RECONSIDERING WORKSHEETS

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.

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

- 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 __________________________ ____.

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 ____________________________.

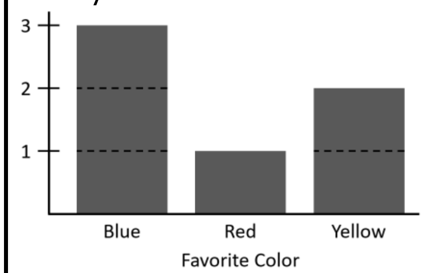
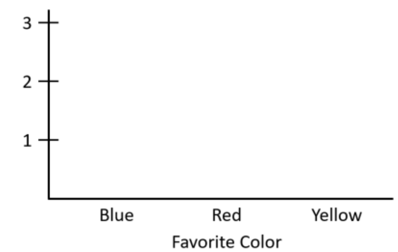
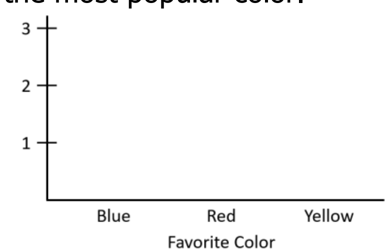
Where Do We Get More Problems?

- 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.			

Depth of Knowledge Matrix - Elementary Math

Topic	Adding 1-Digit Numbers (< 5)	Equality	Interpreting Data	Money
CCSS Stand.	• K.OA.5	• 1.OA.7	• 1.MD.4	• 2.MD.8
DOK 1 Example	Solve. $3 + 1 =$	Determine whether the number sentence is true or false. $4 + 1 = 5 - 2$	How many people were surveyed? 	If you have 1 quarter, 4 dimes, 2 nickels, and 3 pennies, how many cents do you have?
DOK 2 Example	Using the digits 1 to 5 at most one time each, fill in the boxes to create two true number sentences. $\square + \square = \square$	Using the digits 1 to 9 at most one time each, fill in the boxes to create two true number sentences. $\square + \square = \square - \square$	Make a graph that shows a possible result of 7 students' favorite color. 	Make 72¢ in two different ways with either quarters, dimes, nickels, or pennies.
DOK 3 Example	Using the digits 1 to 5 at most one time each, fill in the boxes to create a true number sentences with the greatest possible sum. $\square + \square = \square$	Using the digits 1 to 9 at most one time each, fill in the boxes to create a true number sentence with the greatest possible value. $\square + \square = \square - \square$	Make a graph that shows a possible result of 7 students' favorite color with red being the most popular color. 	Make 72¢ using exactly 9 coins that are either quarters, dimes, nickels, or pennies.

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Depth of Knowledge Matrix - Elementary Math

Topic	Subtracting 3-Digit Numbers	Operations with Time	Comparing Fractions	Multiplying Decimals
CCSS Stand.	• 3.NBT.2	• 3.MD.1	• 4.NF.2	• 5.NBT.7
DOK 1 Example	Solve. $821 - 357 =$	What time will it be 14 minutes after 1:27 pm?	Place a < or > between the two fractions to make a true number sentence. $\frac{4}{7} \quad \frac{3}{5}$	Solve. $3.4 \times 2.5 =$
DOK 2 Example	Using the digits 1 to 9 at most one time each, fill in the boxes to make two different pairs of three-digit numbers that form a true number sentence. □□□-291=□□□	Using the digits 1 to 9 at most one time each, fill in the boxes to make a time that is 4:37 pm. □□ minutes after □:□□ pm	Using the digits 1 to 9 at most one time each, fill in the boxes to create two different fractions: one that is less than one half and one that is more than one half. $\frac{\square}{\square} < \frac{1}{2}$ and $\frac{\square}{\square} > \frac{1}{2}$	Using the digits 1 to 9 at most one time each, fill in the boxes to make a true number sentence. □.□ × 3.2=□.□
DOK 3 Example	Using the digits 1 to 9 at most one time each, fill in the boxes to make a difference that is as close to 329 as possible. □□□-□□□=	Using the digits 1 to 9 at most one time each, fill in the boxes to make the latest possible time. □□ minutes after □:□□ pm	Using the digits 1 to 9 at most one time each, fill in the boxes to create a fraction that is as close to 5/11 as possible. $\frac{\square}{\square}$	Using the digits 1 to 9 at most one time each, fill in the boxes so that the product is as close to 50 as possible. □.□ × □.□ =

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

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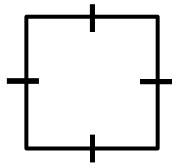
Depth of Knowledge Matrix - Secondary Math

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

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