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Math File Folder Games

A mathematical game is a fun and challenging context in which students interact cooperatively or competitively to achieve a defined goal within a specified set of circumstances while learning or practising math skills.

Math games are a great tool to involve parents, guardians, siblings and other important people in the child's life. It is a great way to facilitate the home and school connection.

Benefits of Math Games:

1. Allows students to apply what they know
2. Creates a positive mathematical environment.
3. Shared experience as we get to know each other, reduces prejudice toward other students.
4. Are highly motivational.
5. Provides practice in specific skills.
6. Utilizes student problem solving competence.
7. Increases ability to communicate. (Because the game uses math vocabulary)
8. Increases ability to reason mathematically, strategically.
9. Enhances students perception of the value of mathematics.
10. Develops self-confidence.

Games:

- People of all ages enjoy games
- All games reinforce and review concepts
- Help students recall ideas
- REVIEW

Enjoy!

www.mathfilefoldergames.com

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Fraction Switch

Fraction Switch is a challenging game that gives students mental agility when dealing with fractions. Even though the cards are drawn by chance, it takes strategy to figure out where numbers can be changed out in numerators or denominators to ensure that the final result is three fractions ordered from least to greatest.

Notice that the face cards have been taken out of the deck. You may want to give students plenty of scratch paper to help them as they are playing the game. For some fractions it will be obvious to them which is larger.

For example, 1/7 is smaller than 1/2. Also, 2/3 is greater than 1/3. Where it may not be clear to them is with fractions such as 5/6 and 7/8, which is larger? This may not be immediately apparent but when they change the fractions to 20/24 and 21/24 respectively then it's apparent that 7/8 or 21/24 is larger.

Another adaptation of this game is to use the face cards to represent the number 10. In other words, if either a Queen, Jack, or King is selected, that card would represent 10.

Another interesting challenge is to use points to score the game. If each correct sequence of three ordered fractions yields a score of 5 points, then add 2 points every time there's a fraction made up from one suit of cards, such as a 2 of diamonds in the numerator with a 4 of diamonds in the denominator.

In this way, even kids that don't win an entire sequence will make points for a fraction. This will introduce more strategy into the game as well since students will be trying to think of ways to construct the fractions from the same suit of cards.

Play this game with teams to try something different in a classroom setting. Have three members on each team and have each student be responsible for just one fraction. This will create a lot of lively discussions among students in terms of which fraction is greater..a great cooperative learning strategy!“

Common Core Mathematical Standard

3.NF Develop understanding of fractions as numbers.

4.NF Extend understanding of fractional equivalence and ordering.

Fraction Switch

Objective: Compare and/or order proper fractions and decimals to hundredths [5.N(NC).9].

Materials: Deck of cards (no JQK, A=1).

Players: 2 players.

Rules:

[1] To begin the game, shuffle the cards well, and deal six cards to each player face down. Without looking at the cards the player arranges the six cards in a pattern as shown at right.

[2] Cards 1 and 2 form a fraction with 1 in the numerator and 2 in the denominator, likewise 3 and 4 form a fraction, and 5 and 6 form a fraction. The player may now turn the cards over.

[3] The remaining cards are placed in a pile face down on the table.

[4] On a turn a player draws the top card from the pile on the table, and if so desired exchanges it for one of the cards in his/her fractions. One card is then discarded.

[5] The first player to build three proper fractions (numerator is less than denominator) in order from least to greatest (left to right) is the winner.

[6] If the pile of cards becomes exhausted before a player finishes building the three fractions, simply shuffle the discard pile to refresh the deck and continue play.

Adaptations:

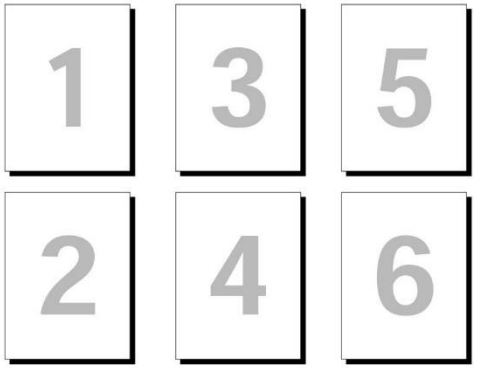
[1] For a much more significant challenge play the game with all of the cards face DOWN. Players may not turn their cards over until they believe that all cards are correctly sequenced!

[2] Allow improper fractions (denominator greater than numerator).

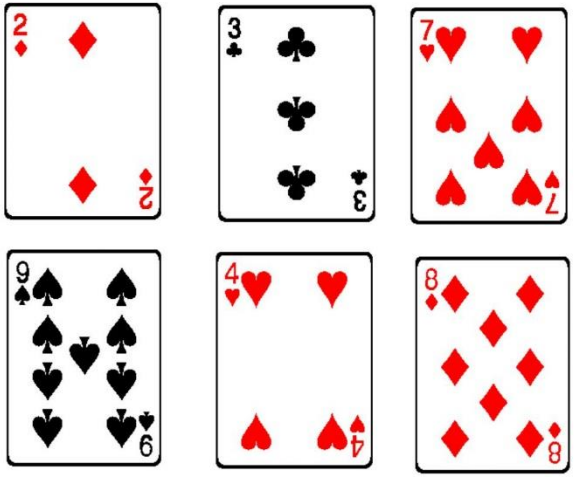
[3] Instead of sequencing the fractions, have players build three equivalent fractions.

Fraction Switch

Example: Arrange your cards like this -



Example: A winning hand!



Fraction Relay

The interesting game of Fraction Relay gives students the opportunity to use manipulatives to create fractions. To move through this game with ease, students will need to have a solid understanding of fractions, place value, and how manipulatives can be used to represent place value.

In addition to these mathematical skills, students will also need to use nonverbal communication skills and the ability to work efficiently with their team members in order to build their fractions more rapidly and successfully than the opposing teams.

By displaying the hi/low card the team leader guides the other members of the team to create the correct fraction. He or she isn't allowed to tell the team what the fraction is. By using this ""hi"" and ""lo"" method to determine whether the team is properly constructing the fraction, a lot of excitement gets added to the game as team players work hard to make sure that their fraction is built more quickly than the opposing team.

The leadership role is important here. A leader who doesn't clearly communicate whether team players are getting closer to the correct fraction will cause the rest of the team confusion.

After teams build two fractions, a variation of this game you may want to try is to have the teams build the sum or difference of their fractions. The first team who gets the correct sum or difference wins that particular relay.

You may want to set up the classroom so each team can't easily view what the other team is doing.

Common Core Mathematical Standard

3.NF Develop understanding of fractions as numbers.

4.NF Extend understanding of fractional equivalence and ordering.

Common Core Standards for Mathematical Practice

4. Model with Mathematics

Note:

Even though the game doesn't explicitly use ordering of fractions, I think that standard makes sense here. As a team member uses the high/low card, students will have to figure out what to do to make their fraction larger or smaller than it currently is, so order is implied.

FRACTION RELAY

Objective: Represent and describe proper fractions [5.N(NC).7].

Materials: Base Ten Blocks (small set for each team), Hi-Lo cards, 6 to 10 fraction cards.

Players: 2 or more teams.

Rules:

[1] Before the game can be played the Hi-Lo cards and the fraction cards must be made. The Hi-Lo cards are simply index cards with the words “too high” on one side and “too low” on the other. The fraction cards are index cards with a fraction written on one side. Fractions should be of the form $\frac{x}{1000}$. For example, $\frac{156}{1000}$ or $\frac{24}{1000}$.

[2] One member of each team is appointed to start. This person comes to the front of the class with the other starters from each team. The teacher shows these players the first fraction card simultaneously.

[3] These players return to their teams and help their teammates build this fraction using the base ten blocks. This player may not talk, but may only give clues by showing either side of the Hi-Lo card while the other teammates work with the base ten blocks.

[4] Once the team has built the fraction, another player comes to the front and tells the teacher the fraction built. If correct, s/he is told the next fraction to be built. This player now takes the HI-Lo card and provides clues to his/her team.

[5] In this way the team that first works its way through the whole set of fraction cards wins.

Adaptations:

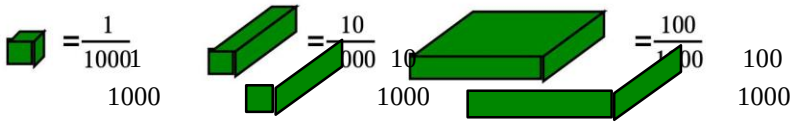
[1] Instead of limiting the fractions to the form $\frac{x}{1000}$, use fractions of the form $\frac{x}{10^n}$, such as $\frac{7}{10}$, $\frac{56}{100}$, or $\frac{854}{1000}$.

[2] Play in several rounds where every team works on the same fraction at the same time. The team which wins the greatest number of rounds wins the game.

FRACTION RELAY

Fraction Cards

$\frac{455}{1000}$	$\frac{12}{1000}$
$\frac{886}{1000}$	$\frac{3}{1000}$
$\frac{500}{1000}$	$\frac{352}{1000}$



Half N Half

This interesting Half-n-Half game cleverly uses cards and pencils to construct both proper and improper fractions. The underlying concept that kids will be learning is fractional equivalency. Something about using the playing cards makes this game a lot more fun than just writing fractions down on a piece of paper!

The ace card is used as the number 1. The face cards and the number 10 cards have been removed to keep the numbers simpler for kids who are still in the process of getting comfortable with fractions.

Make sure that kids understand that they can cover over any of the cards that are in their fractions. The card that's underneath will remain out of play. They can also put a drawn card underneath another card if they don't want to use it, thereby keeping that card out of play.

There are so many potential variations you can add to this game. Keep track of new rules you try to see how they play out with different numbers of players. One potential alteration is to allow the students to build the fractions in any order they want to instead of the 1/2, 1, 1 1/2 progression.

After kids have played the game at this level for awhile you may want to step up the challenge to larger fractions.

Another interesting twist to try would be to introduce the Queens back into the deck. If a player draws a Queen he or she can steal one of the other player's fractions and the underlying cards as well to use as he or she pleases!

Common Core Mathematical Standard

3.NF Develop understanding of fractions as numbers.
4.NF Extend understanding of fraction equivalence and ordering.

HALF N HALF

Objective: Demonstrate and explain the meaning of improper fractions and mixed numbers [6.N(NC).9].

Materials: deck of cards (JQK and 10 removed), pencil.

Players: 2 or more players.

Rules:

[1] In this game the pencil will be used as the fraction line, that is, the line which separates the numerator from the denominator. Ace = 1.

[2] The youngest player goes first and play passes to the left.

[3] The objective of the game is to collect and arrange cards to construct a value equal to $\frac{1}{2}$, then 1, then $1\frac{1}{2}$ (mixed), then $1\frac{1}{2}$ (improper). The first player to finish wins.

[4] To start the game shuffle the cards well and place them face down in a stack to create a draw pile.

[5] On a turn a player will draw one card and place that card in any one of five locations indicated at right. A card may be used to start a new place value, or it may be placed above an existing card to cover it, or beneath an existing card (which essentially discards it).

[6] A card which is covered by another card remains out of play until the end of the game. If the draw pile is exhausted before any player makes it to the end, the player closest to $1\frac{1}{2}$ wins.

Adaptations:

[1] Create a discard pile as well and have players return unused cards to the discard pile. On a turn a player may select between the discard pile and the draw pile.

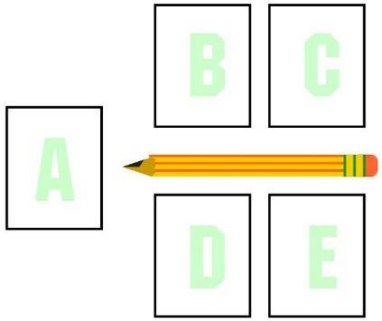
[2] Extend the game to build much larger fractions as well.

[3] Play the game as a form of solitaire. What is the fewest number of cards you need to turn over, one at a time, to build the four fractions?

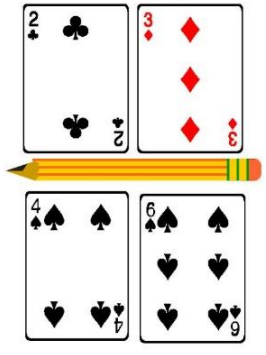
HALF N HALF

Examples

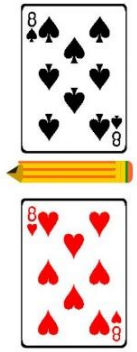
Cards may be played in any one of the five locations shown, although a player does not need to have a card in each of the five locations to complete any given fraction.



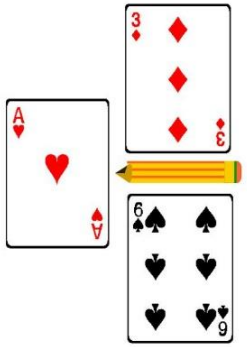
Some models which built in turn would win the game:



$= \frac{1}{2}$



$= 1$



$1\frac{1}{2}$

Flip

The Flip Game gives students the opportunity to understand and connect together the concept of fractions, how to convert the original fraction to an equivalent fraction with 100 as its denominator, and how to convert those fractions with 100 in the denominator to a percentage. It does this in a very clever way.

Teachers and parents have spent all this time showing students how to reduce fractions and now we are asking them to convert to a fraction with a denominator of 100 for a completely different purpose. The rationale may seem foreign to students. By the time students play this game a few times these equivalencies will become crystal clear.

First kids will use the luck of the spinner to determine the fraction they use. Once they spin and their fraction is selected they need to count out 100 chips and place them in rows depending on the denominator of the fraction. So, in other words, if they spin to 3/5, they will be organizing their chips into 5 rows of 20 chips each.

In order to complete their percentage equivalency they'll need to understand that they have to flip over 60 of those chips so they show red. Those 60 chips will represent a percentage of 60%. In other words, when those 60 chips are flipped over to show red this means that 60% of the 100 chips are red. Therefore, the fraction 60/100 is equivalent to 3/5.

Another adaptation of this game is to use a 12-sided die so that students can turn over their chips faster. Be prepared to answer these questions: What happens when the fraction's denominator isn't a factor of 10? Can I still convert a fraction such as 1/3 to a percentage?

Common Core Mathematical Standard

6.RP Understand ratio concepts and use ratio reasoning to solve problems.

Common Core Standards for Mathematical Practice

4. Model with mathematics.

FLIP

Objective: Demonstrate and explain the meaning of percentage concretely, pictorially and symbolically [6.N(NC).11].

Materials: Flip spinnermat, overhead spinner, 6-sided die, 200 two-sided chips

Players: 2 players.

Rules:

[1] To begin the game, each player twirls the spinner to determine his/her fraction that must be converted to a percentage.

[2] Each player takes 100 chips, and arranges them into as many rows as the value in the denominator of the fraction which was spun, all with the white side up.

[3] Players now take turns rolling the die. A player may turn over as many chips to reveal the red side as determined by the value rolled. For example, if a player rolls a 5, s/he can turn over 5 chips providing they are all within the same row.

[4] Each row must be completed before the next row can be started.

[5] The first player to convert his/her fraction to a percentage using the manipulative model is the winner.

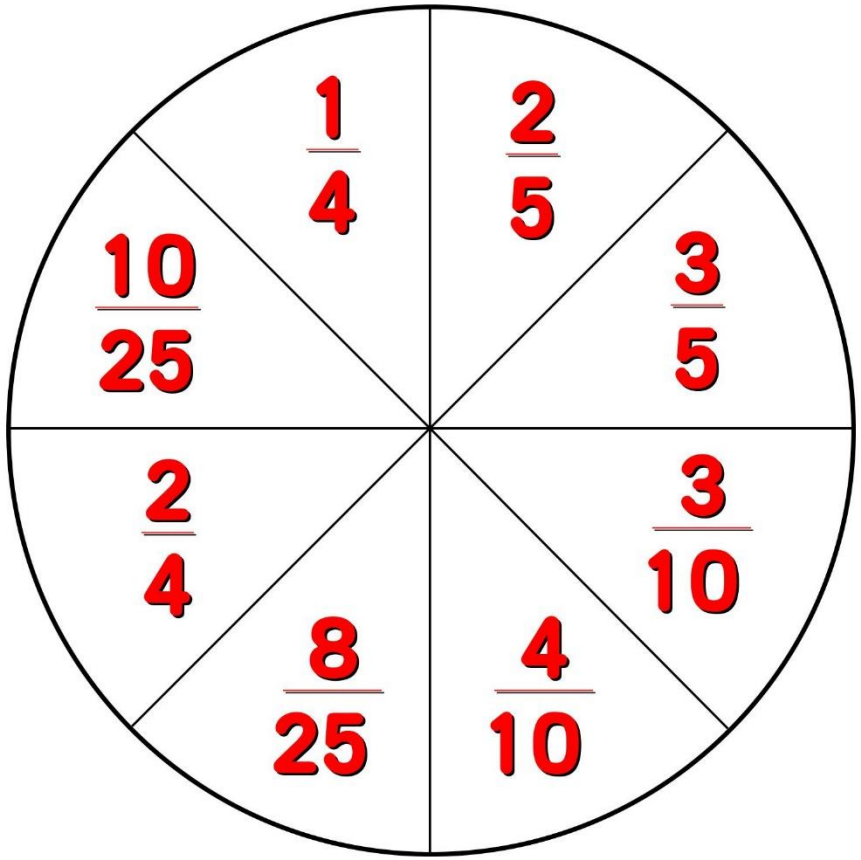
Adaptations:

[1] Add this rule: a player must complete each row with an exact roll before starting the next row.

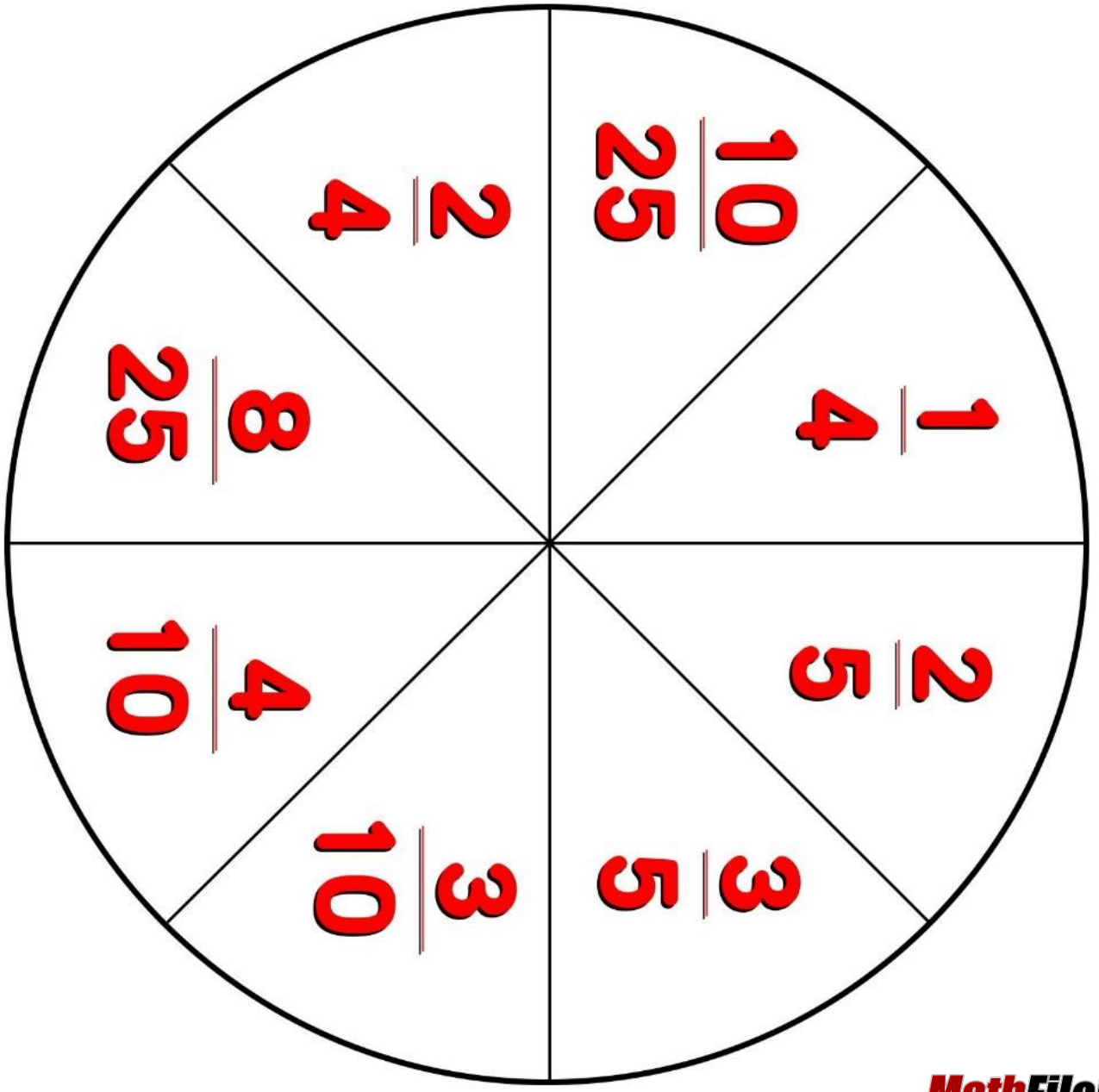
[2] Add this rule: if a player can not use a roll, then his/her opponent can turn over that many chips instead and the turn is passed.

[3] Omit the target value. Simply let players roll the die and turn over as many red chips as the value rolled. Players list as many equivalent fractions for each percentage modeled. When one player reaches 100% the game ends. The player who has found the greatest number of equivalent fractions for their related percentages is the winner.

FLIP



FLIP



FLIP

FLIP

All the Same to Me

The All The Same to Me Game reinforces students' understanding of the equivalence between improper fractions and mixed numbers. It's quite challenging to come up with four versions of the same improper fraction in different forms and especially when the denominators are not the same.

To make matters even more challenging, there's a lot of strategy needed to come up with the best interpretation of the roll of the dice. Students will have to choose the best possible way to build their fractions as quickly as they can.

Most kids will need some scratch paper as they work out fractional equivalencies when the denominators of the fractions don't end up being the same.

Pay close attention as students are forming their answers and you can test their knowledge. Do they really understand that 8/7 is exactly the same as 1-1/7? Is it clear to them that 5/3 and 10/6 represent the same exact fraction? Can they also see that the mixed number forms of these numbers 1-2/3 and 1-4/6 are also the same?

If you feel that students are still having too much trouble with fractions there's another classroom strategy you can use with this game. Give each student a game board with just one fraction already filled in for him or her. Make sure all four gameboards have completely different fractions that are not equivalent to each other. Then write all the different answers for four All the Same to Me gameboards on the board in advance but make sure they are all mixed up. Students will then need to find and fill in their answers from those that exist on the board.

With larger classes you can break students into teams and have one team member responsible for going to the board and circling a fraction they've taken. It doesn't mean that another opposing team member can't circle the fraction as well, but someone is going to be incorrect!

In the meantime, it gives you time to circulate in class so you can get a handle on the difficulties they're having.

Common Core Mathematical Standard

3.NF Develop understanding of fractions as numbers.
4.NF Extend understanding of fraction equivalence and ordering.

ALL THE SAME TO ME

Objective: Demonstrate and describe equivalent mixed numbers and improper fractions [7.N(NC).5].

Materials: All the Same to Me game board, pencil, three 6-sided dice.

Players: 2 players or more players.

Rules:

[1] Each player needs his or her own game board. The oldest player gets to go first.

[2] The objective of this game is to build four equivalent mixed and improper fractions in the boxes provided.

[3] On a turn a player will roll all 3 dice. The player may use any one value rolled, the sum of any 2 values, or the some of all 3 values. This value is placed in one of the boxes on the gamboard. With the following dice the player could make 1, 5, 6, 7, 11 or 12.

[4] Play passes to the left.

[5] The first player to build four equivalent fractions is the winner.

[6] If on a given turn the player cannot make a value which s/he can use the player simply skips that turn and play passes to the left.

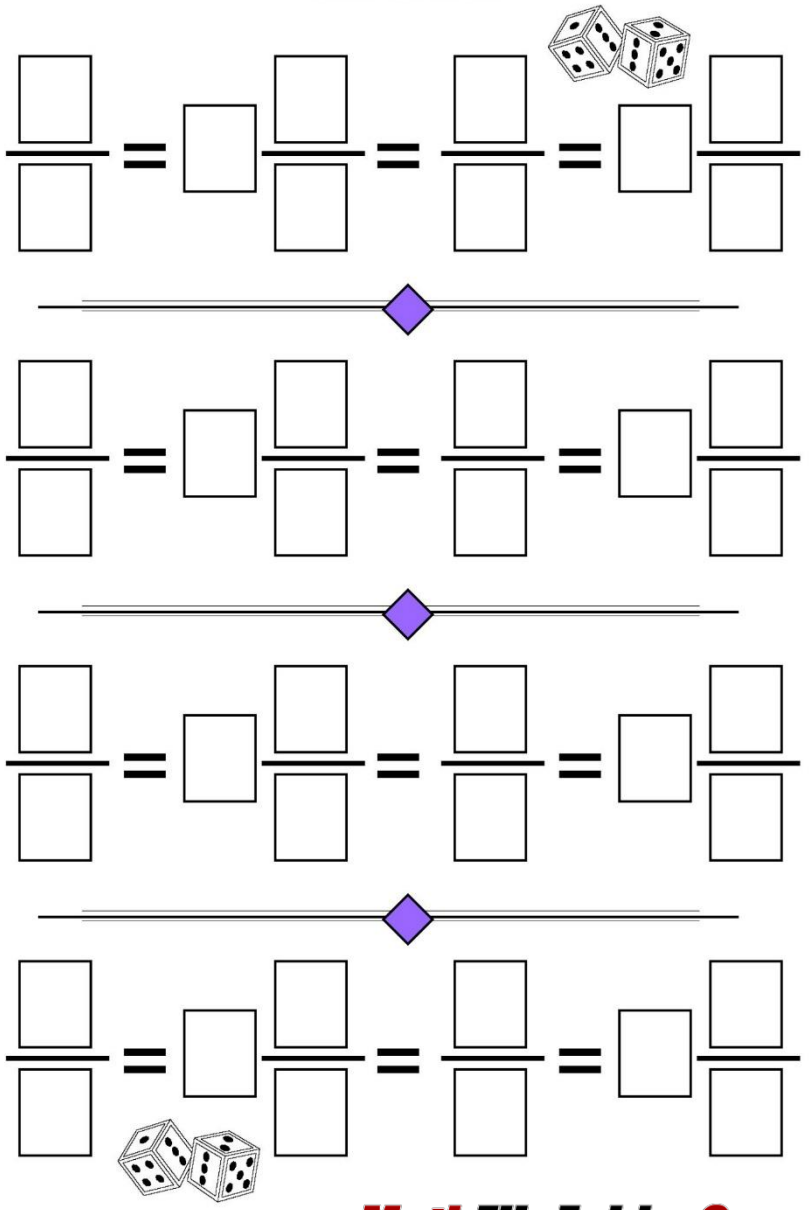
Adaptations:

[1] Begin the game by rolling two dice. The larger value goes in the numerator of the first fraction, the smaller values goes in the denominator. Continue to play as before.

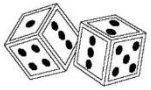
[2] Allow players to use the difference between any two dice in any combination. In the example above this would allow 4 and 10.

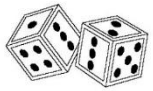
[3] Permit the use of fractions which reduce to a whole number. For example 8/4 = 2.

ALL THE SAME TO ME

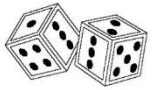


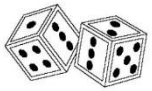
ALL THE SAME TO ME





ALL THE SAME TO ME





Percentage Snap

The Percentage Snap game gives kids the opportunity to test their mental math when it comes to fraction-percentage equivalencies. This is a game of speed and mental agility. Some fractions will be easy for kids to convert quickly. An ace picked first, followed by the two of diamonds, will yield 1/2 or 50%. But a fraction such as 2/7 will be more difficult to figure out or answer quickly without the use of a calculator.

For students who are having trouble with fractions, it might be best to provide a rule at the beginning that says of the two cards turned over the one with the smallest number will be used for the numerator. In that way, you can ensure that they are working with proper fractions to begin the game.

Another adaptation of this game is to have students turn over just one card for the numerator. You pick a number for the denominator that you don't share with them and give them the percentage. Then have students pick the denominator out of the deck.

For example, suppose they pick the number 3 when they turn over a card. You then give them 33.3%. The card they will be seeking will have 9 on its face. If the students both pick the correct number they tie, but if not the student with the correct answer yields one point.

Once students have developed some agility and seem to know most of the standard percentage and fraction equivalencies, you can try splitting the class into teams. Get some physical motion into the game by having some possible percentages listed on the board. As cards are turned over, the team must decide what the percentage equivalency is and then run to the board and circle it before their opponents do!

Common Core Mathematical Standard

6.RP Understand ratio concepts and use ratio reasoning to solve problems.

Percentage Snap

Objective: Estimate and calculate percentages [7.N(NO).18].

Materials: Deck of cards (JQK removed, A=1), calculator.

Players: 2 players.

Rules:

[1] To begin the game, shuffle the cards and split them into two equal sized piles. Each player takes one half the deck and holds them face down in his or her hand.

[2] At the same time, each player turns over one card and places it on the top of the table.

[3] Each player now estimates the percentage equivalent to the fraction formed by the two cards. For example if the cards were a 2 and a 6, the players would estimate a value as close as possible to 33.33%.

[4] The first player to call a value gets first choice, the second player must pick a different value, or concede.

[5] The closest estimate to the actual % (use a calculator to calculate actual percentages if desired) wins those two cards.

[6] Play continues until both players have exhausted their decks. The player with the most cards at the end of the game wins.

Adaptations:

[1] Play the same way, but let the fractions created all be improper fractions, i.e., the larger number over the smaller.

[2] Play the same way, but instead of calling out percentages, call "SNAP" every time the fraction built has a percentage equivalent to any one of the following:

25%, 33%, 50%, 67%, 75% or 100%.

[3] Include the Q in the set, and let Q = 0. Proper fractions only!

Ordered Fractions

Ordered Fractions is a game that requires a thorough understanding of what a fraction means and represents. In order to win this game consistently, students will need to understand how to quickly and fluidly change their fractions to other equivalent fractions with different denominators. For kids who are just beginning their work with fractions you may want to limit the numbers for the denominators of the fractions. Keep it simple to start with so that you can diagnose exactly how much they understand about fractions. You may even want to begin with the simplest possibility, such as using a specific denominator that you give them and having them roll just for the numerator. This is a very challenging and exciting game but they'll get frustrated if their skill level can't keep pace with other players.

Once they've mastered the game with just one denominator, you may want them to use 6-sided dies for both the numerator and denominator. They'll need plenty of scratch paper to figure out: Which is larger 2/3 or 5/6? (just one denominator change); Which is larger 4/6 or 1/3? (just one denominator change); Which is larger 3/5 or 2/3? (two denominator changes). Once you see that they've become proficient at finding equivalent fractions and ordering them using the same denominators, you can move on to a 12-sided die for the numerators and a 6-sided die for the denominators.

Don't rush the process. This is a fascinating game that will give them an incredibly thorough understanding of fractional equivalents. After they've mastered the denominators 1-6, it's time to step up the challenge and have them work with 12-sided dies for both the numerators and denominators.

In addition to the fluidity with which players need to go back and forth among equivalent fractions, there's an enormous amount of strategy needed for them to figure out where they should best place the numbers they are presented with when they roll the dies. There are lots of opportunities for them to see patterns within different groups of fractions, such as fractions that have even numbers as denominators or fractions whose denominators are multiples of each other.

After kids have played this game for an hour or more, it's a great idea to record the winning strings of fractions on a blackboard or somewhere where kids can look at them and review them.

Common Core Mathematical Standard

3.NF Develop understanding of fractions as numbers.

4.NF.1 Extend understanding of fraction equivalence and ordering.

4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. 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, e.g., by using a visual fraction model.

This game also is a **iOS App** that you can play, read more about it **here**.

Ordered Fractions

Objective: Define, compare and order any rational numbers [8.N(NC).3].

Materials: Fraction Derby game board, pencil, 12-sided die.

Players: 2 players.

Rules:

[1] The objective of this game is to build 5 fractions which are properly sequenced from smallest to largest.

[2] On a turn a player will roll the die and place the value rolled in any one of the remaining boxes on his/her game board.

[3] After a player has rolled 10 times, the player crosses out the fewest number of fractions such that the remaining fractions are all in ascending order. Improper fractions are permitted.

[4] The player with the greatest number of remaining fractions wins.

[5] A player must enter the number rolled in a location of the game board on every turn without exception.

[6] Two adjacent fractions may not equal each other. At the end of the game one will have to be crossed off.

Adaptations:

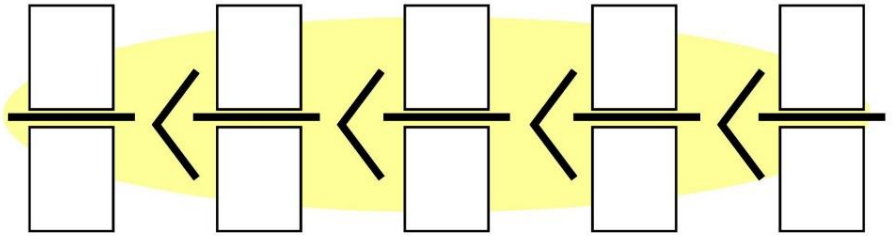
[1] A player may not enter a number unless it creates a fraction that fits within the sequence established. The first player to complete his or her game board is the winner.

[2] Allow each player one "free pass" to not use a number rolled on a turn if it creates a fraction which does not fit in the sequence.

[3] Play as a group of 3 or more players on one game board. If a player cannot enter the value rolled so as to fit the sequence, that player drops out of the game. The last player in the game wins.

Ordered Fractions

Player:



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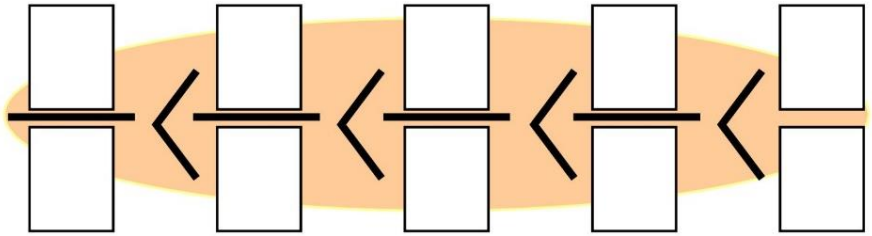

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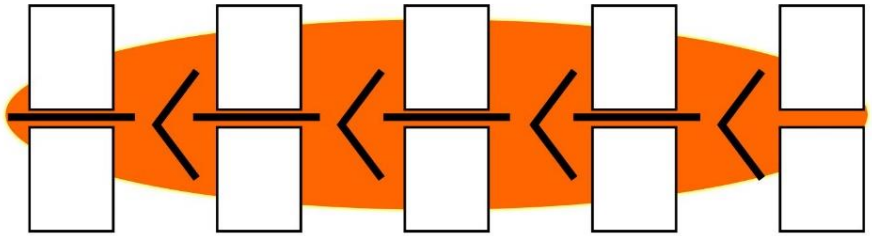

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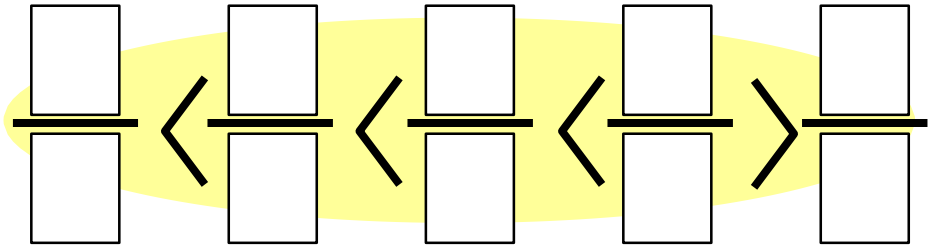

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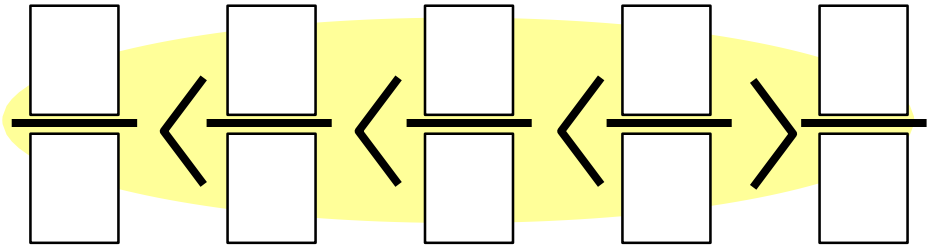

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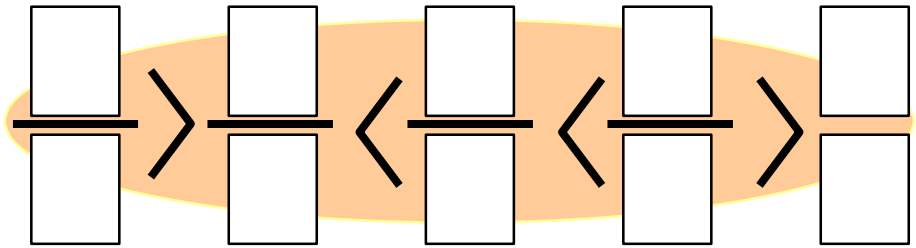

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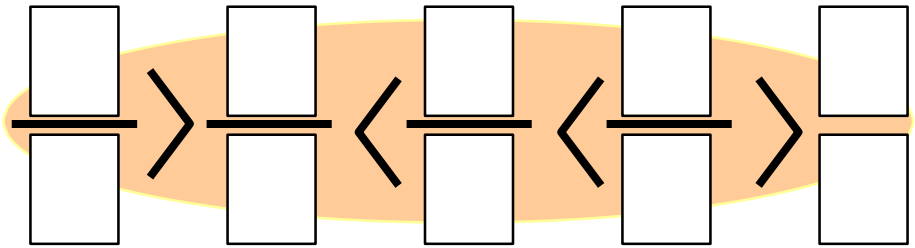

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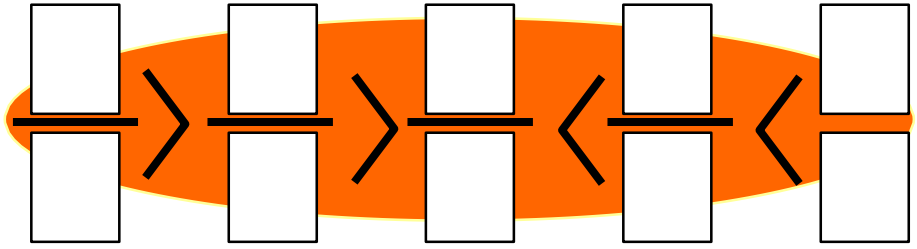

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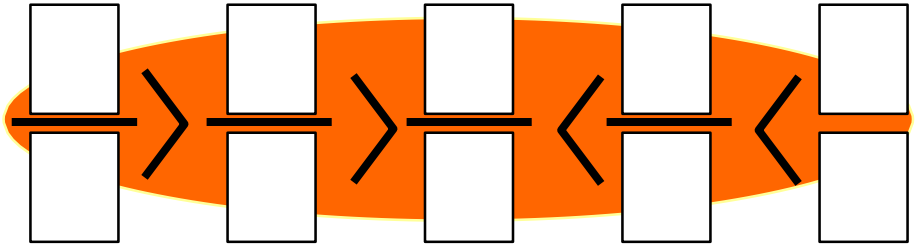


Unlucky Zeros

Unlucky Zeros is a great game for teaching the concept of multiplicative inverses. The terms multiplicative inverse and multiplicative reciprocal, which mean the same thing, are difficult for students to remember and understand when they're first introduced in a classroom presentation. However, playing a game like Unlucky Zeros can help kids discover for themselves what happens when inverses are multiplied against each other. Essentially, the inverses "cancel each other out" to give the final product of 1.

As students play this game, another helpful side benefit is that they will get practice in reducing fractions. For example, 2/4 x 2/1 = 1 because the fraction 2/4 is the same as 1/2. Of course, students can still multiply across and get the answer 4/4, which will still yield the same answer of 1.

If a student rolls a zero (the 10-sided die has numbers from 0-9), he or she will need to strike off a star at the bottom of his or her gameboard. Once a student has received three of those "unlucky zeros" he or she is out of the game!

Students will understand and assimilate the topic of multiplicative reciprocals much more readily after becoming more familiar with what that term really means through the course of this game. Having fun with a game takes the scary factor out of math!

Another interesting way you can present the material here is to phrase it differently. For example, 1/3 of 3/1 is 1; 1/5 of 5/1 is 1; 1/6 of 6/1 is 6. Likewise, 6 times 1/6 is 1; 2 times 1/2 is 1, etc. Being able to translate these phrases into viable equations is one of the first steps in understanding algebra.

Common Core Mathematical Standard

7.NS Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

UNLUCKY ZEROS

Objective: Demonstrate concretely, pictorially and symbolically that the product of reciprocals is equal to 1 [8.N(NC).3].

Materials: Unlucky Zeros Gameboard (one per player), one 10-sided die.

Players: 2 or more players.

Rules:

[1] On a turn a player rolls the die and places the value rolled in one of the blank spaces. Play passes to the left.

[2] A player does need to use a number if s/he prefers not to. A number may only be used if it contributes to building a true equation.

[3] If a player rolls a zero on a turn, the player must strike off one of the stars at the bottom of the gameboard.

[4] At the point any player crosses off his/her third star, that player drops out of the game.

[5] When the last player drops out of the game, all players count all of their completed equations. The player with the greatest number of completed equations is the winner.

[6] Players may start a second or subsequent equation without completing a given equation, i.e., a player can have any number of equations "on the go" at any time.

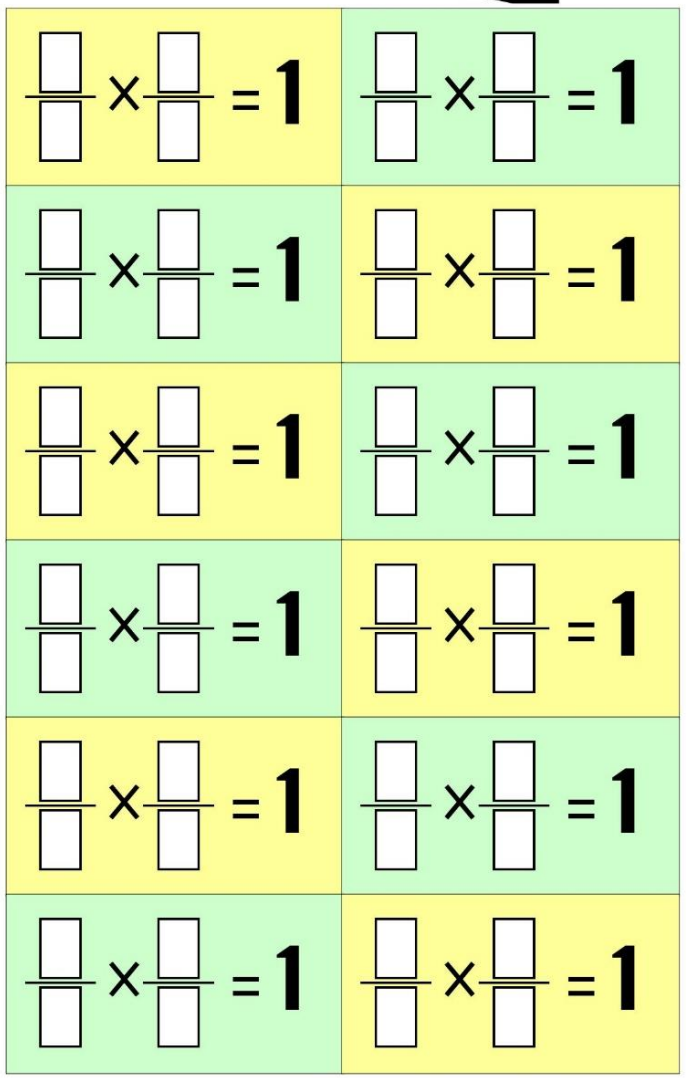
Adaptations:

[1] Limit the number of equations that a student may have on the go at any one time.

[2] In order for an equation to count, it must be unique. In other words, if another player has that equation it cannot be counted toward the game total. If the player has more than one of the same equation only one counts toward the total in the game.

[3] Specify that the zero on the die is treated like a wild card, and can represent any value the player chooses. The first player to complete his or her card wins.

UNLUCKY ZEROS



UNLUCKY ZEROS

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Zeros: ★ ★ ★

UNLUCKY ZEROS

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UNLUCKY ZEROS

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