has a **postindustrial** economy. That means that more people work in services than in industry.

In 1900 Great Britain, France, and Germany ruled over empires that extended beyond Europe to Asia, Africa, the Americas, and the Pacific Islands. The two world wars were hard on the region. Then the Cold War kept it on the brink of war for 40 years. Germany, France, and the United Kingdom are still among the seven biggest economies in the world. The European Union helps Western European nations compete with larger economies, such as the United States, China, and Japan. However, the global financial crisis of 2008 had an impact on all of Europe. Governments of the EU disagreed about how to deal with ongoing financial problems.

Most population growth in Western Europe today is from immigration. Germany, France, the Netherlands, and United Kingdom have large Muslim populations. People come from Africa, Asia, and Eastern Europe looking for job opportunities or to escape political oppression. The mix of European and immigrant cultures creates a more diverse culture, but also creates racial and religious tensions.

Writing

Check for Understanding

1. **Informative/Explanatory** How have the nations of Western Europe adapted to survive the political events of the 1900s?

2. **Informative/Explanatory** What effects has immigration had on the nations of Western Europe?

Northern and Southern Europe

Lesson 1: Physical Geography of the Regions

ESSENTIAL QUESTION

How do people adapt to their environment?

Terms to Know

glaciation the weathering and erosion caused by the movement of glaciers

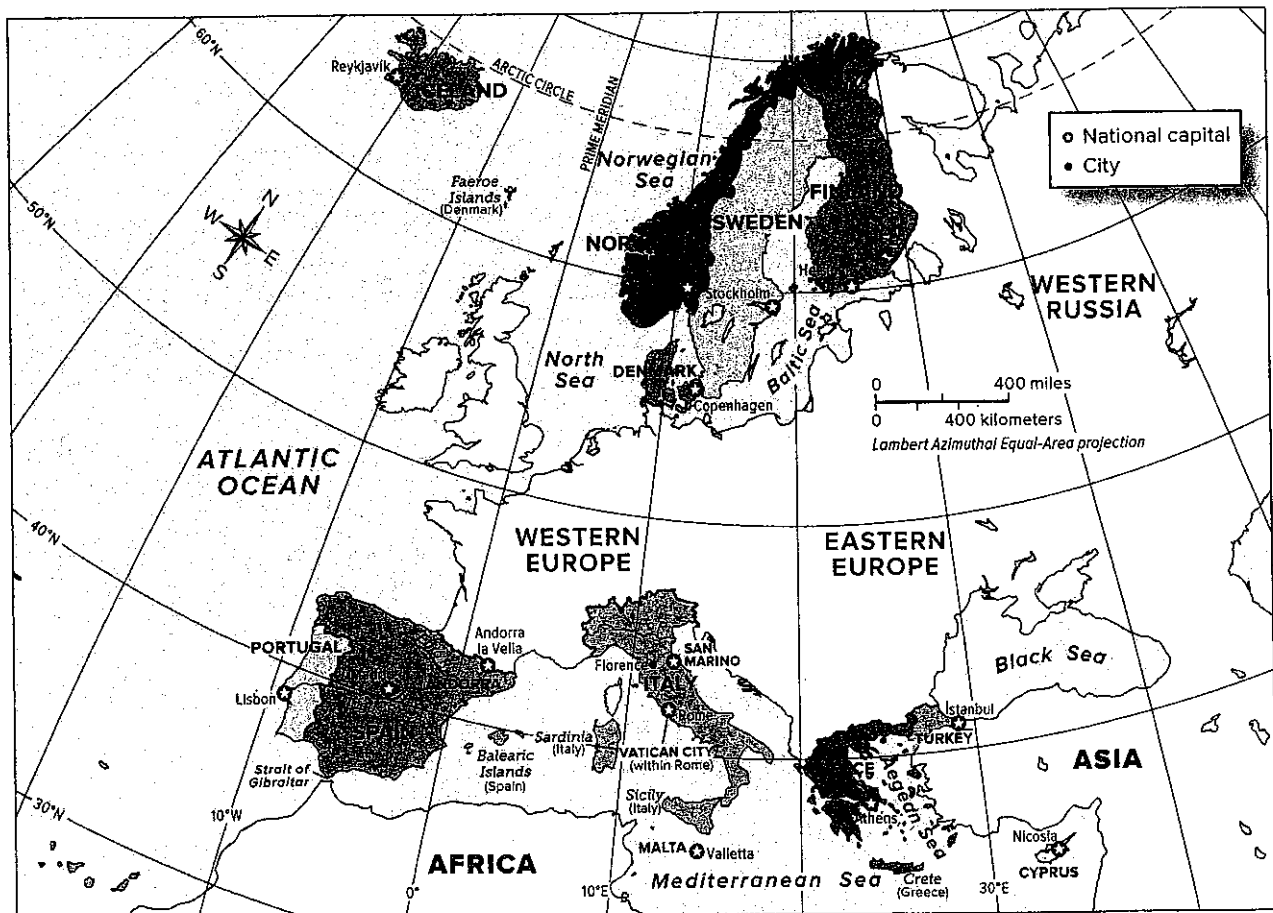
fjord a narrow, U-shaped coastal valley with steep sides formed by the action of glaciers

tundra a flat, treeless plain with permanently frozen ground

scrubland area with a dry climate where mostly short grasses and shrubs grow

trawler a large fishing boat

Where in the World: Northern and Southern Europe



Northern and Southern Europe

Lesson 2: History of the Regions

ESSENTIAL QUESTION

Why do civilizations rise and fall?

Terms to Know

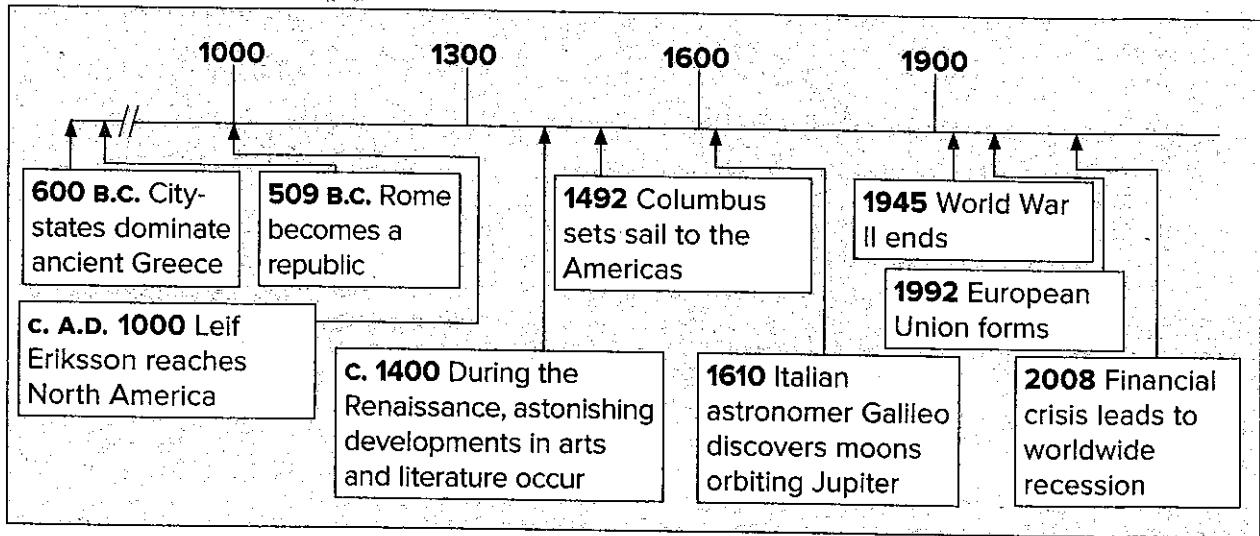
city-state an independent political unit that includes a city and the surrounding area

longship a ship with oars and a sail used by the Vikings

pagan a believer in ancient myths with numerous gods

Renaissance the period in Europe that began in Italy in the 1300s and lasted into the 1600s, during which art and learning flourished

When did it happen?



Early History of the Regions

Guiding Question *Why were early civilizations in Northern and Southern Europe important?*

In ancient Greece, separate communities called **city-states** formed. Each city-state was an independent political unit linked to other city-states by Greek language and culture. Although often jealous of each other, they joined forces to fight a common enemy.

In 490 B.C., the Persian army invaded, and the city-states of Athens and Sparta joined together to defeat the mighty Persian army. After the Persian Wars, Athens emerged as the most developed city-state. It became the first-known democracy, and philosophy and art flourished there.

Defining

1. What is the definition of *city-state*?

Northern and Southern Europe

Lesson 2: History of the Regions, *continued*



Marking the Text

- 2. Read the text on the right. Highlight the passage that explains how the Greek city-states were taken over by another kingdom. Circle the name of the king who conquered them.



Identifying

- 3. What areas did Rome come to control?



Reading Progress Check

- 4. How did warfare affect the civilizations of Greece, Rome, and the Vikings?

Years of war eventually weakened the Greek city-states. The king of Macedon took over Greece as well as Asia Minor, Persia, Egypt, and other kingdoms. Alexander the Great, as he was called, created an empire that would last another 300 years.

While Greek city-states were at their height, the city of Rome rose to power and became the Roman Republic. It was run by consuls who were elected to office annually.

By 275 B.C., Rome controlled the Italian peninsula. It then conquered Spain, Sicily, Macedonia, Greece, and Asia Minor. After the military leader Julius Caesar was assassinated, there were a series of emperors in Rome. The Roman Republic became the Roman Empire.

In A.D. 330, the Emperor Constantine moved the capital from Rome to Byzantium in what is now Turkey. The new capital, renamed Constantinople, was closer to trade routes and farther away from the barbarians attacking the Roman Empire in the west.

In A.D. 476, German invaders took control of Rome and ended the Roman Empire. The eastern empire lasted until 1453, when it fell to the Ottoman Turks. The Turks changed the name of the capital from Constantinople to Istanbul.

In the A.D. 700s, ships carried warriors from Scandinavia to Western Europe. These pirates, called Vikings, raided the coasts and spread fear and destruction. They conquered parts of Britain, as well as Ireland and what is now Normandy in France.

The Vikings eventually turned to trading and exploring. They used their **longships**, which were powered by oar and wind, to travel great distances. They crossed the Atlantic and founded settlements in Iceland and Greenland. Around A.D. 1000 Leif Eriksson led the Vikings to Vinland, which is Newfoundland in Canada. He was the first European known to have reached North America.

The Vikings followed a **pagan** religion, which was based on ancient myths and had a number of gods. After about A.D. 1000, Viking groups began converting to Christianity. More Scandinavians stayed home and the threat of Vikings went away. The Scandinavians helped build the kingdoms of Norway, Sweden, and Denmark.

Discovery and “Rebirth”

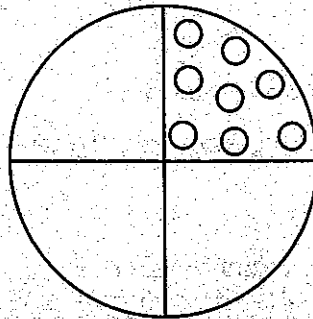
Guiding Question *How did the Renaissance pave the way for voyages of discovery?*

During the period known as the Middle Ages, many important scientific discoveries of the ancient Greeks were largely forgotten in the west. Many important manuscripts were taken to the east.

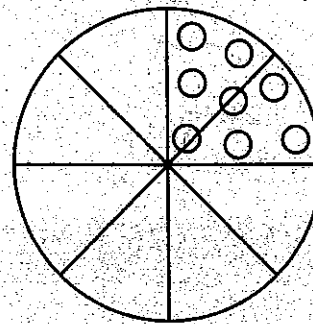
Finding Equivalent Ratios

GETTING THE IDEA

This pizza has pepperoni on 1 of its 4 slices. The **ratio** of slices with pepperoni to the total number of slices is 1:4.



Divide the same pizza two more times to make 8 equal slices. Now, 2 of the 8 slices have pepperoni. The ratio of slices with pepperoni to the total number of slices is 2:8.



The ratios 1:4 and 2:8 are **equivalent** ratios, because they describe the same relationship between the part and the whole. Equivalent ratios are equal comparisons. Like equivalent fractions, they have the same value. If we write the ratios 1:4 and 2:8 as fractions, we can see that $\frac{1}{4} = \frac{2}{8}$.

Just as equivalent fractions, equivalent ratios must describe the same whole.

Example 1

Complete the table below to find ratios that are equivalent to 3:5.

3	5	3:5

Strategy Use multiplication to find equivalent ratios.

Step 1

Write the ratio as a fraction.

The ratio 3:5 can be written as $\frac{3}{5}$.

Step 2

Multiply the numerator and denominator by the same whole number.

$$\frac{3 \times 2}{5 \times 2} = \frac{6}{10}$$

The ratio 6:10 is equivalent to 3:5.

Step 3

Repeat with other whole numbers to find two more equivalent ratios.

$$\frac{3 \times 3}{5 \times 3} = \frac{9}{15}$$

The ratio 9:15 is equivalent to 3:5.

$$\frac{3 \times 10}{5 \times 10} = \frac{30}{50}$$

The ratio 30:50 is equivalent to 3:5.

Step 4

Complete the table.

3	5	3:5
6	10	6:10
9	15	9:15
30	50	30:50

Solution The ratios 6:10, 9:15, and 30:50 are equivalent to 3:5.

Example 2

Eggs are often sold by the dozen. In other words, one carton of eggs contains 12 eggs. Complete the table below to show the relationship between the number of eggs and the number of cartons.

Eggs	Cartons
12	1
24	
48	
	5

Strategy

Use equivalent ratios to solve.

Step 1

Write the given ratio as a fraction.

There are 12 eggs to 1 carton.

$$\frac{12}{1}$$

Step 2

Use equivalent ratios to find the missing numbers.

Multiply the numerator and denominator by the same whole number.

$$\text{Since } 12 \times 2 = 24, \frac{12 \times 2}{1 \times 2} = \frac{24}{2}$$

$$\text{Since } 12 \times 4 = 48, \frac{12 \times 4}{1 \times 4} = \frac{48}{4}$$

$$\text{Since } 1 \times 5 = 5, \frac{12 \times 5}{1 \times 5} = \frac{60}{5}$$

Step 3

Complete the table.

Eggs	Cartons
12	1
24	2
48	4
60	5

Solution

The table in Step 3 shows the relationship between the number of eggs and the number of cartons.

An **ordered pair** is a pair of numbers that describes the location of a point on the **coordinate plane**. A coordinate plane is formed by the intersection of a horizontal number line, called the x-axis, and a vertical number line, called the y-axis. Ratios can be written as ordered pairs and plotted on a coordinate plane.

Example 3

At a used bookstore, customers can buy 3 books for \$2. Use equivalent ratios to graph the number of books and their cost. Graph the number of books on the x-axis and the cost on the y-axis.

Strategy Plot ratios as ordered pairs on a coordinate plane.

Step 1

Write a ratio that describes the information given in the problem.

Customers can buy 3 books for \$2.

The ratio of books to dollars is 3:2.

Step 2

Make a table to find equivalent ratios.

Start with 3 books for 2 dollars, or $\frac{3}{2}$.

Then multiply to find equivalent ratios.

Record the ratios in the table.

$$\frac{3 \times 2}{2 \times 2} = \frac{6}{4} \quad \frac{3 \times 3}{2 \times 3} = \frac{9}{6} \quad \frac{3 \times 4}{2 \times 4} = \frac{12}{8}$$

Books (x)	Price (y)
3	2
6	4
9	6
12	8

Step 3

Write the ratios as ordered pairs.

Books (x)	Price (y)
3	2
6	4
9	6
12	8

→ (3, 2)

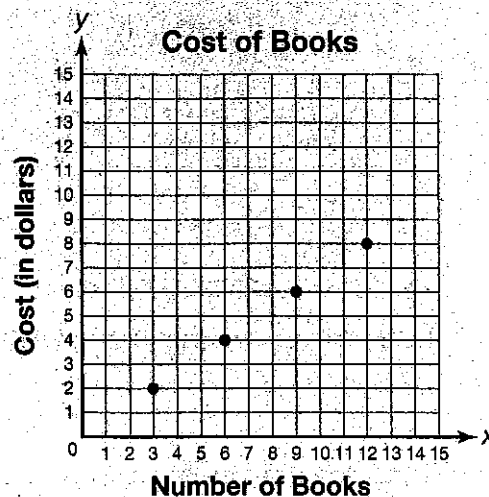
→ (6, 4)

→ (9, 6)

→ (12, 8)

Step 4

Plot the ordered pairs on a coordinate plane.



Solution The graph in Step 4 shows the number of books and their price on a coordinate plane.

Example 4

A school is printing T-shirts for their students. They have received prices from two different companies. Company A says they will print 16 T-shirts for \$40. Company B says they will print 84 T-shirts for \$140. Which company is selling T-shirts at a better price?

Strategy Make tables to compare the ratios.

Step 1 Create a table for each company.

Company A		Company B	
T-shirts	Price	T-shirts	Price
16	40	84	140

Step 2 Use division to find equivalent ratios.

Repeat until each ratio is in its simplest form.

Company A:

$$\frac{16 \div 2}{40 \div 2} = \frac{8}{20}$$

$$\frac{8 \div 2}{20 \div 2} = \frac{4}{10}$$

$$\frac{4 \div 2}{10 \div 2} = \frac{2}{5}$$

Company B:

$$\frac{84 \div 2}{140 \div 2} = \frac{42}{70}$$

$$\frac{42 \div 2}{70 \div 2} = \frac{21}{35}$$

$$\frac{21 \div 7}{35 \div 7} = \frac{3}{5}$$

Step 3 Complete the tables.

Company A		Company B	
T-shirts	Price	T-shirts	Price
2	5	3	5
4	10	21	35
8	20	42	70
16	40	84	140

Step 4 Compare the ratios in their simplest form.

Company A is selling 2 T-shirts for \$5. Company B is selling 3 T-shirts for \$5.

Since Company B is selling one more T-shirt than Company A at the same price, Company B has the better price.

Solution Company B is selling T-shirts at the better price.

2 COACHED EXAMPLE

Two friends have set goals to master all 24 songs in their guitar books. Cece decides to learn 6 new songs every 5 weeks. Kevin decides to learn 4 new songs every 3 weeks. Which friend will master all 24 songs first?

Complete the tables.

How many songs will Cece learn in 10 weeks? $\frac{6 \times \square}{5 \times \square} = \frac{\square}{10}$ In 15 weeks? $\frac{6 \times \square}{5 \times \square} = \frac{\square}{15}$

How many weeks will it take Cece to learn 24 songs? $\frac{6 \times \square}{5 \times \square} = \frac{24}{\square}$

Find equivalent ratios for Kevin's table.

Cece	
6	5
	10
	15
24	

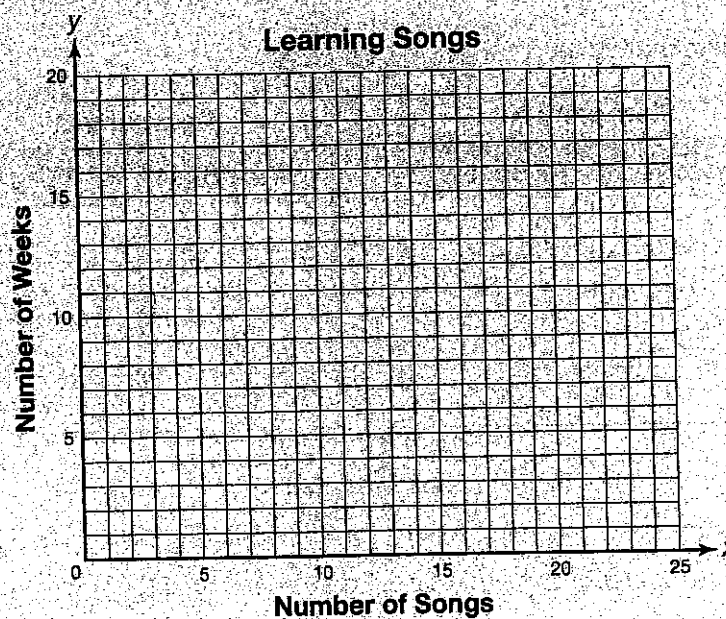
Kevin	
4	3
	6
	12
24	

Write the ratios as ordered pairs.

Cece: _____

Kevin: _____

Plot the ordered pairs on a coordinate plane.



_____ will learn all 24 songs first.

LESSON PRACTICE

1 Which ratio is **not** equivalent to 36:20?

- A. 9 to 5
- B. $\frac{10}{18}$
- C. 18:10
- D. $\frac{72}{40}$

2 A bookstore sells 4 fiction books for every 1 nonfiction book it sells. Choose the ratio that is equivalent to the ratio of fiction books to nonfiction books that the store sells.

- A. 7:35
- B. 28:4
- C. 28:7
- D. 35:5

3 Which pair of ratios is **not** equivalent?

- A. 9:18 and 2:6
- B. 200 to 25 and $\frac{8}{1}$
- C. $\frac{1}{3}$ and 30 to 90
- D. 10:100 and 9 to 90

There are 20 small panes of glass in 5 large windows. Use this information to answer questions 4 and 5.

Small Panes (x)	Windows (y)
	1
8	
	4
20	5
28	

4 What is the ratio of panes of glass to windows in simplest form?

- A. 1 to 4
- B. 5:1
- C. 1:20
- D. $\frac{4}{1}$

5 Which correctly shows the ordered pairs that could be formed when the table is completed to show the relationship between the number of small panes and the number of windows.

- A. (5, 1), (8, 3), (9, 4), (20, 5), (28, 23)
- B. (1, 4), (2, 8), (4, 16), (5, 20), (7, 28)
- C. (1, 5), (8, 3), (4, 9), (5, 20), (28, 23)
- D. (4, 1), (8, 2), (16, 4), (20, 5), (28, 7)

- 6 Which ratio is equivalent to 6:8?
- A. 8:10
 - B. 3:4
 - C. 1:2
 - D. 3:5

- 7 The manager of an ice cream shop orders 3 sugar cones for every waffle cone that he orders. Use this ratio to determine the number of waffle cones the manager would order when he orders 288 sugar cones.
- A. 3
 - B. 96
 - C. 285
 - D. 864

- 8 Grace always does 5 sit-ups for every 2 push-ups that she does. Which of the following statements is true?
- A. When Grace does 10 sit-ups, she does 7 push-ups.
 - B. When Grace does 3 sit-ups, she does 1 push-up.
 - C. When Grace does 4 sit-ups, she does 10 push-ups.
 - D. When Grace does 20 sit-ups, she does 8 push-ups.

- 9 A shoe store stocks 3 pairs of boots for every 5 pairs of athletic shoes. When the store stocks 30 pairs of boots, how many athletic shoes will they stock?
- A. 15
 - B. 32
 - C. 50
 - D. 150

- 10 The table below shows the relationship between the number of cases of tomato juice and the number of cans of tomato juice.

4	32
7	56
12	96

The ratio of cans to cases remains constant. Which ratio could also be included in the table?

- A. 5:40
- B. 6:9
- C. 8:16
- D. 10:38

11 Which pair of ratios are **not** equivalent?

- A. 7:2 and 9:4
- B. 4:5 and 8:10
- C. 2:1 and 50:25
- D. 3:2 and 9:6

12 The principal wants each classroom to have a ratio of 5 nonfiction books for every 4 fiction books in the classroom library. The table below shows the current counts of nonfiction books and fiction books for each classroom.

Classroom	Nonfiction	Fiction
Room 201	50	40
Room 202	105	84
Room 203	215	172
Room 204	80	52

Which class does **not** have the correct ratio of nonfiction to fiction books?

- A. Room 201
- B. Room 202
- C. Room 203
- D. Room 204

A company created a chart to show the relationship between the number of cans of paint and the number of square feet that the paint will cover. Use the table below to answer questions 13 and 14.

Cans of Paint	Square Feet
1	
3	675
5	1,125
8	1,800

13 The relationship between cans of paint and square feet covered is constant. How many square feet could be covered with 1 can of paint?

- A. 225
- B. 275
- C. 450
- D. 672

14 The paint company makes a line graph of the information in the table with the number of cans of paint on the x-axis and the number of square feet the paint would cover on the y-axis. Which ordered pair would **not** be on a graph of the relationship shown in the table?

- A. (1, 225)
- B. (2, 450)
- C. (675, 3)
- D. (8, 1,800)

- 15 Yummy Sandwich Shop rewards its customers for eating at their restaurant. Customers receive 2 points for each sandwich they buy. However, on Tuesdays, customers receive 3 points for each sandwich they buy. For every 12 points they earn, customers receive a free sandwich.

Jorge buys a sandwich at Yummy Sandwich Shop every Monday and Thursday. Grace buys a sandwich there every Tuesday.

Part A

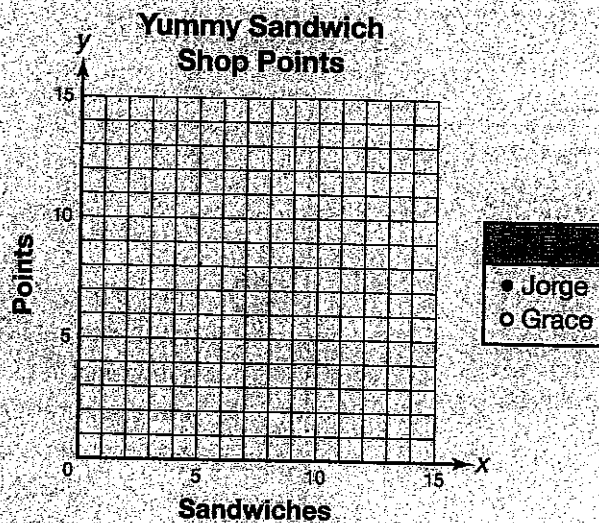
Complete the tables below. Then use the tables to complete the graph. Use filled-in circles for Jorge and empty circles for Grace, as shown on the key.

Points Earned by Jorge

Sandwiches	Points
1	2
2	
4	
	12

Points Earned by Grace

Sandwiches	Points
1	3
2	
	9
	12



Part B

How many sandwiches does Jorge have to buy before he earns a free one? How many does Grace have to buy? Assuming that the week starts on Sunday, who will earn a free sandwich first?

LESSON
2

Understanding Machines



- What Does a Machine Do?
- What Is Mechanical Advantage?
- What Is Efficiency?



my planet DiARY

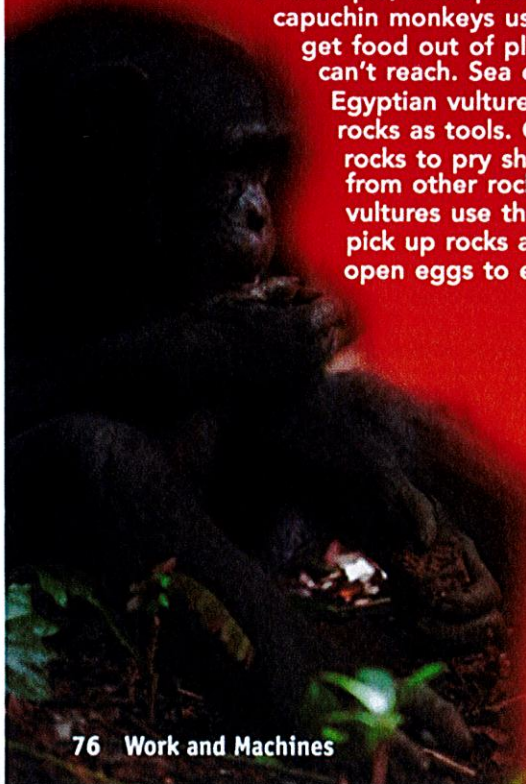
Sticks and Stones

When you need to peel an apple or open a can of soup, you reach for the right tool to do the job.

Some animals use items such as sticks and rocks to make finding or eating their food easier. For example, woodpecker finches and capuchin monkeys use sticks to

get food out of places they can't reach. Sea otters and Egyptian vultures both use

rocks as tools. Otters use rocks to pry shellfish away from other rocks. Egyptian vultures use their beaks to pick up rocks and break open eggs to eat.



76 Work and Machines

FUN FACT

Communicate Discuss these questions with a partner. Write your answers below.

1. How does the rock make it easier for the chimpanzee in the photo to crack open nuts?

2. What human tools would you use to do the same job?

PLANET DIARY Go to Planet Diary to learn more about tools.



Do the Inquiry Warm-Up
Is It a Machine?

Vocabulary

- machine
- input force
- output force
- mechanical advantage
- efficiency

Skills

- 🎯 Reading: Compare and Contrast
- 📌 Inquiry: Predict

What Does a Machine Do?

What do you picture when you hear the word *machine*? You may think of machines as complex gadgets with motors, but a machine can be as simple as a ramp. **Machines** are devices that allow you to do work in an easier way. Machines do not reduce the amount of work you do. Instead, they just change the way you do work. In **Figure 1**, April does the same amount of work to move her speaker onto the stage whether or not she uses a ramp. The ramp makes that work easier. 🗃️ **A machine makes work easier by changing at least one of three factors: the amount of force you exert, the distance over which you exert your force, or the direction in which you exert your force.**

Input Versus Output When you do work, the force you exert is called the **input force**. You exert your input force over the input distance. In **Figure 1B**, April's input force is the force she uses to pull the speaker up the ramp. The **input distance** is the length of the ramp. The machine exerts the **output force** over the output distance. The weight of the speaker is the output force. The height of the ramp is the output distance. Input force times input distance equals input work. Output force times output distance equals output work. Since machines do not reduce the work you do, your output work can never be greater than your input work.

FIGURE 1
Using Machines

Using a ramp makes it easier for April to move the speaker onto the stage.

Interpret Diagram
Figure 1B, draw a line that represents April's output distance and an arrow that represents her output force.

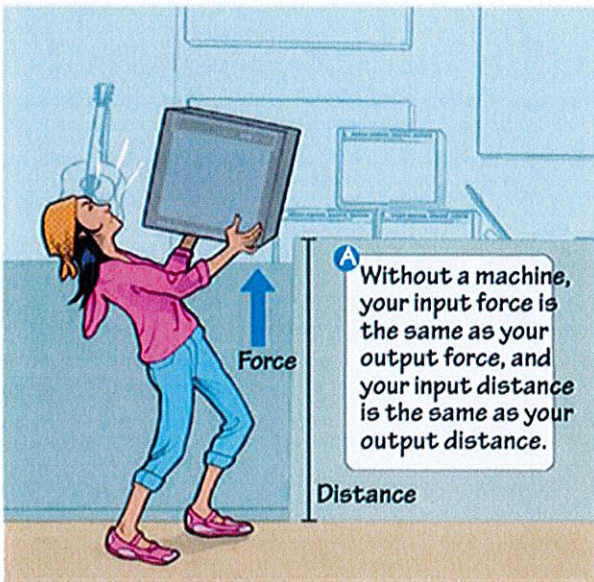
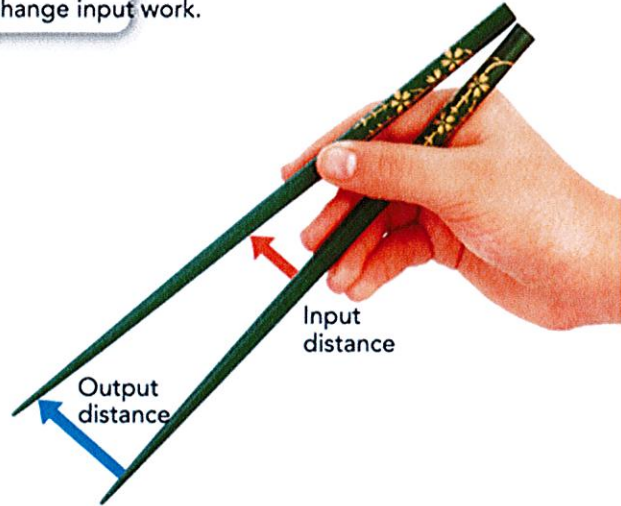
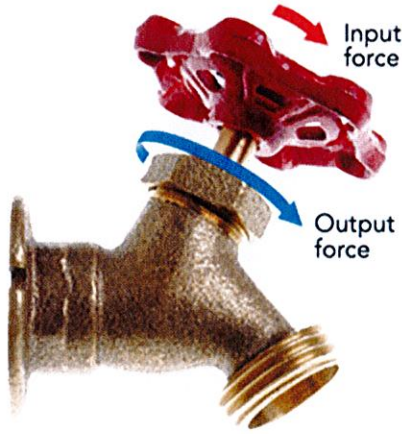


FIGURE 2
Making Work Easier

The devices shown all make work easier in different ways. The arrows on the photos show how the machines change input work.

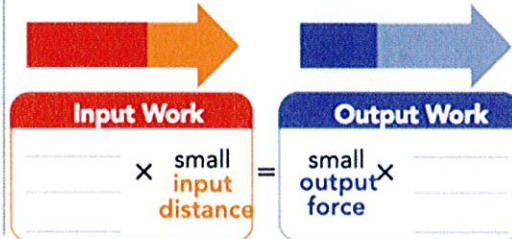
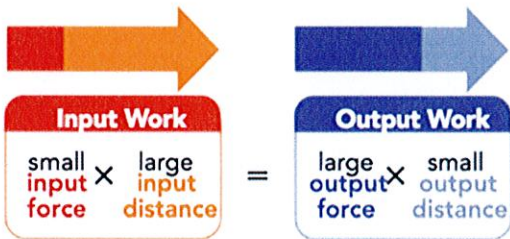


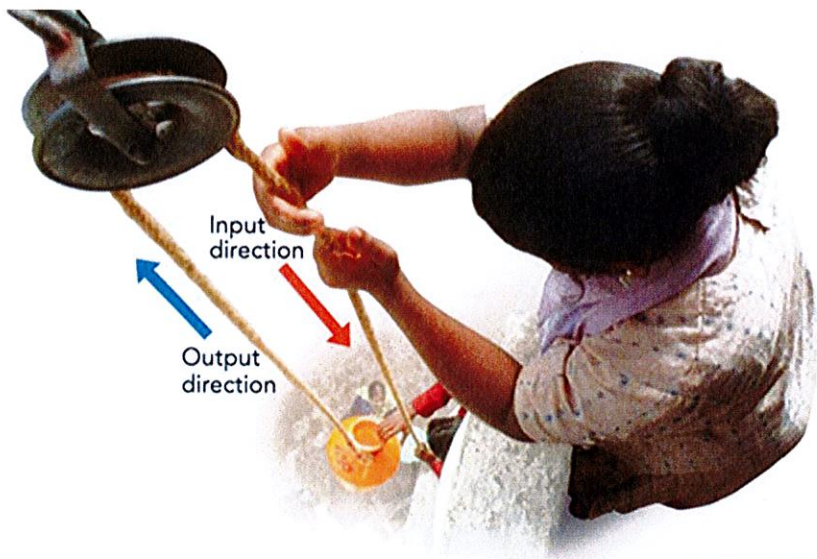
Changing Force In some machines, the output force is *greater* than the input force. How can this happen? Recall the formula for work: $\text{Work} = \text{Force} \times \text{Distance}$. If the amount of work stays the same, a decrease in force means an increase in distance. So if a machine allows you to use less input force to do the same amount of work, you must apply that smaller input force over a greater distance.

You see machines that work like this every day. How hard would it be to turn on a faucet that didn't have a handle? Since the handle is wider than the shaft of the faucet, your hand turns a greater distance than it would if you turned the shaft directly. Turning the handle a greater distance allows you to use less force.

Changing Distance In some machines, the output force is less than the input force. This kind of machine allows you to exert your input force over a shorter distance. In order to apply a force over a shorter distance, you need to apply a greater input force. When do you use this kind of machine? Think of a pair of chopsticks. When you use chopsticks to eat, you move the hand holding the chopsticks a short distance. The other end of the chopsticks moves a greater distance, allowing you to pick up and eat a large piece of food with a small movement.

Complete the equation below. Be sure to describe each quantity as *large* or *small*.

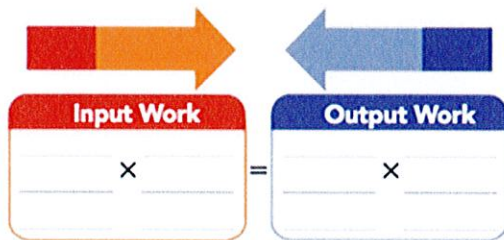




Lab zone Do the Quick Lab Going Up.

Changing Direction Some machines don't change either force or distance. The photo above shows a machine called a *pulley* attached to a bucket. (You'll learn more about pulleys soon.) The pulley doesn't increase input force or distance. However, by changing the direction of the input force, the pulley makes it much easier to move the bucket to the top of a building—you can just pull down on the rope. Without a pulley, you would have to carry the bucket up a ladder or staircase. A flagpole rigging is also a pulley.

Complete the equation below. Be sure to describe each quantity as *large* or *small*.



Assess Your Understanding

1a. List Name two examples of machines for which the output force is greater than the input force.

b. Apply Concepts Suppose that you use a pair of chopsticks and apply a force of 1 N over a distance of 0.01 m. How much work do you do? If the output force of the chopsticks is only 0.5 N, how far do the tips of the chopsticks move?


got it?

I get it! Now I know that machines make work easier by _____

I need extra help with _____

Go to **my science** **coach** online for help with this subject.

What Is Mechanical Advantage?

You've just learned how to describe machines using words, but you can also describe machines with numbers. A machine's **mechanical advantage** is the number of times a machine increases a force exerted on it.  **The ratio of output force to input force is the mechanical advantage of a machine.**

$$\text{Mechanical advantage} = \frac{\text{Output force}}{\text{Input force}}$$

Increasing Force When the output force is greater than the input force, the mechanical advantage of a machine is greater than 1. You exert an input force of 10 newtons on a can opener, and the opener exerts an output force of 30 newtons. The mechanical advantage of the can opener is calculated below.

$$\frac{\text{Output force}}{\text{Input force}} = \frac{30 \text{ N}}{10 \text{ N}} = 3$$

The can opener triples your input force!

Increasing Distance When a machine increases distance, the output force is less than the input force. The mechanical advantage is less than 1. If input force is 20 newtons and the output force is 10 newtons, the mechanical advantage is shown below.

$$\frac{\text{Output force}}{\text{Input force}} = \frac{10 \text{ N}}{20 \text{ N}} = 0.5$$

Your input force is cut in half, but your input distance is doubled.



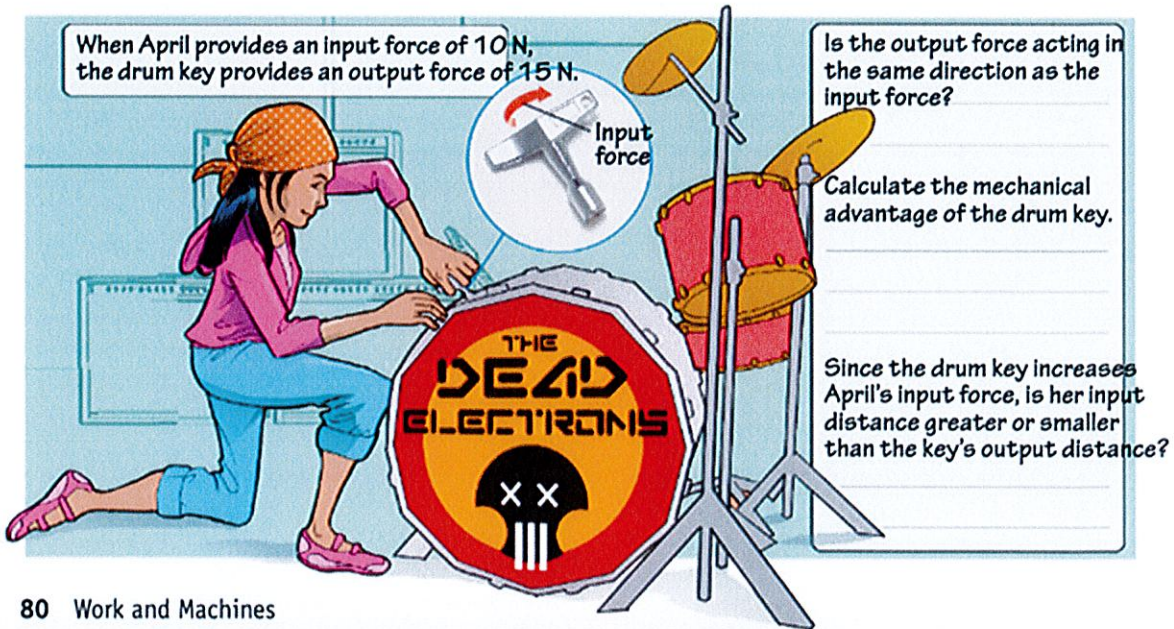
 **Compare and Contrast** On these two pages, underline the sentences that explain how to distinguish among machines based on their mechanical advantages.

FIGURE 3 Mechanical Advantage

Drums are tuned by tightening and loosening bolts. Drum keys make the bolts easier to turn.

 **Identify** Draw an arrow for the key's output force.



When April provides an input force of 10 N, the drum key provides an output force of 15 N.

Input force

Is the output force acting in the same direction as the input force?

Calculate the mechanical advantage of the drum key.

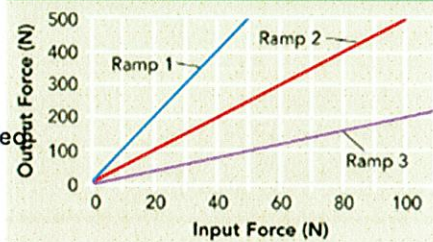
Since the drum key increases April's input force, is her input distance greater or smaller than the key's output distance?

- ▶ **Changing Direction** What can you predict about the mechanical advantage of a machine that changes the direction of the force? If only the direction changes, input force will be the same as the output force. The mechanical advantage will always be 1.

do the math!

The graph shows input and output force data for three different ramps. Use the graph to answer the questions below. (The actual ramps are not pictured. Do not confuse the lines in the graph with the ramps themselves!)

Mechanical Advantages of Ramps



- 1 **Read Graphs** If an 80 N input force is exerted on Ramp 2, what is the output force?

- 2 **Interpret Data** Find the slope of the line for each ramp.

- 3 **Draw Conclusions** Why does the slope represent each ramp's mechanical advantage?

- 4 **Graph** On the graph above, plot a line for a ramp that has a mechanical advantage of 3.

- 5 **CHALLENGE Predict** Which ramp is the steepest? How do you know?



Assess Your Understanding

got it?

- I get it! Now I know that mechanical advantage

- I need extra help with


Go to [my science coach](#) online for help with this subject.

▶ What Is Efficiency?


So far you have assumed that the work you put into a machine is exactly equal to the work done by the machine. In an ideal situation, this would be true. In real situations, however, the output work is always less than the input work.

Overcoming Friction If you have ever tried to cut something with rusty scissors, you know that a large part of your work is wasted overcoming the friction between the parts of the scissors.

All machines waste some work overcoming the force of friction. The less friction there is, the closer the output work is to the input work. The **efficiency** of a machine compares output work to input work. Efficiency is expressed as a percentage. The higher the percentage, the more efficient the machine is. If you know the input work and output work for a machine, you can calculate a machine's efficiency.


Calculating Efficiency  To calculate the efficiency of a machine, divide the output work by the input work and multiply the result by 100 percent. This is summarized by the following formula.

$$\text{Efficiency} = \frac{\text{Output work}}{\text{Input work}} \times 100\%$$

 **Vocabulary Identify Multiple Meanings** Underline the scientific definition of *efficiency* in the text. Then write a sentence that uses the everyday meaning of *efficient*.

apply it!

1 Calculate the efficiency of this bicycle if the input work to turn the pedals is 45 J and the output work is 30 J. Show your calculations.

2  **Predict** What will happen to the efficiency of the bike after the gears have been cleaned and the chain has been oiled?



- ▶ **Real and Ideal Machines** A machine with an efficiency of 100 percent would be an ideal machine. Since all machines lose work to friction, ideal machines do not exist. All machines have an efficiency of less than 100 percent.

How does this affect mechanical advantage? *Ideal* mechanical advantage is your input distance divided by the machine's output distance. It is often related to the measurements of a machine. What you have calculated so far (output force divided by input force) is *actual* mechanical advantage. If machines were ideal and input work was equal to output work, ideal and actual mechanical advantages would be equal. Because of friction, actual mechanical advantage is always less than ideal mechanical advantage.

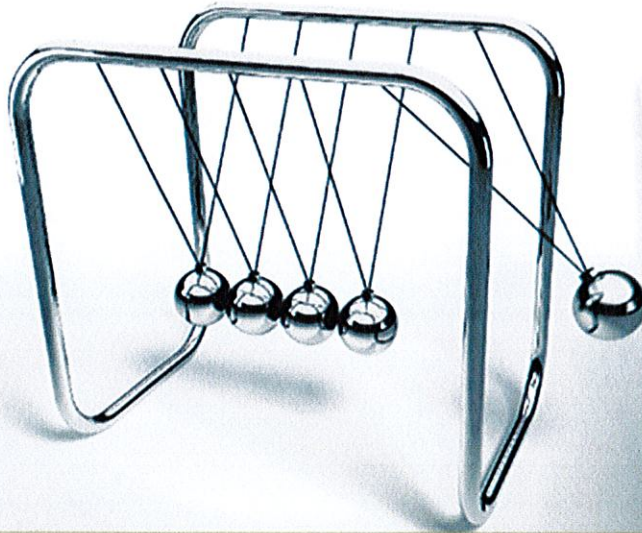



FIGURE 4.....

▶ **REAL-WORLD INQUIRY**

An Ideal Machine?

The balls of this Newton's cradle may swing for a long time, but they will eventually come to rest.

 **Communicate** With a partner, discuss where in this machine work is lost due to friction. Circle these locations on the photo and explain your reasoning.



Do the Quick Lab *Friction and Efficiency.*

 **Assess Your Understanding**

- 2a. **Relate Cause and Effect** Real machines have an efficiency of less than 100% because some work is wasted to overcome _____
- b. **Predict** What happens to the efficiency of a bicycle as it gets rusty? What must you do to maintain the same amount of output work? _____

got it?.....

- I get it! Now I know that efficiency _____
- I need extra help with _____

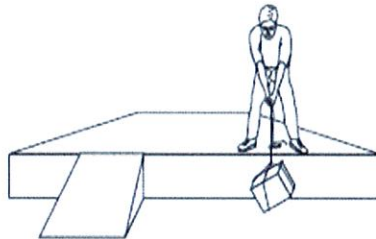
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Review and Reinforce

Understanding Machines

Understanding Main Ideas

In the illustration below, the man can either pull the box upward onto the platform or pull the box up the ramp. Use the illustration to answer Questions 1–4. If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.



1. _____ The work of pulling the box will be easier if the man uses the ramp.
2. _____ The ramp helps the man do work by reducing input distance.
3. _____ To calculate the efficiency of the ramp, divide the output work by the input work and multiply the result by 100%.
4. _____ The ideal mechanical advantage of the ramp is its mechanical advantage with friction.

Building Vocabulary

Fill in the blank to complete each statement.

5. A machine's _____ is the number of times the machine multiplies the input force.
6. The force you exert on a machine is called the _____.

Lesson Quiz

Understanding Machines

Fill in the blank to complete each statement.

1. Machines are devices that allow you to do _____ in an easier way.
2. The force you exert when you use a machine is the _____.
3. The force exerted by the machine is the _____.
4. The force exerted on an object multiplied by the distance the object moves is equal to _____, which is expressed in joules.
5. Divide output work by input work and multiply by 100% to find a machine's _____.

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

6. _____ A machine's mechanical advantage is the output force multiplied by the input force.
7. _____ If the output force is greater than the input force, the mechanical advantage of the machine is greater than one.
8. _____ If the machine increases distance, the output force is greater than the input force.
9. _____ If a machine changes the direction, but not the amount of the input force, the mechanical advantage is greater than 1.
10. _____ An ideal machine has no friction.



Scripps National Spelling Bee

Vocabulary List for Difficulty Level Two Bee

2019-2020

1.	disembark	<i>(verb)</i>	to leave or go ashore from a ship.
2.	earthquake	<i>(noun)</i>	a trembling or shaking of the earth that accompanies crustal movements.
3.	brought	<i>(verb)</i>	conveyed or carried along from one place to another.
4.	gallop	<i>(noun)</i>	the natural three-beat gait of a horse.
5.	dinosaur	<i>(noun)</i>	a member of a group of extinct reptiles.
6.	ancient	<i>(adjective)</i>	existing from a long ago period or date.
7.	tapestry	<i>(noun)</i>	a heavy textile woven by hand used for hangings or curtains.
8.	delivery	<i>(noun)</i>	an instance of the physical transfer of a shipment.
9.	attagirl	<i>(interjection)</i>	— used to express encouragement or approval to a woman or girl.
10.	salamanders	<i>(plural noun)</i>	various small amphibians that resemble lizards but don't have scales, are covered with a soft moist skin, live in moist dark places, pose no harm to humans, and feed on small animals such as aquatic worms and insects.
11.	usual	<i>(adjective)</i>	in accordance with the normal custom, usage or habit.
12.	challenge	<i>(noun)</i>	a thing which one can devote energy or effort to.
13.	cahoots	<i>(plural noun)</i>	secret agreement : collusion.
14.	oozing	<i>(verb)</i>	moving slowly or without notice.
15.	Mars	<i>(noun)</i>	the planet that is fourth from the sun and is noted for its apparent red color.
16.	pelican	<i>(noun)</i>	a large web-footed bird with long wings and a very large bill having a throat pouch in which it catches fish.
17.	drastic	<i>(adjective)</i>	notably vigorous or severe.
18.	yoga	<i>(noun)</i>	a group of exercises for achieving well-being and control of mind and body.
19.	burlap	<i>(noun)</i>	a coarse heavy plain-woven fabric typically made from hemp or jute that is used for bagging and wrapping items.
20.	blazer	<i>(noun)</i>	a single-breasted sports jacket usually with bright stripes or in a solid color that has a notched collar and patch pockets.
21.	trombone	<i>(noun)</i>	a brass instrument that consists of a long cylindrical metal tube that ends in a bell and has a movable slide which makes musical sounds.
22.	trembling	<i>(verb)</i>	quaking due to fear or another emotion.
23.	calmed	<i>(verb)</i>	made peaceful : induced quiet and peace in place of agitation or passion.
24.	police	<i>(noun)</i>	the department of the government which is concerned with maintaining public order, safety and health, and which has the power to enforce laws.
25.	certain	<i>(adjective)</i>	given to or marked by complete conviction and assurance.
26.	barograph	<i>(noun)</i>	an automatic instrument which is used to record variations in atmospheric pressure.



This list includes 225 challenging upper elementary words. If you learn the spellings and meanings of these words, you will be well prepared for your classroom bee. If you would like to be well prepared for a school spelling bee, ask your teacher for the 450-word School Spelling Bee Study List, which includes the words listed here in addition to the words at the One Bee and Three Bee levels of difficulty.

27.	charred	<i>(verb)</i>	partly burned on the outside.
28.	Pakistan	<i>(geographical entry)</i>	a country in southern Asia which borders the Arabian Sea.
29.	pressure	<i>(noun)</i>	the burden of mental or physical distress.
30.	surmised	<i>(verb)</i>	guessed : formed an opinion without substantial proof or certain knowledge.
31.	teak	<i>(noun)</i>	the hard, strong, durable, yellowish brown wood of a tall East Indian timber tree which is highly resistant to insect attack and warping and is used for shipbuilding.
32.	transit	<i>(noun)</i>	the public transportation of people by bus, subway train or other local system of conveyance.
33.	cannonade	<i>(noun)</i>	a noisy persistent attack (as of questions).
34.	appetite	<i>(noun)</i>	the desire to eat when food is available.
35.	luggage	<i>(noun)</i>	suitcases, bags used for travel or other articles used to carry a traveler's belongings.
36.	ramparts	<i>(plural noun)</i>	protective barriers.
37.	vinyl	<i>(noun)</i>	any of a group of tough durable plastics based on resins that are used especially in the forming of films and sheeting, flooring, and sound records.
38.	anemometers	<i>(plural noun)</i>	tools used to gauge the speed of the wind.
39.	dainty	<i>(adjective)</i>	characterized by beauty that is delicate in nature.
40.	buckle	<i>(verb)</i>	to secure two loose ends of something (such as a belt) with one end having a fastening and the other a catch.
41.	avidly	<i>(adverb)</i>	intensely, sharply, keenly.
42.	briny	<i>(adjective)</i>	salty.
43.	pavement	<i>(noun)</i>	the surface of a public thoroughfare which is artificially covered.
44.	garnet	<i>(noun)</i>	a brittle material which is typically red in color and occurs mainly in crystals.
45.	furrow	<i>(verb)</i>	to cultivate or till as if with a plow.
46.	sprawl	<i>(verb)</i>	to lie or sit with arms and legs stretched out : to spread out.
47.	museum	<i>(noun)</i>	a building or institution which is devoted to the gathering, care, study and display of objects of lasting interest and value.
48.	wren	<i>(noun)</i>	any of various small brown singing birds.
49.	legend	<i>(noun)</i>	someone having a special status as a result of possessing extraordinary qualities that are typically partly real and partly mythical.
50.	transistor	<i>(noun)</i>	an electronic device made of a small block of a semiconductor with three electrodes on it and that conducts electrons moving in one direction to the opposite direction.



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51.	amplify	<i>(verb)</i>	to expand, extend or enlarge a statement or idea by adding details or illustration.
52.	security	<i>(noun)</i>	freedom from care, anxiety or fear.
53.	refrain	<i>(noun)</i>	a phrase or verse that recurs regularly typically within a poem or song.
54.	tactics	<i>(plural noun)</i>	methods : systems of procedure.
55.	shepherd	<i>(noun)</i>	a man employed in tending, feeding and guarding sheep.
56.	Angus	<i>(noun)</i>	any of a breed of hornless black or red beef cattle originally from Scotland.
57.	mulish	<i>(adjective)</i>	stubborn, inflexible or uncompromising.
58.	rivalry	<i>(noun)</i>	competition.
59.	siblings	<i>(plural noun)</i>	two or more people with the same parents.
60.	chestnut	<i>(noun)</i>	any of a genus of deciduous trees or shrubs native to temperate regions of the northern hemisphere that have a fruit consisting of a single nut.
61.	minivan	<i>(noun)</i>	a small multipurpose vehicle with rear or side doors and side panels with windows that is used to transport passengers.
62.	plaid	<i>(adjective)</i>	having a cross-barred multicolored pattern.
63.	tissue	<i>(noun)</i>	an aggregate of cells together with their intercellular substance that form one of the structural materials out of which the body of a plant or an animal is made.
64.	scoundrel	<i>(noun)</i>	a bold selfish person who is equipped with low ethical standards.
65.	amino	<i>(adjective)</i>	relating to or containing the group NH ₂ united to a radical other than an acid radical.
66.	menthol	<i>(noun)</i>	an alcohol that occurs naturally in peppermint oil and Japanese mint oil and can be made artificially.
67.	Tabasco	<i>(trademark)</i>	– used for a condiment sauce made from capsicum berries.
68.	obvious	<i>(adjective)</i>	easily perceived by the mind.
69.	pulse	<i>(noun)</i>	a regular wave of distension in the arteries that is a result of blood progressing through an artery at each contraction of the ventricles of the heart.
70.	cottage	<i>(noun)</i>	a small house typically used in the summer.
71.	garland	<i>(noun)</i>	a wreath of leaves or flowers that is worn on the head or used for decoration.
72.	gnaw	<i>(verb)</i>	to bite or chew on with the teeth.
73.	comfort	<i>(noun)</i>	enjoyment in physical or mental well-being.
74.	caroling	<i>(verb)</i>	traveling outside in a group to sing Christmas songs on Christmas Eve.
	OR	carolling	



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75.	foolishness	<i>(noun)</i>	the state of lacking seriousness : folly.
76.	constellation	<i>(noun)</i>	any of the 88 configurations of stars.
77.	sundering	<i>(verb)</i>	breaking or forcing apart.
78.	juncture	<i>(noun)</i>	a seam or joint.
79.	exploits	<i>(verb)</i>	takes undue advantage of.
80.	rabble-rouser	<i>(noun)</i>	a person who stirs up the masses of the people (such as to violence or hatred).
81.	profound	<i>(adjective)</i>	hard to understand or comprehend.
82.	wreath	<i>(noun)</i>	a crown or band of intertwined flowers or leaves worn or given as a mark of honor.
83.	profile	<i>(noun)</i>	a representation of something in outline.
84.	untoward	<i>(adjective)</i>	unfortunate or unlucky.
85.	memorial	<i>(adjective)</i>	commemorative.
86.	industrial	<i>(adjective)</i>	of or belonging to a department of a craft, business or manufacture.
87.	barrier	<i>(noun)</i>	an object or objects that serve to separate or keep items apart.
88.	gratingly	<i>(adverb)</i>	with an irritating or harsh effect or sound.
89.	brayed	<i>(verb)</i>	made a loud harsh cry – used of a donkey.
90.	Harlem	<i>(geographical entry)</i>	section of New York City in northern Manhattan that was a center of African American culture in the 1920s.
91.	messenger	<i>(noun)</i>	someone who delivers a written or oral communication : a courier.
92.	beacons	<i>(plural noun)</i>	fires placed on a hill or tower that are used to communicate signals.
93.	generation	<i>(noun)</i>	development, rise.
94.	coverage	<i>(noun)</i>	the amount of reporting given to a news event.
95.	deters	<i>(verb)</i>	turns aside or discourages from acting.
96.	Nepal	<i>(geographical entry)</i>	landlocked country in Asia in the Himalayas on the northeast border of India.
97.	disinfectant	<i>(noun)</i>	a chemical used to destroy vegetative forms of damaging microorganisms.
98.	campaign	<i>(noun)</i>	a period of continuous and often competitive activity in any seasonal occupation or industry.
99.	starvation	<i>(noun)</i>	the instance of suffering from extreme hunger.
100.	gamma	<i>(noun)</i>	the third letter of the Greek alphabet.
101.	spleen	<i>(noun)</i>	an abdominal organ that plays a role in the maintenance of blood volume, the production of blood cells, the recovery of material from worn-out blood cells and the production of antibodies.



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102.	utensils	<i>(plural noun)</i>	tools or instruments used in a kitchen.
103.	depot	<i>(noun)</i>	a bus station.
104.	incident	<i>(noun)</i>	an uncommon happening.
105.	brambles	<i>(plural noun)</i>	prickly and rough vines or shrubs.
106.	trifecta	<i>(noun)</i>	a bet in which the bettor selects the first, second and third finishers in a contest or race in the correct order.
107.	shingle	<i>(noun)</i>	coarse and rounded detritus found on the seashore and which is different from regular gravel due to its large size.
108.	mason	<i>(noun)</i>	a skilled artisan who builds using stone, brick or concrete.
109.	avoid	<i>(verb)</i>	to stay clear of : to keep away from.
110.	static	<i>(adjective)</i>	stable, stagnant.
111.	samples	<i>(plural noun)</i>	portions to represent a whole.
112.	modern	<i>(adjective)</i>	contemporary : relating to the present time.
113.	chalk	<i>(noun)</i>	the prepared form of a soft limestone, earthy in texture and white, gray or buff in color used for marking or drawing.
114.	concentrate	<i>(verb)</i>	to bring all one's powers, faculties or activities to bear.
115.	proud	<i>(adjective)</i>	elated : highly pleased.
116.	expiration	<i>(noun)</i>	termination, close, extinction.
117.	batteries	<i>(plural noun)</i>	level of enthusiasm or energy.
118.	centuries	<i>(plural noun)</i>	time spans of 100 years.
119.	differed	<i>(verb)</i>	varied : changed from time to time.
120.	fearsome	<i>(adjective)</i>	arousing from fright or terror.
121.	fiercest	<i>(adjective)</i>	characterized by the most furious unrestrained vehemence or zeal.
122.	residence	<i>(noun)</i>	the place where one lives or has their home.
123.	abated	<i>(verb)</i>	lessened : decreased in force.
124.	scattering	<i>(verb)</i>	spreading widely and randomly by throwing about.
125.	toppled	<i>(verb)</i>	tumbled down : fell from top-heaviness.
126.	vane	<i>(noun)</i>	a movable device used to show the direction of the wind.
127.	vortices	<i>(plural noun)</i>	tornadoes : quickly moving and spiraling columns of air.
128.	turbulent	<i>(adjective)</i>	tempestuous or stormy.
129.	obstacles	<i>(plural noun)</i>	things that hinder progress or stand in the way.



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130.	continental	<i>(adjective)</i>	being the portion of the United States located on the continent of North America.
131.	deportment	<i>(noun)</i>	behavior or conduct.
132.	exhibits	<i>(plural noun)</i>	exhibitions or displays.
133.	agricultural	<i>(adjective)</i>	relating to or used in the science or art of working the soil, harvesting crops and raising livestock.
134.	momentous	<i>(adjective)</i>	weighty : of great importance.
135.	disturbance	<i>(noun)</i>	an interruption of quiet or peace.
136.	wily	<i>(adjective)</i>	crafty : full of deceitful cunning.
137.	rookie	<i>(noun)</i>	a member who is new to an athletic team.
138.	transparencies	<i>(plural noun)</i>	matters for displaying which are made on glass, thin cloth, paper or film and which are viewed by the help of light shining through the matter.
139.	hazmat	<i>(noun)</i>	a substance that is shipped and which would be dangerous to life or the environment if released without proper precaution.
140.	Antarctic	<i>(adjective)</i>	relating to the South Pole or the region surrounding it.
141.	perfume	<i>(noun)</i>	a fluid containing essences of flowers or synthetics which is used for its scent.
142.	plaiting	<i>(noun)</i>	braiding : the interweaving of three or more strands of hair.
143.	writers	<i>(plural noun)</i>	people who practice the act of literary or journalistic composition in words as a job.
144.	series	<i>(noun)</i>	a group of three or more things or events succeeding in order and having a relationship to each other.
145.	audience	<i>(noun)</i>	those present at a stage or film production or viewing of a televised program.
146.	insubstantial	<i>(adjective)</i>	imaginary : lacking substance.
147.	staggered	<i>(verb)</i>	swayed or tottered when standing or walking.
148.	assistance	<i>(noun)</i>	aid given to the needy, usually in monetary form.
149.	sanitized	<i>(verb)</i>	made hygienic through sterilization or cleaning.
150.	diminished	<i>(verb)</i>	decreased.
151.	organist	<i>(noun)</i>	someone who plays any of several large musical instruments which produce sustained tones by means of a keyboard.
152.	operator	<i>(noun)</i>	someone in charge of a telephone switchboard.



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153.	Louisiana	<i>(geographical entry)</i>	a state in the southern United States.
154.	perpetual	<i>(adjective)</i>	constant or indefinitely.
155.	blustery	<i>(adjective)</i>	stormy.
156.	molars	<i>(plural noun)</i>	teeth which are adapted for grinding due to having rounded or flattened surfaces.
157.	arrange	<i>(verb)</i>	to put in the correct or desired order.
158.	dissolved	<i>(verb)</i>	passed into an act by which a solid, liquid or gaseous substance is mixed typically with a liquid.
159.	extremely	<i>(adverb)</i>	in an intense manner.
160.	plastic	<i>(noun)</i>	any of a large group of materials of high molecular weight that usually contain a synthetic or semisynthetic organic substance, that are molded into objects of all sizes and shapes.
161.	multiplication	<i>(noun)</i>	a mathematical operation in which the first number is repeated as many times as there are units in the second number.
162.	middle	<i>(noun)</i>	the part halfway between two points.
163.	reasonable	<i>(adjective)</i>	not absurd or ridiculous : being in agreement with right thinking.
164.	closet	<i>(noun)</i>	a recess or cabinet used to hold china, clothing or other utensils.
165.	investigation	<i>(noun)</i>	study or research.
166.	accident	<i>(noun)</i>	an event that occurs by chance.
167.	discussion	<i>(noun)</i>	a consideration of a question typically occurring in informal debate.
168.	confused	<i>(verb)</i>	confounded : failed to distinguish between two or more parties.
169.	microwave	<i>(verb)</i>	to cook or heat food in an oven that prepares the food with short electromagnetic waves.
170.	gabled	<i>(adjective)</i>	furnished with the vertical triangular portion of the end of a building.
171.	settle	<i>(verb)</i>	seat : to cause to sit.
172.	somber OR sombre	<i>(adjective)</i>	dejected in appearance or mood : gloomy.
173.	tampered	<i>(verb)</i>	interfered with so as to change for the worse.
174.	loyal	<i>(adjective)</i>	devoted to a person : faithful.
175.	remarkable	<i>(adjective)</i>	worthy of being noticed.
176.	joists	<i>(plural noun)</i>	the small timbers or iron or steel beams that are arranged in a parallel fashion stretching from wall to wall in a building.
177.	scrambling	<i>(verb)</i>	moving with urgency.



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178.	inspector	<i>(noun)</i>	a police officer ranking below a superintendent.
179.	distressed	<i>(adjective)</i>	overcome with pain or grief.
180.	smudge	<i>(noun)</i>	a splotch or smear.
181.	throttle	<i>(verb)</i>	to choke : to stop the breathing of by any means.
182.	perfection	<i>(noun)</i>	flawlessness : freedom from defect.
183.	capable	<i>(adjective)</i>	marked by general efficiency and by adequate resourcefulness, skill and reliability.
184.	gadgets	<i>(plural noun)</i>	typically small devices that are often considered novelties and that are found especially on pieces of machinery.
185.	channel	<i>(noun)</i>	a band of frequencies able to accommodate a single television or radio communication.
186.	chisel	<i>(noun)</i>	a tool consisting of a metal bar with a sharpened edge at one end used for working on the surface of materials by chipping or carving.
187.	chimney	<i>(noun)</i>	a vertical structure incorporated into a building that carries off smoke, fumes or gases.
188.	minnow	<i>(noun)</i>	a very small fish that can grow up to three inches long and that is common in streams.
189.	domain	<i>(noun)</i>	a large subdivision of the Internet denoted by an abbreviation consisting of computers or sites with a common purpose or a common location.
190.	shuffle	<i>(verb)</i>	to slide the feet back and forth without lifting them.
191.	carpenter	<i>(noun)</i>	a person whose career is to build or repair with wood.
192.	pruners	<i>(plural noun)</i>	a tool which is used to remove dead branches or leaves from vegetation.
193.	parcel	<i>(noun)</i>	a package.
194.	squawk	<i>(verb)</i>	to emit a loud harsh cry.
195.	Sheetrock	<i>(trademark)</i>	— used to describe a plasterboard formed of gypsum between two surfaces of hard paper.
196.	trowel	<i>(noun)</i>	a hand tool with a blade that is used to apply, spread, shape and smooth any loose material.
197.	nervous	<i>(adjective)</i>	originating in or affected by the nerves.
198.	spirit	<i>(noun)</i>	any supernatural being such as an apparition or elf.
199.	equator	<i>(noun)</i>	the circle of the celestial sphere whose plane runs perpendicular to the axis of Earth.
200.	evidence	<i>(noun)</i>	something submitted legally to a tribunal as a means of realizing the truth of any alleged matter of fact under investigation before it.
201.	solar	<i>(adjective)</i>	related to the sun and its effects on Earth and other planets.
202.	explore	<i>(verb)</i>	to search or look into.
203.	distance	<i>(noun)</i>	the amount of separation between two points.
204.	fault	<i>(noun)</i>	responsibility for failure.



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205.	colonists	<i>(plural noun)</i>	someone who settles in a new country.
206.	prudence	<i>(noun)</i>	wisdom shown in the exercise of self-control and reason.
207.	assembly	<i>(noun)</i>	a meeting scheduled for an entire student body and faculty of a school held for recreational, administrative or educational reasons.
208.	sheriff	<i>(noun)</i>	an important county officer in the United States who is typically elected by the people.
209.	tarry	<i>(verb)</i>	to dawdle or procrastinate.
210.	entity	<i>(noun)</i>	something that has an objective or physical reality and distinct character.
211.	archives	<i>(plural noun)</i>	repositories for documents of historical value.
212.	commotion	<i>(noun)</i>	noisy confusion.
213.	vacancy	<i>(noun)</i>	an empty office or post.
214.	beatboxing	<i>(noun)</i>	a musical style comprised of solo vocal imitation of percussion.
215.	mutate	<i>(verb)</i>	to undergo a significant alteration.
216.	commonplace	<i>(noun)</i>	a comment or remark lacking in originality.
217.	gingerbread	<i>(noun)</i>	a cake made with molasses and ginger which is then cut in fancy shapes and frosted.
218.	dispute	<i>(verb)</i>	to wrangle : to argue with persistence.
219.	episode	<i>(noun)</i>	a part of a television or radio serial presented in one period.
220.	confection	<i>(noun)</i>	a delicacy.
221.	autographs	<i>(plural noun)</i>	handwritten signatures.
222.	petite	<i>(adjective)</i>	little or small.
223.	station	<i>(noun)</i>	a post or position of duty.
224.	withers	<i>(plural noun)</i>	the ridge on a horse that falls between the shoulder bones.
225.	hunky-dory	<i>(adjective)</i>	fine.