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Appendix A: Further Activities and Resources

Created for the paper, Fluency Without Fear: Research Evidence on the Best Ways to Learn Math Facts
http://youcubed.org/teachers/wp-content/uploads/2014/10/FluencyWithoutFear.pdf

Table of Contents

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How Close to 100?

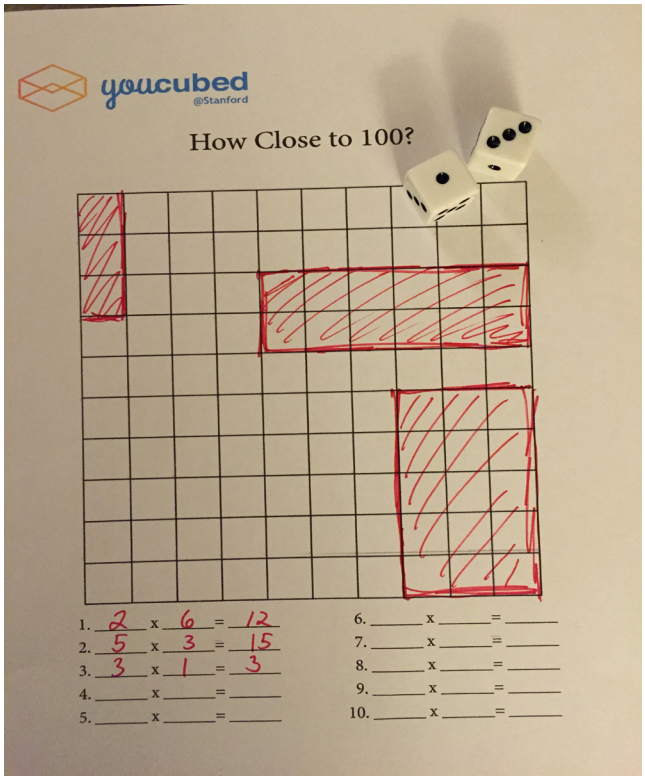
You need

- two players
- two dice
- recording sheet (see next page)

This game is played in partners. Two children share a blank 100 grid. The first partner rolls two number dice. The numbers that come up are the numbers the child uses to make an array on the 100 grid. They can put the array anywhere on the grid, but the goal is to fill up the grid to get it as full as possible. After the player draws the array on the grid, she writes in the number sentence that describes the grid. The second player then rolls the dice, draws the number grid and records their number sentence. The game ends when both players have rolled the dice and cannot put any more arrays on the grid. How close to 100 can you get?

Variation

Each child can have their own number grid. Play moves forward to see who can get closest to 100.



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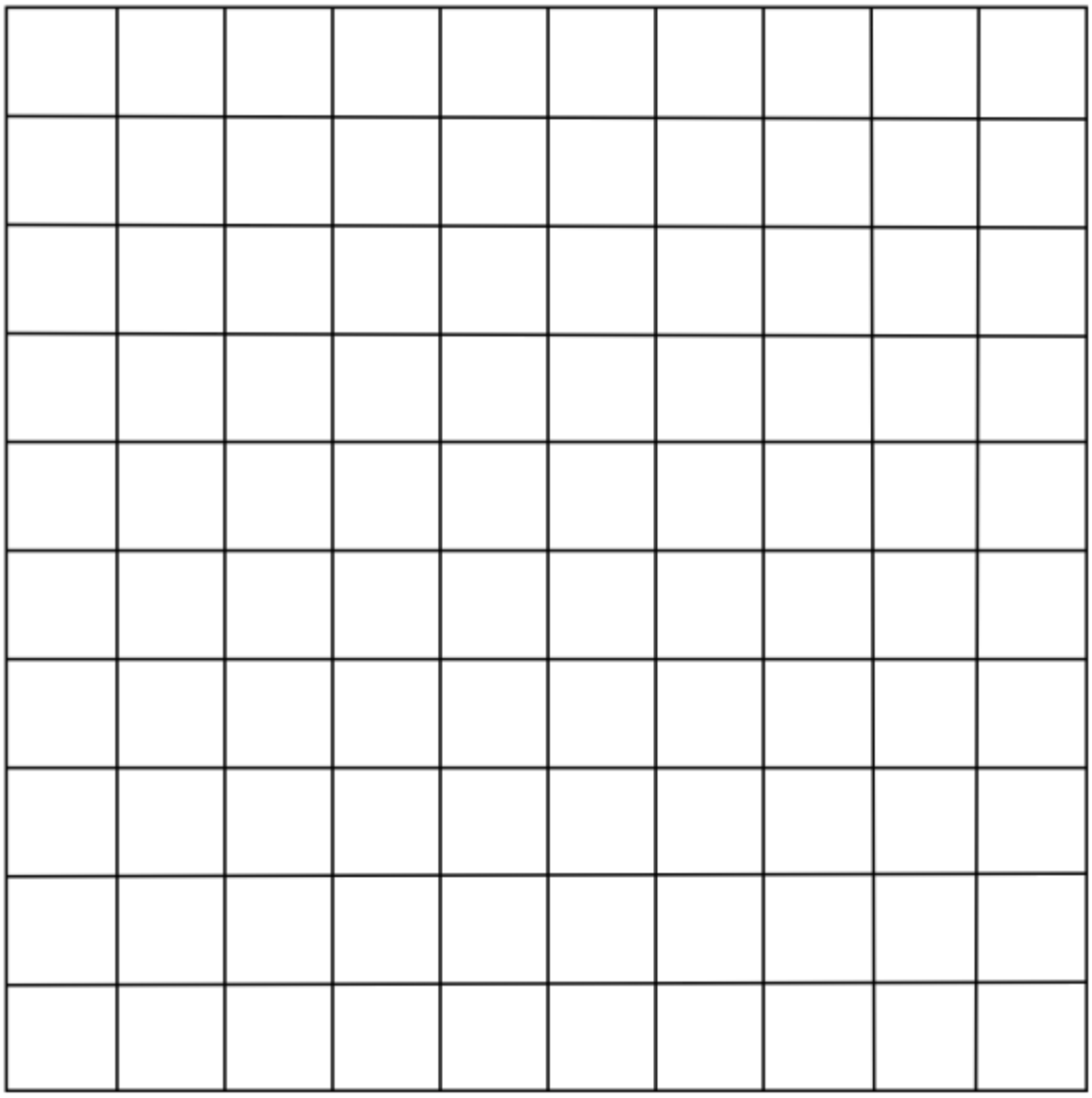
How Close to 100?



1. _____ x _____= _____
2. _____ x _____= _____
3. _____ x _____= _____
4. _____ x _____= _____
5. _____ x _____= _____
6. _____ x _____= _____
7. _____ x _____= _____
8. _____ x _____= _____
9. _____ x _____= _____
10. _____ x _____= _____

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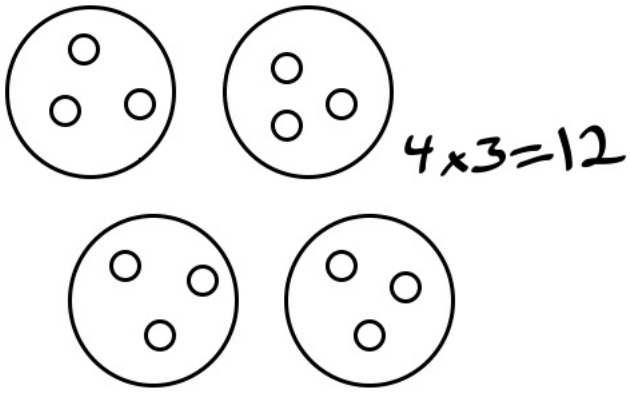
Pepperoni Pizza

You will need

- one or more players
- 2 dice per player
- 10 or more snap cubes per player

In this game, children roll a dice twice. The first roll tells them how many pizzas to draw. The second roll tells them how many pepperonis to put on EACH pizza. Then they write the number sentence that will help them answer the question, "How many pepperonis in all?"

For example, I roll a dice and get 4 so I draw 4 big pizzas. I roll again and I get 3 so I put three pepperonis on each pizza. Then I write 4 x 3 = 12 and that tells me that there are 12 pepperonis in all.

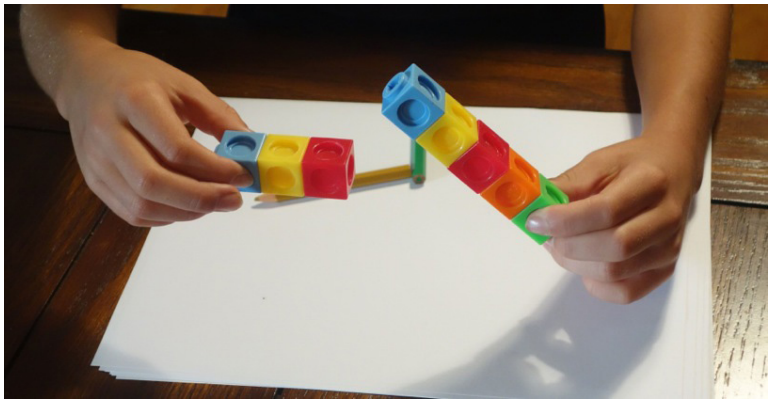


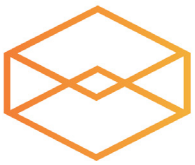
Snap It

You will need

- one or more players
- 10 or more snap cubes per player

This is an activity that children can work on in groups. Each child makes a train of connecting cubes of a specified number. On the signal "Snap," children break their trains into two parts and hold one hand behind their back. Children take turns going around the circle showing their remaining cubes. The other children work out the full number combination.





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How Many Are Hiding

You will need
- one or more players
- 10 or more snap cubes /objects per player
- a cup for each player

In this activity each child has the same number of cubes and a cup. They take turns hiding some of their cubes in the cup and showing the leftovers. Other children work out the answer to the question "How many are hiding," and say the full number combination.

Example: I have 10 cubes and I decide to hide 4 in my cup. My group can see that I only have 6 cubes. Students should be able to say that I'm hiding 4 cubes and that 6 and 4 make 10.

Shut the Box

You will need
- one or more players
- 2 dice
- paper and pencil

Write the numbers 1 through 9 in a horizontal row on the paper. Player 1 rolls the dice and calculates the sum of the two numbers. Player 1 then chooses to cross out numbers that have the same sum as what was calculated from the dice roll. If the numbers 7, 8 and 9 are all covered, player 1 may choose to roll one or two dice. If any of these numbers are still uncovered, the player must use both dice. Player 1 continues rolling dice, calculating the sum and crossing out numbers until they can no longer continue. If all numbers are crossed out the player say's "shut the box". If not all numbers are crossed out player 1 determines the sum of the numbers that are not crossed out and that is their score. If "shut the box" is achieved, player 1 records a score of "0".

Player two writes the numbers 1 through 9 and follows the same rules as player 1. The player with the lowest score wins.

Variation
Player 1 and 2 can choose to play 5 rounds, totaling their score at the end of each round. The player with the lowest total score wins the game.

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Math Cards

You will need

- one or more players
- 1 deck of cards (see next pages)

Many parents use 'flash cards' as a way of encouraging the learning of math facts. These usually include 2 unhelpful practices – memorization without understanding and time pressure. In our Math Cards activity we have used the structure of cards, which children like, but we have moved the emphasis to number sense and the understanding of multiplication. The aim of the activity is to match cards with the same numerical answer, shown through different representations. Lay all the cards down on a table and ask children to take turns picking them; pick as many as they find with the same answer (shown through any representation). For example 9 and 4 can be shown with an area model, sets of objects such as dominoes, and the number sentence. When students match the cards they should explain how they know that the different cards are equivalent. This activity encourages an understanding of multiplication as well as rehearsal of math facts.

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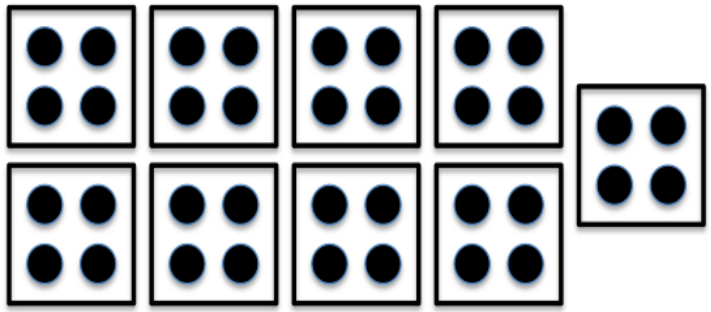


9×4

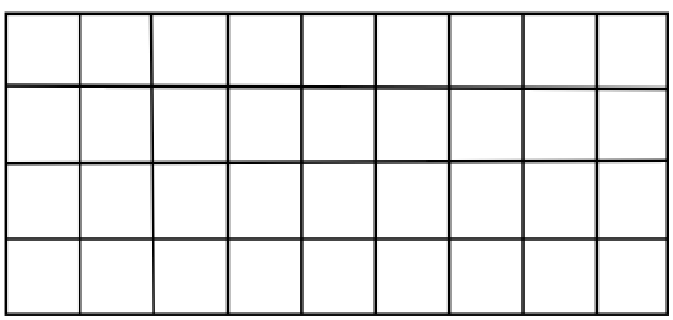
4×9

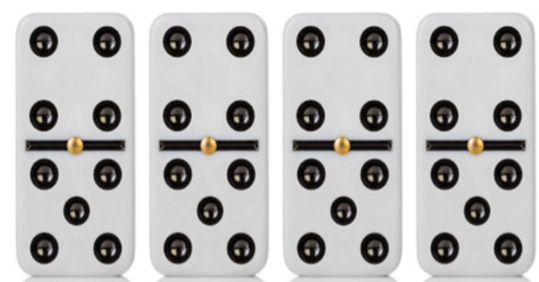
7×9

9×7

9

4





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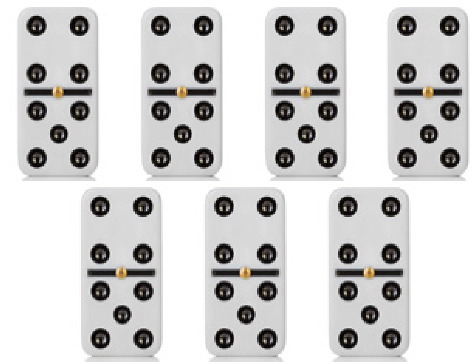

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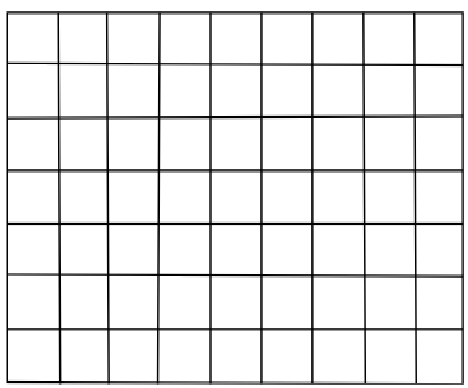

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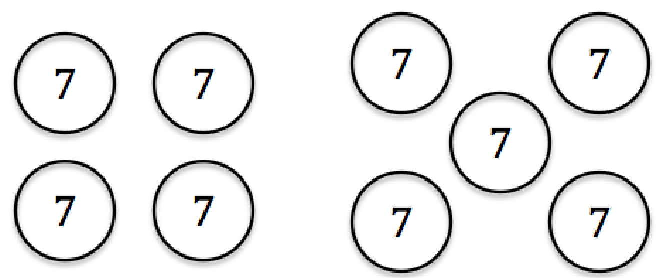

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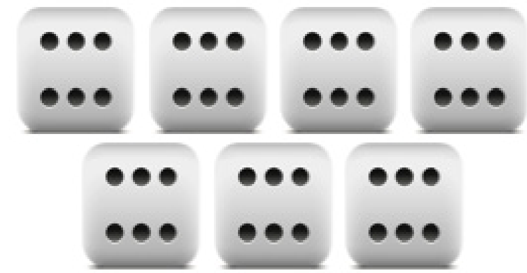
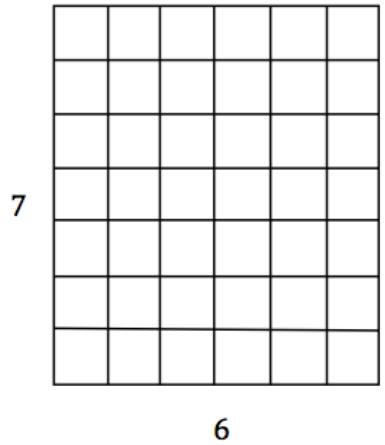


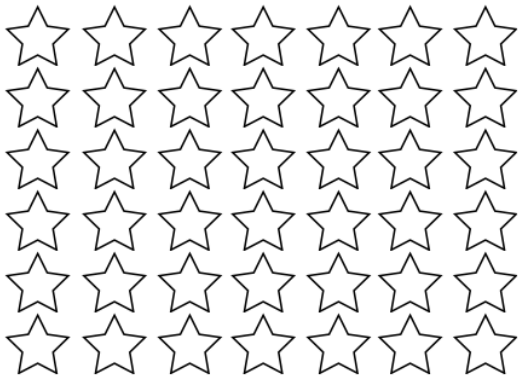
7×6

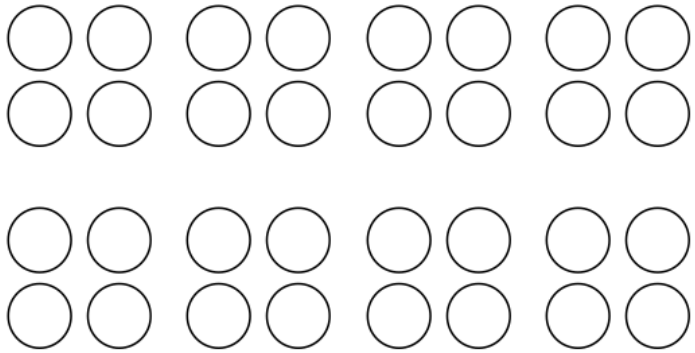
6×7

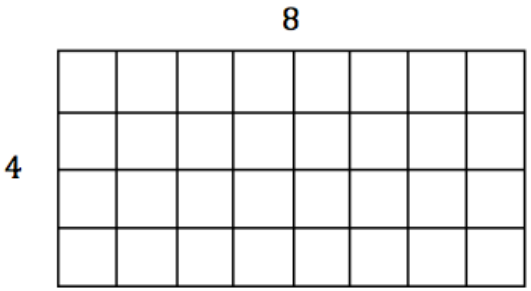
8×4

4×8









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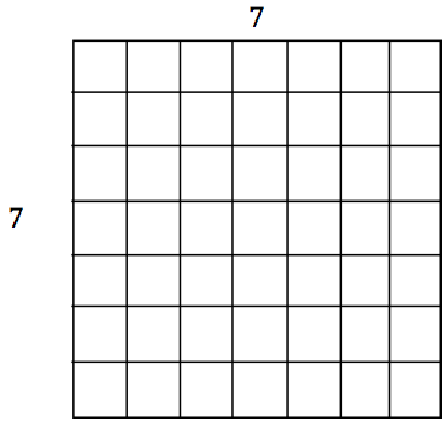
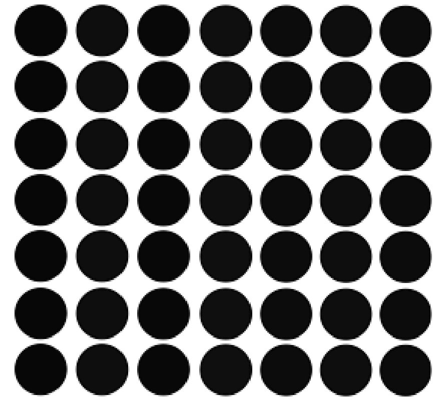
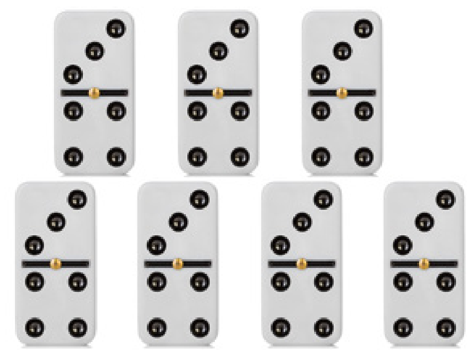




7×7

49

8×8	64
7^2	

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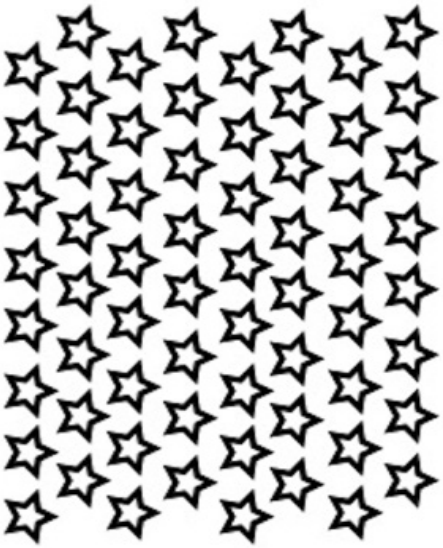

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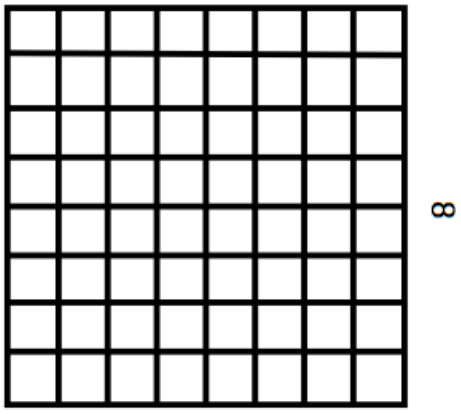

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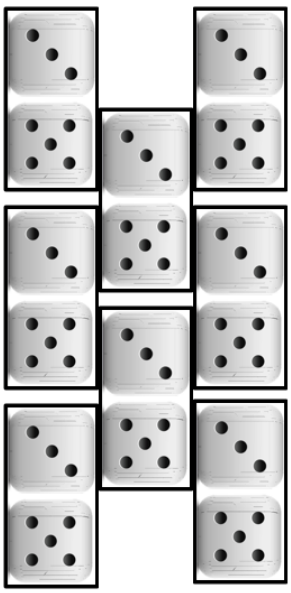
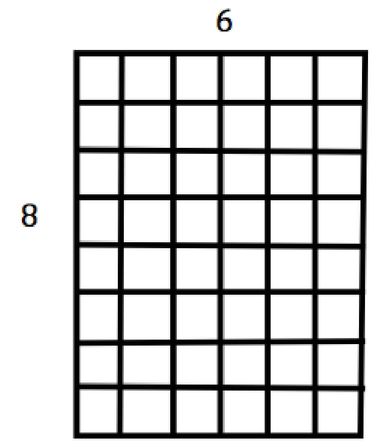
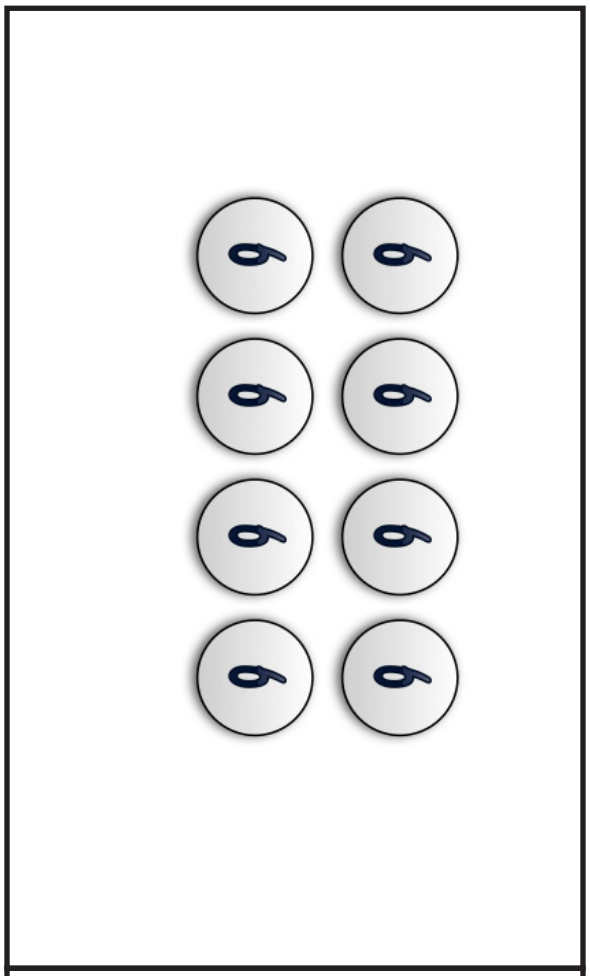
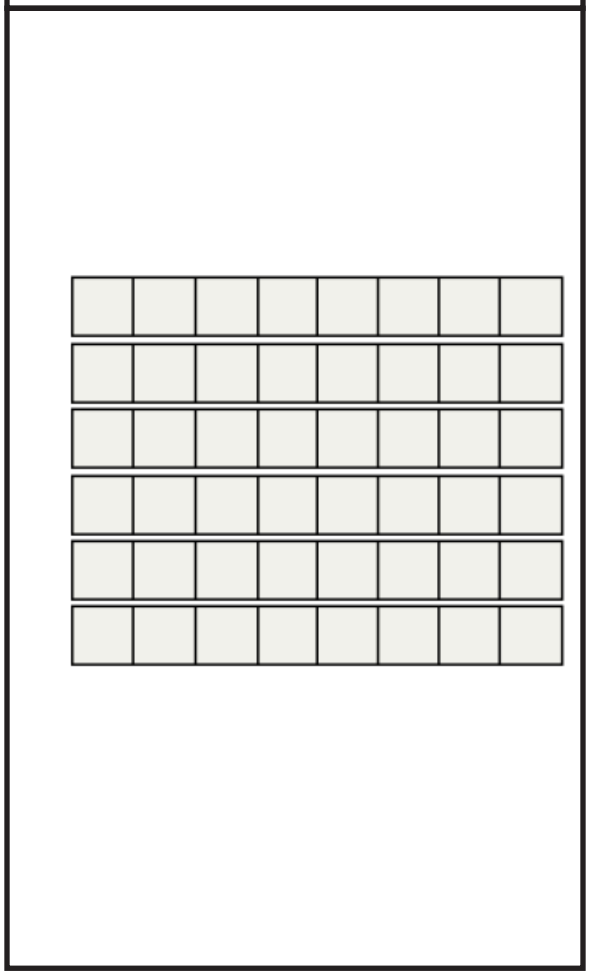


48	
6×8	8×6





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Books:

By Jo Boaler

Boaler, J. (2009). What's Math Got To Do With It? How Parents and Teachers Can Help Children Learn to Love Their Least Favorite Subject. New York: Penguin.

By Jo Boaler and Cathy Humphreys

Boaler, J., & Humphreys, C. (2005). Connecting Mathematical ideas: Middle school video cases to support teaching and learning. Portsmouth, NH: Heinemann.

Math Solutions - http://mathsolutions.com/

Math Solutions is a publishing company that has a range of excellent books to help parents and teachers with number sense

for example:

Burns, Marilyn (2007), About Teaching Mathematics: A K–8 Resource, Third Edition

By Sherry Parrish

Parish, S. (2014). Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K-5, Updated with Common Core Connections. Math Solutions.

By Kathy Richardson

Richardson, K. (1998). Developing Number Concepts: Counting, Comparing, and Pattern. Dale Seymour Publications
Richardson, K. (1998). Developing Number Concepts: Addition and Subtraction Dale Seymour Publications
Richardson, K. (1998). Developing Number Concepts: Place Value, Multiplication and Division. Dale Seymour Publications
Dale Seymour Publications. Understanding Geometry (1999) Lummi Bay Publishing

By Cathy Fosnot and Maarten Dolk

Fosnot, C., Dolk, M. (2001). Young Mathematicians at Work: Constructing Number Sense, Addition, and Subtraction: Heinemann
Fosnot, C., Dolk, M. (2001). Young Mathematicians at Work: Constructing Multiplication and Division:

Heinemann
Fosnot, C., Dolk, M. (2001). Young Mathematicians at Work: Constructing Fraction, Decimals and Percent (2002: Heinemann

By John Van De Walle and Lou Ann Lovin

Van de Walle, J. , Lovin, L.A. (2006). Teaching Student Centered Mathematics, grades K – 3: Pearson
Van de Walle, J. , Lovin, L.A. (2006). Teaching Student Centered Mathematics, grades 5 – 8: Pearson

By Heibert, Carpenter, Fennema, Fuson, Wearne and Murray

Hiebert, J., Carpenter, T., Fennema, E., Fuson, K., Wearne, D., Murray, H. (1997). Making Sense: teaching and learning mathematics with understanding. Portsmouth, NH: Heinemann.

Additional Games:

Set	http://www.setgame.com/set
Muggins!	http://www.mugginsmath.com/store.asp
Mancala	

Games & Apps:

Mathbreakers	https://www.mathbreakers.com
Motion Math	http://motionmathgames.com/
Dragon Box	http://www.dragonboxapp.com/
Refraction	http://play.centerforgamescience.org/refraction/site/
Wuzzit Trouble	http://innertubegames.net
Mancala	http://www.coolmath-games.com/0-mancala/