RECONSIDERING WORKSHEETS SECONDARY HANDOUT

What's Wrong With Worksheets?

- Problematic math worksheets have many of the same kinds of problems on them and often _____ on the bottom.
- They often feel like _____.
- They don't really build _____.
- They don't lead to great _____.
- They don't give us _____.

What Should We Be Doing Instead?

- **Problem One**

  Solve for x.

  $21 + x = 70$

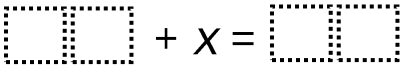
- **Problem Two**

  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. You may reuse digits for each equation.

  $\square\square + x = \square\square$

- **Problem Three**

  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.

- A single _____ problem can replace a whole worksheet of math problems.

- If a student finds the answer in a few attempts, it likely means that the student used significant _____ to find an _____ way to solve the problem.

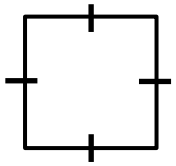
- If the surveyed students are like your students, then Problems 2 and 3 help us see that _____% and _____% of the class are students who correctly answered Problem 1 but have hidden misconceptions.

- My favorite reason for using _____ problems instead of worksheets is _____ _____.

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 • A-REI.3
DOK 1 Example	Evaluate. $\frac{4}{9} \div \frac{2}{5}$	Solve for x. $2x + 3 = 9$	Evaluate. 3^4	Solve for x. $3x + 2 = -2x + 4$
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. $\frac{\square}{\square} \div \frac{\square}{\square} = \frac{2}{3}$	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. $\square x + \square = \square$	Using the digits 1 to 9 at most one time each, fill in the boxes to make two true number sentences. $\square^{\square} = 64$	Using the digits 1 to 9 at most *two* times each, fill in the boxes to make an equation with no solutions. $\square x + \square = \square x + \square$
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. $\frac{\square}{\square} \div \frac{\square}{\square}$	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. $\square x + \square = \square$	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. $\square^{\square} = \square\square\square$	Using the digits 1 to 9 at most one time each, fill in the boxes so that the solution is closest to zero. $\square x + \square = \square x + \square$

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. $\int_{\square}^{\square} x^{\square}\,dx$

How Do We Do It In Our Classrooms?

- When students want to give up with rigorous _____ problems, we can use an _____ so that they want to keep trying and develop a growth mindset about mathematics.

- Three options for integrating _____ problems include our _____, _____, and _____.

Where Do We Get More Problems?

- I can download hundreds of ready-to-go problems from kindergarten through calculus at _____.

What Comes Next?

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