GRADE
4

Building Conceptual Understanding and Fluency Through Games

FOR THE NORTH CAROLINA STANDARD COURSE OF STUDY IN MATHEMATICS

North Carolina Department of
PUBLIC INSTRUCTION

K-12 MATHEMATICS

Building Conceptual Understanding and Fluency Through Games

Developing fluency requires a balance and connection between conceptual understanding and computational proficiency. Computational methods that are over-practiced without understanding are forgotten or remembered incorrectly. Conceptual understanding without fluency can inhibit the problem solving process. – NCTM, *Principles and Standards for School Mathematics*, pg. 35

WHY PLAY GAMES?

People of all ages love to play games. They are fun and motivating. Games provide students with opportunities to explore fundamental number concepts, such as the counting sequence, one-to-one correspondence, and computation strategies. Engaging mathematical games can also encourage students to explore number combinations, place value, patterns, and other important mathematical concepts. Further, they provide opportunities for students to deepen their mathematical understanding and reasoning. Teachers should provide repeated opportunities for students to play games, and let the mathematical ideas emerge as they notice new patterns, relationships, and strategies. Games are an important tool for learning. Here are some advantages for integrating games into elementary mathematics classrooms:

- Playing games encourages strategic mathematical thinking as students find different strategies for solving problems and it deepens their understanding of numbers.
- Games, when played repeatedly, support students' development of computational fluency.
- Games provide opportunities for practice, often without the need for teachers to provide the problems. Teachers can then observe or assess students, or work with individual or small groups of students.
- Games have the potential to develop familiarity with the number system and with "benchmark numbers" – such as 10s, 100s, and 1000s and provide engaging opportunities to practice computation, building a deeper understanding of operations.
- Games provide a school to home connection. Parents can learn about their children's mathematical thinking by playing games with them at home.

BUILDING FLUENCY

Developing computational fluency is an expectation of the North Carolina Standard Course of Study. Games provide opportunity for meaningful practice. The research about how students develop fact mastery indicates that drill techniques and timed tests do not have the power that mathematical games and other experiences have. Appropriate mathematical activities are essential building blocks to develop mathematically proficient students who demonstrate computational fluency (Van de Walle & Lovin, *Teaching Student-Centered Mathematics Grades K-3,* pg. 94). Remember, computational fluency includes efficiency, accuracy, and flexibility with strategies (Russell, 2000).

The kinds of experiences teachers provide to their students clearly play a major role in determining the extent and quality of students' learning. Students' understanding can be built by actively engaging in tasks and experiences designed to deepen and connect their knowledge. Procedural fluency and conceptual understanding can be developed through problem solving, reasoning, and argumentation (NCTM, P*rinciples and Standards for School Mathematics,* pg. 21). Meaningful practice is necessary to develop fluency with basic number combinations and strategies with multi-digit numbers. Practice should be purposeful and should focus on developing thinking strategies and a knowledge of number relationships rather than drill isolated facts (NCTM, *Principles and Standards for School Mathematics,* pg. 87). Do *not* subject any student to computation drills unless the student has developed an efficient strategy for the facts included in the drill (Van de Walle & Lovin, *Teaching Student-Centered Mathematics Grades K-3,* pg. 117). Drill can strengthen strategies with which students feel comfortable – ones they "own" – and will help to make these strategies increasingly automatic. Therefore, drill of strategies will allow students to use them with increased efficiency, even to the point of recalling the fact without being conscious of using a strategy. Drill without an efficient strategy present offers no assistance (Van de Walle & Lovin, *Teaching Student-Centered Mathematics Grades K-3,* pg. 117).

CAUTIONS

Sometimes teachers use games solely to practice number facts. These games usually do not engage children for long because they are based on students' recall or memorization of facts. Some students are quick to memorize, while others need a few moments to use a related fact to compute. When students are placed in situations in which recall speed determines success, they may infer that being "smart" in mathematics means getting the correct answer quickly instead of valuing the process of thinking. Consequently, students may feel incompetent when they use number patterns or related facts to arrive at a solution and may begin to dislike mathematics because they are not fast enough.

For students to become fluent in arithmetic computation, they must have efficient and accurate methods that are supported by an understanding of numbers and operations. "Standard" algorithms for arithmetic computation are one means of achieving this fluency.

– NCTM, *Principles and Standards for School Mathematics,* pg. 35

Overemphasizing fast fact recall at the expense of problem solving and conceptual experiences gives students a distorted idea of the nature of mathematics and of their ability to do mathematics.

– Seeley, *Faster Isn't Smarter: Messages about Math, Teaching, and Learning in the 21st Century*, pg. 95

Computational fluency refers to having efficient and accurate methods for computing. Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently.

– NCTM, *Principles and Standards for School Mathematics,* pg. 152

Fluency refers to having efficient, accurate, and generalizable methods (algorithms) for computing that are based on well-understood properties and number relationships.

– NCTM, *Principles and Standards for School Mathematics,* pg. 144

INTRODUCE A GAME

A good way to introduce a game to the class is for the teacher to play the game against the class. After briefly explaining the rules, ask students to make the class's next move. Teachers may also want to model their strategy by talking aloud for students to hear his/her thinking. "I placed my game marker on 6 because that would give me the largest number."

Games are fun and can create a context for developing students' mathematical reasoning. Through playing and analyzing games, students also develop their computational fluency by examining more efficient strategies and discussing relationships among numbers. Teachers can create opportunities for students to explore mathematical ideas by planning questions that prompt students to reflect about their reasoning and make predictions. Remember to always vary or modify the game to meet the needs of your leaners. Encourage the use of the Standards for Mathematical Practice.

HOLDING STUDENTS ACCOUNTABLE

While playing games, have students record mathematical equations or representations of the mathematical tasks. This provides data for students and teachers to revisit to examine their mathematical understanding.

After playing a game, have students reflect on the game by asking them to discuss questions orally or write about them in a mathematics notebook or journal:

1. What skill did you review and practice?
2. What strategies did you use while playing the game?
3. If you were to play the game a second time, what different strategies would you use to be more successful?
4. How could you tweak or modify the game to make it more challenging?

A Special Thank-You

The development of the NC Department of Public Instruction Document, *Building Conceptual Understanding and Fluency Through Games* was a collaborative effort with a diverse group of dynamic teachers, coaches, administrators, and NCDPI staff. We are very appreciative of all of the time, support, ideas, and suggestions made in an effort to provide North Carolina with quality support materials for elementary level students and teachers. The North Carolina Department of Public Instruction appreciates any suggestions and feedback, which will help improve upon this resource. Please send all correspondence to **Denise Schulz** (denise.schulz@dpi.nc.gov)

GAME DESIGN TEAM

The Game Design Team led the work of creating this support document. With support of their school and district, they volunteered their time and effort to develop *Building Conceptual Understanding and Fluency Through Games*.

Erin Balga, Math Coach, Charlotte-Mecklenburg Schools
Robin Beaman, First Grade Teacher, Lenoir County
Emily Brown, Math Coach, Thomasville City Schools
Leanne Barefoot Daughtry, District Office, Johnston County
Ryan Dougherty, District Office, Union County
Paula Gambill, First Grade Teacher, Hickory City Schools
Tami Harsh, Fifth Grade teacher, Currituck County
Patty Jordan, Instructional Resource Teacher, Wake County
Tania Rollins, Math Coach, Ashe County
Natasha Rubin, Fifth Grade Teacher, Vance County
Dorothie Willson, Kindergarten Teacher, Jackson County

Kitty Rutherford, NCDPI Elementary Consultant
Denise Schulz, NCDPI Elementary Consultant
Allison Eargle, NCDPI Graphic Designer
Renée E. McHugh, NCDPI Graphic Designer

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

OPERATIONS AND ALGEBRAIC THINKING

Represent and solve problems involving multiplication and division.

NC.4.OA.1 Interpret a multiplication equation as a comparison. Multiply or divide to solve word problems involving multiplicative comparisons using models and equations with a symbol for the unknown number. Distinguish multiplicative comparison from additive comparison.

Use the four operations with whole numbers to solve problems.

NC.4.OA.3 Solve two-step word problems involving the four operations with whole numbers.

- Use estimation strategies to assess reasonableness of answers.
- Interpret remainders in word problems.
- Represent problems using equations with a letter standing for the unknown quantity.

Gain familiarity with factors and multiples.

NC.4.OA.4 Find all factor pairs for whole numbers up to and including 50 to:

- • Recognize that a whole number is a multiple of each of its factors.
- Determine whether a given whole number is a multiple of a given one-digit number.
- Determine if the number is prime or composite.

Generate and analyze patterns.

NC.4.OA.5 Generate and analyze a number or shape pattern that follows a given rule.

NUMBER AND OPERATIONS IN BASE TEN

Generalize place value understanding for multi-digit numbers whole numbers.

NC.4.NBT.1 Explain that in a multi-digit whole number, a digit in one place represents 10 times as much as it represents in the place to its right, up to 100,000.

NC.4.NBT.2 Read and write multi-digit whole numbers up to and including 100,000 using numerals, number names, and expanded form.

NC.4.NBT.7 Compare two multi-digit numbers up to and including 100,000 based on the values of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Use place value understanding and properties of operations to perform multi-digit arithmetic.

NC.4.NBT.4 Add and subtract multi-digit whole numbers up to and including 100,000 using the standard algorithm with place value understanding.

NC.4.NBT.5 Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and develop the algorithm.

NC.4.NBT.6 Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division.

NUMBER AND OPERATIONS – FRACTIONS

Extend understanding of fraction equivalence and ordering.

NC.4.NF.1 Explain why a fraction is equivalent to another fraction by using area and length fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size.

NC.4.NF.2 Compare two fractions with different numerators and different denominators, using the denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions by:

- Reasoning about their size and using area and length models.
- Using benchmark fractions 0, ½, and a whole.
- Comparing common numerator or common denominators.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

NC.4.NF.3 Understand and justify decompositions of fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100.

- Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- Decompose a fraction into a sum of unit fractions and a sum of fractions with the same denominator in more than one way using area models, length models, and equations.
- Add and subtract fractions, including mixed numbers with like denominators, by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
- Solve word problems involving addition and subtraction of fractions, including mixed numbers by writing equations from a visual representation of the problem.

Use unit fractions to understand operations of fractions.

NC.4.NF.4 Apply and extend previous understandings of multiplication to:

- Model and explain how fractions can be represented by multiplying a whole number by a unit fraction, using this understanding to multiply a whole number by any fraction less than one.
- Solve word problems involving multiplication of a fraction by a whole number.

Understand decimal notation for fractions, and compare decimal fractions.

NC.4.NF.6 Use decimal notation to represent fractions.

- Express, model and explain the equivalence between fractions with denominators of 10 and 100.
- Use equivalent fractions to add two fractions with denominators of 10 or 100.
- Represent tenths and hundredths with models, making connections between fractions and decimals.

NC.4.NF.7 Compare two decimals to hundredths by reasoning about their size using area and length models, and recording the results of comparisons with the symbols >, =, or <. Recognize that comparisons are valid only when the two decimals refer to the same whole.

MEASUREMENT AND DATA

Solve problems involving measurement.

NC.4.MD.1 Know relative sizes of measurement units. Solve problems involving metric measurement.

- Measure to solve problems involving metric units: centimeter, meter, gram, kilogram, Liter, milliliter.
- Add, subtract, multiply, and divide to solve one-step word problems involving whole-number measurements of length, mass, and capacity that are given in metric units.

NC.4.MD.2 Use multiplicative reasoning to convert metric measurements from a larger unit to a smaller unit using place value understanding, two-column tables, and length models.

NC.4.MD.8 Solve word problems involving addition and subtraction of time intervals that cross the hour.

Solve problems involving area and perimeter.

NC.4.MD.3 Solve problems with area and perimeter.

- Find areas of rectilinear figures with known side lengths.
- Solve problems involving a fixed area and varying perimeters and a fixed perimeter and varying areas.
- Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Represent and interpret data.

NC.4.MD.4 Represent and interpret data using whole numbers.

- • Collect data by asking a question that yields numerical data.
- Make a representation of data and interpret data in a frequency table, scaled bar graph, and/or line plot.
- Determine whether a survey question will yield categorical or numerical data.

Understand concepts of angle and measure angles.

NC.4.MD.6 Develop an understanding of angles and angle measurement.

- Understand angles as geometric shapes that are formed wherever two rays share a common endpoint, and are measured in degrees.
- Measure and sketch angles in whole-number degrees using a protractor.
- Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.

GEOMETRY

Classify shapes based on lines and angles in two-dimensional figures.

NC.4.G.1 Draw and identify points, lines, line segments, rays, angles, and perpendicular and parallel lines.

NC.4.G.2 Classify quadrilaterals and triangles based on angle measure, side lengths, and the presence or absence of parallel or perpendicular lines.

NC.4.G.3 Recognize symmetry in a two-dimensional figure, and identify and draw lines of symmetry.

Table of Contents

Operations and Algebraic Thinking

Number and Operations in Base Ten

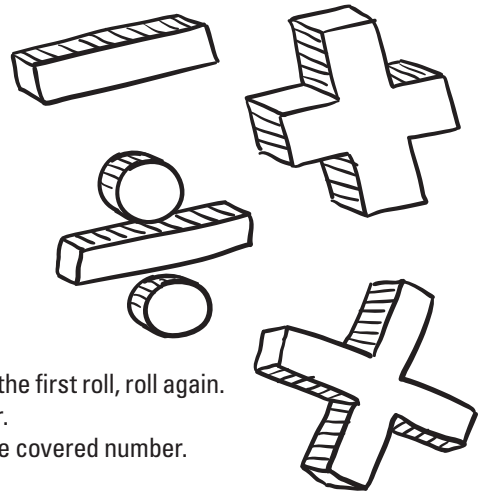
Number and Operations – Fractions

Measurement and Data

REVIEW

Online Games for Each Category

A-Mazing Functions



Building Fluency: follow a given rule or identify a rule

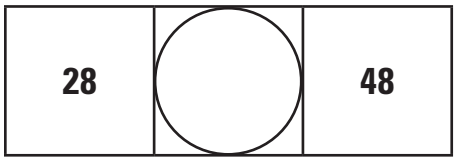
Materials: game marker, a die, 32 counters/cubes to cover circles on gameboard

Number of Players: 2

Directions:

1. Cover each circle with a counter/cube.
2. Place player markers on "start".
3. Roll the die and move your marker that number of spaces around the maze. If you roll 1 on the first roll, roll again.
4. If you land on a covered space, name the function rule that is covered by the counter.
5. Tell how the number before the covered number becomes the number that comes after the covered number.

Example:

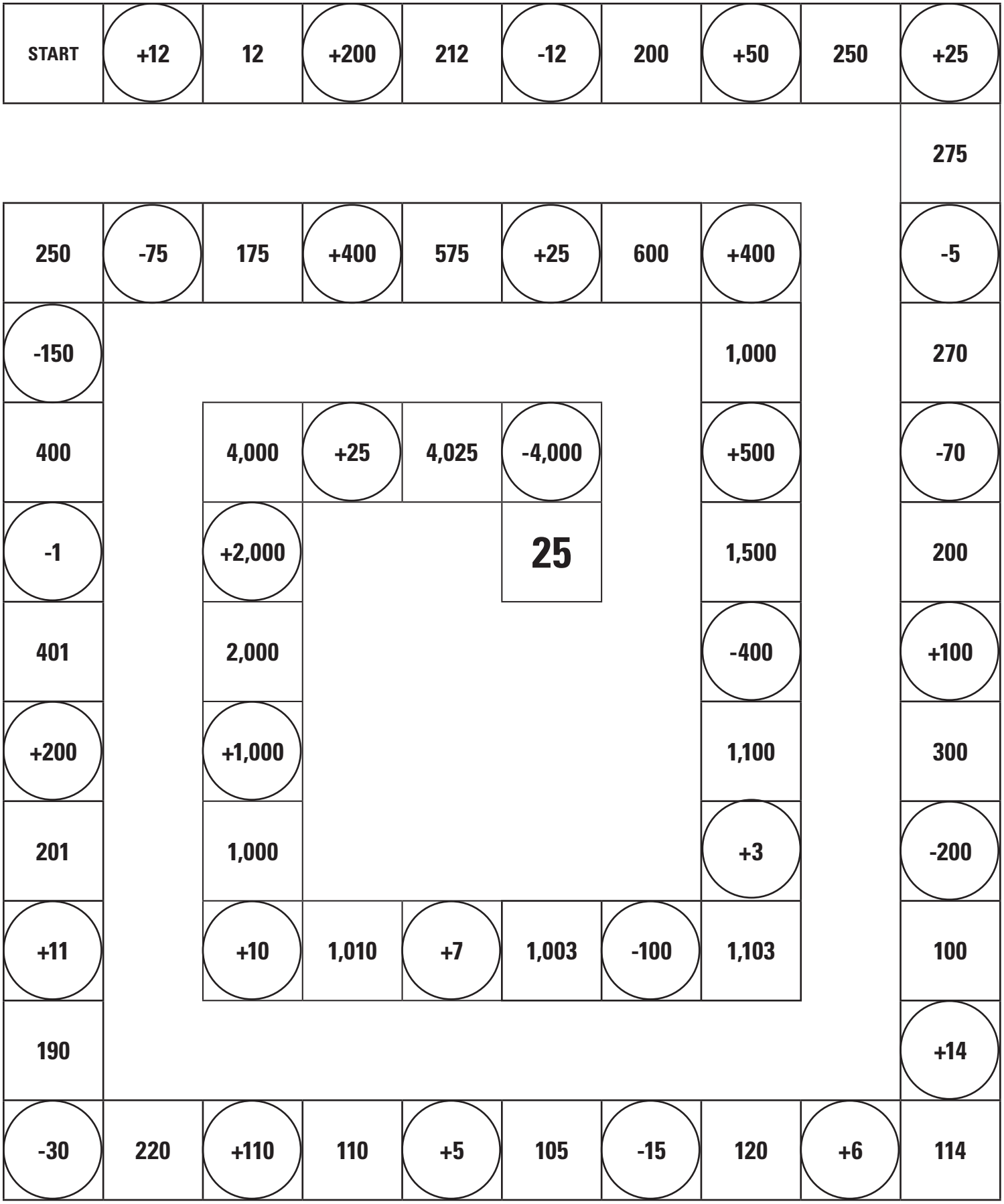


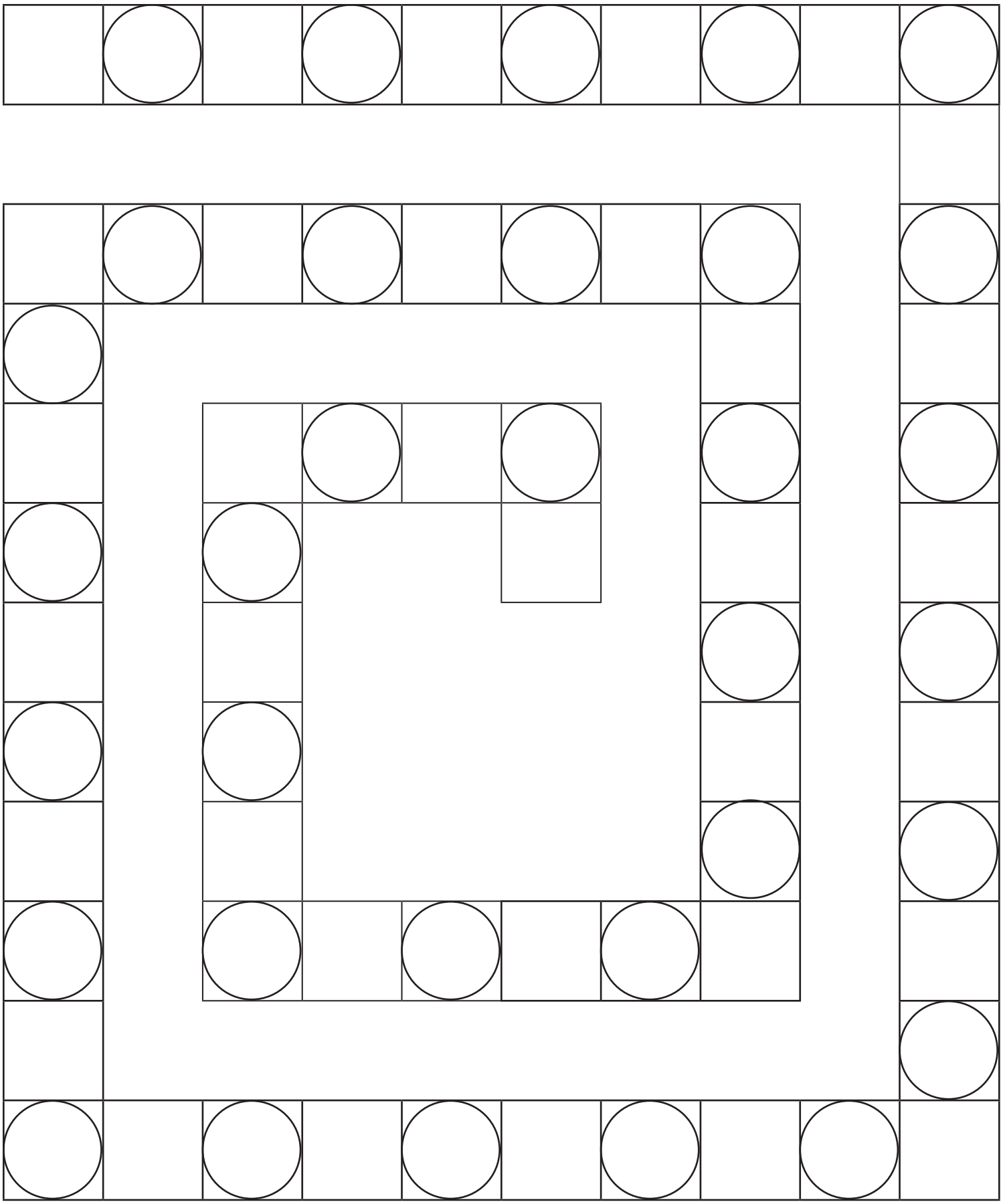
Player says, "The function rule is plus 20 because 28 plus 20 equals 48".
Once player removes the counter they'll see if function rules is correct.

28	+20	48

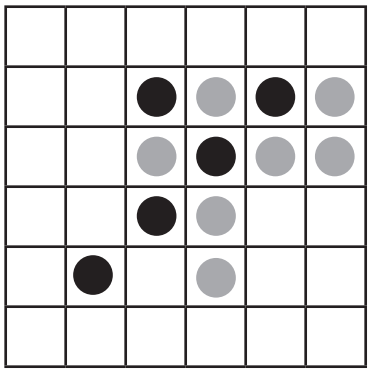
6. If you are correct, keep the counter. If you are not correct, return the counter onto the space.
7. Winner is the player who has the most counters at the end of the game.

Variation/Extension: Students can create their own gameboard with function rules, which could include x and ÷.
An additional gameboard is included for youe convenience.


START
+12
12
+200
212
-12
200
+50
250
+25
275
250
-75
175
+400
575
+25
600
+400
-5
-150
1,000
270
400
4,000
+25
4,025
-4,000
+500
-70
-1
+2,000
25
1,500
200
401
2,000
-400
+100
+200
+1,000
1,100
300
201
1,000
+3
-200
+11
+10
1,010
+7
1,003
-100
1,103
100
190
+14
-30
220
+110
110
+5
105
-15
120
+6
114



Carolina Clip-It



Building Fluency: multiplication facts

Materials: gameboard, 2 paper clips, game markers (approximately 15 of one color per player)

Number of Players: 2

Directions:

1. Player one places paper clips on two numbers at the bottom of the page.
2. Then multiply the two numbers and place a marker on the correct product.
3. Player two can move only one of the paper clips at the bottom of the page.
4. Then multiply the two numbers and place a marker on the correct product.
5. Both paper clips may be placed on the same number.
6. Play continues until one player has 4 markers in a row, horizontally, vertically or diagonally.

Variation/Extension: Students share strategies of how they learned the more difficult multiplication facts.

1	7	15	25	36	54
2	8	16	27	40	56
3	9	18	28	42	63
4	10	20	30	45	64
5	12	21	32	48	72
6	14	24	35	49	81

1 2 3 4 5 6 7 8 9

Charlotte Speedway Race

Building Fluency: multiplying whole numbers

Materials: gameboard, game marker, a die

Number of Players: 2-4

Directions:

1. Player rolls die and moves that number of spaces.
2. Player must give a multiplication fact for the product in the space using 6, 7, 8, and 9 as one of the factors.
3. If an incorrect answer is given, player loses turn, and returns to previous position.
4. Winner is the first to cross the finish line.

Variation/Extension: Students share strategies of how they learned the more difficult multiplication facts.

Start →

49	18	63	28	42	54	PIT STOP	36	24
24								72
48								64
27								Drafted a New Car – Move Forward 2 Spaces
36								56
Trouble on the Curve – Go Back 2 Spaces								48
54	81	72	Your Tire Blows Out – Lose a Turn	56	42	63	32	18

Multiplication Cover-Up

Building Fluency: multiplication facts

Materials: multiplication game card for each player, something to cover the squares on card, and factor cards

Number of Players: 2-12

Directions:

1. Choose one player to be the "caller".
2. The "caller" will place the factor cards face down, then turn one over at a time and call out the multiplication expression. (the two factors on the card)
3. If a player has the product of the expression on their grid, they cover it.
4. The first player to cover 5 in a row, column, or diagonally wins the game.

Variation/Extension: Students share strategies of how they learned the more difficult multiplication facts. Teacher could have students create their own 5 by 5 board in their math notebook filled with products of their choice and play as a class. Additional blank boards are added for your convenience,

SAMPLE BOARDS

9	64	27	5	56
0	45	63	21	36
18	70	FREE	8	1
35	81	20	48	100
28	4	15	54	14

28	70	60	25	15
40	56	1	10	64
9	49	FREE	100	32
30	48	20	21	72
5	80	36	30	42

9	64	27	5	56
0	45	63	21	36
18	70	FREE	8	1
35	81	20	48	100
28	4	15	54	14

28	70	60	25	15
40	56	1	10	64
9	49	FREE	100	32
30	48	20	21	72
5	80	36	30	42

30	63	40	15	42
48	72	60	6	18
10	70	FREE	49	56
50	32	2	100	25
35	16	12	27	24

28	14	25	27	7
12	80	21	63	24
54	42	FREE	20	49
35	72	50	3	30
18	45	64	81	32

0	70	27	48	1
2	54	36	14	100
35	21	FREE	5	9
28	4	15	45	6
64	20	81	8	56

40	10	60	28	9
21	16	24	36	12
2	1	FREE	100	7
48	6	56	5	72
30	15	49	3	70

30	25	40	4	18
32	10	7	3	24
16	12	FREE	2	80
8	6	72	42	63
49	14	50	60	18

64	42	7	5	63
12	20	80	27	18
4	25	FREE	54	9
3	35	45	32	15
14	50	8	81	21

1	21	14	2	35
20	27	100	12	16
6	48	FREE	32	3
60	45	64	0	25
7	10	28	18	63

48	0	80	49	63
27	5	36	12	8
2	100	FREE	1	4
14	24	18	50	36
25	60	9	70	16

56	15	64	60	54
8	10	20	42	3
24	72	FREE	25	9
40	5	81	4	45
2	70	28	30	35

2	48	30	36	16
7	81	0	3	72
56	40	FREE	25	6
60	42	50	80	49
21	32	15	24	10

		FREE		

		FREE		

		FREE		

		FREE		

3x1	6x8	10x2	7x3	7x1
1x2	8x2	5x10	5x1	9x7
1x1	9x5	6x3	7x8	6x4
0x8	4x4	7x7	5x4	1x6
6x0	1x4	9x2	6x9	10x6

7x10	7x4	6x2	6x6	6x7
5x5	3x3	9x9	7x5	3x5
1x8	9x8	6x5	3x4	10x4
8x8	3x9	5x2	10x10	9x4
3x8	1x9	10x8	8x4	7x2

Order Up

Building Fluency: compare multi-digit numbers

Materials: recording sheet, digit cards (or 0-9 die)

Number of Players: 2-4

Directions:

1. The first player selects 6 digit cards and makes the largest possible six-digit number with those digits. Example: cards show these digits: 6, 4, 3, 3, 2, 1, this order makes the largest possible number for those digits.
2. The player writes that number on line 1.
3. The second player selects 6 digit cards and makes the smallest possible number for those digits.
4. The player writes that number on line 10.
5. The next player selects 6 digit cards and must make a number that falls between the other two. They can choose any line to place that number on.
6. The next player selects 6 digit cards and makes a number using those digits that could be placed on an empty line between any two existing numbers.
7. Game continues until a number is correctly placed on each line. (All 10 lines contain a number and they are in the correct order), OR players cannot place a number correctly on any of the empty lines.

Variation/Extension: Once students understand the game they can create their own recording sheet in their math notebook. Teacher can modify this game by changing the number of digits or number of lines. This game can also be used for standard NC.4.NF.7, students make numbers with decimals and compare.

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

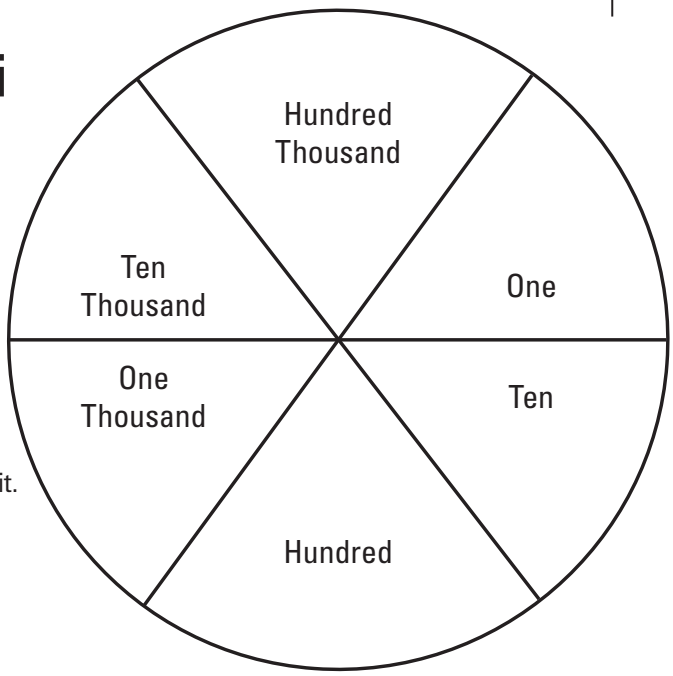
8 _____

9 _____

10 _____

0	1	2	3
4	5	6	7
8	9	0	1
2	3	4	5
6	7	8	9

Digit Ski



Building Fluency: read, write and compare whole digit numbers

Materials: number cards, game markers, and a spinner with pencil and small paper clip.

Number of Players: 2-4

Directions:

1. Place number cards face down in a pile.
2. Place markers on start.
3. Take turns, pick the top card from the pile and spin the spinner.
4. Say the digit in the place named by the spinner, and the value of the digit. Example: if a 2 is in the ten thousands place, its value is 20,000.
5. If said correctly, move your marker that many spaces.
6. Return the card to the bottom of the pile.
7. If you land on a space with directions, follow them.
8. The winner is the first person to reach the Ski Lodge.

Variation/Extension: Students could compare their number to the other players in the game. Player with the highest number gets to move an extra space. Student could modify the game by changing the spinner and using decimals.

START

Stopped to enjoy the view, lose a turn.

Steep slope! Move forward 4.

Slippery slope, move forward 3.

Slowed for skiing class, go back 2.

Got a ski lift ride, move forward 6.

Fell over a root, move back 3.

SKI LODGE

793,926	618,334	987,245	825,691	734,518	342,657
232,469	377,821	561,385	483,518	718,746	129,152
123,976	828,030	456,926	100,794	654,447	208,554
983,270	788,300	350,302	608,004	570,112	408,241
251,921	815,384	128,773	629,397	542,789	815,437
647,817	583,561	964,232	433,816	196,528	

Appalachian Steps

Building Fluency: read multi-digit whole numbers

Materials: number cards and game marker for each player

Number of Players: 2

Directions:

1. Put the number cards face down in a pile and place the markers on start.
2. When it is your turn, pick a digit card from the top of the pile and read the directions beside the step you are on.
3. Move up or down as directed. Do not move if you cannot follow the directions.
4. Put the card on the bottom of the pile.
5. Continue taking turns until someone reaches the END. This person is the winner of the game.

Variation/Extension: Students can create their own gameboard.

START

If your number is greater than 300,000, go down 1 step.

If the 10's digit in your number is greater than the 10,000's digit, move down one step.

If the 1,000's digit is less than 7, move down one step.

If the 10,000's digit is less than the 10's digit, move down one step.

If the number has a 5 in it, name its place. If the 5 means 5,000 or more, move down two steps. If the 5 means 500 or less, move back up one space.

If the 1's digit is less than the 100,000's digit, move down two steps.

Take two cards. Tell which number is larger. If you are correct, move down one step. If you are wrong, move back up two steps.

If the 1,000's digit is greater than 5, move down two steps. If it is 5, do not move. It is less than 5, move back up 2 steps.

Read your number. If you read it correctly, move down one step. If you read it incorrectly, move up one step.

If the 100,000's digit is greater than the 1's digit, move down one step. If it is less, move back up one step. If it is the same, do not move.

END – You've climbed safely down the mountain!

793,926	618,334	987,245	825,691	734,518	342,657
232,469	377,821	561,385	483,518	718,746	129,152
123,976	828,030	456,926	100,794	654,447	208,554
983,270	788,300	350,302	608,004	570,112	408,241
251,921	815,384	128,773	629,397	542,789	815,437
647,817	583,561	964,232	433,816	196,528	

Becca's Battle

Building Fluency: rounding multi-digit whole numbers

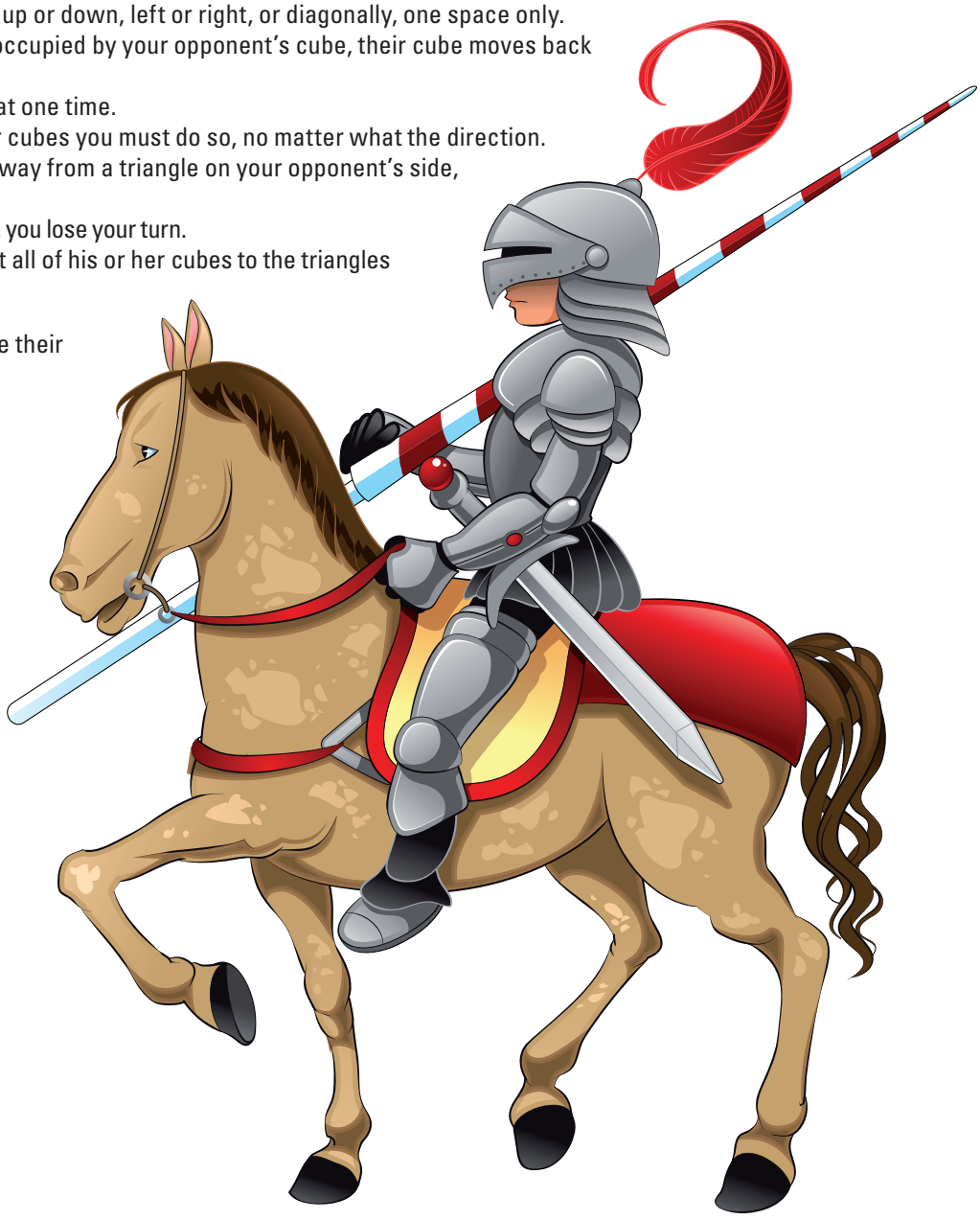
Materials: number cards, 5 cubes per player

Number of Players: 2

Directions:

1. Each player chooses one side of the board and places her or his five game pieces on the 5 triangles on that side.
2. Player 1 chooses a game piece and moves it forward one space in any direction (straight, left, or right.)
3. Player 1 then draws the top card from the Number Card pile. The player must round the number shown on the card to the place value they landed on.
   Example: if the player landed on the 100 space and drew the card 734,518, they must round that number to the nearest hundreds (100's) place; so the answer would be 734,500.
4. Player 2 checks Player 1's answer. If Player 1 answered correctly, they may stay on that space. If they answered incorrectly, Player 1 must move back to their previous space.
5. Player 2 then takes a turn, repeating the previous steps.
6. Players continue to take turns moving one space, drawing a card, and rounding the number on the card to the place value they landed on. Players may move up or down, left or right, or diagonally, one space only.
7. If your cube can move to a space occupied by your opponent's cube, their cube moves back to a beginning triangle.
8. Only one cube may be on a space at one time.
9. If you are able to move one of your cubes you must do so, no matter what the direction. If the only move you can make is away from a triangle on your opponent's side, you must make that move.
10. If you have no move within the rules, you lose your turn.
11. The winner is the first player to get all of his or her cubes to the triangles on the other side of the board.

Variation/Extension: Students can create their own gameboard and number cards



S	T	A	R	T
10,000	Ten	100,000	One Hundred	Ones
One Hundred Thousand	1	1,000	Ten Thousand	10
One Hundred	1,000	Ten	Ones	100,000
1,000	10,000	100	10	One Thousand
Ones	100,000	Ten Thousands	One Hundred Thousand	100
10	100	1	One Thousand	Ten Thousands
S	T	A	R	T

793,926	618,334	987,245	825,691	734,518	342,657
232,469	377,821	561,385	483,518	718,746	129,152
123,976	828,030	456,926	100,794	654,447	208,554
983,270	788,300	350,302	608,004	570,112	408,241
251,921	815,384	128,773	629,397	542,789	815,437
647,817	583,561	964,232	433,816	196,528	

Climbing Chimney Rock

Building Fluency: adding multi-digit whole numbers

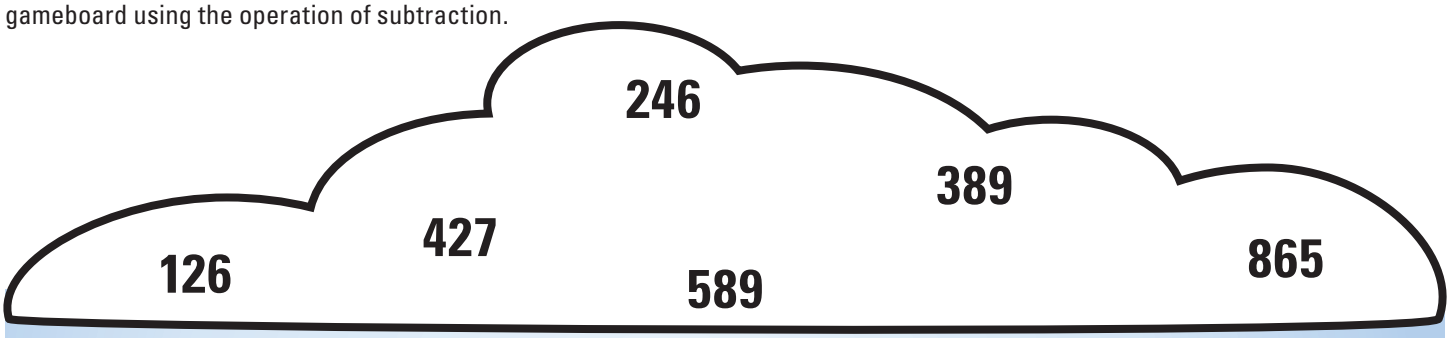
Materials: pencil, paper, and 11 markers per player

Number of Players: 2

Directions:

1. To climb Chimney Rock, add two or more of the numbers located in the cloud above the rock.
2. If the sum results in one of the totals on your path, you may place a chip on that number.
3. The first player to cover all numbers on the path wins or the player who has the most numbers covered when time is up wins.

Variation/Extension: Teacher may modify this game to decreasing or increasing the multi-digit number. Students could create a gameboard using the operation of subtraction.



PLAYER 1
942
991
1016
553
1111
761
372
673
1418
1380
1681

PLAYER 2
515
1254
816
835
1292
715
1454
635
1405
1843
1500

Valuable Digits!!

Building Fluency: review of place value and add multi-digit whole numbers

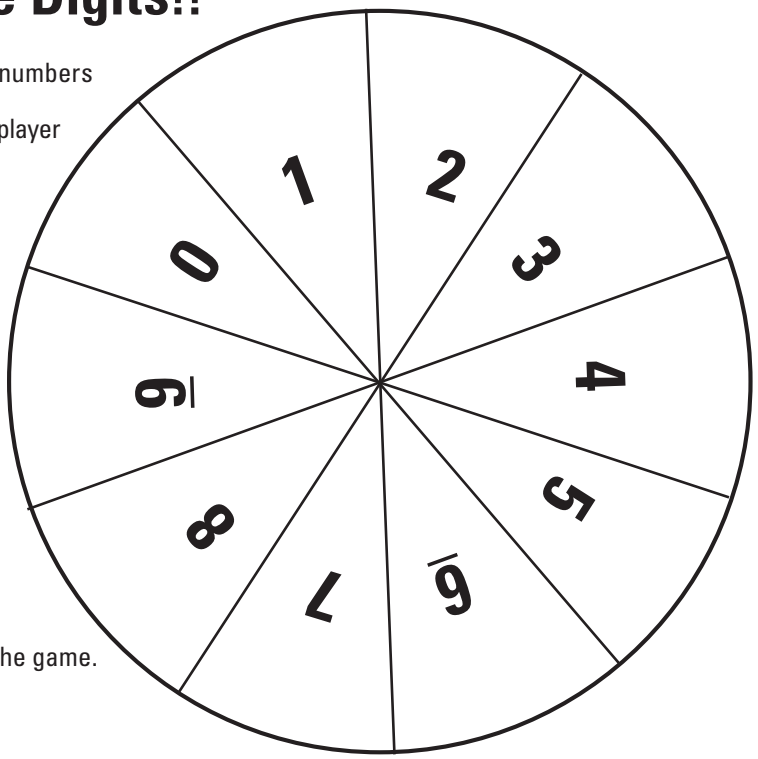
Materials: spinner with paperclip and pencil, paper, game marker per player

Number of Players: 2-4

Directions:

1. Each player puts a marker on any number on the board. This is the starting space.
2. Player 1 spins the spinner.
3. They can move one space in any direction (vertically, horizontally, or diagonally) but they must move to a space that contains the number shown by the spin.
   Example: If a player spins a "7" and the player's marker is on 5976, the player can move to 7890. The score for that spin would be 7000 since the "7" is in the thousand's place.
4. If a player cannot move after their spin, the player should record 0 score for that spin.
5. Players take turns until each player has five spins.
6. Players' total scores, the player with the highest score wins the game.

Variation/Extension: Player with the lowest sore wins.



3861	7590	3546	2968	5371
7846	4289	1789	4709	6530
1527	6849	4285	3691	1824
3784	2968	1043	5976	4765
4095	3289	6453	7890	1289
5862	3724	5914	2639	6540

PLAYER 1

SPIN 1	
SPIN 2	
SPIN 3	
SPIN 4	
SPIN 5	
TOTAL	

PLAYER 2

SPIN 1	
SPIN 2	
SPIN 3	
SPIN 4	
SPIN 5	
TOTAL	

PLAYER 3

SPIN 1	
SPIN 2	
SPIN 3	
SPIN 4	
SPIN 5	
TOTAL	

PLAYER 4

SPIN 1	
SPIN 2	
SPIN 3	
SPIN 4	
SPIN 5	
TOTAL	

Four Quotients

Building Fluency: review of division

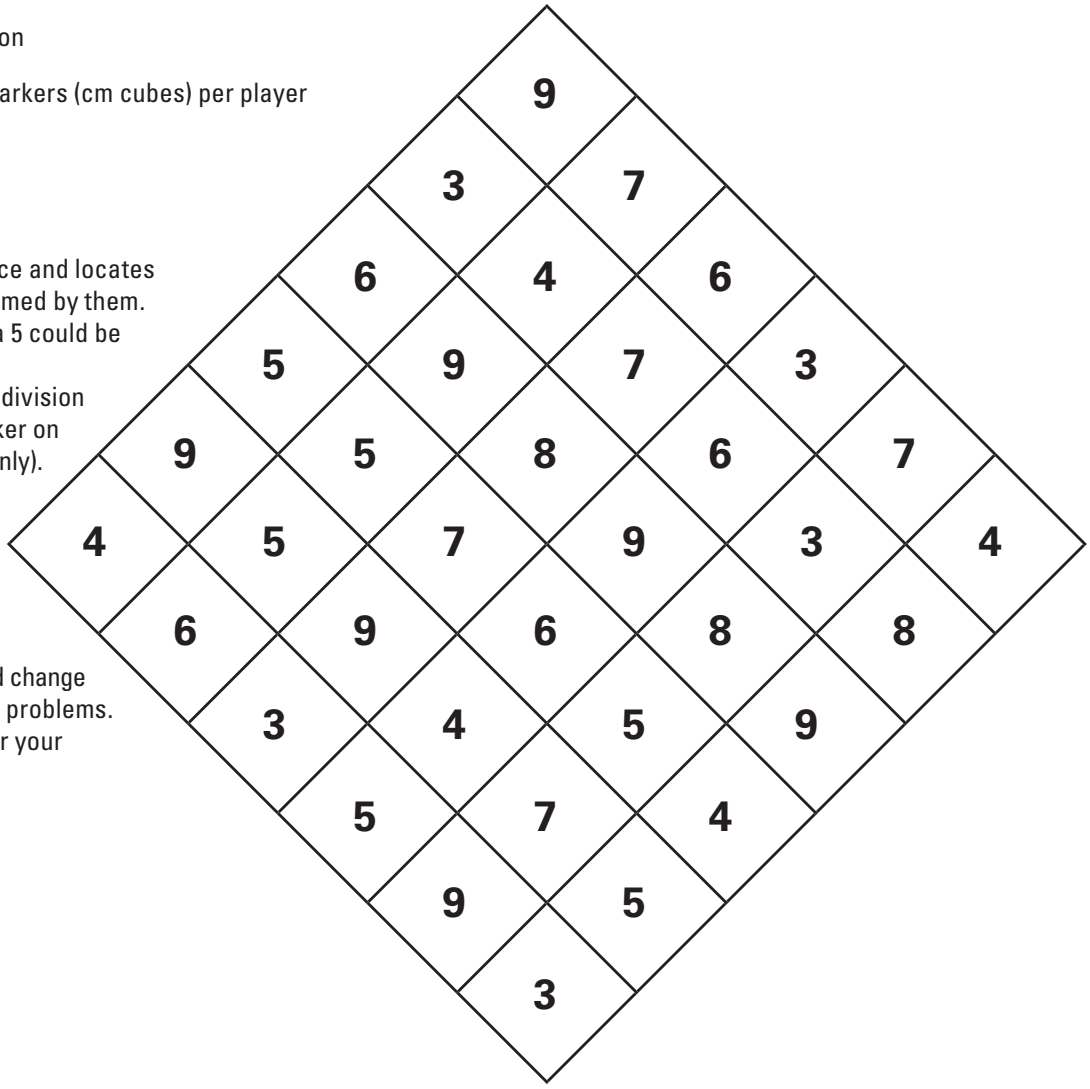
Materials: a pair of dice and 15 markers (cm cubes) per player (different color for each player)

Number of Players: 2

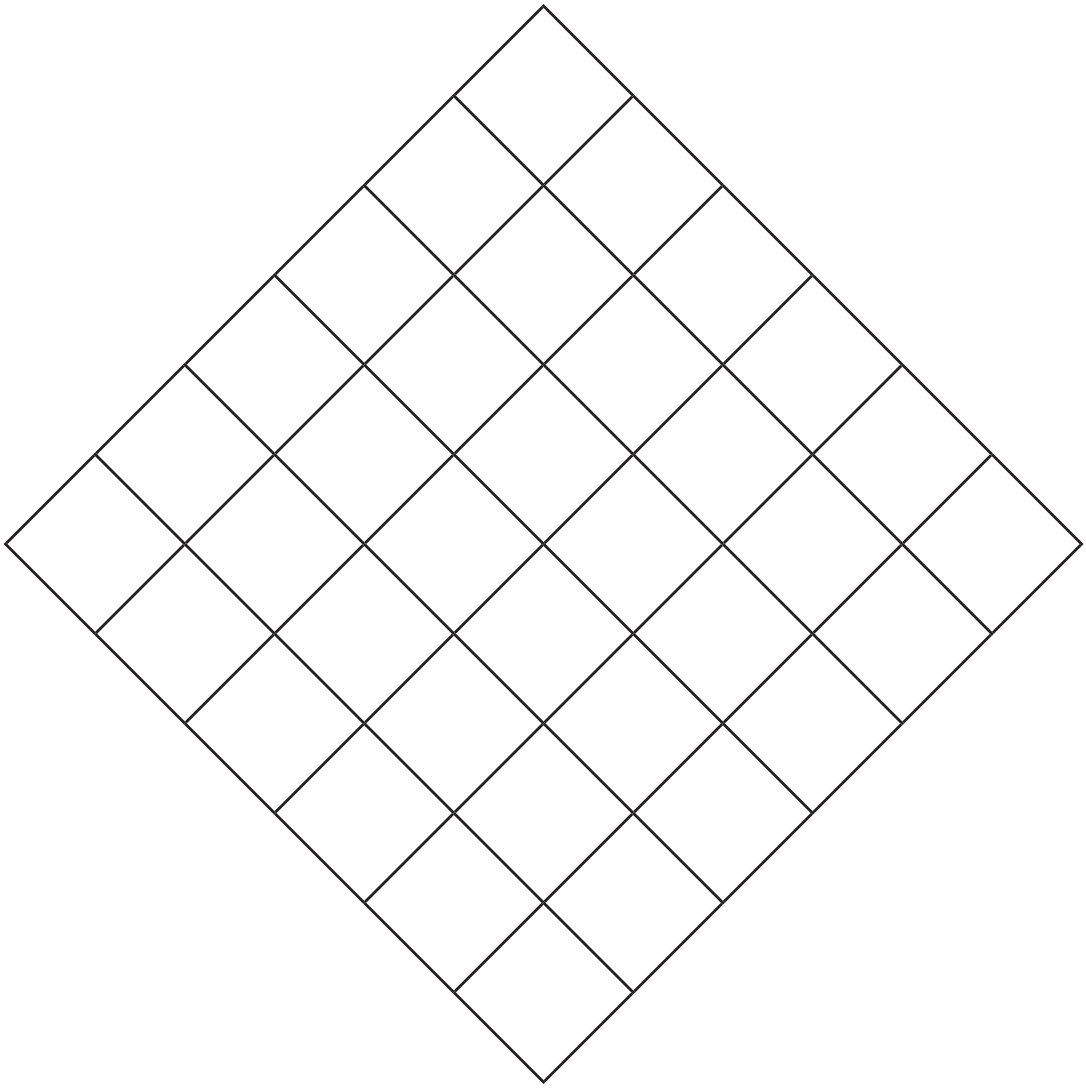
Directions:

1. The first player rolls the dice and locates the space(s) on the grid named by them.
2. Example: A roll of a 3 and a 5 could be space (3, 5) or (5, 3).
3. The player chooses either division problem and places a marker on the quotient (in one space only).
4. The object of the game is to get four markers in a row in any direction.
5. The first player to get four in a row is the winner.

Variation/Extension: Teacher could change the difficultly level of the division problems. A blank gameboard is included for your convenience.



	1	2	3	4	5	6
1	8) 48	8) 24	6) 36	6) 54	6) 24	9) 45
2	4) 32	6) 42	9) 63	6) 30	7) 56	7) 28
3	3) 24	7) 35	9) 81	4) 24	8) 64	8) 32
4	9) 36	8) 72	5) 30	7) 49	5) 35	7) 42
5	9) 54	8) 56	5) 40	4) 28	9) 72	4) 36
6	9) 27	8) 40	6) 48	7) 63	3) 27	5) 45



	1	2	3	4	5	6
1	⟌	⟌	⟌	⟌	⟌	⟌
2	⟌	⟌	⟌	⟌	⟌	⟌
3	⟌	⟌	⟌	⟌	⟌	⟌
4	⟌	⟌	⟌	⟌	⟌	⟌
5	⟌	⟌	⟌	⟌	⟌	⟌
6	⟌	⟌	⟌	⟌	⟌	⟌

Race to the Resort

Building Fluency: division with remainders, explain what the remainder means

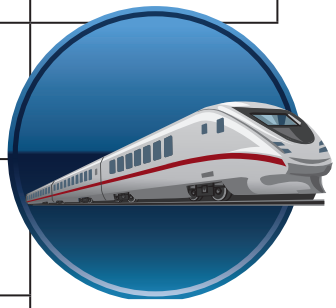
Materials: a die, game marker per player

Number of Players: 2

Directions:

1. Players take turns rolling a die, move that many spaces.
2. Player must find the quotient and remainder for the equation.
3. They must also come up with a context for that equation and explain what the remainder means.
   Example: 52 ÷ 5 = 10 r 2, Jim had 52 pieces of gum to share among he and his four finds? How many pieces of gum did they each get? The remainder of 2 represents the 2 pieces of gum left over after 52 pieces were shared equally among 5 people.
4. If player can do that correctly they can stay in that space, otherwise they lose their turn.
5. If you land on the same square as your opponent, you can send that player back to start!

Variation/Extension: Student can create another gameboard varying the level of difficulty of the division problems.

START	$6\overline{)44}$				$9\overline{)75}$
					$62 \div 4$
					Out of Gas: Lose a Turn
					$4\overline{)21}$
					$23 \div 8$
	$23 \div 5$	$6\overline{)32}$	$57 \div 9$		$5\overline{)34}$
$10\overline{)103}$	**Low on Fuel: Lose a Turn**		**No Wind: Move Back 3 Spaces**		$37 \div 9$
$4\overline{)34}$			$62 \div 8$		**Bonus: Move Ahead 1 Space**
$53 \div 8$			$3\overline{)35}$		$9\overline{)88}$
$4\overline{)30}$			$47 \div 6$		$6\overline{)19}$
Stormy Seas: Move Back 2 Spaces		$50 \div 7$	$7\overline{)43}$		$14 \div 4$
$6\overline{)43}$		**YOU WIN!!**			**Flat Tire: Lose a Turn**
$46 \div 8$	$3\overline{)16}$	$8\overline{)79}$	**Ship Ran Aground: Move Back 3 Spaces**	$27 \div 4$	$5\overline{)23}$

Mount Mitchell Rock

Building Fluency: division with remainders

Materials: a die and game marker

Number of Players: 2

Directions:

1. Place markers on start.
2. Take turns rolling the die, and moving the number on the die.
3. Divide the number under your marker by the number on the die.
4. The remainder tells the number of additional spaces you may move.
5. The first player to reach the top of the mountain is the winner.

Variation/Extension: Student may wish to create their own gameboard. This game may also be modified by using a die (or digit cards) with higher numbers.

FINISH

50 49 48 47 46

45

43

34 35 36 37 42

33 38 39 40 41

32

30 29 28 26

25

23

14 15 16 18 20 21

12

START

Rockingham Remainders

Building Fluency: division with remainders

Materials: a die, a game marker and score sheet per player

Number of Players: 2-4

Directions:

1. The first player rolls the cube, then chooses a number to cover.
2. They then divide the covered number by the number rolled.
3. The remainder is his or her score.
4. The winner is the first player to score at least 20 points.

Variation/Extension: Students write context for their equations and explain the meaning of the remainder. Example: Jim had 52 pieces of gum to share among he and his four finds? How many pieces of gum did they each get? The remainder of 2 represents the 2 pieces of gum left over after 52 pieces were shared equally among 5 people.

12	21	30	38
14	22	32	39
15	24	33	40
16	25	34	41
18	26	35	42
20	28	36	43
23	29	37	44

PLAYER _____

NUMBER COVERED	NUMBER ROLLED	EQUATION	REMAINDER	TOTAL OF REMAINDER

PLAYER _____

NUMBER COVERED	NUMBER ROLLED	EQUATION	REMAINDER	TOTAL OF REMAINDER

The Great Raleigh Road Race

Building Fluency: division with remainders

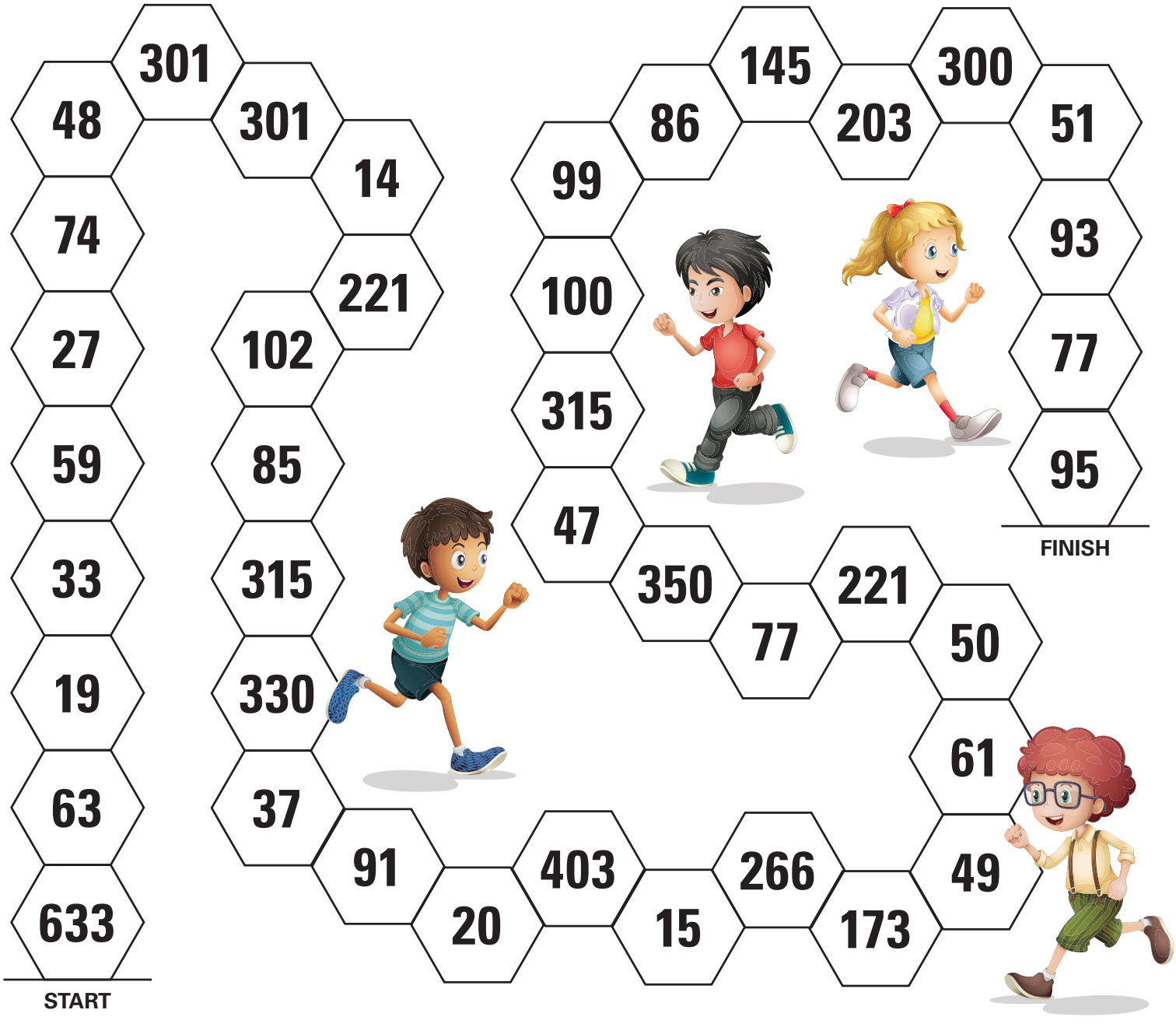
Materials: a die, game marker, paper and pencil, calculator

Number of Players: 2

Directions:

1. Player rolls the die and uses that number as the divisor for the first place on the board.
2. Player move the number of spaces indicated by the remainder.
3. At each turn divide the number where the player's marker is located by the number on the die.
4. If no remainder, no spaces are moved.
5. First player to cross the finish line wins.

Variation/Extension: use a die with larger numbers. Student can record their word on a piece of paper or math notebook. May need a calculator to check work.



Tangram Challenges

Building Fluency: fraction equivalence

Materials: gameboard

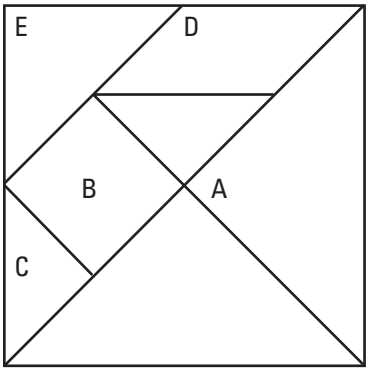
Number of Players: 2

Directions:

1. Complete the tables.
2. Be certain both players agree with the answers.
3. Compare your work with another team.
4. If your answers are different be ready to justify your thinking and critique the reasoning of others.

Variation/Extension: Instead of using the tangram pieces students could create their own shape with fractional parts.

If the entire tangram = 1, then . . .



PIECE	FRACTION NAME
A	
B	
C	
D	
E	

If part D costs 40¢, then. . .

PIECE	COST
A	
B	
C	
D	40¢
E	

If part A costs $2, then. . .

PIECE	COST
A	$2
B	
C	
D	
E	

If part B is equal to 1, then . . .

PIECE	FRACTION
A	
B	1 or $\frac{1}{1}$
C	
D	
E	

Bonus: Suppose the value of the entire tangram is $32.00. What would be the value of the middle-sized triangle?

_____

How did you know this? _____

_____

_____

_____

_____

Terrific Tar Heels

Building Fluency: understanding of fractions

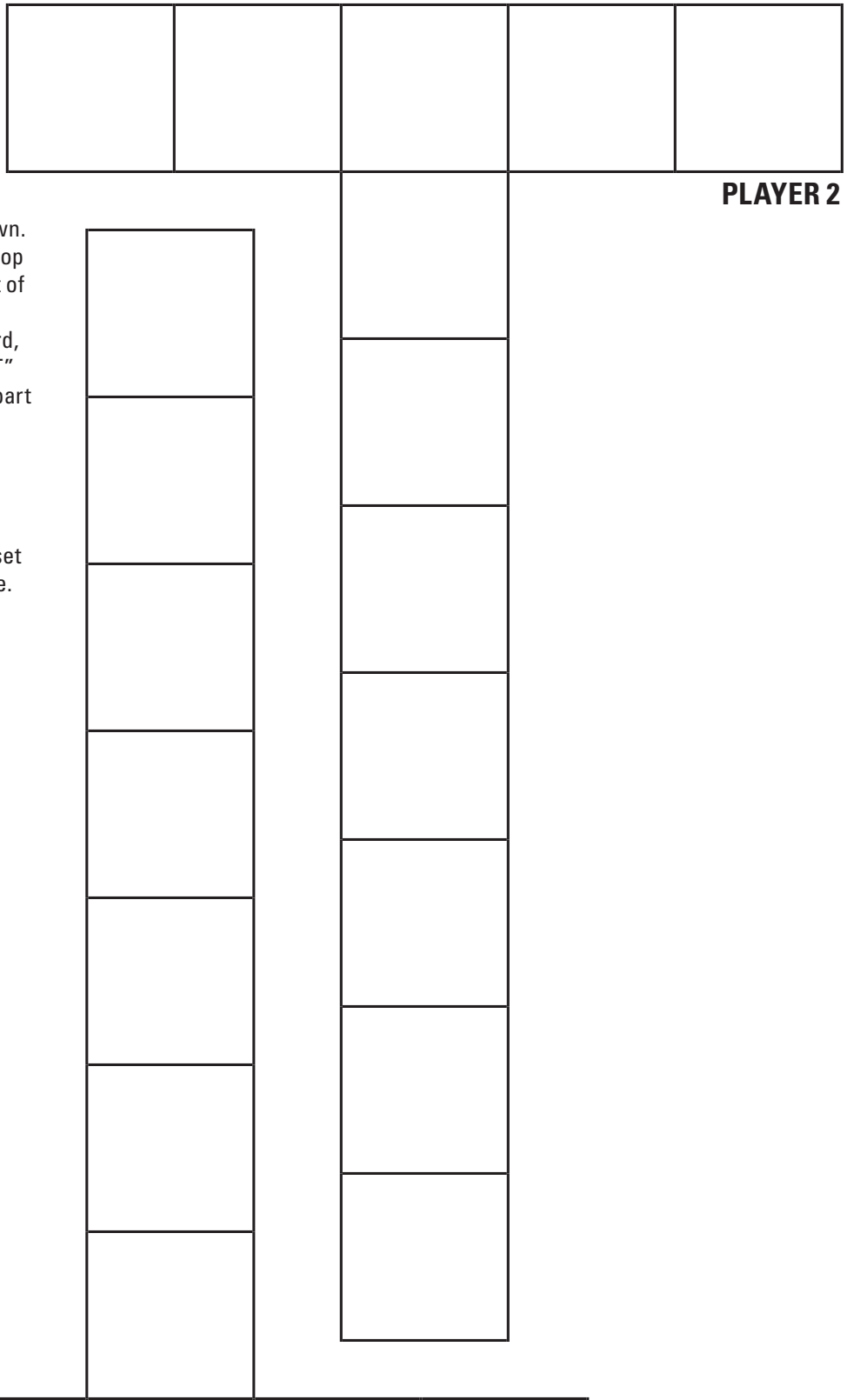
Materials: game markers (11 of one color per player) and fraction cards

Number of Players: 2

Directions:

1. Put the fraction cards in a pile face down.
2. The first player draws a card from the top of the pile and covers that fraction part of their "T".
3. Players alternate turns – drawing a card, covering that fractional part on their "T"
4. If a player cannot cover the fractional part shown on the card, they lose a turn.
5. Continue playing until one person has covered the entire "T".

Variation/Extension: Student can create their own shape and fraction cards. An additional set of blank cards are added for your convenience.



$\frac{6}{12}$	$\frac{1}{2}$	$\frac{3}{6}$	$\frac{5}{12}$
$\frac{4}{12}$	$\frac{2}{6}$	$\frac{1}{3}$	$\frac{3}{12}$
$\frac{3}{12}$	$\frac{1}{4}$	$\frac{2}{12}$	$\frac{2}{12}$
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Hatteras Hop

Building Fluency: understanding fractions

Materials: about 40 markers (color tiles) and fractions cards

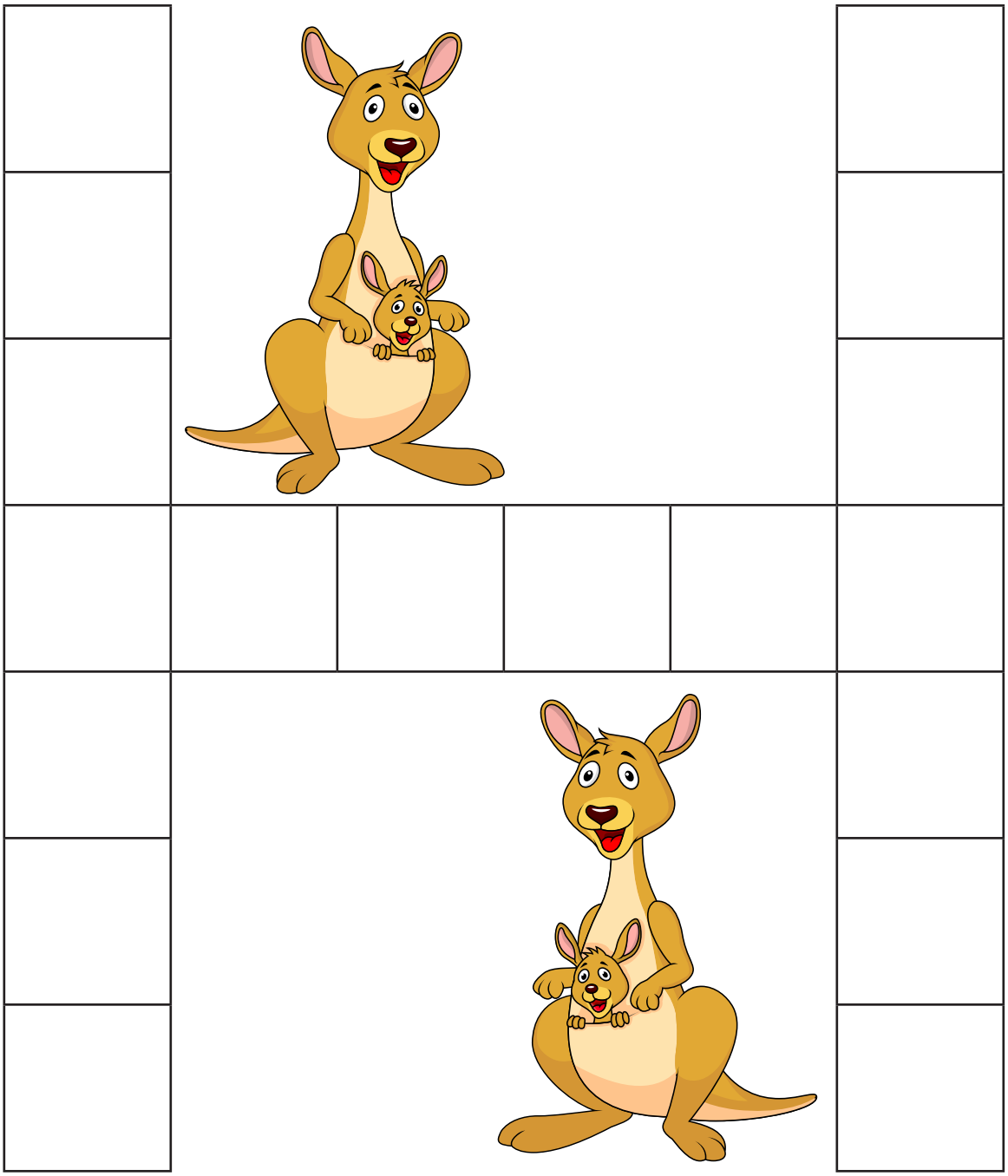
Number of Players: 2

Directions:

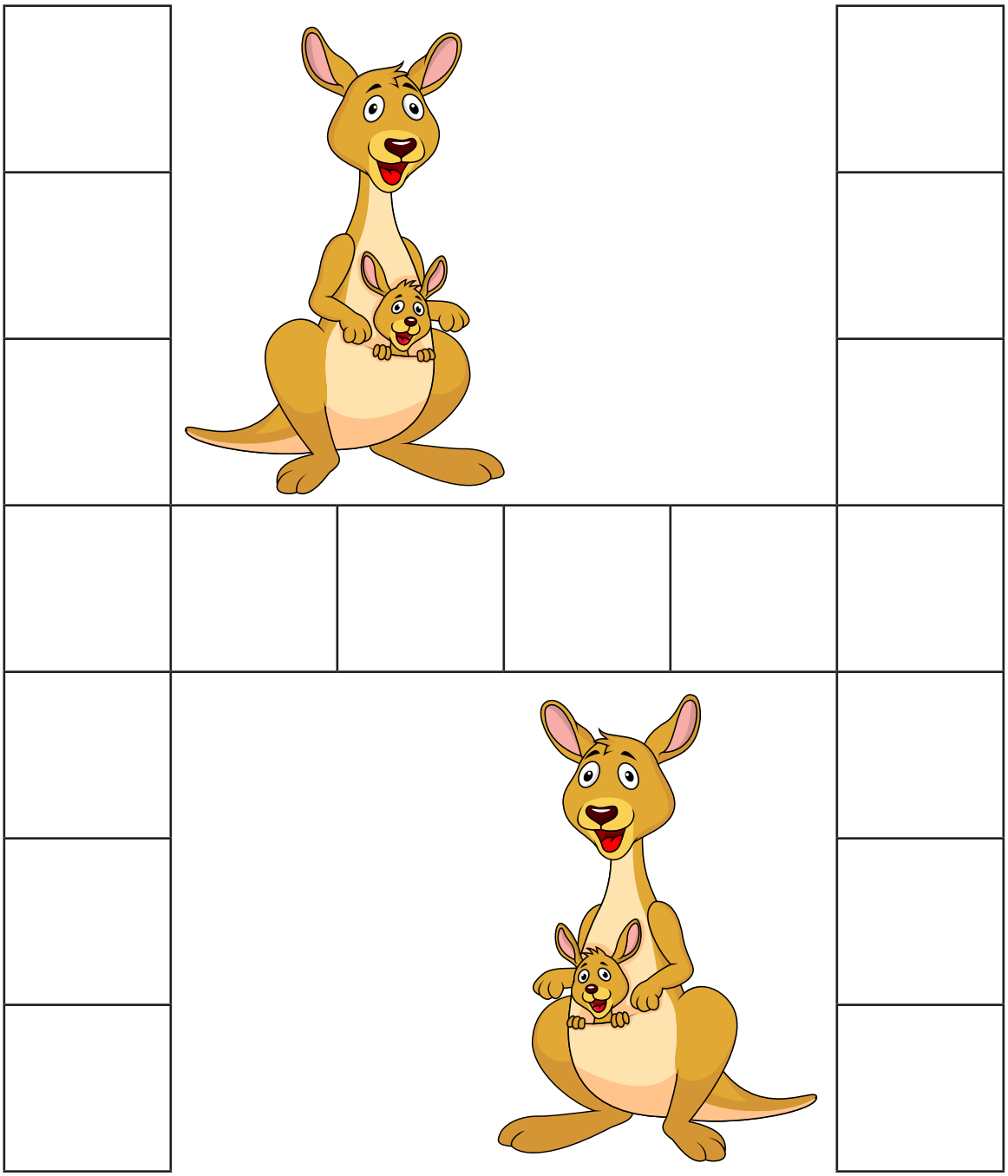
1. Shuffle and place the fraction cards face down. Then each player picks a card from the top of the pile.
2. The player with the smaller fraction colors or covers that fractional part of their "H". Then continue with two more cards.
3. If the player with the smaller fraction cannot color or cover that fractional part of the "H", replace both cards and choose two more.
4. Continue until one person has colored the whole "H" that person has "Hopped To Hatteras!"

Variation/Extension: Student can create their shape to cover. An additional set of blank cards are added for your convenience.

PLAYER 1



PLAYER 2



$\frac{6}{12}$	$\frac{1}{2}$	$\frac{3}{6}$	$\frac{5}{12}$
$\frac{4}{12}$	$\frac{2}{6}$	$\frac{1}{3}$	$\frac{3}{12}$
$\frac{3}{12}$	$\frac{1}{4}$	$\frac{2}{12}$	$\frac{2}{12}$
$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Multiplying and Comparing Fractions Game

Building Fluency: multiply and compare fractions

Materials: small digit cards (1-9), gameboard

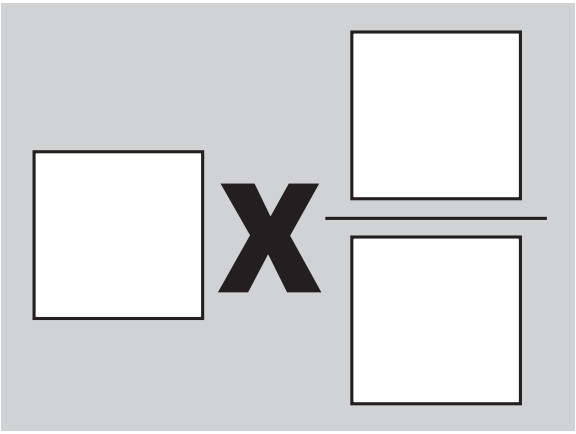
Number of Players: 2

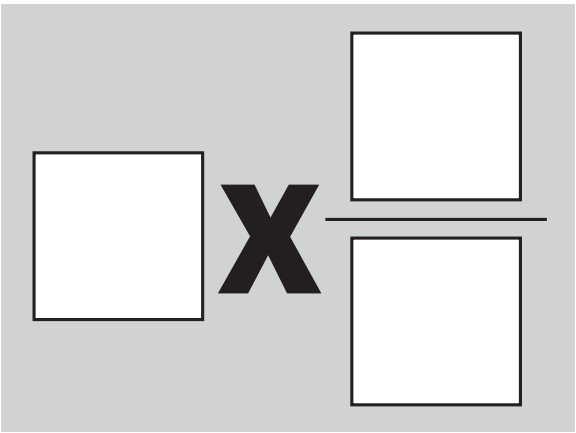
Directions:

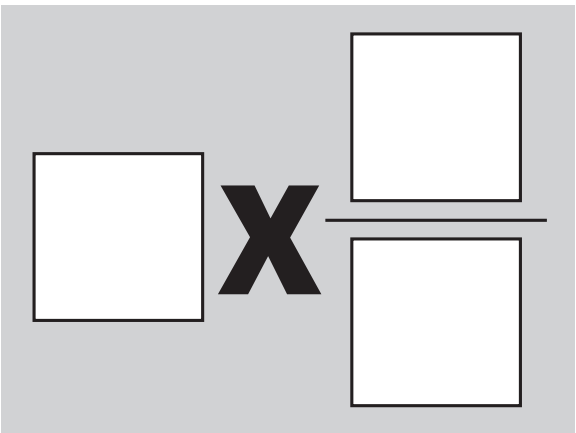
1. Both players draw three number cards and create an equation on their gameboard that is a whole number times a proper fraction.
2. Each player then solves the equation they created. Players check each other's answers for accuracy.
3. Compare their answers.
4. The player with the larger fraction receives a point.
5. The player with the highest number of points when board filled is the winner.

Variation/Extension: Additional gameboards added for your convenience.

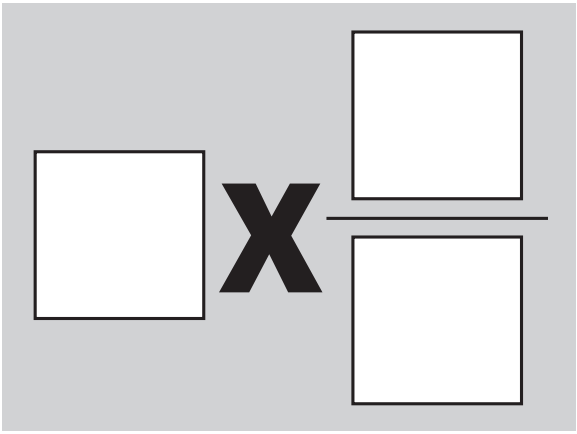
PLAYER 1

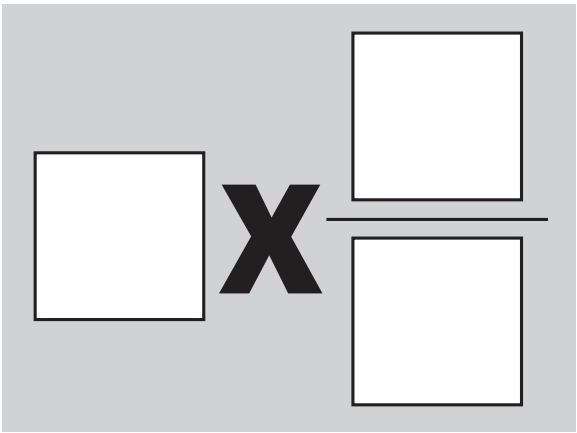


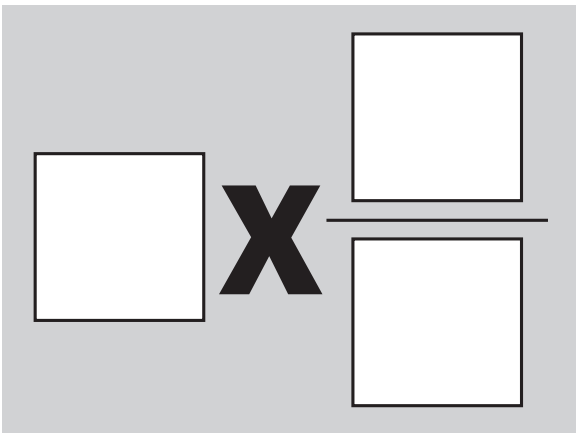




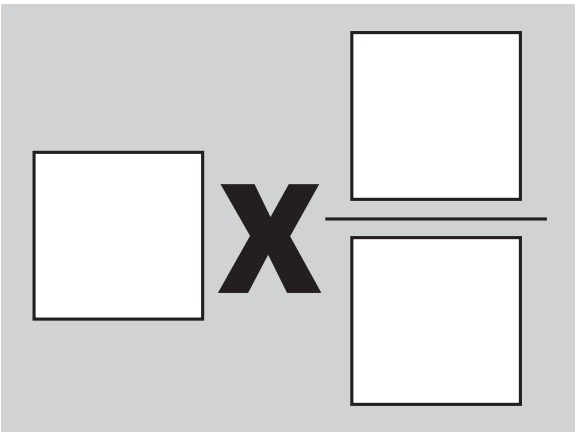
PLAYER 2

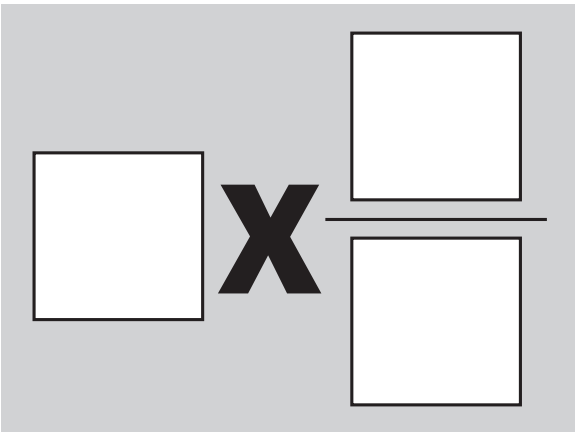


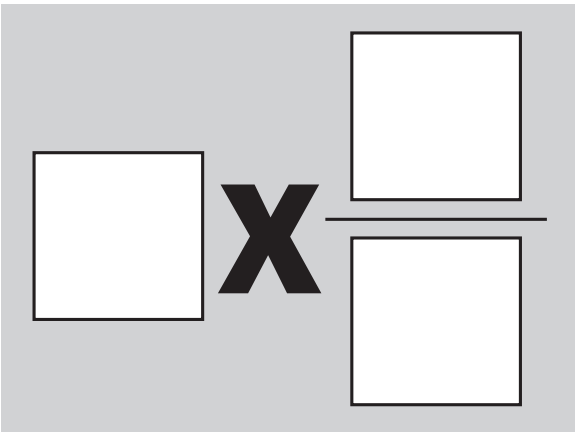


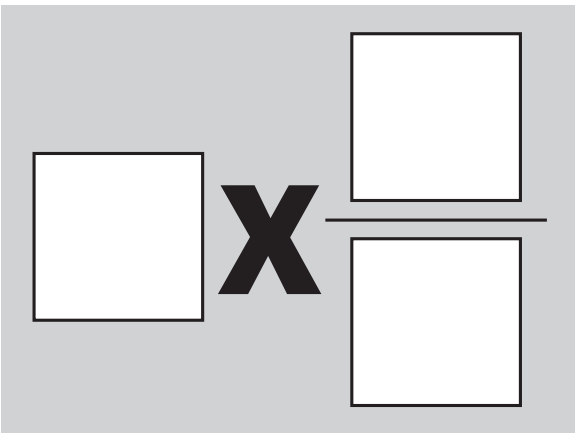


PLAYER 1

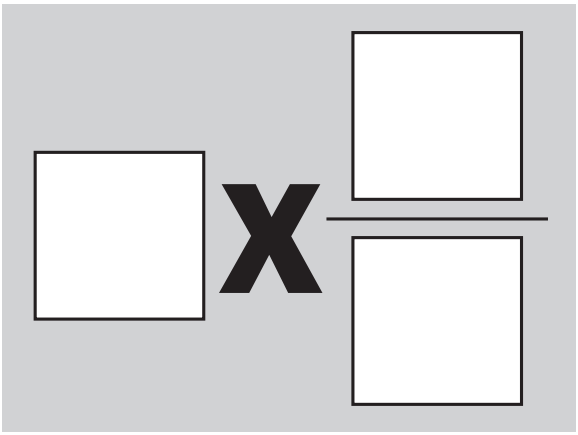


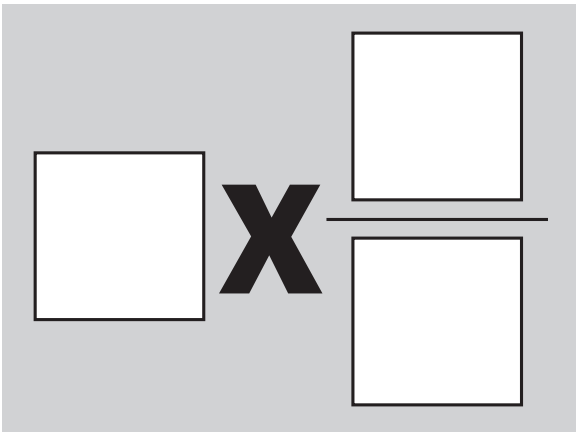


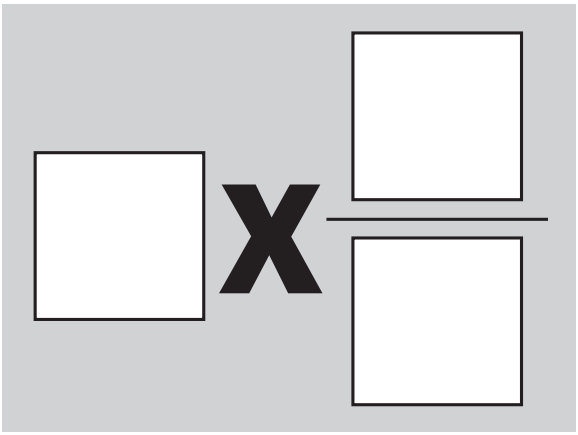


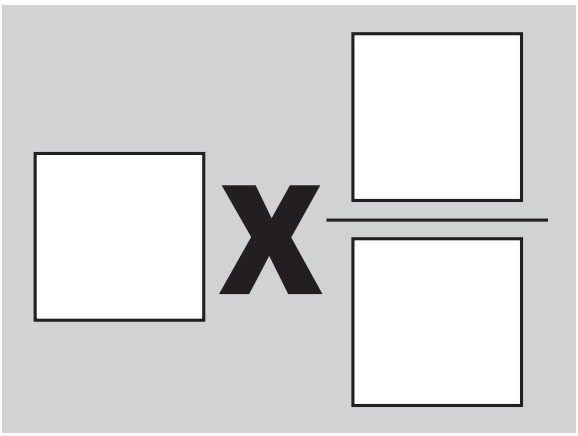


PLAYER 2









1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9

Find the Fraction Model

Building Fluency: adding fractions

Materials: circle fractions cards and fraction equation cards

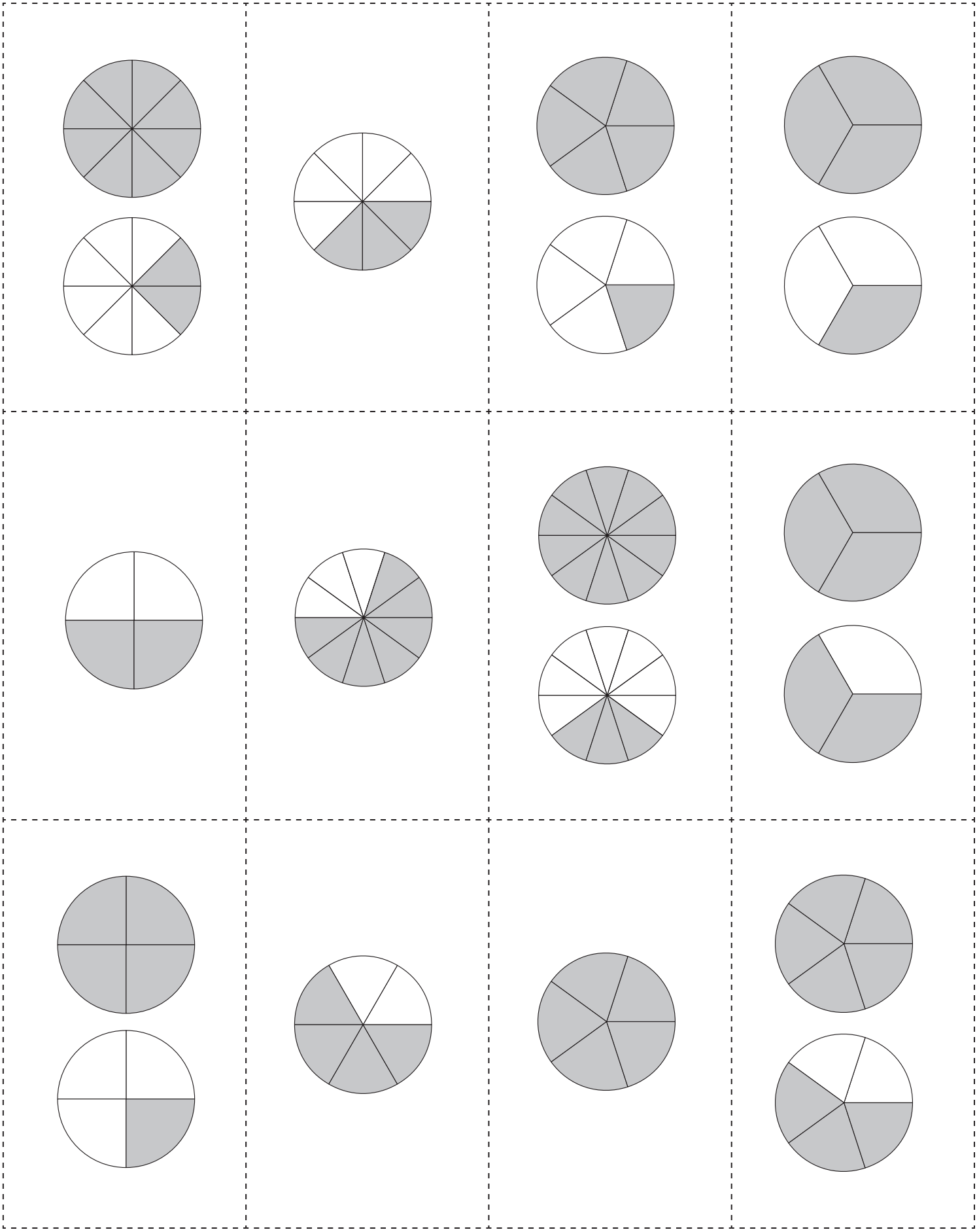
Number of Players: 2-4

Directions:

1. Place the equation cards face down in a pile between the players.
2. Spread out the circle fraction cards, face up.
3. Player 1 draws the top card from the equation pile. The first player to identify the matching circle fraction card, wins the cards.
4. Player 2 then draws the next card from the equation pile and players race to find the matching circle fraction card.
5. Play continues until all cards have been identified.
6. Player with the most cards is the winner!

Variation/Extension: Students can create their own cards. Add a timer is you dare!

$\frac{1}{5} + \frac{4}{5}$	$\frac{2}{3} + \frac{2}{3}$	$\frac{2}{3} + \frac{3}{3}$
$\frac{1}{6} + \frac{3}{6}$	$\frac{1}{8} + \frac{2}{8}$	$\frac{8}{8} + \frac{2}{8}$
$\frac{3}{4} + \frac{2}{4}$	$\frac{1}{4} + \frac{1}{4}$	$\frac{2}{5} + \frac{4}{5}$
$\frac{7}{10} + \frac{6}{10}$	$\frac{5}{10} + \frac{2}{10}$	$\frac{4}{5} + \frac{4}{5}$



Fraction "Close To" Game

Building Fluency: adding fractions

Materials: die and gameboard

Number of Players: 2

Directions:

1. Players agree upon the target sum (1/2, 1, or 2) at the beginning of each round.
2. Player 1 rolls the die and uses the digit shown as the denominator for both fractions.
3. Player 2 does the same for their fractions. Players may have different denominators.
4. The students then take turns rolling the die and determining whether to place the number in a numerator box or a throw away box.
5. Students receive a maximum of 4 rolls after the denominator is determined.
6. After the students have their two numerators placed, they add their fractions and determine their sum.
7. The student closest to the target sum receives a point. The student who reaches 5 points first is the winner.

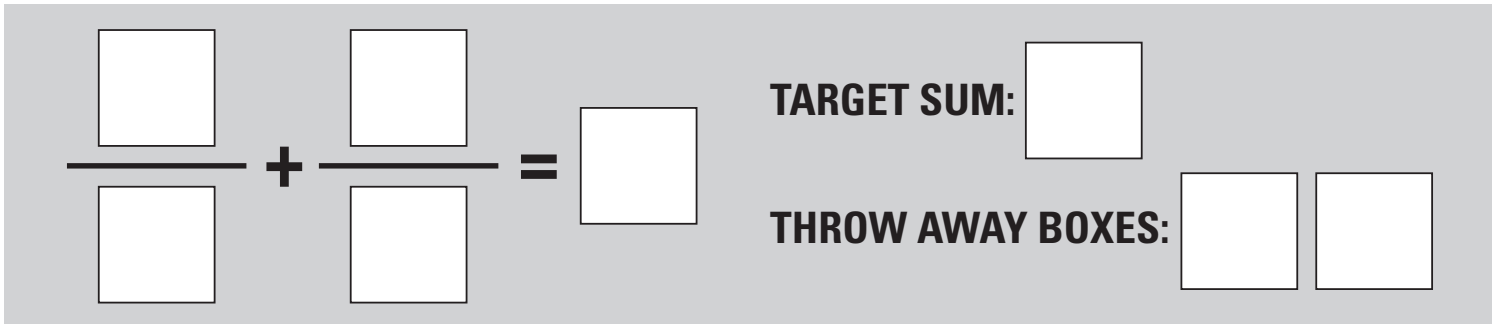
Variation/Extension: Students can change the number reached to be the winner.

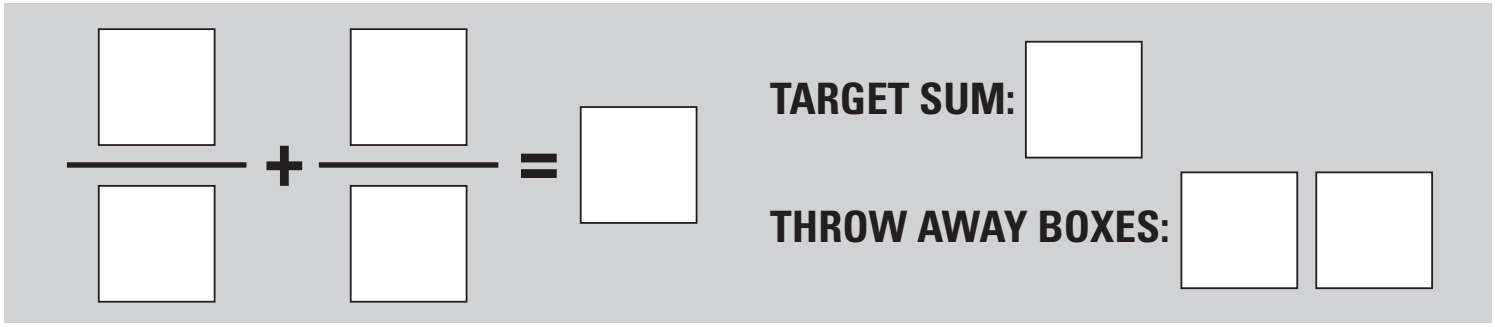
$$\frac{\square}{\square} + \frac{\square}{\square} = \square$$

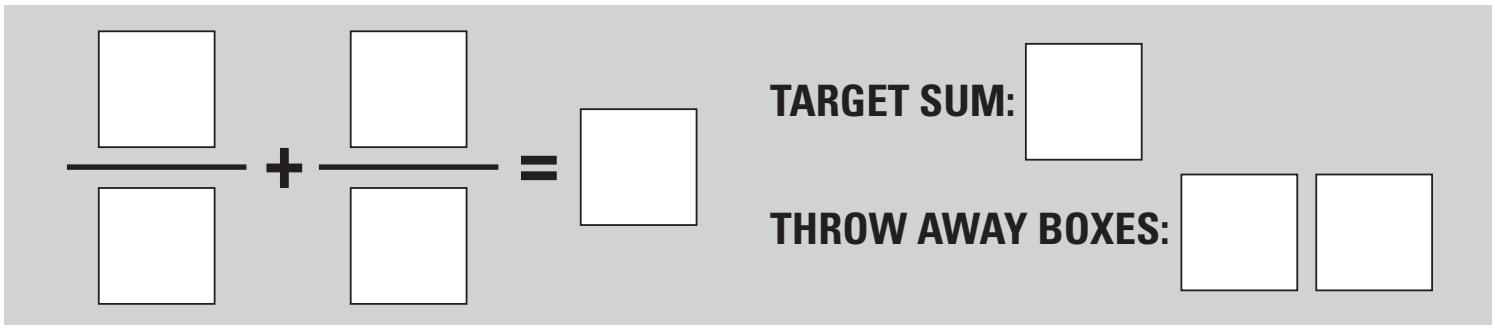
TARGET SUM: ☐

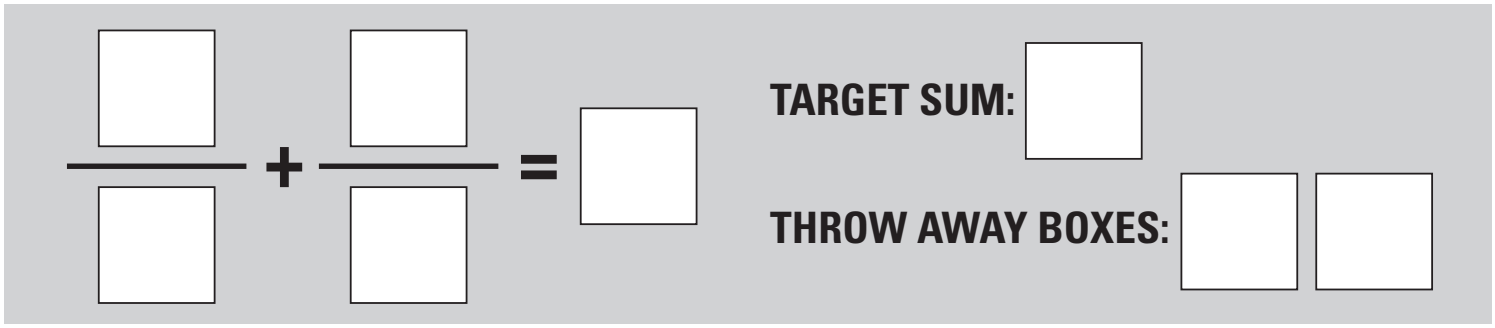
THROW AWAY BOXES: ☐ ☐

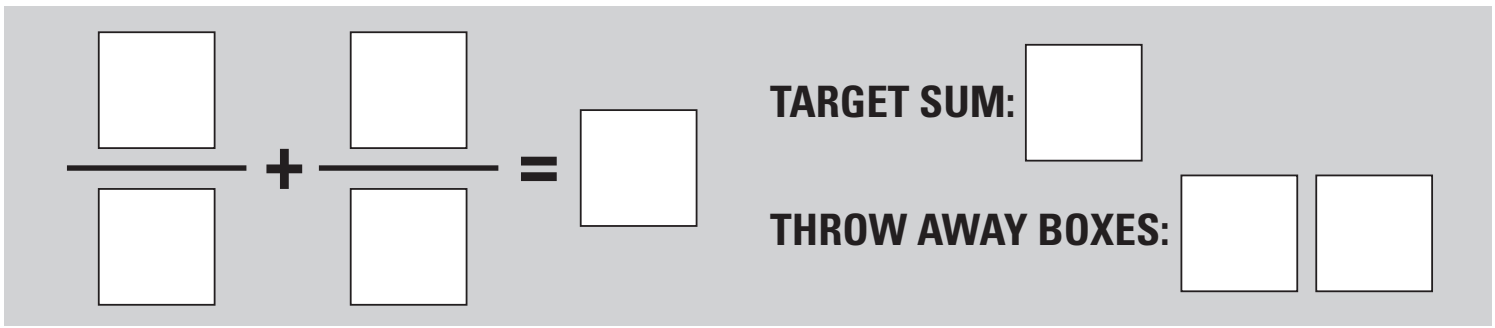
PLAYER 1


TARGET SUM:
THROW AWAY BOXES:

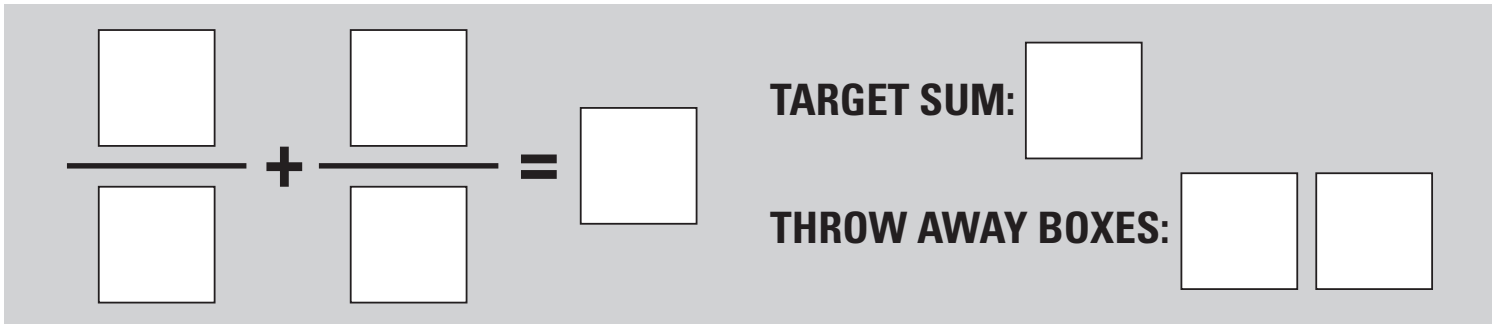

TARGET SUM:
THROW AWAY BOXES:

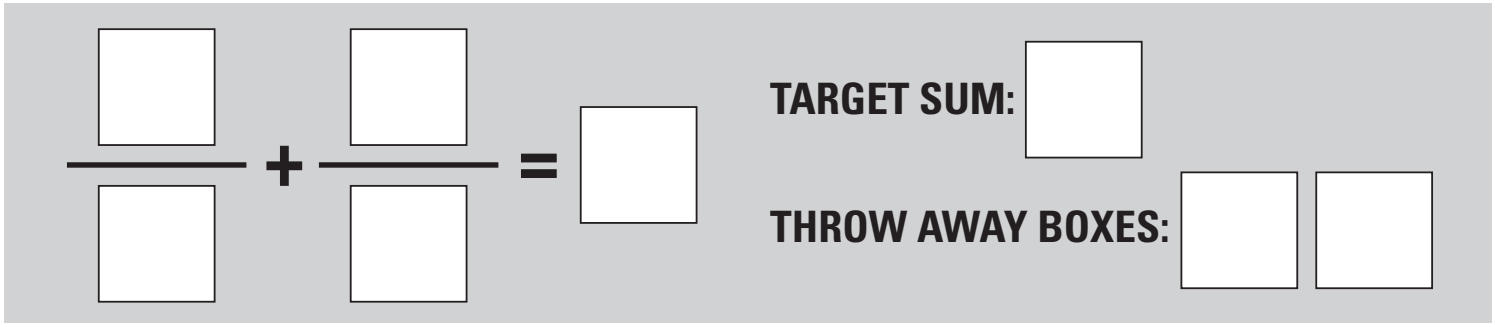

TARGET SUM:
THROW AWAY BOXES:

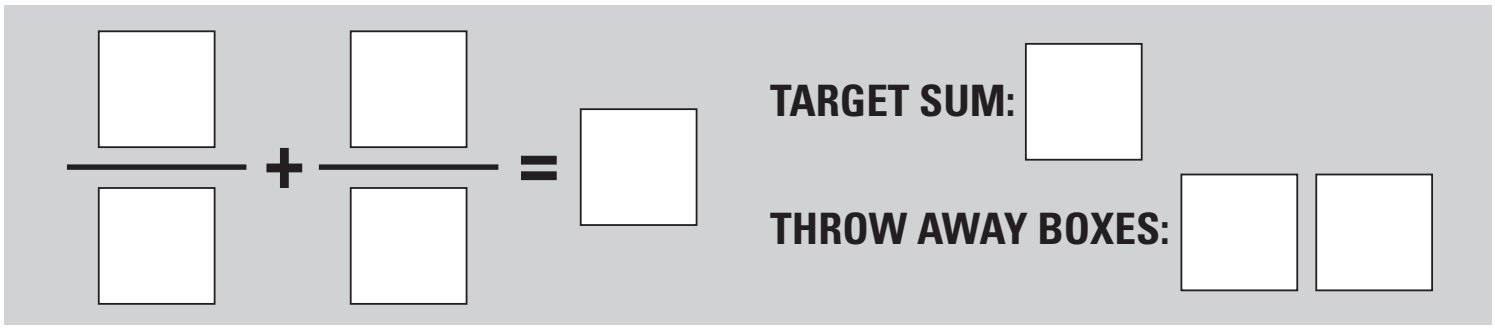

TARGET SUM:
THROW AWAY BOXES:

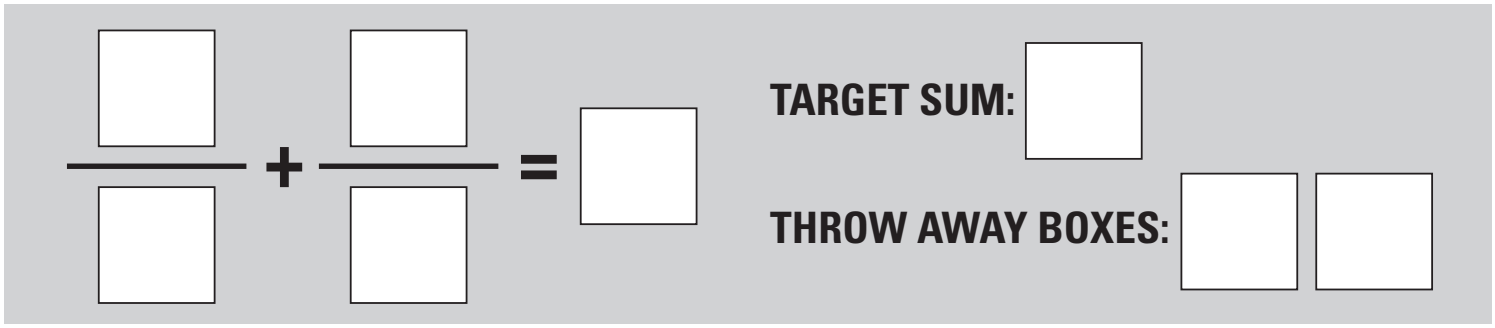

TARGET SUM:
THROW AWAY BOXES:

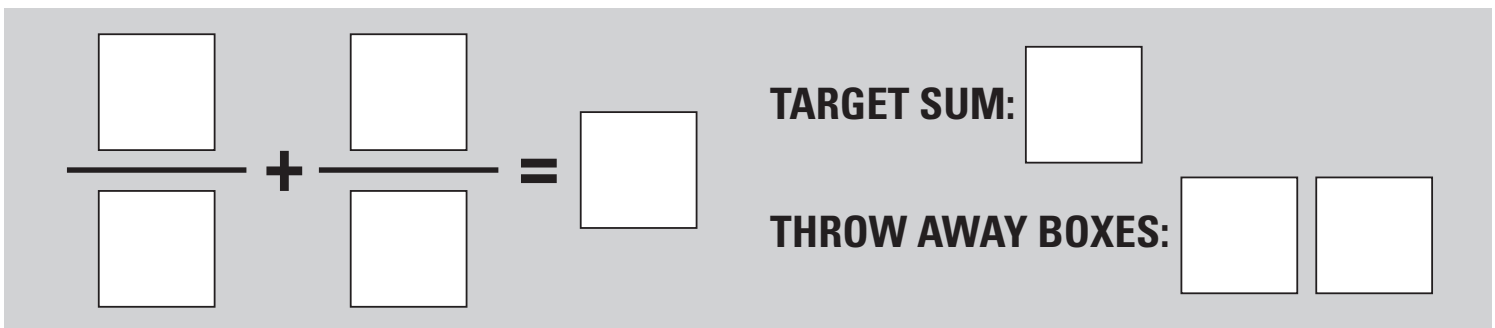
PLAYER 2


TARGET SUM:
THROW AWAY BOXES:


TARGET SUM:
THROW AWAY BOXES:


TARGET SUM:
THROW AWAY BOXES:


TARGET SUM:
THROW AWAY BOXES:


TARGET SUM:
THROW AWAY BOXES:

Zach's Zoo Adventure

Building Fluency: multiply whole number by a fraction

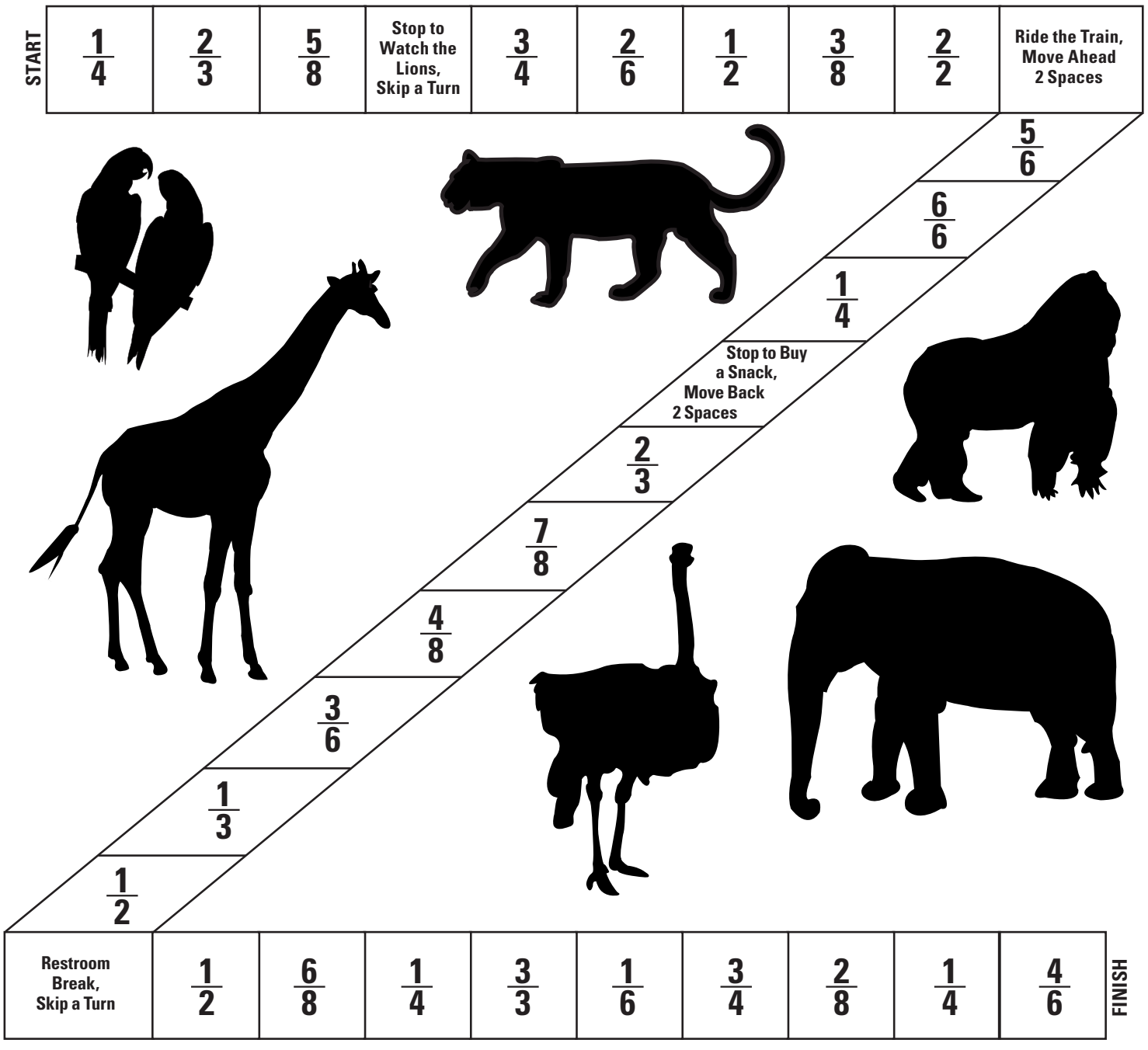
Materials: die, gameboard, game marker, calculator -optional

Number of Players: 2-4

Directions: Zach is visiting the Asheboro Zoo for the day. He needs your help to navigate his way through the zoo.

1. All players begin on "Start". Player 1 rolls the die and multiplies the digit on the die by the fraction their game piece is on.
2. If it is correct (may use calculator to check your work) Player 1 moves forward the number of spaces shown on the die.
3. Players take turns rolling the die and multiplying the digit on the die by the fraction their game piece is on.
4. The first player to cross the finish line wins. Play until every player crosses the finish line. You've helped Zach visit the entire zoo!

Variation/Extension: Students can create their own gameboard and/or use a die with larger numbers. Student can record their work on a piece of paper of in math notebook.



Parts of a Whole

Building Fluency: multiplication of whole number by a fractions

Materials: whole number die (1-6), fraction circle, and fraction cards or fraction die or spinner

Number of Players: 2

Directions:

1. Player rolls a standard whole number die, and spins the spinner.
2. The standard die represents the number of groups, and the spinner represents the fraction in each group. Example: A roll of 3 on the standard die, and spin $\frac{1}{4}$ on the spinner would be represented 3 groups with $\frac{1}{4}$.
3. Use fraction circles to help determine the product for each round.
4. If your result is 1 or more, you receive a star.
5. Play several rounds and count the stars you have collected.
6. The player with the most stars collected is the winner.

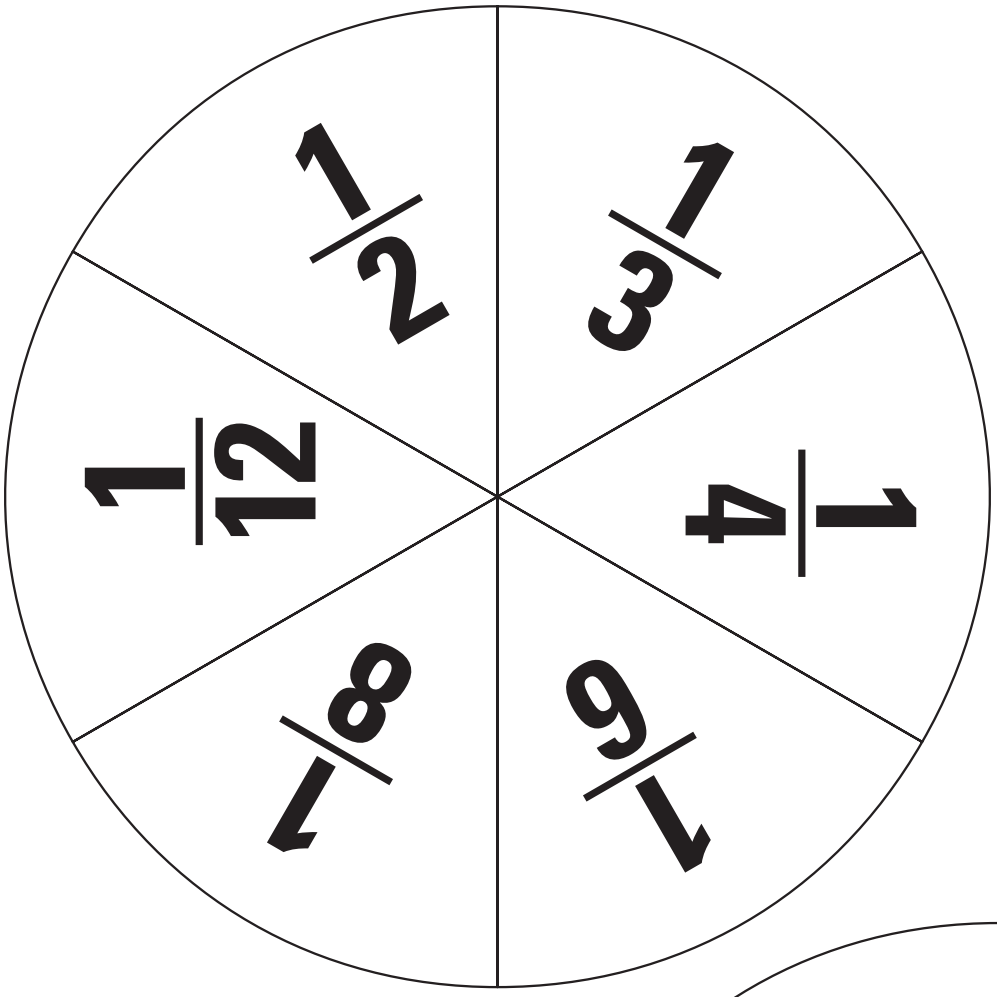
Variation/Extension: Student may want to modify fractions on spinner or use a die 0-9. A blank spinner and fraction circles are added for your convenience. Teacher may also want students to add the products. Students may want to write coordinating problems to fit each equation.

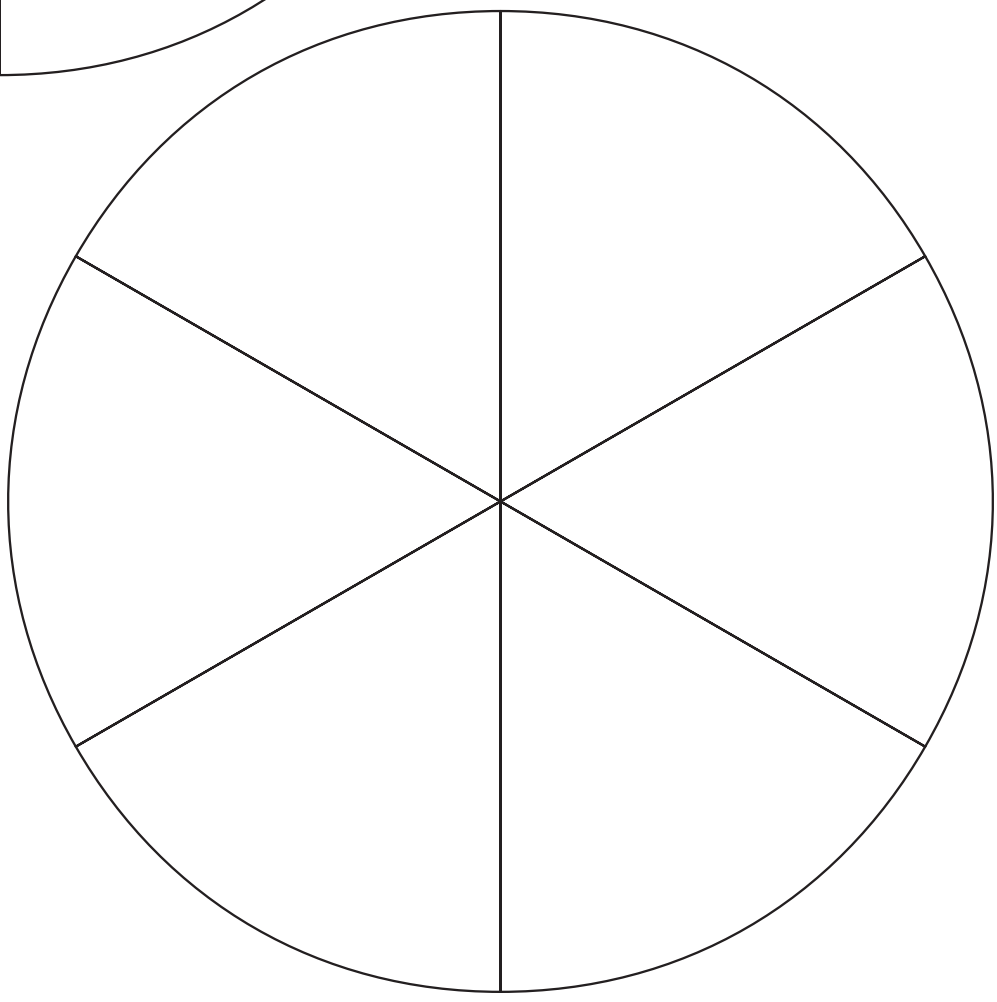
PLAYER 1

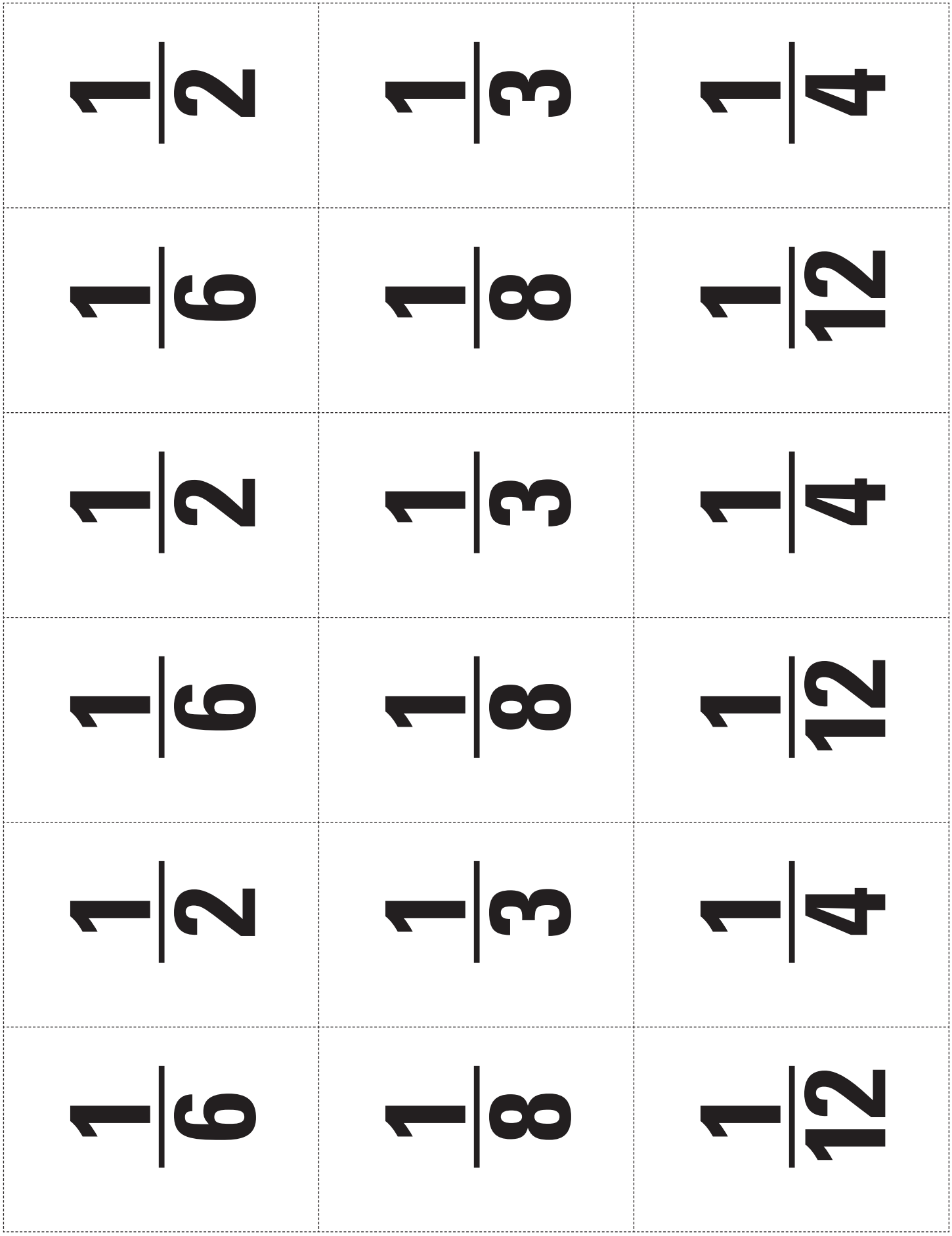
ROLL	SPIN	EQUATION

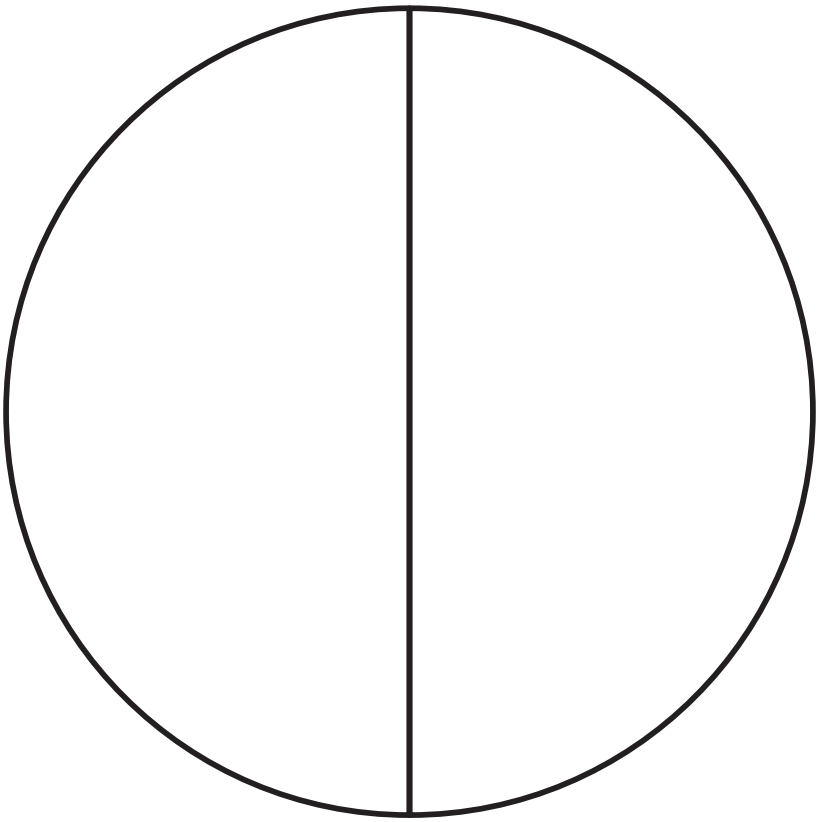
PLAYER 2

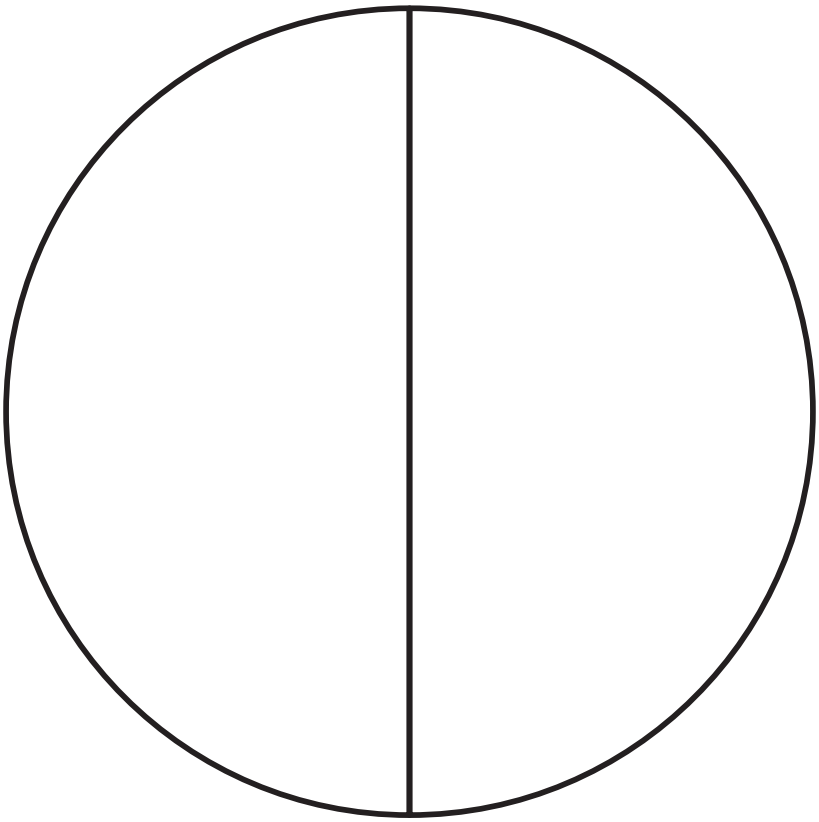
ROLL	SPIN	EQUATION

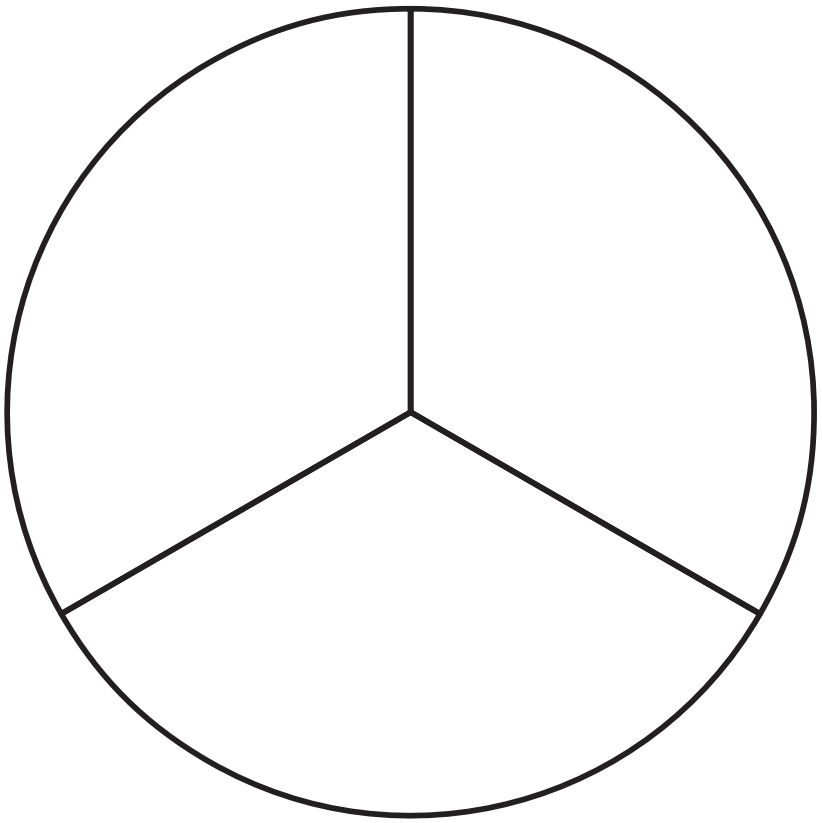

1/2
1/3
1/12
1/4
1/8
1/9

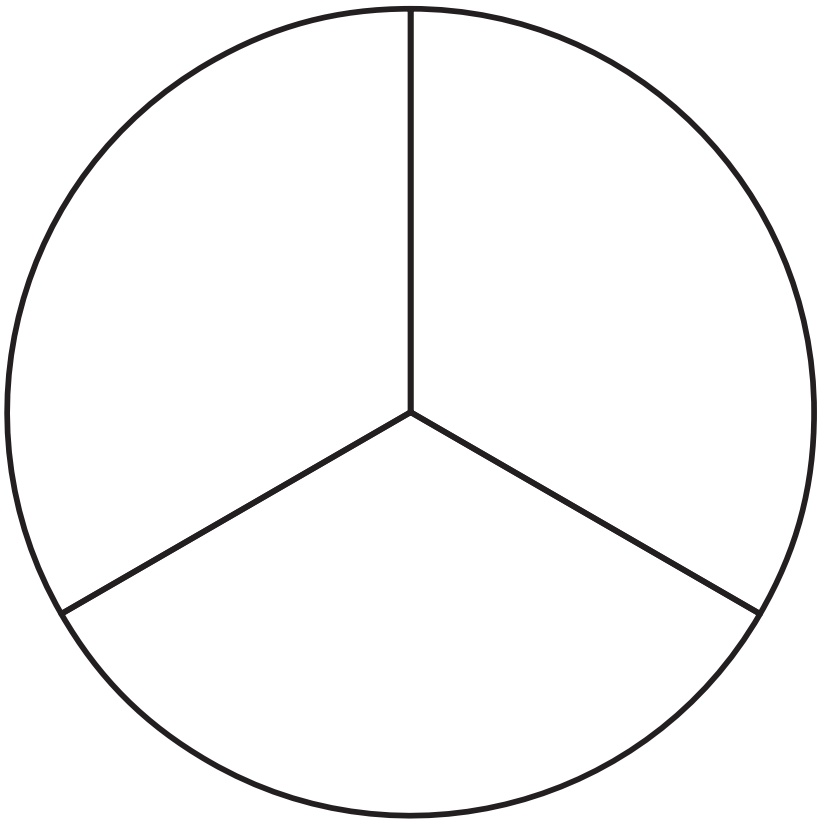


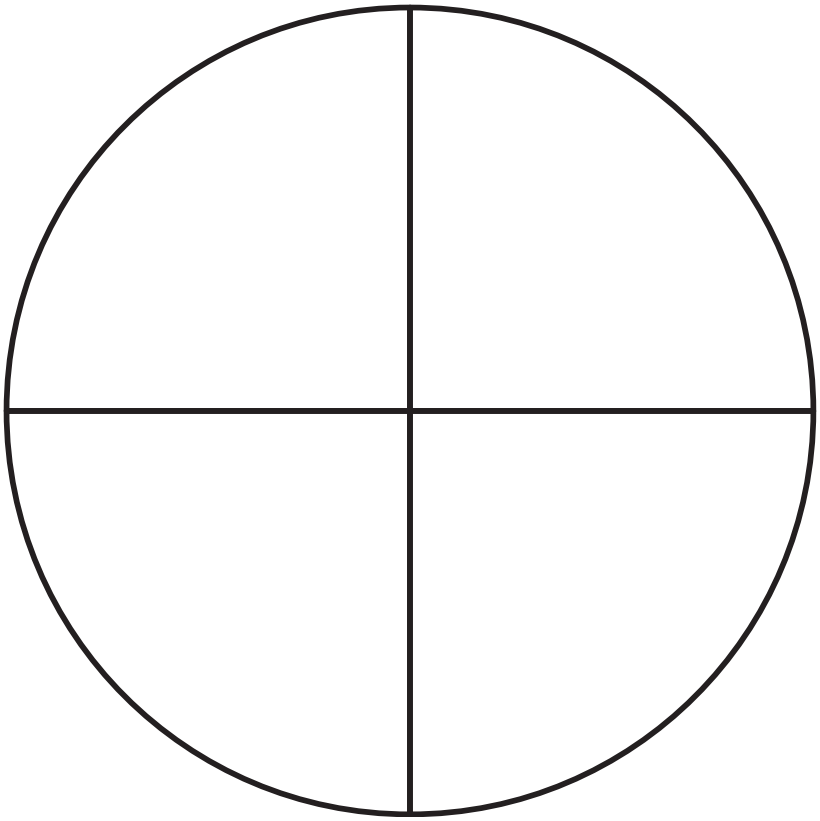

1/2
1/3
1/4
1/6
1/8
1/12
1/2
1/3
1/4
1/6
1/8
1/12
1/2
1/3
1/4
1/6
1/8
1/12

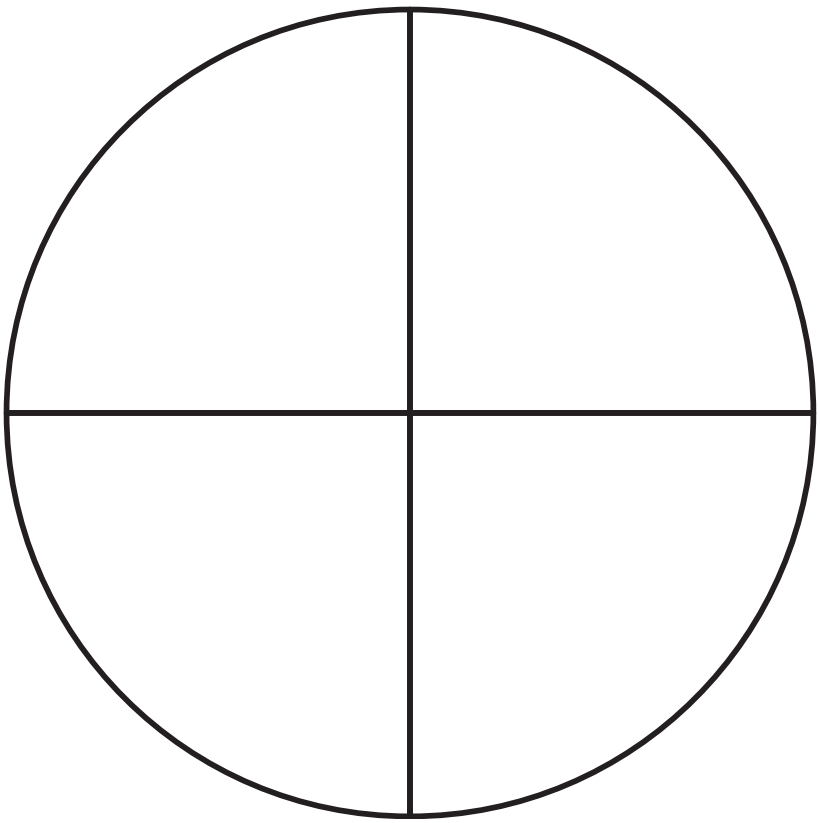


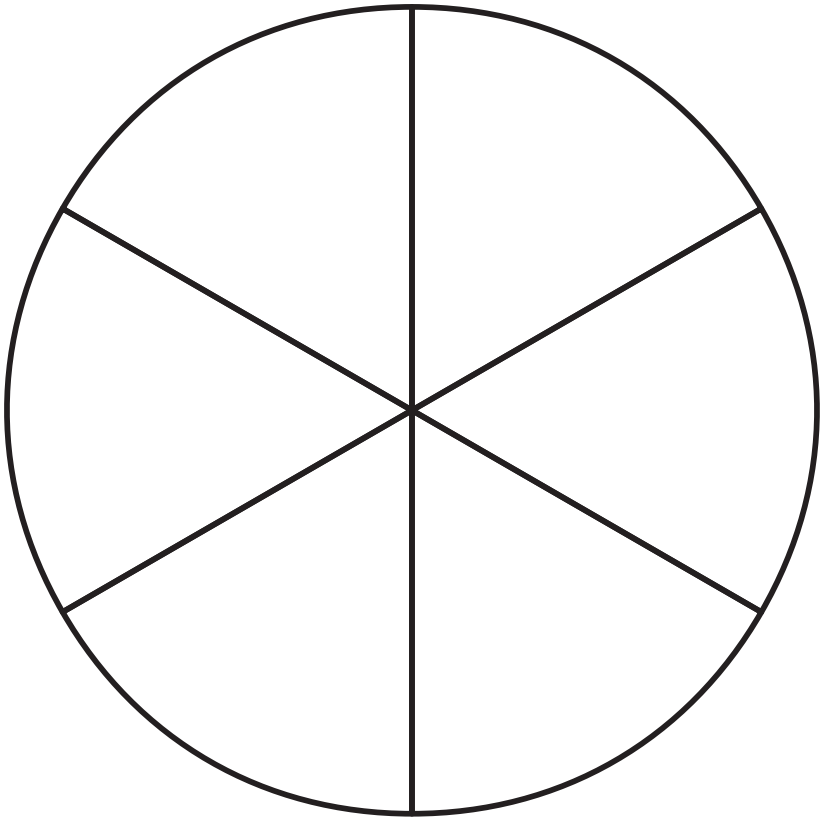


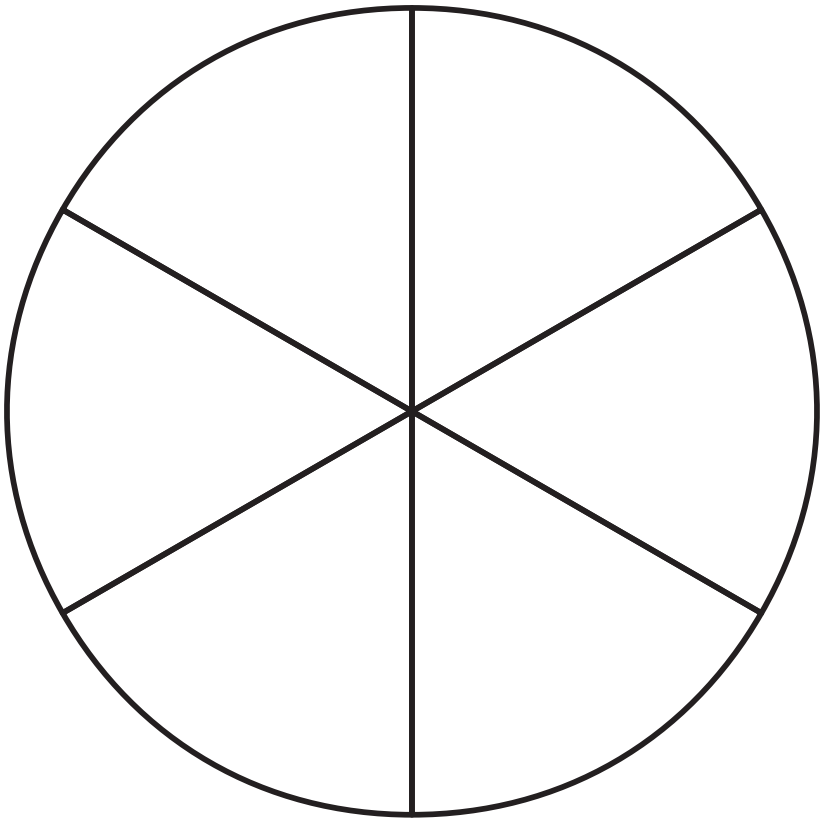


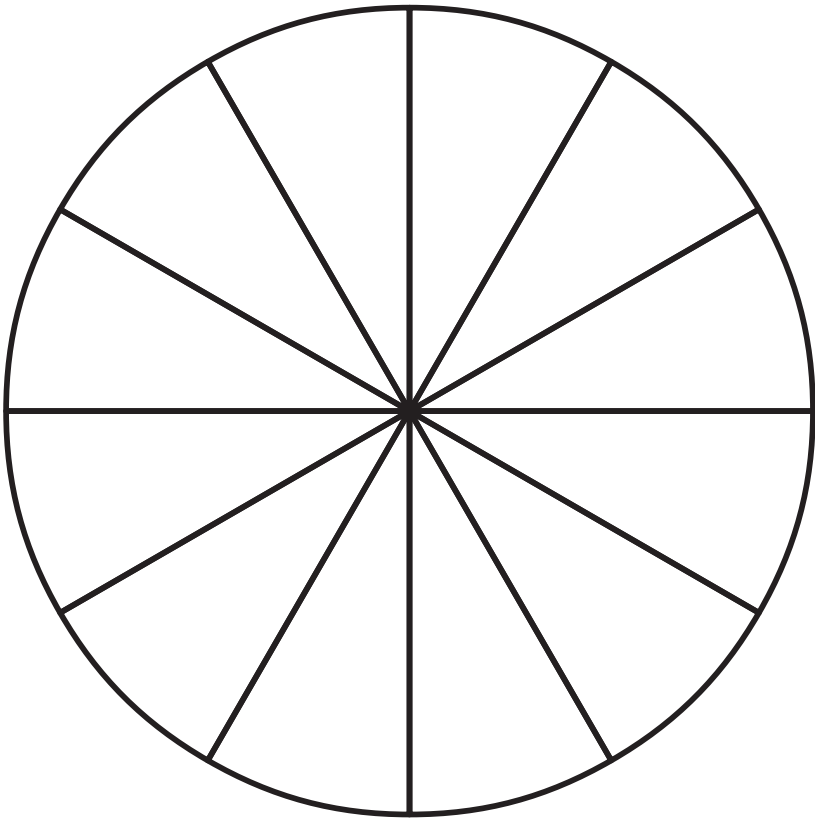


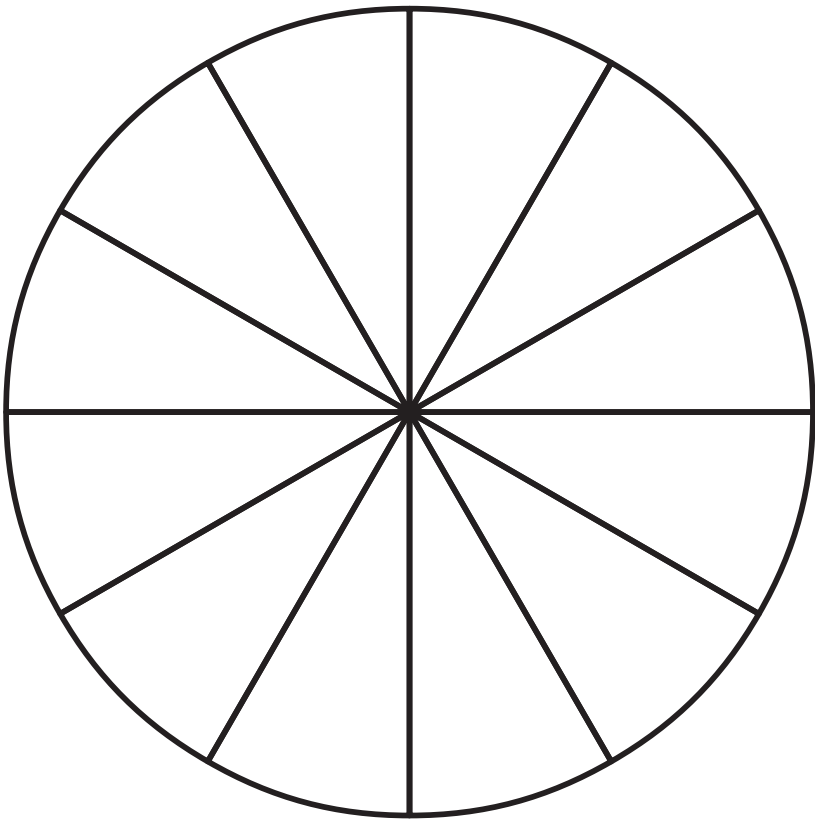


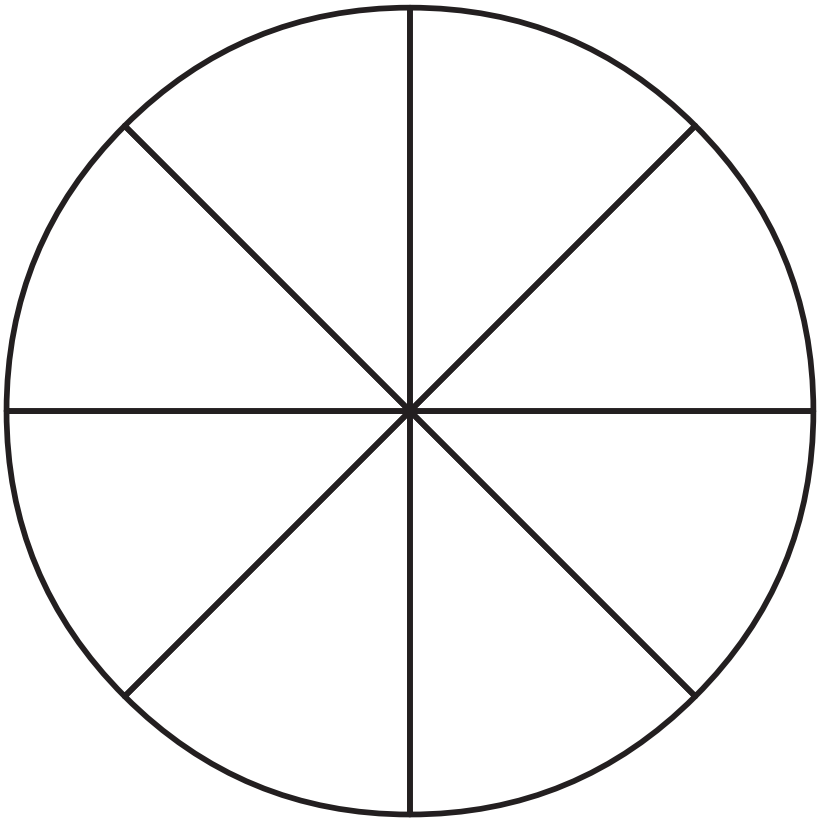


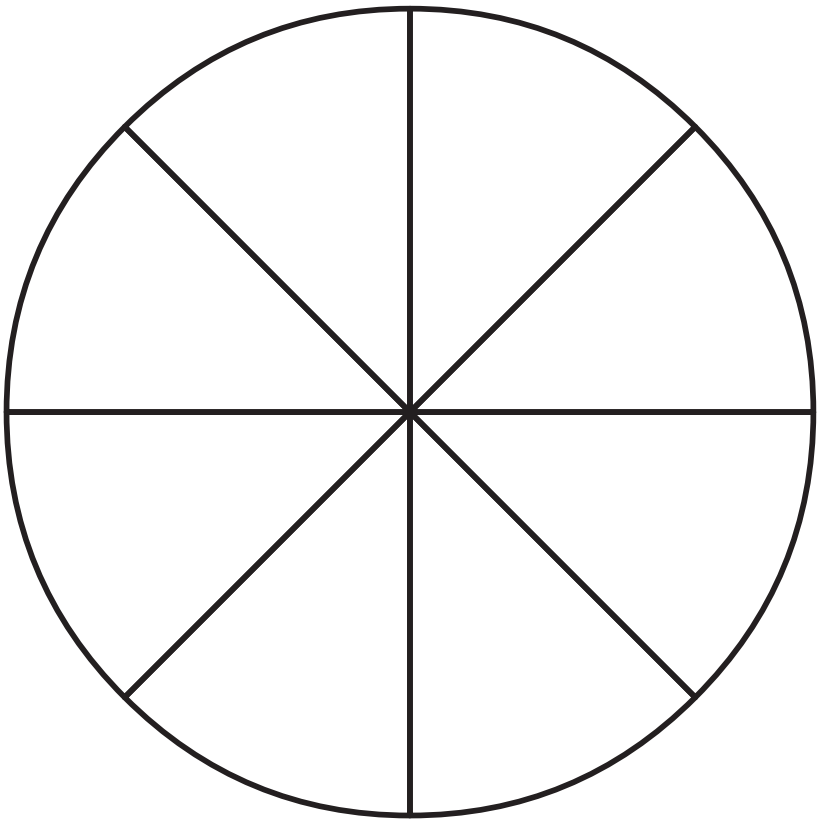












Fraction Go Fish

Building Fluency: decimal notation for fractions

Materials: Go Fish Card

Number of Players: 4

Directions:

1. Each player is dealt 5 cards from the deck. The remaining cards are in a pile face down.
2. Players look at their 5 cards. If they are holding any matches, they set those aside.
3. The player whose turn it is asks another player for a particular card.
   Example: if Ryan has $\frac{51}{100}$, he asks Emily "Do you have $\frac{5}{10} + \frac{1}{100}$?
4. If the player has the card, they must hand it over. If they do not have the card, they say "Go Fish" and the first player draws a card from the middle pile. If they make a pair, they set those cards aside.
5. Play continues to the player on the left.
6. The game is over once all the pairs are found.

Note to Teacher: Before having students play this game, review possible ways that students can ask for matching cards. There are 2 types of pairs: $\frac{90}{100}$ and $\frac{9}{10}$ or $\frac{51}{100}$ or $\frac{5}{10} + \frac{1}{100}$ OR Players need to be able to ask each other for the opposite card in the pair.

Variation/Extension: Students can create their own set of fish cards. Additional blank cards are included for your conviencene.

$\frac{2}{10} + \frac{3}{100}$	$\frac{5}{10} + \frac{2}{100}$	$\frac{8}{10} + \frac{9}{100}$	$\frac{3}{10} + \frac{4}{100}$
$\frac{4}{10} + \frac{5}{100}$	$\frac{1}{10} + \frac{5}{100}$	$\frac{9}{10} + \frac{1}{100}$	$\frac{6}{10} + \frac{8}{100}$
$\frac{1}{10} + \frac{1}{100}$	$\frac{7}{10} + \frac{6}{100}$		

$\frac{9}{10}$	$\frac{90}{100}$	$\frac{8}{10}$	$\frac{80}{100}$
$\frac{1}{10}$	$\frac{10}{100}$	$\frac{3}{10}$	$\frac{30}{100}$
$\frac{6}{10}$	$\frac{60}{100}$	$\frac{7}{10}$	$\frac{70}{100}$
$\frac{52}{100}$	$\frac{34}{100}$	$\frac{68}{100}$	$\frac{45}{100}$
$\frac{91}{100}$	$\frac{11}{100}$	$\frac{2}{10}$	$\frac{20}{100}$
$\frac{15}{100}$	$\frac{23}{100}$	$\frac{5}{10}$	$\frac{50}{100}$
$\frac{76}{100}$	$\frac{89}{100}$		

Deci-Mill Dunk

Building Fluency: comparing decimals

Materials: a pair of dice, 20 different color game markers per player (color tiles)

Number of Players: 2-4

Directions:

1. Take turns rolling the dice.
2. Choose either space on the grid named by the digits on the die Example: (4,5) or (5,4).
3. Find a number less than the number on the grid in the space you rolled. Place your marker there.
4. If there is no open space with a number less than your roll, you lose a turn.
5. Continue taking turns until one player has four in a row in any direction. If all spaces are filled with no color in a row of four, the player with the most markers on the board is the winner.

Variation/Extension: Students can create their own gmaeboard. Have students explain how they know which decimal is bigger.

6	.04	.41	.46	.59	.45	.09
5	.26	.40	.76	.51	.75	.19
4	.33	.31	.62	.85	.68	.34
3	.37	.39	.69	.87	.61	.38
2	.17	.3	.74	.52	.73	.24
1	.07	.29	.44	.58	.43	.02
	1	**2**	**3**	**4**	**5**	**6**

Deci-Moves

Building Fluency: comparing decimals

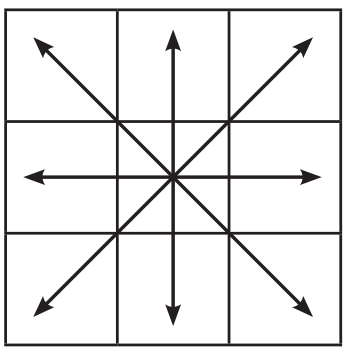
Materials: gameboard, 4 color game markers per player (clear plastic chips work well), and a coin

Number of Players: 2

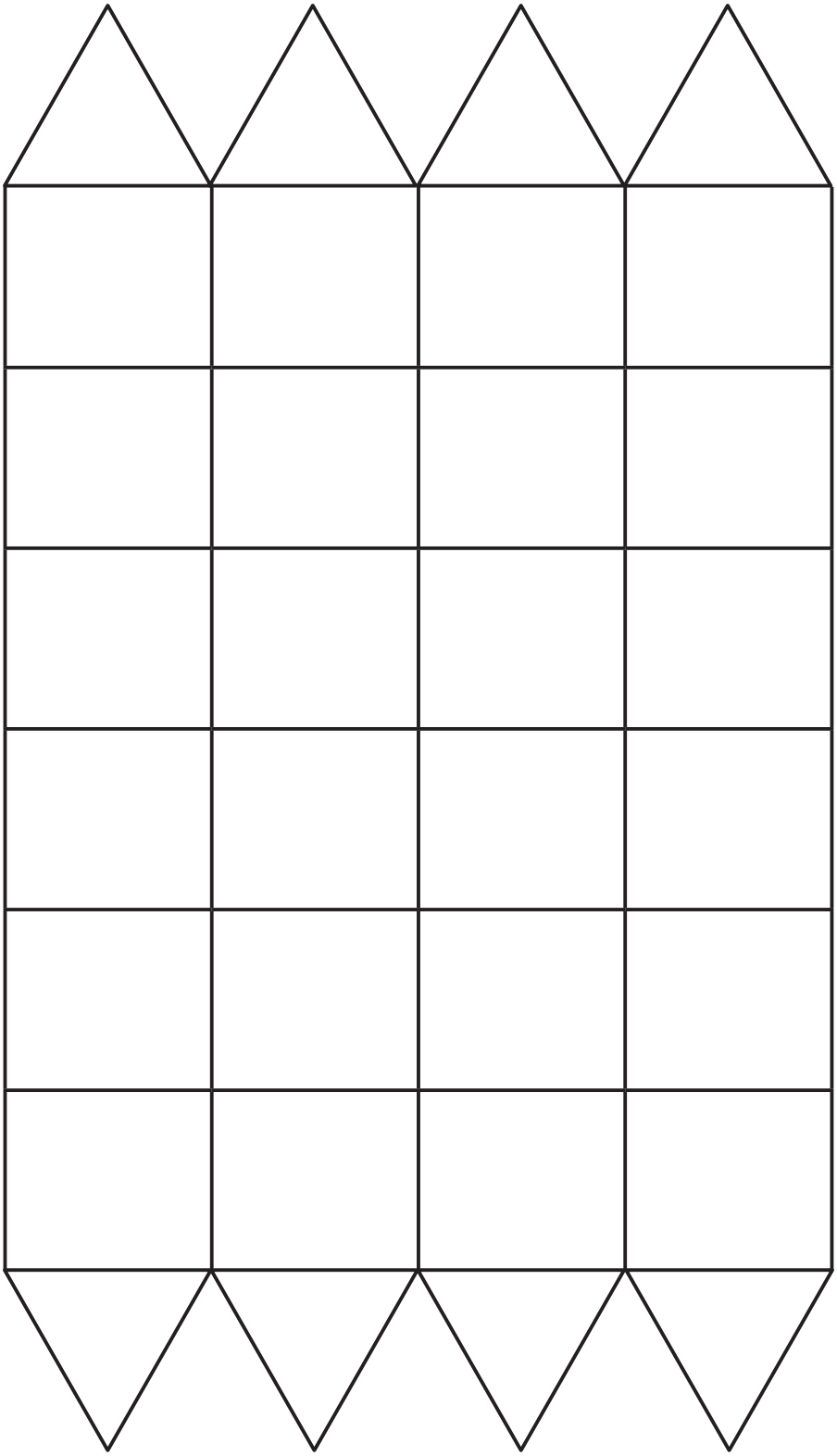
Directions:

1. Each player chooses one side of the board and places her or his game markers on the 4 triangles on that side.
2. Take turns tossing the coin.
3. If the coin comes up heads, move one of your markers to a space having a number larger than the number your game marker is on.
4. If the coin comes up tails, move one of your game markers to a space having a number smaller than the number your game marker is on.
5. You can move up or down, left or right, or diagonally, one space only (See diagram to the right).
6. If your game marker can move to a space occupied by your opponent's game marker their game marker moves back to a beginning triangle. Only one game marker may be on a space at one time.
7. If you are able to move one of your game markers, you must do so, no matter what the direction. If the only move you can make is away from a triangle on your opponent's side, you must make that move.
8. If you have no move within the rules, you lose your turn.
9. The winner is the first player to get all of her or his game markers to the triangles on the other side of the board.

Variation/Extension: Students can create their own gameboard. An additional blank gameboard is added for your conviencene.



0.7	0.8	0.5	0.2
0.62	0.88	0.60	0.15
0.09	0.67	0.72	0.02
0.4	0.81	0.3	0.27
0.04	0.75	0.1	0.91
0.49	0.05	0.57	0.25
0.31	0.95	0.13	0.65
0.3	0.4	0.5	0.6



Metric Measure Up

Building Fluency: metric units of measurement

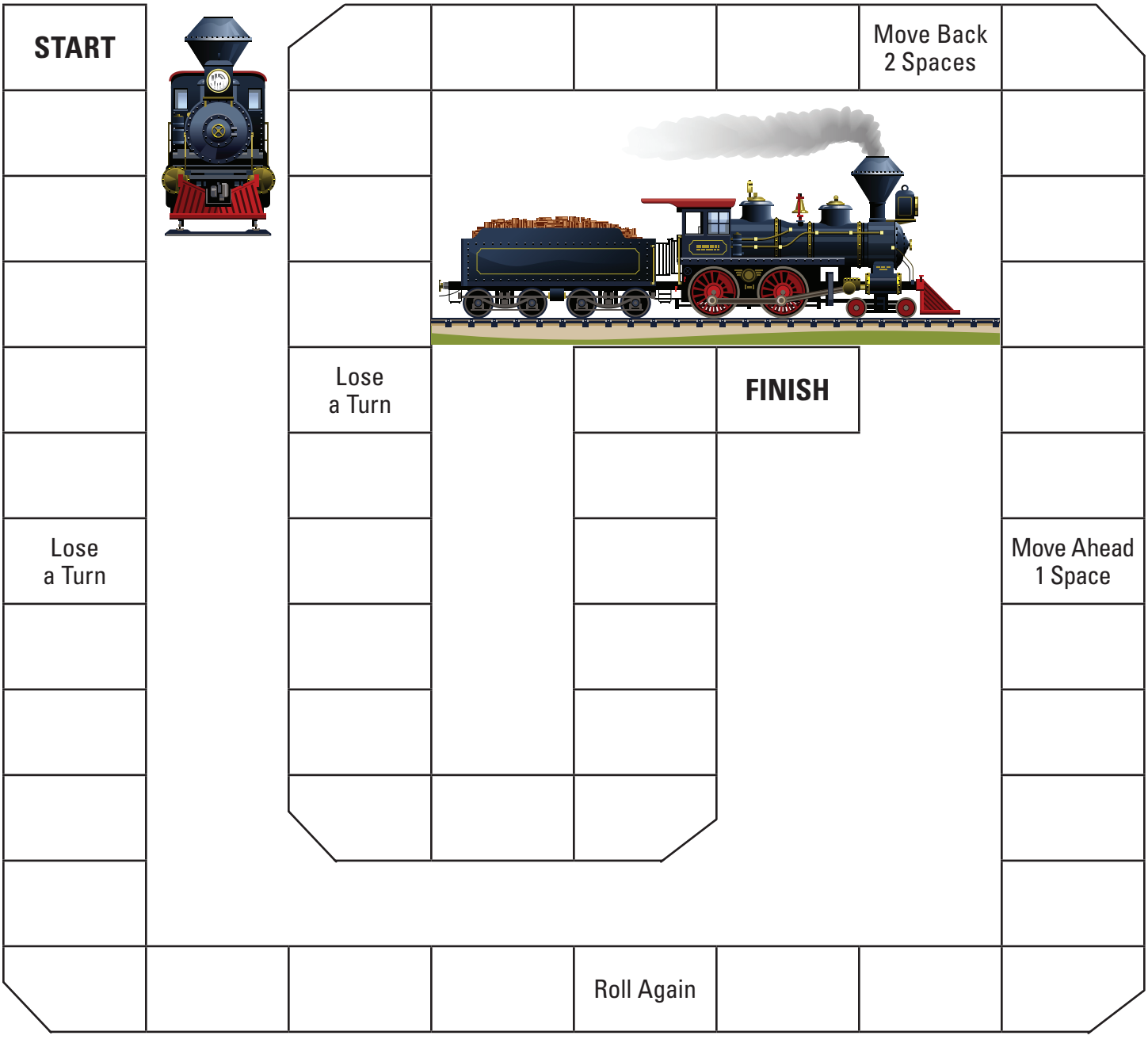
Materials: die, gameboard, game marker, and metric unit game cards

Number of Players: 2-4

Directions:

1. Each player places markers on "start".
2. Shuffle the game cards.
3. First Player draws the top card from the deck and reads.
4. The second player must fill in the blank with the correct unit of measure. If the player answers correctly, then they roll the cube and move that many spaces. If the player answers incorrectly, no spaces are moved.

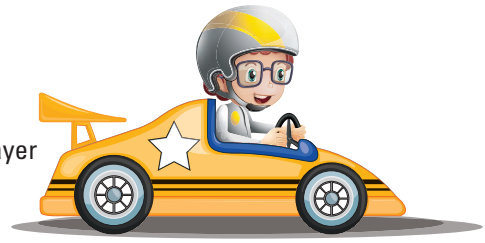
Variation/Extension: Student can add additional metric unit cards to the game. An additional page of cards are included for your convenience.



A large bottle of soda holds about two _____. liters	**An airplane weighs about 300,000 _____.** kilograms	**A necktie weighs about 62 _____ .** grams
An airplane is about 69 _____ long. meters	**A necktie is about 122 _____ long.** centimeters	**A Blue Whale weighs about 164,000_____.** kilograms
A dictionary weighs about one _____ . kilogram	**A Blue Whale is about 3,000_____ long.** centimeters	**A dictionary is about 25 _____ long.** centimeters
A broom is about 137_____ long. centimeters	**A new pencil is about 20 _____ long.** centimeters	**A broom weighs about 1,000_____.** grams

A hotdog weighs about 60 _____. grams	**A ladder weighs about ten _____.** kilograms	**A hotdog is about 15 _____ long.** centimeters
A ladder is about two _____ long. meters	**A motorcycle weighs about 220 _____.** kilograms	**A roll of 50 pennies weighs about 120___.** grams
A motorcycle is about 180 _____ long. centimeters	**A roll of 50 pennies in about 10 _____ long.** centimeters	**A medium sized dog weighs about 15 ___ .** kilograms
The keyboard on a piano is about two ____ long. meters	**A medium sized dog is about 30 _____ long.** centimeters	**A piano weighs about 240_____.** kilograms

I Get Around!



Building Fluency: build rectangles and find perimeter

Materials: pair of dice, recording sheet per player, and centimeter grid paper for each player

Number of Players: 2

Directions:

1. Player 1 tosses the dice and constructs a rectangle on the centimeter grid by marking length on a horizontal line according to the number thrown on one die and width according to the number on the other die.
2. The player then outlines the entire rectangle, colors it in and records length, width and perimeter on the score sheet.
3. After four rounds, a total score is determined by the sum of the perimeters.
4. Highest score wins!

Variation/Extension: Teacher could add the area concept to this game. Once students understand the game they can create recording sheets in their math notebook.

PLAYER 1

Round	Length	Width	Perimeter
1			
2			
3			
4			
		Total Score	

PLAYER 2

Round	Length	Width	Perimeter
1			
2			
3			
4			
		Total Score	

PLAYER 1

PLAYER 2

Raging Rectangles

Building Fluency: area and perimeter

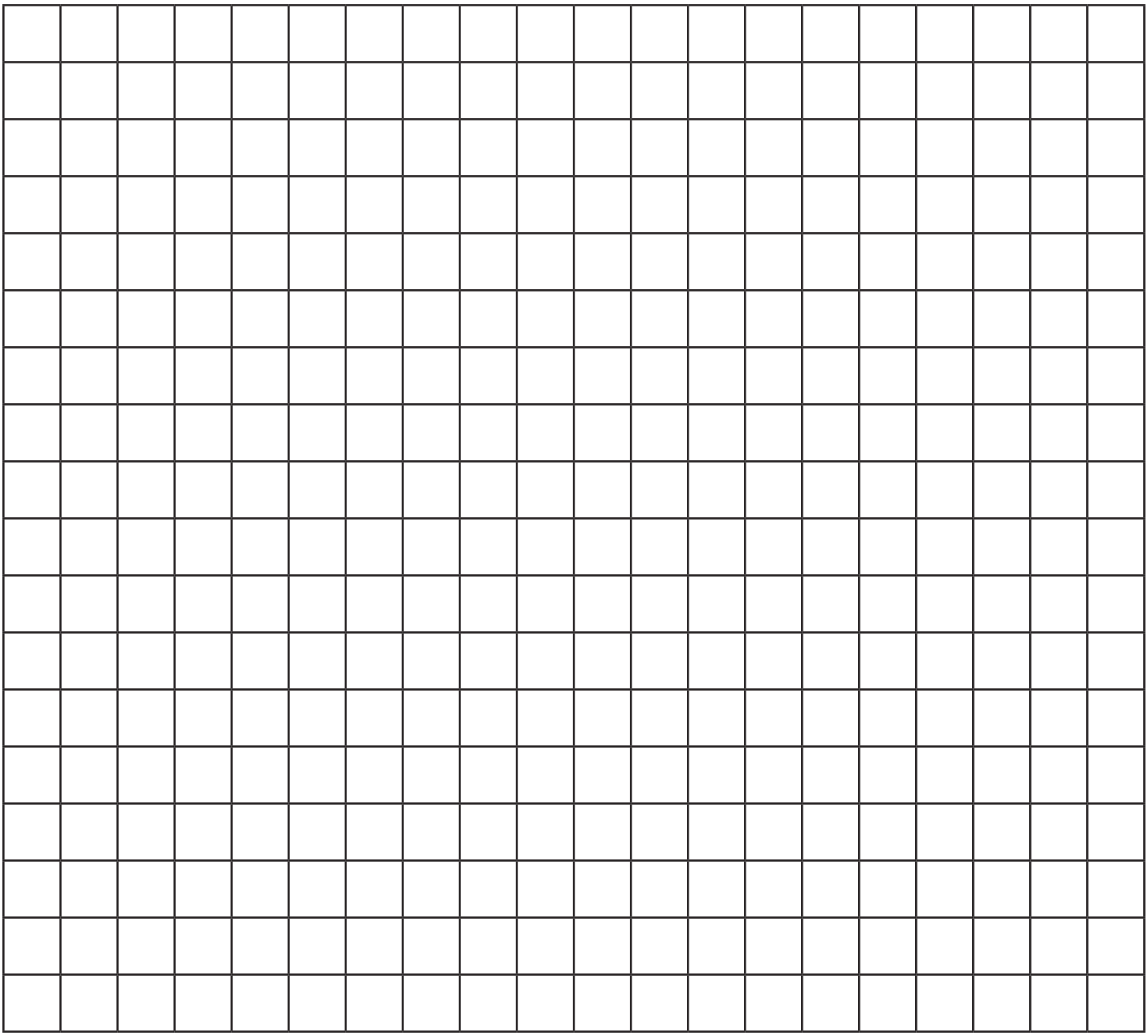
Materials: a pair of dice, gameboard, and crayons or colored pencils

Number of Players: 2

Directions:

1. In turn each player rolls the dices. A player outlines and colors a rectangle on the gameboard to match the dice. Example: a roll of 6 and 3 = a 6 x 3 rectangle or a 3 x 6 rectangle
2. Player writes an equation to represent total number of squares (area) in the center of the rectangle.
3. A player loses a turn when he rolls and cannot fit his rectangle on the gameboard. Game is over when neither player can draw a rectangle. Winner is the player with the most squares colored on the gameboard.

Variation/Extension: Teacher can change the dimensions of the gameboard or let each player have their own gameboard. They could also find the total area of their gameboard. Player with largest area wins.



End-of-the-Year REVIEW

Musical Mathematics and Social Studies (played similar to musical chairs)

Building Fluency: review of many standards

Materials: question cards

Number of Players: whole class

Directions:
End-of-the-year reviews are a part of every classroom. Here is one idea for an integrated review. Hopefully, you will add to these "factual" questions some "thought" questions which are very important but which do not fit the format of this review. You may also want to use the questions in other games. There are six pages of questions. Cut each review question out. *Number the questions to make three sets of 1-30. Place one card on each child's desk. Each student should have a numbered grid answer sheet or notebook paper numbered 1-30. (Note: you may decide to make duplicate copies of the questions so that you could have a five day review with fewer questions each day.)

Students will move around the room from desk to desk, answering one question at each stop. Music will cue students when to move. When you are ready to begin, start the music. The children move from desk to desk. When the music stops, the children should write the answer to the question on the desk where they've stopped in the appropriate grid box.

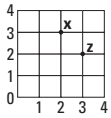
When the music starts again, the students start moving to other desks. Just like before, when the music stops, the students answer the question on the desk where they've stopped. This procedure continues until all the boxes on the grid have been filled in.

When everyone has returned to his or her own desk, go over all the questions, marking correct answers. Award points for all correct answers and have students use their calculators to determine the team's score for that round. At the end of three rounds, find the winning review team.

Note: You have enough cards to make three sets of 30 with six extras. Add your own questions to personalize the review.

Draw an example of perpendicular lines.	A room is 8 feet by 12 feet. What is the perimeter?	What holds more – a liter or a quart?
 What is the area of this figure? What is its perimeter?	Which is heavier, 5 pounds of sugar or 75 ounces of chocolate?	How many tens are there in 456?
Use the ruler to draw a quadrilateral with a perimeter of 12 centimeters.	How many hundreds are there in 2,645?	I added 15 to a number, divided it by 3 and the result was 8. What number did I begin with?
Which holds less – a pint or a cup? How many cups are in a gallon?	If each vowel is worth 25¢ and each consonant is worth 1¢, how much is "mathematics" worth?	If lunch costs $1.15, how much does lunch cost for a entire week of school?

Name something taller than two meters in height.	853,246 What digit is in the ten thousands place?	19,542 Nearest thousand?
Put this data in a line plot: 28, 34, 26, 35, 23, 28, 31, 37, 28, 35, 28, 25, 26, 35, 34	Write two fractions for this figure. 	$\frac{1}{4} = 0.25$ True or False?
Continue the pattern... 4, 16, 5, 25, 6, 36, 7, ___, ___, ___	Write the decimal number one tenth.	Cube | Tetrahedron | Cone | Triangle Which figure is not three dimensional?
How many calories are in one dozen eggs if each egg has 75 calories?	Draw two intersecting lines.	Draw an acute angle.

If it is 2:45 p.m., how many hours is it until 8:00 p.m.	Tell something that is measured in liters.	What was the time three hours and forty minutes ago? 
Mountain (Height) Mt. Sterling (5,835) Mt. Hardison (6,134) How much taller is Mt. Hardison?	33 + (65 - 5) = ?	25 ÷ 2 What is the remainder?
Which letter is at (2,3) in the grid? 	Draw a number line to represent $\frac{1}{2} \times 4$	Draw an array model to represent $\frac{3}{4} + \frac{1}{4} + \frac{2}{4}$
$3\overline{)3714}$	▲ + © = 15 ▲ x 4 = © What is the value of the ▲? What is the value of the ©?	Write a related multiplication fact for 27 ÷ 3 = 9.

Which is greater – 8 x 4 or 120 ÷ 3?	Write a related division fact for 8 x 5 = 40.	How many verticies does a cube have?
Name something about six inches wide.	Draw and label a right angle.	Give a real-world example for parallel lines.
598,076 What digit is in the thousand's place?	Draw an obtuse angle.	Which is the most southern county in North Carolina? Which is the most western county?
9004 + 56 + 825 =	A hexagon is a figure with how many sides? How many sides does a pentagon have?	Fourth grades students collected 608 cans. There were 429 juice cans. How many cans were not juice cans?

There are 82 pages in a booklet. If we produce 7 copies, how many pages will be printed?	If you round 357 to the nearest 10, what would it be?	If there are three yards of string left on the ball, how many 6" lengths can you cut?
If it is 2:00 p.m., how many hours is it until 11:30 p.m.		

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

11) _____

12) _____

13) _____

14) _____

15) _____

16) _____

17) _____

18) _____

19) _____

20) _____

21) _____

22) _____

23) _____

24) _____

25) _____

26) _____

27) _____

28) _____

29) _____

30) _____

Online Games Available

Operations and Algebraic Thinking

Operator Arithmetic
http://www.sheppardsoftware.com/mathgames/arithmetic/arithmetic.htm

Building Fluency with Standard: NC.4.OA.3

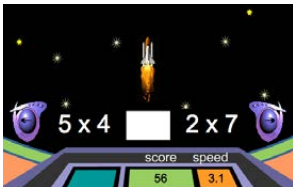
Number and Operations in Base Ten

Place Value Pirates
http://mrnussbaum.com/placevaluepirates

Building Fluency with Standard: NC.4.NBT.1

Estimation Valley Golf
http://mrnussbaum.com/estimationvalley

Building Fluency with Standard: NC.4.NBT.4



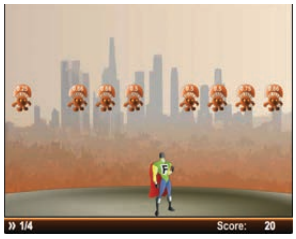
Space Racer Multiplication
http://www.mathplayground.com/spaceracer_multiplication.html

Building Fluency with Standard: NC.4.NBT.5

Number and Operations – Fractions continued

Fraction Splat
http://www.coolmath-games.com/0-fraction-splat/index.html

Building Fluency with Standard: NC.4.NF.2



Death to Decimals
http://mrnussbaum.com/deathdecimals/

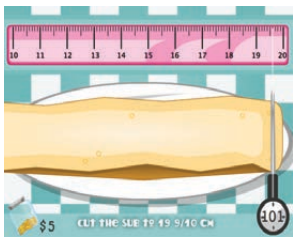
Building Fluency with Standard: NC.4.NF.7

Measurement and Data

Horrendous Soup

http://mrnussbaum.com/soup

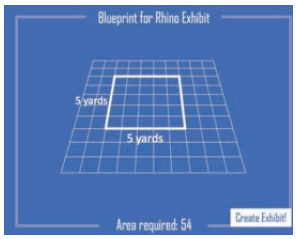
Building Fluency with Standard: NC.4.MD.1



Sal's Sub Shop

http://mrnussbaum.com/sal

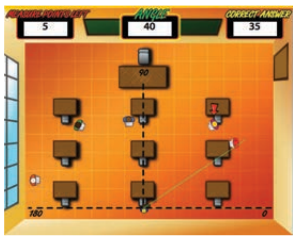
Building Fluency with Standard: NC.4.MD.1



Zoo Designer

http://mrnussbaum.com/zoo

Building Fluency with Standard: NC.4.MD.3



Anti-Homework Elementary

http://mrnussbaum.com/antihomework

Building Fluency with Standard: NC.4.MD.6