A.2 Fractional Number Concepts

Developing the Concept of Fractions *(Simpson)*

Children understand what one-half, perhaps one-third, and one-quarter are in the spoken language before they come to school. They learn this by sharing chocolate bars, pieces of cake, etc.

Here is an exercise to teach the children how to write a fraction and equate it with its meaning. Have each child take a strip of paper and fold it so the ends meet evenly. Draw a line on the fold. How many equal lengths do you have? Elicit the answer "2." Teacher writes "2" on the blackboard. Color one piece red. What part of the strip did you color? Answer "1." Write $\frac{1}{2}$. Do numerous exercises using halves and quarters. Write the fraction on the board. After some practise, have the children write on the piece of paper the representative fraction. For extra practise, use a fraction kit on flannel board, as well as many diagrams and shapes (squares, circles and rectangles). By questioning, make certain all the pupils understand that the bottom digit tells how many pieces the whole was cut into and the top digit represents how many pieces we are going to use (for example, color $\frac{2}{3}$ of the square red).

In another exercise, give each child four identical rectangles of paper. Can you fold each a different way to divide it into halves? Also, have each child take a strip of adding machine tape (about two feet long). Fold in half. Draw a line on the fold; mark $\frac{1}{2}$. Fold again. How many equal pieces do you have? Do you see any equal fractions? Equal fractions can be shown using two identical strips. Fold one in halves and one in quarters. Match the folds. What do you see? Fold again. What do you see?

Thirds are a bit harder to fold but with direction and patience they can learn to do it. Fold again and what have you got this time? (If you plan to fold thirds, halves and quarters on the same strip it is easier if you fold thirds first.)

Grade III children understand fractions quickly when they are dividing the whole into equal parts. They experience difficulty in writing fractions when they divide groups of objects (marbles, etc). They can do the manual dividing, such as dividing twelve marbles among three children, but when asked what fraction of the 12 marbles each child has, they usually answer something like, "Mary has four marbles so she has one-quarter." It takes a great deal of practise with objects, starting with two and working up until the children learn that the fraction doesn't mean the number Mary has in her hand.

Activities on Fractions: Grade IV *(Hamilton)*

This workshop is designed as an immediate follow-up procedure after the children have been introduced to the idea of fractions--what they mean, how they are written, naming numerator and denominator, etc. The idea of the workshop is to give pupils the opportunity to work with fractions using very familiar objects, to give them a better knowledge of what fractions mean, to give them the opportunity to manipulate objects in several ways so that they can see how fractions

are an integral part of everyday living and, finally, to give them an opportunity to be creative in making fractions using their own ideas. In some aspects, the workshop, can be correlated with measurement and language, or even art!

1. Given a square piece of paper or a box and several one-inch squares (made from construction paper), the pupils are asked to make as many fractions as they can by fitting the inch squares into the box. Then they are asked to look for combinations of fractions that are equal to other fractions and to make shapes (using construction paper) to show these new fractions, bringing in the idea that some fractions are equivalent. The pupils are encouraged to try and make different patterns with their shapes as they fit them into the box.

2. When the first activity is completed, pupils might now be asked to repeat the first activity using larger boxes and larger or smaller squares (or even other shapes that they might come up with). For example, you might say, "What would happen if you cut the small squares in half, or divided them into three equal parts, or four equal parts, ...?"

3. Pebbles in a bag. Divide them evenly among the members of your group. What fraction of all the pebbles does each child get? 3 children? 4 children? etc.

4. Long strip of liquorice. Fold in the middle and cut into 2 halves. Write $\frac{1}{2}$ of 1 strip = $\frac{1}{2}$. Eat one piece. With the other piece, continue to fold, cut, write, and eat until the liquorice is gone.

5. Cups and jug. How would you find out what fraction of the whole jug one cup would be? 2 cups? etc.

6. Tin pie plates and construction paper. Show how mother cuts a pie so that each member of the family gets a piece.

7. Divide a strip of ribbon evenly among the members of your group. What fraction of the whole ribbon does each child get? 2 children? etc.

8. Wind two strings of different thickness around a piece of cardboard to measure one inch. Count the strands. What fraction is one string to all the strings. SURPRISE! The fraction with the larger denominator goes with the thinner string.

9. How many different fractions can you make in talking about the members of your family? Show your ideas on a chart (using cut paper, pipe cleaners, etc.).

10. What fraction represents the number of children present today? Absent? Show on a chart.

11. Show on a chart the fraction that tells the number of children in your class that are boys, girls, 9-year-old boys, 9-year-old girls, ten-year-old boys, ten-year-old girls, children 9 years old, children 10 years old, desks that are empty, desks that are filled, big desks, small desks,

windows that will open, windows that will not open, tiles that are different colors (floor), etc.

12. Cut up oranges to show the idea of improper fractions. For example, how would you cut two oranges so that each of five persons would get $\frac{1}{4}$ of an orange, or $\frac{1}{3}$ of an orange? Are any pieces left over? Which would you rather have, a third or a quarter? What fraction names all the pieces that were given to the five people?

Fractions Workshop *(Seeger)*

The objectives of the following activities are:

a) to give the student some familiarity with the concept of fractional amounts and,

b) to help the student gain an understanding of the meaning of fractional amounts.

The workshop is divided into sections. For each section, students should be divided into groups and rotated through the activities. Section A is a rather simple introductory section.

SECTION A

1. Provide the group with scissors and pieces of construction paper cut into geometric shapes such as circles, rectangles, pentagons, hexagons, etc.

   a) Can you cut each different shape into 2, 3, 4, 5, 6, 7, 8 equal pieces? What are these different pieces called? Write the name 1/2, 1/3, 1/4, etc. on the appropriate piece.

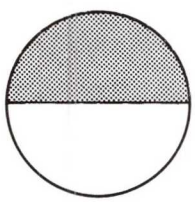
   b) Using the equal pieces of one of the shapes only, each of the halves is the same as how many of the eighths, fourths, sixths?

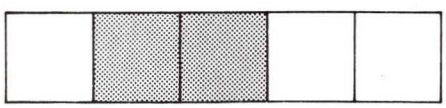
2. Provide each student with about two or three feet of adding machine tape.

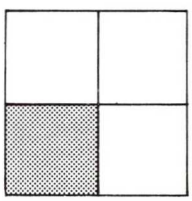
   a) Can you fold the adding machine tape to show halves, quarters, thirds, sixths, and eighths? As you do this, mark each fold 1/2, 1/4, etc.

   b) Are there places on the tape where two or more folds are in the same place? Give several examples of this.

3. Provide the students with worksheets which have geometric figures drawn on them with portions shaded.







What fractional portion of each of the shapes has been shaded?

SECTION B

1. Provide the group with worksheets and balance beams or scales.

Worksheet

Object	*1/2 of the weight*	*estimate of 1/4 weight*

a) Collect a number of different objects in the room. How can you find $\frac{1}{2}$ of the weight of each?

b) Can you estimate what $\frac{1}{4}$ of the weight of each object might be?

2. Provide the group with worksheets and spring scales.

a) Collect several objects in the room. Can you find the weight of each object in air and in water?

b) Can you show how the weights compare by using a fraction?

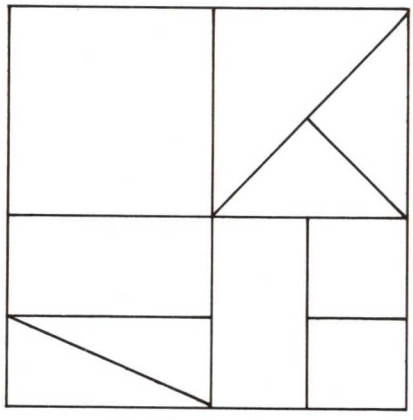
3. Provide each student with a tape measure and worksheets.

a) Find your height.

b) Can you make a fractional comparison between your height and the length of your shadow at different times of the day?

c) At what times of the day is this fraction close to being equal to one?

4. Provide each student with a sheet on which the rectangle below has been drawn.



a) Express each region in the rectangle as a fraction of the entire rectangle.

b) Combine two or more regions to form larger fractions. Shade these areas.

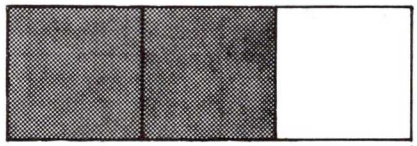
c) Can you write equations using the fractional amounts in the rectangle?

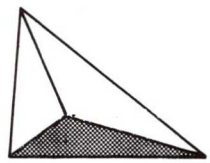
SECTION C

1. Provide each student with a worksheet showing geometric figures divided into fractional amounts, with portions shaded.

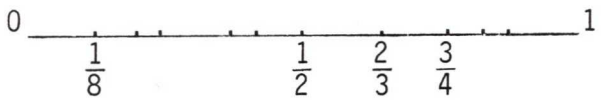
   a) How much of each polygon is shaded?

   b) What would you add to each shaded amount to get a value equal to one?





2. Provide each group with a fractional number line



   a) Can you complete this number line?

   b) How can you use this fractional number line to add and subtract?

3. Provide each group with a geoboard and rubber bands.

   a) Can you show fractions on 2x2 or 3x3 sections of the geoboard?

   b) Can you use your geoboard to show how to add or subtract your fractions?

Fractions *(Willis)*

This unit is intended to provide Grade V students with concrete experience in working with fractions. To be able to construct, assemble, compare, and generally manipulate the materials will help provide a more thorough understanding of the concept "fraction." The work set out is not a complete unit of study for fractions in Grade V, but it provides a good background for further work and materials. The ideas are basically - numerator and denominator, parts of a whole, equivalence, common denominators.

All these come from the S.T.A. Grade V text. The treatment is similar to what can be found in many commercial productions but the particular combination and work topics are an accumulation of many ideas. It is hoped that at the completion of this workshop the students will be able to:

1. Identify the numerator and denominator of given fractions.

2. Pick out the smallest fractions from a list of fractions with the numerator the same.

3. Pick out the largest fractions from a list of fractions with the denominator the same.

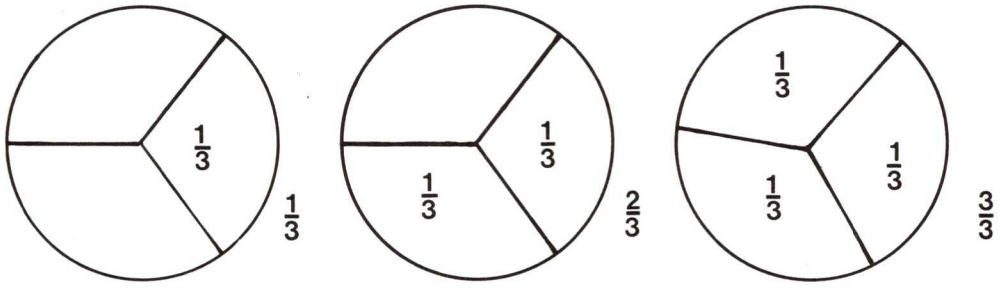
4. Identify various fractional parts of a whole object.

5. Write arithmetic sentences showing equality between fractions.

6. Figure out a common denominator for the fractions given.

TASKS

1. Take the materials and construct complete circles out of the pieces so that you are using pieces all the same size to make the circles. If your circle is being made from 3 (three) identical pieces, your notation is like this:



Can you complete a chart like the following?

Number of pieces to make whole				*Fractions you obtained as you built circle*			
1							1
2						1/2	2/2
3					1/3	2/3	3/3
4				1/4			
5					3/5		
6							6/6

2. Notice that the bottom number on each fraction in any row of your chart is the same as the number of pieces in the circle. What is the name given to the bottom number?

3. Notice that the top number of each fraction in any row changes as the number of pieces added to the circle becomes larger. What is the name of the top number?

4. Which of these fractions is the smallest? 1/3 1/5 1/7
If the top number (numerator) remains the same, how can you tell which fraction is going to be the smallest?

5. Which of these fractions is the largest? 3/4 1/4 2/4
If the bottom number (denominator) remains the same, how can you tell which fraction is going to be the smallest?

6. Manipulate the figures to show which parts of circles are equal to other parts of the same circle. For example, can you show that 1/6 + 1/6 = 2/6 = 1/3? What other equalities can you find? Write them down in the same manner as the above example.

7. If you want to add two or more fractional parts together that do not have the same denominator, what can you do? For example, 1/4 + 1/2. Try assembling the figures suggested.

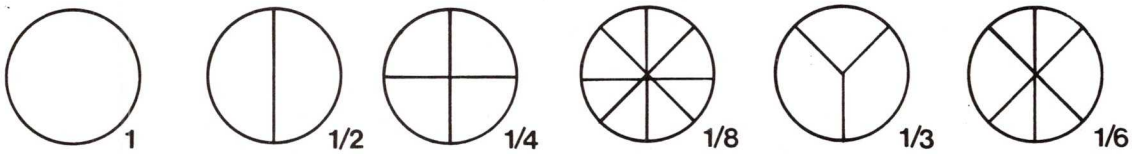
Fractions *(Feeney, Kanik)*

Fraction - one or more of equal parts into which a unit or number can be divided.

Numerator - the top number of a fraction that tells how many parts.

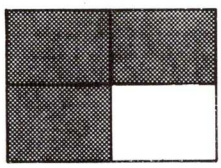
Denominator - the bottom number of a fraction that names the fractional parts.

1. Illustrate fractions beginning with -



2. Use fractions in sentences.

3. Fractions can be shown in several ways.

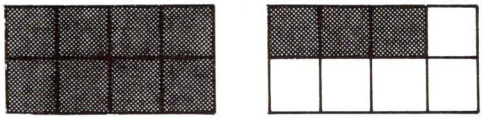


3/4 is shaded / three-quarters is shaded

4. *Improper fraction* - applies to fractions having *numerators equal to or greater than* their denominators.

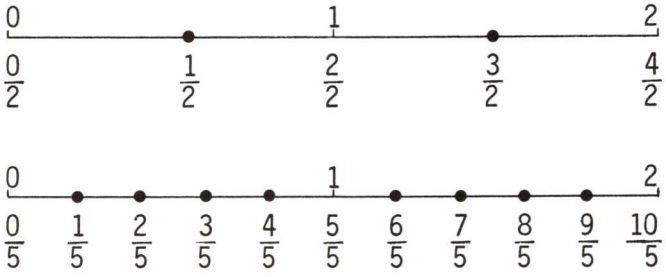
8/8 is shaded

or



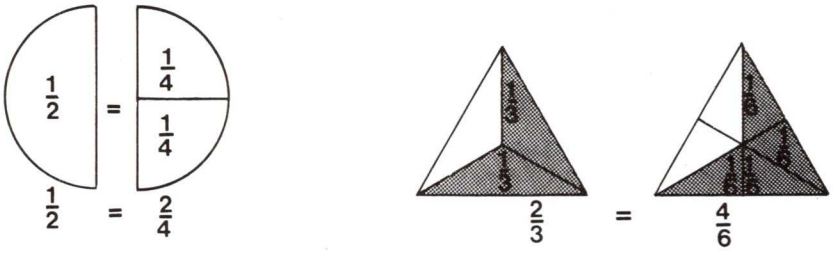
11/8 rectangles are shaded

5. Fractions on number lines -



See how many different number lines you can make. Use as many different fractions as you can. Compare some of these number lines to each other. Can you find several different names for the same point on your number lines?

6. Equivalent fractions - make as many equal fractions as you can. Make them in as many different ways as you can. Label each fraction.



Here are two different sets of equivalent fractions:

1/4 2/8 3/12 4/16 5/20 6/24

5/6 10/12 15/18 20/24

- see how many sets of equivalent fractions you can make,
- compare several of these sets,
- what do you notice about the denominators of some of the fractions in different sets?

Before we can add one fraction to another we must find an equivalent fraction that has the same denominator. If you took the two sets of equivalent fractions for 1/3 and 1/5 -

1/3 2/6 3/9 4/12 5/15 6/18, and

1/5 2/10 3/15 4/20

could you find the fractions in each set that have the same denominator? Once you find the common denominator you can add the two fractions.

Write down several sets of equivalent fractions. Can you find any common denominators in these sets?

Divide several transparencies into fractions. By laying one on top of the other, show how you are able to explain to your partner how to add fractions. Take turns with your partner to make up some questions in which you add fractions. Make illustrations of your questions and answers or use the available material to show how you found your answers.

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