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At All Learners Network, we know that games are a powerful tool in the math classroom. Students and educators alike can easily name some of the benefits of playing games during math class:


- Games are fun and social.
- Games are engaging.
- Games allow for strategy development.
- Games reinforce social emotional skills.

Some games allow students to be pattern seekers and discover strategies that take advantage of those patterns. In “Don’t Break the Bank” for example, students who attend to patterns will realize that building with dimes first may help get them closer to 100 without going over.



Don't Break the Bank!

Build place value understanding of two digit numbers

2

Players

Set Up:

Materials/Set up

Paper/Pencil
1 die
20 pennies and 20 dimes
20 small ten frames

Goal:

Each time the die is rolled, you can take that number of pennies or dimes. How close can you get to 100 cents without going over?


Play:

Each Player:

Draw a t-chart with 2 columns and 7 rows. Write 10 cents and 1 cent as the labels for each side of the t-chart.

Each Player:

Roll 7 times. You can choose to take pennies or dimes for each roll. Keep track of your dimes and pennies on your t-chart. The goal is to get as close to 100 cents as you can without going over.



The game ends at the end of 7 rolls.

100 cents is a perfect game. Closest to 100 without going over at the end of 7 rolls wins.

Questions to ask during game play:

- ★ What do you hope to roll next time?
- ★ How many more dimes before we break the bank?
- ★ How many more pennies before we break the bank?

Scaffold:

- ★ Place tiny ten frames under each dime to support conceptual understanding that a dime represents one ten.

Variations:

- ★ Start at 100 cents and remove what you roll each turn trying to get as close to zero cents as possible in 7 rolls.

Inspired by <https://mathforlove.com/lesson/double-digit-and-dollar-digit/>



Some games allow for targeted and repetitive computation practice. For example, in the game “Factor Path” students are repeatedly thinking about whether a number is a factor of another number.

Factor Path
I can use what I know about factors and products to play this game.

Set Up:
Materials: 2 dice and 2 counters
Set Up: Players decide if they want to play on the same Factor Path game board or each have their own game boards and place a counter next to the start box.

Play:
Player 1: Roll the 2 dice. Find the sum. Is the sum a factor of the first number? **Yes:** Move a counter onto the first space on your Factor Path. **No:** Play passes to Player 2.
Player 2: Roll the 2 dice. Find the sum. Is the sum a factor of the first number? **Yes:** Move a counter onto the first space on your Factor Path. **No:** Play passes to Player 1.
Take turns: On each turn, roll the 2 dice and determine if the sum is a factor of the **next** number on the path. **Yes:** Move the counter to the next space on your Factor Path. **No:** Play passes to the other player.
The game ends when... A player reaches the end of their Factor Path!

Scaffold:
 ★ Use a multiplication chart to find the factors of a product.
 ★ Review the meaning of “sum,” “product,” and “factor.”

Variations:
 ★ Players could find the sum or the difference of the numbers rolled to make a factor.
 ★ Players could use any operation to make a factor.

Inspired by Climb the Factor Ladder from K-5 Math Teaching Resources

Some games allow students to explore flexibility and creativity when operating. In the game “24”, students must combine operations using the 4 fixed numbers on the dice to achieve the target number 24.

24
I can use four numbers and any of the operations to make 24.

Set Up:
Materials/Set up: 4 dice, 10 sided or 6 sided, Pencil and paper for each player, Timer
Goal of Game: Be the first to achieve the target number 24! You must use all 4 dice.

Play:
Leader for the Round: Set the timer to 24 seconds. Do not start it yet! Roll the four dice.
All Players: Try to combine the dice to achieve the target number 24. The first player to get 24 calls out “24” and starts the timer. Everyone else has the remaining 24 seconds to find a solution.
Scoring for Each Round: Anyone who finds the solution before the time expires including the first person scores 1 point. Mistakenly calling 24 when you don’t have a solution costs you 1 point.
First to 5 points wins the game.

Variations:
 ★ [24 in 60](#)
 ★ [24 in 60](#)

Check out Math Games With Bad Drawings by Ben Ortin to learn more about the history and variations on this game

Some games allow students to be creative problem solvers. The game “Target Number” is similar to the game “24” but involves even more creative thinking for how to combine a set of numbers to achieve a target number. Upper elementary and middle school students can be challenged to play “Fraction Target Number” using a set of fraction cards instead of a deck with whole numbers.



Target Number 2 Players

I can creatively use numbers and operations to get to a target number.

Set Up:
Materials/Set up: Deck of 1-10 cards Or Deck of cards with face cards removed
Each round: Lay out nine cards face up in a three by three array

1	4	7
2	6	9
1	5	10

Play:
Both Players: Decide on the target number for the game. The target is 15. OR Decide to roll a die to have a new target number each turn.
Player 1: Use the numbers available in the 9 cards to make the target number using any operation. $10 + 9 - 4$. Be creative - try to use as many cards as you can! Keep all the cards you used.
Player 2: Replace the array so that you start with 9 cards. Use the numbers available in the new set of 9 cards to make the target number. Keep all the cards you used.
The game ends when... There are no more cards in the deck to make an array of 9. Player with the most cards wins.

Teacher Notes:
 ★ Use ten frame cards or other visual representations of the numbers to support students who need more concrete representations.
 ★ This can be played with any combination of operations across grade levels. You can simply use addition and subtraction, or add in multiplication, division, and even incorporate adding parentheses to practice order of operations. You can also adjust the range of target number as needed.

Fraction Target Number 2 Players

I can creatively use fraction numbers and operations to get to a target number.

Set Up:
Fraction cards: **Each Round:** Lay out nine cards face up in a three by three array

$\frac{1}{2}$	$\frac{0}{4}$	$\frac{1}{4}$
$\frac{2}{8}$	$\frac{2}{4}$	$\frac{5}{8}$
$\frac{1}{8}$	$\frac{3}{4}$	$\frac{2}{2}$

Play:
Both Players: Decide on a target number for the game. One, two or one half work well for this game. Feel free to challenge yourself with other target numbers.
Player 1: Use the numbers available in the 9 cards to make the target number using any operation. Be creative- try to use as many cards as you can! Keep all the cards you use.
Player 2: Replace the array so that you start with 9 cards. Use the numbers available in the new set of 9 cards to make the target number. Keep all the cards you used.
The game ends when... There are no more cards in the deck to make an array of 9. Player with the most cards wins.

Teacher Notes:
 ★ Use fraction cards with visual representations of the numbers to support students who need more concrete representations.
 ★ Some students may benefit from starting with fractions with the same denominator, while others will be ready to play with fractions that have unlike denominators.

Fraction Card Decks:
[Deck 1 \(simple, fourth, eighth\)](#)
[Deck 2 \(thirds, sixths, twelfths\)](#)
[Deck 3 \(halves, thirds, tenths\)](#)

Some games even help students better access their growth mindset. In the game “Three in a Row”, students may be coached to choose the board that will allow them to practice a particular fact family that they want to get stronger at. Goal setting and recording evidence of growth with students can happen through the use of this game.

Three in a Row Multiplication 2 Players

I can play this game to practice my multiplication facts

Set Up:
Materials: One 0-9 die
Set Up: Choose the gameboard with the facts that you'd like to practice or make your own game board. $\times 6, \times 7, \times 8, \times 9, \text{ or } \times 12$

Multiplication 3 in Row $\times 6$				
6	12	18	24	30
36	42	48	54	0
6	12	18	30	24
36	42	48	54	12
0	54	12	30	24

Play:
Player 1: Roll the die. Multiply the number you rolled with the number on your board. Mark the product on the gameboard with an X.
Player 2: Roll the die. Multiply the number you rolled with the number on your board. Mark the product on the gameboard with an O.
Player 1 and 2: Take turns rolling the die and marking your product. If you can't find a total that matches to cross off on the board, your turn is over.
The game ends when... One player marks three spaces in a row. You can get three in a row up and down, across, or diagonal.

Scaffolds: ★ A student could also play with tiles or other manipulatives to build equal groups or arrays for the numbers that they rolled
Extensions: ★ Change the dice and ask students to make their own board using those dice before they begin to play
Variations: ★ Playing for 4 in a row or 5 in a row would make the game last longer and become more challenging to win

Multiplication 3 in Row $\times 7$

7	14	21	28	35
42	49	56	63	0
7	14	21	35	28
49	42	63	28	14
0	63	21	49	42

I'm passionate about including play-based learning in our math intervention efforts. When we purposefully position games in math intervention, magic can happen. An experience I had with a student with whom I worked with in the past really hammered home for me the powerful leverage that playing games can have in a student's learning trajectory. This student had started first grade in another state. All of our baseline assessments indicated that his strengths in math fell primarily in the kindergarten high leverage concept. His reading assessments indicated a similar starting point in early literacy skills.

When we reached out to his previous educators, we learned that this student had spent the majority of his time out of the classroom for both kindergarten and first grade while he was with them. It was a devastating combination, where his behaviors were extreme



and their policies were extreme. As a result, he was regularly removed from access to instruction for large chunks of time.

We immediately began working with him on targeted literacy and math goals. He spent the same amount of time receiving reading intervention and math intervention space. His teacher consistently reinforced what we were doing in both the reading and math intervention lessons back in his regular classroom space as well. The reading interventionist was using a program which provided systematic, direct instruction to purposefully sequenced literacy skills. I was using the first grade high leverage concept progression to purposefully sequence a series of math games.

Both the reading interventionist and I were using evidence based practices and specific, measurable goals driven by data to provide this student a much needed additional layer of instruction. On paper, the reading interventionist actually had the potentially more impactful instructional design because she was using a research-based program to guide her lessons. I was using a progression and a sequence of games built based on data from each week.

Using games with this student felt truly magical. So many huge aha moments and growth happened as we joyfully played game after game in our intervention sessions. The relaxed environment of our game-play paired with the purposeful sequence of the games based on the progression and data led to so much growth for this student.

In every MTSS meeting that we had about this student after our initial interventions at the end of first grade (from 2nd-6th grade), his classroom teachers would report two completely different students in literacy and math. In math, he showed confidence, a willingness to try something new, and the ability to make sense of grade level concepts. In reading, he was consistently disengaged, unwilling to try, and seeking to leave the classroom through disruptive behavior.

Obviously, this contrast cannot be explained simply by a difference in instruction. I played games with him as an early math intervention approach. The reading interventionist implemented direct instruction as it was detailed in the research-based program, primarily call and response. The reasons for his on-going struggles in literacy are of course complex and cannot be attributed to a single factor. But I do wonder, if his early literacy intervention had been more play-based would he have been more engaged thus resulting in more growth early on when it mattered most?

We learn the most important lessons from our students. I have had so many students like the one in this story who grow best through engaging in game play. I believe that every student who needs an additional layer of math instruction should have access to play-based games and number sense routines that support early numeracy development. Purposeful game play as an early intervention approach can have a trajectory-changing impact on our most vulnerable students.



What Now? Scan the QR code and scroll to the bottom of the post for links to next steps



1. Check out “Don’t Break the Bank” to see if you can use it in your classroom. This game is usually reserved for ALO Unlimited!
2. Purchase our \$10 Games Before Kindergarten kit. If you are an ALO Unlimited member, you can access it through your account, in the Math Menu Library.
3. Bring All Learners Network (ALN) into your school or district for embedded professional development.

