NWMC 2022
Tacoma, Washington

The Power of Math Games
For Differentiating Your Elementary Math Instruction

Presented by John Felling

Thursday, October 13th,
10:00 AM - 1:00 PM
Murano, Cavallino Room

BOX Cars & One-Eyed Jacks

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Reset Brain

Teach
(10 Minutes)

Engaged Practice
(?? Minutes)

Summary Conclusions
(5 Minutes)

Easiest Ways To Differentiate a Game

1 - Change manipulative
2 - Change the rules
3 - Change both

Summarizes Research from:
Jensen
Sousa & Thomlinson
Arden

King = 0 (because "Zero's The Hero")

Ace = 1 Jack = 11 Queen = 12

2, 3, 4,…10 = 2, 3, 4, …10

Joker = Wild Card (0 to 12)

For Place Value Games: use cards 0-9 only

To make games EASIER: use small value cards like 1-5

To make games HARDER: use high value cards like 6-12

BoxcarsEducation YouTube Videos Links

Upper Elementary Math Games with Cards

Red Solo Cups Explaining Place Value to 10s and 1s

https://youtu.be/xkx2OKuPYeo

Red Solo Cups are used to help students understand 10s and 1s place value. Shows ten ones are embedded in each 10s place ie 10s are composed of ten 1s

Red Solo Cups Addition without Regrouping (no carrying)

https://youtu.be/RQICNm5Ayhg

Red Solo Cups are used to help students understand what is happening mathematically when they add multi-digit numbers.

Red Solo Cups Addition with Regrouping (carrying)

https://youtu.be/60kKnd0g3yw

Red Solo Cups are used to help students understand what is happening mathematically when they add multi-digit numbers that involves "carrying" or regrouping.

Red Solo Cups Subtraction with Decomposing (borrowing)

https://youtu.be/TnekAceVxsg

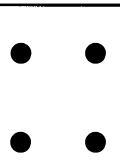
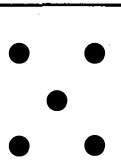
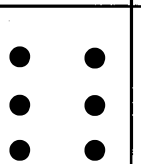
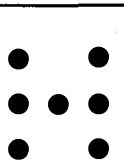
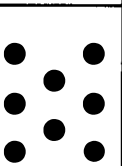
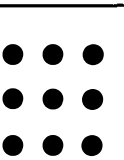
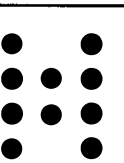
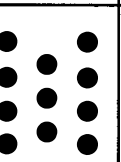
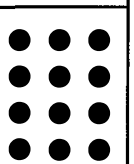
Red Solo Cups are used to help students understand what is happening mathematically when they subtract multi-digit numbers that involves having to "borrow" or decompose.

Red Solo Cups Subtraction using Rounding/Compensating

https://youtu.be/K2ugufwZMuE

This video demonstrates how rounding and then compensating may be a more efficient way for students/ general public, to perform simple subtraction problems.

ROLL AND WRITE TO 12 GAMEBOARD

1 one	2 two	3 three	4 four	5 five	6 six	7 seven	8 eight	9 nine	10 ten	11 eleven	12 twelve
											

SUBITIZING SHAKE UP RECORDING SHEET

SEE	NUMBER

SEE	NUMBER

SEE	NUMBER

SEE	NUMBER

SEE	NUMBER

SEE	NUMBER

NUMBER FACE OFF

LEVEL: Pre-Kindergarten - Grade 1

SKILLS: count using one-to-one correspondence, identify objects in a group as > < or = to

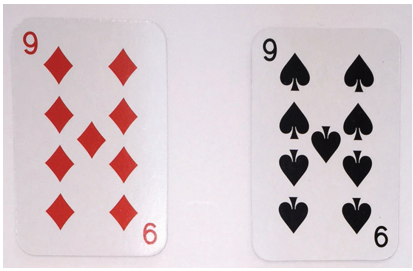
PLAYERS: 2 1 vs 1

EQUIPMENT: deck of cards (Ace=1)-5 to start or (Ace=1)-10, (remove Jokers, Jacks, Queens and Kings)

GOAL: to have the greatest number and to collect the most cards by the end of the game

GETTING STARTED:

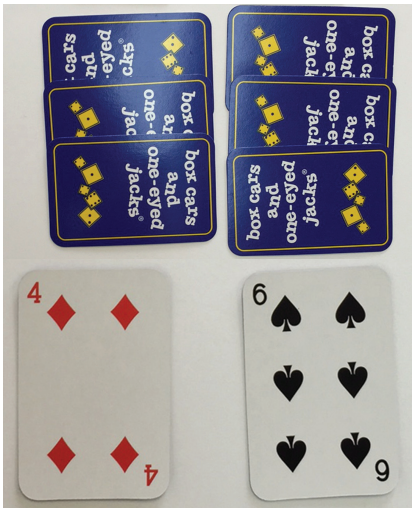
Players divide cards evenly between themselves. Each player turns over one card, counts and says the number out loud. The player with the greater number wins both cards. In the event of a tie, where each player has the same number, players declare a “Face Off”.



Each player deals out three cards upside down and turns over one new card.

“TIE-BREAK”

The new cards are compared for greatest.
The greater number collects all the cards.
Player Two would say “6 is greater than 4”
and put all ten cards into their points pile.
Play continues for a set period of time. The player with the most cards is the winner.



MATH TALK

Make sure students are using correct math vocabulary as they play, for example “6 is a greater number than 4”. As they mature they can verbalize part-whole relationships such as “6 is greater than 4 ... by 2”.

VARIATION:

1. Play for least number as the winner of the cards, verbalizing “4 is less than 6” before putting cards into the point pile.

MAKE A TEN

SEE	+	?	=		SEE	+	?	=		SEE	+	?	=	
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10
	+		=	10		+		=	10		+		=	10

MAKE A TWENTY

SEE	+	?	=		SEE	+	?	=		SEE	+	?	=	
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20
	+		=	20		+		=	20		+		=	20

ADDITION FACE OFF

LEVEL: Grade 1

SKILLS: solve and add within 10, understand addition as putting together and adding to, fact families

PLAYERS: 2

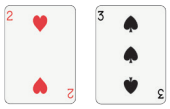
EQUIPMENT: cards (Ace=1) - 5

GOAL: to have the greatest sum of two cards

GETTING STARTED: Players divide cards evenly between themselves. Each player turns over two cards and adds them together. The greatest sum gets all of the cards. In the event of a tie (ie. each player has the same sum), FACE OFF is declared. Each player deals out three more cards face down and then turns over two more cards. These two cards are added together. The greatest sum wins all of the cards. Play continues until one player has collected all of the cards.

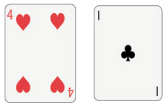
EXAMPLE:

PLAYER ONE



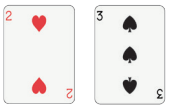
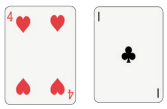
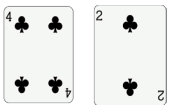
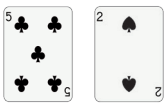
2 + 3 = 5

PLAYER TWO



4 + 1 = 5

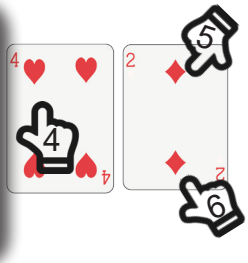
FACE OFF IS DECLARED

PLAYER ONE	PLAYER TWO
	
	 "TIE BREAK"
	
4 + 2 = 6	**5 + 2 = 7**

Player 2 collects all of the cards.

MATH TALK

Students who are having difficulty adding the numbers can use the strategy of using the symbols on the cards (ie. hearts, spades, diamonds or clubs) to count on from the higher numbered card. For example, if a 4 of hearts and 2 of diamonds are turned over, students start at 4, saying “4” and then touch the symbols on the second card counting on “5”, “6”.



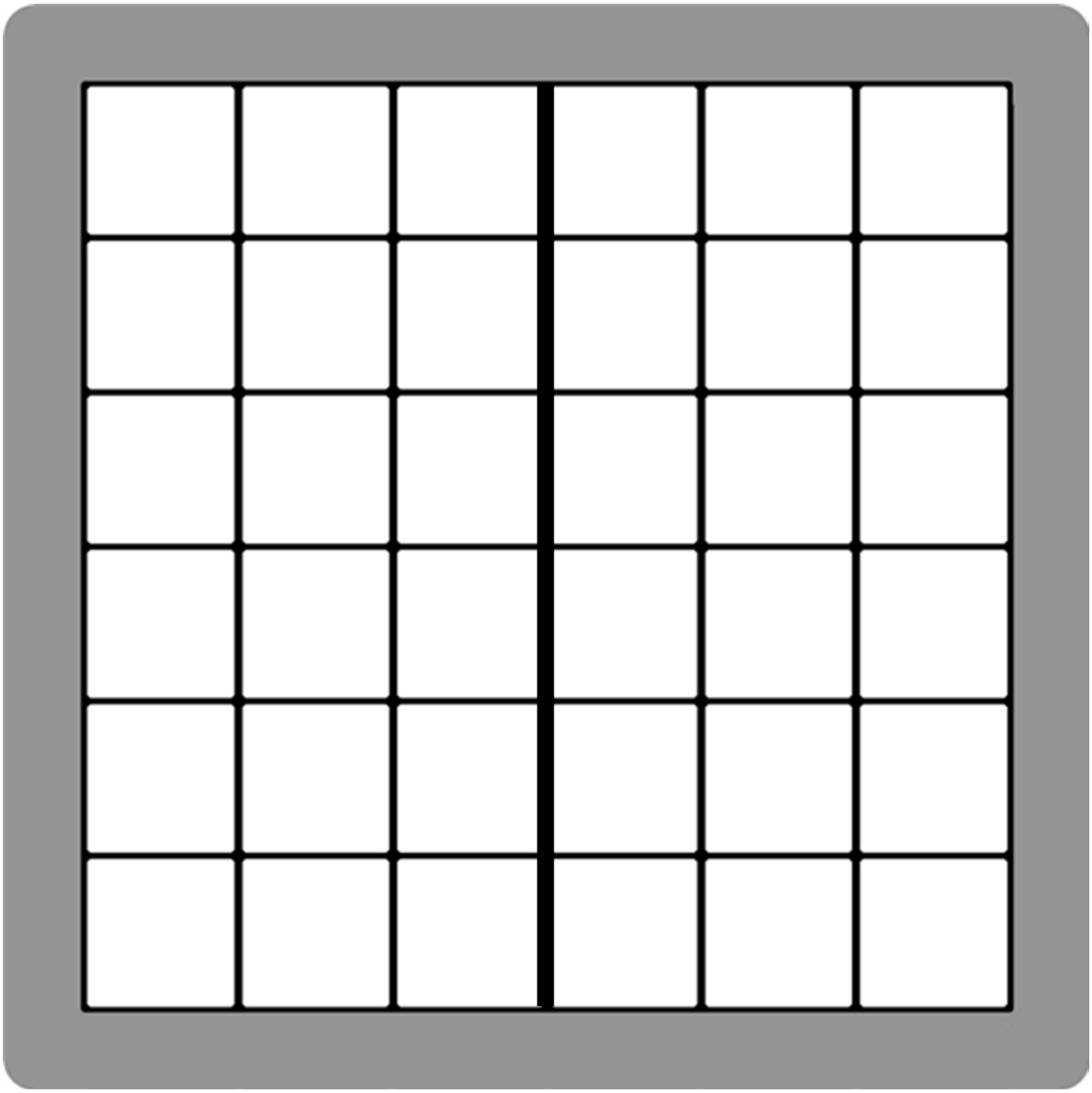
VARIATIONS:

1. Increase the value of cards used : (Ace=1) - 6 for addition to 12 ; (Ace=1) - 9 for addition to 18.
2. Divide cards evenly between two players. Each player turns over two cards, creates a two-digit number and verbalizes the number. Players each turn over a third card and add it to their two-digit number. The player with the greater number wins all the cards.

HORSE RACE

PLAYER ONE

PLAYER TWO



START

START

- Each player takes 18 dice of own color.
- Each player rolls two dice and adds.
- Player with the greatest sum places them into their side of the tray, least sum places in lid.
- Player with the most dice on their side of the tray at the end of the game wins.

SEVEN UP - ADD UP RECORDING SHEET

Shake # My 7 numbers _____ _____ _____ _____ _____ _____ _____ My Sum

How I grouped my addends — Strategy I used

- ______________ → ______________
- ______________ → ______________
- ______________ → ______________
- ______________ → ______________

Shake # My 7 numbers _____ _____ _____ _____ _____ _____ _____ My Sum

How I grouped my addends — Strategy I used

- ______________ → ______________
- ______________ → ______________
- ______________ → ______________
- ______________ → ______________

Shake # My 7 numbers _____ _____ _____ _____ _____ _____ _____ My Sum

How I grouped my addends — Strategy I used

- ______________ → ______________
- ______________ → ______________
- ______________ → ______________
- ______________ → ______________

Shake # My 7 numbers _____ _____ _____ _____ _____ _____ _____ My Sum

How I grouped my addends — Strategy I used

- ______________ → ______________
- ______________ → ______________
- ______________ → ______________
- ______________ → ______________

PLACE VALUE FACE OFF

LEVEL: Grade 1

SKILLS: read, compare and order numbers to 100, variation to 999

PLAYERS: 2

EQUIPMENT: cards (Ace=1) - 9, gameboard or place value mat (page 118-119); for variation use 0-9 dice, 00-90 dice

GOAL: to be the player with the greatest number and collect the most cards by the end of the game

GETTING STARTED: Players divide cards evenly between themselves. Each player turns over two cards and places them onto the gameboard. The first number turned over is the tens number and the second is the ones. Both players say their numbers. Have them verbalize, for example, "six tens and two ones equals sixty-two". The player with the greatest number gets all cards. In the event of a TIE (ie. each player has the same number) FACE OFF is declared. First, each player places three cards face down. Then, each player turns over two cards, building a two digit number. The player with the greatest number gets all of the cards. Play continues until one player has collected all of the cards.

EXAMPLE:

PLAYER ONE

43

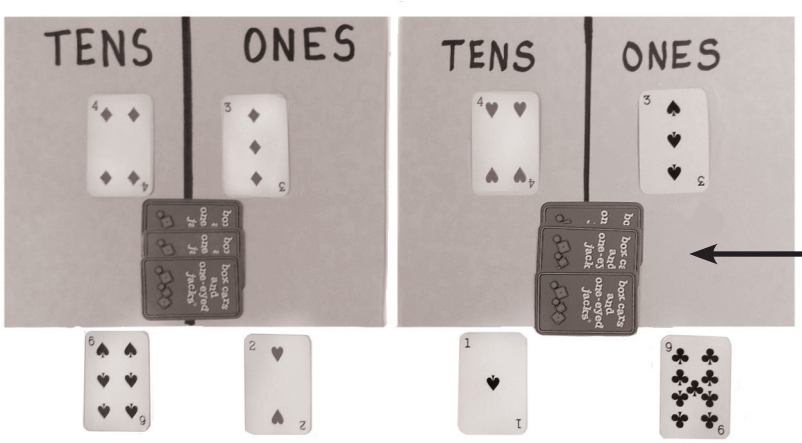
"forty-three"

FACE OFF IS DECLARED!

PLAYER TWO

43

"forty-three"



THREE CARDS FACE DOWN FOR "TIE BREAK"

6 tens 2 ones 1 ten 9 ones

62

"sixty-two"

19

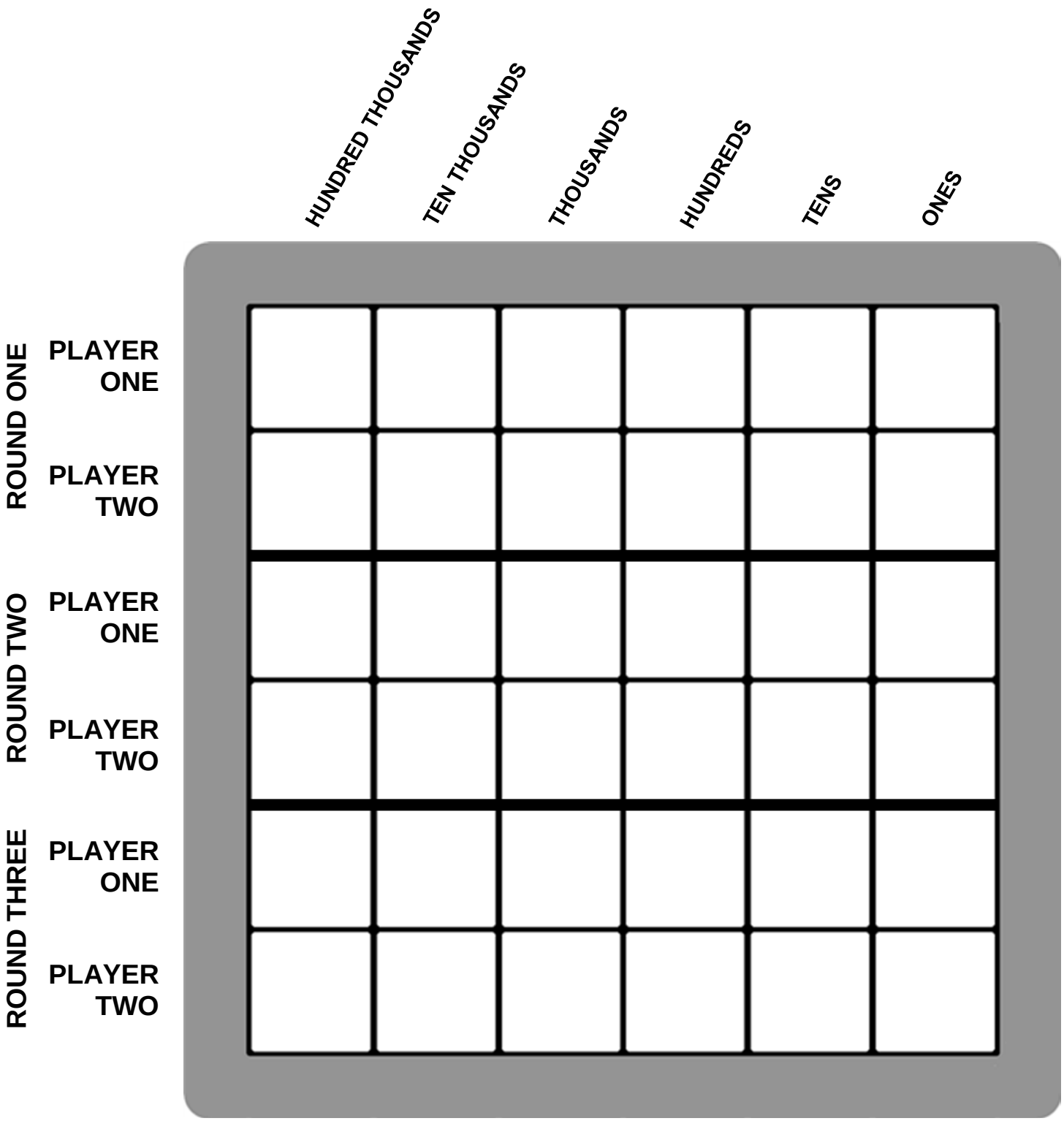
"nineteen"

MATH TALK

Player One verbalizes "sixty-two is greater than nineteen because 6 tens are greater than 1 ten" and collects all of the cards.

NOTE: Rules can be changed to play for LEAST number winning.

ROLL ON PLACE VALUE



The goal of the game is to create the largest number. Players take turns rolling a die, placing it into the tray and announcing it's place value for that roll. After 6 rolls, players compare numbers. A point is earned by the player with the largest number. A Place Value Systems die is rolled to identify a specific place value (for example 100's) . A second point is earned by the player with the highest place value in that place. A third "upside down bonus point" is awarded to the player with the biggest number when the tray is rotated 180 degrees and the numbers are compared.

Roll On Place Value

Follow Up Questions

Players _____

Date _____ Grade(s)_____

What Version did you play?_____ (up to 1000s or 100,000s or decimal etc)

What did you think of when figuring out where to place each die (ie what was your strategy)?

	Draw a picture of your game when two rolls/player are left. With two rolls left, which player do you think has the best chance to win the game AND why do you think that?
What would have to happen for the other player to win?	
	Draw a picture of your game when one roll/player are left. With one roll left, which player do you think has the best chance to win the game AND why do you think that?
What would have to happen for the other player to win?	

Player One's Number	**> = <**	Player Two's Number

What's Under My Thumb?

Level: Grades K-3

Concepts: Missing Addend, Subtraction, Counting On or Back

Players: 1 vs 1

Equipment: Stratedice Tray, One Game board, pencil; may also be played with cards.

Goal: To figure out the number under the other player's finger.

Setting Up: Each player has their own color dice. Player One turns their back to Player Two and secretly rolls two of Player Two's dice (rolled 5 and 1, covered the 1 with a finger), adds the two dice together to get the sum of 6. Player One then turns back around so Player Two can see the 5 and the other covered die (1). Player One then says "Six is my sum! What's under my thumb?" Player Two figures out that 1 added to 5 equals 6 and says "ONE".
Player Two records the 5 on the line for one addend, records the 1 in the box for the missing addend and records the sum (6) into the sum location. Since player Two was correct, Player Two places both dice into their side of the Black Tray. Players continue to alternate turns secretly rolling two of the other player's dice, adding them and saying the rhyme. If players say the correct missing addend, they get to put their dice into the Black Tray. If they are incorrect, they place their dice into the clear lid. The player with the most dice in the Black Tray at the end of 9 rounds wins the game.

Example:
Player One rolled 1 and 5 and covered the 1 and said **"Six is my sum! What's under my thumb?"**

Player Two filled in the 5 + 1 = 6 on the paper and said **"ONE".**

Since Player Two was correct, they placed their dice into the Black Tray. (incorrect answers go in lid)

Addition

____ + ____ =	____ + ____ =
____ + ____ =	____ + ____ =
____ + ____ =	____ + ____ =
____ + ____ =	____ + ____ =
____ + ____ =	**Total Dice in Black Tray =**

Multiplication

____ x ____ =	____ x ____ =
____ x ____ =	____ x ____ =
____ x ____ =	____ x ____ =
____ x ____ =	____ x ____ =
____ x ____ =	**Total Dice in Black Tray =**

SALUTE ADVANCED

LEVEL: Grade 3 and up

SKILLS: missing factor, problem solving

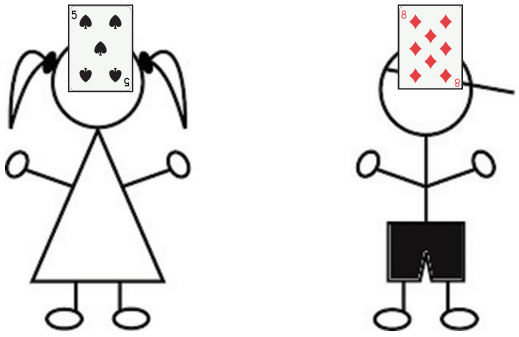
PLAYERS: 3 cooperative - 1 general/referee, 2 players

EQUIPMENT: cards (Ace=1) - 10 ; multiplication table (see page 49)
VARIATION: (Jack=11, Queen=12)

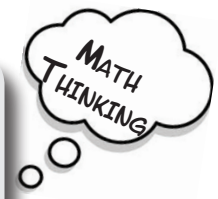
GOAL: to identify the missing factor (card) on your head

GETTING STARTED: One player is designated as the "General" and will provide the SALUTE signal and call the PRODUCT for players. The other two players divide the cards and place them face down. The General calls "SALUTE!" and both players take a card from the top of the deck and, without looking at it, place it on top of their heads so that the other player can see it. The general must multiply the two cards and call the product out loud.

EXAMPLE:



Players "Salute" - both players draw a card and place on their heads. The General says "Your product equals 40, what's on your head?" The players then use the PRODUCT and the number on the card they can see on the other player's head to try and figure out their own card.



Player One "I know the product is 40. I see 8. 40 ÷ 8 = 5, My card/factor must be a 5."

Player Two "I know the product is 40. I see 5. 5 × ? = 40. I know my 5 times table. 5 × 8 = 40. My card/factor must be 8.

Players should let the group know the strategy they used to figure out the number on their head.

The General calls "Salute" again, and without looking, both players draw a new card and place them on their heads. The General says the product out loud and players again try to figure out their card value. Have players change roles so that each will have a chance to be the General.

VARIATION:

1. Include (Jack=11) and (Queen=12) for a greater challenge.

JOURNAL WORK & EXTENSIONS:

1. After practicing several rounds have students complete the Salute Recording Sheet.
2. Have students describe and illustrate three strategies they could use to figure out their number.

WHAT'S THE DIFFERENCE

LEVEL: Grade 3 and up

SKILLS: subtracting three-digit numbers

PLAYERS: 2 or more, or teacher vs whole group

EQUIPMENT: cards (Ace=1) - 9, one recording sheet for each player

GOAL: to make the least difference

GETTING STARTED: The deck is placed face down. A card is drawn and placed face up. Each player selects a space on their recording sheet and writes the number of this card on it. Five more cards are drawn and players continue to fill in their recording sheets. Once all spaces are filled in, players complete their subtraction. The player with the least difference is the winner for that round and scores one point. In the event of a tie, each player receives a point. Any negative difference causes that player to strike out for that round. As players have more experience with this game, they will develop strategies to maximize their chances of creating the least possible difference.

EXAMPLE:

PLAYER ONE

	5	2	7
−	4	9	6
=		3	1

PLAYER TWO

	6	7	9
−	5	2	4
=	1	5	5

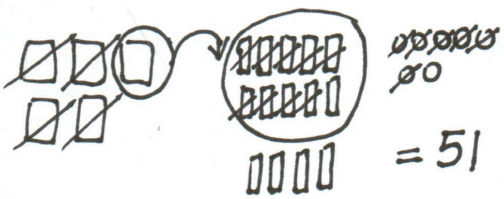
31 is the least difference,
Player 1 scores one point.

VARIATION:

1. Vary the number of cards to modify the level of difficulty.

JOURNAL WORK & EXTENSIONS:

1. Have players take their three least differences and draw the subtraction to match.



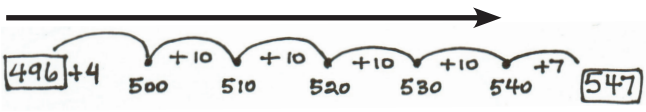
2. Have students round their numbers and estimate their three differences.

547 ⟶ 550
− 496 ⟶ 500 My difference is ≈ 50

	5	4	7
−	4	9	6
		5	1

400 + 40 + 7
− 400 + 90 + 6
= 50 + 1
= 51

3. Have students show their subtraction using a number line for their three differences.



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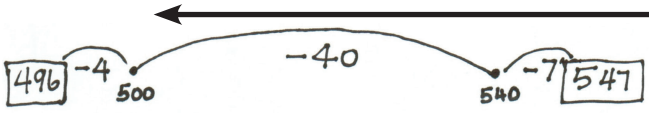
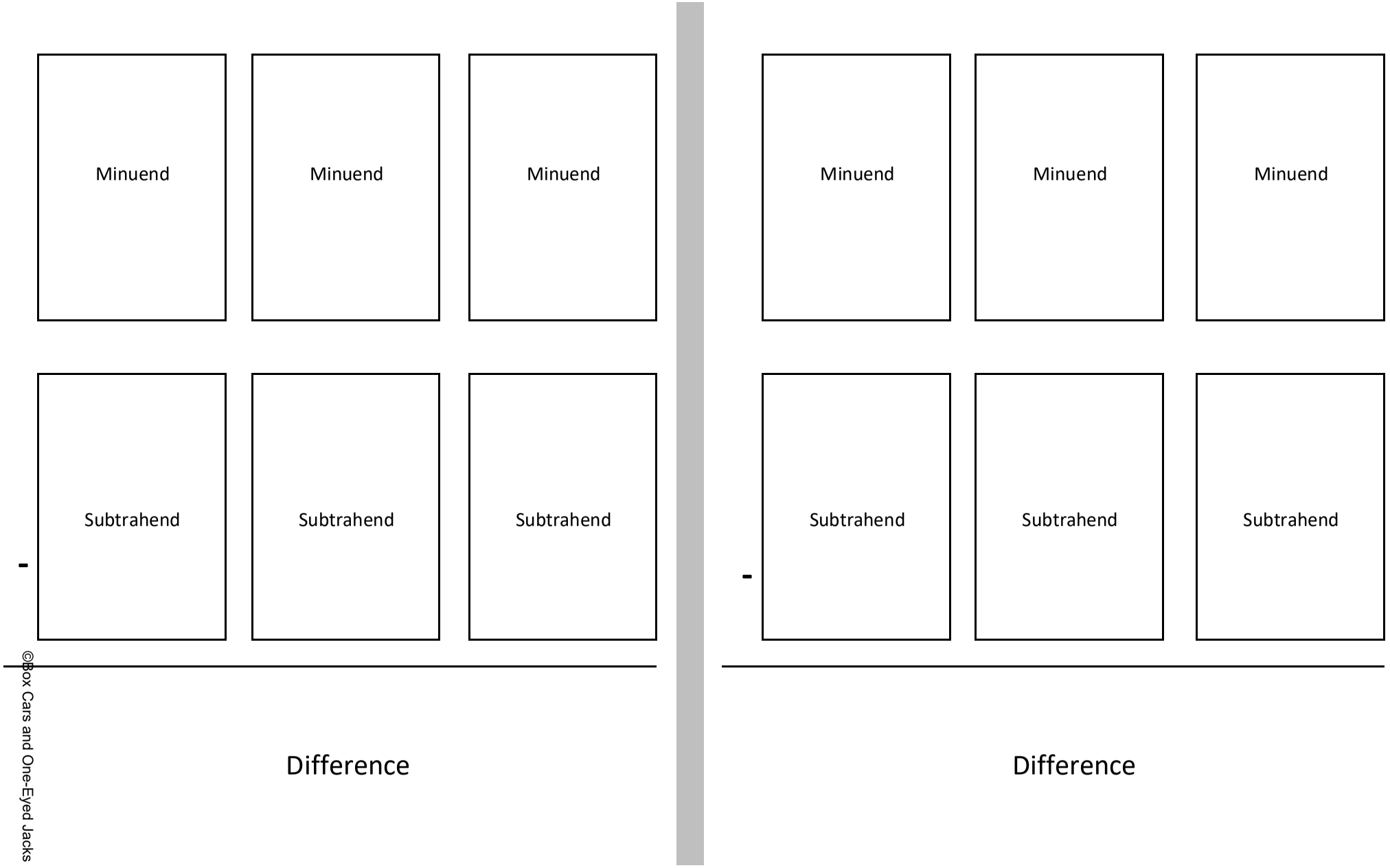


My difference = 51

My difference = 51



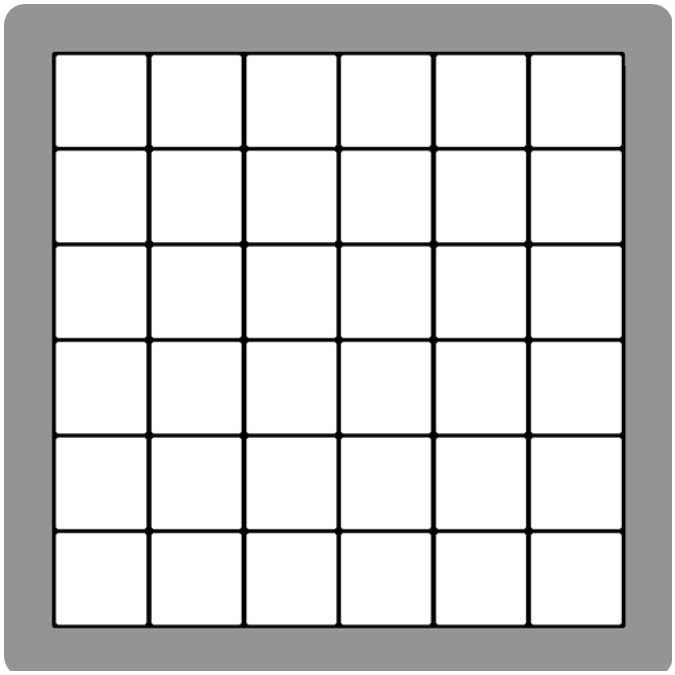
OPERATION MIXED OPS RECORDING SHEET

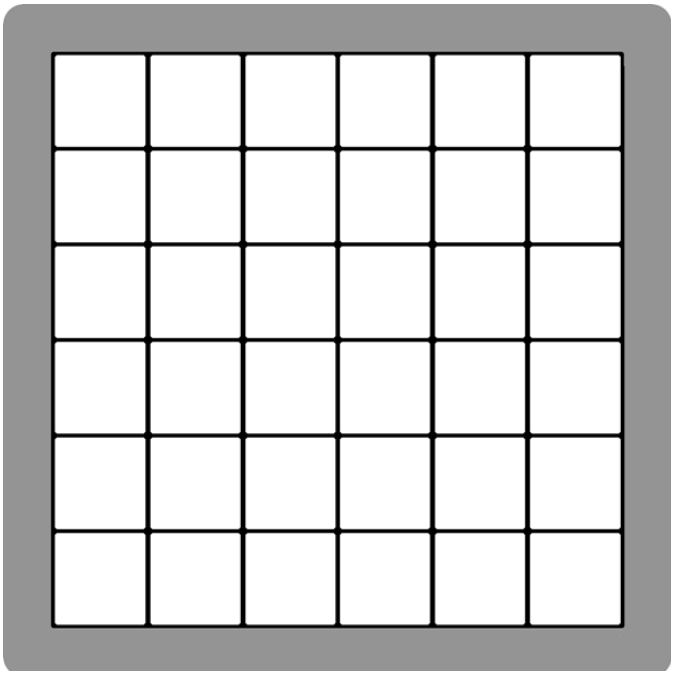
	Shake							Target	Solution to Equal Target	Score # of dice used
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										

INSTRUCTIONS: Set a target, then use as many dice from your shake as possible to create a math sentence that equals the target. 7 is a perfect score.
VARIATION: Without re-shaking, see how many different math sentences you can make that use all 7 dice and that equal the same target.

Total Score:

PRIMARY SUPER MUSH





Object of the Game: Get all the dice into the tray with no dice leftover.

Preparation: Partners "Super Mush" the dice for about 10-15 seconds, thoroughly mixing them. Next, partners choose a "Target Number" (randomly / by rolling a die / flipping over a card).

How to Play: Partners work together and use 2, 3, 4 or 5 dice to create a math sentence that equals the target number. They put the dice into the tray. Partners again use between 2 to 5 dice to create another math sentence that equals the target number and place those dice into the tray as well. Partners continue to select dice to make math sentences until all the dice are in the tray or until they can't make a math sentence that equals the target.

EQUIVALENT FRACTION ACTION RECORDING SHEET

SHAKE ONE

Numerator							
Denominator							
Equivalent Fractions							

Ordered Least _____ _____ _____ _____ _____ _____ _____ Greatest

SHAKE TWO

Numerator							
Denominator							
Equivalent Fractions							

Ordered Least _____ _____ _____ _____ _____ _____ _____ Greatest

SHAKE THREE

Numerator							
Denominator							
Equivalent Fractions							

Ordered Least _____ _____ _____ _____ _____ _____ _____ Greatest

Fractions Decimals Percents

One Whole 1/1 1.00 100%											
One Half 1/2 0.50 50%	Two Halves 2/2 1.00 100%										
One Third 1/3 0.333 33%	Two Thirds 2/3 0.666 67%	Three Thirds 3/3 1.00 100%									
One Fourth 1/4 0.25 25%	Two Fourths 2/4 0.50 50%	Three Fourths 3/4 0.75 75%	Four Fourths 4/4 1.00 100%								
One Fifth 1/5 0.20 20%	Two Fifths 2/5 0.40 40%	Three Fifths 3/5 0.60 60%	Four Fifths 4/5 0.80 80%	Five Fifths 5/5 1.00 100%							
One Sixth 1/6 0.166 17%	Two Sixths 2/6 0.333 33%	Three Sixths 3/6 0.50 50%	Four Sixths 4/6 0.666 67%	Five Sixths 5/6 0.833 83%	Six Sixths 6/6 1.00 100%						
One Seventh 1/7 0.143 14%	Two Sevenths 2/7 0.286 29%	Three Sevenths 3/7 0.429 43%	Four Sevenths 4/7 0.571 57%	Five Sevenths 5/7 0.714 71%	Six Sevenths 6/7 0.857 86%	Seven Sevenths 7/7 1.00 100%					
One Eighth 1/8 0.125 12.5%	Two Eighths 2/8 0.25 25%	Three Eighths 3/8 0.375 37.5%	Four Eighths 4/8 0.50 50%	Five Eighths 5/8 0.625 62.5%	Six Eighths 6/8 0.75 75%	Seven Eighths 7/8 0.875 87.5%	Eight Eighths 8/8 1.00 100%				
One Ninth 1/9 0.111 11%	Two Ninths 2/9 0.222 22%	Three Ninths 3/9 0.333 33%	Four Ninths 4/9 0.444 44%	Five Ninths 5/9 0.555 56%	Six Ninths 6/9 0.666 67%	Seven Ninths 7/9 0.777 78%	Eight Ninths 8/9 0.888 89%	Nine Ninths 9/9 1.00 100%			
One Tenth 1/10 0.10 10%	Two Tenths 2/10 0.20 20%	Three Tenths 3/10 0.30 30%	Four Tenths 4/10 0.40 40%	Five Tenths 5/10 0.50 50%	Six Tenths 6/10 0.60 60%	Seven Tenths 7/10 0.70 70%	Eight Tenths 8/10 0.80 80%	Nine Tenths 9/10 0.90 90%	Ten Tenths 10/10 1.00 100%		
One Eleventh 1/11 0.091 9%	Two Elevenths 2/11 0.182 18%	Three Elevenths 3/11 0.273 27%	Four Elevenths 4/11 0.364 36%	Five Elevenths 5/11 0.454 45%	Six Elevenths 6/11 0.545 55%	Seven Elevenths 7/11 0.636 64%	Eight Elevenths 8/11 0.727 73%	Nine Elevenths 9/11 0.818 82%	Ten Elevenths 10/11 0.909 91%	Eleven Elevenths 11/11 1.00 100%	
One Twelfth 1/12 0.083 8%	Two Twelfths 2/12 0.166 17%	Three Twelfths 3/12 0.25 25%	Four Twelfths 4/12 0.33 33%	Five Twelfths 5/12 0.417 42%	Six Twelfths 6/12 0.50 50%	Seven Twelfths 7/12 0.583 58%	Eight Twelfths 8/12 0.667 67%	Nine Twelfths 9/12 0.75 75%	Ten Twelfths 10/12 0.83 83%	Eleven Twelfths 11/12 0.92 92%	Twelve Twelfths 12/12 1.00 100%

GENERAL ADDITION SKILLS CHECKLIST

Name	Recognizes up to 5, subitizes to 10, to 20	Recognizes part/part/whole	Counts on to determine sum	Knows amount is unchanged when sum is rearranged	Uses Doubles, Doubles +1 Doubles -1	Makes 10's to add sums; to add sums to 20	Commutative Property	Associative Property	Uses equations __ + __ =	Adds 10 to any # of one's from 11-20 without counting	Adds 2 #'s with sums >10 by recomposing into 10/1's

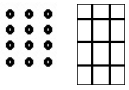
GENERAL SUBTRACTION SKILLS CHECKLIST

Name	Understands subtraction as difference Taking away	Counts back from > number to determine difference	identifies missing parts by using related combinations	Knows missing parts of numbers to 10, 20 10 - □ = 4	Uses equations to record subtraction 6 - 2 = □	Subtracts 10 from any number 11-20 without counting	Uses a ten strategy for subtraction of numbers 11-20

TWO OR THREE CARD ADDITION FACE OFF CHECKLIST

Name	Selects greatest number first	Uses doubles	Makes 10	Groups numbers together flexibly	Can explain thinking/ reasoning	Has recall of facts 9 + 9	Using talk moves or math sentence

SKILLS CHECKLIST MULTIPLICATION

NAME	Understand multiplication 3x4 can be said as "3 groups of 4"	Uses Arrays & Area Models 	Uses Square Facts as benchmarks 2x2=4, 3x3=9, 4x4=16 etc	Skip count as strategy verbally and number line 4 8 12...	Understands Commutative Property Knows 3x4 = 4x3 fact	Understands Associative Property is friendly grouping of numbers	Distributive Property used (10x12)+(4x12) same 14x12

SKILLS CHECKLIST WHOLE NUMBER PLACE VALUE UPPER ELEMENTARY

Name	Read whole numbers up to 100,000	Read whole numbers 1,000,000 and greater	Identify value of digit in any specific place value	Can round whole numbers to closest 10s 100s 1000s etc place	Correctly order whole numbers from least to greatest	Records standard and expanded form 626 = 600 + 20 + 6 of whole numbers up to and beyond 100,000

SKILLS CHECKLIST DECIMAL PLACE VALUE UPPER ELEMENTARY

Name	Reads decimal numbers to hundredths and 0.01	Reads decimals = or < than 0.001 thousandths	Understands relationship of fractions / decimals 3/10 = 0.3 365/1000 = 0.365	Identify specific place value of a grade level appropriate decimal	Round to nearest 0.1s, 0.01s, 0.001s etc decimal place	Correctly order numbers with or without decimals from least to greatest

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