

# RATIO AND PERCENT

**Grade Level:** Fifth Grade

**Written by:** Susan Pope, Bean Elementary, Lubbock, TX

**Length of Unit:** Two/Three Weeks

## I. ABSTRACT

- A. This unit introduces the relationships in ratios and percentages as found in the Fifth Grade section of the *Core Knowledge Sequence*. This study will include the relationship between percentages to fractions and decimals. Finally, this study will include finding averages and compiling data into various graphs.

## II. OVERVIEW

- A. Concept Objectives for this unit:
1. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  2. Students will understand the general nature and uses of mathematics.
- B. Content from the *Core Knowledge Sequence*:
1. Ratio and Percent
    - a. Ratio (p. 123)
      - determine and express simple ratios,
      - use ratio to create a simple scale drawing.
      - Ratio and rate: solve problems on speed as a ratio, using formula  $S = D/T$  (or  $D = R \times T$ ).
    - b. Percent (p. 123)
      - recognize the percent sign (%) and understand percent as “per hundred”
      - express equivalences between fractions, decimals, and percents, and know common equivalences:  
 $1/10 = 10\%$   
 $1/4 = 25\%$   
 $1/2 = 50\%$   
 $3/4 = 75\%$   
find the given percent of a number.
- C. Skill Objectives
1. Mathematics
    - a. Compare two fractional quantities in problem-solving situations using a variety of methods, including common denominators
    - b. Use models to relate decimals to fractions that name tenths, hundredths, and thousandths
    - c. Use fractions to describe the results of an experiment
    - d. Use experimental results to make predictions
    - e. Use table of related number pairs to make predictions
    - f. Graph a given set of data using an appropriate graphical representation such as a picture or line
    - g. Identify the mathematics in everyday situations

## A. BACKGROUND KNOWLEDGE

- D. For Teachers

1. Hirsch, Jr., E. D. *What Your 5<sup>th</sup> Grader Needs to Know*. New York, NY: Doubleday, 1993, ISBN 0-385-31464-7
  2. Moredock, Janet. *Handy Homework Helper: Math-A study reference guide*. Lincolnwood, IL: Publications International, Ltd., 1999, ISBN 0-7853-1955-7
- E. For Students
1. Fractions and Decimals
  2. Review TALK (Title, All Labels, Key) graphing skills

## B. RESOURCES

- A. Hirsch, Jr., E. D. *What Your 5<sup>th</sup> Grader Needs to Know*. New York, NY: Doubleday, 1993, ISBN 0-385-31464-7
- B. Mitchell, Cynthia. *Decimals and Fractions: Grades 4-8*. New York: Scholastic Professional Books, 1998, ISBN 0-590-37365-X
- C. Moredock, Janet. *Handy Homework Helper: Math-A study reference guide*. Lincolnwood, IL: Publications International, Ltd., 1999, ISBN 0-7853-1955-7
- D. Moscovich, Ivan. *Probability Games and Other Activities*. Workman Publishing Company, Inc., 2000, ISBN 0-7611-2017-3
- E. Viorst, Judith. *Alexander, Who Used to Be Rich Last Sunday*. New York, NY: Atheneum Books for Young Readers, 1978, ISBN 0-689-30602-4

## III. LESSONS

### Lesson One: Percent

- A. *Daily Objectives*
  1. Concept Objective(s)
    - a. Students will make connections between fractions/decimals and percents.
  2. Lesson Content (p. 123)
    - a. Recognize the percent sign (%) and understand percent as “per hundred”
    - b. Express equivalence’s between fractions, decimals, and percents, and know common equivalences:  $1/10 = 10%$ ;  $1/4 = 25%$ ;  $1/2 = 50%$ ;  $3/4 = 75%$
  3. Skill Objective(s)
    - a. Students will use models to relate decimals to fractions that name tenths, hundredths, and thousandth.
- B. *Materials*
  1. 99 red jelly beans and 11 green jelly beans
  2. blindfold
  3. two wide-mouth jars
  4. homework pass (or incentive of your choice)
- C. *Key Vocabulary*
  1. percent- one part in each hundred
  2. percentage- a rate or proportion per hundred
  3. percentile- a number that divides a series into a hundred groups having equal frequencies
- D. *Procedures/Activities*
  1. Place 1 green jellybean in a jar with 9 red jellybeans.
  2. Place 10 green jellybeans in another jar with 90 red jellybeans.
  3. Tell the students that you have placed these jellybeans in the jar and the student who can pick a green jellybean from one of the two jars may have a free homework pass.

4. Have the students discuss among themselves which jar they think would be the best from which to try and pick a green jellybean while blindfolded. Use your own method to decide the order in which your students will draw from the jar.
  5. Have each student draw one bean from the jar of his or her choice.
  6. Keep a record of the beans chosen and have the students brainstorm relationships they find among the outcomes.
  7. Make a list of what the students' brainstorm.
  8. Explain to the students that the chances of picking one bean, from one jar, one time, are the same for each jar because 1 out of 10 is = 10 out of 100.
  9. Most often, students believe 1 chance out of 10 are better than 10 chances out of 100, but the ratio of green jellybeans to red jelly beans is the same.
  10. [1:10 =  $1/10 = 0.10 = 10\%$ ]      [1:100 =  $1/100 = 0.100 = 100\%$ ]
- E. *Assessment/Evaluation*
1. Teacher Observation

## **Lesson Two: Ratio**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  2. Lesson Content (p. 123)
    - a. Determine and express simple ratios,
    - b. Express equivalence's between fractions, decimals, and percents, and know common equivalence's:  $1/10 = 10\%$ ;  $1/4 = 25\%$ ;  $1/2 = 50\%$ ;  $3/4 = 75\%$
  3. Skill Objective(s)
    - a. Use fractions to describe the results of an experiment
    - b. Use experimental results to make predictions
- B. *Materials*
1. 2 different flavored soda-pops from 2 different manufacturers (enough of one for girls in class and enough of the other for boys in class)
  2. Appendix A-E
  3. Offices (two file folders overlapped and laminated so as to stand when opened)
- C. *Key Vocabulary*
1. ratio- A ratio is used to compare two quantities;  
It can be written: in words- one to two  
with a symbol- 1:2  
as a fraction-  $1/2$
  2. simplify (reduce)- to make simple or lessen in size
  3. greatest common factor (GCF)- greatest factor shared between numbers
- D. *Procedures/Activities*
1. Pass out the flavored sodas to boys and girls. (One kind for each group.)
  2. Ask the students to find a pattern for which they received their sodas. (They will probably notice the boys received one kind and the girls another.)
  3. Introduce the idea of ratio. Compare the number of girls to boys in class.  
Example: eight girls to twelve boys or twelve boys to eight girls  
Also, point out the ratio of one flavor of soda to the other flavor of soda and also one manufacturer to the other manufacturer.
  4. Ask students to give you examples of ratios.

Demonstrate how ratios can be written in words- eight to twelve, with a symbol- 8:12, or as a fraction-  $\frac{8}{12}$

5. Demonstrate as many examples as necessary, writing the 3 forms of ratio, until student confidence is acquired. (My students like to play for tickets. I give them an example to solve. I walk about the room checking answers. Correct answers are rewarded with a ticket the students may spend in my store of school supplies and such. Examples are checked as a whole class when everyone has had a chance to answer once. They like to use 'offices' when we play for tickets.)
6. When you feel comfortable with the students' knowledge of writing the 3 forms of ratio, move onto simplifying fractional ratios and writing the reduced form as a decimal and percent. See Appendix A-C. Appendix D may be used for homework and evaluation. Appendix E may be placed in a center setting to reinforce the skill of simplifying fractional ratios.

E. *Assessment/Evaluation*

1. Teacher Observation / Appendix D (*Homework*)
2. Appendix C

**Lesson Three: Bar Graph**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Students will understand the general nature and uses of mathematics.
2. Lesson Content (p. 123)
  - a. Determine and express simple ratios.
3. Skill Objective(s)
  - a. Graph a given set of data using an appropriate graphical representation such as a picture or line.
  - b. Identify the mathematics in everyday situations.
  - c. Use table of related number pairs to make predictions

B. *Materials*

1. Appendix F

C. *Key Vocabulary*

1. None

D. *Procedures/Activities*

1. Use the TALK (Title, All Labels, Key) method to guide students through making a bar graph of the ratios from yesterday's lesson. They may choose to use the comparison between flavors of soda, boys to girls, or one shared during discussion from lesson two.
2. Use Appendix F to help with this lesson.
3. You may also choose to have the students make a graph using Microsoft Word or Excel.

E. *Assessment/Evaluation*

1. Bar Graph

**Lesson Four: Proportion**

A. *Daily Objectives*

1. Concept Objective(s)
  - a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
2. Lesson Content (p. 123)

- a. Determine and express simple ratios
3. Skill Objective(s)
  - b. Compare two fractional quantities in problem-solving situations using a variety of methods, including common denominators
- B. *Materials*
  1. Sets of Index cards with multiples of 3 & 4 to 30 & 40, 2 & 5 to 20 & 50, 6 & 7 to 60 & 70, 4 & 9 to 40 & 90, 3 & 4 & 6 to 30 & 40 & 60
  2. Appendix G & M
  3. Pages 9, 11-12, 13-14, 17, 15-16 from *Decimals and Fractions*
- C. *Key Vocabulary*
  1. Proportion- a number sentence that maintains two ratios is equal.
  2. Scale- a relationship between the size of things in a drawing and its actual size.
  3. Least Common Multiple- the lowest, common value between two or more numbers.
- D. *Procedures/Activities*
  1. Proportion and scale are terms that express relationship. Relationships are comparisons. To understand the relationship between proportion and scale, you must also understand Least Common Multiple (LCM) which allows us to compare fractional quantities.
  2. Give each of 10 students an index card with the multiple of 3 and have them line up consecutively shoulder - to - shoulder. Then, give each of ten more students an index card with multiples of 4 and have them line up consecutively shoulder - to - shoulder facing the multiples of 3.
  3. Have the “4” multiples look for the first “3” multiple that is the same as theirs and call him over Red Rover style. Then, the “3” multiples should call back the LCM’s. In this manner, students should begin to understand the Least Common Multiple between numbers. Continue with more sets of multiples.
  4. Use Appendix G to allow students further practice with LCM. *The Mysterious Fraction Zone* (pg. 9) from Decimals and Fractions: Grades 4–8 can be used as further guided practice. *The Wheel of Fractions* (pg. 11-12) from Decimals and Fractions: Grades 4–8 can be used as Independent Practice. *Optical Illusions* (pg. 13-14) from Decimals and Fractions: Grades 4–8 can be used as homework. *Fraction Line-Up* (pg. 17) from Decimals and Fractions: Grades 4–8 can be placed in a center to reinforce LCM.
- E. *Assessment/Evaluation*
  1. *The Wheel of Fractions* and *Optical Illusions*

### **Lesson Five: Circle Graph**

- A. *Daily Objectives*
  1. Concept Objective(s)
    - a. Students will understand the general nature and uses of mathematics.
  2. Lesson Content (p. 123)
    - a. Determine and express simple ratios.
  3. Skill Objective(s)
    - b. Graph a given set of data using an appropriate graphical representation such as a picture or line.
    - c. Identify the mathematics in everyday situations.
- B. *Materials*
  2. *Sensational Surveys* from Decimals and Fractions: Grades 4-8

- C. *Key Vocabulary*
  - 1. None
- D. *Procedures/Activities*
  - 1. Follow directions as explained on pg. 15-16, *Sensational Surveys* from Decimals and Fractions: Grades 4-8
- E. *Assessment/Evaluation*
  - 1. Use Appendix H to evaluate Graphing project.

**Lesson Six: Proportion**

- A. *Daily Objectives*
  - 1. Concept Objective(s)
    - a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  - 2. Lesson Content (p. 123)
    - a. Use ratio to create a simple scale drawing.
    - b. Ratio and rate: solve problems on speed as a ratio, using formula  $S = D/T$  (or  $D = R \times T$ ).
  - 3. Skill Objective(s)
    - a. Compare two fractional quantities in problem-solving situations using a variety of methods, including common denominators
    - b. Identify the mathematics in everyday situations
- B. *Materials*
  - 1. Map of United States
  - 2. Metric/Customary Ruler
  - 3. Appendix I
- C. *Key Vocabulary (Review)*
  - 1. mph- miles per hour
- D. *Procedures/Activities*
  - 1. Use a map to locate the actual distance from your hometown to San Diego, California. (My hometown is Lubbock, Texas and it is approximately 1,665 miles to San Diego, California.)
  - 2. *Rate and ratio: solve problems on speed as a ratio.* Using the formula  $S = D/T$  (or  $D = R \times T$ ) have the students figure how long it would take them to drive from your hometown to San Diego, CA if they traveled at a rate of 65 mph.  
Example:  $65 \text{ mph} = 1665 \text{ mi } \square \text{ hrs}$   
(Speed or Rate) = (Distance) (Time)  
  
 $1665 \text{ mi} \quad 65 \text{ mph} = 26 \text{ hrs}$   
(Distance) (Rate or Speed) = (Time)  
  
 $65 \text{ mph} = 1665 \text{ mi } 26 \text{ hrs}$   
(Speed or Rate) = (Distance) (Time)  
  
 $1665 \text{ mi} = 65 \text{ mph} \times 26 \text{ hrs}$   
(Distance) (Rate or Speed) x (Time)
  - 3. Use Appendix I to allow students the opportunity to make a scale showing the distance between your hometown and San Diego, California. The scale may use metric or customary units of measure. Students should use their scale

measurement and their actual measurement to show the relationship in proportion of their map to the actual distance. *For ease of demonstration, round each measurement.* For example: The distance between Lubbock, Texas and San Diego, California is approximately 1,665 miles and measures 15 cm (according to my map). Find a fraction equivalent to the scale. The scale is 1 centimeter. The actual length on the map is 15 centimeters. The actual distance is 1,665 miles. Therefore, 1,665 divided by 15 = 111. You multiply 1 cm x 111 to get 111, and you multiply 15 by 111 to get 1,665.

$$\begin{array}{l} \text{Length on plan: } \underline{1 \text{ cm}} = \underline{111 \text{ cm}} \\ \text{Actual length: } 15 \text{ cm} = 1665 \text{ mi} \end{array}$$

- E. *Assessment/Evaluation*
1. Scale

### **Lesson Seven: Proportion**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  2. Lesson Content (p. 123)
    - a. Use ratio to create a simple scale drawing.
  3. Skill Objective(s)
    - a. Compare two fractional quantities in problem-solving situations using a variety of methods, including common denominators
    - b. Identify the mathematics in everyday situations
- B. *Materials*
1. Craft Sticks
  2. Skinny Craft Sticks
  3. Glue
  4. String
  5. Appendix J – Student Worksheet
  6. Appendix K – Teacher Answer Sheet
- C. *Key Vocabulary (Review)*
1. None
- D. *Procedures/Activities*
1. Use Appendix I to help students figure measurements for a scale model of the Golden Gate Bridge.
  2. Group students to build the Bridge above water, Bridge below water, Tower, Cables using their scale measurements, sticks, and glue.
  3. The pieces should then be glued together. It could be painted orange to give a more authentic appearance.
- E. *Assessment/Evaluation*
1. Observation

### **Lesson Eight: Percentage**

- A. *Daily Objectives*
1. Concept Objective(s)

- a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  - 2. Lesson Content (p. 123)
    - a. Recognize the percent sign (%) and understand percent as “per hundred”
    - b. Express equivalence’s between fractions, decimals, and percents, and know common equivalence’s:
      - $1/10 = 10\%$
      - $1/4 = 25\%$
      - $1/2 = 50\%$
      - $3/4 = 75\%$
 find the given percent of a number.
  - 3. Skill Objective(s)
    - a. Use models to relate decimals to fractions that name tenths, hundredths, and thousandths
    - b. Use fractions to describe the results of an experiment
    - c. Identify the mathematics in everyday situations
- B. *Materials*
- 1. *Alexander, Who Used To Be Rich Last Sunday*
  - 2. Appendix L or play money
  - 3. Overhead Fraction Circles
  - 4. Appendix M – Transparency, Student Handout
  - 5. Appendix N – Teacher Answer Sheet
  - 6. Appendix O
- C. *Key Vocabulary* (Review)
- 1. None
- D. *Procedures/Activities*
- 1. In play money, give groups of students 1 dollar, 4 quarters, 10 dimes, 20 nickels and 100 pennies.
  - 2. Walk students through how various quantities of each of the different coins is equal to one dollar.
  - 3. As you demonstrate this concept with play money, also write the values in decimal form.
  - 4. Again, walk the students through the decimal value of each coin and how many are needed to equal one dollar. But, this time, show the percentage of each coin needed to equal one dollar by using the fraction circles and writing the percentage.
  - 5. Once the students have made a connection between decimals, fractions, and percentages using money, read the story *Alexander, Who Used To Be Rich Last Sunday*.
  - 6. Give each student 3 dollars, 5 quarters, 6 dime, 12 nickels, and 31 pennies in play money. Have the students count out how much money Anthony has after reading page one. Have the students tell you how many dollars, quarters, dimes, nickels and pennies Nicholas has after counting what is left. Read page two. Continue reading the story.
  - 7. Have the students begin to follow along “spending” their money as Alexander does after receiving one dollar from Grandma Betty and Grandpa Louis. This will require them to regroup their dollar. It may be necessary to allow some students to work in groups.

8. Use Appendix M as an overhead transparency and a copy for each student and have the students follow along “spending” one dollar.
  9. At the completion of the story, the students may then use the handout to convert the decimal dollar amount left after each exchange to a fraction and then to a percentage of the dollar Alexander has spent.
  10. Appendix O may be used to create a center. Place the fractions on one side of an index card and its decimal equivalent on the other. Cut the corner to allow the card to flip over when placed in a flip chute.
- E. *Assessment/Evaluation*
1. Appendix M

### **Lesson Nine: Percentage**

- A. *Daily Objectives*
1. Concept Objective(s)
    - a. Students will understand and apply basic and advanced properties of the concept of ratios and percents.
  2. Lesson Content (p. 123)
    - a. Recognize the percent sign (%) and understand percent as “per hundred”
    - b. Express equivalence’s between fractions, decimals, and percents, and know common equivalence’s:
 
$$\frac{1}{10} = 10\%$$

$$\frac{1}{4} = 25\%$$

$$\frac{1}{2} = 50\%$$

$$\frac{3}{4} = 75\%$$
 find the given percent of a number.
  3. Skill Objective(s)
    - a. Graph a given set of data using an appropriate graphical representation such as a picture or line
    - b. Identify the mathematics in everyday situations
- B. *Materials*
1. Appendix M - Graded and corrected
  2. Appendix F
  3. Appendix L
- C. *Key Vocabulary (Review)*
1. None
- D. *Procedures/Activities*
1. Have students use Appendix L to make a pictograph on Appendix F using the data from Appendix M.
- E. *Assessment/Evaluation*
1. Pictograph

### **IV. CULMINATING ACTIVITY**

- A. Students will dress as professional marketers and present their graphical findings from a graph within the unit (or a new one if you have the time to allow for this).

### **V. HANDOUTS/WORKSHEETS**

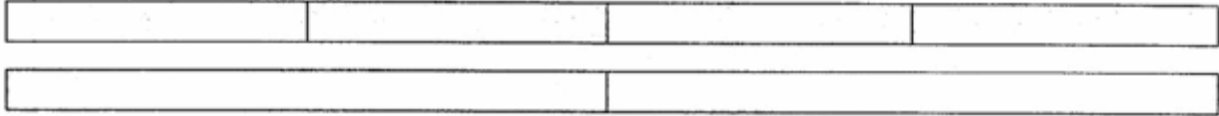
- A. Appendices A-O.
- B. See *Decimals and Fractions*.

## VI. BIBLIOGRAPHY

- A. Hirsch, Jr., E. D. *What Your 5<sup>th</sup> Grader Needs to Know*. New York, NY: Doubleday, 1993, ISBN 0-385-31464-7
- B. Mitchell, Cynthia. *Decimals and Fractions: Grades 4-8*. New York: Scholastic Professional Books, 1998, ISBN 0-590-37365-X
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- E. Viorst, Judith. *Alexander, Who Used to Be Rich Last Sunday*. New York, NY: Atheneum Books for Young Readers, 1978, ISBN 0-689-30602-4
- F. <http://www.thoma.com/thoma/ggbfacts.html>
- G. <http://www.atozkidsstuff.com>

## Ratio & Percent

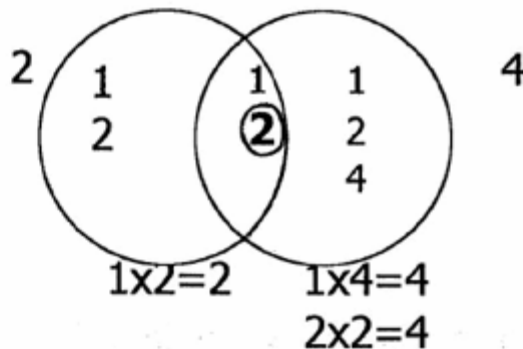
To simplify (reduce) a ratio written in the form of a fraction, like  $\frac{2}{4}$ . We must find its value as expressed using the fewest pieces necessary ( $\frac{1}{2}$ ) to show equal value to its original form  $\frac{2}{4}$ .



It is easy to see the fractional ratio  $\frac{2}{4}$  simplified to  $\frac{1}{2}$  using the above picture, but we need another way to simply fractional ratios when we do not have access to accurate pictures, or manipulatives. Have you ever heard your Mother say, "Everything isn't always as it appears"?

A good way to do this is by finding the Greatest Common Factor, or GCF, of the denominators. This can be done using a Venn Diagram. You may have used a Venn Diagram to compare things before. We will use it to compare factors that are shared between denominators.

Begin listing factors of the first given number being careful to always begin with  $1 \times \square = \square$  and continue in a consecutive manner until all factors of  $\square$  are found.



Divide the numerator and the denominator by the GCF to simplify the fractional ratio to its lowest terms (value of fraction using fewest pieces).

fraction  
 $\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$

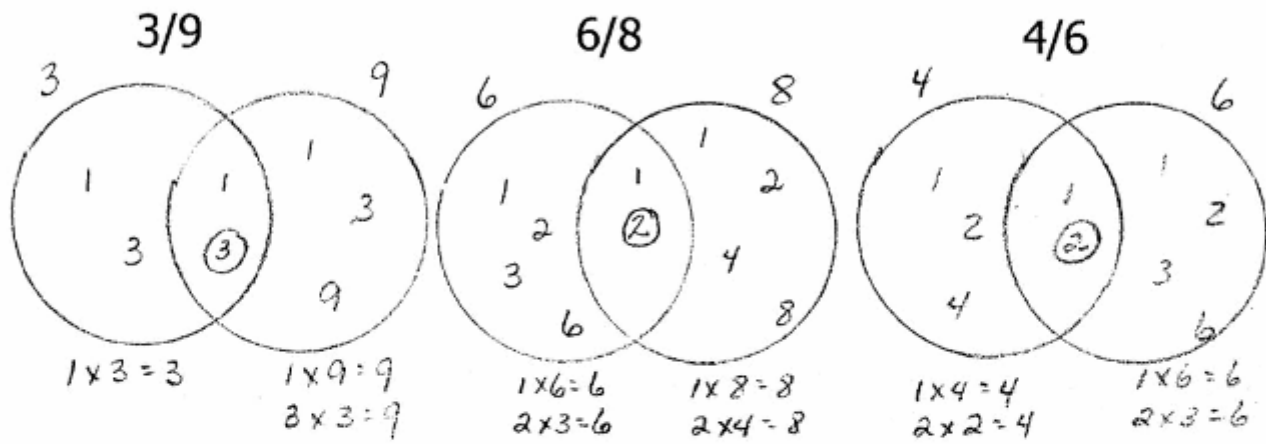
words  
 one to two

symbol  
 1:2

Appendix A

## Ratio & Percent

Demonstrate the following examples with students until they are confident simplifying fractional ratios using the Greatest Common Factor (GCF) of the denominators. Remember to write each simplified form of ratio in fractions ( $\frac{2}{4}$ ), in words (two to four), and using a symbol (2:4).



$$\frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$$

one to three

1:3

$$\frac{6}{8} \div \frac{2}{2} = \frac{3}{4}$$

three to four

3:4

$$\frac{4}{6} \div \frac{2}{2} = \frac{2}{3}$$

two to three

2:3

Appendix B

## Ratio & Percent

**Game:** Shattered Stars

**Skill:** Greatest Common Factor / simplifying Fractions

**Directions for making the game:**

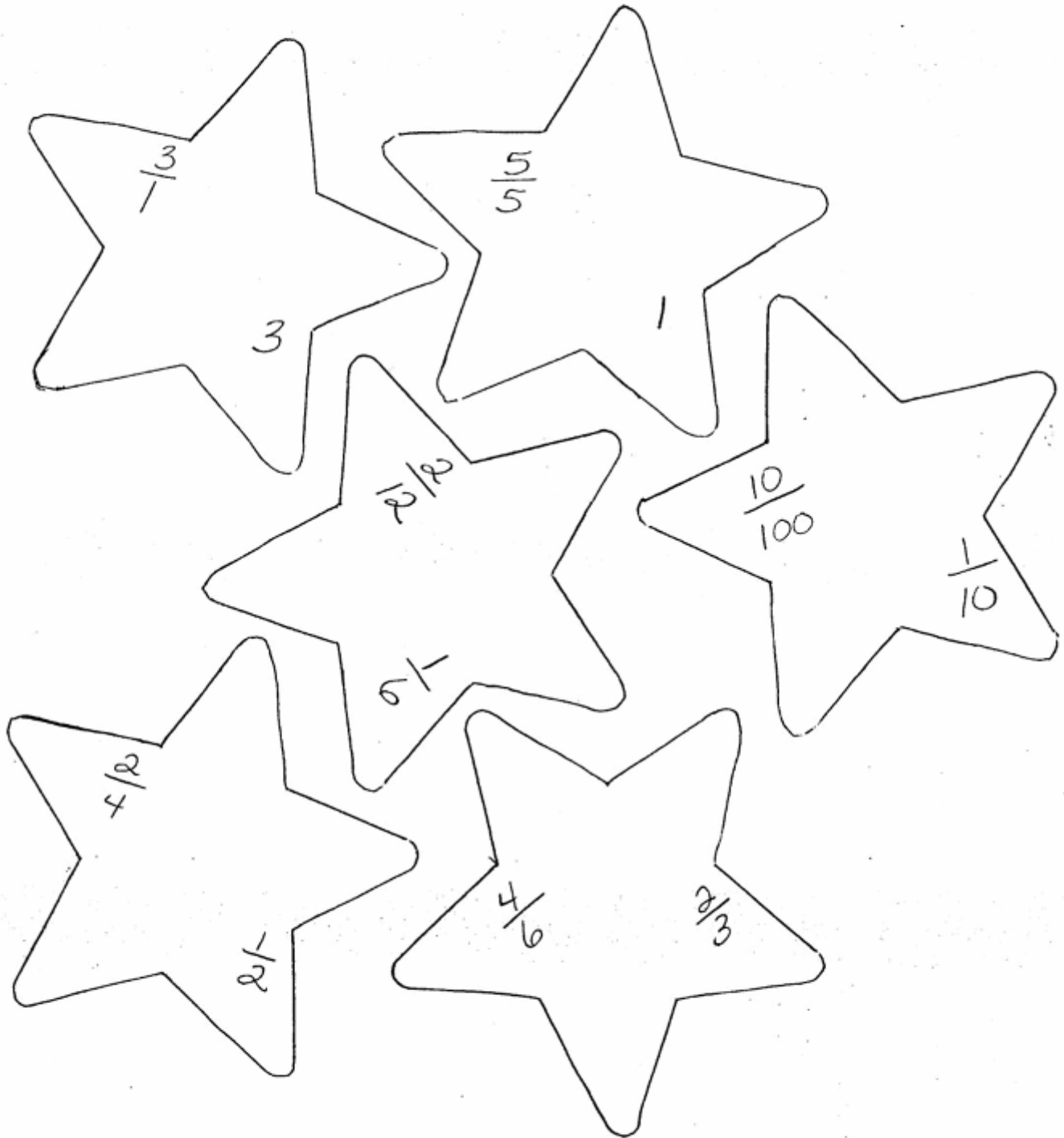
1. Copy the stars onto yellow paper.
2. Cut out "Shattered Stars" and mount on a colored file folder.
3. Cut out "Directions" and mount inside the file folder.
4. Cut out stars, cut stars apart using zigzag scissors, and mount one half of each star on the file folder.
5. Laminate the folder and game pieces for durability.
6. Staple a Zip-lock baggie inside the folder to hold the game pieces.

# Shattered Stars

**Directions:** Match the equivalent fractions to complete the star.

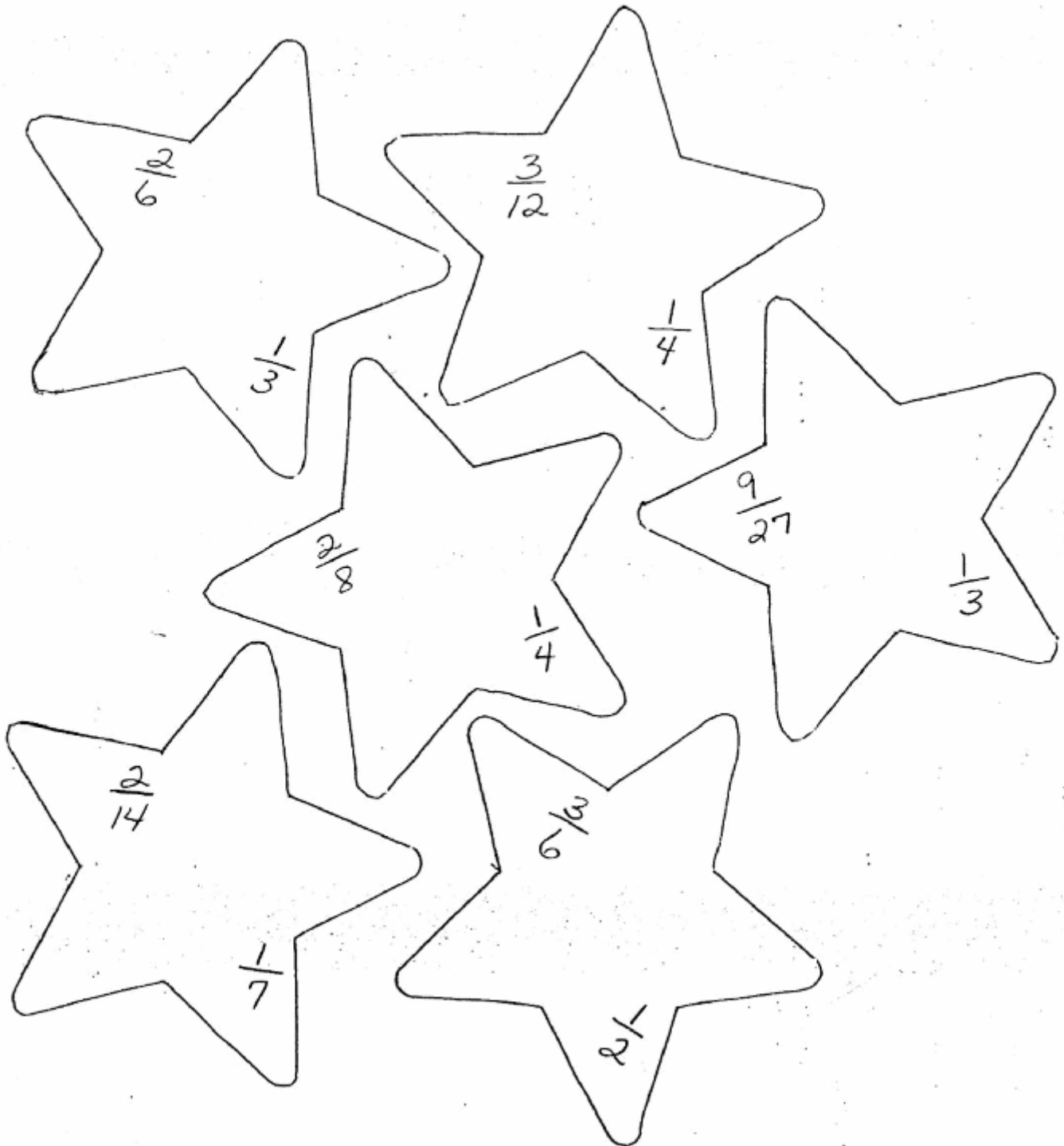
Appendix C

## Ratio & Percent



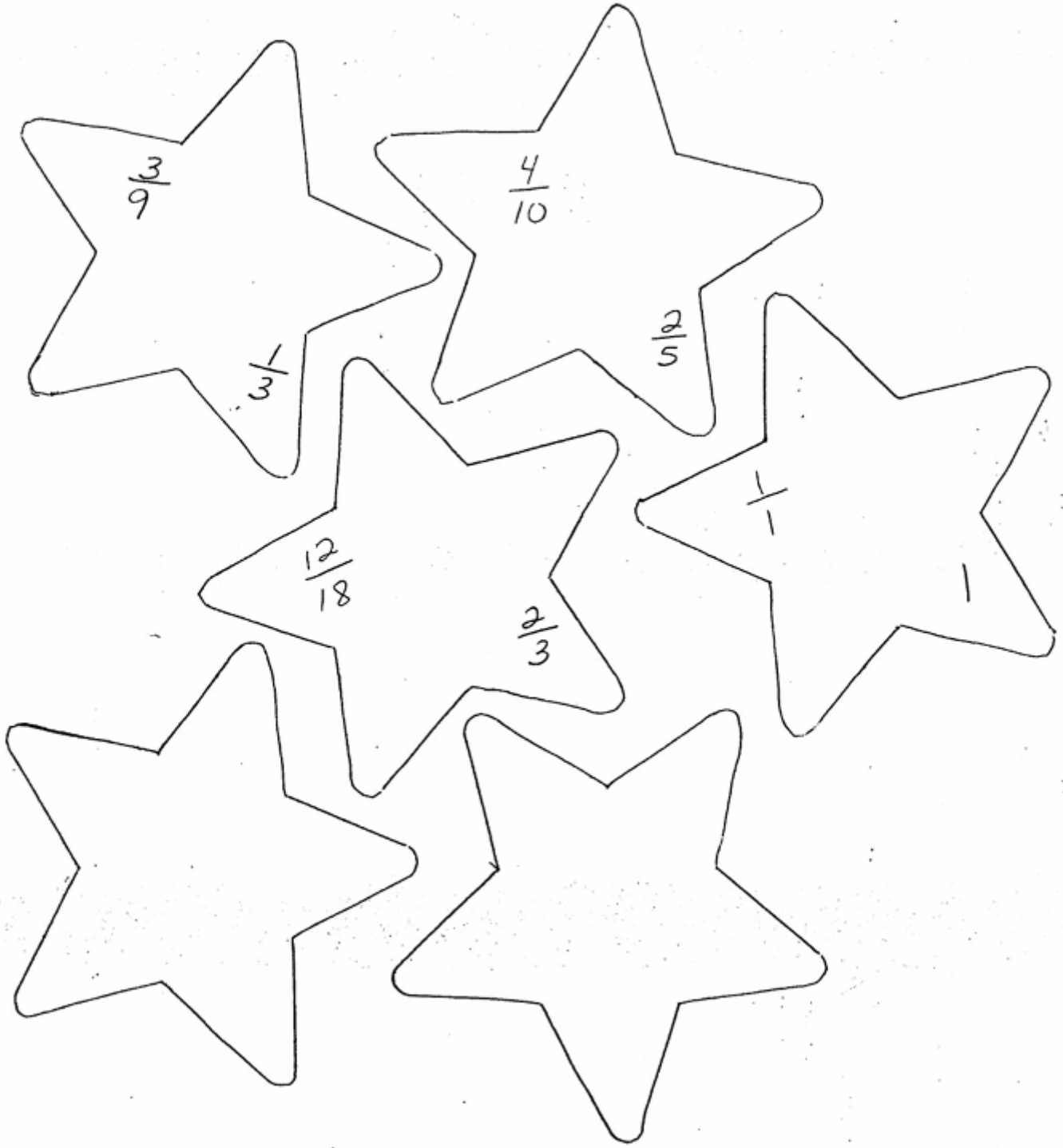
## Appendix C

## Ratio & Percent



## Appendix C

## Ratio & Percent



## Appendix C

## Ratio & Percent

All of Jessica's pets are dogs except one, and all of her pets are cats except one. How many dogs and how many cats does she have? To solve this riddle, simplify the fractions below. Then, match the letters in the problem boxes with the answers printed at the bottom of the page. Finally, write the correct letters on the lines.

Example:  $\frac{5}{25} = \frac{5 \div 5}{25 \div 5} = \frac{1}{5}$       The fraction,  $\frac{1}{5}$ , is now in its simplest form.

<b>H</b> = $\frac{9}{15}$	<b>I</b> = $\frac{12}{15}$	<b>T</b> = $\frac{6}{14}$	<b>S</b> = $\frac{10}{12}$	<b>E</b> = $\frac{4}{6}$
<b>A</b> = $\frac{2}{16}$	<b>E</b> = $\frac{4}{16}$	<b>A</b> = $\frac{3}{6}$	<b>C</b> = $\frac{9}{24}$	<b>E</b> = $\frac{6}{8}$
<b>G</b> = $\frac{2}{8}$	<b>N</b> = $\frac{16}{20}$	<b>J</b> = $\frac{4}{10}$	<b>C</b> = $\frac{3}{18}$	<b>N</b> = $\frac{4}{20}$
<b>O</b> = $\frac{4}{32}$	<b>A</b> = $\frac{9}{27}$	<b>D</b> = $\frac{15}{18}$	<b>O</b> = $\frac{8}{10}$	<b>O</b> = $\frac{9}{12}$
<b>A</b> = $\frac{3}{21}$	<b>S</b> = $\frac{12}{36}$	<b>N</b> = $\frac{4}{12}$	<b>S</b> = $\frac{5}{25}$	<b>D</b> = $\frac{6}{16}$

$$\frac{2}{5} \quad \frac{2}{3} \quad \frac{5}{6} \quad \frac{1}{3} \quad \frac{4}{5} \quad \frac{3}{8} \quad \frac{1}{8}$$

$$\frac{3}{5} \quad \frac{1}{2} \quad \frac{1}{5} \quad \frac{1}{8} \quad \frac{4}{5} \quad \frac{1}{4} \quad \frac{5}{6} \quad \frac{2}{5} \quad \frac{1}{4}$$

$$\frac{1}{3} \quad \frac{1}{5} \quad \frac{3}{8} \quad \frac{3}{4} \quad \frac{1}{3} \quad \frac{3}{4} \quad \frac{1}{6} \quad \frac{1}{7} \quad \frac{3}{7}$$

Appendix D

## Ratio & Percent

Games are great for strengthening students' skills. Spike your ability to find equivalent fractions with Tic-Tac-Toe Volleyball. Grab a partner, a dice, and different colored game markers. Best 3:4 is the winner.

Gameboard 1

$\frac{3}{6}$	$\frac{2}{16}$	$\frac{3}{24}$
$\frac{2}{6}$	$\frac{3}{12}$	$\frac{4}{6}$
$\frac{6}{9}$	$\frac{5}{10}$	$\frac{9}{12}$

Winner: \_\_\_\_\_

Gameboard 2

$\frac{5}{20}$	$\frac{6}{18}$	$\frac{7}{14}$
$\frac{12}{18}$	$\frac{4}{6}$	$\frac{9}{18}$
$\frac{4}{32}$	$\frac{6}{8}$	$\frac{3}{24}$

Winner: \_\_\_\_\_

Gameboard 3

$\frac{5}{40}$	$\frac{12}{16}$	$\frac{10}{15}$
$\frac{2}{4}$	$\frac{2}{8}$	$\frac{8}{12}$
$\frac{6}{12}$	$\frac{4}{16}$	$\frac{9}{27}$

Winner: \_\_\_\_\_

Gameboard 4

$\frac{6}{8}$	$\frac{2}{8}$	$\frac{8}{12}$
$\frac{3}{9}$	$\frac{4}{32}$	$\frac{4}{16}$
$\frac{4}{12}$	$\frac{4}{8}$	$\frac{6}{12}$

Winner: \_\_\_\_\_

Appendix E

## Ratio & Percent

Use this bar graph to show data you have collected. Use TALK to make sure your graph is complete.



Write three questions that can be answered using your graph.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Appendix F

## Ration & Percent

Use the Least Common Multiple (LCM) between two denominators of a fraction to compare. List the multiples of the denominators in a table until you find the LCM.

For example: Compare  $\frac{2}{5}$  and  $\frac{9}{10}$

<b>5</b>	<b>10</b>
<b>10</b>	

Since 10 is the LCM of 5 & 10, 10 will be the new denominator (Least Common Denominator) of the original fractions.

Divide the new denominator (10) by the original denominator (5) to find a factor that can be multiplied by the original numerator to find the new numerator. Explain to the students that both the numerator, and the denominator, can be multiplied by the same number because the value is 1, and any number multiplied by 1, is itself. Therefore, the value of the fraction is not changed. You have merely found equivalent fractions that can be easily compared.

$$\frac{2}{5} = \frac{n}{10} \quad 10 \div 5 = 2 \quad \frac{2}{5} \times \frac{2}{2} = \frac{4}{10}$$

$$4/10 < 9/10$$

$$\frac{9}{10} = \frac{n}{10} \quad 10 \div 1 = 10 \quad \frac{9}{10} \times \frac{1}{1} = \frac{9}{10}$$

Continue to have students compare fractions they demonstrate proficiency. This would be another good time to "play for tickets".

Appendix G

# Graphing: Graphing

Teacher name: Susan Pope

Student Name \_\_\_\_\_

CATEGORY	Excellent	Good	Satisfactory	Needs Improvement
<b>Units</b>	All units are described (in a key or with labels) and are appropriately sized for the data set.	Most units are described (in a key or with labels) and are appropriately sized for the data set.	All units are described (in a key or with labels) but are not appropriately sized for the data set.	Units are neither described NOR appropriately sized for the data set.
<b>Neatness and Attractiveness</b>	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. A ruler and graph paper (or graphing computer program) are used.	Neat and relatively attractive. A ruler and graph paper (or graphing computer program) are used to make the graph more readable.	Lines are neatly drawn but the graph appears quite plain.	Appears messy and "thrown together" in a hurry. Lines are visibly crooked.
<b>Data Table</b>	Data in the table is well organized, accurate, and easy to read.	Data in the table is organized, accurate, and easy to read.	Data in the table is accurate and easy to read.	Data in the table is not accurate and/or cannot be read.
<b>Title</b>	Title is creative and clearly relates to the problem being graphed (includes dependent and independent variable). It is printed at the top of the graph.	Title clearly relates to the problem being graphed (includes dependent and independent variable) and is printed at the top of the graph.	A title is present at the top of the graph.	A title is not present.

Appendix H

## Ratio & Percent

**Directions:** Use the formulas below to create a scale of the distance between your hometown and San Diego, California.

$$S \quad = \quad D \quad T$$
$$\underline{\quad} \text{mph} \quad \underline{\quad} \text{mi} \quad \square \text{ hrs}$$

$$D \quad = \quad R \quad \times \quad T$$
$$\underline{\quad} \text{mi} \quad = \quad \underline{\quad} \text{mph} \quad \times \quad \square \text{ hrs}$$

The Inverse Operation of Multiplication allows us to rearrange the previous Number Sentence to:

$$D \quad R \quad = \quad T$$
$$\underline{\quad} \text{mi} \quad \underline{\quad} \text{mph} \quad = \quad \square \text{ hrs}$$

$$\text{Scale} \quad \underline{\quad} \text{cm} \quad = \quad \underline{\quad} \text{mi}$$
$$\text{Actual} \quad \text{cm} \quad = \quad \text{mi}$$

Appendix I

## Scale Model of Golden Gate Bridge

**Directions:** Using what you know about proportion and scale, figure what the measurements for a model of the Golden Gate Bridge would be if 1 centimeter = 10 feet. Round answers for easier calculating. The first one has been done for you. Use the back of the page to show your work. Write your answers in the spaces provided.

(scale) 1 cm = 10 ft (represented)  
 (model measurement) 898 cm = 8,981 ft (real measurement)

You multiply 1 cm (scale) by 10 to get 10 ft (represented). To find the model measurement, you must divide 8,981 ft (real measurement) by 10 to get 898 cm (model measurement).

<b>Bridge</b>			
Length of approach to bridge	1,265.5	ft	
Length of one side span	1,125	ft	
Length of main span	4,200	ft	
Total length of bridge	8,981	ft	898 cm
Width of Bridge	80	ft	
Width of Roadway between curbs	62	ft	
Width of sidewalk	10.5	ft	
Clearance of water	220	ft	
Clearance below water	110	ft	
Base of each leg	1,782	ft. sq.	
<b>Tower</b>			
Height Above Water	746	ft	
Height Above Roadway	500	ft	
Width of Tower	80	ft	
Length of one cable	7,650	ft	

Appendix J

## Scale Model of Golden Gate Bridge

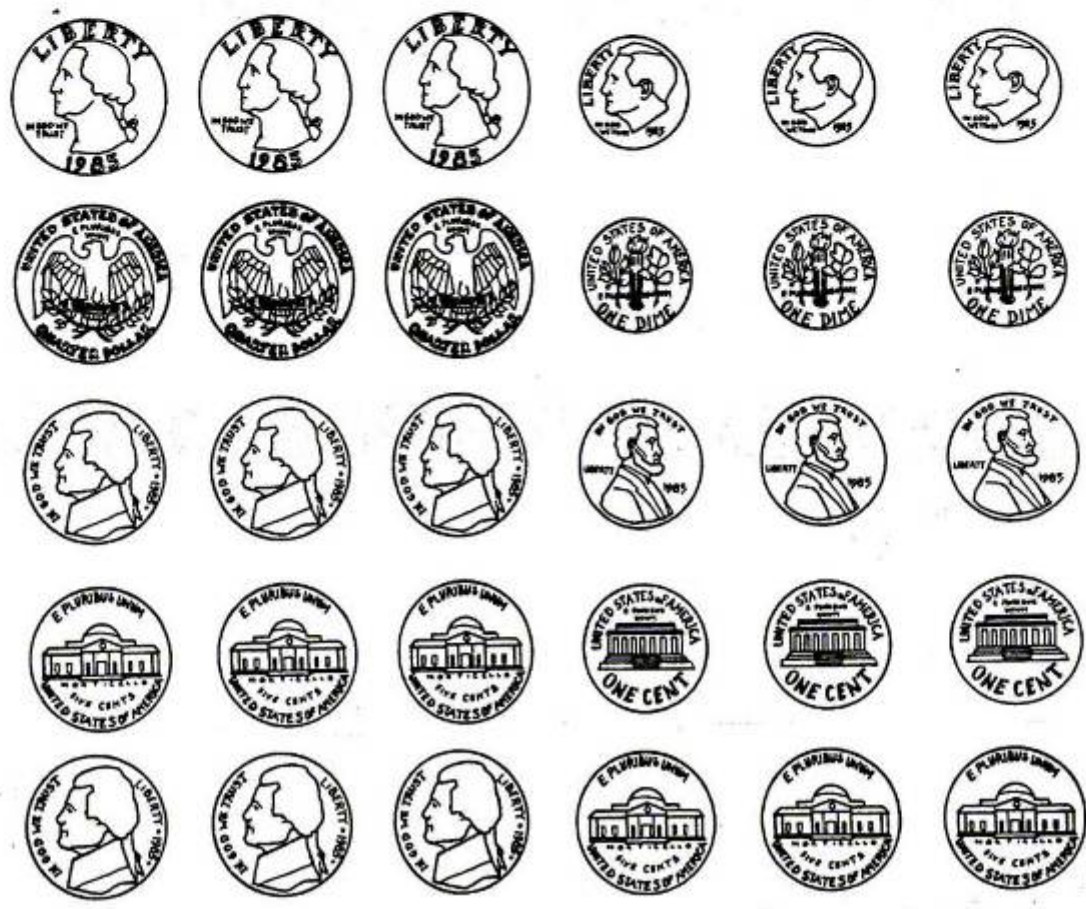
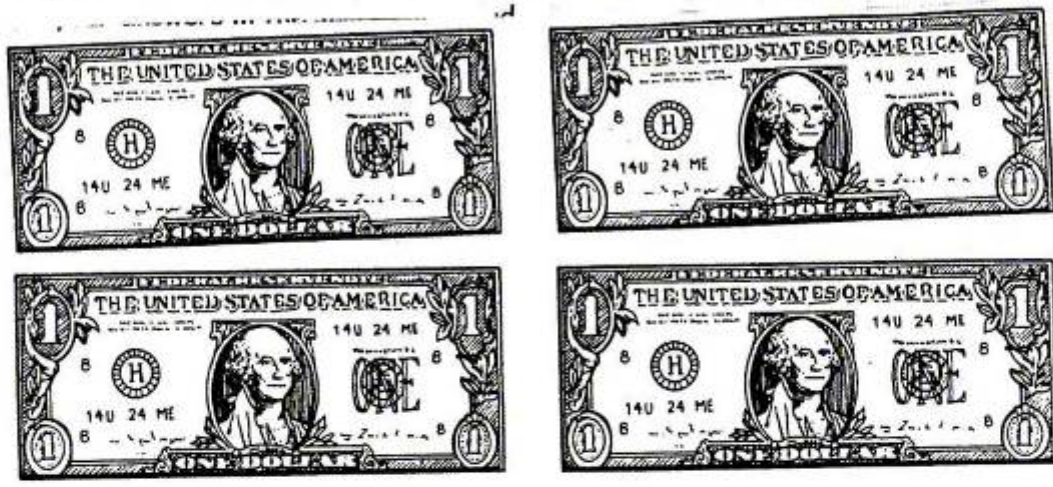
**Directions:** Using what you know about proportion and scale, figure what the measurements for a model of the Golden Gate Bridge would be if 1 centimeter = 10 feet. Round answers for easier calculating. The first one has been done for you. Use the back of the page to show your work. Write your answers in the spaces provided.

$$\begin{aligned} & \text{(scale)} \quad 1 \text{ cm} = 10 \text{ ft (represented)} \\ & \text{(model measurement)} \quad 898 \text{ cm} = 8981 \text{ ft (real measurement)} \end{aligned}$$

You multiply 1 cm (scale) by 10 to get 10 ft (represented). To find the model measurement, you must divide 8,891 ft (real measurement) by 10 to get 898 cm (model measurement).

<b>Bridge</b>		
Length of approach to bridge	1,265.5 ft	127 cm
Length of one side span	1,125 ft	113 cm
Length of main span	4,200 ft	420 cm
Total length of bridge	8,981 ft	898 cm
Width of Bridge	80 ft	8 cm
Width of Roadway between curbs	62 ft	6 cm
Width of sidewalk	10.5 ft	1 cm
Clearance of water	220 ft	22 cm
Clearance below water	110 ft	11 cm
Base of each leg	1,782 ft. sq.	178 cm sq.
<b>Tower</b>		
Height Above Water	746 ft	75 cm
Height Above Roadway	500 ft	50 cm
Width of Tower	80 ft	8 cm
Length of one cable	7,650 ft	765 cm

Appendix K



Appendix L

## Ratio & Percent

**Directions:** Keep a running record of the money Alexander spends.

		Ones	.	1/10	1/100		
<b>\$ 1.00</b>	<b>start</b>	<b>1</b>	.	<b>0</b>	<b>0</b>	<u><b>100</b></u>	<b>100%</b>
\$ .	-		.				
\$ .	-		.			_____	%
\$ .	-		.			_____	%
\$ .	-		.			_____	%
\$ .	-		.			_____	%
\$ .	-		.			_____	%
\$ .	-		.			_____	%
\$ .	-		.			_____	%
<b>\$ 0.00</b>	<b>\$</b>	<b>0</b>	.	<b>0</b>	<b>0</b>		<b>0 %</b>

**Appendix M**

## Ratio & Percent

**Directions:** Keep a running record of the money Alexander spends.

		Ones	.	1/10	1/100	
\$ 1.00	start	1	.	0	0	$\frac{100}{100} = 100\%$
-	-		.	1	5	
<u>.15</u>	-		.	8	5	$\frac{85}{100} = 85\%$
\$ .85		0	.	1	5	
-	-		.	7	0	$\frac{70}{100} = 70\%$
<u>.15</u>	-		.	1	2	
\$ .70		0	.	5	8	$\frac{58}{100} = 58\%$
-	-		.	1	0	
<u>.12</u>	-		.	4	8	$\frac{48}{100} = 48\%$
\$ .58		0	.	0	8	$\frac{40}{100} = 40\%$
-	-		.	1	1	
<u>.10</u>	-		.	2	9	$\frac{29}{100} = 29\%$
\$ .48		0	.	0	4	$\frac{25}{100} = 25\%$
-	-		.	2	5	$\frac{20}{100} = 20\%$
<u>.08</u>	-		.	0	5	
\$ .40		0	.	2	0	$\frac{20}{100} = 20\%$
-	-		.	2	0	
<u>.11</u>	-		.	2	0	
\$ .29		0	.	2	0	$\frac{0}{100} = 0\%$
-	-		.	2	0	
<u>.04</u>	-		.	2	0	
\$ .25		0	.	2	0	
-	-		.	2	0	
<u>.05</u>	-		.	2	0	
\$ .20		0	.	2	0	
-	-		.	2	0	
<u>.20</u>	-		.	2	0	
\$ 0.00	\$	0	.	0	0	

**Appendix N**

## Ratio & Percent

Name \_\_\_\_\_

### HOW MUCH IS IT WORTH?

**Directions:** Match the fractions to their decimal by dividing the numerator by the denominator.

Example:  $3/10 = 10 \overline{)3.0}^{\cdot 3}$

1.  $\frac{2}{10}$

2.  $\frac{9}{10}$

3.  $\frac{4}{100}$

4.  $\frac{80}{100}$

5.  $\frac{5}{10}$

6.  $\frac{7}{10}$

7.  $\frac{49}{100}$

8.  $\frac{84}{1,000}$

9.  $\frac{285}{1,000}$

10.  $\frac{27}{100}$

a. .7

b. .27

c. .8

d. .2

e. .084

f. .04

g. .9

h. .5

i. .285

j. .49

Appendix O