



What is a Math Lab? (Part 2)

INTRODUCTION TO THINKLAW MATH LABS

Description

Thinkers will be introduced to Math Labs and discuss 3 tips for success in critical thinking.

Indiana Academic Standards



3.CA.2 Solve real-world problems involving addition and subtraction of multi-digit whole numbers. (E)

3.CA.7 Solve real-world problems involving whole number multiplication and division within 100 in situations involving equal groups, arrays, and measurement quantities. (E)

4.CA.2 Multiply a whole number of up to four digits by a one-digit whole number and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Describe the strategy and explain the reasoning. (E)

5.CA.2: Solve real-world problems involving multiplication and division of whole numbers (e.g., by using equations to represent the problem). In division problems that involve a remainder, explain how the remainder affects the solution to the problem. (E)

E: Essential IDOE standards

Standards for Mathematical Practice

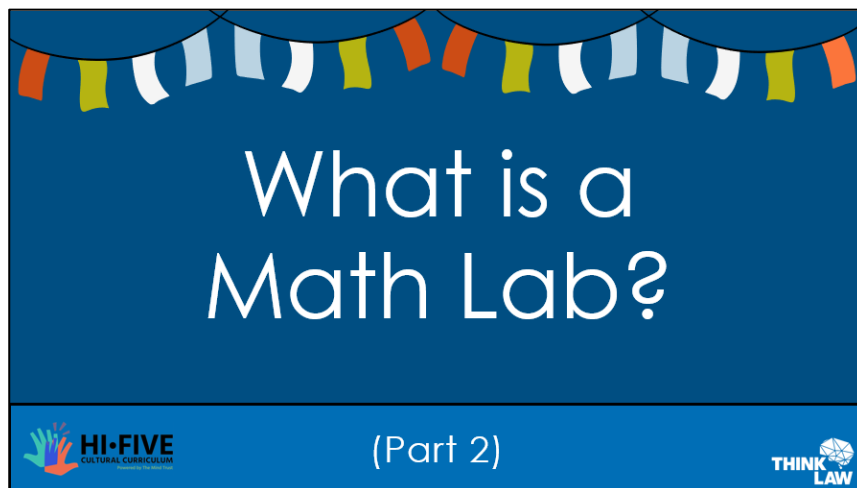


PS.1 Make sense of problems and persevere in solving them.	PS.2 Reason abstractly and quantitatively.	PS.3 Construct viable arguments and critique the reasoning of others.	PS.4 Model with mathematics.
PS.5 Use appropriate tools strategically.	PS.6 Attend to precision.	PS.7 Look for and make use of structure.	PS.8 Look for and express regularity in repeating reasoning.

Lesson Materials



- thinkLaw Student Work pages
- Writing Utensils



What is a Math Lab?

(Part 2)

HI-FIVE CULTURAL CURRICULUM

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A blue rectangular card with a decorative banner of colorful flags at the top. The text "What is a Math Lab?" is centered in white. Below it, "(Part 2)" is also centered. At the bottom left is the HI-FIVE logo, and at the bottom right is the THINK LAW logo.

thinkWarm-Up
Before we begin...

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What is a Math Lab? (Part 2)
A thinkLaw Math Lab Warm-Up

Directions: Read each problem and choose the best answer. Write the letter of the correct answer in the space provided.

1. A number line is shown below. What is the value of x ?

A. $10x + 100 = 1$
B. $10x + 100 = 10$
C. $10x + 100 = 100$
D. $10x + 100 = 1000$

2. A number line is shown below. What is the value of x ?

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Instructor's Note:

thinkLaw Math Labs have been created with 5 warm-up problems designed to serve multiple purposes: pre-assessment tool, a review tool, an activation of learning, or a readiness tool.

The purpose of the warm-up section is to offer students a brief but effective practice session lasting approximately 5-10 minutes. If students encounter difficulties with any of the problems, it's perfectly fine to proceed, as the Math Lab is structured to provide support and scaffold their learning.

In the slides provided, you'll find a designated prompt indicating where to incorporate the warm-up section with your students. The slide can also serve as an opportunity to review the answers to the warm-up problems together with your students before continuing with the math lab.

For convenience, we recommend printing the warm-up and cool-down sections front to back on a single sheet of paper, facilitating easy access and organization during the Math Lab session.

A Math Lab is an opportunity for you to try what you're learning in math with real-life legal cases and issues!

Math Labs are also an opportunity to listen to the other thinkers in class. They will help you think of more ideas.

THINK LAW

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Jack bought 2 umbrellas and 3 hats and spent between \$30 and \$50. Each umbrella costs the same amount. Each hat costs the same amount. The price of a hat is \$4.00.

What is the least amount Jack could have spent for each umbrella? Solve.

THINK LAW

Jack bought 2 umbrellas and 3 hats and spent between \$30 and \$50. Each umbrella costs the same amount. Each hat costs the same amount. The price of a hat is \$4.

What is the least amount Jack could have spent for each umbrella? Solve.

Let's first find the total cost of the hats:

$$3 \text{ hats} \times \$4 = \$12$$

Since Jack spent between \$30 and \$50 in total, we can subtract the cost of the hats from these amounts to find the range for the umbrellas.

For the least amount:

$$\$30 \text{ (total spending)} - \$12 \text{ (cost of hats)} = \$18$$

So, the least Jack could have spent on umbrellas is \$18.

Teacher Note:

This is a 5th grade Algebraic Thinking example. If it does not meet the current needs of your students, it can be switched out for a different problem. This problem was chosen as an example that students would be comfortable solving mathematically. If this doesn't match your current pacing, you can change it for something that aligns better. The goal is for thinkers to spend most of the time focused on the critical thinking.

Pretend you are the teacher grading the assignment. Student A and Student B both got the answers wrong.

Student A	Student B
$2 \times 4 = 8$	$3 \times 4 = 12$
$30 - 8 = 22$	$30 - 12 = 28$

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What's your gut reaction, which student deserves to make a better grade? Why?

Pretend you are the teacher grading the assignment. Student A and Student B both got the answers wrong.

Student A's answer: \$22

Student B's answer: \$28

What's your gut reaction; which student deserves to make a better grade? Why?

Look at their work, what mistake did each student make?

Student A	Student B
$2 \times 4 = 8$	$3 \times 4 = 12$
$30 - 8 = 22$	$30 - 12 = 28$

THINK LAW

Look at their work; what mistake did each student make?

Student A- Student A multiplied the wrong numbers; they multiplied the \$4 by the umbrellas instead of the hats.

Student B- Student B regrouped incorrectly when they were subtracting.

Which student deserves to get a better grade?

Student A	Student B
$2 \times 4 = 8$	$3 \times 4 = 12$
$30 - 8 = 22$	$30 - 12 = 28$

THINK LAW

What's the best argument for both sides?

Which student deserves to get a better grade?


What's the best argument for both sides?

Thinkers may say that Student A is more right because they were able to complete

the computation of the problem correctly. Their math is right; it's just that it isn't answering the question asked by the problem correctly.

Thinkers may say that Student B is more right because they understood the problem. They were able to set up their work correctly, multiply correctly, and correctly subtract the one's place.

As the teacher, what's your final decision? Which wrong answer is more right?




Student A	Student B
$2 \times 4 = 8$	$3 \times 4 = 12$
$30 - 8 = 22$	$30 - 12 = 28$

THINK LAW

As the teacher, what's your final decision? Which wrong answer is more right?
Student answers will vary.

Now we are going to think about Joe Schmo. Joe always falls for the trick answer. Joe does not read the directions carefully. Joe does not complete all the steps in a problem. We are going to think about the mistakes Joe may make on a math test.



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Let's go back to the original problem...

Jack bought 2 umbrellas and 3 hats and spent between \$30 and \$50. Each umbrella costs the same amount. Each hat costs the same amount. The price of a hat is \$4.00.

What is the least amount Jack could have spent for each umbrella?

Solve.

THINK LAW

Let's go back to the original problem.

Jack bought 2 umbrellas and 3 hats and spent between \$30 and \$50. Each umbrella costs the same amount. Each hat costs the same amount. The price of a hat is \$4.00.

What is the least amount Jack could have spent for each umbrella?

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If we surveyed 100 students in our school and asked them, "What mistake would Joe Schmo make on this question?", what would be the top 3 responses?

Top 3 responses:

- Might set up the problem wrong, multiply or subtract wrong numbers
- Do the math wrong, make a multiplication or subtraction error
- Chose the wrong operation, add, or divide instead of multiplying and adding

Probing Questions:

- This problem has two steps. What problems might occur in the first step?

- What problems might occur in the second step?
- Rank the mistakes. Which mistake is the most likely?

Use these top three mistakes to write 4 multiple-choice answers to the question.

Be sure to also include the correct response.

Jack bought 2 umbrellas and 3 hats and spent between \$30 and \$50. Each umbrella costs the same amount. Each hat costs the same amount. The price of a hat is \$4.00. What is the least amount Jack could have spent for each umbrella?

A	
B	
C	
D	

THINK LAW

Use these top three mistakes to write 4 multiple-choice answers to the question. Be sure to also include the correct response. **Student answers will vary.** Possible answer choices could be:

- A. \$22- multiplied incorrectly/ computation error
- B. \$18- the correct answer
- C. \$38- the most that could have been spent on the umbrellas
- D. \$28- subtracting and regrouping incorrectly

Probing Questions:

- Think about the order you choose for your three responses. Where do you want to place the correct response? What response do you want to put in choice A position? Why? What mistake is Joe Schmo likely to make?
- Why did you choose each incorrect response? How did the mistake analysis help you choose the incorrect responses you wanted to use?

How is this similar and different to the math we do everyday?

How did it feel to do this type of thinking in math?

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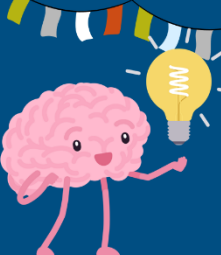
- How was that similar/ different to the math we do every day? Why? **Thinkers may say it makes them think about their answers, not just find an answer. This type of math also has more of a real-life application.**

- How did it feel to do this type of thinking in math? **Thinkers may say that it's more interesting and more fun than just doing worksheets or practice problems from a workbook.**

In the real world we must think critically using math.

Why don't we do that more often in our math classes?

Why is that more fun?



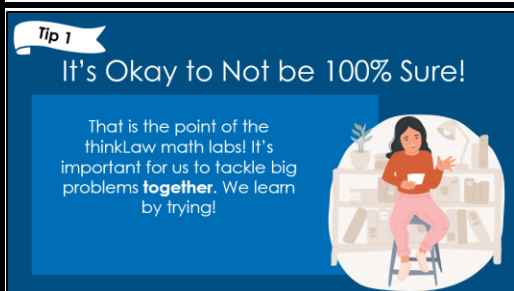
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In the real world, we must think critically using math.

Why don't we do that more often in our math classes? Why is that more fun?



Here are a few tips for success with thinkLaw Math Labs.

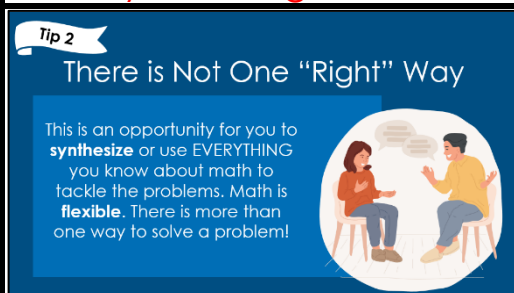


Tip 1: It's Okay to Not be 100% Sure!

That is the point of the thinkLaw math labs! It's important for us to tackle big problems **together**. We learn by trying!

Probing Questions:

- Have you ever been unsure when solving a math problem? How did that make you feel? Is it normal to feel unsure in math?
- Did you know that some math problems have never been solved? Why would someone keep working for years on a problem that has never been solved?
- What strategies can we use when feeling unsure in math makes us feel anxious? What can we do to cope?
- Why is feeling unsure an important part of learning math?



Tip 2: There is Not One "Right" Way

This is an opportunity for you to **synthesize** or use **EVERYTHING** you know about math to tackle the problems. Math is **flexible**. There is more than one way to solve a problem!

Probing Questions:

- What does it mean to be flexible? Do you think math is flexible? Why or why not?
- Why is synthesis and flexible thinking important to solve complex problems that do not have easy answers?

Tip 3

Questions, Questions, Questions

Math is supposed to make sense. If something doesn't make sense, ask! Also, **be curious!** What do these math labs make you wonder about the world?



Tip 3: Questions, Questions, Questions

Math is supposed to make sense. If something doesn't make sense, ask! Also, **be curious!** What do these math labs make you wonder about the world?

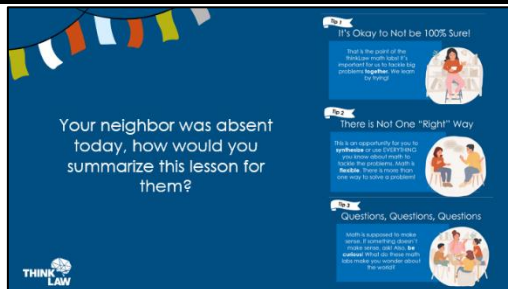
Probing Questions:

- How can we make sure everyone in the class feels comfortable asking questions?
- What would math look like if no one could ask questions?
- Can you use questions to build relationships and connect with others?
- Who in the class can answer questions? Is it just the teacher? Why or why not?
- Do you think all your questions will have answers? Why or why not?



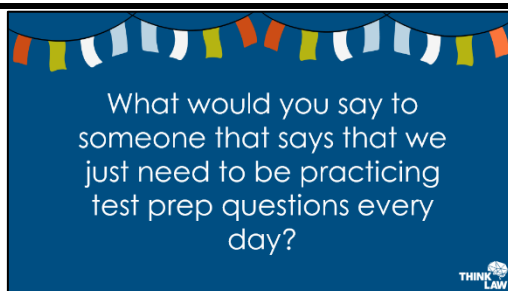
Most Importantly... Show Up with Your WHOLE Self and HAVE FUN!

You can laugh and learn at the same time.



Your neighbor was absent today; how would you summarize this lesson for them?

Teacher Note: This is a great opportunity to share with students when you'll be using thinkLaw Math Labs.



What would you say to someone who says that we just need to practice test prep questions every day? Thinkers may say that in real life, math doesn't really look like it does on a test.

