Hands-On Kinesthetic Activities for General Education and Special Education Classrooms

Jump$tart National Educator Conference

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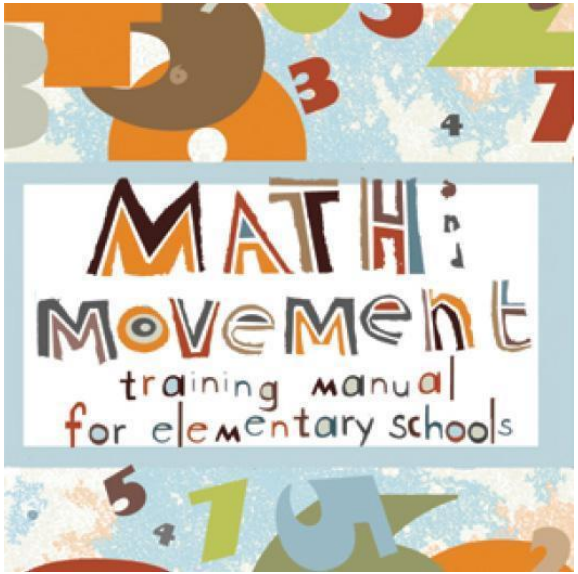
Suzy Koontz, Math & Movement Founder and CEO

Scan the QR code to get a free copy of the Math & Movement Training Manual ebook!



Suzy Koontz

MY GOAL IS TO SET STUDENTS ON A PATH TOWARDS EXCELLENT HEALTH AND ACADEMIC SUCCESS

- An associate of the Society of Actuaries
- An author of over 20 books for adults and children
- Founder and CEO of Learn Thru Movement, Inc. / Math & Movement and Hop Into Literacy
- Founding board member of the non-profit, the National Math Foundation
- ASCD Book Author

Why Do Students Find Math So Challenging?

Please Share Your Thoughts!

Common Reasons Why Students Find Math Challenging

1. Memorization is difficult
2. Have never felt successful while doing math
3. Test anxiety
4. Fear of criticism or getting something wrong
5. Different learning styles
6. Boring...

Where Students Are

An Ongoing Learning Crisis...

- According to ProLiteracy, **36 million adults in the United States** cannot read, write, or do math above a third-grade level.
- According to the National Child Traumatic Stress Network (NCTSN), around **40% of students in the U.S.** have been exposed to some form of traumatic stress in their lives.
- According to Picha (2018), math anxiety is experienced by **over 50% of Americans**. Anxiety over one's performance in math affects girls in the classroom in particular.

Where are our students at?

- Childhood obesity in the US includes >20% of all adolescents (Brooks et al., 2021)
- Adolescent recreational screen time more than doubled from 3.8 hours per day to 7.7 hours per day (not including school work) (Raney et al., 2022)
- Moderate-to-vigorous physical activity (60 minutes per day) decreased from 16.1% (pre-pandemic) to 8.9% during the pandemic (Raney et al., 2022; Cortez et al., 2023)

Cognitive “Tug-of-War”

QUICK Development

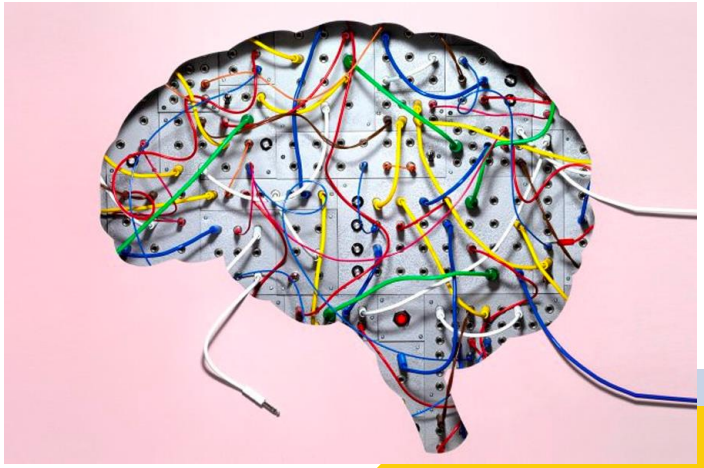
- Social sensitivity
- Emotional systems
- Resting connectome

SLOW Development

- Complex systems reasoning improvement
- Cognitive control

*Greater screen time and lower PA have been associated with adolescent **depression**, **anxiety**, and **obesity***

(Raney et al., 2022)



How can we support our students' development?

Repeated movements can strengthen neural connections in brains, improving efficiency and speed of learning, especially in children who have experienced **childhood adversity.**

(Supekar et al., 2015)

Our Approach:

1. Behavioral and academic impact of making **affirmations** daily routine (Disengaged vs Engaged)
2. Sustained, active engagement creates "WOW" moments for students

What is Math & Movement?

Math & Movement is a **kinesthetic, multi-sensory** approach to teaching math that incorporates **physical exercise, stretching, cross-body movements,** and **visually-pleasing** floor mats designed to encourage student to practice math.

Benefits of Movement-Based Learning

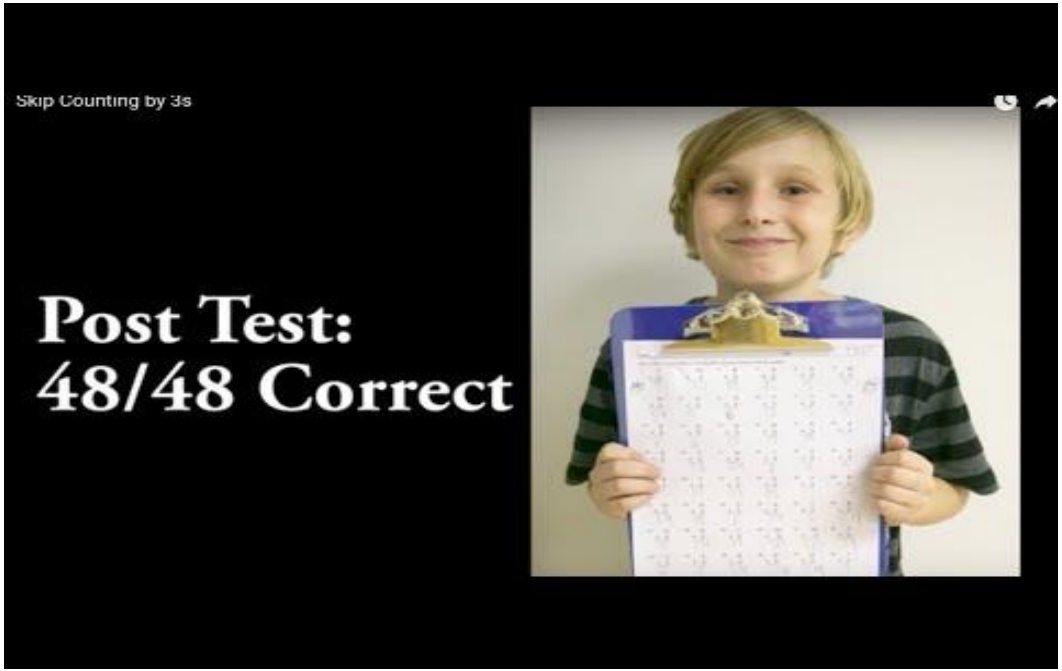
- Students love it!
- Increase dopamine, increase learning!
- Keeps kids healthy!
- Increases student engagement
- Boosts student achievement.
- Addresses the “new” achievement gap

How to Include Movement

ACTIVE MATH MOVEMENTS

FLOOR MATS OR DECALS

Example of How Movement Transforms Self-Confidence



Why Kinesthetic Learning?

The Importance of Activity and Exploration

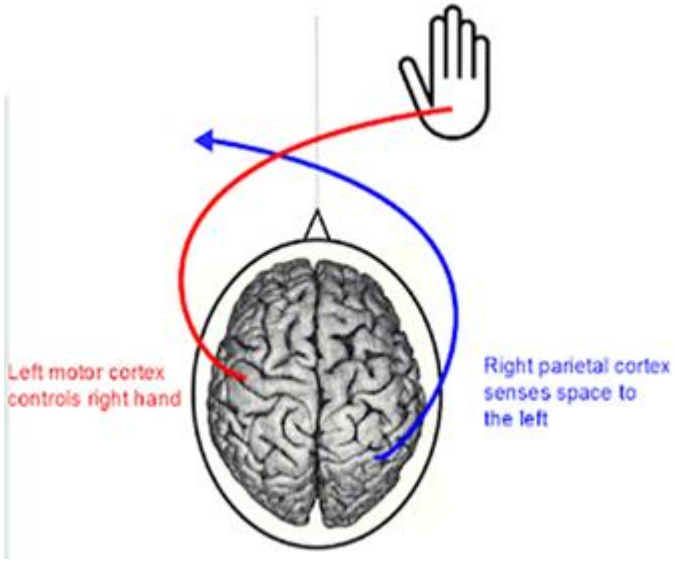
What is Kinesthetic Learning?

Kinesthetic learning refers to a learning style that involves whole-body movement and tactile engagement.

Kinesthetic learners process information best when they are physically engaged during the learning process; they often prefer a ‘learning through doing’ approach (Fleming & Mills, 1992).

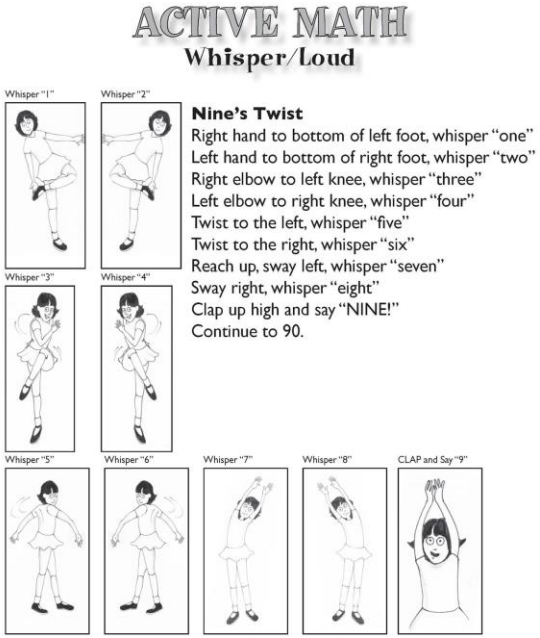
Cross-Lateral Movements

- Picture an imaginary line from your nose to the floor. Crossing the line with your arms or legs is called a cross-lateral movement.
- When learning new information, your brain is like a blender!
- Crossing the midline engages both hemispheres of the brain resulting in increased learning and retention.



Muscles that are wired together fire together!

Nines Twist


ACTIVE MATH
Whisper/Loud
Whisper "1"
Whisper "2"
Nine's Twist
Right hand to bottom of left foot, whisper "one"
Left hand to bottom of right foot, whisper "two"
Right elbow to left knee, whisper "three"
Left elbow to right knee, whisper "four"
Twist to the left, whisper "five"
Twist to the right, whisper "six"
Reach up, sway left, whisper "seven"
Sway right, whisper "eight"
Clap up high and say "NINE!"
Continue to 90.
Whisper "3"
Whisper "4"
Whisper "5"
Whisper "6"
Whisper "7"
Whisper "8"
CLAP and Say "9"

Financial Literacy Topics

The Importance of Financial Literacy

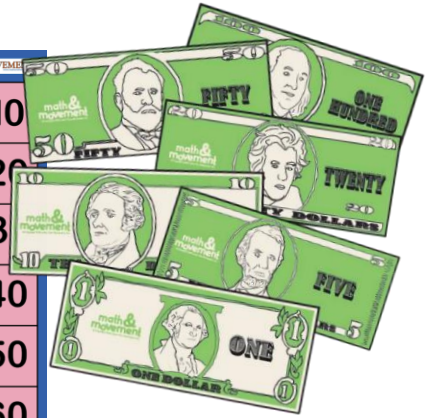
Financial Literacy Topics

- Saving
- Banking
- Earning
- Credit cards
- Taxes
- Budgeting
- Loans
- Debt
- Spending
- Investing
- Checking Accounts

Financial Literacy Foundations Begin With Money!

Suzy Kontz's — Add/Subtract Mat — MATH MOVEMENT

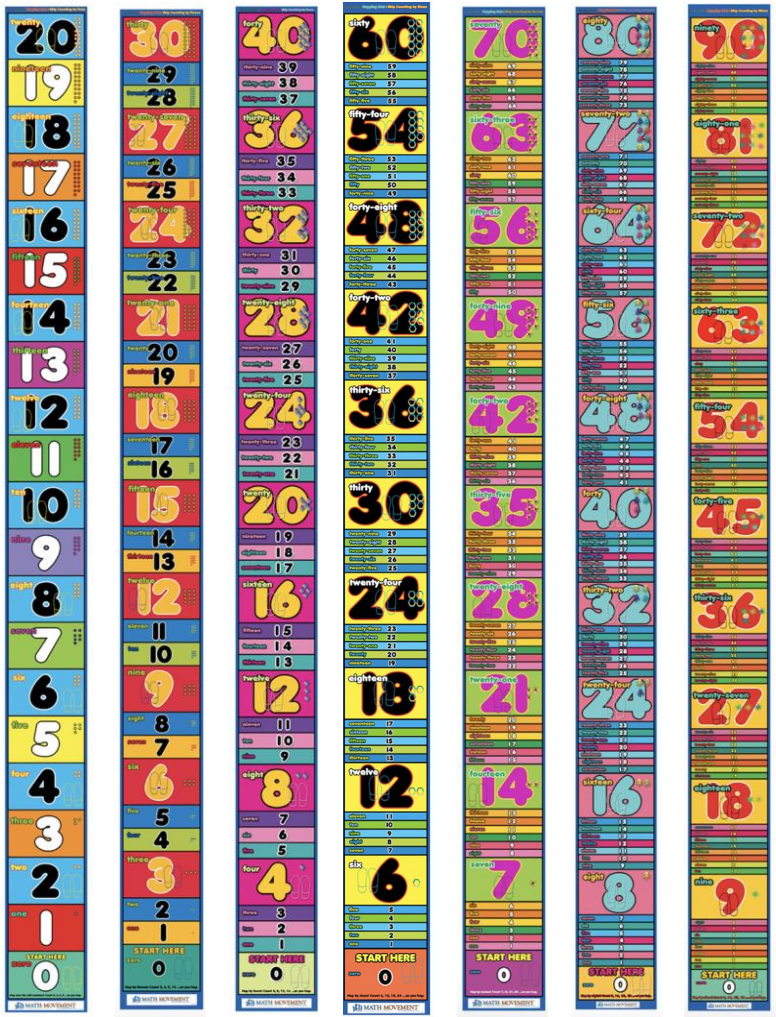
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Financial Literacy Needs Fluency in Foundational Math Skills!

These mats can be used to meet curriculum standards for

- Addition/Subtraction
- Multiplication/Division
- Fractions/Decimals/Percents
- Factoring
- LCM
- Algebra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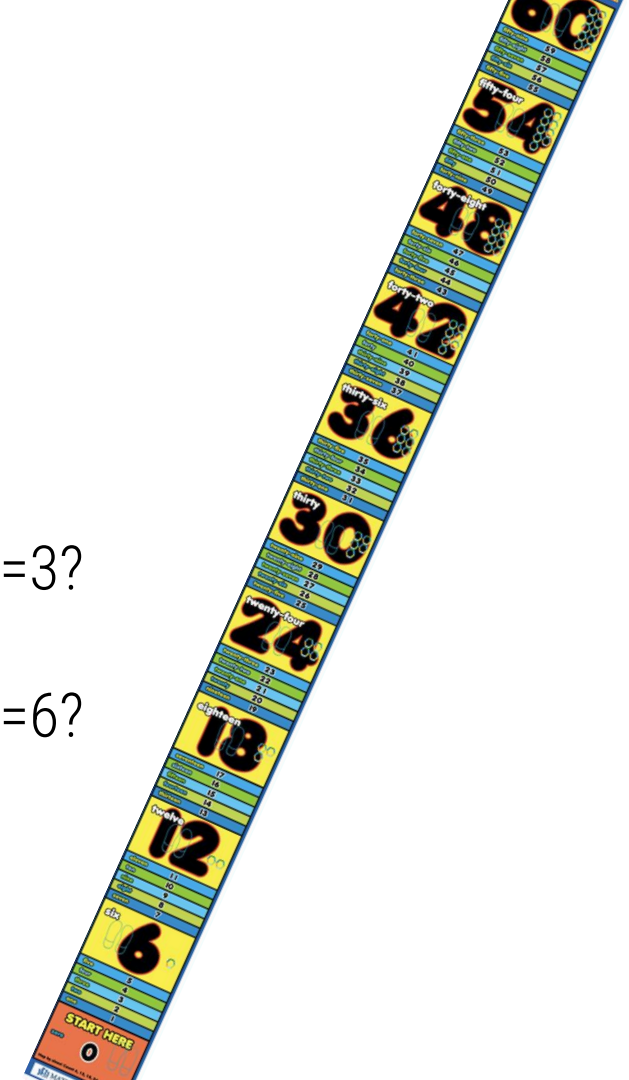
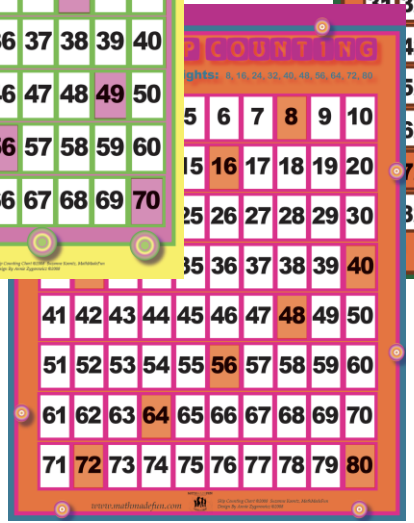
What is 6x+5 when x=3?

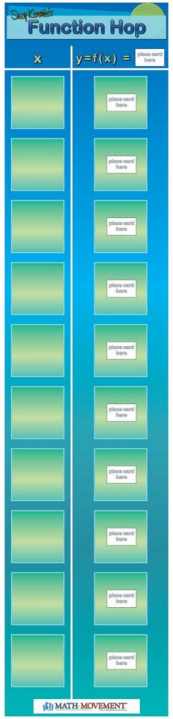
What is 6x+2 when x=6?

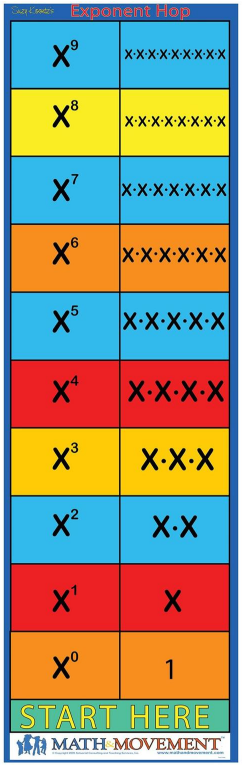


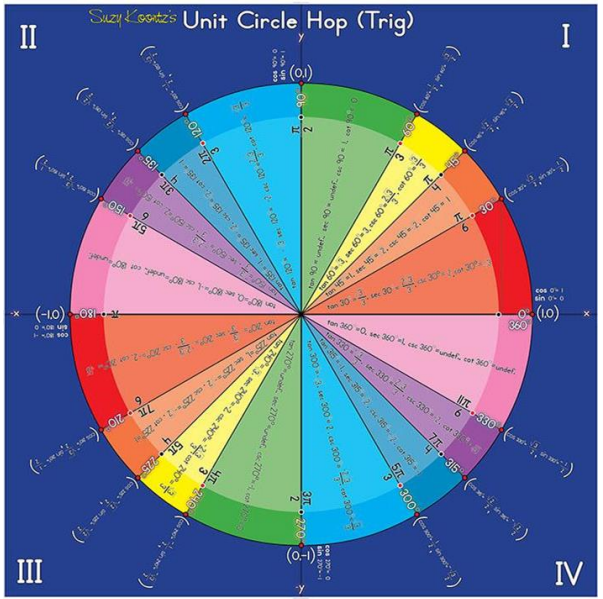
Skip Counting Banners



MATH & MOVEMENT FOR HIGH SCHOOL



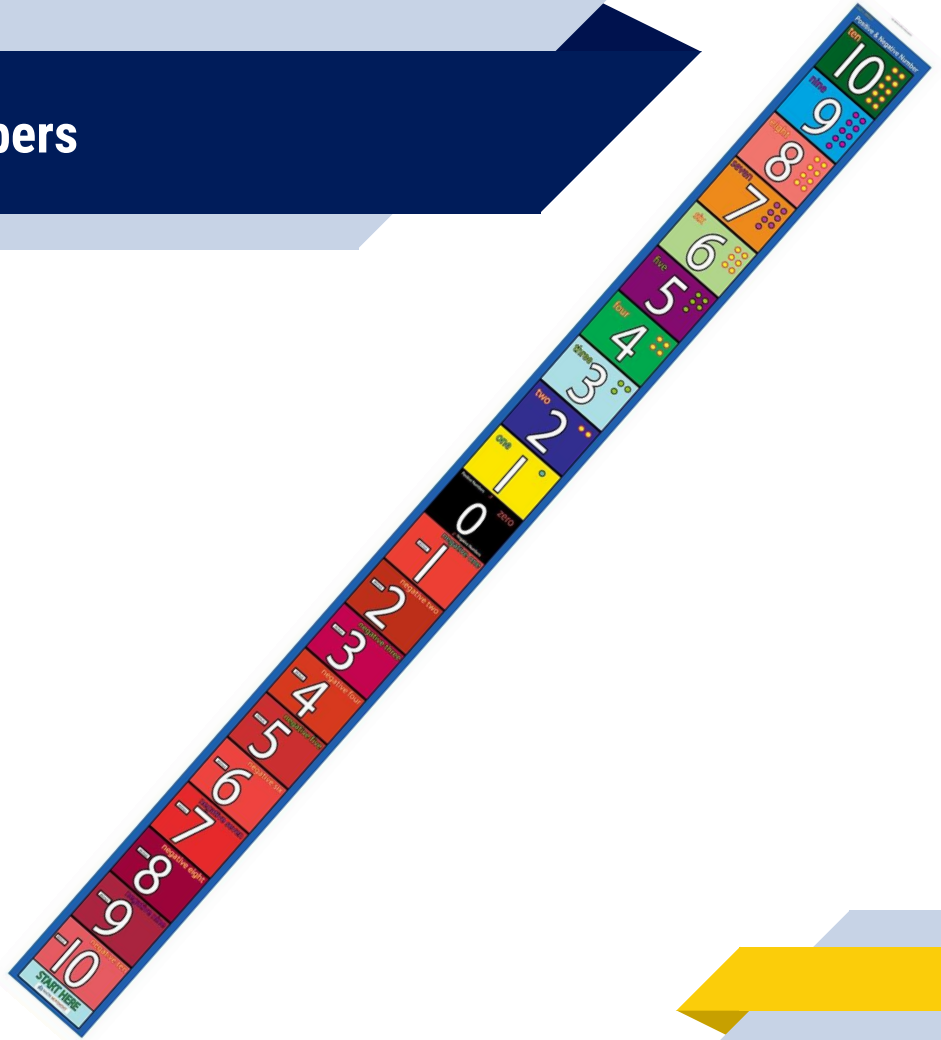


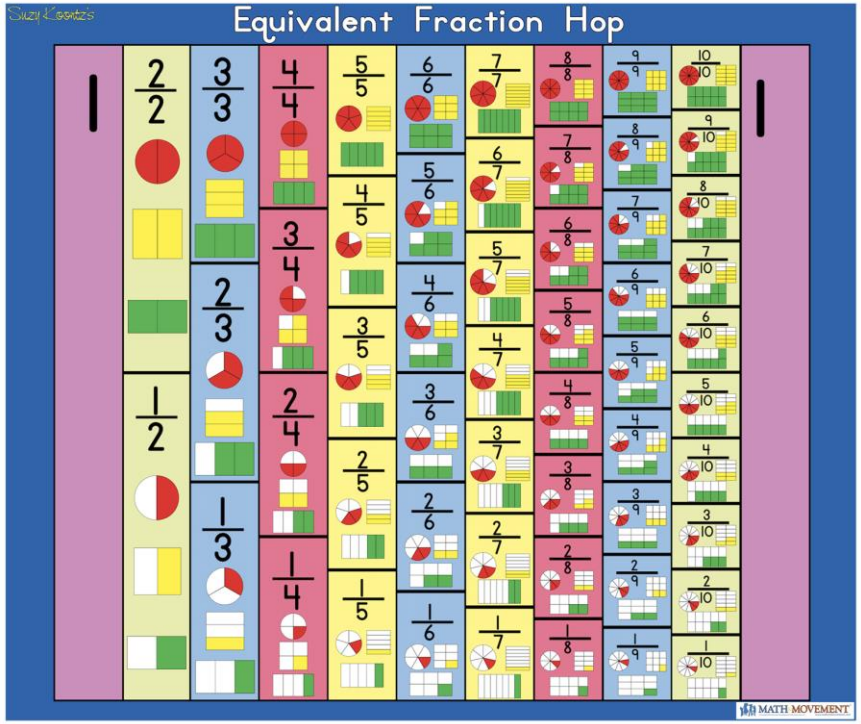


Positive and Negative Numbers

What is -5+-3?

What about -3 - (-7)?

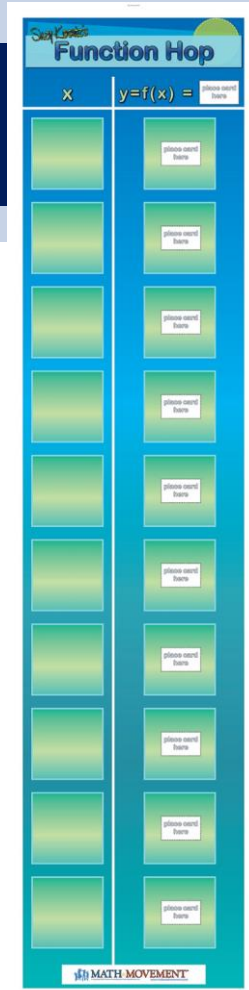


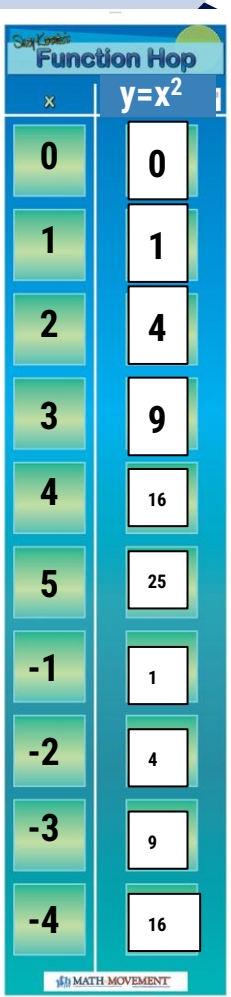


Equivalent Fraction

Function Hop

- Write a function on an index card and place at the top.
- Choose values of x.
- Plug in the values of x into the function.



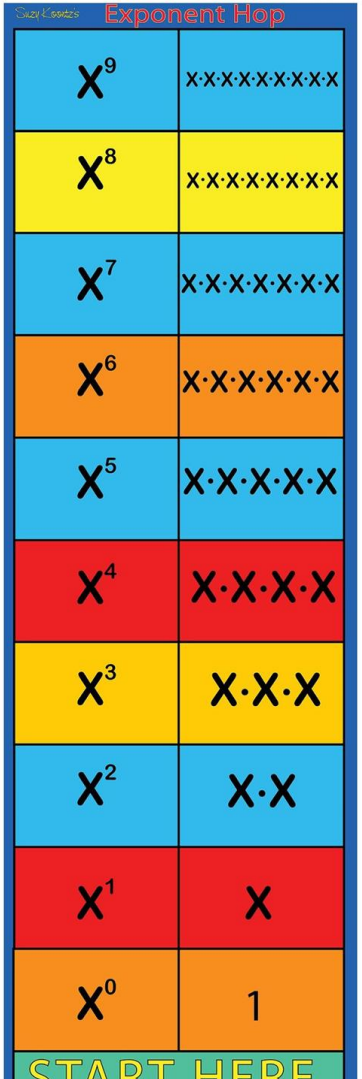


Exponent Hop

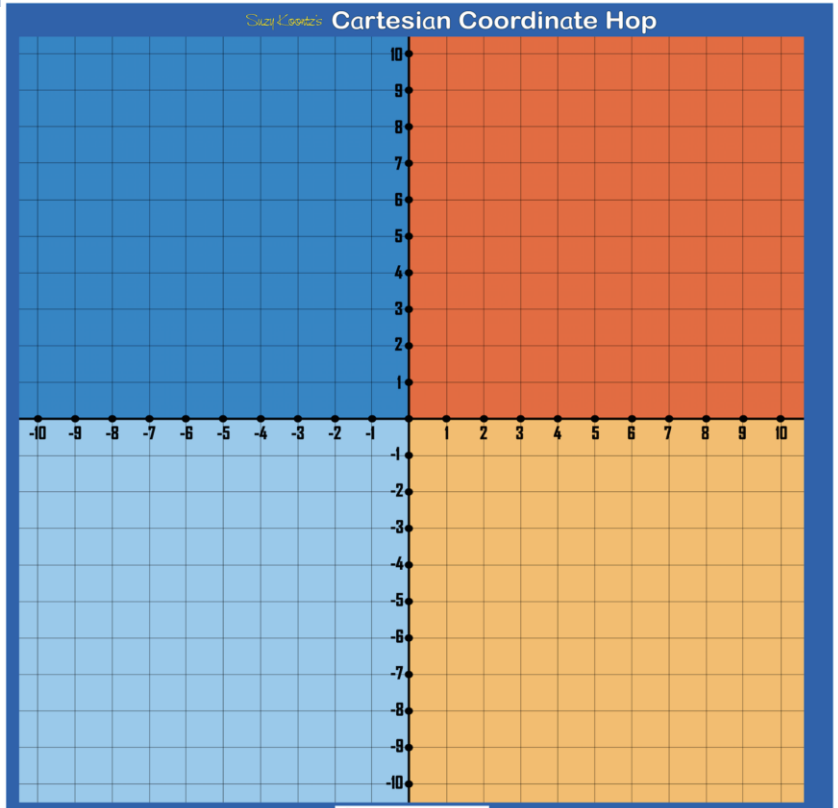
Students jump on exponents to develop conceptual understanding of exponents.

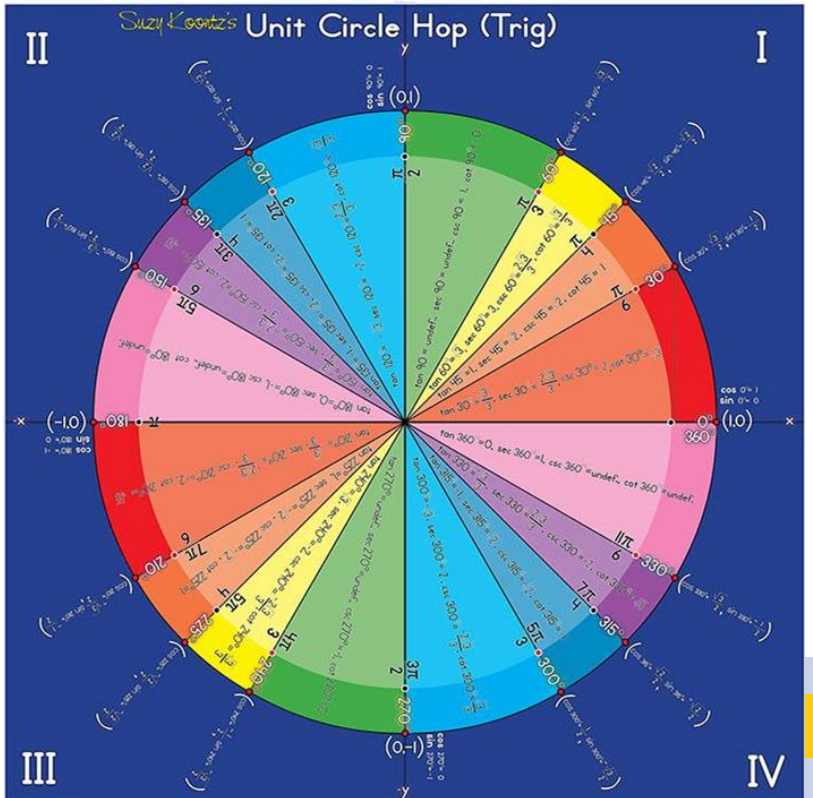
x cubed is equal to x times x times x

What is x squared times x cubed?



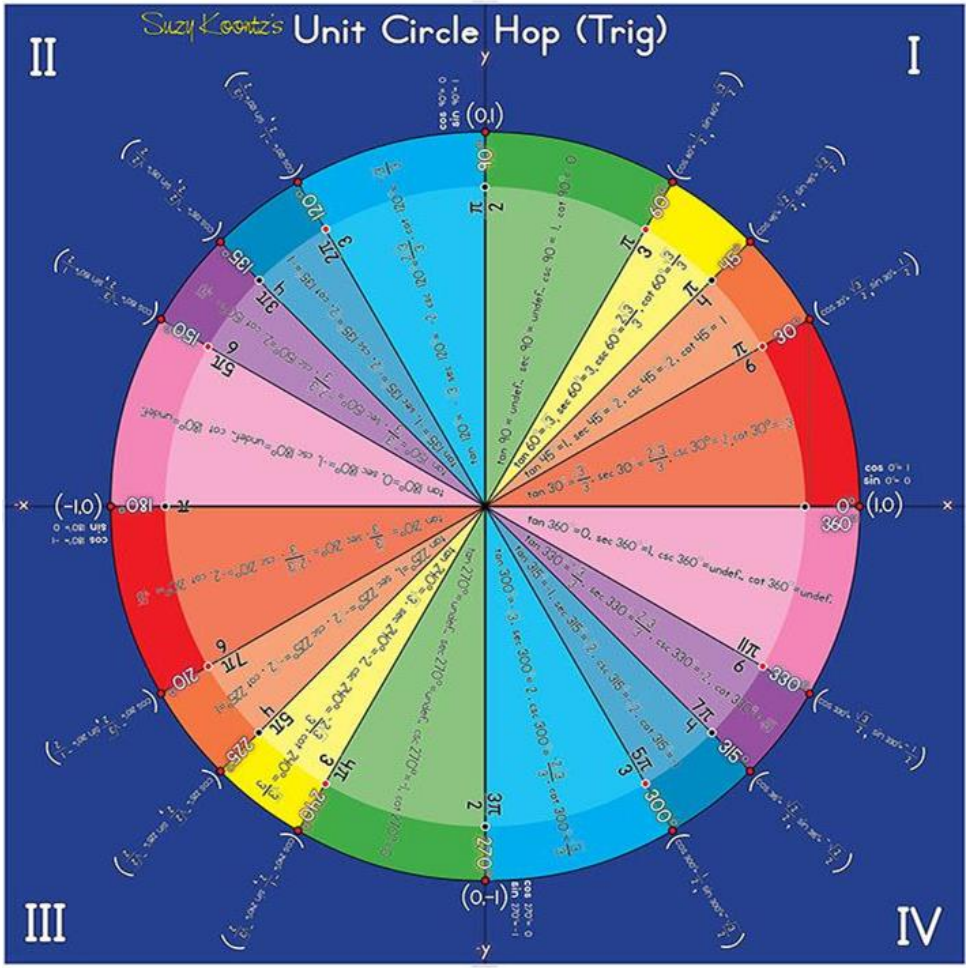
Algebra and Trig





Algebra and Trig Question Examples

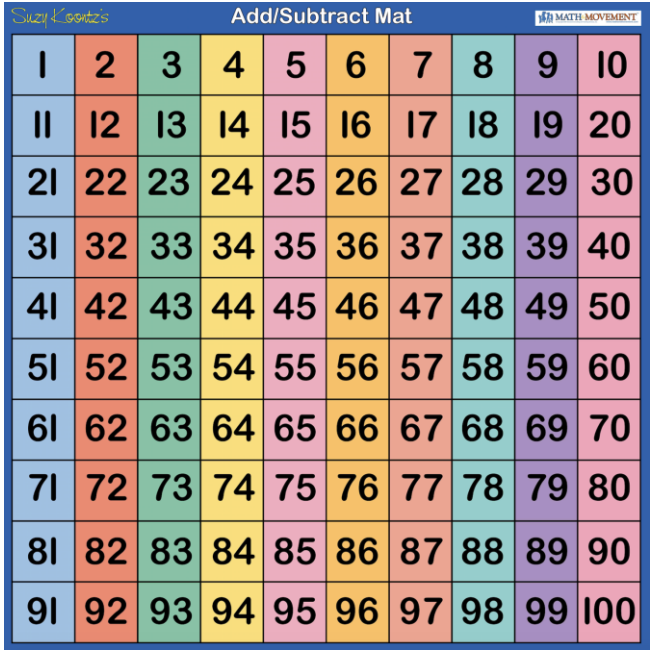
- What would happen if we blew up the spot on this mat between the x values of -1 to 1 AND the y values of -1 to 1?
- What if we enlarged it so much that it was the exact same size as this 8 feet by 8 feet Cartesian Coordinate mat?
- This is what I have done here and I put a circle in between these points.Now that we have a circle, we can talk about how many degrees are in the circle. Answer 360
- We can determine the sin and cos of common angles!


Suzy Koontz's Unit Circle Hop (Trig)
II
I
III
IV
(0,1)
(1,0)
(-1,0)
(0,-1)
90
60
45
30
0
360
330
315
300
270
240
225
210
180
150
135
120
π/2
π/3
π/4
π/6
0
11π/6
7π/4
5π/3
3π/2
4π/3
5π/4
7π/6
π
3π/4
2π/3

Rounding

Select a number and ask your students to round it to the nearest ten or hundred. Have them hop to the rounded number.

You could also have a student roll a die or toss a bean bag to select the initial number.



Fractions, Decimals and Percents

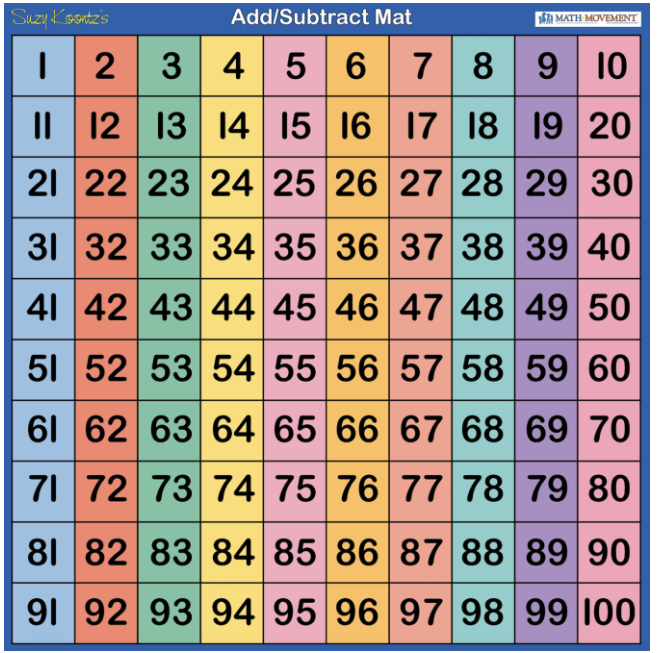
Have students stand on boxes 1, 2, and 3.

How many boxes are filled out of 100 boxes?

What is the fraction?

What is the decimal?

What is the percent?



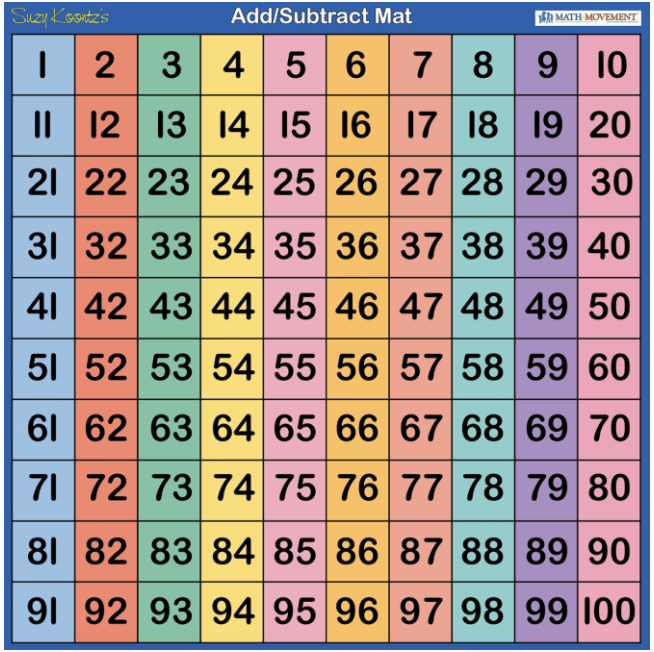
Sieve of Eratosthenes (Grades 4 - 5)

A prime number is a natural number that is greater than one and only has two factors, one and itself. Have your students use the Sieve of Eratosthenes to find all the prime numbers up to 100.

1. Stand on the number one. One is special - it is neither prime nor composite.

2. Step to the number two. This number is prime. Skip count by twos, covering all the multiples of two with black construction paper.

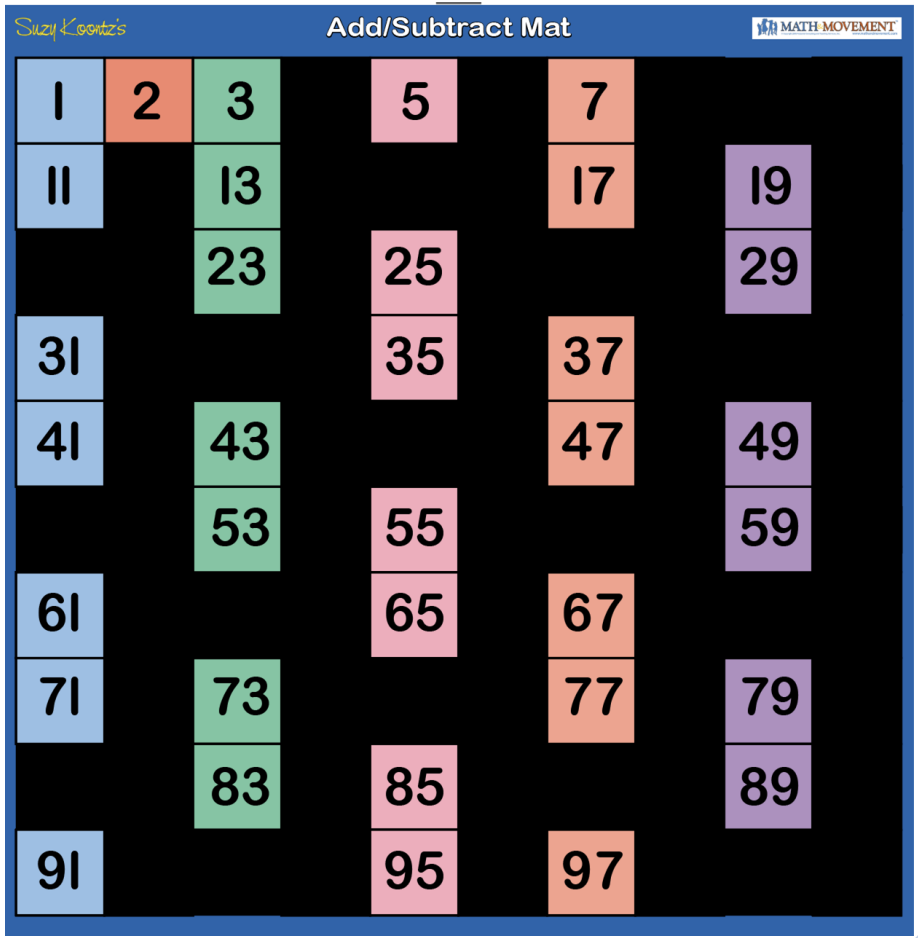
4. Continue the same pattern until 100. The numbers not covered in black construction paper are the prime numbers.



Move to the next number that is not covered with construction paper (in this case it will be three). Skip count by 3s and cover all the multiples of 3 with black construction paper.

Next have the student step on 5. What multiplies of 5 will be covered with black construction paper?

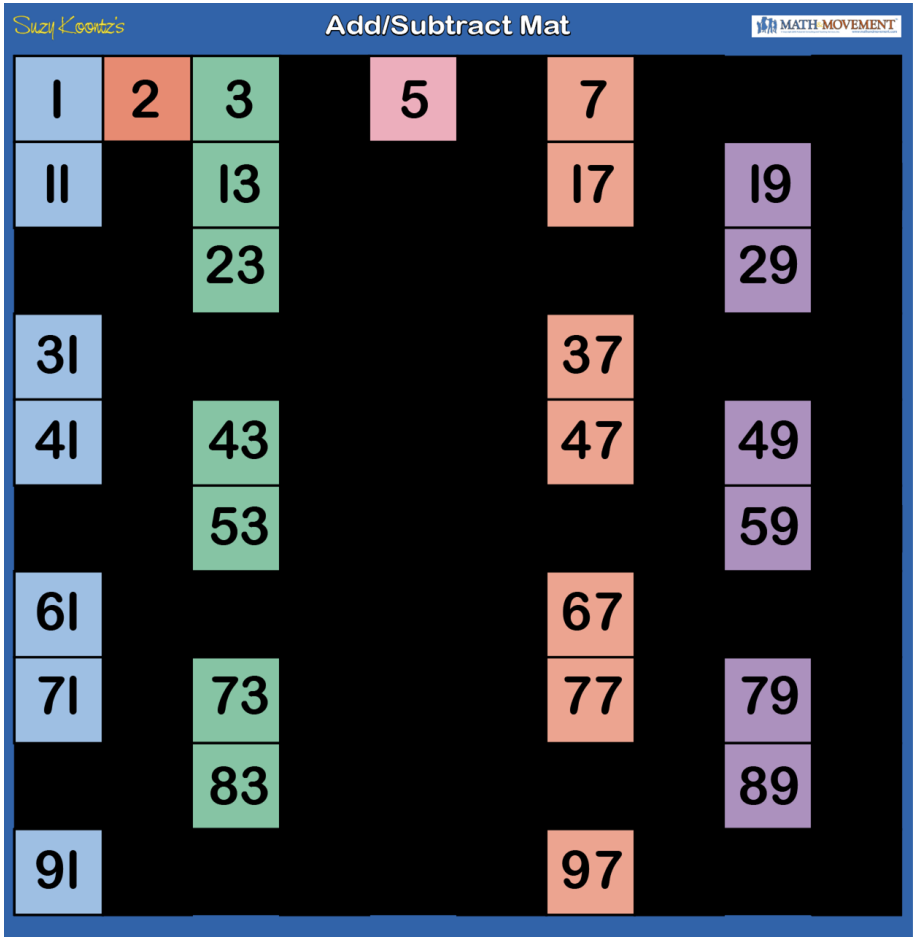
The composite numbers 25, 35, 55, 65, 85 and 95 will be eliminated!



What is the next prime number? Have student stand on 7 and skip count by 7s.

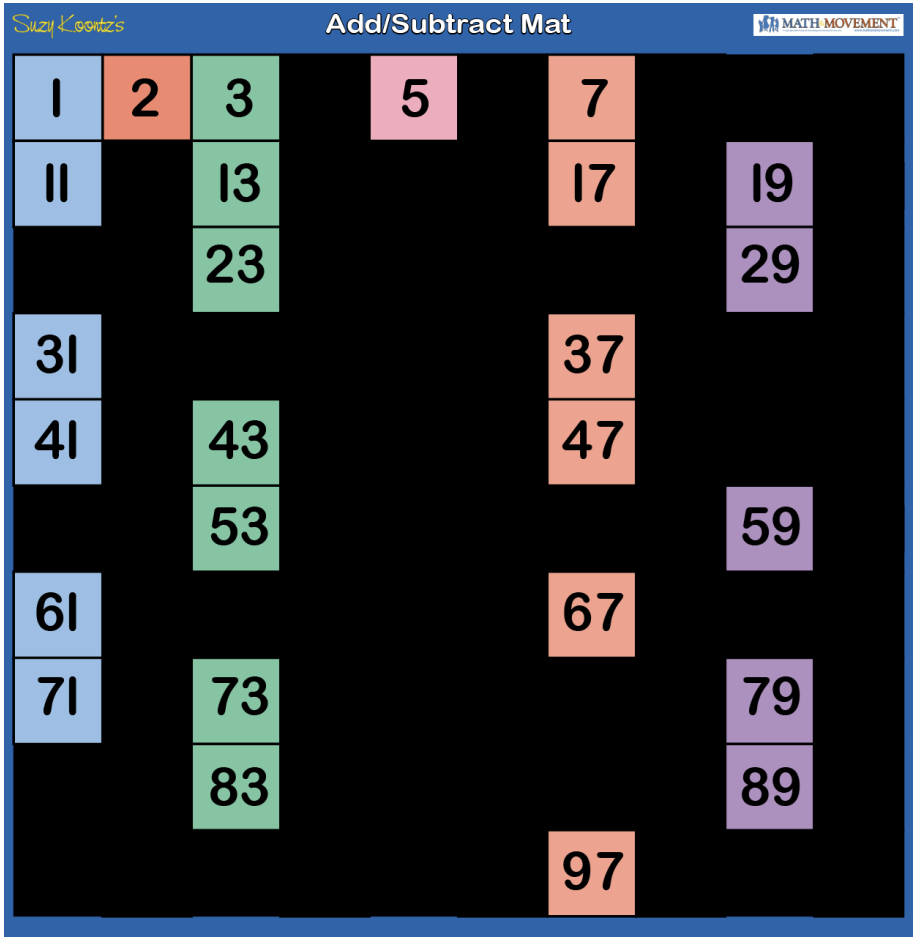
7, 14, 21, 28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98

3 more composite numbers will be eliminated!



Next have the student stand on 11 and skip count by 11s.

11, 22, 33, 44, 55, 66, 77, 88, 99. All these composite numbers have been eliminated!

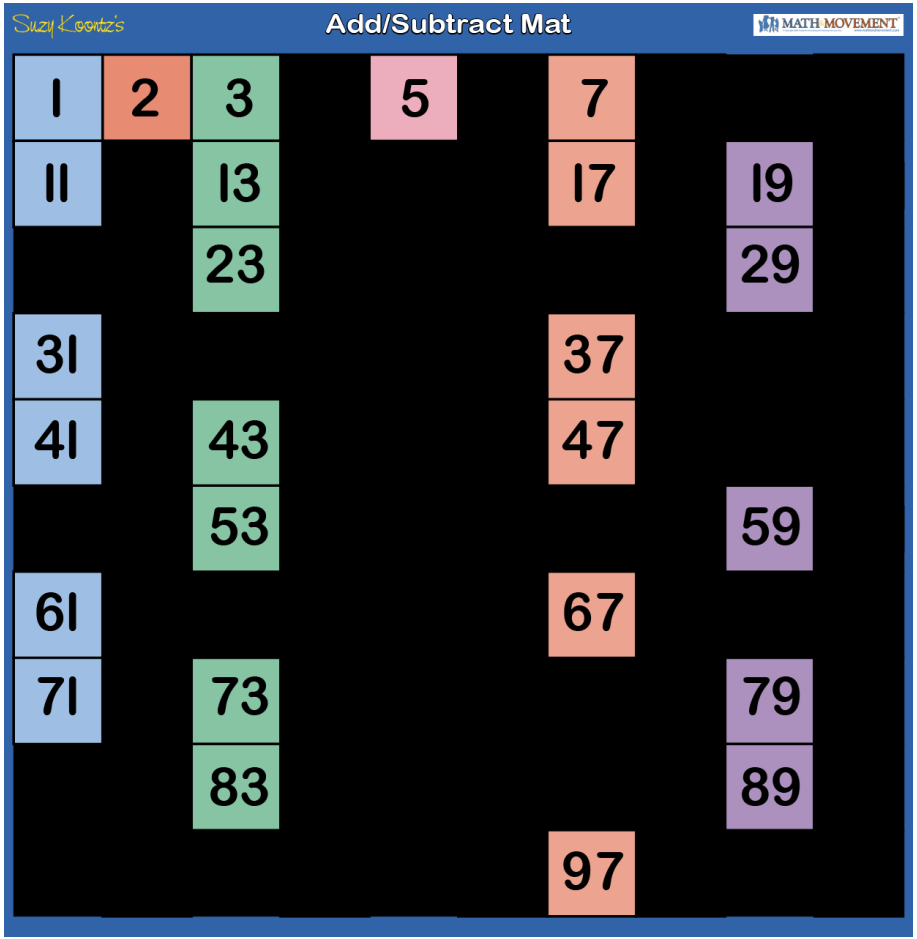


Next have the student stand on 13 and skip count by 13s.

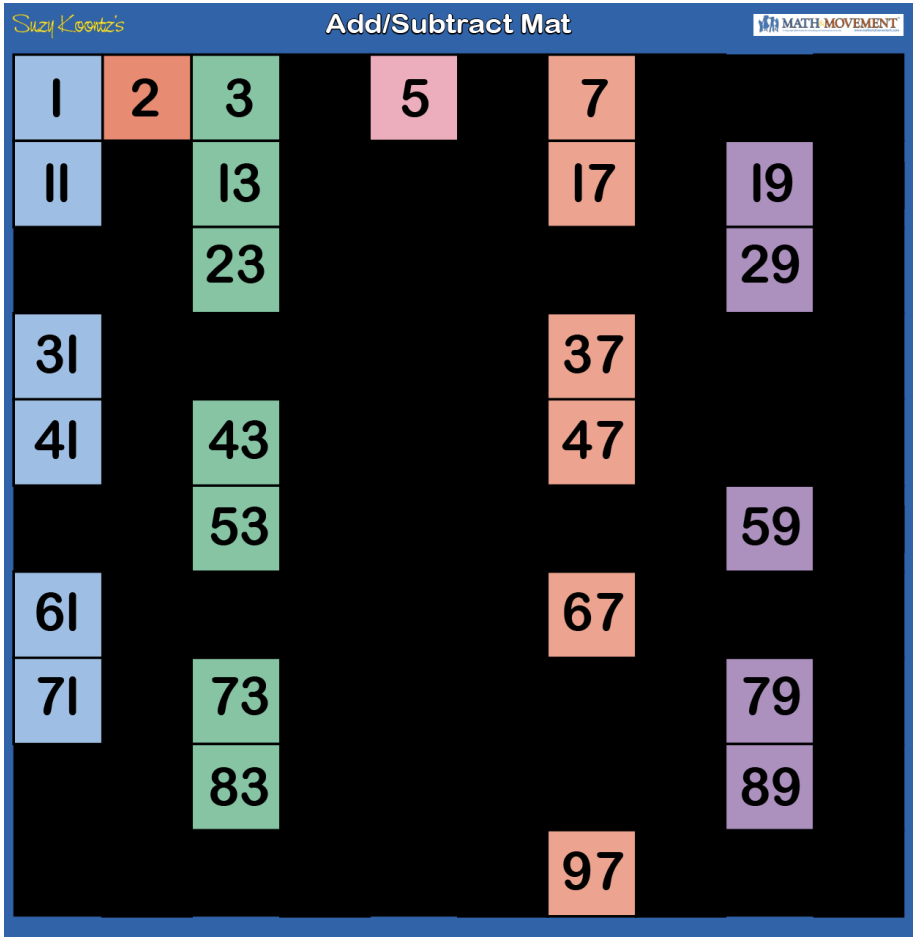
13, 26, 39, 52, 65, 78, and 91.

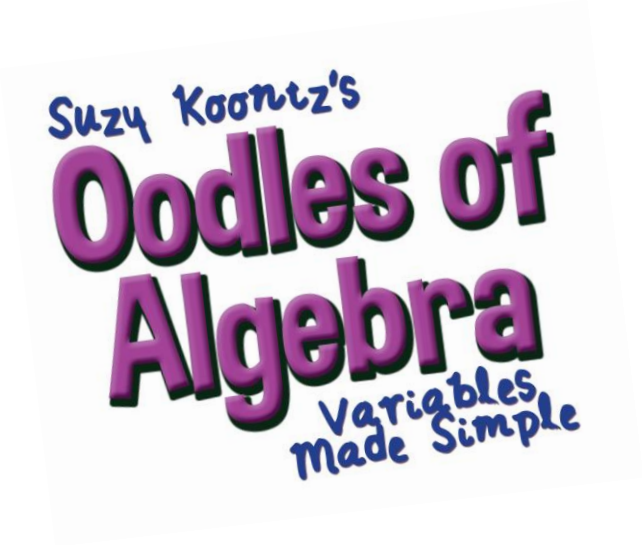
All these composite numbers have been eliminated!

Next check the multiples of 17. 17, 34, 51, 68, 85.



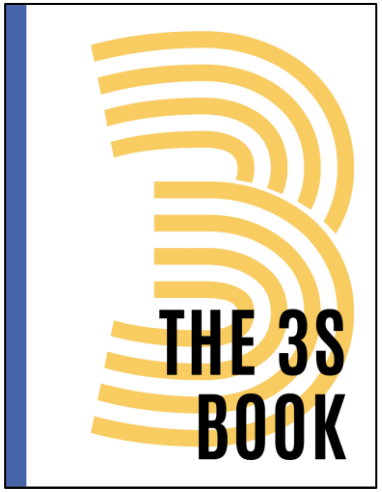
There are 25 **prime numbers between 1 and 100**. They are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97!





Addition	Multiplication
$2x^2z + 3xz = can't\ add$	$2x^2z \cdot 3xz = 6x^3z^2$
$4x^2z + 9xz =$ _____	$4x^2z \cdot 9xz =$ _____
$8x^2z + 3x^2z =$ _____	$8x^2z \cdot 3x^2z =$ _____
$6x^4 + 3x^3 =$ _____	$6x^4 \cdot 3x^3 =$ _____
$7xyz + 4xyz =$ _____	$7xyz \cdot 4xyz =$ _____
$9xz + 3xz^2 =$ _____	$9xz \cdot 3xz^2 =$ _____
$5z^2z + 8z^2z =$ _____	$5z^2z \cdot 8z^2z =$ _____
$4z^5 + 6z^5 =$ _____	$4z^5 \cdot 6z^5 =$ _____
$3z^5 + 7z^5 =$ _____	$3z^5 \cdot 7z^5 =$ _____
$6z^3 + 5z^3 =$ _____	$6z^3 \cdot 5z^3 =$ _____
$5xyz + 7xz =$ _____	$5xyz \cdot 7xz =$ _____

THE 3S E-BOOK IS INCLUDED FOR ALL PARTICIPANTS



- Skip Counting Fill in the Blank
- Multiplication Problems
- Multiplication Word Problems
- Division Problems
- Division Word Problems
- Oodles of Algebra
- I Love to Cancel
- More Fun With Algebra

Addition	Multiplication
$2x^2z + 3xz =$ *can't add*	$2x^2z \cdot 3xz = 6x^3z^2$
$3x^2z + 4x^2z =$ _____	$3x^2z \cdot 4x^2z =$ _____
$7xz + 3x^2z =$ _____	$7xz \cdot 3x^2z =$ _____
$3x^4 + 6x^3 =$ _____	$3x^4 \cdot 6x^3 =$ _____
$3xyz + 5xyz =$ _____	$3xyz \cdot 5xyz =$ _____
$1xz + 3xz^2 =$ _____	$1xz \cdot 3xz^2 =$ _____
$9z^2z + 3z^2z =$ _____	$9z^2z \cdot 3z^2z =$ _____
$3z^5 + 3z^5 =$ _____	$3z^5 \cdot 3z^5 =$ _____
$3y^5 + 8y^4 =$ _____	$3y^5 \cdot 8y^4 =$ _____
$2y^3 + 3y^3 =$ _____	$2y^3 \cdot 3y^3 =$ _____
$3xy + 7xy =$ _____	$3xy \cdot 7xy =$ _____
$4xy + 3xz =$ _____	$4xy \cdot 3xz =$ _____

1. $\frac{18fgh}{3fg} =$

2. $\frac{30iz}{3iq} =$

3. $\frac{33tawr}{3awr} =$

4. $\frac{21\psi s}{3\psi} =$

5. $\frac{9mde}{3mdvz} =$

6. $\frac{15j\pi}{3j\pi} =$

7. $\frac{24yx}{3yx} =$

8. $\frac{27vpu}{3vu} =$

9. $\frac{12\beta ta}{3ta} =$

10. $\frac{36ce\phi}{3ce\phi} =$

11. $\frac{24bn}{3bn} =$

12. $\frac{6gf}{3f} =$

13. $\frac{3wx}{3x} =$

14. $\frac{12jyz}{3jyz} =$

1.) $(x+3)(x+8) =$ _____

	x	+	8
x			
+			
3			

2.) $(x+3)(x+7) =$ _____

	x	+	7
x			
+			
3			

3.) $(x+3)(x+12) =$ _____

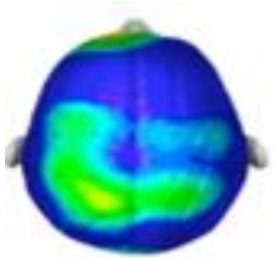
	x	+	12
x			
+			
3			

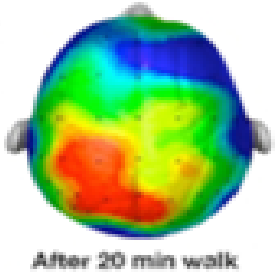
The Science Behind Movement-Based Learning

THE LINK BETWEEN PHYSICAL ACTIVITY AND BRAIN ACTIVITY

The images are a composite scan of 20 students' brains taking the identical test. The top image is the brain activity from students who sat quietly prior to the test. The bottom image is from students who were physically active prior to the test. The images show their brains were more active, as well!

-Dr. Chuck Hillman, University of Illinois





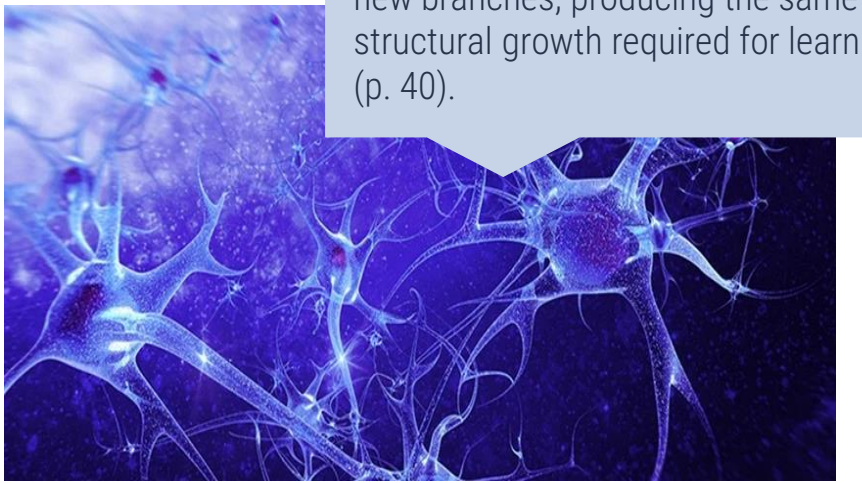
I cannot underestimate how important regular exercise is in improving the function and performance of the brain. Exercise stimulates our gray matter to produce 'Miracle-Gro' for the brain.' This refers to the brain chemical BDNF (brain-derived-neurotrophic factor). Exercise stimulates the brain to produce extra BDNF which is used to enhance the development of new neurons (and their connections).

Dr. John Ratey
Spark: The Revolutionary New Science of Exercise and the Brain

BDNF in the Brain

In addition, Ratey states, “Inside the cell, BDNF activates genes that call for the production of more BDNF as well as serotonin and proteins that build up the synapse. BDNF directs traffic and engineers the roads as well. Overall, it improves the function of neurons, encourages their growth and strengthens and protects them against the natural process of cell death” (p. 40).

“Early on researchers found that if they sprinkled BDNF onto neurons in a petri dish, the cells automatically sprouted new branches, producing the same structural growth required for learning” (p. 40).



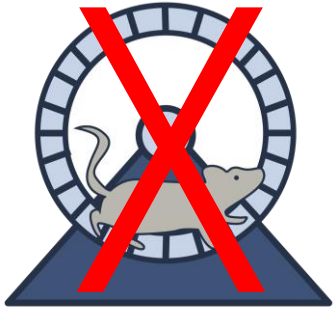
What is BDNF?

- BDNF stands for brain-derived-neurotrophic factor
- BDNF is related to the neurotrophin family of growth factors
- BDNF is the protein that stimulates and controls the growth of new neurons in the brain

BDNF and Physical Activity

Group 1

Control Group



Group 2

Mice ran two nights a week.

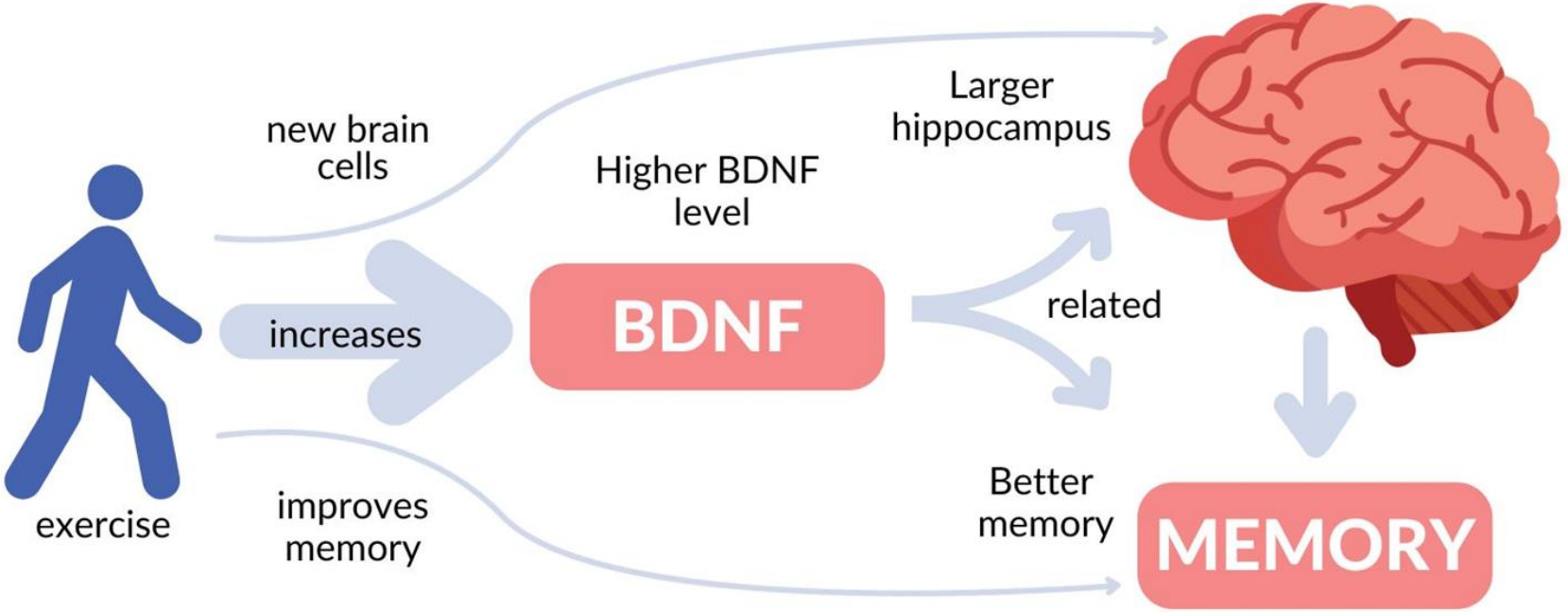
Group 3

Mice ran four nights a week.

Group 4

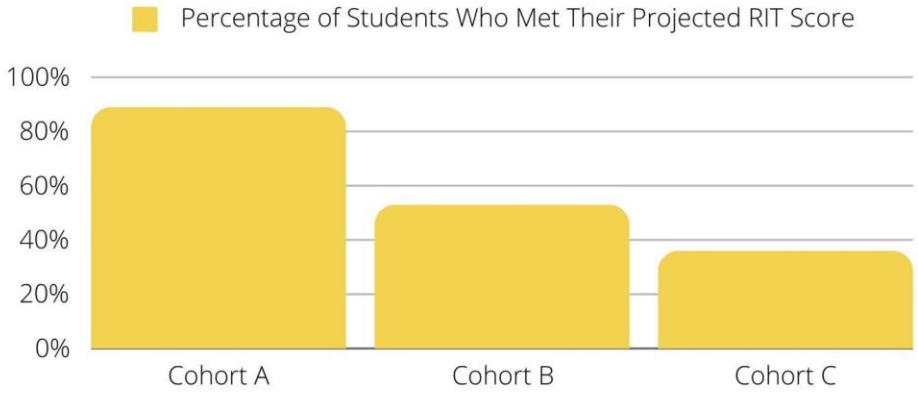
Mice ran seven nights a week.

Brain scans showed **increased levels of BDNF in the running mice** vs. the controls. The farther the mouse ran, the higher the levels of the BDNF.


new brain cells
Higher BDNF level
Larger hippocampus
increases
BDNF
related
exercise
improves memory
Better memory
MEMORY

Data Behind Movement-Based Learning In Schools

Davidson Elementary School, Davidson, NC, 2017



***RIT score**: estimated instructional level and progress*

***Cohort A**: Direct lessons, interventions, and warm-ups using the materials regularly*

***Cohort B**: Used materials as student learning supplements*

***Cohort C**: Did not participate in the project*

Why Math & Literacy?

Ending “Math-Phobia”

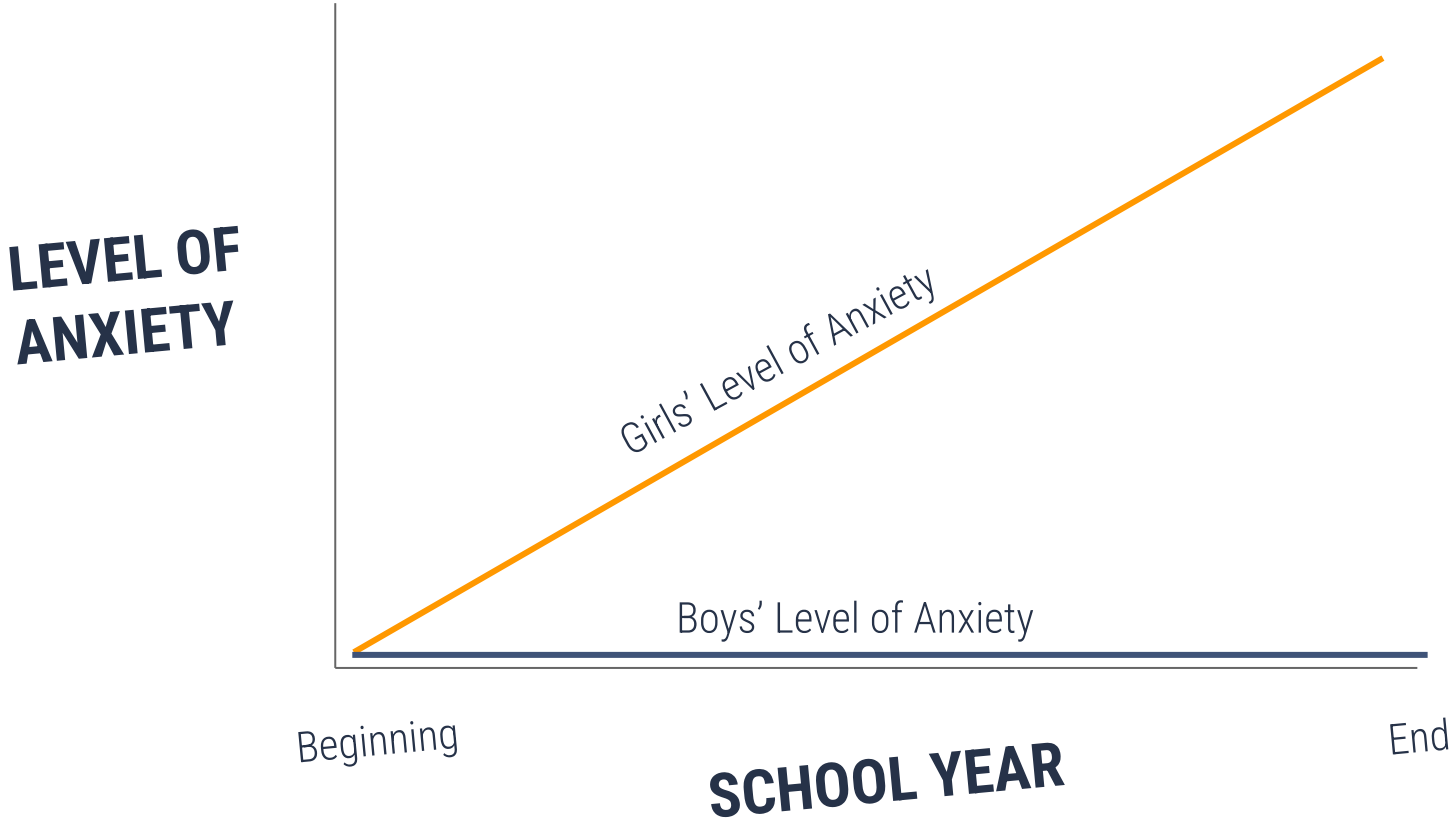
Math Anxiety

- Definition: an unpleasant affective response to even the idea of learning or being tested on math concepts (Young, Wu, & Menon, 2012)
  - Effects 50% of Americans (Picha, 2018).
  - Reasons for Math Anxiety include.. Fear of making mistakes, feeling dumb when getting a problem wrong, and having no confidence in one's ability to do math (Harper & Daane, 1998).
- Gender Disparity
  - Disproportionately affects women and girls (Goetz et al., 2013)

Female Teachers' Math Anxiety Affects Girls' Math Achievement

Highly math-anxious teacher

Less math-anxious teacher


LEVEL OF ANXIETY
Girls' Level of Anxiety
Boys' Level of Anxiety
Beginning
End
SCHOOL YEAR

The Power of Positive Affirmations

Boosting Students' Self-Confidence

Students' Self-Esteem

- High self-esteem can be damaging to students' achievement if praise (or other self-esteem building actions) is not directed towards positive behavior and effort.
- Praise is beneficial to students' mental health and can be an incentive for them to perform better on tests if that praise is given during moments when they are putting good effort.
  - Aimless or superfluous praise like "wow you are smart" has been shown to actually be unhelpful!

Positive Emotions and BBT

- Positive emotions have also been linked to the development of thought-processing skills.
- “broaden-and-build” theory (BBT)
  - According to this theory, positive emotions don’t simply act as markers or signals of well-being and health, but actually work to produce well-being and health.

Movement and Emotions

Where does kinesthetic learning come into play among our discussion of positive emotions?

- Movement and play in the classroom have been associated with prevalent feelings of positive emotion and, in turn, the resulting neural, emotional, and sociocognitive benefits.
  - play is fun, and when one has fun, one experiences positive emotion!
  - Children who are playing display more positive affect than children not playing, which doesn't come as a surprise when observing them (Moore & Russ, 2008),

Where to Include Positive Affirmations?

- In Our Mantras and Energizers
- On the Walls
- On the Floor
- On the Ceiling
- On the Sidewalk
- In Our Bathrooms

Positive Affirmations

Affirmations on the Ceiling

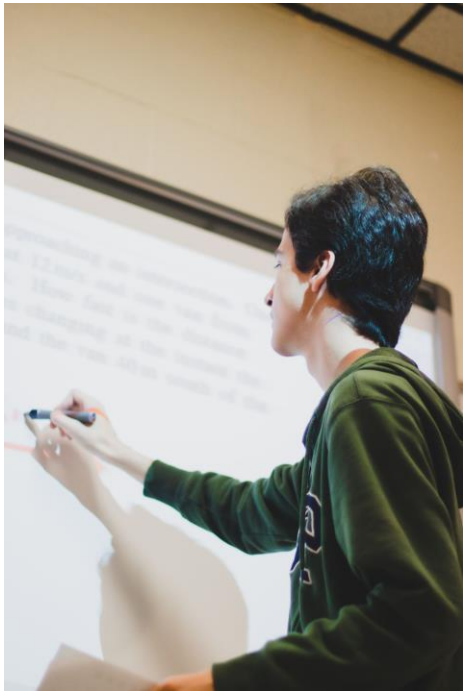
Affirmations in the Bathroom

Emotion Contagion

Definition: Students' and teachers' tendency to mimic and synchronize each other's nonverbal behaviors, tone, and ultimately emotional experiences (Mottet & Beebe, 2000).

Contagion effect is strongest for the feeling of joy; teachers' positive emotional expression towards material.

- As a result, students become…
  - Excited in the subject matter and increase their participation.
  - More motivated to learn.
  - More likely to develop creative skills (Kimura, 2010).
    - Ex: Study on Middle schoolers becoming more mastery-oriented (**believing success is obtained through effort and working to understand**) (Sutton, 2005)



Benefits for Students

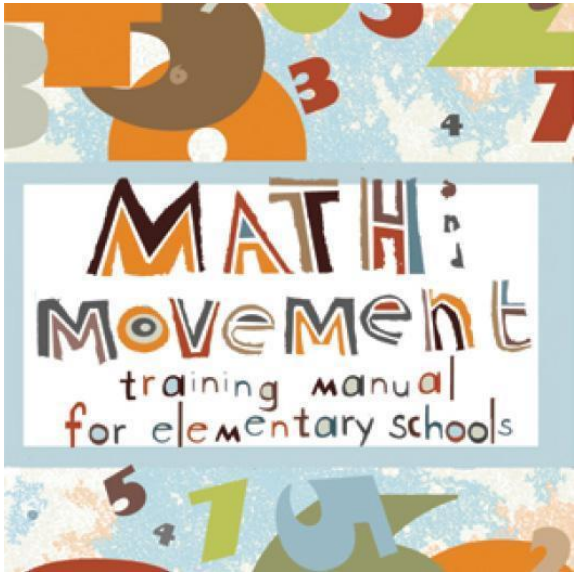
- Benefits of a Personal Connection with a Caring Teacher
  - Improved learning, more positive attitudes towards school, improved social skills
  - For example, fifth-graders whose math classes had higher levels of emotional support were more engaged in the math they were learning, enjoyed thinking through problems more, and even helped other students learn more (Rimm-Kaufman et al., 2014).
- Long-lasting impacts
  - In one study that followed kindergarteners into middle school, kindergarteners with a greater degree of closeness with their teacher entered middle school had developed better social skills than children who had had conflict-marked relationships in the past (Berry & O'Connor, 2009).

How Teachers Benefit from Positive Relationships

Teacher Benefits

- Teachers who have strong, positive relationships with their students find greater fulfillment in their profession (Spilt, Koomen & Thijs 2011).
- Between 25% and 40% of new teachers leave the field of education within five years of having entered it (Garcia and Weiss 2019). Positive relationships can reduce this number, and demonstrate to teachers that their work changes lives and matters a great deal.

Scan the QR code to get a free copy of the Math & Movement Training Manual ebook!



THANK YOU!

Any questions? info@mathandmovement.com
suzy@mathandmovement.com
www.mathandmovement.com

Notable Studies in Kinesthetic Learning

1. An early study by Dunn and Dunn (1978) found that 20-30% of school-age children are auditory learners, 40% visual learners, and **30-40%** are tactile/kinesthetic learners.
2. A study by Muneera Spence (2006) found that visual learners account for around 30% of the population, auditory learners 25%, and kinesthetic learners as much as **45%**.
3. A study by Mulalic (2019) discovered that the kinesthetic learning style was the most preferred learning style among ESL students.
4. A study by Gilakjani (2012) discovered that L2 immigrants and ESL students in the US favor kinesthetic styles over all others.
5. According to the Kunjufu Learning Styles Model, it is estimated that as many as **two-thirds of students**, and an even larger percentage of African-American males, are visual-picture, auditory, and kinesthetic learners.

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