

High Yield Routines and Resources to Support Math Instruction

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Principles to Action: Math Teaching Practices, NCTM, 2014

Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Number Talks/Number Strings

- Short daily routines that help students develop computational fluency
- Not intended to replace curriculum or take up majority of time
- Takes 5 to 15 minutes and most effective 3-5 days per week
- Often include an entry problem, helper problems and a challenge problem

3 Act Tasks

- Engage students at various entry points and create a deep need for the math!
- Act 1: Introduces the central conflict and hooks the participant
 - What do you notice? What do you wonder? What do you think/estimate?
- Act 2: The participant overcomes obstacles, looks for resources and develops tools
 - What do you need to know in order to answer your question?
- Act 3: Resolve the conflict
- The originator: Dan Meyer <http://blog.mrmeyer.com/>
- Making it elementary: Graham Fletcher <https://gfletchy.com/>
- My resources (in process) <https://sites.google.com/site/mathladyri/>

Notice/Wonder

Noticing and wondering is a tool to help students:

- Understand the story, the quantities, and the relationships in the problem.
- Understand what the problem is asking and what the answer will look like.
- Have some ideas to begin to solve the problem.

Some activities with noticing and wondering:

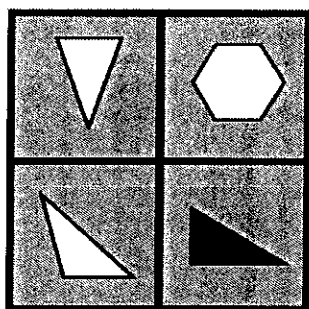
- Basic Brainstorm - Promote deeper understanding of problems
- Forget the Question - Allow access for all
- Think Pair Share - Increase engagement and accountability

I use photos and scenarios from www.bedtimemath.org

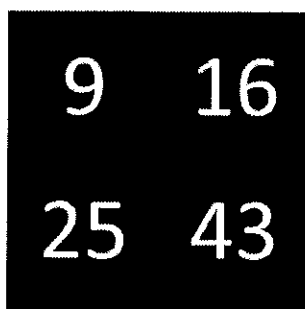
WODB/Eliminate It

Students are presented with four math concepts and need to identify which one doesn't belong and justify why. This routine provides the opportunity for students to see that a problem can have more than one correct answer.

<http://wodb.ca/> or <https://hcpss.instructure.com/courses/107/pages/eliminate-it>



SHAPES



NUMBERS

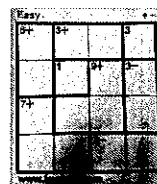
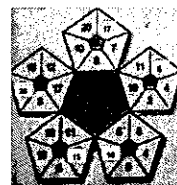
examples from www.wodb.ca

Data Day

- Pick a day to provide a data task regularly
- Have student needs develop the topic whenever possible
- Vary the format or tool used and discuss why that one is better

RESOURCES

- Kakooma gregtangmath.com
- www.kenken.com
- Suggested Twitter Resources: #tcmchat #mathtalkchat #mtmschat #ElemMathChat #mtbos
- www.NCTM.org National Council of Teachers of Mathematics
 - Journals, Illuminations, Calculation Nation, Problem of the Week Resources
 - MyNCTM
 - Membership: Essential, Premium, Student (intro discount 1st 2 years)
 - PK-8 School Membership (5 e-memberships, \$10 for each additional)
 - Use my discount code to save more on individual membership: BGK0419



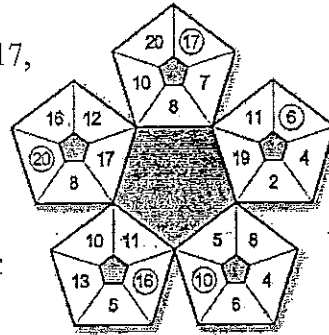
KAKOOMA®

ADDITION

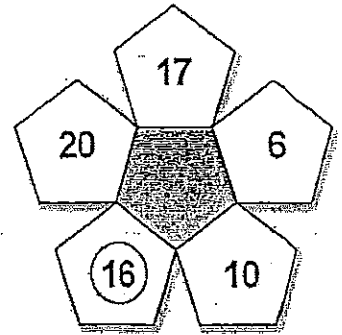
Kakooma starts with a deceptively simple idea: in a group of numbers, find the number that is the sum of two others. Sounds easy, right? Sometimes it is, but other times the answer is right in front of you and you just can't see it. To solve a single puzzle, you often end up doing dozens of calculations in your head, sometimes more than a hundred! Before you know it, your mind is sharper and your math skills are better. Kakooma makes you smarter.

In the example below there are five, 5-number mini-puzzles. In each mini-puzzle, find the number that is the sum of two others. Use all 5 sums to create one final "puzzle-in-a-puzzle" and solve.

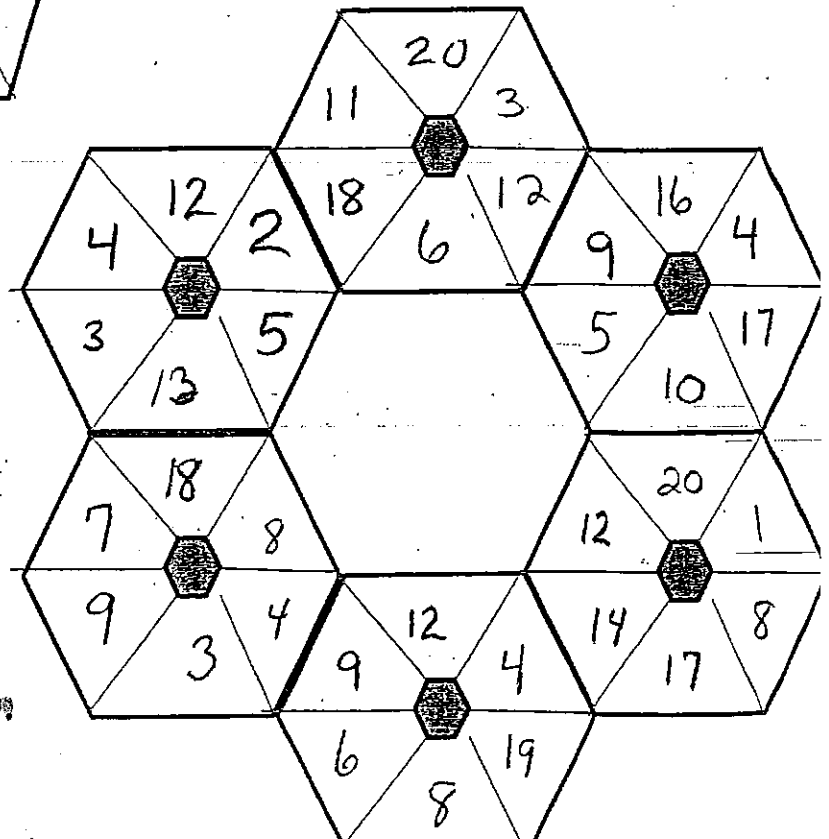
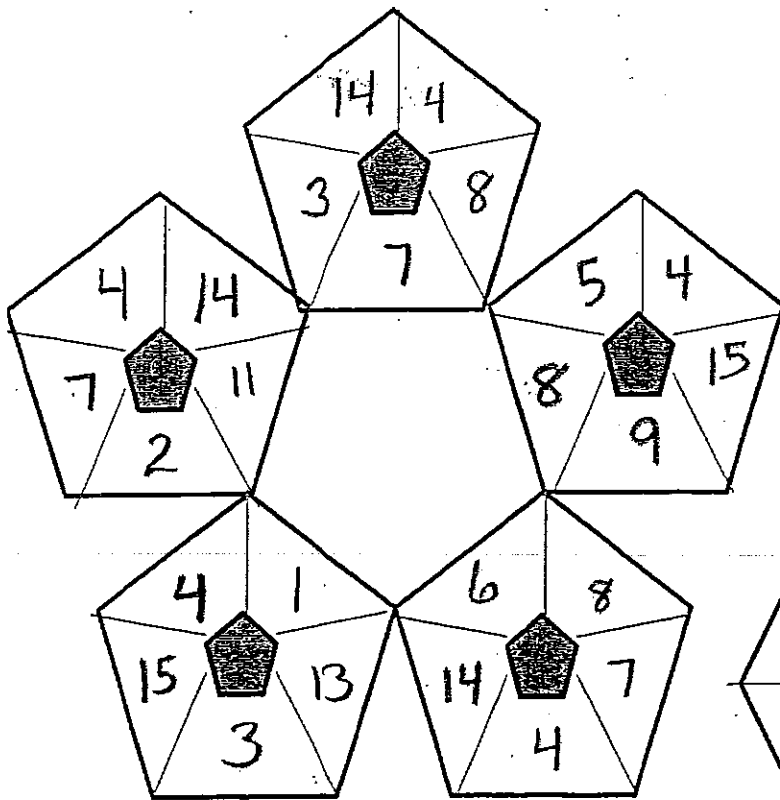
Start with the mini-puzzle at the top. Since $10 + 7 = 17$, the answer is 17. Next, look at the mini-puzzle to the right. Since $4 + 2 = 6$, the answer is 6. Solve the three remaining mini-puzzles the same way and all 5 sums form ... another puzzle! In this final puzzle, once again find the number that is the sum of two others. The final answer is $10 + 6 = 16$. Puzzles get more difficult as the number of mini-puzzles increases. Go to www.kakooma.com for more.



Initial Puzzle



Final Puzzle



Also available for

• Multiplication

• Negatives

• Fractions

or download at gregtarymath.com
Resources

Fill the grid with digits so as not to repeat a digit in any row or column, and so the digits within each heavily outlined box or boxes (called a cage) will produce the target number shown in that cage by using the operation (addition, subtraction, multiplication, or division) shown by the symbol after the numeral.

For single box cages, simply enter the number that is shown in the corner.

So, for example, the notation $6+$ means that the numerals in the cage should add up to 6, and the notation $48x$ means that by multiplying the numbers in the cage you will get 48. A 4x4 grid will use the digits 1-4. A 5x5 grid will use 1-5. A 6x6 grid will use 1-6, and so on.

KENKEN

CLASSROOM

Puzzles That Make You Smarter.

Easy

+ -

6+	3+		3
	1	9+	3-
7+			
		2-	

www.kenken.com

22-13

Easy

+ -

8+		3-	
	4	2-	4+
3+			
3-		1-	

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22-14

Easy

+ - × ÷

2÷	60X			3
	11+			4-
4+			6X	
4-	10+			32X

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22-23

Medium

+ - × ÷

4-		24X	2÷	
2-			2÷	9+
	2-	2÷		
2÷			8+	2-
	20X			

www.kenken.com

22-24

For more KenKen of all sizes and difficulty levels, visit www.kenken.com
 For tips and hints on solving puzzles, visit www.kenken.com/solvingtips



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