Is it Fair to Trick Kids?

4th Grade

A THINKLAW MATH LAB

OBJECTIVE	Thinkers will **use mistake analysis** to think like a test maker to write multiple choice questions that would trick fictional character Joe Schmo.

Lesson Outline

1. In the thinkstarter, thinkers will respond to 2 Family Feud-style questions about standardized math tests.
2. Thinkers will analyze 6 standardized math questions. Thinkers will determine the top 3 mistakes classmates might make when solving these problems.
3. Thinkers will use the top mistakes to craft multiple choice questions that might trick Joe Schmo.
4. Thinkers will synthesize these experiences to name the top 3 ways thinking like a test maker can help students take standardized tests.
5. In the thinkBigger, thinkers will determine if it is fair for test makers to use mistake analysis to trick kids. Thinkers will brainstorm arguments from both sides.

Indiana Academic Standards

4.CA.6: Add and subtract fractions with common denominators using visual fraction models. Decompose non-unit fractions to represent them as iterations of unit fractions. (E)
4.CA.8: Solve real-world problems involving addition and subtraction of fractions referring to the same whole and having common denominators (e.g., by using visual fraction models and equations to represent the problem). (E)
4.NS.5: Write tenths and hundredths in decimal and fraction notations. Use words, models, standard form, and expanded form to represent decimal numbers to hundredths. Mentally calculate fraction and decimal equivalents for halves and fourths (e.g., 1/2 = 0.5 = 0.50, 7/4 = 1 3/4 = 1.75). (E)
4.DA.1: Formulate questions that can be addressed with data. Collect, organize, and graph data from observations, surveys, and experiments using line plots with whole number intervals, single- and scaled bar graphs, and frequency tables. Solve real-world problems by analyzing and interpreting the data using grade-level computation and comparison strategies. (E)
4.M.2: Within given measurement systems, convert larger units to smaller units, including km, m, cm; kg, g; lb, oz; l, ml; hr, min, sec., and use these conversions to solve real-world problems. (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

PowerPoint Presentation:

Instructor's Note:
Asking a Family Feud-style question is a quick strategy you can use with any content.

Instructor's Note:
Have thinkers answer the questions and then give them the opportunity to share. What was the top response for the class?

Probing Questions:

- Have you ever watched Family Feud? What do you like about the show? Why do you think the show is so popular?
- Share a time you made a mistake on a math test. What did you learn from that mistake? How has that mistake helped you avoid mistakes on other tests?
- Why do you think students rush through tests? What types of mistakes do you make when you rush?
- What do you do when you think a question on a test is confusing? What strategies can you use if you cannot ask for help?
- What qualities should a test maker possess? If you were to interview a person to be a test maker, what questions would you ask? Why are the answers to these questions important?

SEL Instructor's Note:
It is not uncommon for students to feel nervous before taking a math test.

- How do you feel before you take a math test? How do you think these feelings impact your performance on a test?
- What can you do to feel less stress when you take a test? How would that strategy help you feel better?

Name_____

Is it Fair to Trick Kids?

A thinkLaw Math Lab

thinkStarter

Family Feud is a game show. Two families compete. The host asks a survey question that was asked to a group of 100 people, such as, "Name the hour that you get up on Sunday mornings." Contestants must guess the most popular response. The game continues until one family has guessed all the answers on the board, or until time runs out.

Answer these Family Feud-style questions.

If we surveyed 100 students in our school and asked them "What is the most common mistakes that students make on math tests?", what would be the #1 response?	
1	Misreading or Misunderstanding the Question
2	Making Careless Computation Errors
3	Rushing Through the Test

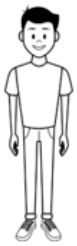
If we surveyed 100 students in our school and asked them "What are the ways test makers try to trick kids on standardized math tests?", what would be the #1 response?	
1	Using Similar Answer Choices
2	Using Problems that Require Multiple Steps
3	Using Common Mistakes in Answer Choices

thinkStarter Summary

There are common mistakes that students make on math tests. The people who make tests use mistake analysis to help them write questions that will trick kids. **Mistake analysis** is when you spend time thinking critically about

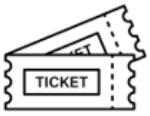
mistakes. Is this fair? In this thinkLaw math lab, we will think more about mistake analysis and thinking like a test maker.

What Would Joe Schmo Do?



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

Question 1



For a concert, there are student tickets and adult tickets for sale. Of the total tickets $\frac{39}{100}$ have been sold as student tickets and $\frac{5}{10}$ as adult tickets. The rest of the tickets have not been sold. What fraction of the total number of tickets for the concert have not been sold?

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may forget to find the lowest common denominator.
2	Joe may only add the two fractions and not subtract.
3	Joe may make computation errors.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

For a concert, there are student tickets and adult tickets for sale. Of the total tickets $\frac{39}{100}$ have been sold as student tickets and $\frac{5}{10}$ as adult tickets. The rest of the tickets have not been sold. What fraction of the total number of tickets for the concert have not been sold?	
A	$\frac{44}{110}$ (Straight Added Numerator and Denominator)
B	$\frac{89}{100}$ (Forgot to Subtract)
C	$\frac{11}{100}$ (Correct Answer)
D	$\frac{66}{100}$ (Did Not Change $\frac{5}{10}$ to $\frac{50}{100}$)

Instructor's Note:
The student materials for thinkLaw lessons are editable. The questions in this lesson are sample 3 grade standardized math questions. Feel free to switch out the examples to be released items from your own test or questions from your current math unit.

Instructor's Note:
Do the first example together.

First, carefully read the question. How could this problem be solved? The first problem requires multiple steps. Thinkers need to first change $\frac{5}{10}$ to $\frac{50}{100}$. Thinker then should add the two fractions which totals $\frac{89}{100}$. Finally, thinkers should subtract $\frac{100}{100} - \frac{89}{100} = \frac{11}{100}$.

Second, think about what could go wrong. Ask thinkers to brainstorm a list of potential mistakes.

- This problem has multiple steps. What problems might occur in the first step? What mistakes do thinkers make when they need to add fractions?
- What problems might occur in the second step?

Rank the mistakes. Which mistake is the most likely? Identify the top three mistakes.

Third, use the top 3 mistakes to help you create the 3 incorrect responses to your multiple choice questions. One response does need to be the correct response.

- 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 the 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?

Instructor's Note: Thinkers will have different responses. The responses shown in red are just sample responses.

Probing Questions:

- Why do you think test makers use multiple-choice questions? How do they trick students?
- What strategies do you use when you see a multiple-choice question?
- Do you read all the answer choices when you take a multiple-choice test? Why or why not?

Instructor's Note:

Problem 2 not only asks thinkers to convert the decimal to a fraction but asks thinkers to write the fraction in simplest form. Thinkers should start with $\frac{62}{100}$ and then convert the fraction to $\frac{31}{100}$.

- What mistakes might students make with reducing fractions?

Question 2

Rosa's favorite sports team has won 0.62 of its games this season. How can Rosa express this decimal as a fraction? Write the fraction in simplest form.

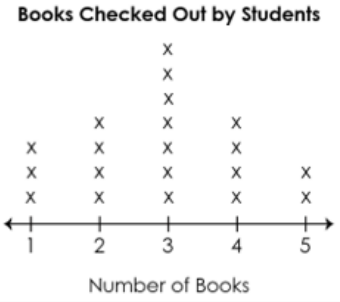
If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may select the wrong denominator.
2	Joe may not reduce the fraction.
3	Joe may make computation errors.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Rosa's favorite sports team has won 0.62 of its games this season. How can Rosa express this decimal as a fraction? Write the fraction in simplest form.	
A	$\frac{62}{1000}$ (Selected the Wrong Denominator)
B	$\frac{62}{100}$ (Did Not Reduce)
C	$\frac{15}{25}$ (Computation Error)
D	$\frac{31}{50}$ (Correct Answer)

Question 3

Jessica keeps track of the number of books each student checks out from the library. How many students check out more than three books? Use the line plot to answer the question.



If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may count columns 3-5.
2	Joe may count the x's in the 3 column.

Instructor's Note:

Thinkers are considering the most common mistakes that an individual might make when answering the question. Practicing this skill teaches thinkers to pause and consider mistakes that might be easy to make within a multiple-choice question. In this strategy, we ask thinkers to make reasonable predictions and inferences.

Instructor's Note:

Using a fictional character allows thinkers to step back and speculate about how someone else might miss the response. This approach is more comfortable than thinking about how they might miss the answer. In class, you can always ask, "How would _____ answer this question?" if thinkers are hesitant to share their own ideas. Asking how another person would answer a question or what mistake someone else will make creates a layer of psychological safety.

3	Joe may count all the x's on the graph.

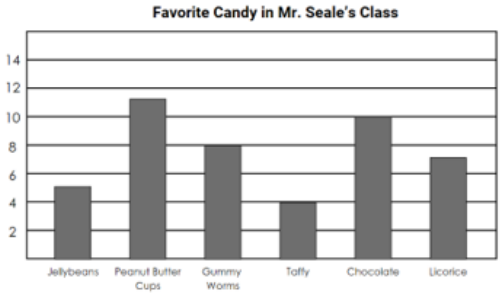
Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Jessica keeps track of the number of books each student checks out from the library. How many students check out more than three books? Use the line plot to answer the question.

A	13 students (Counted Columns 3-5)
B	6 students (Correct Answer)
C	7 students (Counted Column 3)
D	20 students (Counted All Columns)

Question 4

Mr. Seale graphs his students' favorite candy. The class has earned a candy party. All bowls of candy have the same amount to start with. Which two candies are likely to run out first? Use the graph to answer the question.



If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?

1	Joe may select the lowest two columns.
2	Joe may only select one candy.
3	Joe may pick jellybeans because it is listed first.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Mr. Seale graphs his students' favorite candy. The class has earned a candy party. All bowls of candy have the same amount to start with. Which two candies are likely to run out first? Use the graph to answer the question.

Instructor's Note:
For problem 3, the question asks students to find how many students checked out MORE than 3 books. Thinkers should count the x's in columns 4 and 5.

Instructor's Note:
For problem 4, thinkers need to understand that the MOST popular candy will be eaten first. The two largest columns will be eaten first.

Probing Questions:

- What are common mistakes students make with graphs?
- What mistakes might a student make if they do not carefully read the questions?

Instructor's Note:
The Family Feud exercise is helpful when writing multiple choice questions. Too often, if we ask thinkers to prepare their own multiple-choice responses to a question, students will select silly answers for the wrong responses. We are asking thinkers to make reasonable predictions and inferences. We are helping them develop the habit of putting themseves in the shoes of others, which also helps to develop empathy.

Instructor's Note:
For problem 5, thinkers must divide 36 feet by 3 because there are 3 feet in a yard.

Probing Questions:

- What are common mistakes students make with measurement?
- What other measurements might thinkers confuse with yards?
- What mistakes do students make with decimals?

Instructor's Note:
For problem 6, thinkers will need to subtract the two numbers. They will need to line up the decimals before subtracting.

A	Jellybeans and Taffy (Least Popular)
B	Taffy (Just One Option, Least Popular)
C	Peanut Butter Cups and Chocolate (Correct)
D	Peanut Butter Cups and Gummy Worms (Misread Chart)

Question 5

The school building is 36 feet high. What is the height of the building in yards?

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may confuse inches and yards and divide by 12.
2	Joe may not understand that there are 3 feet in a yard.
3	Joe may make computation errors.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

The school building is 36 feet high. What is the height of the building in yards?	
A	3 yards (Divided by 12 Instead of 3)
B	6 yards (Divided by 6 Instead of 3)
C	9 yards (Divided by 4 Instead of 3)
D	12 yards (Correct Answer)

Question 6

Which number correctly completes the subtraction sentence 5.0 – 3.25 = _____?

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe will forget to borrow when they subtract.
2	Joe may misplace the decimal.

Probing Questions:

- What would school look like if EVERY student thought like a test maker?
- What advice would you give a friend about thinking like a test maker?
- Is thinking like a test maker cheating? Why or why not?

Instructor's Note:
One theme we repeat throughout the thinkLaw math labs is the idea that math is supposed to make sense! Before you begin to solve a test problem, press pause. What answer would make sense for this problem? What answers would not make sense for this problem?

3	Joe may subtract incorrectly.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Which number correctly completes the subtraction sentence 5.0 – 3.25 = ____?	
A	2.75 (Did not borrow)
B	1.75 (Correct Answer)
C	17.5 (Misplaced Decimal)
D	1.25 (Computation Error)

What are the top 3 ways thinking like a test maker helps you take a standardized test?

1	Press pause and think about common mistakes.
2	Look for the common mistakes. Cross them out.
3	Read all answer choices. Don't stop at choice A.

thinkBigger

Do you think it is fair for test makers to use mistake analysis to trick kids?

What is the best argument for each side?

It is fair for test makers to use mistake analysis.	It is NOT fair for test makers to use mistake analysis.
• Using mistake analysis to write multiple choice questions is smart. Test takers are thinking deeply about the questions they write. • If students know the content and take their time, they will not be fooled by the incorrect responses.	• Test makers are taking advantage of students who are in a hurry. Students see a response that looks like it could be correct and select that option. • It's sneaky! Thinkers should be able to solve the problems without looking at incorrect answers.

Probing Questions:

- What surprised you most when you started to really think about multiple choice questions?
- In the past, have you made any "Joe Schmo" mistakes when testing? What mistakes did you make? How can you make sure that you do not continue to make these mistakes?
- How will you change your approach to multiple-choice questions after this analysis?
- Are there other common mistakes that students make while taking tests? How can test makers take advantage of those common mistakes?
- What do you think is easier? Taking a test or writing a test? Why?
- Do you think multiple choice questions are easier or harder than open response? Why?
- What type of questions are easier to grade? Multiple choice questions or open response questions? Why do you think so many standardized tests have multiple choice questions?

After the Lesson:
thinkLaw math labs include exit tickets for additional practice.

Remember, if you would like to use different numbers you can edit the Word version of the student work pages.

Name_____

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A thinkLaw Math Lab

What Would Joe Schmo Do?

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

Question 1

A class has 20 gallons of lemonade for the class party. The students at the dance drink 14 gallons and 1 quart. How much lemonade does the school have left over in gallons and quarts?

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may forget to convert gallons to quarts.
2	Joe may subtract incorrectly.
3	Joe may convert incorrectly.

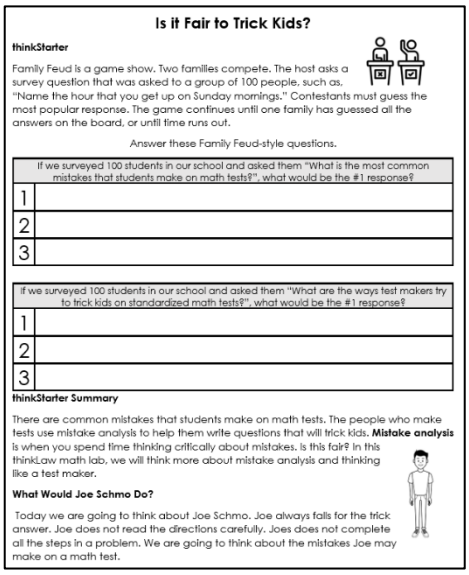
Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

A class has 20 gallons of lemonade for the class party. The students at the dance drink 14 gallons and 1 quart. How much lemonade does the school have left over in gallons and quarts?	
A	6 Gallons (Did not subtract the 1 quart)
B	23 Quarts (Did not Convert to Gallons)
C	5 Gallons and 3 Quarts (Correct Answer)
D	4 Gallons and 6 Quarts (Converted Gallons incorrectly)

Question 2

A flower shop had 242 flowers. On Saturday it sold 128 of the flowers. On Monday the shop got some more flowers to sell. Now it has 150 flowers. How many flowers did the shop get on Monday?

Instructor's Note:
thinkLaw math labs also include take-home student sheets that are available in English and Spanish. Encourage thinkers to try a mini version of the lesson at home with their families! Asking thinkers to reteach the lesson to their parents helps thinkers to practice synthesis and gives them additional practice with the material.



Is it Fair to Trick Kids?

thinkStarter

Family Feud is a game show. Two families compete. The host asks a survey question that was asked to a group of 100 people, such as, "Name the hour that you get up on Sunday mornings." Contestants must guess the most popular response. The game continues until one family has guessed all the answers on the board, or until time runs out.

Answer these Family Feud-style questions.

If we surveyed 100 students in our school and asked them "What is the most common mistakes that students make on math tests?", what would be the #1 response?	
1	
2	
3	

If we surveyed 100 students in our school and asked them "What are the ways test makers try to trick kids on standardized math tests?", what would be the #1 response?	
1	
2	
3	

thinkStarter Summary

There are common mistakes that students make on math tests. The people who make tests use mistake analysis to help them write questions that will trick kids. **Mistake analysis** is when you spend time thinking critically about mistakes. Is this fair? In this thinkLaw math lab, we will think more about mistake analysis and thinking like a test maker.

What Would Joe Schmo Do?

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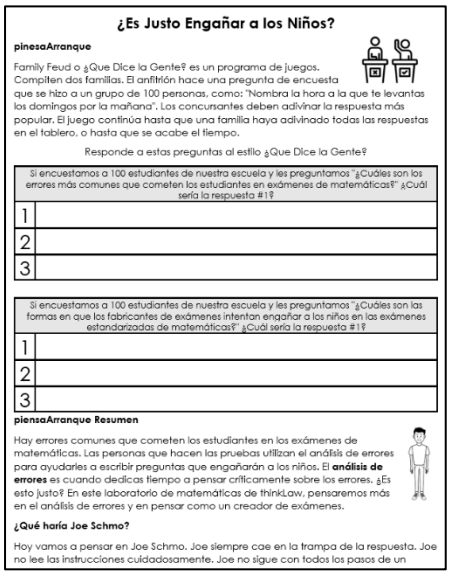

¿Es Justo Engañar a los Niños?

pinesaArranque

Family Feud o ¿Que Dice la Gente? es un programa de juegos. Compiten dos familias. El anfitrión hace una pregunta de encuesta que se hizo a un grupo de 100 personas, como: "Nombra la hora a la que te levantas los domingos por la mañana". Los concursantes deben adivinar la respuesta más popular. El juego continúa hasta que una familia haya adivinado todas las respuestas en el tablero, o hasta que se acabe el tiempo.

Responde a estas preguntas al estilo ¿Que Dice la Gente?

Si encuestamos a 100 estudiantes de nuestra escuela y les preguntamos "¿Cuáles son los errores más comunes que cometen los estudiantes en exámenes de matemáticas?" ¿Cuál sería la respuesta #1?	
1	
2	
3	

Si encuestamos a 100 estudiantes de nuestra escuela y les preguntamos "¿Cuáles son las formas en que los fabricantes de exámenes intentan engañar a los niños en los exámenes estandarizadas de matemáticas?" ¿Cuál sería la respuesta #1?	
1	
2	
3	

piensaArranque Resumen

Hay errores comunes que cometen los estudiantes en los exámenes de matemáticas. Las personas que hacen las pruebas utilizan el análisis de errores para ayudarles a escribir preguntas que engañarán a los niños. El **análisis de errores** es cuando dedicas tiempo a pensar críticamente sobre los errores. ¿Es esto justo? En este laboratorio de matemáticas de thinkLaw, pensaremos más en el análisis de errores y en pensar como un creador de exámenes.

¿Qué haría Joe Schmo?

Hoy vamos a pensar en Joe Schmo. Joe siempre cae en la trampa de la respuesta. Joe no lee las instrucciones cuidadosamente. Joe no sigue con todos los pasos de un

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may subtract incorrectly.
2	Joe may use the extra information.
3	Joe may add instead of subtracting.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Rosa's favorite sports team has won 0.62 of its games this season. How can Rosa express this decimal as a fraction? Write the fraction in simplest form.	
A	22 flowers (Correct Answer)
B	92 flowers (Subtracting Incorrect Numbers)
C	278 flowers (Adding Instead of Subtracting)
D	114 flowers (Subtracting Incorrect Numbers)

Question

Sophie bought $\frac{3}{16}$ pound of flour and $\frac{7}{16}$ pound of sugar. What is a reasonable estimate of the total amount of flour and sugar Sophie bought?

If we surveyed 100 students in our school and asked them "What mistake would Joe Schmo make on this question?", what would be the #1 response?	
1	Joe may forget to find a common denominator.
2	Joe may not simplify the fraction.
3	Joe may add incorrectly.

Use these top three mistakes to write a multiple-choice question. Be sure to also include the correct response.

Sophie bought $\frac{3}{16}$ pound of flour and $\frac{7}{16}$ pound of sugar. What is a reasonable estimate of the total amount of flour and sugar Sophie bought?	
A	$\frac{3}{16}$ pound
B	$\frac{3}{16}$ pound
C	$\frac{3}{16}$ pound
D	$\frac{5}{8}$ pound (Correct)