Mathematics Component

Ask the students to tell you how to add two fractions. Tell them today you are going to subtract fractions. Put the number line transparency on the overhead. Write 3 3/4 - 1 2/4 under the fourths line. Ask the students to write what they think the answer will be on a scrap of paper. Start at 3 3/4 and count back 2/4 to 3 1/4 and then count back 1 whole to 2 1/4. See how many students had that answer on their paper.

Have students find the red 5/6 bar and 2/6 bar. Model finding the difference between them. Have students find the green 1/2 bar and the purple 1/5 bar. Ask the students to discuss with their partner how to find the difference and then to find it. For those needing guidance, suggest they find a common denominator. Write out the subtraction problem vertically and solve it (3/10). Compare your answer with the answer they got with fraction bars. Repeat with the blue 3/4 and yellow 2/3 bar.

Pass out Subtraction Sheet 1. Have the students work the 4 problems helping each other as needed. As they turn in the sheets, help them correct errors. Then give them a copy of Fraction Bar Worksheet 64.

Give each pair of students a Number Line mat (side 1) and a few markers. Write 1 5/6 - 3/6 = on the overhead. Have the students put a paper marker over 1 5/6 on their mat. Have them subtract (back up) 3/6. Ask what the answer is (1 2/6). Have the students turn over their mats to side 2. Write 1 3/8 - 5/8 on the overhead. Have the students place a marker over 1 3/8. Have them subtract 5/8. Ask the answer (6/8). Write 1 3/8 - 5/8 vertically. Show them that we cannot subtract 5 from 3. Tell them we are going to trade 1 into more eighths. Ask how many eighths are in 1. Cross out the 1 and say that we have traded this one for 8 eighths. We already have 3 eighths. So 8 + 3 is 11. Cross out the 3 and write 11. Go over what you have just done one more time. Now subtract 11/8 - 5/8 = 6/8. Repeat the process with 2 4/10 - 7/10 using the mat then working it out trading 1 for 10/10. If needed repeat using 2 1/5 - 4/5.

Write 2 1/4 - 1 2/3 vertically. Remind students that we have unequal denominators so we need a common denominator. Write 2 3/12 - 1 8/12 beside the original problem. Tell them we now need to trade. Write 1 15/12 - 1 8/12 beside the appropriate place in the problem. Let them complete the subtraction. Have them write 4 1/5 - 1 2/3 on a sheet of paper and work the problem with you. Repeat with 3 1/5 - 1 7/8. Pass out Subtraction Sheet 2 for students to complete.

Subtraction Sheet 1

Name _____

1. $\frac{9}{10} - \frac{6}{10} =$ _____

2. $\frac{3}{5} - \frac{1}{2} =$ _____

3. $3\frac{7}{8} - 1\frac{2}{8} =$ _____

4. $4\frac{3}{4} - 1\frac{2}{3} =$ _____

Name _____ **Fraction Bars Worksheet, p. 64**

To subtract two mixed numbers, replace their fractions with fractions having the same denominator.

Example 1 $2\frac{3}{5} - 1\frac{1}{4}$

20 is the smallest common denominator for $\frac{3}{5}$ and $\frac{1}{4}$.

$$2\frac{3}{5} = 2\frac{12}{20}$$
$$-\ 1\frac{1}{4} = 1\frac{5}{20}$$
$$1\frac{7}{20}$$

Example 2 $1\frac{2}{3} - 1\frac{4}{9}$

9 is the smallest common denominator for $\frac{2}{3}$ and $\frac{4}{9}$.

$$1\frac{2}{3} - 1\frac{4}{9} = 1\frac{6}{9} - 1\frac{4}{9} = \frac{2}{9}$$

Compute the difference by first getting the smallest common denominator for the fractions.

1. $3\frac{5}{6} - 1\frac{1}{3} =$

2. $1\frac{7}{8} - \frac{3}{4} =$

3. $2\frac{4}{7} - 1\frac{1}{5}$

4. $3\frac{4}{7} - 2\frac{1}{3}$

5. $1\frac{1}{2} - 1\frac{1}{3}$

6. $5\frac{3}{5} - 2\frac{1}{3} =$

7. $3\frac{1}{4} - 3\frac{1}{9} =$

8. $3\frac{5}{7} - 2\frac{2}{3}$

9. $3\frac{1}{5} - \frac{1}{6}$

10. $3\frac{2}{7} - 1\frac{1}{4}$

Sample problems for Lesson

Subtraction Sheet 2

Name _____

1. $2\frac{1}{4} = 2\frac{3}{12} = 1\frac{15}{12}$
$-\ 1\frac{1}{3} = 1\frac{4}{12} = 1\frac{4}{12}$
$\frac{11}{12}$

2. $4\frac{2}{3}$
$-\ 3\frac{7}{10}$

3. $2\frac{1}{5}$
$-\ 1\frac{1}{4}$

4. $5\frac{1}{3}$
$-\ 2\frac{5}{6}$

5. $4\frac{1}{4}$
$-\ 2\frac{1}{2}$

6. $3\frac{5}{8}$
$-\ 1\frac{4}{5}$

7. $3\frac{2}{5}$
$-\ 1\frac{2}{3}$

8. $12\frac{1}{4}$
$-\ 1\frac{5}{6}$

FRAC

Objective 12: Multiply fractions and whole numbers by fractions.

Vocabulary

of
recipe

Materials

Overhead
Overhead pens
Two-colored counters
1 large sheet of paper
1 marker
Overhead fraction bars
Blank transparency
Fraction bars
Water-based markers
Recipe - either
on a chart or
1 per student

Language Foundation

1. In this lesson the word *of* is used to mean "multiply". This is a new meaning for this word. The students will be familiar with *of* in contexts such as a cup of coffee, a piece of paper, a slice of pizza, meaning part of the whole thing, that is, not all the coffee, only a cup. Explain that *of* in this case means a part.

2. You may need to review the word *shortcut*.

3. As students formulate rules for multiplying fractions you may wish to write these on a multiplying fractions chart along with examples to post on the wall.

4. Some students may still not be ready for "lowest terms" in step 3. Don't worry about it as the main objective here is how to multiply.

5. Some students may not have seen a recipe before. Explain that a recipe is a set of directions for preparing food. It has a list of ingredients or things you need and then a set of steps telling you what to do. (This recipe is for gingerbread. You might want to bring in gingerbread men for the students to sample.)

Mathematics Component

Give each group of students a pile of 2-sided counters. Have them make a group of 12. Write 1/4 of 12 = on the overhead. Tell them to divide the 12 counters into 4 equal groups. Ask how many are in each group (3). Write 3 after the equal sign. Write 3/4 of 12 = . Tell them this means that we are to look at 3 of the 4 equal parts. We have divided 12 into 4 equal parts and we are looking at 3 of those parts. How many counters is 3/4 of 12? Write 9. Repeat the process for 2/3 of 12. Repeat for 4/5 of 10. Explain that *of* means to multiply so we can rewrite 4/5 of 10 = 8 as 4/5 x 10 = 8. We can also rewrite it as 10 x 4/5 = 8. Write 1/3 x 10 = on the overhead. Put 10 counters on the overhead and show the students that they don't divide evenly into 3 groups. Write 1/3 x 10 = 10/3. Tell them that 10/3 means you are trying to divide 10 by 3. Remind them that this is an improper fraction and help them simplify it to 3 1/3. Have them work with you to solve 2/5 x 14. Have them help you write a rule for multiplying a fraction by a whole number. Elicit, "Multiply the numerator by the whole number and keep the denominator". Simplify the improper fraction. Write these 5 problems on the overhead to let them practice: 2/5 x 10 = , 3/4 x 5 = , 1/2 x 16 = , 1/4 x 20 = , and 2/3 x 8 =.

Tell students we are now going to multiply a fraction times a fraction. Hold up the sheet of paper and fold it twice so it is divided **vertically into fourths**. Write 1/2 of 1/4 = 1/2 x 1/4 = on the overhead while telling them you are going to shade 1/2 of 1/4. Fold the paper horizontally in half to form eighths and shade 1/2 of 1/4. Ask the students what part has been shaded. Have them count the parts and then ask them what fraction tells how many parts are shaded. Write 1/8 as the answer. Put the blue 1/4 bar on the overhead. Lay the blank transparency over the 1/4 bar. Draw dotted lines splitting each section of the bar in 2 equal parts. Draw a circle around 1/2 of the shaded 1/4. Ask what fraction of the bar is circled. Elicit 1/8. Compare to the paper example. Have students find the green 1/2 bar. Write 3/4 x 1/2 = on the overhead. Model for them dividing each half into 4 equal parts. (If you have water-based markers or pens, they can be used on the fraction bars and will wipe off.) Ask how many parts you have. Tell them we want 3 of those parts. Ask what the answer is. Elicit 3/8. Repeat to find 2/3 of 1/4. Write 3/4 x 1/2 = 3/8 and 2/3 x 1/4 = 2/12 on the overhead. Ask the students to look at the 2 problems to see if they can see a pattern or a rule for multiplying fractions. If not try writing 3/4 x 2/3 = 6/12 and 2/5 x 3/4 = 6/20. Help students come up with the rule: **To multiply 2 fractions you multiply the numerator times the numerator and the denominator times the denominator.** Write these problems on the overhead for the students to practice: 2/3 x 2/5 = , 3/4 x 1/5 = , and 2/5 x 3/5 = .

Tell the students we are now going to learn a short cut. Write 2/3 x 3/2 = 6/6 on the overhead. Ask what 6/6 equals. Elicit 1. Show them how to divide by crossing out the 2 twos and writing 1 in each place. Then repeat by crossing out the 2 threes. Show them that what you now have is 1 x 1 over 1x1 which is 1. Write 2/3 x 1/8 = 2/24. Remind them that we can write 2/24 in lowest terms by finding the greatest common factor of 2 and 24 and by dividing both the numerator and denominator by this factor. Help them use the multiplication table to find that 2 is the greatest common factor. Divide 2 by 2 and 24 by 2 to rewrite 2/24 as 1/12. Leaving this on the overhead, rewrite 2/3 x 1/8 = . Ask the students if they can find the GCF for 2 and 8. Elicit 2. Cross out the 2 and write 1, cross out the 8 and write 4. Rewrite the equation using 1/3 and 1/4 = . Have them multiply and write 1/12. Compare the new answer with the first answer. Repeat with 2/3 x 9/10 = . If you need to, repeat with 4/5 x 5/8 = .

Pass out the recipe worksheet. Model how to do it. Let students work on it.

Recipe Worksheet Name _____

GINGERBREAD

Recipe	x $\frac{1}{2}$	x2
1 3/4 c. whole wheat flour	_____	_____
1/2 c. white flour	_____	_____
1/2 tsp. salt	_____	_____
1 tsp. baking soda	_____	_____
2 tsps. baking powder	_____	_____
1 Tbsp. grated ginger root (or 1 tsp. ginger and 1 tsp. cinnamon)	_____	_____
2 eggs, beaten	_____	_____
1/3 c. melted butter	_____	_____
1 c. molasses	_____	_____
3/4 c. hot water	_____	_____

Stir flour, salt, baking soda, baking powder, and ginger root (or ginger and cinnamon) together in one bowl.

Stir the eggs, butter, molasses, and hot water together in another bowl.

Mix together all of the ingredients. Place the mixture in a greased baking pan.

Bake at 325° F for 35 minutes. Makes 12 pieces.

Objective 13: Multiply mixed numbers by whole numbers and fractions.

Vocabulary

improper fraction
cancel
lowest terms

Materials

Overhead
Overhead pens
Practice sheet
1/student
Transparency of
Practice Sheet

Language Foundation

1. This is a short lesson allowing time to review vocabulary such as improper fractions, cancel, and lowest terms. It will also allow you time to work one-on-one with students on areas of need.

Mathematics Component

Review with students how to write mixed numbers and improper fractions by discussing the meaning of a mixed number. Write 2 2/3 on the overhead. Under it write 2 2/3 = 2 + 2/3 explaining that this is what 2 2/3 means. Then continue to explain that since 2 = 1+1, we can write 2 2/3 = 1 + 1 + 2/3. Ask how many thirds are in 1 (elicit 3). Then we can write 2 2/3 = 3/3 + 3/3 + 2/3 =. Review the adding rule (Add the numerators and leave the denominator alone.) Then write in 8/3 as the answer. Remind them they can use a short cut to change a mixed numeral to an improper fraction by multiplying the whole number by the denominator, adding the fraction's numerator, and writing the total over the denominator. Model by using 2 2/3 and compare the results. Write these numbers on the overhead and have the students convert them into improper fractions : 2 1/2, 3 2/3, 2 4/5, 3 3/4, and 3 1/3.

Tell them that multiplying mixed numerals will be easy. We just change them to improper fractions and multiply like fractions. Pass out the Practice Sheets. Do the sample problems with the students, reviewing canceling and lowest terms. Let students work in cooperative groups to complete the sheet.

Practice Sheet Name _____

Samples

1. $2\frac{2}{3} \times 6 =$
2. $\frac{1}{4} \times 1\frac{3}{5} =$
3. $1\frac{1}{3} \times 2\frac{1}{2} =$
4. $3\frac{3}{4} \times 2\frac{4}{5} =$

1. $3\frac{1}{2} \times \frac{1}{2} =$

2. $9 \times 1\frac{2}{3} =$

3. $1\frac{3}{8} \times 2\frac{1}{3} =$

4. $\frac{3}{4} \times 16 =$

5. $2\frac{2}{5} \times 6\frac{1}{2} =$

6. $4\frac{1}{2} \times 3\frac{1}{3} =$

7. $2\frac{1}{4} \times 5\frac{1}{3} =$

Objective 14: Divide fractions by whole numbers. Divide whole numbers and fractions by fractions.

Vocabulary

÷
reciprocal
approximate

Materials

Overhead
Overhead fraction bars
Fraction bars
Overhead pens
1 set of paper strips per pair of students - 2 of each
- 6 inches long
- 12 inches long
- 18 inches long

14 2-sided counters
Blank transparency
Fraction Bars Worksheet, p. 85
1/student
Division worksheet
1/student

Language Foundation

1. The students may be unfamiliar with the ÷ symbol. Tell them it is another way to write "divided by". Ask them to show you other ways to write a division problem. Remind them all these signs are asking how many times the second number goes into (divides into, fits into) the first. Give some examples such as $25 \div 5 = 5$, $8 \div 2 = 4$, etc.

2. Discuss the word "guess" with the students. Tell them the word *approximate* means the same thing. When we approximate or hunt the approximate number, we are making a guess or trying to find *about how many*. Remind them that *estimate* means the same thing.

3. To introduce the word *reciprocal*, talk about the word *reciprocate*. If you gave me a Coke, I will reciprocate by giving you a Coke. That makes us even. Give some examples and then talk about reciprocals which are numbers that make things even.

Mathematics Component

Have the students find the yellow 1/3 bar, and the red 1/6 bar. Demonstrate that the shaded part of the red bar "fits into" the shaded part of the yellow bar 2 times. Tell the students you have divided the shaded part of the yellow bar by the shaded part of the red bar. Write 1/3 ÷ 1/6 = 2. Repeat the process with the yellow 2/3 bar and the orange 2/12 bar. (2/3 ÷ 2/12 = 4). Repeat the process with the red 6/6 bar and the yellow 1/3 bar (6/6 ÷ 1/3 = 3). Now have the students find the blue 3/4 bar and the yellow 1/3 bar. Ask the students to find the approximate number of times the shaded part of the yellow bar "fits into" the shaded part of the blue bar. Elicit more than 2 but less than 3. Repeat with the purple 4/5 bar and the blue 1/4 bar. Be sure to use the word "approximate".

Give each group of students a set of paper strips. Have them use a fraction bar to measure how many fraction bars each strip of paper represents and to write that number on each strip. Model this. (6" = 1 bar, 12" = 2 bars, 18" = 3 bars). Write 1 ÷ 4 = on the overhead. Have the students fold one of the bar strips into 4 equal pieces. Ask what 1 ÷ 4 equals and write the answer. Now write 2 ÷ 4 = and repeat the process. Ask them to compare the folded part with a blue 2/4 bar. Write 2 ÷ 4 = 2/4. Repeat by folding the 3 bar into 4 equal parts comparing it with the blue 3/4 bar. Write 3 ÷ 4 = 3/4. Ask the students to fold the 2 bar into 3 equal parts. Compare it with the yellow 2/3 bar. Write 2 ÷ 3 = 2/3. Ask the students to come up with a rule for dividing a whole number by a whole number. **Elicit when dividing one whole number by another whole number, write a fraction with the first whole number as the numerator and the second whole number as the denominator.** Show them this works with bigger numbers. Write 14 ÷ 3 = . Ask students what the fraction should be. Write 14/3. Help the students convert this improper fraction to 4 2/3. To prove this put 14 2-sided counters on the overhead. Put them in groups of 3. There are 4 groups with 2 left over. Ask students what 2 ÷ 3 equals. Write 2/3. So 14 ÷ 3 = 4 2/3. Repeat with 10 counters to show 10 ÷ 3 = 10/3 = 3 1/3. Write these problems on the overhead and have the students practice:

$$5 \div 6 = \ , \ 7 \div 10 = \ , \ 2 \div 5 = \ , \ 9 \div 4 = \ 8 \div 3 = \ , \ 15 \div 4 = \ .$$

Show the students and have them find the yellow 2/3 bar and the red 1/6 bar. Ask them to determine how many times the shaded part of the red bar fits into the shaded part of the yellow bar. Write 2/3 ÷ 1/6 = 4. Repeat with the green 1/2 bar and the orange 1/12 bar. Write the equation 1/2 ÷ 1/12 = 6. Repeat with the blue 2/4 and the red 3/6 bar. Write 2/4 ÷ 3/6 = 1. Pass out worksheet 85 for students to complete.

Write 1/3 x 3/1 =, 2/5 x 5/2 =, 10/4 x 4/10 = on the overhead. Have the students help you work each problem. Tell them that 2 fractions that equal 1 when multiplied together are called reciprocals. Write 3/10 on the overhead and ask what the reciprocal is (10/3). Ask them to give you a rule for finding the reciprocal of a number.

Put the yellow 3/3 (whole) bar on the overhead. Have the students find that bar and the white 1/10 bar. Ask what number the yellow bar is equal to (1). Write 1 ÷ 1/10 = on the overhead. Have them find how many tenths fit into the yellow whole bar modeling on the overhead. When they have found 10, complete the equation. Repeat by having them divide by the purple 1/5 bar. Writing 1 ÷ 1/5 = 5. Repeat with the red 1/6 bar (1 ÷ 1/6=6). Ask if they see a pattern. Write 1 ÷ 1/27 = on the overhead. See if the students can predict the answer is 27.

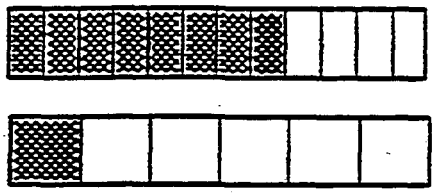
Tell the students you are now going to use reciprocals to divide. Write 1 ÷ 1/10 = 10. Under it write 1 ÷ 1/10 = 1 x 10/1 = 10. Show them the reciprocal for 1/10 (10/1) and that you got the same answer. Repeat for 1 ÷ 1/5 = 5. Put back up the yellow 2/3 bar and find out how many times the red 1/6 bar goes into it (4). Write the equation 2/3 ÷ 1/6 = 4. Then ask what the reciprocal for 1/6 is (6/1). Write 2/3 ÷ 1/6 = 2/3 x 6/1 = 12/3 = 4. Compare the answers. Repeat with the blue 2/4 bar and the red 3/6 bar writing 2/4 ÷ 3/6= 2/4 x 6/3 = 12/12 = 1 after demonstrating with the bars. Help the students come up with the rule for dividing fractions. (Multiply the first number by the reciprocal of the second number.) Have students find the red 5/6 bar and see how many times the yellow 1/3 bar fits into the shaded part. Then have them write 5/6 ÷ 1/3 = and find the reciprocal and multiply. Ask if they got the same answer (2 1/2). (They may have 15/6 or 2 3/6 as their answer. If so, you may want to review how to convert the answer to get 2 1/2.) Repeat with the white 1/10 bar and the purple 1/5 bar dividing 1/5 into 1/10 to get 1/2.

Write 2 1/2 ÷ 2 2/3 = on the overhead. Ask if any student can predict (guess) what we should do. Elicit, "Convert to improper fractions, use a reciprocal, and multiply." Write 5/2 x 3/8 = 15/16. Repeat with 1 3/4 ÷ 2 1/3. (Remind the students they can cancel the 7's in this problem.) If you need to repeat the process, use 2 1/5 ÷ 1/2.

Name _____ Fraction Bars Worksheet, p. 85

To divide one fraction by another fraction, we can compare the shaded amounts of their fraction bars.

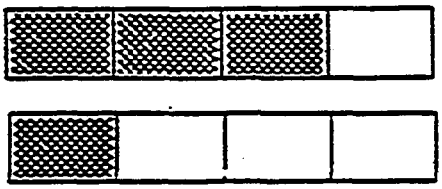
The shaded amount of the $\frac{8}{12}$ bar is 4 times greater than the shaded amount of the $\frac{1}{6}$ bar.



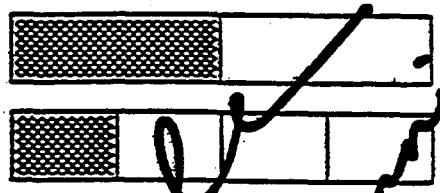
The shaded amount of the $\frac{1}{6}$ bar fits into the shaded amount of the $\frac{8}{12}$ bar, 4 times.

$$\frac{8}{12} \div \frac{1}{6} = 4$$

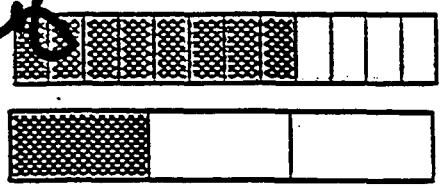
Complete the division equations.

1. 

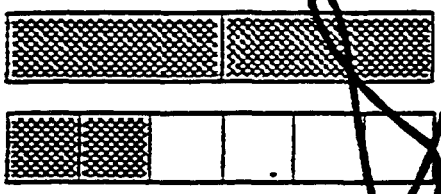
$\frac{3}{4} \div \frac{1}{4} =$

2. 

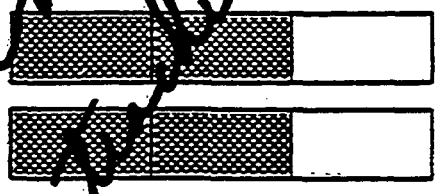
$\frac{1}{2} \div \frac{1}{4} =$

3. 

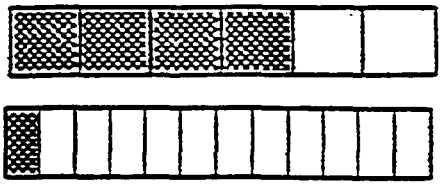
$\frac{8}{12} \div \frac{1}{3} =$

4. 

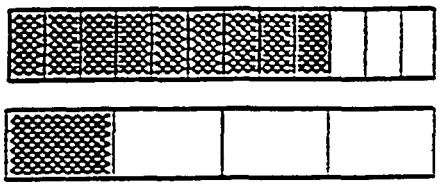
$1 \div \frac{2}{6} =$

5. 

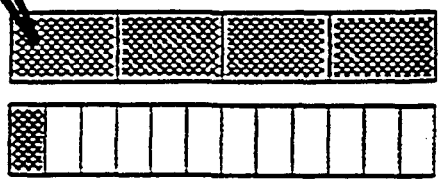
$\frac{2}{3} \div \frac{2}{3} =$

6. 

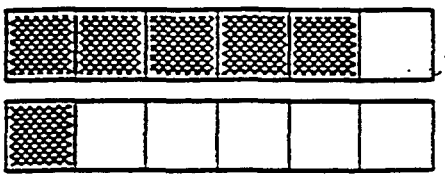
$\frac{4}{6} \div \frac{1}{12} =$

7. 

$\frac{9}{12} \div \frac{1}{4} =$

8. 

$1 \div \frac{1}{12} =$

9. 

$\frac{5}{6} \div \frac{1}{6} =$

Fraction Bars
Division, Step 4 (Parts 1 and 2)
Objective D-3

Division Worksheet Name _____

1. $\frac{3}{4} \div \frac{2}{5} =$

2. $\frac{5}{8} \div \frac{1}{3} =$

3. $\frac{1}{5} \div \frac{1}{4} =$

4. $\frac{3}{7} \div \frac{2}{3} =$

5. $\frac{11}{3} \div \frac{2}{5} =$

6. $1\frac{2}{3} \div \frac{1}{6} =$

7. $3\frac{1}{4} \div 1\frac{1}{2} =$

8. $1\frac{5}{6} \div 1\frac{1}{10} =$

9. $5\frac{1}{3} \div 1\frac{3}{4} =$

10. $8\frac{1}{2} \div 2\frac{1}{3} =$

Objective 15: Determine the two consecutive whole numbers that a fraction is between; round to the nearest whole number. Use rounding to the nearest half or whole number to estimate and check reasonableness of answers requiring computation with fractions.

Vocabulary

greater than
less than
>
<
nearest
round
table

Materials

Overhead
Overhead pens
Overhead fraction bars
Fraction bars
Fraction bars number line - 1/student pair
Transparency of Fraction Bar Number Line
Fraction cards
Rulers
Measurement Table 1/student

Optional:
Fraction Bars Work-sheets, pp. 39 & 40

Language Foundation

1. You will need to review the terms "greater than" and "less than" and their appropriate signs. Give both concrete and numerical examples.

2. You will also need to review "nearest", reminding them that the *-est* ending says we are comparing more than 2 things. Give some examples such as "Who is nearest to the door?"

3. The word *round* in this context will need to be explained. (If you have completed the Mental Math and Estimation Unit, simply review the term *round* and its meaning.) Ask the students what *round* means to them. Tell them today we are going to round fractions and mixed numerals to the nearest whole number. An example of this kind of rounding is to round 684 to the nearest 100. Tell the students that 684 is between 600 and 700. Ask which one it is nearest to. If you need to, sketch a number line showing 600, all the 10's (i.e. 610,620,...) between 600 and 700. Mark the position of 684 on the number line and ask which hundred it is closest to. Tell the students that we have rounded 684 to the nearest hundred, 700.

4. The word *table* may confuse the students. Tell them a table in math is a chart or a place to write numbers. Watch to see that when you tell them to write their fractions on the *table*, that they don't literally do it.

Mathematics Component

Show the students and have them find the orange 5/12 bar and the green 1/2 bar. Compare the 2 to determine if 5/12 is greater than or less than 1/2. Write 5/12 < 1/2 on the overhead. Ask the students if 5/12 is closer to 0 or 1. Tell them because it is less than 1/2, it is closer to 0 so we would round it to 0. Have the students select the red 5/6 bar and compare it to the green 1/2 bar. Ask the students if 5/6 is greater than or less than 1/2. Write 5/6 > 1/2. Ask if 5/6 is closer to 0 or to 1. Tell them that because 5/6 is greater than 1/2, it is closer to 1 so we would round it to one. Repeat with the white 5/10 bar explaining that when a fraction is equal to 1/2, we round it up to 1. Repeat with the purple 3/5 bar. Repeat with the purple 2/5 bar.

Give each pair of students a copy of the Fraction Bar Number Line and put the transparency on the overhead. Tell them we are going to work with the line marked 0 to 1, the line above the thick black line in the center. Model selecting a fraction card, writing the fraction on the table, and placing the fraction on the number line. Help them complete the first line of the table. Have them select 4 more cards, placing each fraction on the number line and completing the table.

Have the students move to the number line under the heavy black line. Briefly discuss the numbers already on the line. Tell the students you have chosen 5 mixed numbers to round. Work with the class to put each mixed number on the number line. Model completing one line of the table. Have the students complete the table. Discuss their results and resolve any differences.

Give each student a ruler and a measurement table. Have them list 6 objects to measure. Help them select objects less than 12 inches long. Help them write the names of the objects on their tables. Have them write the 2 whole inches between which the measurement falls. Then have them write to which whole inch each measurement is closest. You may need to model this.

Worksheets 39 and 40 from the Fraction Bar Kit are recommended for homework.

Fraction Bar Number Line Name _____

0 1/2 1

fraction	Nearest whole number	rounded number

0 1/2 1 1 1/2 2 2 1/2 3 3 1/2 4

Mixed Number	Nearest Whole Number	Rounded Number

Measurement Table

Name _____

Object	Between	Closest to
	_____ and _____	
	_____ and _____	
	_____ and _____	
	_____ and _____	
	_____ and _____	
	_____ and _____	

Objective 16: Write a ratio to show a comparison between 2 quantities.

Vocabulary

ratio
quantities
compare

Materials

Overhead
Overhead pens
Intro. to Ratios transparency
Two-colored counters
Styrofoam cups 1/student pair
Ratio Game Rules transparency
Fraction bars Worksheets, pp. 80 & 82 1/student

Language Foundation

1. You may need to review the word *compare* meaning how things are the same and how they are different. We will compare the number of things in two groups.

2. You may need to model how to set up a score sheet for the red and yellow counter activity.

Mathematics Component

Tell the students today we will be learning about ratios. A ratio looks like a fraction and is used to compare 2 groups of things. Put the Intro. to Ratios transparency on the overhead. We can write a ratio comparing the number of women in this room to the number of men. Point out that the first group is women so it is the numerator. Men is the second group, so it is the denominator. Complete the transparency with the students pointing out which group is the numerator and which is the denominator. In number 6, note that the ratio is an improper fraction, but that when we write a ratio, it must be an improper fraction because of the order of the comparisons.

Pass out a styrofoam cup with 15 to 20 two-colored counters in it to each pair of students. Use the transparency or write the rules on the overhead as you explain them.

- Pour out the counters.
- Write the ratio for red to yellow. $\frac{\text{red}}{\text{yellow}}$
- Score 1 point if the ratio is less than 1. Red < yellow.
- Score 2 points if the ratio is more than 1. Red > yellow.
- Score 3 points if the ratio is equal to 1. Red = yellow.
- Record your score and take turns.
- The first player with 21 points wins.

Have a pair of students come to the front of the room and model playing the game. Have the students play the game. Help those for whom either the concept or the game structure is difficult.

Pass out the Fraction Bars worksheet 80 & 82 to the students. Modify them, if you wish, by crossing out the statement about lowest terms. On sheet 82 help the students look for the words with capital letters and the word *to* help them "read" the ratio. For example in number 1 they should look at "Atlantic" and "Pacific" separated by *to the*.

If there is additional time let the students play either the 2-colored counter game or the Ratios of Dots Game (p. 94 Fraction Bars Teacher's Guide).

INTRODUCTION TO RATIOS

Definition: A ratio is used to compare 2 quantities.

1. The ratio of women to men is _____ to _____ or ____.
   (girls) (boys)

2. The ratio of students to desks is _____ to _____ or ____.

3. The ratio of students absent to students present is ____.

4. The ratio of windows to doors is ____.

5. Students wearing sneakers to students *not* wearing sneakers is ____.

6. Students to teachers ____.

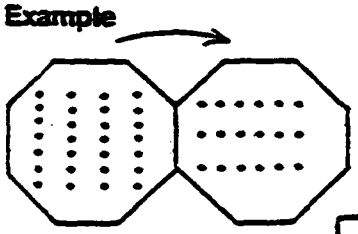
7. Erasers to pieces of chalk ____.

8. Students who drive to school to students who ride the bus ____.

In the RATIO OF DOTS game, the player forms the ratio of the number of dots where he starts to the number of dots where he ends.

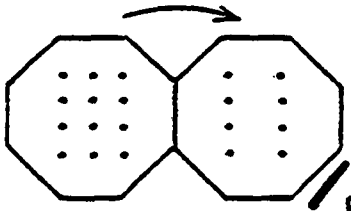
Write each ratio as a fraction in lowest terms.

Example



$\frac{28}{21} = \frac{4}{3}$ $\frac{4}{3}$

1.



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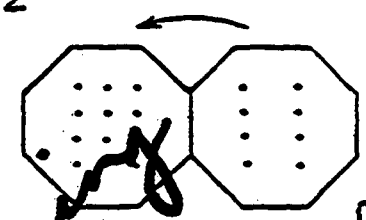

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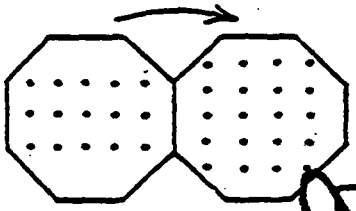

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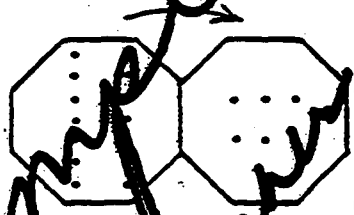

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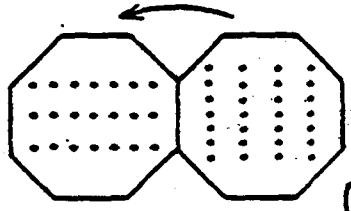

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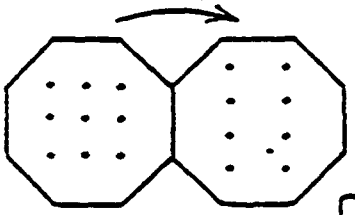

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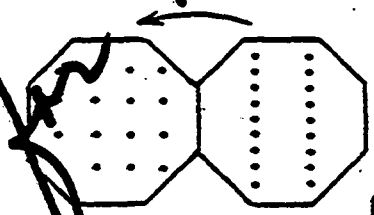

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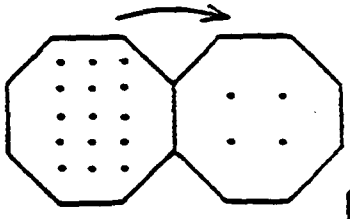

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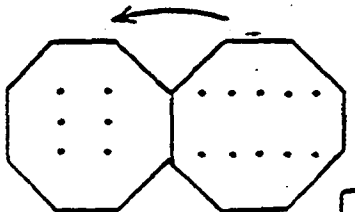

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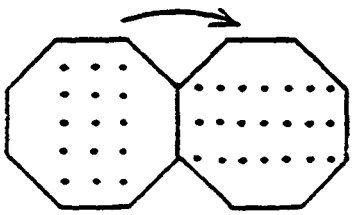

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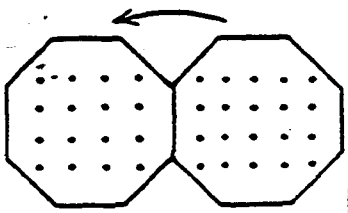
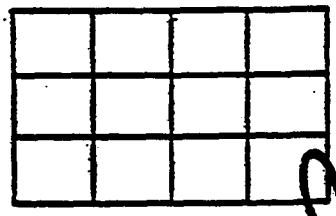


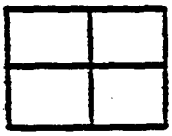
Fraction Bars
Division, Step 2
Objective D-1

The sizes of the 4 biggest oceans are illustrated by the following figures.



Pacific Ocean

Atlantic Ocean



Indian Ocean

Arctic Ocean

The ratio of the area of the Arctic Ocean to the Atlantic Ocean is $\frac{1}{6}$.

Write each of the following ratios in lowest terms.

1. The ratio of the area of the Atlantic to the Pacific is _____.
2. The ratio of the area of the Indian to the Atlantic is _____.
3. The ratio of the area of the Arctic to the Pacific is _____.
4. The ratio of the area of the Pacific to the Atlantic is _____.
5. The ratio of the area of the Atlantic to the Indian is _____.

Fraction Bars
Division, Step 2
Objective D-1

Objective 17: Create, write, and solve story problems that involve computation with fractions.

Vocabulary

strategy
solve
pattern
simpler

Materials

Overhead
Overhead pens
Transparencies for each problem
Student Problem Packets, 1/student
Fraction Bars
1 set/student pair
Problem Solving Strategies Chart

Language Foundation

1. This whole lesson will be on solving story problems. The first step in solving each problem is to be certain that the students understand all the language in the problem. As you talk through each problem, help the students verbalize what they could do to solve it. Tell them that what they do to solve the problem is called a "strategy". A suggested strategy is outlined for solving each problem. (These strategies need to be taught and modeled for future applications if the students have not done the Problem Solving Unit.) Encourage students to work together to solve each problem.

2. If you do not have a chart of Problem Solving Strategies in the classroom, you may wish to begin one. A suggested format is included at the end of the lesson.

Mathematics Component

Pass out Student Problem Packets to each student and a set of fraction bars to each pair of students. Tell the students that today we will be working together to use fractions to solve word problems. We will also be learning some strategies or ways to solve the problems. When we solve a word problem, we find the answer.

Put Problem 1 on the overhead and have the students find it in their packet. Discuss the problem. Tell the students we are going to make a table to begin to solve the problem. Explain that one strategy is called *Make a Table*. Complete the table with the students' help through 6 pizzas saying we can stop now because we have more than 45 pieces. Have the students complete their table. Ask a few questions which allow the students to use the table such as "Are 5 pizzas enough?" When the class has decided that between 5 and 6 pizzas are needed, write 45/8 = on the transparency. Ask them to convert this improper fraction to a mixed numeral. Ask them if their answer is between 5 and 6 pizzas. Model writing their answer (5 5/8 pizzas) on the answer line.

Put Problem 2 on the overhead covering the line and have students move down the page to it. Discuss the problem. Uncover the line and tell the students that we are going to draw a picture to help us solve this problem. Tell them that another strategy is *Draw a Picture*. Have them copy the line onto their paper. Discuss where Bill lives and where to put his "house" on the picture. Put an "x" and the word "Bill"near the center of the line. Have the students do the same. Ask how far Bill lives from Julio. Write 3/10 between Julio and Bill. Ask how far Bill lives from Marta. Write 4/10 between Bill and Marta. Have the students complete their pictures. Reread the question and ask how we can find the answer. Have the students solve the problem. When they are finished, model writing 7/10 miles on the line.

Put Problem 3 on the overhead. Have the students turn to the next page of their packet to problem 3. Discuss the problem. Discuss drill bits and how they make holes. Tell the students we are going to use objects to solve this problem. *Using Objects* is another strategy for solving problems. Tell them to find the orange 7/12 bar and the yellow 2/3 bar. Ask which is larger. Reread the question. Have the students write their answer in the answer blank. Check to see if they wrote 2/3 inch. (You can have them check it by cross-multiplying.) You may need to review this with them.

Put Problem 4 on the overhead. Have the students find the problem. Read and discuss it. Tell them that we will use another strategy called Find a Pattern to solve this problem. Explain that a pattern is something that happens over and over again. (You may need to show them some patterns such as A B A B A ; 2, 4, 6, 8, 10; ▲ ○ ○ ▲ ○ ○ ▲ ○ ○.) Tell them we need to find the pattern that will tell us which numbers go on the lines between 7 1/2 and 0. Look at 12 and then 10 1/2. What do we do to get from 12 to 10 1/2? Elicit subtract 1 1/2. Now look at 10 1/2 and 9. What do we do to get from 10 1/2 to 9? (Subtract 1 1/2). Tell them maybe the pattern is to subtract 1 1/2 to get the next number. Let's check it by seeing if 9 - 1 1/2 is 7 1/2. Because it is, we have found the pattern. Help the students subtract 1 1/2 from 7 1/2 to get 6. Write 6 in the first blank. Help them subtract 1 1/2 from 6 to get 4 1/2. Write 4 1/2 in the second blank. Have the students finish finding the last 2 numbers.

Put Problem 5 on the overhead and have the students find it. Read and discuss it. (You may have to explain multiplying a recipe again.) Tell them we will make it simpler. *Make It Simpler* is the name of another strategy; it means to make it easier. Explain that to make it simpler we change the numbers to numbers that are easier to work with. In this problem we can change 1 1/2 to 2 and 2 1/2 to 3. Reread the problem using 2 and 3 as numbers. Discuss how to find the answer (multiply). Now that we know to multiply, we can go back and use the real numbers. Write 1 1/2 x 2 1/2 = on the transparency. Have the students work together to solve it. Check that they write 3 3/4 cups on the answer line.

Put Problem 6 on the overhead. Ask the students to find it. Read and discuss it. Ask if they can think of a strategy to use to solve it. Lead them to *Draw a Picture*. Have them try to solve it with a partner. Remind them to draw a picture first. Also remind them to add the inches together. Help those who need it.

Review the strategies used today : Make a Table, Draw a Picture, Use Objects, Find a Pattern, and Make it Simpler. Tell them we used these today to solve fraction problems but these strategies can be used over and over again.

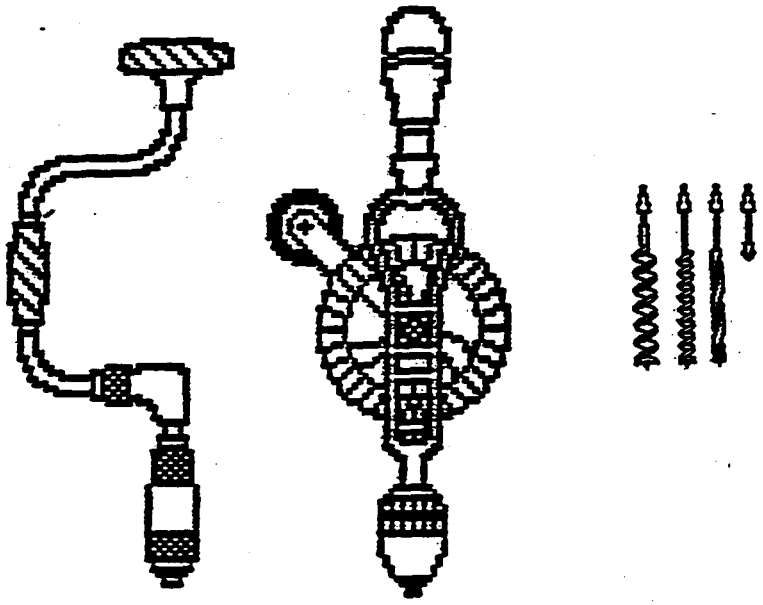
STUDENT PROBLEM PACKET

1. Joe's Pizza cuts pizzas into 8 pieces. We need 45 pieces. How many pizzas do we need?

Pizza	Pieces
1	8
2	

2. Bill lives between Julio and Marta. Bill lives 3/10 miles from Julio and 4/10 miles from Marta. How far does Julio live from Marta?

3. Which will drill a bigger hole, a 7/12 inch drill bit or a 2/3 inch drill bit?



4. Finish the pattern:

12, 10½, 9, 7½, ___, ___, ___, ___, 0

5. It takes 1½ cups of sugar to make cookies. Sue wants to make 2½ times as many cookies. How much sugar does she need?

6. Jose jumped 6 feet 5¼ inches last week. Today he jumped 6½ inches farther. How far did he jump today?

Name _____

1. Joe's Pizza cuts pizzas into 8 pieces. We need 45 pieces. How many pizzas do we need?

Pizza	Pieces

_____

2. Bill lives between Julio and Marta. Bill lives 3/10 miles from Julio and 4/10 miles from Marta. How far does Julio live from Marta?

Julio _____ Marta

_____

Name _____

3. Which will drill a larger hole, a 7/12 inch drill bit or a 2/3 inch drill bit?

4. Finish the pattern:

   12, 10½, 9, 7½, ___, ___, ___, ___, 0

Name _____

5. It takes 1½ cups of sugar to make cookies. Sue wants to make 2½ times as many cookies. How much sugar does she need?

_____

6. Jose jumped 6 feet 5¼ inches last week. Today he jumped 6½ inches farther. How far did he jump today?

_____

Problem Solving Strategies

1. Act out or use objects.
2. Draw a picture.
3. Guess and check.
4. Find a pattern.
5. Make a list.
6. Make a table.
7. Use logical reasoning.
8. Solve a simpler problem.
9. Work backward.

Fraction Unit
Suggested Means of Assessing Lessons

Lesson	Means of Assessment
1	Writing Activity
2	Checklist
3	Worksheet / Pair Cooperation
4	Anecdotal Record as the Measure
5	Checklist
6	Cooperative Learning Assessment
7	Anecdotal Record
8	Worksheet
9	Checklist
10	Anecdotal Record
11	Cooperative Learning Assessment
12	Worksheet
13	Cooperative Learning Assessment
14	Anecdotal Record
15	Anecdotal Record as they measure; Compare with number 4
16	Pair cooperation / worksheet
17	Checklist

Fraction Unit Assessment
Item/Objective Match

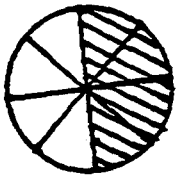
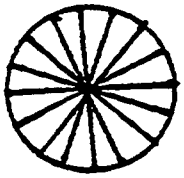
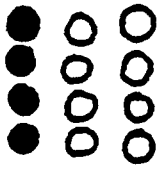
Item No.	Objective
1, 15	Divide shapes into 2, 3, 4, 5, 6, 10, and 12 equal parts. Use the words halves, thirds, fourths, fifths, sixths, tenths, and twelfths to describe the equal parts into which the shape is divided. Know that halves are equal only when the shapes or groups are equal in size.
1, 15	Identify a given portion of a shape or group using the correct oral and written fraction. Know that 2/2, 3/3, etc. describes the whole.
2	Compare models of fractions using $>$, $<$, $=$, and $\neq$. Know that fractions can only be compared when the whole is the same size. Use $>$, $<$, $=$, and $\neq$ to compare fractions and mixed numerals.
3	Measure and compare lengths of objects to nearest 1/2", 1/4", and 1/8".
4	Identify and write fractions and mixed numbers as decimals.
5	Determine if 2 fractions are equivalent; find a fraction equivalent to a given fraction.
	Find the factors of a number. Find the greatest common factor of 2 numbers. Use the greatest common factor to write a fraction in lowest terms.
2	Compare and order fractions and mixed numbers.
7,8	Write mixed numbers as improper fractions; write improper fractions as mixed numbers.
9	Use physical materials to add common fractions. Add fractions, whole numbers, and mixed numerals with like and unlike denominators.
10	Use physical materials to subtract common fractions. Subtract fractions, whole numbers, and mixed numerals with like and unlike denominators.
11	Multiply fractions and whole numbers by fractions.
	Multiply mixed numbers by whole numbers and fractions.

Item No.	Objective
12	Divide fractions by whole numbers. Divide whole numbers and fractions by fractions.
13	Determine the 2 consecutive whole numbers that a fraction is between; round to the nearest whole number. Use rounding to the nearest half or whole number to estimate and check reasonableness of answers to computation with fractions.
14	Write a ratio to show a comparison between 2 quantities.
16, 17	Create, write, and solve story problems that involve computation with fractions.

Name _____

Fraction Assessment
Page 1

1. What part is shaded?

_____ _____ _____ _____ _____

2. Put >, <, or = in the circle.


$\frac{1}{5} \bigcirc \frac{1}{3}$ $\frac{3}{8} \bigcirc \frac{5}{8}$ $2\frac{1}{3} \bigcirc 1\frac{1}{4}$

$\frac{2}{3} \bigcirc \frac{3}{4}$ $\frac{3}{6} \bigcirc \frac{2}{4}$ $2\frac{3}{5} \bigcirc 2\frac{5}{9}$

3. Use a ruler to measure each line.

_____ _____

_____ _____

_____ _____

4. Write as a decimal.

$\frac{3}{10} =$ $\frac{1}{2} =$ $\frac{23}{100} =$ $3\frac{7}{10} =$ $8\frac{6}{12} =$

5. Finish each fraction.

$\frac{1}{2} = \frac{}{10}$ $\frac{3}{5} = \frac{9}{}$ $\frac{2}{3} = \frac{}{15}$ $\frac{3}{4} = \frac{}{100}$

6. Circle each mixed number.

$\frac{15}{2}$ $8\frac{1}{2}$ $\frac{3}{5}$ $2\frac{1}{4}$ $\frac{17}{3}$

Fraction Assessment page 2 Name _____

7. Write each improper fraction as a mixed numeral.

$\frac{7}{4}$ = $\frac{8}{3}$ = $\frac{16}{8}$ = $\frac{20}{6}$ =

8. Write each mixed numeral as an improper fraction.

$1\frac{3}{4}$ = $2\frac{2}{5}$ = $4\frac{3}{10}$ =

9. Add.

$\frac{1}{3} + \frac{1}{3}$ $\frac{2}{5} + \frac{1}{2}$ $1\frac{1}{5} + 2\frac{1}{3}$ $2\frac{1}{2} + 3\frac{4}{5}$

10. Subtract.

$\frac{3}{5} - \frac{1}{5}$ $\frac{1}{2} - \frac{3}{8}$ $2\frac{4}{7} - 1\frac{1}{2}$ $5\frac{1}{4} - 2\frac{2}{3}$

11. Multiply.

$\frac{1}{2} \times \frac{2}{4}$ = $\frac{4}{5} \times \frac{3}{8}$ = $1\frac{1}{3} \times 2\frac{3}{4}$ =

$\frac{1}{3} \times \frac{1}{2}$ = $\frac{3}{4} \times 2$ =

 Name _____

12. Divide.

$\frac{1}{4} \div 3 =$ $6 \div \frac{1}{2} =$

$\frac{2}{5} \div \frac{3}{4} =$ $3\frac{1}{4} \div 1\frac{1}{2} =$

13. Round to the nearest whole number.

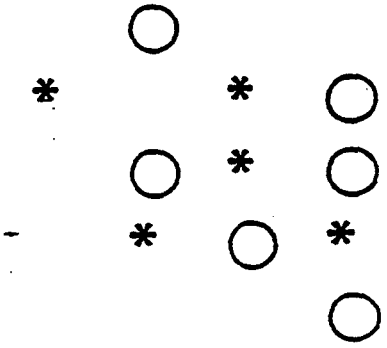
$\frac{1}{6}$ _____ $\frac{8}{9}$ _____ $2\frac{3}{4}$ _____ $4\frac{1}{3}$ _____

14. Write a ratio to show

7 boys to 9 girls _____

14 tires to 7 bikes _____

stars to circles _____



 Name _____

15. Read these fractions.

$\frac{2}{3}$ $\frac{4}{6}$ $\frac{9}{10}$

$3\frac{1}{5}$ $16\frac{19}{100}$ $5\frac{10}{12}$

16. Solve.

Jo has 1/2 bottle of Coke. She drinks 3/4 of it. How much does she have now?

17. Write a story problem using fractions.

Answer Key
Fraction Assessment

1. 1/3, 4/4 or 1, 4/8 or 1/2, 0/16 or 0, 4/12 or 1/3

2. >, <, <
   >, <, =, >

3. 2 5/8", 4 7/8", 4"

4. 0.3, 0.5, 0.23, 3.7, 8.5

5. 5, 15, 10, 75

6. Circles around 8 1/2 and 2 1/4

7. 1 3/4, 2 2/3, 2, 3 2/6 or 3 1/3

8. 7/4, 12/5, 43/10

9. 2/3, 9/10, 3 8/15, 6 3/10

10. 2/5, 1/8, 1 1/14, 2 7/12

11. 2/8 or 1/4, 12/40 or 3/10, 11/3 or 3 2/3, 1/6, 6/4 or 1 2/4 or 1 1/2

12. 1/12, 12, 8,15, 2 2/12 or 2 1/6

13. 0, 1, 3, 4

14. 7/9, 14/7 or 2/1, 5/6

15. Oral response

16. 1/8

17. Answers will vary.

Measurement

Measurement Objectives
(Draft)

		SOL Link
Obj. 1	Identify the instruments used to measure length (ruler, yard stick, measuring tape, tape measure); weight (scale); time (clock: digital and analog); calendar (day, month, and season); and temperature (thermometer).	K 10
Obj. 2	Compare objects according to the following attributes: length (shorter, longer), height (taller, shorter), weight (heavier, lighter), and temperature (hotter, colder).	1.4
Obj. 3	Estimate and measure lengths of objects using non-standard, customary (to the nearest 1/2", 1/4", and 1/8"), and metric units.	2.12 3.14 4.11
Obj. 4	Identify the most appropriate unit for measuring length of given objects. Compare and convert units of measure for length within the customary and within the metric system.	4.12 6.12
Obj. 5	Estimate and measure weight/mass of objects using nonstandard, customary, and metric units.	3.14 4.11
Obj. 6	Identify the most appropriate unit for measuring weight/mass of given objects. Compare and convert units of measure for weight within the customary system and within the metric system.	4.13 6.10
Obj. 7	Compare the volumes of given objects using concrete materials (e.g. jellybeans, sand, water. etc.). Estimate and measure liquid volume in customary and metric units (cups, pints, quarts, gallons, liters), including the concepts of more, less, and equivalent.	2.17 3.14 6.10
Obj. 8	Identify the pattern of 60 seconds in a minute, 60 minutes in an hour, and 24 hours in a day. Know the meaning of a.m. and p.m. Tell time using analog and digital clocks.	1.11 2.16 3.15
Obj. 9	Convert units of time. Find the elapsed time in hours and minutes between two given times.	3.16 5.12
Obj. 10	Compare times in different zones.	

Obj. 11	Read and write calendar dates. Identify relationships among days, months, and years. Convert calendar units.	3.16
Obj. 12	Read the temperature on a Celsius and Fahrenheit thermometer. Compare temperatures within systems. Estimate temperature in Celsius and Fahrenheit using familiar situations (freezing, boiling, etc.).	3.17
Obj. 13	Solve problems involving length, weight/mass, capacity, time, and temperature.	5.11

Objective 1: Identify the instruments used to measure length (ruler, yard stick, measuring tape, tape measure), weight (scale), time (clock: digital and analog; calendar: day, month, and season); and temperature (thermometer).

Vocabulary

length
height
long
short
tall
weight
weigh
heavy
light
time
day
week
month
year
season
temperature
hot
cold

Materials

ruler
yard stick
measuring tape
tape measure
scale
clock
calendar
thermometer

Transparencies
- Tools for Measuring

Student Copies
- Tools for Measuring
- Measuring Tools Matching Game
- Choosing a Measuring Tool
- Vocabulary Practice

Language Foundation

1. Introduce and/or review words students can use when talking about measuring items. Include the nouns **length** and **height**. Explain to students that when we measure the length of something, we can tell how **long** something is; when we measure the **height**, we can tell how **tall** or **short** something is.

Point out the verb **weigh**. Tell students that when we **weigh** something we are looking for its **weight** (a noun). We can describe the **weight** of an object by saying it is **light** or **heavy**.

2. Have students brainstorm what they can use to find the length, height, or weight of an object. Add the concept of time and temperature to the discussion. Introduce and/or review the words **hot** and **cold**.

3. Introduce and/or review the word **season**. Explain that a season is a period in the year that lasts three months: **winter**, **spring**, **summer**, or **fall**. Talk with students about the seasons in their native countries. Explain that the seasons in the United States might be different from the seasons in their countries.

Mathematics Component

1. Investigate tools used to measure length (ruler, yard stick, measuring tape, tape measure), weight (scale), time (clock: digital and analog; calendar: day, month, week, season), and temperature (thermometer).
   - Gather some instruments people use to measure: rulers, scales, clocks, calendars, and thermometers. If you can, bring to class more than one of each type. Label and place objects on a table in front of the room.
   - Go over the names of the objects on the table.

   Length:
   - Show the students a doll or stuffed animal of some sort and and ask them: "How **tall** is this toy? What can we use from this table to measure how **tall** this toy is?" (ruler)
   - Model how a ruler works. Use the toy as an example. Some may not know how to use a ruler so they may need to rely on your expressions. Ex. "2 feet?! - The doll is **short**, not **tall**. I'm 6 feet - a lot taller."
   - Ask them, "How **long** is the chalkboard? What can we use from this table to measure how **long** the chalkboard is?" (ruler) Again model how to measure with a ruler. Use a different type of ruler if you can, such as a yard stick.
   - Tell students we use a **ruler**, **tape measure**, and **measuring tape** to measure how tall, short, or long something is.

   Weight:
   - Ask them, "How **heavy** is this bag?" (Fill a bag with stones). Go around and have them hold it. "What can we use from this table to measure how **heavy** this bag is?" (scale)
   - Model how a scale works by weighing several objects. Show them different scales.
   - Tell students we use a **scale** to measure how heavy things are - how much they weigh.

   Temperature:
   - Ask them, "How **cold (or hot)** is it in this classroom? What can we use from this table to measure how **cold (or hot)** it is?" (thermometer)
   - Model how a thermometer works. You can put it in glasses of hot and cold water (add some ice). Show them the different thermometers.
   - Tell students that a **thermometer** is used to measure how hot or cold something is.

   Time:
   - Ask them, "What **time** is it? What can we use from this table to measure what **time** it is?" (clock/ watch)
   - Model how a clock works. Show them different clocks/ watches.
   - Tell students that a **clock** isused to measure or tell time.
   - Ask them, "What **day** is it? What can we use from this table to tell what **day** it is?" (calendar)

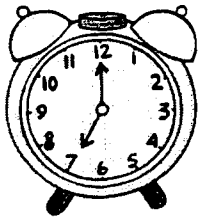
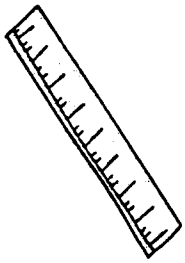
- Model how we read a **calendar.** Point out days, weeks, months and seasons.
- Tell students that a clock measures time in minutes and hours, while a calendar measures time in days, weeks, and months.

2. Place the transparency Tools for Measuring on the overhead. Hand students a copy of Tools for Measuring. Have them follow along with you.
   - Point to a picture. Ask them, "What is this a picture of?" Write the name of the object on the overhead. "What do we measure with a _____?" Write down key words in a different color marker, like tall, heavy, etc. Do this for each picture. Make sure students are writing the information down on their copy.

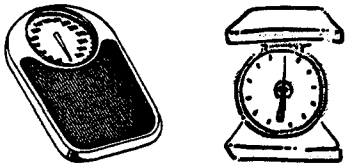
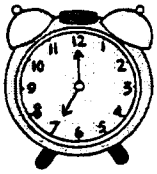
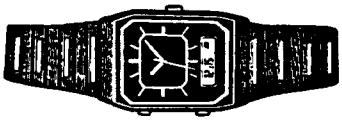
3. See Measuring Tools - Matching Game. (Cut these out and place in envelopes ahead of time.) Students are to match the picture with the word and what they measure. Have the students work in pairs.
   - Hand each pair an envelope. Tell them what they are going to do - match a picture with its word and what it measures.
   - Have students lay out the puzzle pieces on their desks and rearrange them, matching the picture to the word and to what is being measured.
   - Practice as a class first by picking out one word and matching it to the two other parts. A larger version of the game can be made (with sentence strips and stick on magnets) to demonstrate the game. Have students use the strips to play the game on the board.
   - The activity sheet Choosing a Measuring Tool can be done for further practice.
   - To reinforce vocabulary in this unit, the activity sheet Vocabulary Practice has been provided.

4. If time permits, have the students create a bulletin board that they can add on to. Have each pair do a part - a picture of a measuring tool with a label and a few things they measure. Example: For time, cut out movie listings with times, store ads with opening and closing times, etc.

Tools For Measuring

	Name(s)	What do we measure?
		
		
		
 		
		

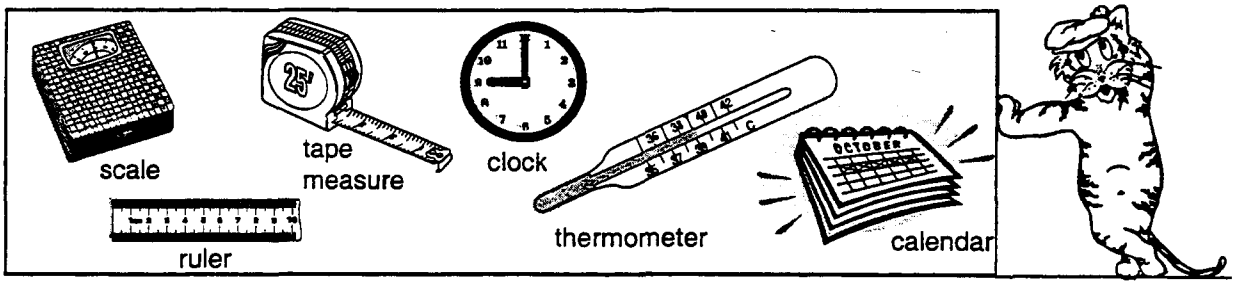
Measuring Tools Matching Game

	RULER	How long?
	RULER	How tall?
	SCALE	How heavy?
	THERMOMETER	How cold is it?
	CLOCK	What time is it?
	WATCH	What time is it?
	CALENDAR	What day is it?
	THERMOMETER	How hot is it?

Name:_____

Choosing a Measuring Tool

Different measuring tools work best for different jobs.
Pick the best tool and write the name in the blank .



1) Maria needs to measure the window to make curtains.

_____

2) I need to see what day my birthday is this year.

_____ 

3) In the doctor's office, the nurse is telling Mr. Smith he is too heavy and must lose weight! _____

4) We need to see what the temperature is outside. Should we wear a jacket or just a shirt? _____

 ? 

5)  Anh needs to see if she is late for school.

_____

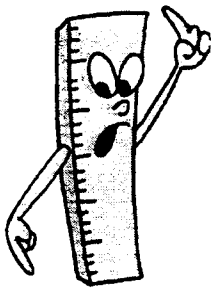
6) Tom is measuring how much his plant has grown in biology class. _____

7) I need to measure how hot the water is in our science class

_____

Name _____

Vocabulary Practice



Use the vocabulary words in the box to complete the sentences below. You will use each word only one time.

clock	length	scale
days	measuring tape	short
heavy	months	thermometer
hot	ruler	weight

1. We can use a _____ or a yard stick to measure the length of something. When we measure _____ we can tell how long, _____, or tall something is.
2. When we measure _____ we can tell how _____ or light something is. We use a _____ to measure the weight of something.
3. When we look at a calendar, we can see the _____ of the year. A calendar also tells us the _____ of the week.
4. We use a _____ to measure the temperature inside or outside. We can tell by looking at a thermometer how _____ or cold it is outside.
5. If we want to to make pants or a shirt, we use a _____ to measure our arms or legs.
6. We measure time by looking at a _____.

Answer Key
Measurement - Obj. 1

Choosing a Measuring Tool

1)Tape measure or ruler

2) Calendar

3) Scale

4) Thermometer

5) Clock

6) Ruler

7) Thermometer

Objective 2: Compare objects according to the following attributes: length (shorter, longer), height (taller, shorter), weight (heavier, lighter), and temperature (hotter, colder).

Vocabulary

length
shorter
longer
taller, tallest
height
weight
heavier
lighter
temperature
hotter
colder

Materials

pencil
masking tape
paper clip
stuffed animal
ice

Transparencies
- Longest, Shortest, Tallest
- Heavier, Lighter, Hotter, Colder

Student Copies
- Let's Compare
- Vocabulary Practice
- Writing Challenge

Language Foundation

1. Tell students that in this lesson they will compare the **length**, **weight**, and **temperature** of various objects. Explain that in English we use the comparative and superlative forms of adjectives to make comparisons between people, objects, and other things. Explain that to compare two things, they will add **er** to the end of the adjective. When they have three or more things to compare, they will add **est** to the adjective. Give students examples of some of the adjectives they will use in the lesson such as **long, longer, longest** and **hot, hotter, hottest.**

The lesson will provide students with practice using comparatives and superlatives to compare the attributes of various objects.

Mathematics Component

1. Investigate **length (short, shorter, shortest - long, longer, longest).**
   - Tell the students that we are going to compare how **long** pencils are.
   - Draw a line down the center of a blank transparency. Write **shorter** on the left side and **longer** on the right side of the line.
   - Place a pencil (to be used as a point of reference) on the center line.
   - Show the students another pencil and have them decide if the pencil is **longer** or **shorter** than the reference pencil on the center line. Place it on the appropriate side. Say "This pencil is ____ than the first pencil" as you place the second pencil on the overhead transparency.
   - Repeat using a different pencil as the standard. Again say "This pencil is ____ than the first pencil" as you place the third pencil on the overhead transparency.
   - Give the students pencils and let them come up, make the comparison with their pencil, and place it appropriately. Have students tell which is the **shortest** an **longest** of the pencils.
   - On the overhead place the transparency Longest, Shortest, Tallest . Complete **Section A** as a class. Say the words **longer, longest, shorter, shortest** as much as possible.

2. Investigate **height (tall, taller, tallest - short, shorter, shortest).**
   - Tell the students that they are now going to compare how **tall** they are.
   - Draw a line down the center of the blackboard. Write **shorter** on the left side and **taller** on the right side.
   - Have 1 student come up to the front of the room and stand along the center line. This student will be the point of reference. Have another student come up to the front of the room and stand beside the "point of reference". Ask the class "Is (Maria) **shorter** or **taller** than (Jung)?" Have this student stand under the appropriate words (shorter/ taller).
   - Pick another student (preferably the opposite of the last student) and ask the class again "Is (Paula) **shorter** or **taller** than (Jung)?" and have this student stand under the appropriate words.
   - Have the rest of the class come up and line up - students **shorter** than "the reference" on one side, and students **taller** than "the reference" on the other side."
   - Count how many students are **taller** than "the reference" and how many are **shorter**.
   - Finally, have the students decide who is the **tallest** (write this student's name on the board to the right of **taller**) and who is the **shortest** (write this name on the board to the left of **shorter**).
   - See if they can arrange themselves from shortest to tallest.
   - Place the transparency Longest, Shortest, Tallest on the overhead. Complete **Section B** as a class. Say the words **taller, tallest** and **shorter, shortest** as much as possible.

3. Investigate **weight (heavy, heavier, heaviest - light, lighter, lightest).**
   - Tell the students that they are now going to compare how **heavy** things are.
   - Place a piece of masking tape down the center of a table. On another piece of masking tape, write the word **heavier** and place it on the left side. On another piece of masking tape, write the word **lighter** and place the piece of tape on the right side.
   - Place an eraser (or other object) on the center line as the point of reference.
   - Show the students a paper clip and have them decide if it is **heavier** or **lighter** than the eraser and place it on the appropriate side. Say "This paper clip is **lighter** than the eraser" as you place it on the table.
   - Repeat using a textbook.
   - Give the students other objects and let them come up, make the comparison, and place it appropriately.
   - On the overhead place Heavier, Lighter, Hotter, Colder . Complete **Section A** as a class. Say the words **heavier** and **lighter** as much as possible.

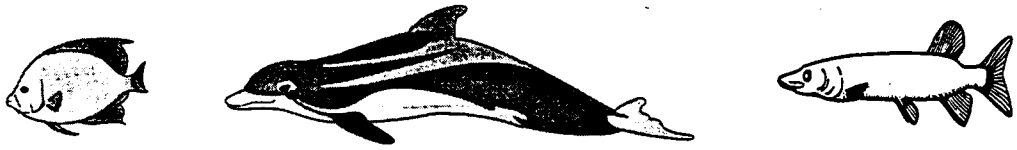
4. Investigate **temperature (hot, hotter, hottest - cold, colder, coldest).**
   - Tell the students that they are now going to compare how **hot** or **cold** things are.
   - Again place a piece of masking tape down the center of a table. On another piece of masking tape, write the word **hotter** and place it on the left side. On another piece of masking tape, write the word **colder** and place it on the right side.
   - Show the students a stuffed animal (or other object). Place this on the center line as the point of reference.
   - Show the students a bag of ice (or an ice cold drink). Let them touch the stuffed animal and then the bag of ice. Then have them decide if the ice is **colder** or **hotter** than the animal and place it on the appropriate side. Say "The ice is **colder** than the animal" as you place it on the table.
   - Repeat using a warm cup of coffee or tea. (Be careful they don't get burned. Have them touch the outside.)
   - Give the students pictures of other objects (like a burning fire, snow, etc.) and let them come up, make the comparison, and place the picture appropriately.
   - On the overhead place Heavier, Lighter, Hotter, Colder . Complete **Section B** as a class. Say the words **hotter** and **colder** as much as possible.

5. Pass out the activity sheet Let's Compare. This can be done individually in class or can be completed for homework.

6. Vocabulary practice sheets are included for further language practice. Encourage students to use as many measurement tools as possible on the Writing Challenge. (rulers to measure cloth, tape measure to measure the waist or skirt length, clock to tell time to be ready for the dance, calendar to plan time to prepare, temperature to know if she'll need a coat, etc.)

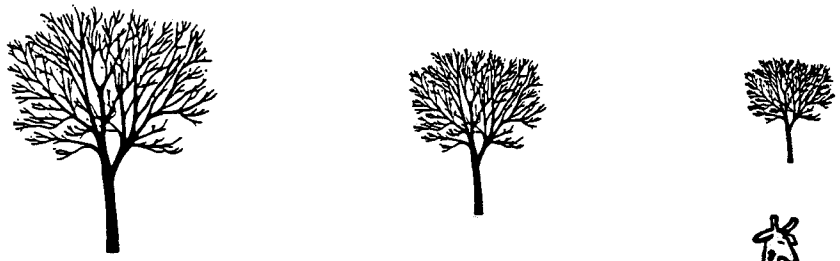
Longest, Shortest, Tallest

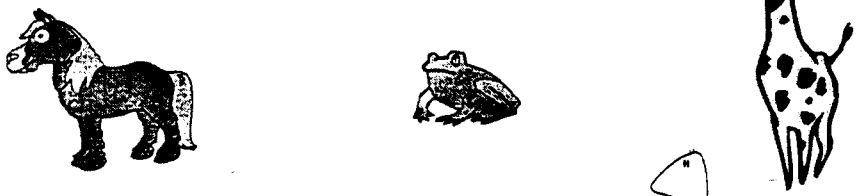
A. Circle the (shortest) Draw a box around the [longest].

1. 

2. 

B. Circle the (shortest) Draw a box around the [tallest].

1. 

2. 

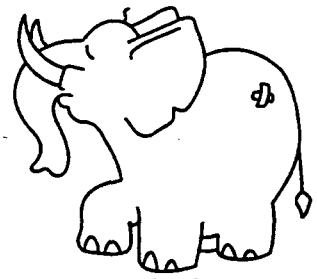
3. 

Heavier, Lighter; Colder, Hotter

A.

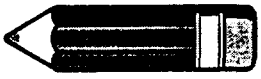
Circle the heavier animal.

mouse



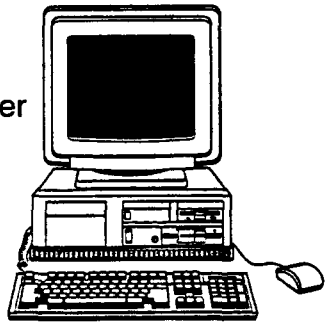
elephant

Circle the lighter item.



pencil

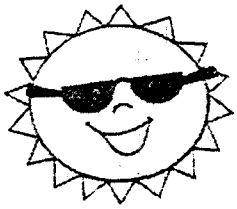
computer



B.

Circle the hotter item.

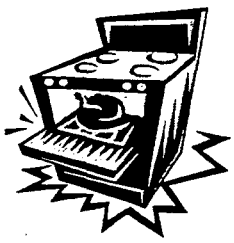
sun



snowman

Circle the colder item.

stove



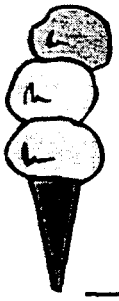
refrigerator

Name:_____

Let's Compare

1. Write **shortest** next to the shortest ice cream and **tallest** next to the tallest ice cream.


_____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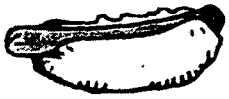
_____

2. Write **shortest** under the shortest hot dog and **longest** under the longest hot dog.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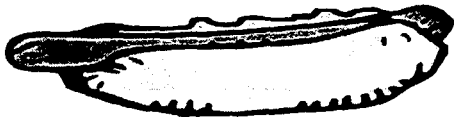

_____


_____

3. Write **heaviest** next to the heaviest apple and **lightest** next to the lightest apple.

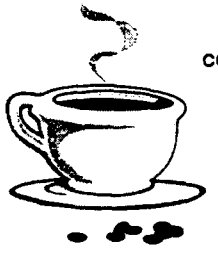

_____


_____


_____

4. Write **colder** next to the coldest drink and **hotter** next to the hottest drink.

_____



_____

Name _____

Vocabulary Practice

Write sentences about the pictures.

1. Which animal is shorter? Which is taller?

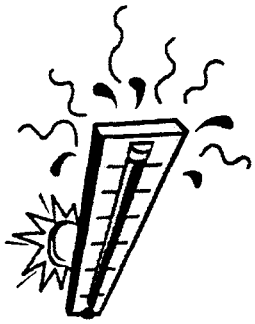
fox

tiger

_____

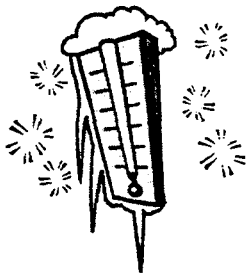
_____

2. Which thermometer is the hottest? Which is the coldest?



thermometer 1

thermometer 2



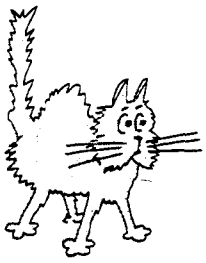
thermometer 3

_____

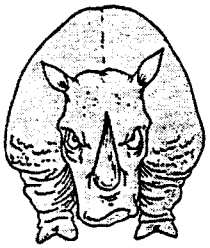
_____

3. Which animal is the lightest? Which is the heaviest?

ant



cat

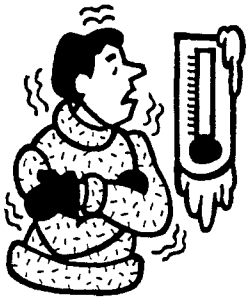


rhino

4. Which man is the coldest? Which is the hottest?

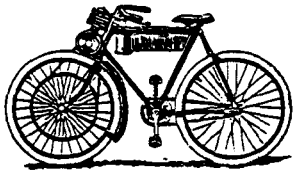
man #1

man #2

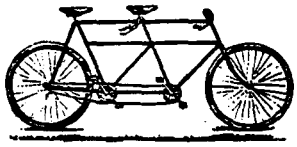


man #3

5. Which bike is longer? Which is shorter?

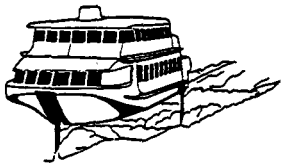


bicycle



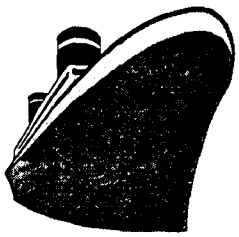
bicycle for two

6. Which boat is the heaviest? Which is the lightest?



hydrofoil

sailboat



cruise ship

Name: _____

Writing Challenge

Patricia wants to go to a dance. Her mother tells her that she will help Patricia make a dress to wear to the dance. What measurement tools will Patricia and her mother use to make the dress? How will they use these tools? Think about other measurement tools Patricia might use in preparing for the dance. What tools could she use? How do you think she will she use them?

Answer Key
Measurement - Objective 2

Let's Compare

1.	shortest	tallest	_____
2.	shortest	longest	_____
3.	_____	lightest	heaviest
4.	colder	hotter	

Vocabulary Practice

1. Fox is shorter. Tiger is taller. Sentences will vary.
2. Thermometer 1 is the hottest. Thermometer 3 is the coldest. Sentences will vary.
3. Ant is the lightest. Rhino is the heaviest. Sentences will vary.
4. Man #3 is the coldest. Man #1 is the hottest. Sentences will vary.
5. Bicycle for two is longer. Bicycle is shorter. Sentences will vary.
6. Cruise ship is the heaviest. Sailboat is the lightest. Sentences will vary.

Writing Challenge

Answers will vary but should include as many measurement tools (rulers, yard stick or meter stick, tape measure, clock, calendar, thermometer, etc) as possible.

Objective 3: Estimate and measure lengths of objects using nonstandard, customary (to the nearest 1/2", 1/4", and 1/8"), and metric units.

Vocabulary

nonstandard
standard
inch
foot, feet
centimeter
meter
millimeter
kilometer
customary units
yard
mile

Materials

large & small paper clips
clear ruler for overhead (in/cm)
rulers (in/cm) for students
coins - pennies, dimes, quarters
meter stick

Transparencies

- Units of Length - Metric System
- Millimeters and Centimeters
- What Would You Use?
- Units of Length - Customary Units

Student Copies

- Let's Measure with the Metric System
- How Long?
- An Inch
- Measuring in Inches
- Measuring Review Sheets
- Can You Find?

Language Foundation

1. Discuss the meaning of the word **standard**. Explain to students that the word **standard** in this lesson means the normal or usual way we do something.

2. Introduce and/or review the prefix **non** which means not or the opposite of. Ask students if they can guess what the word **nonstandard** means. Explain that in this lesson, students will be learning about **standard** and **nonstandard** units of measurements.

3. Introduce and/or review the following numerical prefixes:

centi, cent - one hundredth 1/100
milli - one thousandth 1/1000
kilo - 1000

For Spanish speakers, point out that the numbers ciento (100) and mil (1000) are similar in meaning to the prefixes above. Also explain that a **kilometer** in English is equal to the word kilómetro in Spanish.

Brainstorm with students words that use these prefixes such as century, centimeter, centigrade, millennium, milliliter, milligram, kilometer, and kilogram.

4. Explain to students that some words in English have more than one meaning. One example is the word **foot**. It can mean the foot on our body or the the foot of the bed. Tell students that the word **foot** has a different meaning in math. Explain that one **foot** is a unit of measurement equal to 12 inches. Use a ruler to point out inches and a **foot** if necessary. Explain that if we have more than one **foot** we use the word **feet**.

Another example of a word with more than one meaning is the word **yard**. Students may be familiar with the meaning of yard as the land around a house. Explain that the word **yard** has a different meaning in math. It is a unit of measurement equal to 3 feet. Use a yard stick to demonstrate one **yard**.

Mathematics Component

1. **Nonstandard Units of Measurement**
   - Hand each pair of students some small paper clips and some large paper clips.
   - Tell the students, "We are going to measure the length of our books. We will find out how long the books are."
   - On an extra book, demonstrate for them how to measure the book using small paper clips. Start off with about four paper clips. Make sure you count out loud as you lay out the paper clips.
   - With their small paper clips, have students finish measuring their books. Record this number on the board.
   - Now measure the book using the large paper clips. Have students first estimate how many large paper clips will be needed to measure the book. Record the actual number used on the board .
   - Tell students that the paper clips are a **nonstandard** measurement. A nonstandard unit is a unit you make up yourself. Tell them, "We can measure a desk using paper clips. We can also measure the desk with our hand. How else can we measure the desk?" Elicit a variety of nonstandard units of measurement.
   - Have students measure their desks using the nonstandard units elicited. First have students estimate how many hands, books,etc. it will take to measure the length of the desk Record on the board. Compare their estimates to the actual measurement.

DESK Nonstandard Measurement
___ sm paper clips ___ large paper clips ___ hands ___ other

2. **Standard Units of Measurement - The Metric System**
   - Tell the students that sometimes the nonstandard units are confusing to people because there are so many different answers. Point to the recorded list on the board for the desk measurements.
   - Show the students a ruler. Tell students that when we use this ruler we get a **standard** unit of measurement. Standard units of measurement are used by people all over the world to measure things. Some countries use metric units (meters, centimeters, etc.) as the standard, in the U.S. , we use customary units (inches, feet, etc.). Everyone gets the same answer with standard units.
   - Give students an example: if you use the **standard** units of measurement (feet, meters) to find out how tall a person is, then everyone will have the same answer. If you don't use a standard unit of measure, then you will get a variety of answers. Such a variety can be very confusing. One person could use his hand to measure; another could use a paper clip!
   - Post the Units of Length - The Metric System for them to see.

Measuring Centimeters (cm)

- A basic standard metric measuring unit is a **centimeter.** Tell students they can write **cm** as the short form. Write "centimeter (cm)" on the overhead.
- Using the clear ruler on the overhead, show them what a centimeter is. Explain it is a **short** distance. We use this to measure small things like a pencil, an eraser, or a coffee cup.
- Hand them each a ruler with centimeters so they can see for themselves.
- On the overhead, demonstrate how to use a ruler to measure objects in centimeters. For many students this will be their first experience with a ruler. You will need to point out where to begin measuring and where to end. As you show them say, " Line up the end of the pencil with the left end of the ruler. Next, look at the right end of the pencil and find the closest centimeter mark. "What is the closest cm mark? " Write down _____ cm.
- Tell students that if their measurement is more than half way or more between two centimeter marks, they should record the larger number.
- Pass out items that you have grouped in bags. (markers, pens, spoons, etc.) Each bag should have the same items. Have groups of students practice measuring the items in centimeters using rulers and recording their results. (Remind them that they can abbreviate with **cm.**) Compare the measurements from each group to see if they are similar.
- Pass out Let's Measure with the Metric System and practice measuring in **cm.** Go over the example first.

Drawing Centimeter Lines

- When the students feel comfortable measuring centimeters with a ruler, show them how to draw a line which measures a certain distance. Model measuring and drawing 10 cm on the overhead.
- Have a few students come up to the overhead and draw lines using the ruler. Use whole centimeters like 4 cm, 9 cm, 12 cm, and 17 cm.
- Pass out How Long?. Have the students practice drawing centimeter lines with rulers individually. Have students come up and demostrate drawing lines from section A on the overhead.

Millimeters (mm)

- Introduce the millimeter by having students attempt to measure the width of the outer edge of different coins using centimeters.
- Point out that a unit smaller than a centimeter is needed to tell the difference in the widths of the coins.
- Tell them that a **millimeter (mm)** is smaller than a centimeter and that 10 millimeters = 1 centimeter. Refer to the Units of Length - The Metric System. Tell them we abbreviate ***millimeters*** as ***mm.***
- Show them on the overhead ruler,or the transparency Millimeters and Centimeters, that each mark represents 1 millimeter. Together count the millimeter marks in a centimeter on the ruler.
- Now have the students measure the coins to the nearest millimeter.