



I'LL HALVE S'MORE, PLEASE!

**Math Topic: Fractions**

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**ABOUT THE AUTHOR**

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**MATH TOPIC:** Fractions

**GRADE LEVEL:** 3-5

**TIME ALLOTMENT:** Three 45-minute class periods

### OVERVIEW:

The CYBERCHASE kids attempt to solve riddles using fractions in the episode "Zeus on the Loose." CYBERCHASE is a daily, animated math adventure TV series on PBS Kids that's ideal for all levels of math students because the episodes are fun to watch and they stress the importance of using math in everyday life. This particular episode gives the heroes a chance to redeem themselves in the eyes of Zeus by answering several riddles using fractions.

The lesson also features several interactive Web sites to allow students to practice their fraction skills. Using fractions in the CYBERCHASE episode and in the Web sites will strengthen students' ability to manipulate fractions with ease.

**SUBJECT MATTER:** Mathematics

**LEARNING OBJECTIVES:** Students will be able to:

- Describe a fraction in terms of sharing parts of a whole;
- Understand the meaning of the parts of a fraction (numerator and denominator);
- Add and subtract like fractions;
- Apply fractions to problem situations;
- Recognize and use equivalent fractions and represent them geometrically.

**STANDARDS:** From the National Council of Teachers of Mathematics Standards, available online at <http://standards.nctm.org/document/chapter5/index.htm>.

**Number and Operations Focus Areas for Grades 3-5:** Mathematics instructional programs should foster the development of number operation sense so that all students:

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- Use computational tools and strategies fluently and estimate appropriately.

### MEDIA COMPONENTS:

#### Video

CYBERCHASE Episode #106: "Zeus on the Loose"

#### Web Sites

##### Meet the CYBERCHASE Kids

<http://pbskids.org/cyberchase/meet.html>

Students have an opportunity to learn about the characters in CYBERCHASE.

##### CYBERCHASE Web Game: "Thirteen Ways To Look At A Half"

[http://pbskids.org/cyberchase/games/fractions/fractions\\_intro3.html](http://pbskids.org/cyberchase/games/fractions/fractions_intro3.html)

This is an interactive Web activity, where the user must identify how one-half can be represented by forming 13 different geometric patterns.

**CYBERCHASE Web Game: "Vortex"**

<http://pbskids.org/cyberchase/games/timelapse/timelapse.html>

This is an interactive Web activity, where the user must match images that have been divided into fractional sections as rapidly as possible.

**MATERIALS:**

**(For the class)**

- Large numbers cut out of construction paper (numbers 1-8); about 12 inches high
- A sturdy piece of construction paper (approximately 12 inches long and 3 inches wide). This piece will serve as the bar between the numerator and denominator.
- Adhesive spray glue
- Four assembled 's'mores' (A s'more consists of a flat Hershey's chocolate bar and two large marshmallows melted on two graham crackers. One can eat an unmelted s'more for this exercise if a microwave is not readily available.)
- Knife (only the teacher should use the sharp knife during the activity.)



**(For each student or pair of students)**

Note: Cover the materials and place out of reach of the students during the initial portion of the Introductory Activity.

- 1 chocolate bar
- 2 graham crackers
- 3 large marshmallows
- Paper towels
- Stiff paper plates
- A foot-long piece of yarn or string
- "Zeus On The Loose" worksheet (reproducible provided)

**PREP FOR TEACHERS:**

- Download the Shockwave and Flash plug-ins, available at <http://www.shockwave.com> and <http://www.flash.com> to computers that will be used during this lesson. **CUE** the videotape to the appropriate starting point. Prepare the student's materials and handouts for the lesson by providing a copy for each student.
- Prepare four s'mores for the lesson. The teacher will eat one s'more and the others will be used in the demonstration. A s'more consists of one chocolate bar with three to four marshmallows sandwiched between two graham crackers. The s'more is typically heated to melt the chocolate with the marshmallows.
- When using media, provide the students with a **FOCUS FOR MEDIA INTERACTION**, a specific task to complete and/or information to identify during or after viewing video segments, Web sites, or other multimedia components.
- To read about what kids know and don't know about this lesson's math topic, please turn to the last page of this lesson.

## INTRODUCTORY ACTIVITY:

1. Show the students a s'more and discuss how it is made—a s'more consists of one chocolate bar with three to four marshmallows sandwiched between two graham crackers. Ask your students if they like s'mores. Carefully cut or break one of the s'mores into two equal sized pieces and begin eating it very slowly. Hopefully, you will have piqued their attention enough to begin the discussion of fractions.
2. After swallowing your initial bite, show the students a whole s'more that is unbroken. Have students compare the uneaten half of the first s'more and the unbroken one and describe that the big one represents a 'whole,' while the little piece represents a 'part of the whole.' Some students might mention the word 'fraction,' as they have seen it before. If so, write it on the board and have kids pronounce the word. You might relate 'fraction' to 'fracture,' a break or a part. This is one way to remember the word and its meaning.
3. Ask two students to come to the front of the room. Present them with the whole s'more. Ask the class to suggest how these two students could share the s'more. (*They will probably suggest cutting it into two parts.*) Ask your students if you can cut it anywhere, and appear to be about to cut the s'more so that there is a tiny piece and a large piece. Have students discuss that the pieces have to be the same size to be fair. You might want to place the  $\frac{1}{2}$  piece on the whole one and flip it back and forth to show that when we make the cut, there will be two equal-sized pieces.
4. Now, carefully cut or break the whole s'more in half. Looking at one of the two student volunteers standing, ask the class: **How much will one of the volunteers get?** (*Discuss that the student would get one of the two pieces. Emphasize that in order to share among two students, you divided the whole into two equal sized pieces.*)
5. Ask your students: **How can we write the number that represents a part of the whole?** Some students might know how to write it. Have them describe it first in words. Put up the 12-inch by 3-inch paper to serve as the fraction bar. Have a student place the cut out numeral '1' over the fraction bar, and the numeral '2' under it. Ask: **What does the '2' mean?** (*The number of equal sized pieces to share*) **What does the '1' mean?** (*The number each person got*) Reward your two student volunteers with one half of the s'more apiece.
6. Ask the students: **Do you want s'more?** Of course, the implication is that the students think they are being offered the actual s'more. The teacher, on the other hand, will seize the moment to offer up s'more fraction concepts! This is a somewhat cheesy yet humorous approach to teaching fractions, but it will work—especially at the end of the day.
7. Ask: **Could you share a whole s'more with more students?** (*They will most likely respond with a resounding, "yes."*) Bring four student volunteers to the front of the room. Hold up a single graham cracker and ask a student to point to specific places on the s'more where breaks or cuts could be made to divide the graham cracker. Since the cracker is divided into four sections, typically students will point to the lines to break. Break the graham cracker on the lines indicated, and show the number of pieces. At this point, you should have four pieces of graham cracker. Discuss the meaning of fraction again, stressing the whole was cut into four equal-sized pieces to share with four students, and each got one of the pieces. Ask: **How could you**

**represent one of the pieces as a fraction?** (Have a student use the cut-out numbers and place them in the proper position above and below the fraction bar. Students should place the cut-out number one above the bar, and the cut-out number four below the bar.) Have the students say 'one-fourth.' If the opportunity arises, students might want to name the top number the 'numerator' and the bottom number the 'denominator.'

8. Ask: **Do you want s'more?** Since they have already heard this question, give one of the students who says "yes" a piece of the s'more you began eating at the beginning of the lesson. Tell the students you will give them some more, but that it's going to get trickier.
9. Bring out two more whole s'mores. Ask your students to discuss how the two s'mores could possibly be shared among the four student volunteers. There are many ways to do this. Consider sketching students' answers on the board. For example, you could break each s'more into four equal-sized pieces (making a total of eight pieces in all), and give each of the four student volunteers two pieces. You could also break each s'more in half, and give each student  $\frac{1}{2}$  piece.
10. Have students use the cut-out numbers to form each fraction. You might want to discuss that what they are saying means that  $\frac{1}{2}$  and  $\frac{2}{4}$  represent the same amount. By putting the two  $\frac{1}{4}$  pieces together they will get the  $\frac{1}{2}$ -sized piece.
11. For the last time, ask the class: **Do you want s'more?** Regardless of their answer, give each student their own plate of ingredients to make a s'more. Show the students how to make a s'more by placing the chocolate bar and the marshmallows in between the graham crackers. Challenge the students to try and break their s'more into eight even pieces without crumbling the crackers. Based on your approval, students may eat fractional portions of their s'more.

### LEARNING ACTIVITY:

The CYBERCHASE episode "Zeus on the Loose," will help demonstrate to students how fractions can be used as a practical tool in everyday life. If your students are not familiar with the series, introduce the students to the characters on the show using the CYBERCHASE Web site at <http://pbskids.org/cyberchase/meet.html>.

Provide the students with a **FOCUS FOR MEDIA INTERACTION**, asking them to look at the page and list the main characters. This will allow the students to become more familiar with the characters. If students are familiar with all the characters, this step may be skipped. After students have viewed the site, their list of characters should include: **Inez, Matt, and Jackie** (The CYBERCHASE kids), **Digit** (their sidekick, a talking bird), **Motherboard and Dr. Marbles** (guardians of Cyberspace), **Hacker** (the villain, out to destroy the Motherboard and gain control over Cyberspace), **Buzz and Delete** (Hacker's henchmen).



1. **CUE** CYBERCHASE #106 "Zeus on the Loose" to the beginning of the episode for a brief synopsis of how the CYBERCHASE story began. If students are familiar with the

storyline, then **CUE** CYBERCHASE #106 to the point immediately after the theme song, where you see Zeus towering over the CYBERCHASE kids. Give each student the handout titled, “Zeus on the Loose.” Provide students with a **FOCUS FOR MEDIA INTERACTION**, asking the students to listen for the first riddle the CYBERCHASE kids have to solve. **PLAY** the tape.

2. **PAUSE** the tape when Zeus throws a lightning bolt at the CYBERCHASE kids. **CHECK** student comprehension and see if students are able to repeat the riddle. **REWIND** the portion of the video stating the riddle and **REPLAY**. Have the students fill in key words in the riddle on the worksheet. Restate the riddle for the students. (*Answer to Questions 1-5 on worksheet: 1. Beasts and fates can set you **free**; 2. When you divide the **shares** equally; 3. Find my **cave**. 4. Survive the **rain**. 5. A second chance is yours to **gain**.) Once the students have the key words filled in their worksheet, you may proceed.*
3. Provide students with a **FOCUS FOR MEDIA INTERACTION**, asking them to determine how to equally divide the laurel wreath for the three Fates. **PLAY** the video. **PAUSE** when the video shows the three Fates fighting over the laurel wreath. Give each student a piece of string, and ask your students if they can find a way to divide it into three equal pieces. What are their suggestions? (*Student answers will vary.*)
4. Ask your students to make predictions about how the CYBERCHASE kids could divide the laurel wreath into three equal pieces. Have students write their predictions on the worksheet (#6). Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking them to check and see if their predictions are correct.



**PLAY** the video. **PAUSE** video when Inez says, “One-third for you, one-third for you and one-third for you.” The screen will show Inez handing each Fate a piece of the wreath. Ask the class if any of their responses were correct. How many pieces did each Fate receive? The students can write their answers on #7 of the worksheet. (*Each sister received one piece of the wreath.*) Ask your students how their solution with the string was similar to the CYBERCHASE kids’ solution? How was it different? (*Student answers will vary.*)

Ask: **What fraction of the whole did each sister receive?** ( $\frac{1}{3}$ ) Have the students write their answer on #8. Check for accuracy. Allow students to write the correct answer on their worksheet. Have one of the students place the fraction the CYBERCHASE kids created with the wreath on the classroom wall. ( $\frac{1}{3}$ )

5. **CUE** the video until you see the CYBERCHASE kids standing on some rocks, and Inez says “That’s persevering, Didge, not perspiring.” Provide the students with a **FOCUS FOR MEDIA INTERACTION**, asking them to determine how they would solve the problem of feeding each dog an equal amount? **PLAY** the video. **PAUSE** when Inez says, “So how do we share two apples equally with three heads?”

6. Ask one of your best artists to come up to the board and quickly sketch a three-headed dog. On the opposite side of the board, sketch two apples. Restate the problem: **The kids must feed each head of the dog an equal amount of the two apples. How could the kids divide the two apples so that each head gets an equal amount?** *(Student answers will vary. There are a number of different ways to work out this challenge. Students should make predictions verbally of how they would solve the problem. Ask students to modify the drawings on the board to come up with a solution to the problem. Have the students write their favorite solution on question #9 on the worksheet.)*
7. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking your students to determine whether or not their solution is the same solution the CYBERCHASE kids use. **PLAY** the video. **PAUSE** the video when the CYBERCHASE kids feed the dogs and Atlas says, "Aren't you forgetting something?" Was your students' solution the same as the solution in the show? Ask your students to write the solution in the second part of #9 on the worksheet.

Restate the solution presented in the show so that all students can write it down. *(The kids can equally divide the apples by dividing each apple into three pieces and feeding each dog two pieces.)* Have the students write the fraction of the whole group of apples each dog would eat. *(Answer to #10 on the worksheet: The fraction is  $\frac{2}{6}$  or  $\frac{1}{3}$ .)* Ask another student volunteer to show the correct fraction on the wall with the construction paper numbers.

8. Provide the students with a **FOCUS FOR MEDIA INTERACTION**, asking them to determine how the CYBERCHASE kids will equally divide the gold bars between the two goat boys. **PLAY** the video until the short Goat Boy states, "Each of these bars must be one-eighth the whole bar." **PAUSE** the video so that you have a clear image of the four rows of gold bars.
9. Ask for a student volunteer to come up to the TV and **DRAW ON THE SCREEN** (with a dry erase marker, of course) to show how the bars could be divided evenly among the two goat boys without breaking the bars. Give them a hint to consider the length of the bar as a method of division. Give a few students a chance to share their predictions on the television, showing that there is more than one solution to this problem.
10. Restate the previous **FOCUS FOR MEDIA INTERACTION**. **PLAY** video until Digit says, "Because  $\frac{8}{8}$  is the same as a whole." **PAUSE** the tape. Ask students if any of their solutions were used.

Instruct the students to quickly draw in space #10 on their worksheet the amount of gold each goat boy received after the division. Sketch on the board how many pieces of gold each goat boy received in the episode.

11. Provide the students with a **FOCUS FOR MEDIA INTERACTION**, asking students to determine if the CYBERCHASE kids completely answered the riddles. **PLAY** video until Digit flies into Zeus's shield. **STOP** video. Ask: **Did the CYBERCHASE kids answer all the riddles?** *(Yes, the CYBERCHASE kids answered all the riddles.)*

### **CULMINATING ACTIVITY:**

1. Introduce your students to the Web site <http://pbskids.org/cyberchase/games/fractions/index.html> and the character of Dr. Marbles. He will demonstrate to

students how you can look at fractions in different ways. Provide the students with a **FOCUS FOR MEDIA INTERACTION**, asking students to complete the activity by trying to find all 13 combinations that make one half. Teachers may choose to complete the exercise with one monitor and computer to assist students in finding as many combinations as possible without rotating or flipping the picture.

Their goal is to click the mouse and fill in parts of a square to make new combinations that represent  $\frac{1}{2}$  of the whole. If using one monitor, have different students come to the mouse and click on their idea of a new combination. Students may assist the student working at the computer. The game will record the number of combinations the class has successfully made. It also shows a picture of the triangles that have been filled in by previous students so that combinations are not repeated.

Give students 10 minutes to see how many combinations they can find, either as a class or as individuals. How many combinations could they come up with? What strategies worked? What didn't? *(Student answers will vary. Please note: It is very difficult to complete this activity. The important point is that it is FUN, and not that it has to be mastered.)*

2. If students complete Dr. Marble's 13 combinations, you may direct the students to another fractions game called "Vortex" at <http://pbskids.org/cyberchase/games/timelapse/timelapse.html>. Provide students with a **FOCUS FOR MEDIA INTERACTION**, asking them to click on the shape that matches the image on the right side of the screen. Students will need to pay attention to how each shape is divided into fractional portions in order to make a successful match.

"Vortex" is a speed game, so encourage the students to concentrate and click on the like shape as soon as they see it. For students with hand-eye coordination difficulties, assist them in finding the matching ball while the game is occurring. You may need to help correctly position the student's hand on the mouse.

At the end of the exercise, ask the students their score. Ask: **What did today's lesson and fractions have to do with the "Vortex" exercise?** *(The shapes in the activity are divided into different shaded areas. Each shaded area is a fraction of the whole image. In order to match images, you sometimes had to count the fraction of the shape that was filled in, and not just look at the shape.)* This exercise should not be used as a graded activity but utilized merely to reinforce like fractions.

## CROSS-CURRICULAR EXTENSIONS:

- **Art.** Students can use their knowledge of fractions to color various geometric areas. One great activity, available online at <http://www.math.rice.edu/~lanius/Patterns/designs.html> allows the user to create a geometric map with specific number of triangles with particular colors. This site provides multiple exercises to strengthen a student's ability to utilize fractions to design art.
- **History/English.** Using key terms and names mentioned in the video, "Zeus on the Loose," students can gain a greater understanding of Greek mythology. Student may use the Web site at <http://www.mythweb.com/gods/index.html> to view pictures and read more about the different Greek gods and goddesses.
- **Technology.** Cyberspace is a term that has real meaning beyond the animated video series. Provide students with a list of words from the lesson episode including cyberspace, motherboard, digit, and hacker. Have students research the meaning of each term using Webopedia at <http://www.webopedia.com>, an online dictionary for

computer and Internet terminology. Each Webopedia entry includes links to other related terms that students can add to their own personal glossary.

- **Reading.** Students may also choose to read one of the following books and guides to assist them with the various mythological characters. The Web site, <http://www.magicaljourneys.com/TravelGuides/children.html>, can also be of assistance for online research about Greek mythology.

***A Gift From Zeus*** by Jeanne Steig (HarperCollins Children's Books, 2001)  
The ancient gods of Greece and Rome come alive in this retelling of 16 favorite myths.

***Mythology*** by Edith Hamilton (Little, Brown & Company, 1998)  
Edith Hamilton loved the ancient Greek myths with a passion — believing they tell us quite a bit about the early Greeks and ourselves.

***Gods and Goddesses of Olympus*** by Aiki (HarperCollins Children's Books, 1997)  
This large-format book provides a quick, brightly illustrated introduction to the ancient Greek gods and goddesses.

***Classical Kids: An Activity Guide To Life in Ancient Greece and Rome*** by Laurie Carlson (Chicago Review Press, 1998)  
Travel back in time to see what life was like in ancient Greece and Rome while having fun with such hands-on activities as making a star gazer, chiseling a clay tablet, weaving Roman sandals, and making a Greek mosaic.

### **COMMUNITY CONNECTIONS:**

- How much of your day is used for sleeping? Students can calculate out of 24 hours the fraction that is used for sleeping and for other day-to-day activities.
- Order pizza for the students and have the pizza shop cut it into 16 pieces instead of eight. Have the students decide how many pieces each person will receive based on the amount that is cut.



## ZEUS ON THE LOOSE

NAME \_\_\_\_\_

### RIDDLE

Fill in the blanks while watching and listening to the video.

1. Beasts and Fates can set you \_\_\_\_\_.
2. When you divide the \_\_\_\_\_ equally.
3. Find my \_\_\_\_\_.
4. Survive the \_\_\_\_\_.
5. A second chance is yours to \_\_\_\_\_.

**Predict the answer to solve the problem for The Fates.**

6. How will the CYBERCHASE kids divide the laurel wreath equally?

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7. How many pieces did each sister receive? \_\_\_\_\_
8. What fraction of the whole did each sister receive? \_\_\_\_\_

**Predict the answer to solve the problem for the Three-Headed Dogs.**

9. How would you divide the apples to feed all three dogs?

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CYBERCHASE solution \_\_\_\_\_

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10. On a separate piece of paper, draw a picture of the gold bars that shows how the CYBERCHASE kids divided the gold evenly.

## **Math Topic: Fractions**

(To go with “I’ll Have S’more, Please”)

### **What we can assume 8- and 9-year-olds already know about FRACTIONS:**

Kids have trouble comparing the size of fractions without the use of concrete items or visuals. The representation in fraction form is counter-intuitive to information about whole numbers. Up to this point, their entire understanding of number is based on whole numbers, so kids believe that bigger is better. Therefore, since 4 is greater than 3,  $1/4$  should be greater than  $1/3$ !

Fourth-graders are familiar with number lines, but they are astounded with the discovery that a world of numbers exists from one whole number to the next. While the concept of ‘half’ is clear and can be placed on the number line, they have less experience with fourths, eighths, and sixteenths. With some coaching, however, kids will recognize that these fractional partitions exist on a number line and are similar to those on a ruler.

### **What confuses kids about FRACTIONS:**

Halves, fourths and eighths are the easiest for kids to learn since the fractional part can be found from folding paper in half and in half again and again. Kids also have experience cutting through the middle of circular shapes (when cutting cakes, pies and pizzas, for example), so halves, fourths and eighths are easily visualized using the circular model. But finding fractional parts for thirds, sixths and fifths is more obscure and baffling because kids have much less concrete experience with these amounts.

While this age group may be familiar with the idea that a collection of objects can be separated into equal portions, it is a challenge for them to figure out the fraction that represents the portion. At 4<sup>th</sup>-grade level, kids are used to dividing up a collection in a one-to-one fashion, the same way we deal cards, or by demonstrating “one for you, one for me.” It takes many experiences before a child views a collection of 12 things shared by 3 people and is able to state, “One portion is  $4/12$ ths,” or “We each have  $1/3$  of the 12 things.”

When working with fractions, kids must be reminded that the denominator, the bottom number, represents the total number of parts. Kids can understand what that means when they compare  $1/3$  to  $1/5$  by asking themselves, “Would I rather share my pizza with 3 people or with 5 people? Fewer people mean there will be bigger pieces...I’ll get more! So  $1/3$  is the bigger fraction.” A lot of reasoning has to take place when viewing the fractional form without a visual picture to accompany it.