Title: Rings Around Decimals

Brief Overview:

This unit focuses on the recognition of fractions and decimals. Students participate in classroom Olympic events and compare results using fractions and decimals. The culminating activity provides opportunities for the "judges" to orally present final results and awards.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

<u>Number and Operations</u>

- *Understand numbers, ways of representing numbers, relationships among numbers, and number systems.*
- *Understand meanings of operations and how they relate to one another.*

<u>Geometry</u>

- *Specify locations and describe spatial relationships using coordinate geometry and other representational systems.*
- *Use visualization, spatial reasoning, and geometric modeling to solve problems.*

Measurement

- *Understand measurable attributes of objects and the units, systems, and processes of measurement.*
- *Apply appropriate techniques, tools, and formulas to determine measurements.*

Data Analysis and Probability

- *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.*
- *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.*

- **Process Standards**

Problem Solving

- *Build new mathematical knowledge through problem solving.*
- *Solve problems that arise in mathematics and in other contexts.*
- *Apply and adapt a variety of appropriate strategies to solve problems.*
- *Monitor and reflect on the process of mathematical problem solving.*

Reasoning and Proof

- *Recognize reasoning and proof as fundamental aspects of mathematics.*
- *Select and use various types of reasoning and methods of proof.*

Communication

- *Organize and consolidate their mathematical thinking through communication.*
- *Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.*
- *Analyze and evaluate the mathematical thinking and strategies of others.*
- *Use the language of mathematics to express mathematical ideas precisely.*

Connections

- *Recognize and use connections among mathematical ideas.*
- *Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.*
- *Recognize and apply mathematics in contexts outside of mathematics.*

Representation

- *Create and use representations to organize, record, and communicate mathematical ideas.*
- *Select, apply, and translate among mathematical representations to solve problems.*
- *Use representations to model and interpret physical, social, and mathematical phenomena.*

Grade/Level:

Grades 5 - 6

Duration/Length:

40-50 minute sessions for approximately 6 days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Recognition, construction, and comparison of fractions
- Recognition, construction, and comparison of decimals to the tenths place value
- Graphing
- Mixed numbers
- Linear Measurement

Student Outcomes:

Students will:

- show equivalency between fractions and decimals.
- compare and order decimals to the hundredth place.
- add and subtract decimals to the hundredth place.
- analyze and construct data displays.
- give oral presentations.
- graph results of data.

Materials/Resources/Printed Materials:

- Geoboards with rubber bands
- Geoboard paper (see sample at end of unit)
- Centimeter graph paper
- Math Explorer calculator (Texas Instruments)
- Decimal rulers
- Metric rulers and meter stick
- Activity sheets, student score sheets, rules and directions for the six games (all found at the end of unit)
- Vanilla wafers (approximately 1 per student)
- Bendable straws
- Cotton balls
- Pennies
- Ramp (refer to teacher's directions)
- Timer
- Fraction Dice
- Student Activity Sheets 1-10
- Student Team Score Sheets 1-6

Development/Procedures:

Days 1-2 *Fabulous Flags*

- Students work on designing flags using geoboards. They are given specific fractional directions to follow. They are assessed on how well they follow these guidelines and their ability to convert the fractions to decimals.
- See *Teacher Directions Activity 1* and *Student Activity Sheet 1*.

Days 3-4 *Let the Games Begin!*

- Teacher explains rules and procedures for math Olympic games.
- Students move from game center to game center spending approximately five minutes for participation and five minutes for computation/conversion. Score cards are to filled in completely before moving to the next event.
- See *Teacher Directions, Student Activity Sheets 2 through 8, Student Team Score Sheets 1 through 6, Gameboard, rules and procedures, and scoring sheets for games.*

Day 5 *It's a 10(th)!*

- Students acting as judges prepare for award ceremonies by computing, comparing and ordering decimal scores (to the hundredth place), and designing decimal gold, silver, and bronze medals.
- Teacher gives guidelines (rubric) for evaluation of scoring process, presentation and awards.
- See *Teacher Directions: Presentation and Awards Rubric*.

Day 6 *Go for the Gold!*

- Students present their findings in an oral presentation with visual graphics and justification of their data.
- Awards ceremony follows with recognition of three best scores with medals.
- See *Teacher Directions: Presentation and Awards Rubric*.

Performance Assessment:

The assessment for this unit will be on going. Students will be assessed formally and informally on the following activities:

- Showing equivalency between fractions and decimals (6 Events Rubric)
- Comparing and ordering decimals to the hundredth place (Presentation Rubric: Computation)
- Adding and subtracting decimals to the hundredth place (Judging Rubric)
- Analyzing and constructing data displays (Presentation Rubric: Graphic)
- Giving oral presentations (Presentation Rubric: Communication)
- Graphing results of data (Presentation Rubric: Graphics)

Extension/Follow Up:

- Through media, follow the actual Olympic games and record and compare scores of the events to the thousandth place in decimals.
- Write a commiseration letter to one of the contestants who lost an event by a difference of 1/1000. Be sure to have the students include their understanding of how excruciatingly close the score was.
- Use fraction stack as an alternative to the Alpine skiing event instead of game board.
- Teachers could create and give overall performance medals.

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Fabulous Flags

Directions:

1. Prepare index cards for each group of students. Students will choose their flag colors but the teacher will provide them with the number of colors they may select. Index cards should include no more than 4 colors and the fractional representation for each.

Example:

Choose 3 colors.

1/2 flag one color

1/4 flag one color

1/4 flag one color

2. If necessary, review how to use geoboards.

3. Each team member is responsible for completing a geoboard worksheet and flag.

4. As students work on converting fractions to decimals, monitor their work.

Fabulous Flags

Color Options: Red, Blue, Green, Yellow, Black, and White

Directions:

1. Read your index card and choose the colors your team would like.

2. Use your geoboards to create 3 different designs for your flag. Remember to check your index card! Each color is a fraction of your geoboard.

3. Draw and color each design on your geoboard paper.

4. Choose 1 design to represent your team and color it on the large graph paper.

5. Use the following chart to show each color in fraction and decimal form.

Color	Fraction	Decimal

Teacher Scoring Guide

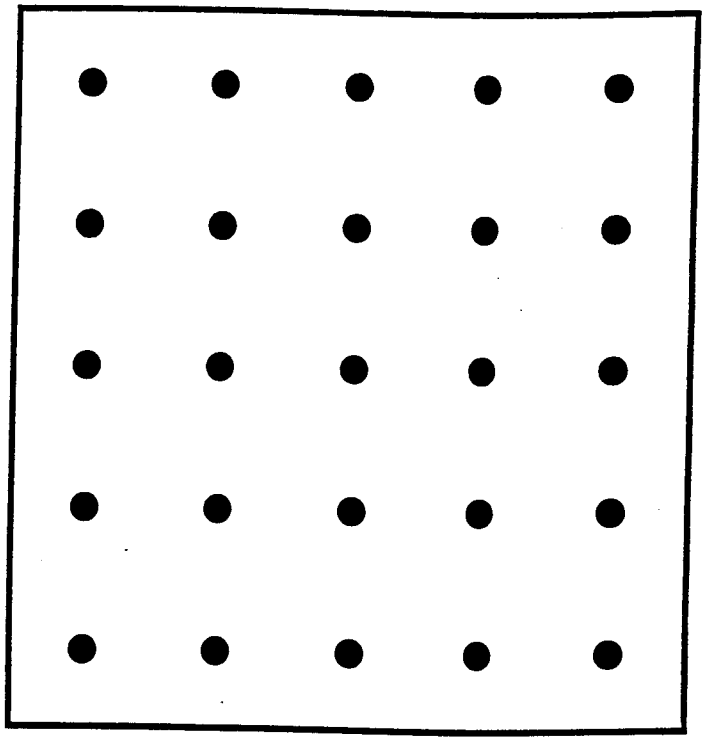
Fabulous Flags

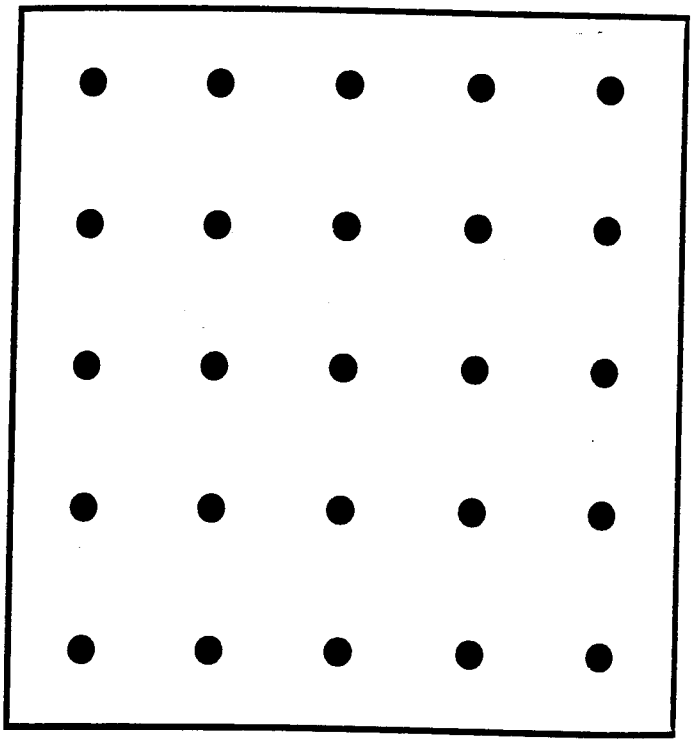
30 points	**Geoboard sheet – 3 flag examples**	_____
20 points	**Final fraction flag completed**	_____
20 points	**Proper fraction to decimal conversion**	_____
20 points	**Degree of pattern originality/difficulty**	_____
5 points	**Neatness**	_____
5 points	**Completed on time**	_____
100 points	**Total :**	_____

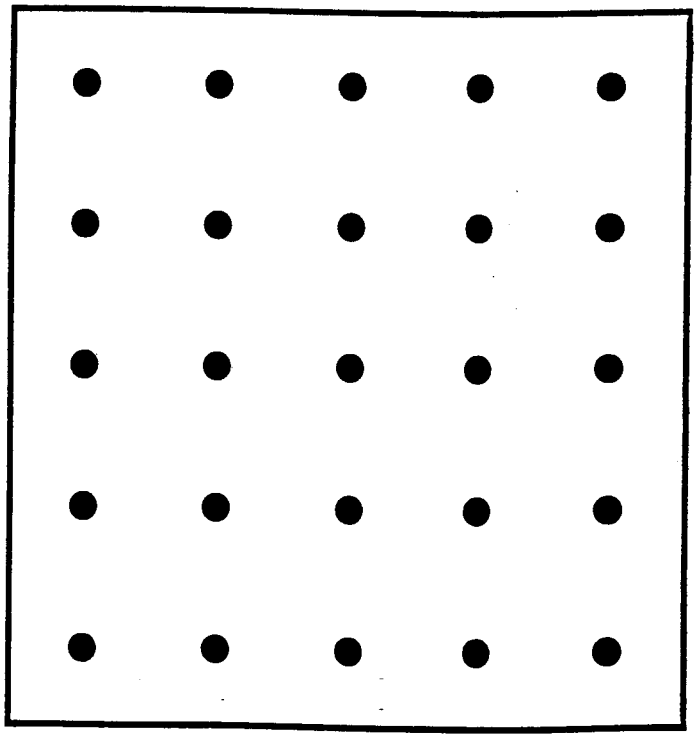
Student's name _____

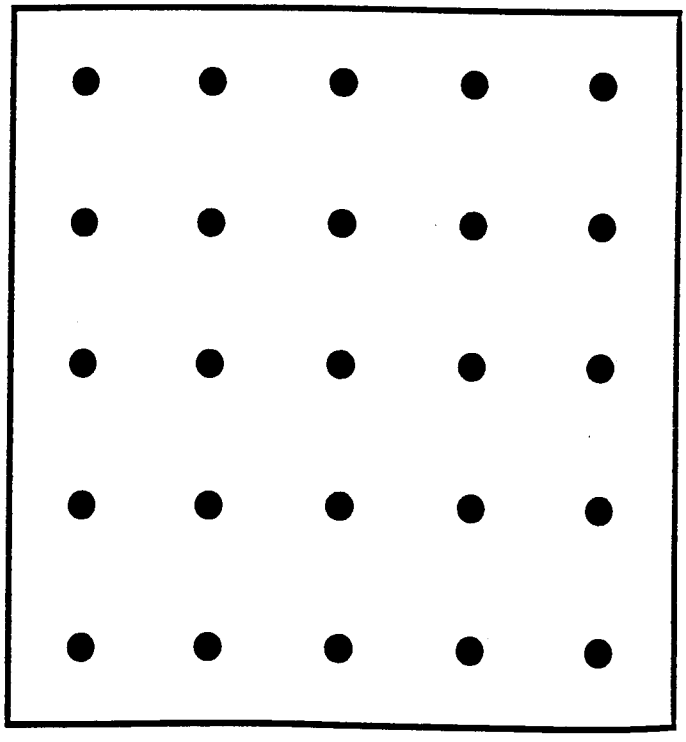
Additional comments:

Fabulous Flags



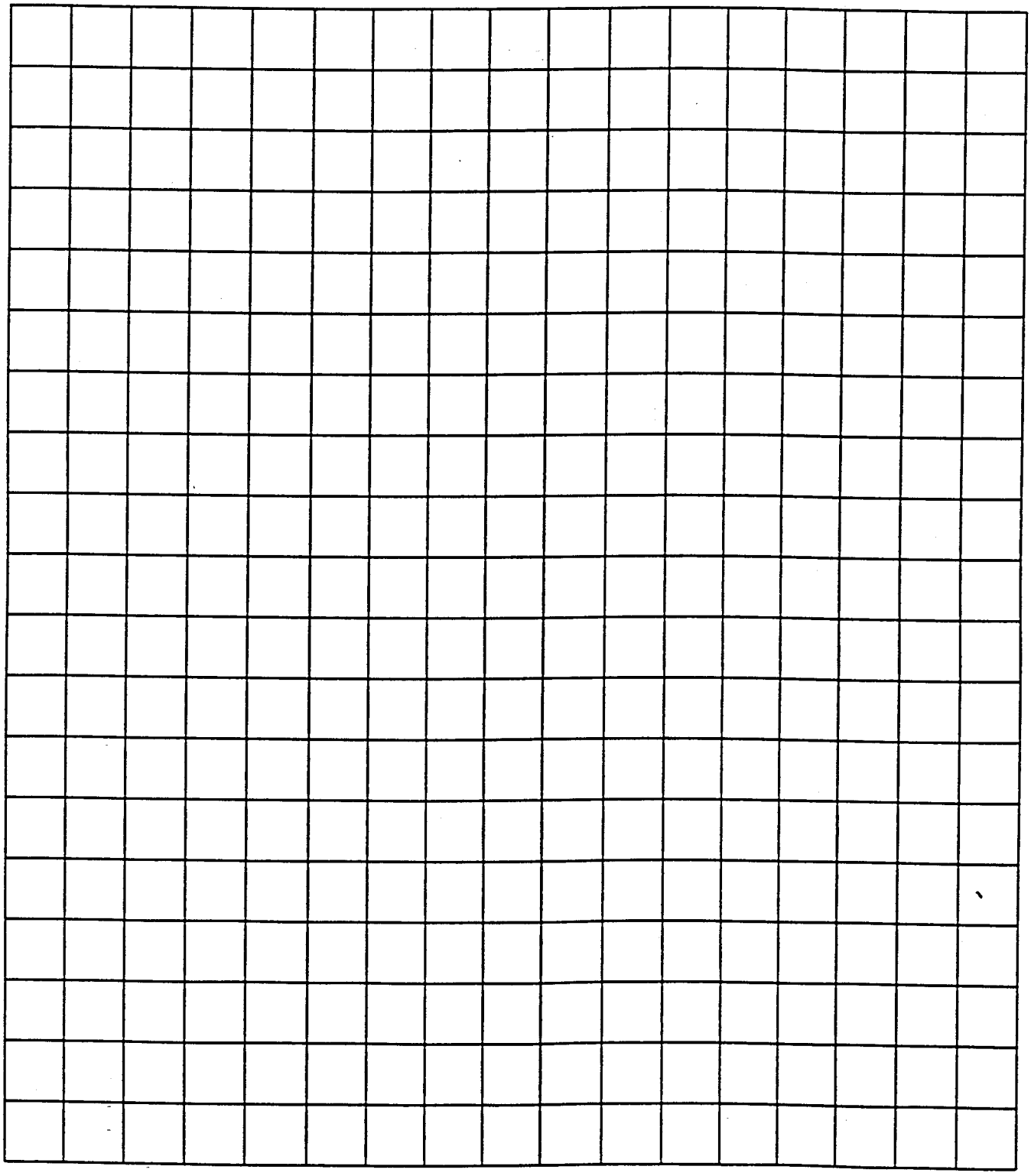






Fabulous Flags

1-CM GRID



Rings Around Decimals

Generic Teacher Directions: *Any student who is absent will not be allowed to make-up work.*

Fraction Hockey

Materials: bendable straws, cookie "pucks", hockey rink gameboard, student activity sheet 2, student team score sheet 1

Snow Ball Toss

Materials: Cotton balls, 30 centimeter ruler (meter stick), student activity sheet 4, student score sheet 2

Penny Ski Jump

Materials: pennies, ramp, 30 centimeter ruler (meter stick), student activity sheet 5, student team score sheet 3

Special Directions: **1.** Creating a ramp: It can be as elaborate or as simplistic as you like. You could stack 2 or 3 books on top of each other or actually build a ramp. **2.** Place a ruler at the base of the ramp to extend outward to measure 30 centimeters. **3.** Teacher may want to provide guidelines for releasing penny from ramp.

"Figure" Skating

Materials: Student activity sheet 6, student team score sheet 4

Special Directions: **1.** Student comes to teacher for answer sheet after completing activity. **2.** The highest score is 13/4 = 3 1/4 = 3.25 **3.** Teacher determines time length.

Freezing Fractions

Materials: 4 different colored fraction dice, student activity sheet 7, student team score sheet 5

Special Directions: **1.** Choose 4 die from the set of fraction dice. **2.** At teacher discretion, students may use math explorer calculator to convert fractions to decimals.

Alpine Skiing

Materials: Student activity sheet 8, student activity 9 & 10, student team score sheet 6

Special Directions: **1.** Student activity sheet 9 is used as student gameboard and student activity sheet 10 is used to make flash cards. **2.** Teacher determines duration of game. **3.** At teacher discretion, students may use math explorer calculator to convert fractions to decimals. We found it to be needed more in this particular game.

Teacher Scoring Guide

Rings Around Decimals

25 points	**Event scores completed on time**	_____
25 points	**All 6 event scores recorded**	_____
25 points	**Tabulate scores correctly in fractions and equivalent decimals**	_____
25 points	**Displayed good sportsmanship and teamwork**	_____
100 points	**Total :**	_____

Student's name _____

Additional comments:

Fraction Hockey

Object: To get the lowest decimal score by hitting "puck" across the hockey "rink".

Rules:

1. Each student gets 1 practice shot and 2 shots that count. The student will choose the lesser of the 2 scores.

2. If a cookie puck lands on a line between 2 fractions, the student must take the highest fraction of the 2.

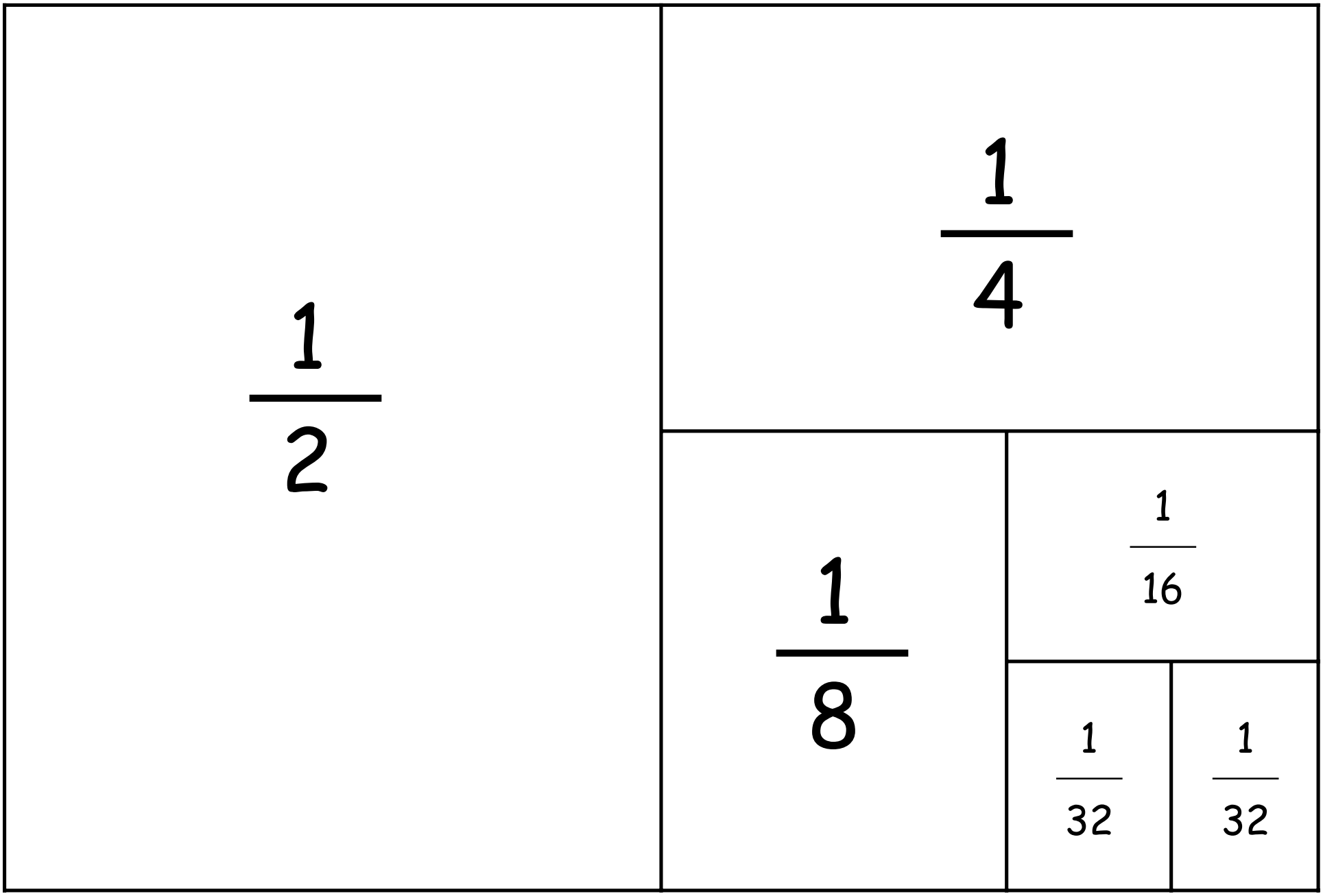
3. Record fractions below.

4. Convert fractions to decimals. **All fractions must be converted to decimals to be eligible for awards!**

5. Select lowest score and circle it.

Try #	Fraction	Decimal

Hockey Rink



Fraction Hockey

Directions: Each student records their name and best score in the chart below.

Name	Score

Snow Ball Toss

Object: To throw a cotton ball the greatest distance possible without exceeding 1 meter

Rules:

1. Each student gets 1 practice shot and 2 shots that count. The student will choose the greater of the 2 scores.

2. If a cotton ball exceeds 1 meter, the student is disqualified.

3. Record fractions below.

4. Convert fractions to decimals. **All fractions must be converted to decimals to be eligible for awards!**

5. Select highest score and circle it.

Toss	Fraction	Decimal

Snow Ball Toss

Directions: Each student records their name and best score in the chart below.

Name	Score

Penny Ski Jump

Object: To push a penny off a ramp and get the closest "jump" to 30 centimeters (a ruler's length) without going over.

Rules:

1. Each student gets 2 practice rolls and 2 rolls that count. The student will choose the greater of the 2 scores.

2. If the penny rolls further than 1 meter, the student is disqualified for that turn.

3. Record fractions below.

4. Convert fractions to decimals. **All fractions must be converted to decimals to be eligible for awards!**

5. Select highest score and circle it.

Toss	Fraction	Decimal

Penny Ski Jump

Directions: Each student records their name and best score in the chart below.

Name	Score

"Figure" Skating

Object: To solve the scavenger hunt within the teacher determined time frame. The highest score wins.

Rules:

Clue	
First 1/3 of GOTHIC	
First 2/5 of FORTY	
Middle 1/3 of ARE	
Last 2/9 of HUNDREDTH	
First 1/10 of EQUIVALENT	
First 4/7 of POLYGON minus the "P"	
Last 1/2 of LAMP	
First 1/6 of ICICLE	
Last 1/2 of GOOD	
Last 1/2 of GOLD	
First 2/4 of MEET	
First 1/2 of DATA	
Last 1/4 of DECIMALS	

Answer Sheet

"Figure" Skating

Object: To solve the scavenger hunt within the teacher determined time frame. The highest score wins.

Clue	Answer
First 1/3 of GOTHIC	Go
First 2/5 of FORTY	fo
Middle 1/3 of ARE	r
Last 2/9 of HUNDREDTH	th
First 1/10 of EQUIVALENT	e
First 4/7 of POLYGON minus the "P"	Oly
Last 1/2 of LAMP	mp
First 1/6 of ICICLE	ic
Last 1/2 of GOOD	Go
Last 1/2 of GOLD	ld
First 2/4 of MEET	me
First 1/2 of DATA	da
Last 1/4 of DECIMALS	ls

"Figure" Skating

Directions: Each student records their name and best score in the chart below.

Name	Score

Freezing Fractions

Object: To get the highest decimal total after rolling each of the 4 dice.

Rules:

1. Each student rolls each of the 4 fraction dice once.

2. Record fractions below.

3. Convert fractions to decimals. All fractions must be converted to decimals to be eligible for awards.

4. Add the decimal column and record your score.

Toss #	Fraction	Decimal

Total _____

Freezing Fractions

Directions: Each student records their name and best score in the chart below.

Name	Score

Alpine Skiing

Object: To get to the bottom of the mountain with the lowest score.

Rules:

1. Each student begins at the start line and must move from one row to the next. A player may *not* skip a row.

2. Shuffle the fraction cards and draw a card. If the fraction card matches a fraction on Row 1, the student must mark that fraction. If the card does not match, draw until a match is found. Record fraction on chart below.

3. Repeat step 2 until student reaches bottom of the mountain.

4. Convert fractions to decimals. All fractions must be converted to decimals to be eligible for awards.

5. Add the decimal column and record your score.

Row #	Fraction	Decimal

Total _____

Alpine Skiing

Directions: Each student records their name and best score in the chart below.

$\frac{1}{6}$	$\frac{7}{11}$	$\frac{3}{8}$	$\frac{9}{12}$
$\frac{3}{4}$	$\frac{3}{7}$	$\frac{4}{10}$	$\frac{3}{6}$
$\frac{1}{5}$	$\frac{1}{4}$	$\frac{6}{12}$	$\frac{2}{5}$
$\frac{2}{12}$	$\frac{6}{8}$	$\frac{8}{10}$	$\frac{1}{3}$

Answer Sheet

Alpine Skiing

Directions: Each student records their name and best score in the chart below.

START 0.1666	0.636	0.375	0.75
0.75	0.4285	0.4	0.50
0.20	0.25	0.50	0.40
0.1666	0.75	0.80	0.333 FINISH

Alpine Skiing

Directions: Each student records their name and best score in the chart below.

Name	Score

Go for the Gold!

Generic Teacher Directions: *Any student who is absent will not be allowed to make-up work.*

Day 5: Additional Instructions

- Each team is responsible for scoring 1 of the 6 events.
- Teams collect the data for that event.
- They compute, compare and order the decimal results ranking first, second, and third according to event rules.
- Teams are responsible for producing "gold", "silver", and "bronze" awards for the individual winners.
- Team must produce a visual graphic representation of their data.
- Team orally justifies results and presents awards on Day 6.
- Students should receive a copy of rubric expectations (Teacher Scoring Guide: Rings Around Decimals).

Rings Around Decimals

PRESENTATION RUBRIC	4 WOW	3 ALMOST THERE	2 ON THE WAY	1 KEEP TRYING
Looking for	**Evidence of all:**	**Evidence of most:**	**Evidence of some:**	**Evidence of little or none:**
Computation	* correct computation * proper place value * equivalent fractions and decimals accurate	* correct computation * proper place value * equivalent fractions and decimals accurate	* correct computation * proper place value * equivalent fractions and decimals accurate	* correct computation * proper place value * equivalent fractions and decimals accurate
Graphics	* thorough record keeping * visual model representation of data * complete titles	* thorough record keeping * visual model representation of data * complete titles	* thorough record keeping * visual model representation of data * complete titles	* thorough record keeping * visual model representation of data * complete titles
Flags and Awards	* neat, complete and well-planned process * decimals clearly represented * correct and clearly understood visuals	* neat, complete and well-planned process * decimals clearly represented * correct and clearly understood visuals	* neat, complete and well-planned process * decimals clearly represented * correct and clearly understood visuals	* neat, complete and well-planned process * decimals clearly represented * correct and clearly understood visuals
Communication	* how data was organized, analyzed, and ordered * problem solving, i.e., ties in scores * clear, concise planning	* how data was organized, analyzed, and ordered * problem solving, i.e., ties in scores * clear, concise planning	* how data was organized, analyzed and ordered * problem solving, i.e., ties in scores * clear, concise planning	* how data was organized, analyzed, and ordered * problem solving, i.e., ties in scores * clear, concise planning
Presentation	* team participation * clear, concise presentation * completed decimal medals presented	* team participation * clear, concise presentation * completed decimal medals presented	* team participation * clear, concise presentation * completed decimal medals presented	* team participation * clear, concise presentation * completed decimal medals presented