Math for All: Differentiating Math Instruction

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National Council of Teachers of Mathematics

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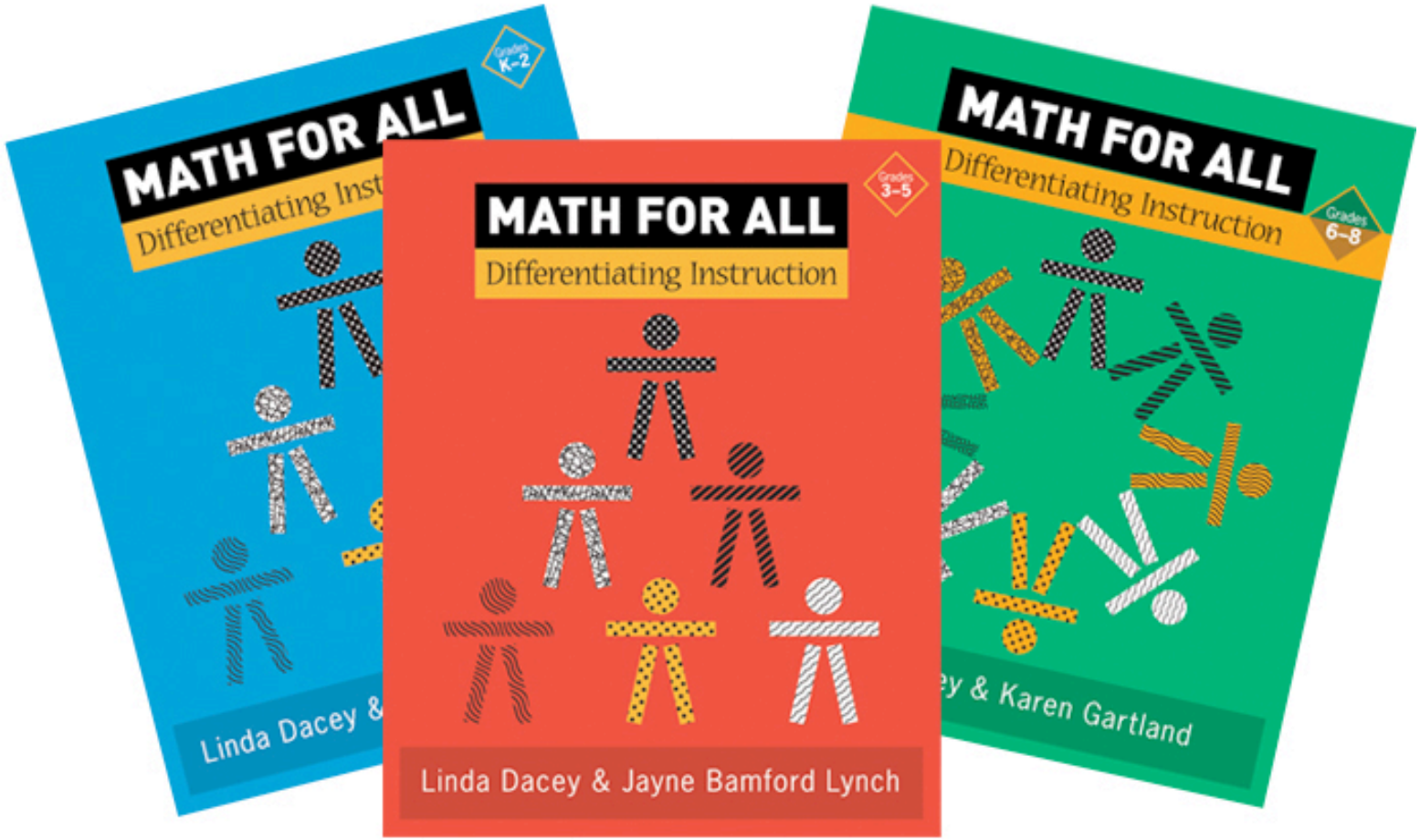

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Differentiated Instruction —

Instruction designed to meet differing learners' needs

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Instruction Can be Differentiated by Focusing on….

- **Content**
- **Process**
- **Product**

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Which number does not belong? Why?

4, 16, 36, 48, 64, or 81

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4	81
"It's the four!" "It's only one number. The rest are two." "It's the only number less than ten; the rest are between ten and one hundred." "It's only one digit; the rest are two-digit numbers."	"Wait. I got another number answer, too. It's eighty-one." "Eighty-one is not divisible by four. All of the other numbers are even, but they have to be if they are multiples of 4." "You can't get to 81 with just these numbers." 64 ÷ 16 = 4 64 ÷ 4 = 16 48 – 16 + 4 = 36 64 – 16 = 48 16 x 4 = 64
48	
"It's the only one that is not a square number."	

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- What knowledge and understanding could you assess with this task?

- How is the task “Which Does Not Belong?” like what you already do to learn more about what your students know and how they solve problems? How is it different?

- What was the purpose of having you draw lines under your work as we moved through the processing of the problem? How did your thinking grow and change as you listened to your peers?

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Scaffolding

Temporary supports that allow students to accomplish tasks that they otherwise would be unable to complete

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Some ways learning can be scaffolded include:

- Teaching Strategies
- Questioning Strategies
- Student Collaboration
- Whole-group Discussions
- Graphic Organizers

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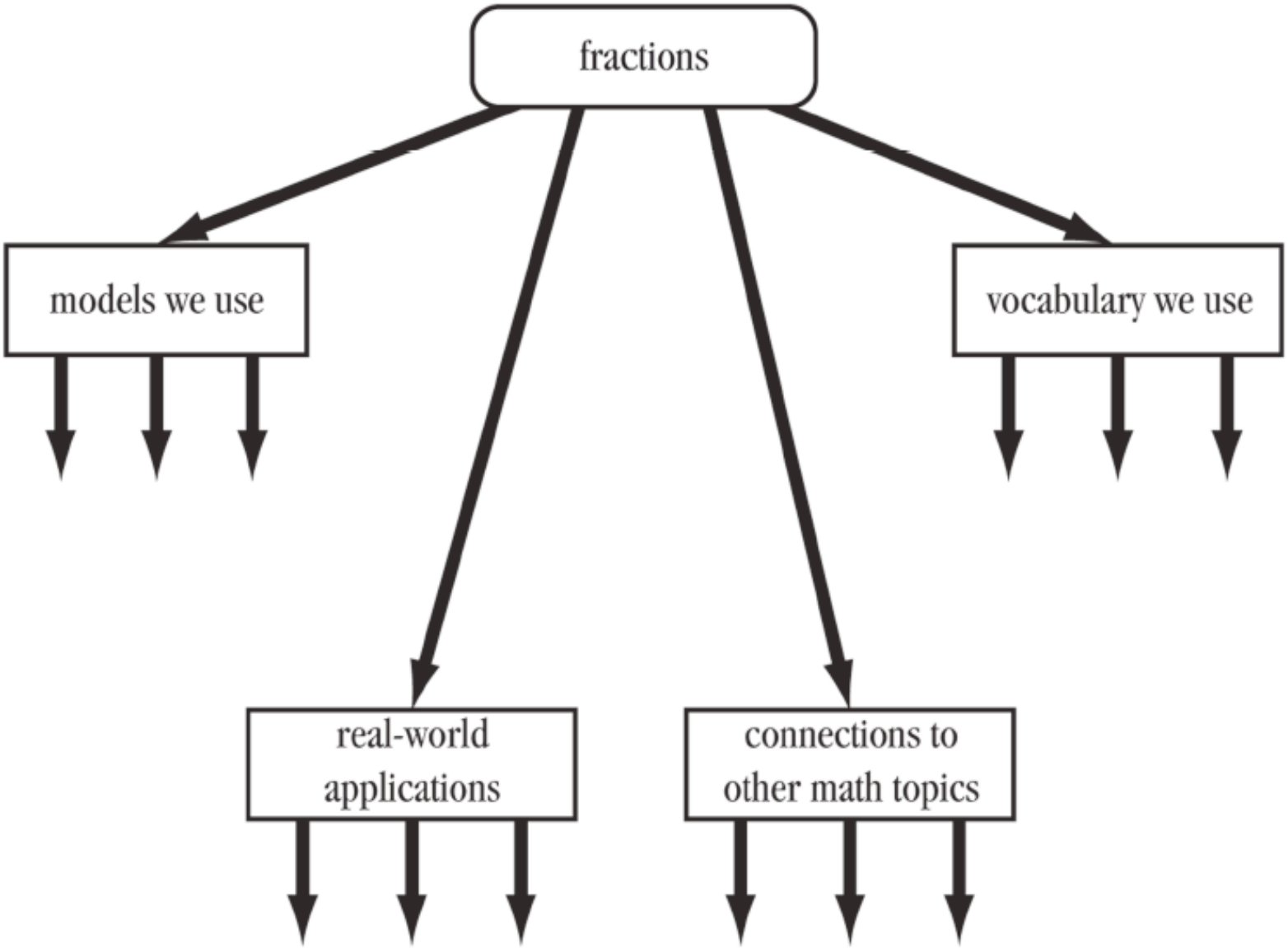
fractions
models we use
vocabulary we use
real-world applications
connections to other math topics

How are a square and cube…..

Same	Different

Word Bank

Angle	face	three-dimensional
Cube	degrees	rectangular prism
Edge	side	two-dimensional
Square	vertices	vertex

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There are some bicycles and tricycles.
There are 14 vehicles.
There are 34 wheels.
How many bicycles are there?
How many tricycles are there?

Facts:	Drawings:
Computation:	Answer:

Casting a Wider Net

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Tasks Cast a Wider Net when they…..

- **Allow students control over difficulty level**

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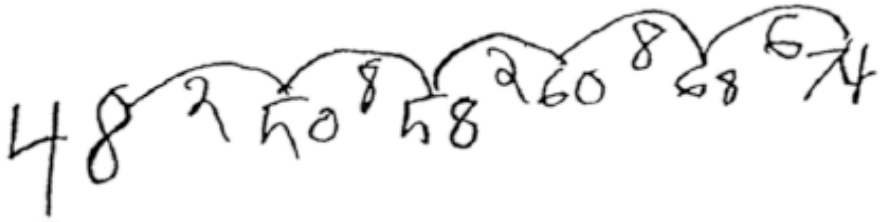
There were 48 children on the playground.
26 more came to join them.
How many children were on the playground then?

(A) 48, 26 B) 138, 134

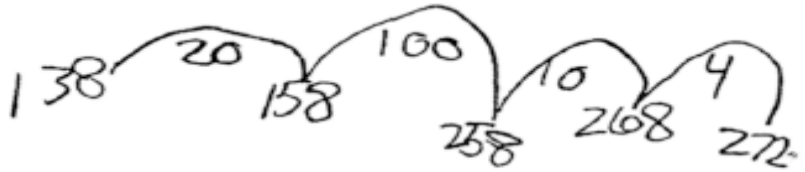


I started with 48 and added 2 then I got 50 then I added 8 and I got 58 I added 2 and got 60 then I added 8 and I got 68 then I added 6 and got 74.

There were _____ children on the playground.
_____ more came to join them.
How many children were on the playground then?

A) 48, 26

B) 138, 134



I added 138 to 20 and I got 158
then I added 100 and I 258, also
I added it to 10 and I got 268
Also I added it to 4 and got
the number I wanted it is 272.

Tasks Cast a Wider Net when they…..

- **Allow students control over difficulty level**
- **Are open to multiple solutions or strategies**

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Billie has won a $25.00 shopping spree to the museum and must spend it all. If he doesn't spend the $25.00 he does not receive change back. Use the list below, determine which items Billy can buy so that he spends all $25.00.

Find as many different solutions as you can.

$3.00	$4.00	$5.00
Origami Paper	Kaleidoscope	Dinosaur Kit
Gem Magnet	Magnifying Glass	Inflatable globe
Prism	Inflatable shark	Glow stars
Koosh ball	Sunprint Kit	Stuffed animal

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Tasks Cast a Wider Net when they…..

- Allow students control over difficulty level
- Are open to multiple solutions or strategies
- Provide students with "number story" and with "answers" -- then have students create the questions

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Number Story:

Sabina and Mike ran each day this week. Each day Sabina ran 3 miles in 30 minutes. Mike ran 6 miles in 72 minutes.

Here are the answers: 42, 2, 294, 3 1/2

What could be the questions?

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Tasks Cast a Wider Net when they…..

- Allow students control over difficulty level
- Are open to multiple solutions or strategies
- Provide students with "number story" and with "answers" -- then have students create the questions
- Make use of open-ended probes

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Open-Ended Probes

- How do you describe a cube to someone who has never seen one?
- The answer is 87. What could the question be?
- How is measurement used in your home?
- How might we write numbers if we didn't have zeroes?

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Tasks Cast a Wider Net when they…..

- Allow students control over difficulty level
- Are open to multiple solutions or strategies
- Provide students with "number story" and with "answers" -- then have students create the questions
- Use open-ended probes
- Allow students to show their understanding in different ways

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Imagine you are trying to help someone understand what three-tenths means.

What pictures could you draw to be helpful?

You can draw more than one picture. Let's see how many different pictures we can make.

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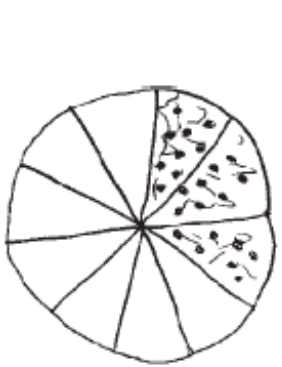
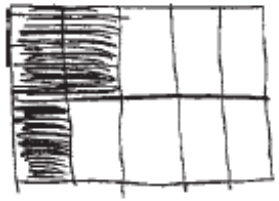
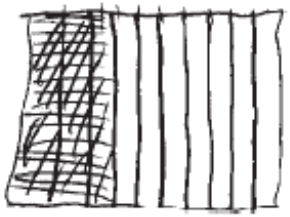


Mac's work



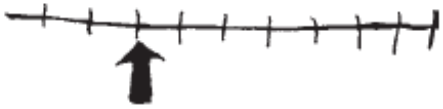
Suzie's work



Nora's work

Ned's work

Michelle's work



Lazaro's work

Chad's work

Remember, in order to provide for a wider range of students:

- Allow students some control over the difficulty level
- Transform problems so they allow for more solutions or a wider range of responses
- Encourage the use of multiple models

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Planning for Differentiated Instruction — Questions to guide our Thinking

- What is the mathematics I want my students to learn?
- What do my students already know? How can I build on their thinking?
- How can I expand access to this task or idea by thinking about interests, learning styles, use of language, cultures, and readiness?

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Planning for Differentiated Instruction — Questions to guide our Thinking

- How can I ensure that each student experiences challenges?
- How can I scaffold learning to increase the likelihood of success?
- In what different ways can my students demonstrate their new understanding?
- Are there choices students can make?

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Differentiated instruction is most successful when teachers:

- Believe that all students have the capacity to succeed at learning mathematics

- Recognize that multiple perspectives are necessary to build important mathematical ideas and that diverse thinking is an essential and valued resource in the classroom

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At Olympics Day, two friends are running in a race.

One friend is 5/8 of the way to the finish line and the other friend is ¾ of the way.

Who is winning?

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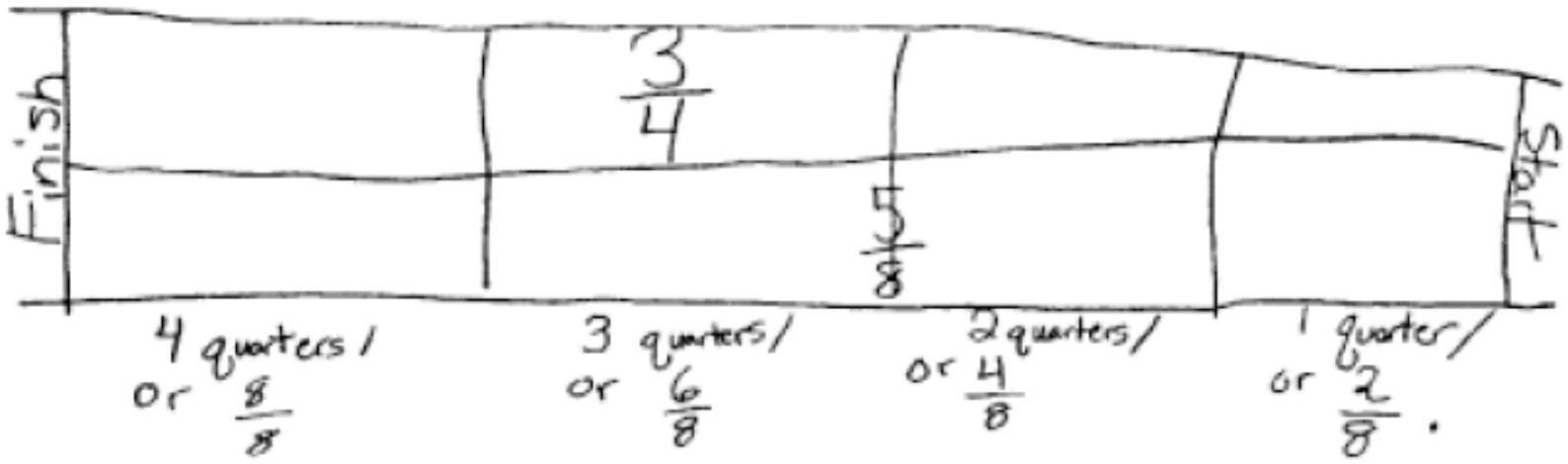
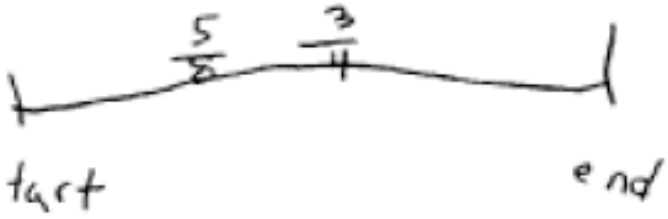
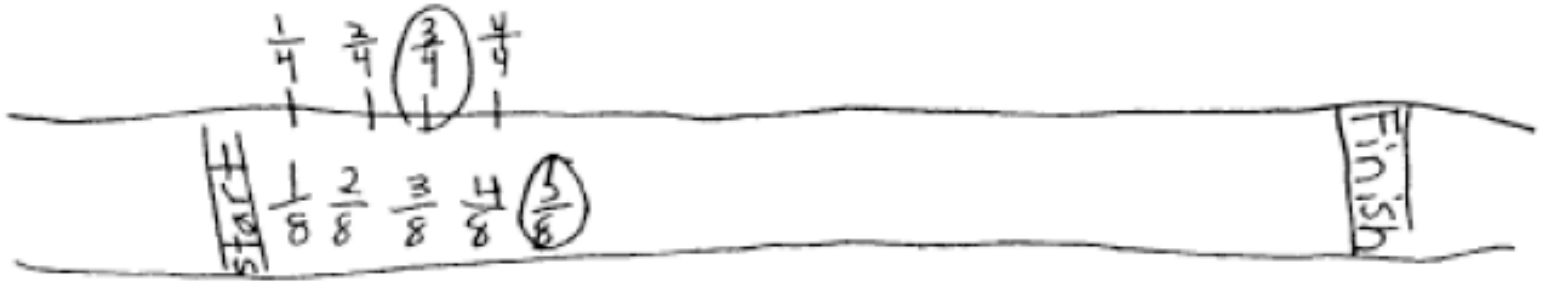


$\frac{3}{4}$ is at 3 quarters / or $\frac{6}{8}$ because 3 quarters is just 3 out of 4.
$\frac{5}{8}$ is in between 2 quarters / or $\frac{4}{8}$ and 3 quarters / or $\frac{6}{8}$ because $\frac{5}{8}$ is in between $\frac{4}{8}$ and $\frac{6}{8}$.
That is what I got!

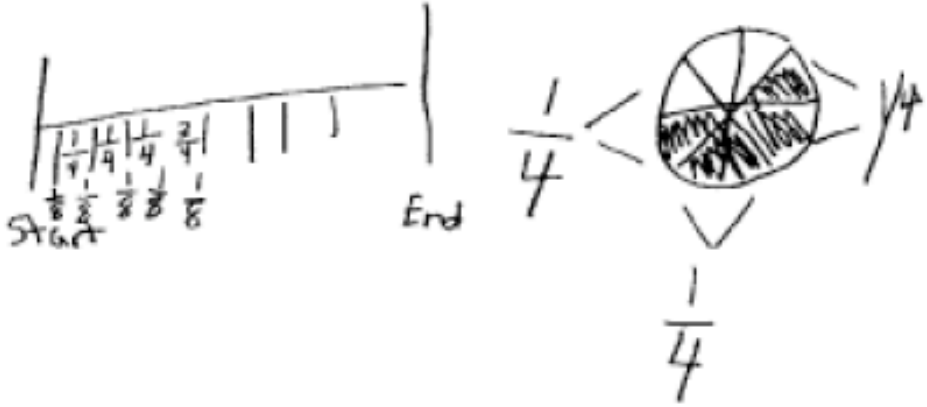


3/4 is colowser to the finish Because 3/4 is the lettle number But in math the lettle number is the hpest and 5/8 is the lowest.



The $\frac{5}{8}$ is closer because if the top number is bigger it would be farther.

$\frac{3}{4}$ is bigger because $\frac{2}{8} = \frac{1}{4}$ and there are $\frac{5}{8}$ and if $\frac{2}{8} = \frac{1}{4}$ $\frac{5}{8}$ would only $= \frac{2}{4}$ and $\frac{1}{8}$ but we need $\frac{3}{4}$ so one of the friends is loosing by $\frac{1}{8}$.



Answer $\frac{3}{4}$'s

Differentiated instruction is most successful when teachers:

- Believe that all students have the capacity to be successful learners;
- Recognize that diverse thinking is an essential and valued resource;
- Know and understand mathematics and are confident in their ability to teach mathematical ideas;

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Differentiated instruction is most successful when teachers:

- Are intentional about curricular choices
- Develop strong learning communities in their classrooms;
- Focus assessment; and
- Support each other in their efforts.

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"In the end, all learners need your energy, your heart, and your mind.

They have that in common because they are young humans.

How they need you, however, differs. Unless we understand and respond to those differences, we fail many learners."

Carol Ann Tomlinson

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