# WHY WE SHOULD RECONSIDER (AND WHAT WE SHOULD BE DOING INSTEAD)


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# GOALS

- ❑ WHO AM I?
- ❑ WHAT'S WRONG WITH WORKSHEETS?
- ❑ WHAT SHOULD WE BE DOING INSTEAD?
- ❑ HOW DO WE DO IT IN OUR CLASSROOMS?
- ❑ WHERE DO WE GET MORE PROBLEMS?
- ❑ WHAT COMES NEXT?

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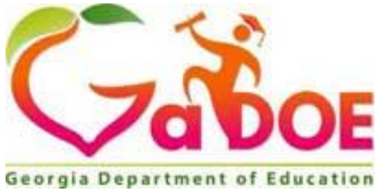
GaDOE
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ASCD
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Discovery
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Algebra 1

Name_____

# One-Step Equations

Date_____ Period____

**Solve each equation.**

1) $26 = 8 + v$

2) $3 + p = 8$

3) $15 + b = 23$

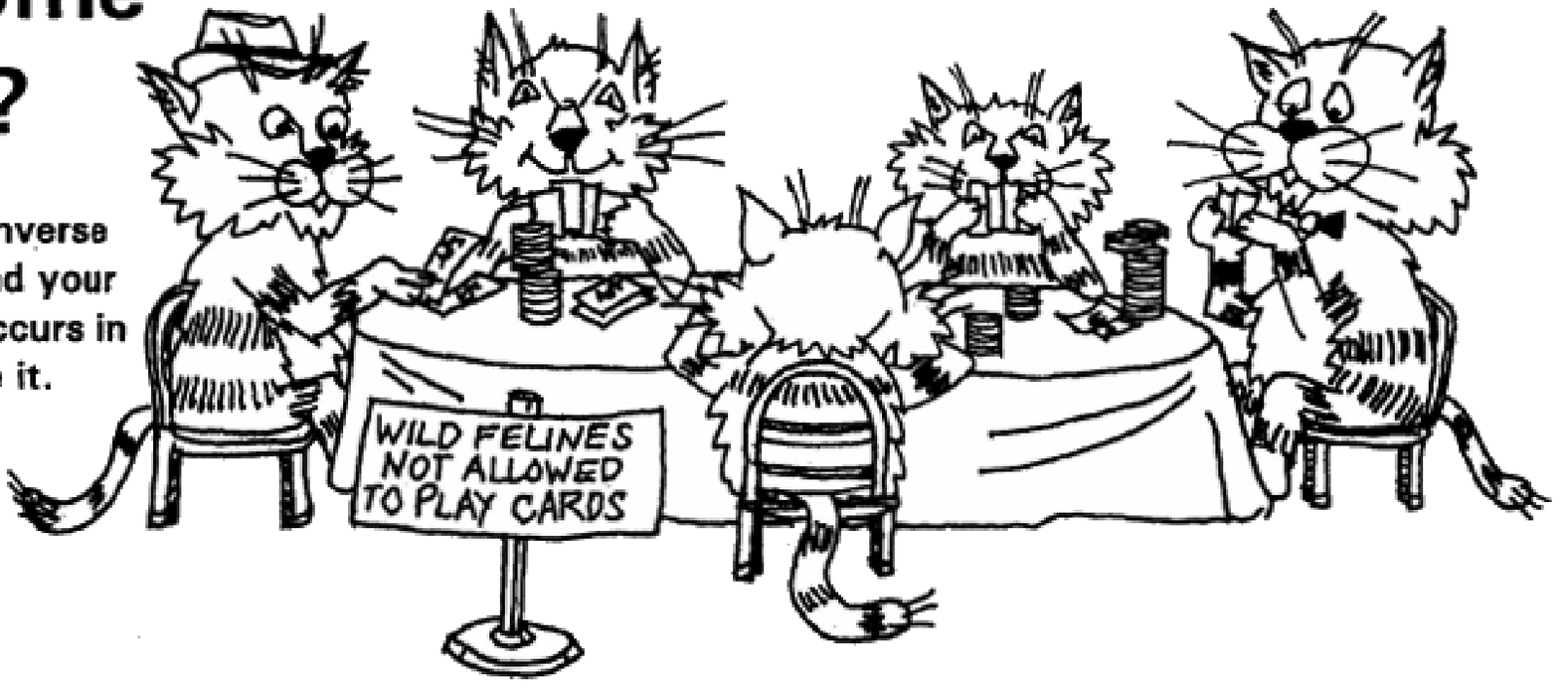
4) $-15 + n = -9$

5) $m + 4 = -12$

6) $x - 7 = 13$

NAME_____ 

# Why shouldn't some cats play cards?




**DIRECTIONS:** Solve each equation by using the inverse operation. Use a calculator where necessary. Find your answer in the decoder. Each time your answer occurs in the decoder, write the letter of the problem above it.

1. $3 + g = 13$ (g= _____)

2. $34 = a \cdot 2$ (a = _____)

3. $\frac{h}{15} = 10$ (h = _____)

4. $15 = d - 18$ (d = _____)

5. $132 = m \times 11$ (m = _____)

6. $15o = 210$ (o = _____)

7. $\frac{i}{2.3} = 6.7$ (i = _____)

8. $2.5e = 40$ (e = _____)

9. $180 = t - 35$ (t = _____)

10. $90 = 3l$ (l= _____)

11. $7.2 = 0.36n$ (n = _____)

12. $\frac{b}{5} = 31$ (b= _____)

13. $4c = 60$ (c= _____)

# WORKSHEET CONCERNS

- ~~OFTEN FEELS LIKE BUSY WORK~~
- ~~DON'T REALLY BUILD SENSE MAKING~~
- ~~RARELY LEAD TO GREAT CONVERSATIONS~~
- ~~DON'T GIVE US RICH INFORMATION~~

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# PROBLEM ONE

Solve for *x*.

$$21 + x = 70$$

# PROBLEM TWO

Using the digits 1 to 9 at most one time each, place a digit in each box to create two equations: one where $x$ has a positive value and one where $x$ has a negative value. You may reuse the digits for each equation.

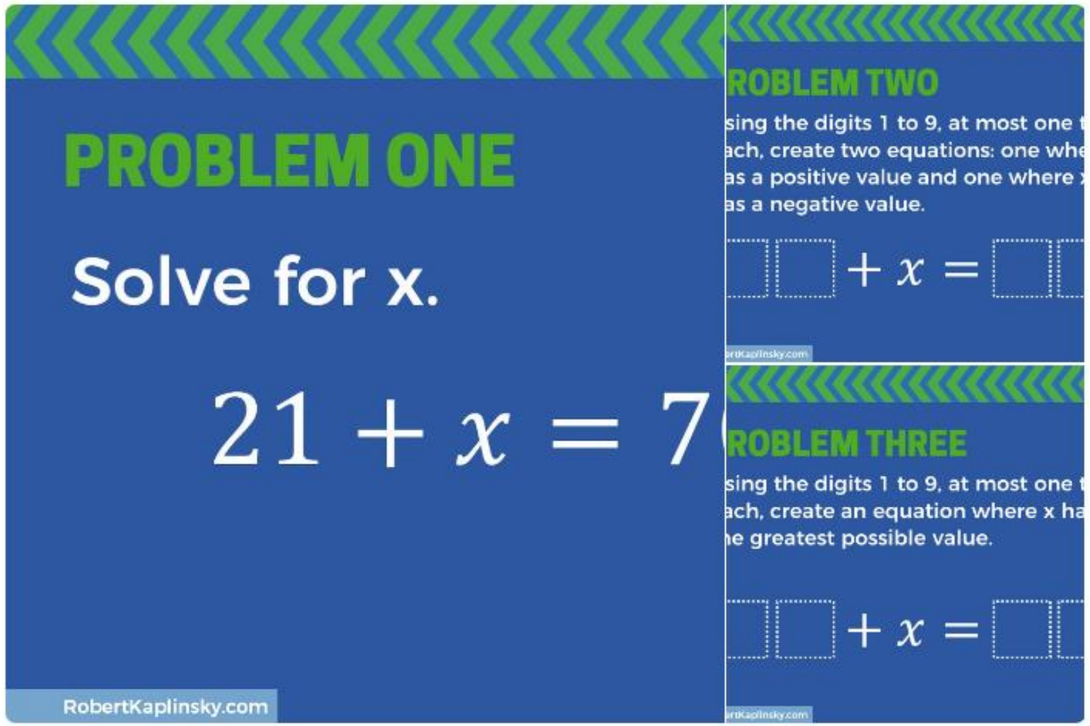
# PROBLEM THREE

Using the digits 1 to 9 at most one time each, place a digit in each box to create an equation where $x$ has the greatest possible value.

$$\boxed{1}\boxed{2} + x = \boxed{9}\boxed{8}$$

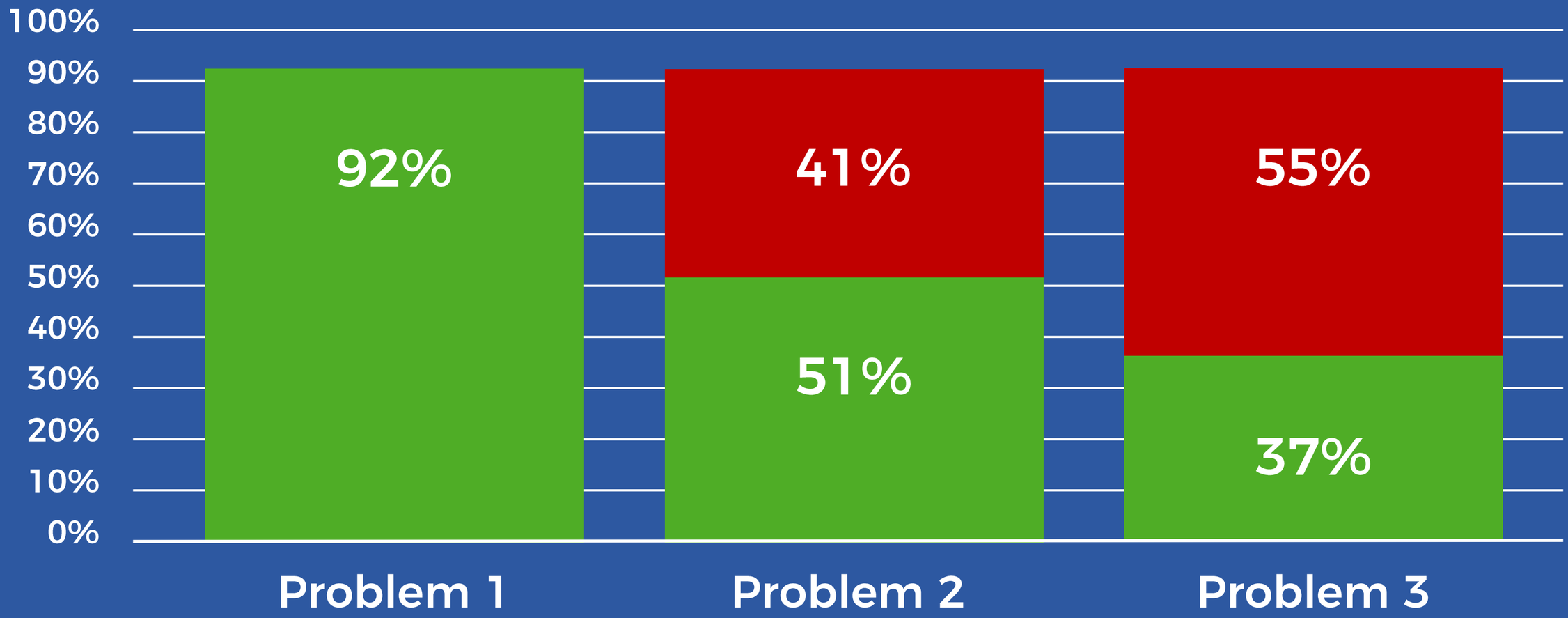
**Robert Kaplinsky**
@robertkaplinsky

MS & HS #MTBoS Ts, please ask your Ss these 3 ?s and put the % who answered correctly here: docs.google.com/forms/d/e/1FAI …. Answers at top of form.




RETWEETS 36 LIKES 54

# PROBLEM RESULTS



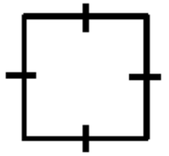
# Depth of Knowledge Matrix - Secondary Math

| Topic | Dividing Fractions | Solving Two-Step Equations | Exponents | Solving Equations with Variables on Both Sides |
|---|---|---|---|---|
| CCSS Standard(s) | • 6.NS.1 | • 7.EE.4a | • 8.EE.1 | • 8.EE.8<br>• A-REI.3 |
| DOK 1 Example | Evaluate.<br>$\frac{4}{9} \div \frac{2}{5}$ | Solve for $x$.<br>$2x + 3 = 9$ | Evaluate.<br>$3^4$ | Solve for $x$.<br>$3x + 2 = -2x + 4$ |
| DOK 2 Example | Using the digits 1 to 9 at most one time each, fill in the boxes to make two different pairs of fractions that have a quotient of 2/3.<br>$\frac{\square}{\square} \div \frac{\square}{\square} = \frac{2}{3}$ | Using the digits 1 to 9 at most one time each, fill in the boxes to create two equations: one where $x$ has a positive value and one where $x$ has a negative value.<br>$\square x + \square = \square$ | Using the digits 1 to 9 at most one time each, fill in the boxes to make two true number sentences.<br>$\square^{\square} = 64$ | Using the digits 1 to 9 at most *two* times each, fill in the boxes to make an equation with no solutions.<br>$\square x + \square = \square x + \square$ |
| DOK 3 Example | Using the digits 1 to 9 at most one time each, fill in the boxes to make two fractions that have a quotient that is as close to 4/11 as possible.<br>$\frac{\square}{\square} \div \frac{\square}{\square}$ | Using the digits 1 to 9 at most one time each, fill in the boxes to create an equation where $x$ has the greatest possible value.<br>$\square x + \square = \square$ | Using the digits 1 to 9 at most one time each, fill in the boxes to make a result that has the greatest value possible.<br>$\square^{\square} = \square\square\square$ | Using the digits 1 to 9 at most one time each, fill in the boxes so that the solution is closest to zero.<br>$\square x + \square = \square x + \square$ |



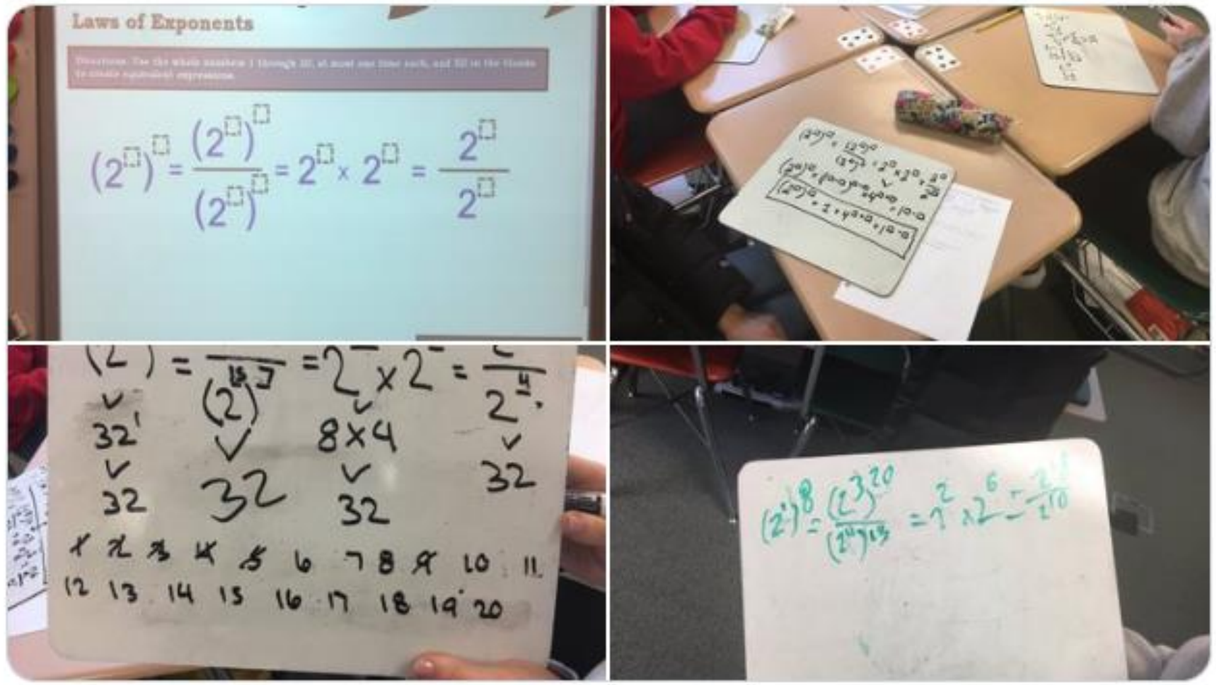
Version 1.8

# Depth of Knowledge Matrix - Secondary Math

| Topic | Geometric Proofs | Complex Numbers | Trigonometric Functions | Definite Integrals |
|---|---|---|---|---|
| CCSS Standard(s) | • G-CO.11 | • N-CN.2 | • F-TF.3 | • N/A |
| DOK 1 Example | Add one geometric marking to demonstrate the quadrilateral is a square.  | Multiply the binomials. $(3+4i)(2+3i)$ | Evaluate. $\sin\frac{\pi}{3}$ | Solve. $\int_2^6 x^3\,dx$ |
| DOK 2 Example | Use exactly five geometric markings to show that a quadrilateral is a square. | Using the integers -9 to 9 at most one time each, fill in the boxes twice: once to make a positive real number product and once to make a negative real number product. $(\square+\square i)(\square+\square i)$ | Using the digits 1 to 9 at most one time each, fill in the boxes to make two true number sentences. $\sin\frac{\square\pi}{\square}=1$ | Using the digits 1 to 9 at most one time each, fill in the boxes to make a positive and a negative solution. $\int_{\square}^{\square} x^{\square}\,dx$ |
| DOK 3 Example | What is the least number of geometric markings needed to demonstrate that a quadrilateral is a square? | Using the integers -9 to 9 at most one time each, fill in the boxes to make a real number product with the greatest value. $(\square+\square i)(\square+\square i)$ | Using the digits 1 to 9 at most one time each, fill in the boxes to find the function's greatest possible value. $\sin\frac{\square\pi}{\square}=\frac{\sqrt{\square}}{\square}$ | Using the digits 1 to 9 at most one time each, fill in the boxes to make a solution that is as close to 100 as possible. $\int_{\square}^{\square} x^{\square}\,dx$ |

**Wendy Kozina**
@wkozina

Kids begging for more time and yelling, “No” when I asked if they wanted a hint! Amazing activity @robertkaplinsky @openmiddle

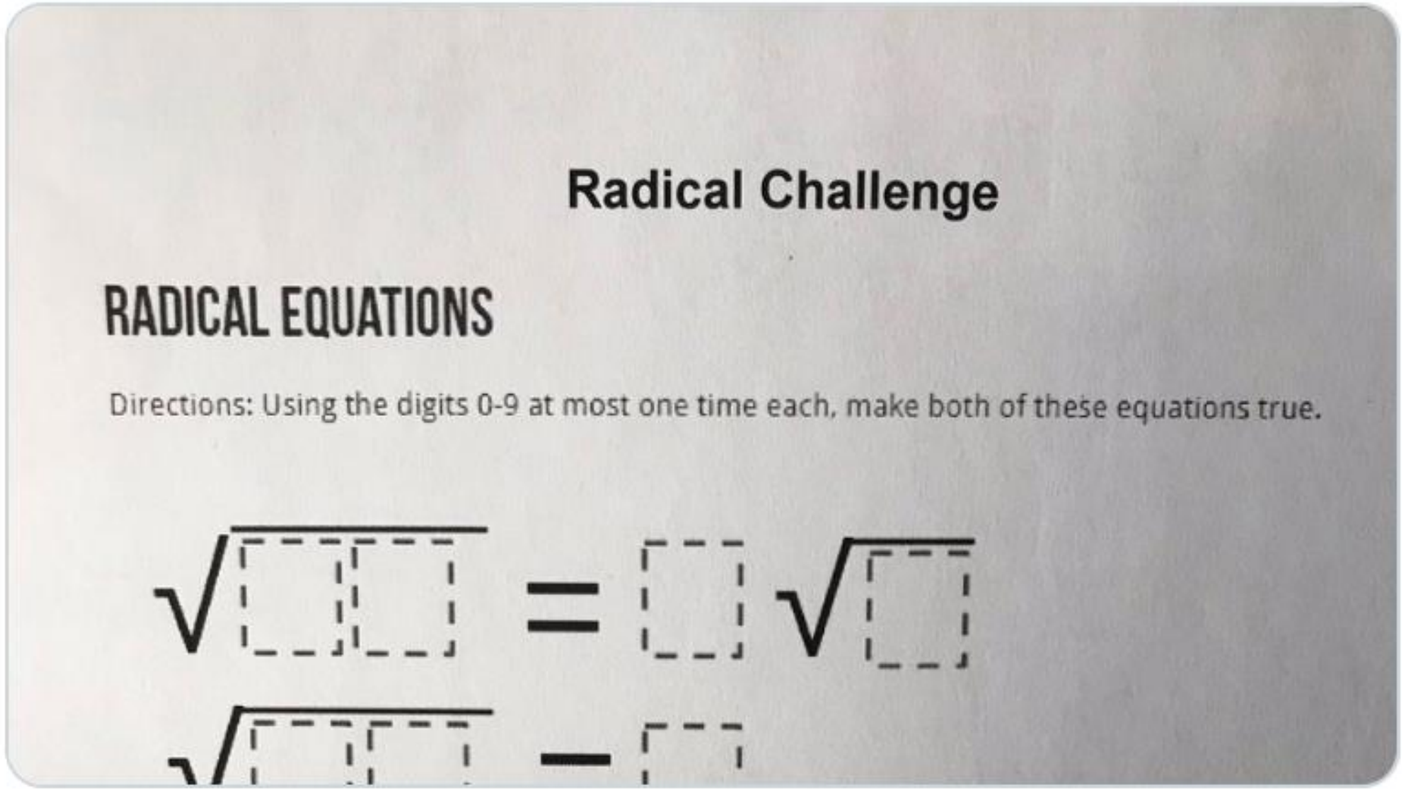



1:30 PM · Mar 8, 2019 · Twitter for iPhone

**14** Retweets **98** Likes

**Marguerite Spriggs** @mspriggs30 · Nov 16, 2018

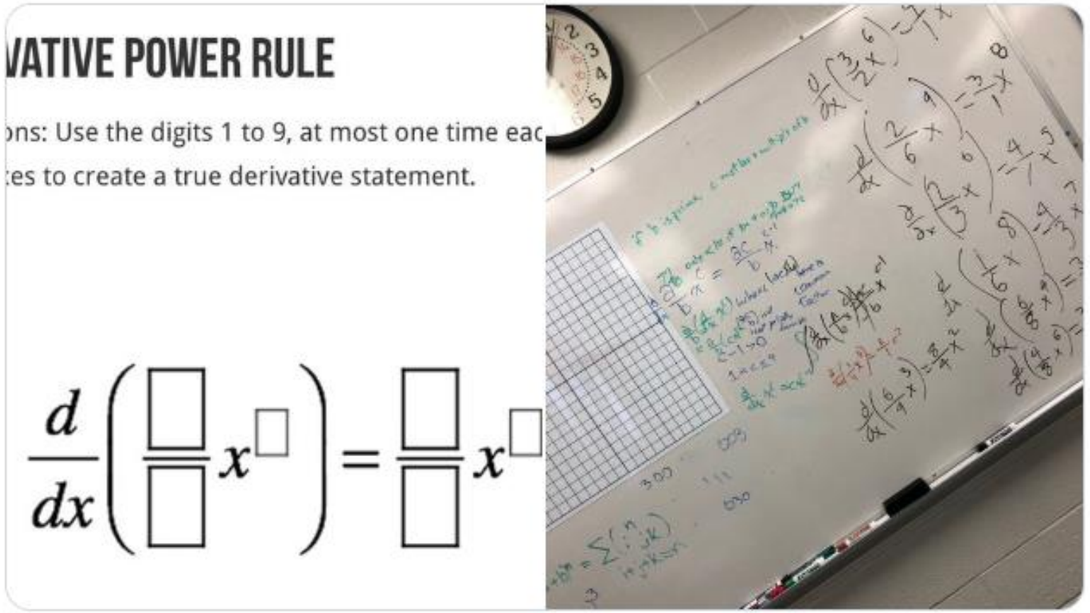
My **first time trying** an **@openmiddle** problem with my students today. Wasn't sure how it would go or if they'd solve it. After a few minutes going at it (and coming up with more than one solution) they asked "can we do another one?" "That was fun - we should do it more!"




1 1 7

**Katherine MacKenzie**
@kmackenzie7

Tried an @openmiddle problem (for the 1st time) with my calculus crew. Left it on the board went to grab a photocopy before class start. Came back and Ss were crowded around the board sharing ideas. It's was magical. I *must* bring these to all my classes #MTBoS #iteachmath




2:17 PM · Apr 18, 2019 · Twitter for iPhone

**20** Retweets **156** Likes

**MrsDill**
@MrsDill2

Replying to @robertkaplinsky @openmiddle and @And02B

My students live for these!  Nearly every day I'm asked, "You got anymore of those open problem things for us to solve?"

6:44 PM · Apr 17, 2019 · Twitter for iPhone

**5** Likes

# OPEN MIDDLE PROBLEM BENEFITS

- KIDS LOVE DOING THEM
- BUILD CONCEPTUAL UNDERSTANDING
- OFTEN LEAD TO GREAT CONVERSATIONS
- REVEAL HIDDEN MISCONCEPTIONS

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# HOW DO WE DO IT?

- Open Middle Worksheet

Name: _____ Period: _____ Date: _____

First attempt: Points: ____/2 attempt ____/2 explanation

What did you learn from this attempt? How will your strategy change on your next attempt?

Second attempt: Points: ____/2 attempt ____/2 explanation

First attempt: Points: _____/2 attempt _____/2 explanation

What did you learn from this attempt? How will your strategy change on your next attempt?

# HOW DO WE DO IT?

- Open Middle Worksheet
- Classwork
- Homework
- Assessments

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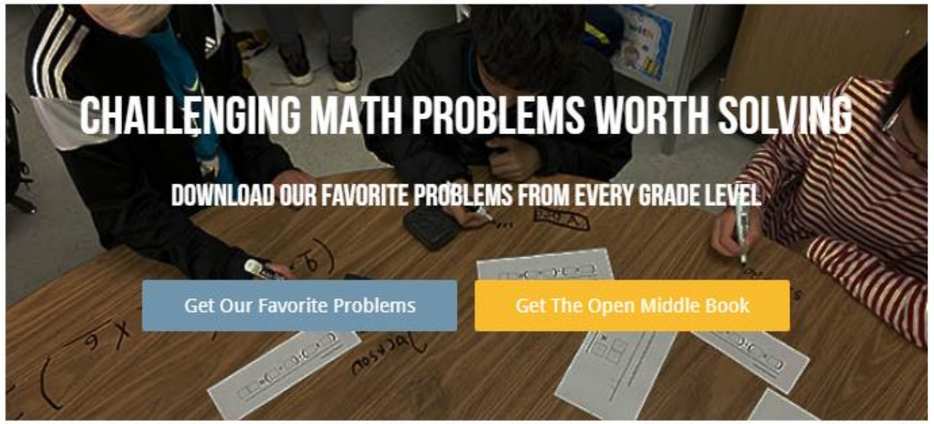
# OPEN MIDDLE

Get The Open Middle Book



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### OPEN MIDDLE WORKSHEET

English (student version)
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### NUMBER TILES

Printable PDF with the digits 0 to 9
Printable PDF with the integers -9 to 9

### BROWSE BY COMMON CORE STATE STANDARDS

- Kindergarten (13)
  - Counting & Cardinality (3)
  - Geometry (3)
  - Number & Operations in Base Ten (1)
  - Operations & Algebraic Thinking (6)
- Grade 1 (21)
  - Geometry (3)

# TWO-STEP EQUATIONS

Directions: Using the digits 1 to 9 at most one time each, place a digit in each box to find the greatest (or least) possible values for x.

Hint

How does each constant's value affect the solution's value?
How does the coefficient's value affect the solution's value?

Answer

Assuming x can be a negative value, 1x + 9 = 2 gives the least possible value of -7. The greatest possible value would be, 1x + 2 = 9

Source: Audrey Mendivil, Daniel Luevanos, and Robert Kaplinsky



Tags 7.EE.4.A AUDREY MENDIVIL DANIEL LUEVANOS DOK 3: STRATEGIC THINKING ROBERT KAPLINSKY

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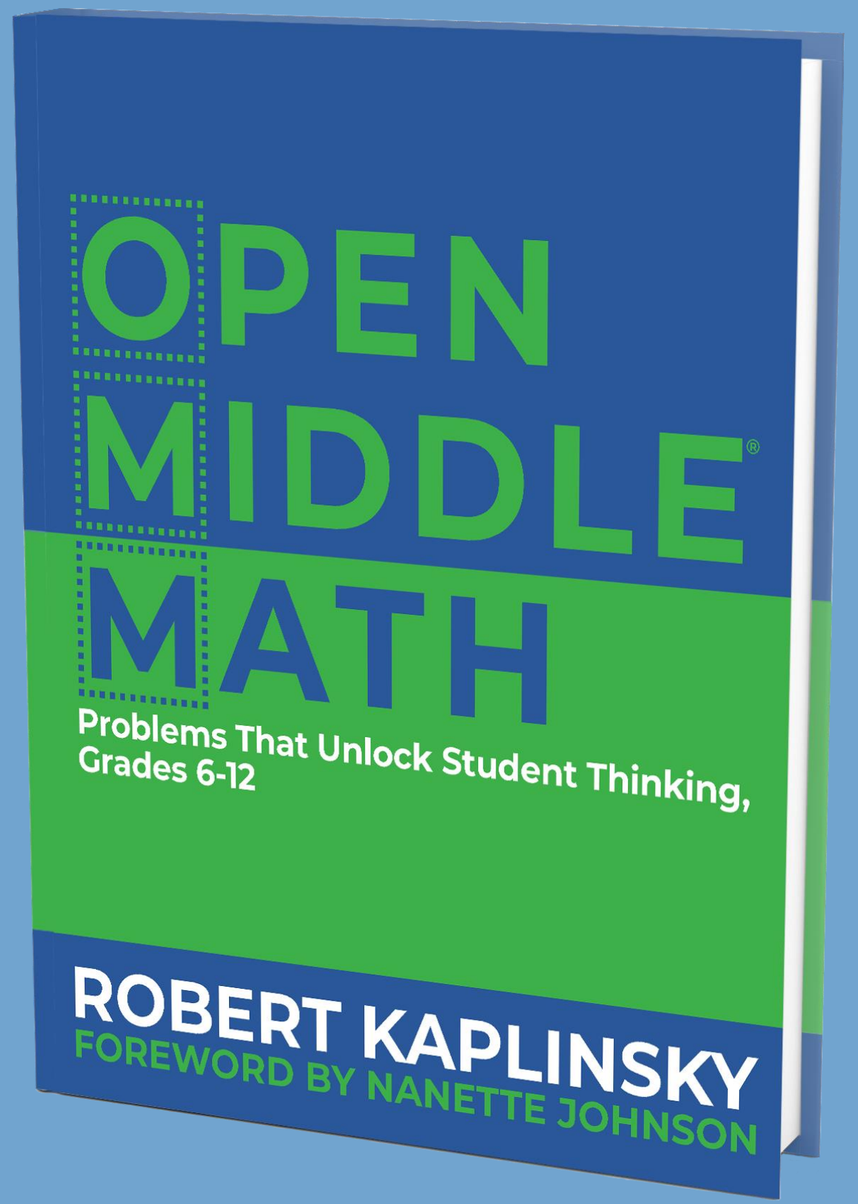
# WHAT COMES NEXT?

| Action | Do Now | Start Planning | Don't Do |
|---|---|---|---|
| Try Open Middle problems out with your students | ✓ | | |
| Find more problems I can use on the Open Middle website. | ✓ | | |
| Incorporate Open Middle problems on assessments. | | ✓ | |
| Replace all traditional problems with Open Middle problems. | | | ✓ |
| Share these resources with colleagues to make them aware. | ✓ | | |

smarturl.it/openmiddle

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# WEBINAR RESOURCES

- PDF copy of the presentation
- Elementary version of this webinar
- Open Middle DOK Matrices

robertkaplinsky.com/stenhouse