Harvard Forest LTER Schoolyard Ecology

Buds, Leaves, and Global Warming Data Analysis Lesson Plan: Graphing Leaf Color

Author: K. Robichaud, Teacher, J.R. Briggs Elementary School

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Dr. Betsy Colburn and Dr. John O'Keefe, Harvard Forest Ecologists
Pamela Snow, Harvard Forest Schoolyard Coordinator

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Curricular areas: Mathematics: Data analysis/ Graphing, Science: Ecology/Climate, Language Arts: Poetry

Grade Level: 4

Enduring Understanding: Students will develop data collection and analysis skills by collecting leaves, estimating the amount of color change (fraction and percentage of non-green color on the leaf), classifying the estimated data into categories, graphing the data, and evaluating patterns from the graph. These skills will be transferred to other life knowledge and learning in science and math.

Essential Questions:
1. How long is the growing season in our schoolyard?
2. How might the length of the growing season relate to weather and climate?
3. How do we use fractions/percents to represent leaf-color change??
4. What is the current stage of color change for your specific leaf and for the entire class's leaves?

Additional Questions:

1. Why is color change different (the color change, the actual color, the rate of color change, and the percentile of change over a given period of time) in different tree species?
2. If the class graph was completed again in two week's time with a "fresh" sampling of leaves, what would you predict would happen?

Assessments: Students' learning will be assessed by participation in and completion of:

1. Collection of Individual leaf/Homework assignment
2. Poetry Review
3. Leaf Color Change Graph
4. Activity Self-Assessment

Curriculum Standards:

Science: Life Science Biology 1, 3, 5, 7, 9
LSB 1 Classify plants and animals according to the physical characteristics that they share
LSB 2 Identify the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, reproduction, growth, and protection.
LSB 3 Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.
LSB 7 Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).
LSB 9 Recognize plant behaviors, such as the way seedlings' stems grow toward light and their roots grow downward in response to gravity. Recognize that many plants and animals can survive harsh environments because of seasonal behaviors, e.g. in winter, some trees shed leaves, some animals hibernate, and other animals migrate.
Math 4N3 Demonstrate an understanding of fractions as parts of unit wholes, as parts of a collection, and as locations on the number line.
Math 4D3 Construct, draw conclusions, and make predictions from various representations of data sets such as lists, tables, or graphs, (including circle graphs) with the actual set of data.
ELA Poetry 14.3 Respond to and analyze the effects of sound, figurative language, and graphics, in order to uncover the meaning in poetry.

Instructional Strategies or Goals:

To involve students in a real life experience involving data collection related to the color change of leaves before they drop. To prepare students to accurately complete field data sheets throughout this year's *Buds, Leaves, and Global Warming* Schoolyard Ecology project. To integrate students' understanding of math, science, and language arts through the study of presenting and analyzing data of leaf color change.

<u>Activities</u>:

A. Day One:
   1. Students select a leaf from a site in Ashburnham as a homework assignment.

   2. Students meet in the meeting area to view the poem *The Tree on the Corner* by

Lilian Moore. The poem should be displayed on chart paper or an over head. Other recommended poems are *The Leaves Fall* Down by Margaret Wise Brown and/or *Leaves* by Soseki. Students will read the poem to themselves first, the teacher then reads (models) the poem, and finally, the class chorally reads the poem. The meaning of the poem is discussed as well as the poem's pattern, poetic device (simile, onomatopoeia, etc.) and parts of speech. In small groups, students fill in a Poetry Review think sheet. All students should be provided with an individual copy of the selected poem.

3. Practice estimating leaf color change percents/fractions:
    a. In order to practice estimating fraction/ percentage for their upcoming leaf placement, the teacher shows students examples of real leaves with different amounts of color change. The teacher begins with 2 leaves with very simple and clear color delineation, and then shows 1 or 2 leaves with small patches of color for which it is more difficult to estimate percent of color change.
    b. Students are given blank leaf diagrams and practice coloring the diagrams based on the sample leaves. Each diagram is colored with the fraction/percentage of color change observed on a sample leaf. .
    c. Students then place each leaf diagram into the appropriate category of fraction/percentage of non-green color, as described in the Buds, Leaves, and Global Warming protocol and in section B.1. below.

B. Day Two:

1. Students post the individual leaf that they brought from home on the leaf color change bulletin board. The board is divided into four columns. Each column is labeled at the top with a different ascending percentage/fraction.(0-1/4(0-25%), 1/4-1/2 (26-50%), 1/2-3/4 (51-75%), 3/4-4/4 (76-100%). Students who are unsure of their fraction/percentage of color that is not green (on their leaf) may be assisted by the teacher in placing their leaf in the appropriate color change category.

2. Class discussions and observations of the bulletin board graph are made after the class has completed their postings.

3. Students will look at the posted leaves and count how many leaves fall into each color-change category, as follows. In the meeting area, on chart paper, (or you may use an overhead) the following calculations are made:
    a. Color change from 0-25% is tallied
    b. Color change from 26-50% is tallied
    c. Color change 51-75% is tallied
    d. Color change 76-100% is tallied.

4. On a class bar graph, data are displayed. See sample bar graph enclosed.

5. Students are given a *Graphing Leaf Color Scoring Rubric.*

6. Students complete their own using colored pencils at their seats. This is an introductory lesson to get the thought of color change in the minds of the student.
    a. The graph is titled: *Leaf Color Change Class Graph*
    b. The key is color-coded and completed.

    Teacher notes regarding color on the bar graph: Because nine and ten year olds enjoy color and it is a graphing skill, it is included in this graphing lesson. This graph does

not require color coding-it is up to the discretion of the teacher whether to have students use color coding or not. We recommend that if this part of the lesson is included, that the colors chosen should be colors that are not common autumn leaf colors, so as not to confuse those analyzing the graph. Colors such as pink, purple, gray, and black would be appropriate color choices.

7. Students fill out a *Student Self-Assessment*.
8. Students meet again for a poetry reading on the rug. (One of the above-mentioned poems may be used or teachers may wish to obtain a copy of *The Earth Is Painted Green, A Garden of Poems About Our Planet*, edited by Barbara Brenner, illustrated by S.D. Schindler, published by Scholastic, compilation copyright 1994 by Byron Press Publications, Inc. This book is a wonderful teaching tool.)

Tools and Resources:

- Harvard LTER Schoolyard Program Web pages-Protocols and Data, suggested reading, related research: http://harvardforest.fas.harvard.edu/museum/phenology.html
- Autumn Tree Poetry Sheet with poems from *The Earth is Painted Green, A Garden of Poems About Our Planet edited by* Barbara Brenner
- *Poetry Review* sheet
- Leaf coloring sheets
- Percent (Fraction) of Leaf Color (Non-Green) Graph Template
- *Graphing Leaf Color Scoring Rubric*
- *Student self-assessment* sheet
- Crayons
- Colored pencils,
- #2 pencils
- Chart paper
- Overhead if teacher prefers
- Bulletin board space

Name: _____ Date: _____

Graphing Leaf Color Scoring Rubric

Please check off each requirement that you have met.

Accuracy _____

Neatness _____

Title _____

Key _____

I have followed my rubric and I have met all the requirements:_____.
Student Signature

SD Strongly Developed (meets all requirements)
D Developed (meets three of the four requirements)
ND Not Yet Developed (meets two of the four requirements)
U Unsatisfactory (meets one or no requirements)

Student Score: _____
Teacher Comments:
_____
_____

The Tree on the Corner

I've seen
the tree on the corner
in spring bud
and summer green.
Yesterday
it was yellow gold

Then a cold
wind began to blow.
Now I know-
you really do not see
a tree
until you see
its bones.

Lilian Moore

The Leaves Fall Down

One by one the leaves fall down
From the sky falling one by one
And leaf by leaf the summer is done
One by one by one by one.

Margaret Wise Brown

Leaves

The winds that blow –
  Ask them, which leaf of the tree
    Will be next to go!

Soseki

The Earth is Painted Green, A Garden of Poems About Our Planet edited by Barbara Brenner

Name: _____ Date: _____

Graph Title: _____

Number of Leaves

0-25% (0-1/4)	26-50% (1/4-1/2)	51-75% (1/2-3/4)	76-100%(3/4-4/4)

Percent (Fraction) of Leaf Color (Non-Green)

□Green □ Yellow □ Orange □ Red = KEY

Make sure to color code your key.

Name: _____ Date: _____

Poetry Review

Title: _____

Author: _____

List three adjectives that the poet uses in this poem:

_____

List three nouns that the poet uses in this poem:

_____

List three descriptive phrases that the poet uses:

_____

_____

_____

Describe the picture you have in your mind, after reading this poem:_____

_____

_____

Did you enjoy this poem? Why or why not?

_____

_____

_____

What is the pattern in this poem?

_____

List any poetic devices that you can find? (ex. simile, metaphor, personification, onomatopoeia, alliteration, etc.)

_____

_____

_____

Bonus: write and illustrate a poem using the format this poet used or illustrate this author's poem.

Name: _____ Date: _____

Subject:_____ Project:_____

Student Self-Assessment:

1. I listened carefully to directions. Yes No

2. I helped my group members. Yes No

3. I worked quietly. Yes No

4. I handled materials with care. Yes No

5. I did my fair share of the work. Yes No

6. I cleaned up my materials, in an orderly manner, when I was asked to do so. Yes No

7. I cooperated with my group members. Yes No

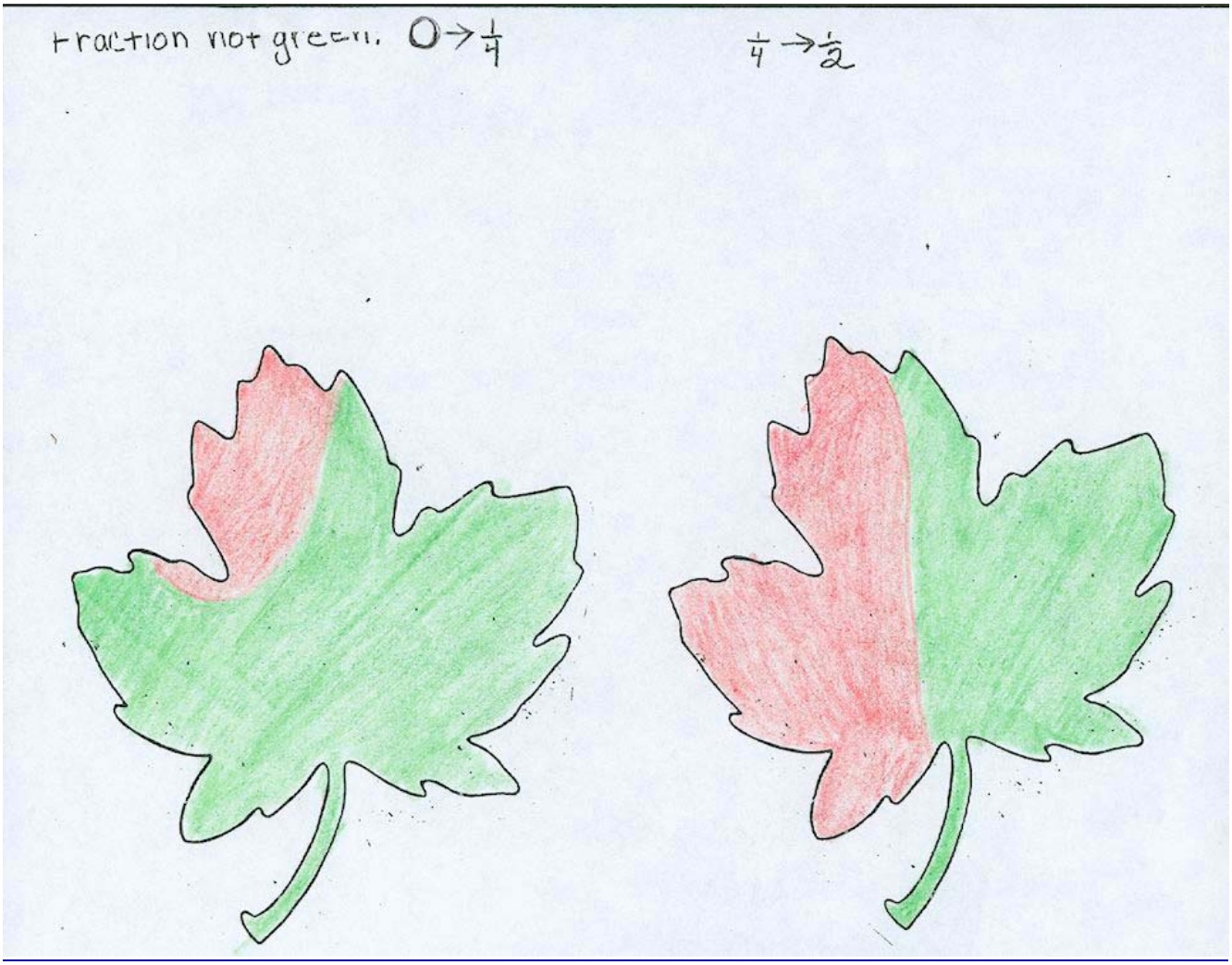
8. My research notes were complete and useful. Yes No

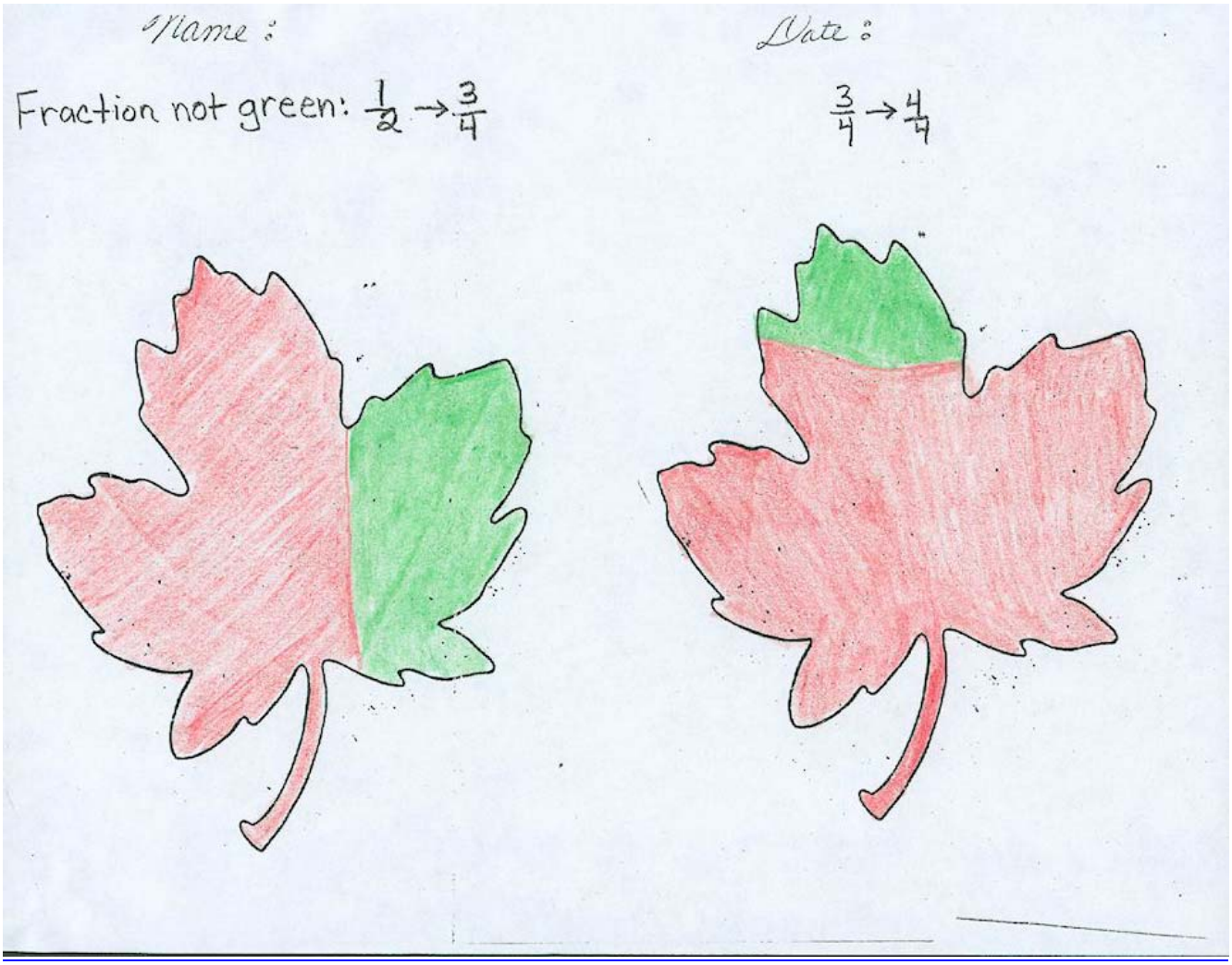
9. I worked with _____

Grade student believes he/she earned: _____ Grade from teacher: ____

Teacher comments on student performance:

_____
_____
_____
_____
_____
_____
_____


fraction not green. 0→1/4
1/4→1/2


Name :
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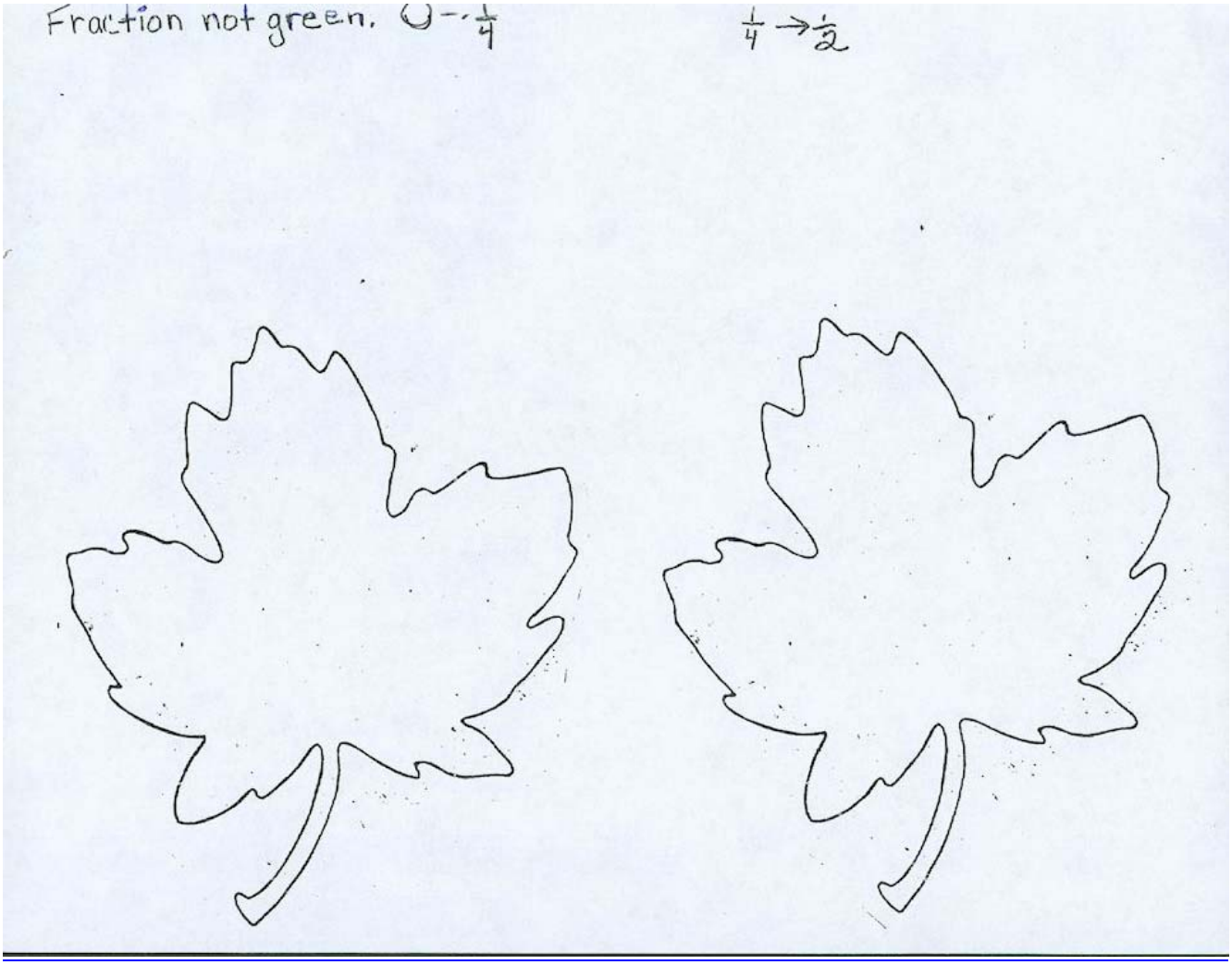
Fraction not green: $\frac{1}{2} \rightarrow \frac{3}{4}$
$\frac{3}{4} \rightarrow \frac{4}{4}$

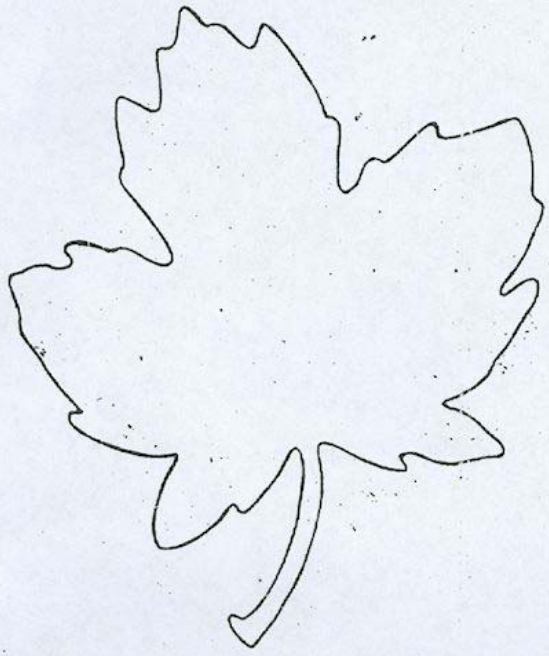

Fraction not green. $\frac{1}{4}$
$\frac{1}{4} \rightarrow \frac{1}{2}$

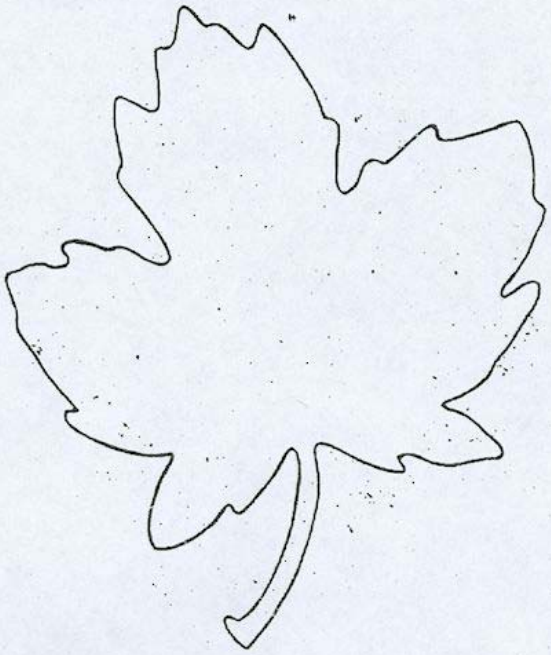
Name :

Date :

Fraction not green: $\frac{1}{2} \rightarrow \frac{3}{4}$

$\frac{3}{4} \rightarrow \frac{4}{4}$






0→1/4
0-25%
26-50%
1/4→1/2
51-75%
1/2→3/4
3/4→4/4
76-100%
Percent of color on the leaf