

Roll the dice...

a little bit of rational number fun



Focus of session

This workshop was presented at NZAMT conference in July. Let's explore and have a play in the rational number space (Years 4 – 8 but tasks can be extended). **Tasks** will include games, conversation starters like discussNdefend and conjectures, and ways to use equipment to support ākonga **justifying and explaining** their understanding and make connections between concepts.

As we explore each task, we will make connections with the **mathematical processes** and how you can support ākonga to develop these skills to support their learning and how the processes can support you as a kaiako in your role as an adaptive practitioner.

Ahakoa iti, he pounamu
Although it is small, it is precious



Fractional Thinking

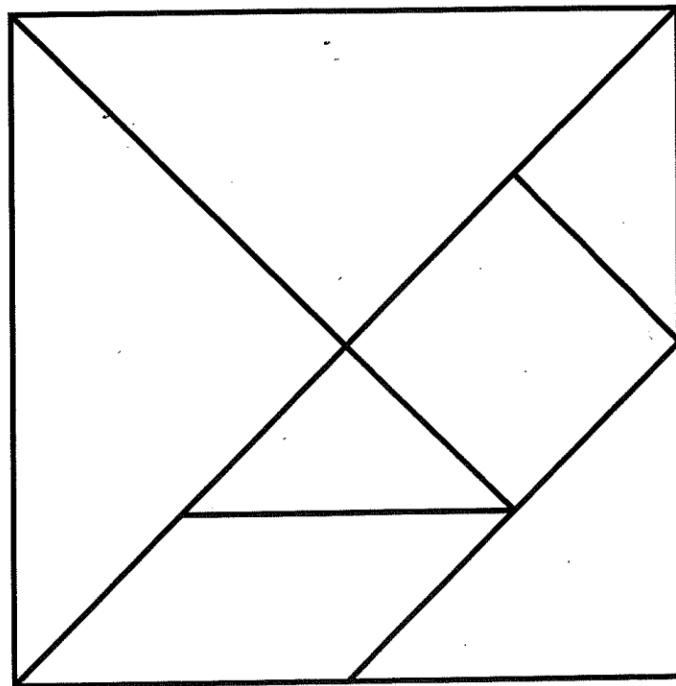
Underlying the development of fractional thinking is a **number system that is different from the numbers** that students have already had experience with.

Fractions have different rules for naming, quantifying, ordering, adding, subtracting, multiplying, dividing, etc. Students will need to develop an understanding of these rules and be able to apply them when working with fractions. Using a **variety of visual and numerical representations** for fractions can support students to build up experiences with the different areas of fractions (**fractional constructs**).

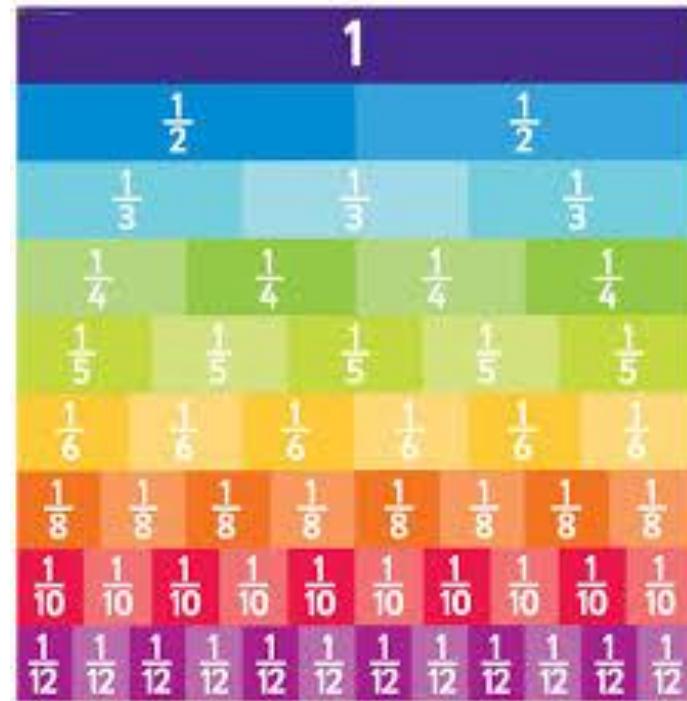
ARB: Fractional Thinking Concept Map - Introduction

Representations

Tangrams



Fraction wall and fraction strips



Mathematics Knowledge and Practice



The New Zealand Curriculum Mathematics and Statistics Years 0–10

October 2025



Mathematics and Statistics Years 0–10 |

Page 1

Mathematics and Statistics DO Processes

Investigating situations



Representing situations



Connecting situations



Generalising findings

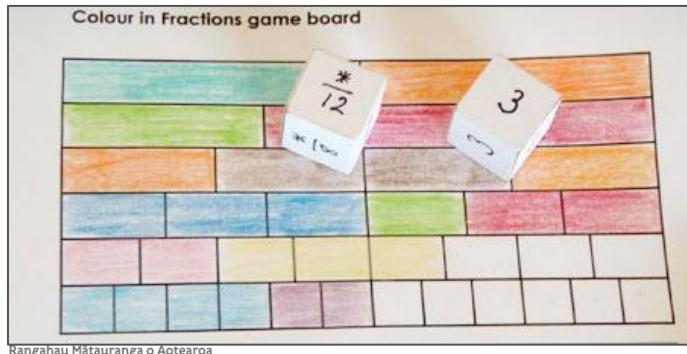


Explaining and justifying findings



Fractions tasks

| Task | Focus | Phase |
|--|---|---------------|
| Tangram relationships <ul style="list-style-type: none"> - Making a tangram - Relationships among the tangram pieces | Identifying fraction parts of a whole Relationships among fractions | Phase 2 |
| Equality statements <ul style="list-style-type: none"> - Comparison statements - Number boxes | Comparing fractions Mixed and improper fractions Equivalent fractions | Phase 2 and 3 |
| Fraction war | Comparing fractions Mixed and improper fractions Equivalent fractions | Phase 2 and 3 |
| Colour fraction wall | Comparing fractions Equivalent fractions | Phase 2 and 3 |



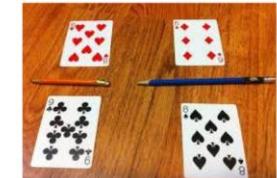
Fraction war

Need: Cards (1 - 6, 8 and 10)

Each player gets two cards and creates a fraction.

Compare the fractions. Person with largest fraction gets a point/counter.

First to get five counters is the winner.



Have fraction wall or strips available to support the comparison.

Tangram exploration

How to make a tangram

Presentation last saved: Just now

Player Information

About Brightcove

Fold and cut square paper to create tangram pieces.

Let's make a tangram from a square of paper.

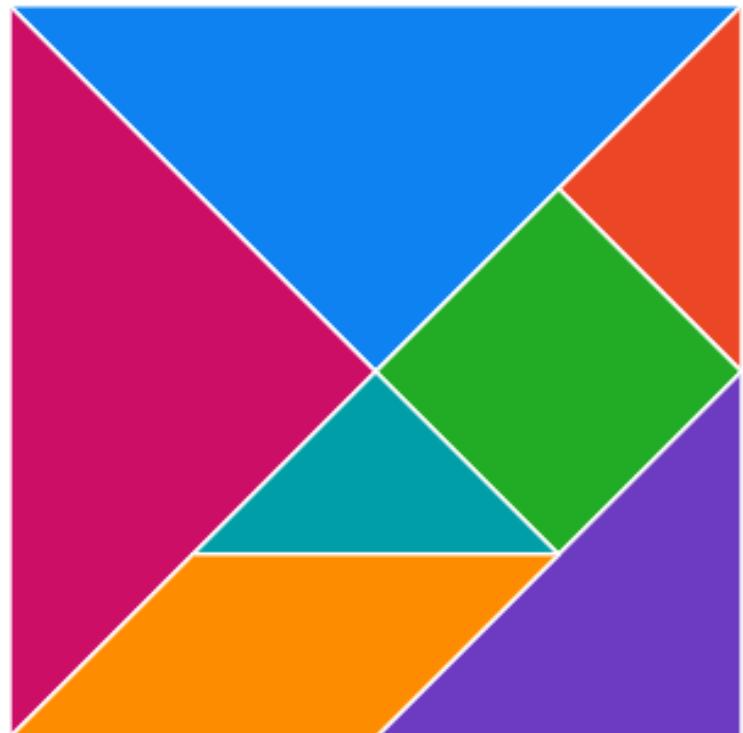
Relationships among tangram pieces

Tangram square equals 1 whole.

Identify the fractional parts of the whole for each piece.

What do you notice as you identify the parts?

Prove and justify why some pieces are equivalent.



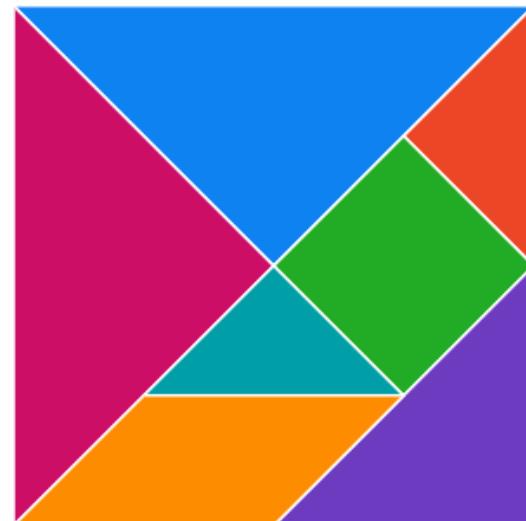
Supporting all students

What are the key mathematical ideas the task is exploring?

Enable

What accommodations can be used to enable students to access the learning in this task?

Base task



Extend

How can you extend and challenge student thinking with this task?

How are students demonstrating the **mathematical processes** (Dos) when exploring this task?

Rapid Routines – what?

1

revisitNretain and recallNreason

- Practise and deepen the fluency of key skills and concept (includes games)
- Sequenced exercises with a focus on appropriateness of strategy
- Initially individual then come together for number talk

2

moveNprove

- Understanding big ideas and reasoning
- Whole class snapshots for assessing conceptual understanding of key ideas
- Can link to open ended explorations

3

discussNdefend

- Puzzles/pictures/graphics to stimulate curiosity, wonder, doubt
- Working together to share ideas, insights, experiences





Target = 35

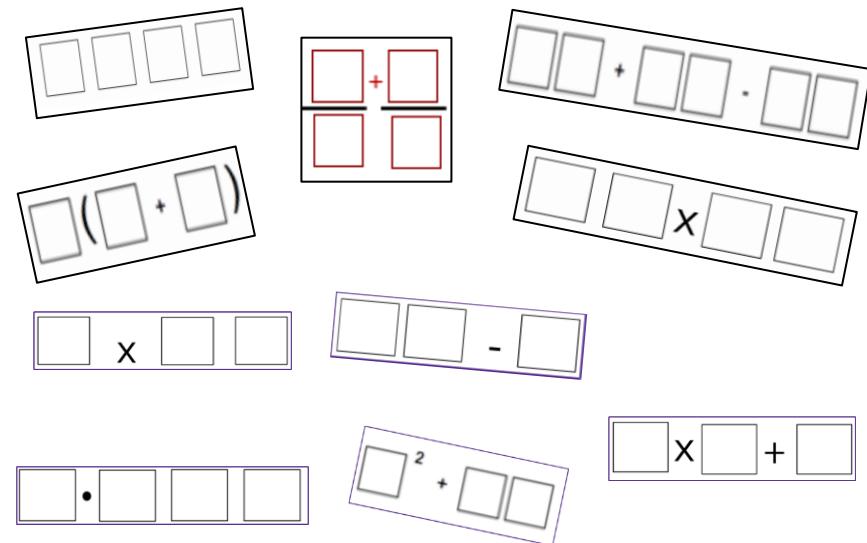
Player 1

| | | | | |
|---|---|---|---|---|
| 2 | 6 | + | 5 | 1 |
|---|---|---|---|---|

Player 2

| | | | | |
|---|---|---|---|---|
| 3 | 1 | + | 4 | 6 |
|---|---|---|---|---|

throw away box



Number Boxes

Years 1 to 8



Materials: 6 sided (or 9 sided dice, pen and paper

Maths concepts: computation, place value

Aim: Be the closest to the target number

1. Choose which number box layout you want to play and decide on a specific target number to aim for, e.g. 35
2. Players take turns to roll a dice and place it somewhere in one of their boxes.
3. Once the number has been placed, it cannot be moved. One number on any given round may be “thrown away” and written in the throw away box instead.
4. Play continues until all of the boxes are full. Players justify which number is closest to the target number (e.g. using a number line).

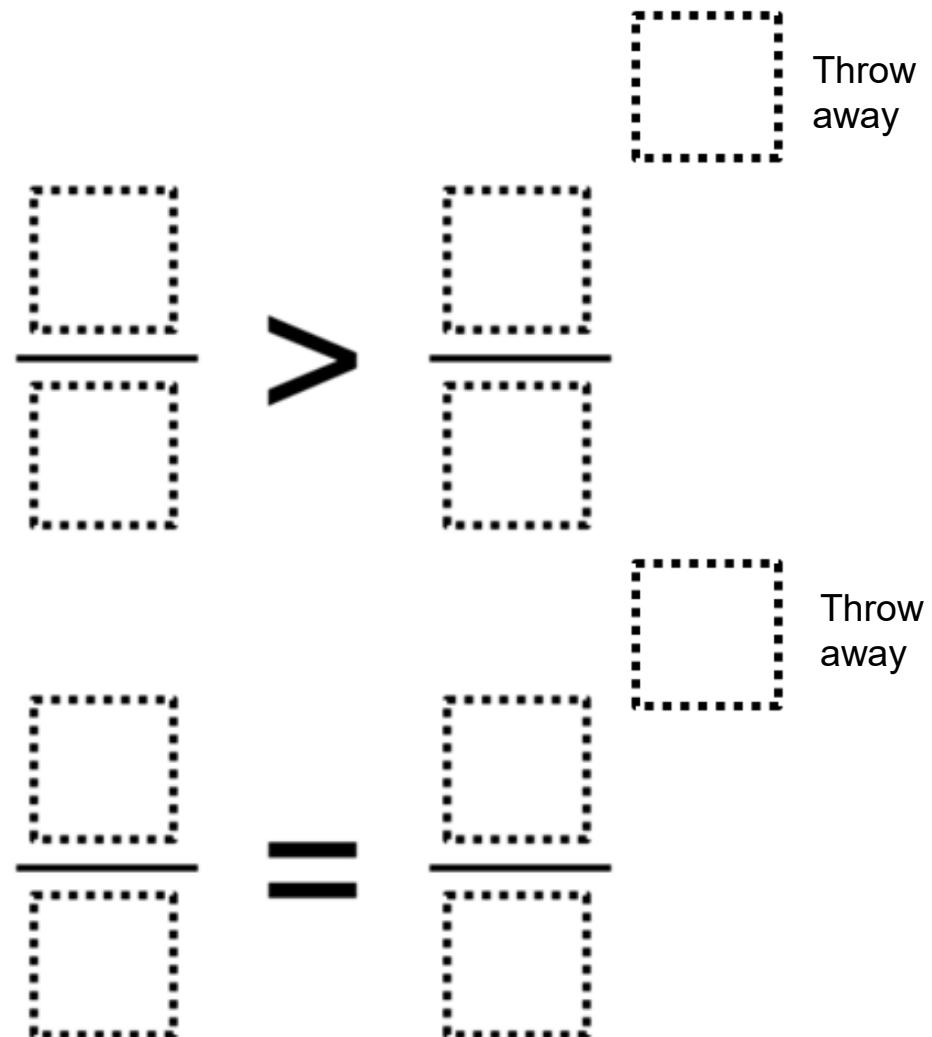
| | | | | | |
|---|--|---|---|--|--|
| $\square + \square = \square$ | $\square - \square = \square$ | $\square \times \square = \square$ | $-\square \times \square = \square$ | $\frac{\square}{\square} = \square$ | $\square \times \square$ |
| $\square \square + \square \square = \square$ | $\square \square - \square \square = \square$ | $\square \square \times \square = \square$ | $(\square + \square)(\square + \square) = \square$ | $\frac{\square}{\square} = \square$ | $\square + \square + \square$ |
| $\square \square + \square = \square$ | $\square \square - \square = \square$ | $\square \square \div \square = \square$ | $(\square + \square)(\square - \square) = \square - \square$ | $\frac{\square}{\square} = \square$ | $\square \div \square$ |
| $\square \cdot \square + \square \cdot \square = \square$ | $\square \times \square = \square \square + \square$ | $\square! + \square + \frac{\square}{\square} = \square$ | $\square - \square \square = \square$ | $\frac{\square}{\square} + \frac{\square}{\square} = \square$ | $\square \times \square$ |
| $\square \times (\square + \square) = \square$ | $\square \times \square + \square - \square \square = \square$ | $\square \square + \square \square = \square$ | $\frac{\square}{\square + \square} = \square$ | $\frac{\square}{\square} \times \frac{\square}{\square} = \square$ | $\frac{\square}{\square} \div \square$ |
|  | | $\square \times \left(\frac{\square}{\square} + \frac{\square}{\square}\right) = \square$ | $\frac{\square}{\square} + \frac{\square}{\square} = \square$ | $\frac{\square}{\square} \times \frac{\square}{\square} = \square$ | $\left(\frac{\square}{\square}\right) = \square$ |

True statements

Aim: Make two true statements

Need: Dice (1, 2, 3, 4, 6, 8)

1. Players take turns to roll a dice and place it somewhere in one of their boxes.
2. Once the number has been placed, it cannot be moved. One number on any given round may be “thrown away” and written in the throw away box instead.
3. Play continues until all of the boxes are full. Players justify the statements are true (e.g. using fraction wall or strip).



Supporting all students

What are the key mathematical ideas the task is exploring?

Enable

What accommodations can be used to enable students to access the learning in this task?

Base task

$$\frac{\square}{\square} > \frac{\square}{\square}$$

$$\frac{\square}{\square} = \frac{\square}{\square}$$

Extend

How can you extend and challenge student thinking with this task?

How are students demonstrating the **mathematical processes** (Dos) when exploring this task?

Robert Kaplinsky task examples

ADDING FRACTIONS 4

Directions: Using the integers 1 to 10 at most one time each, fill in the boxes so that the sum is equal to 1.

$$\frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} = 1$$

MIXED NUMBER AND FRACTION GREATER THAN ONE

Directions: Using the digits 0 to 9 at most one time each, place a digit in each box to make the equality true.

$$\frac{\square \square}{\square} = \square \frac{\square}{\square}$$

COMPARING FRACTIONS 3

Directions: Using the digits 1 to 9 at most one time each, place a digit in each box to create a true statement.

$$\frac{\square}{\square} < \frac{\square}{\square} < \frac{\square}{\square}$$

Fraction war

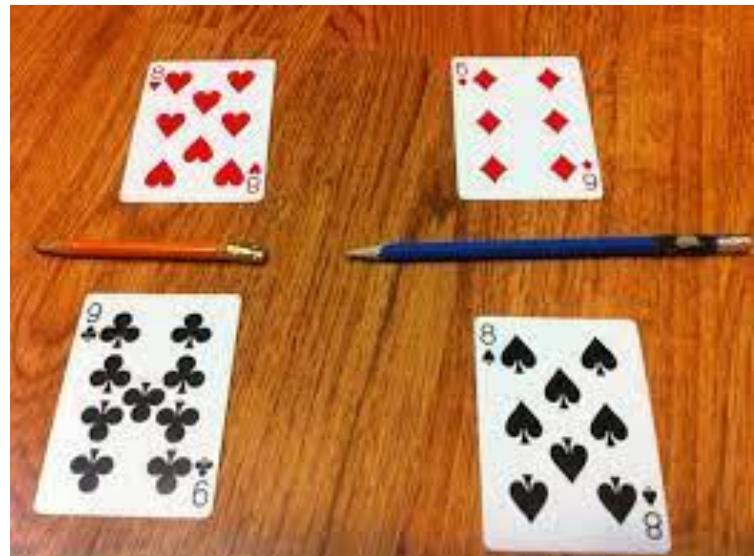
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Compare the fractions. Person with largest fraction gets a point/counter.

First to get five counters is the winner.

Have fraction wall or strips available to support the comparison.



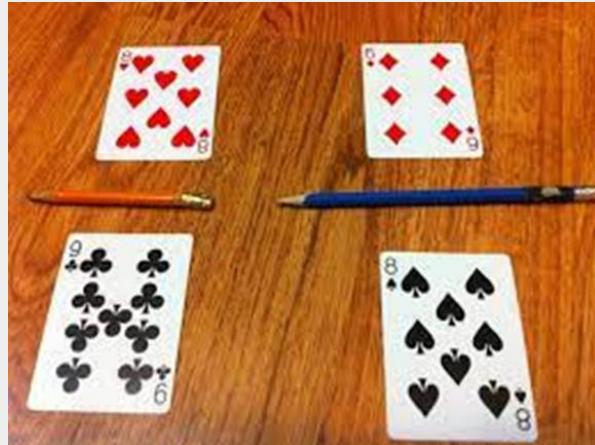
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Colour Fraction wall game

You will need:

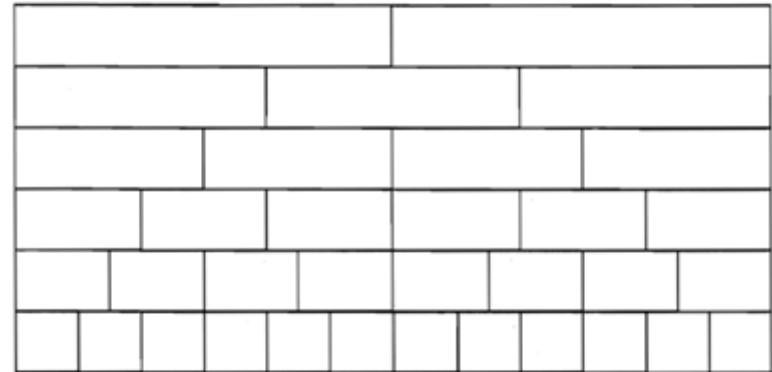
Pens

Fraction wall gameboard

Dice

Play in pairs

Winner is...



Supporting all students

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Enable

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Base task



Extend

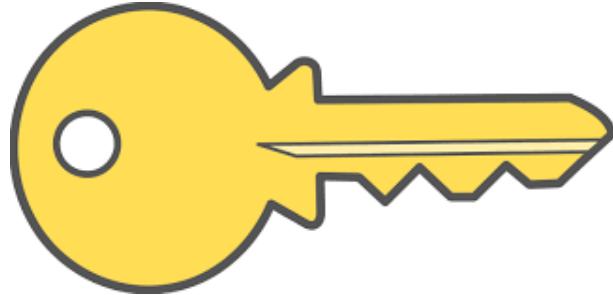
How can you extend and challenge student thinking with this task?

How are students demonstrating the **mathematical processes** (Dos) when exploring this task?

Key ideas



- Part–whole interpretation of fractions is that the whole has been divided into a number of equivalent parts.
- Use fractional parts as measures to work out other fractions.
- Equivalent fractions are ways of describing the same amount by using different-sized fractional parts.
- Comparing and ordering unit fractions relies on recognising that the numerator and denominator work together to define the size of a fraction.
- Fractions can be compared by reasoning about the relative size of the fractions.



Akoranga hou
(new learning)



Kaupae i muri
(next steps)



Kei te mīharo au
(wondering, thinking about)

Maths - ideas and insights



enhancing pedagogy for
effective teaching and learning
any curriculum - any program



Group by Rob Proffitt-White

TLF Maths: ideas and insights

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<https://www.facebook.com/groups/thelearnerfirstmaths>

moveNprove

There are 20 friends. They each get a one sixth slice of pizza.



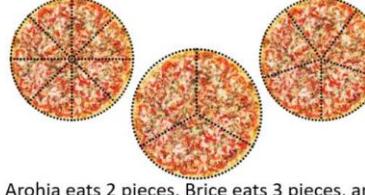
How many pizzas are needed to feed all the friends?

a. 3 pizzas b. $3\frac{1}{2}$ pizzas
 c. $3\frac{1}{2}$ pizzas d. $3\frac{2}{3}$ pizzas
 e. 4 pizzas f. 6 pizzas

Decode
Decide
Defend

discussNdefend

Three friends order three pizzas. The pizza are cut like this:

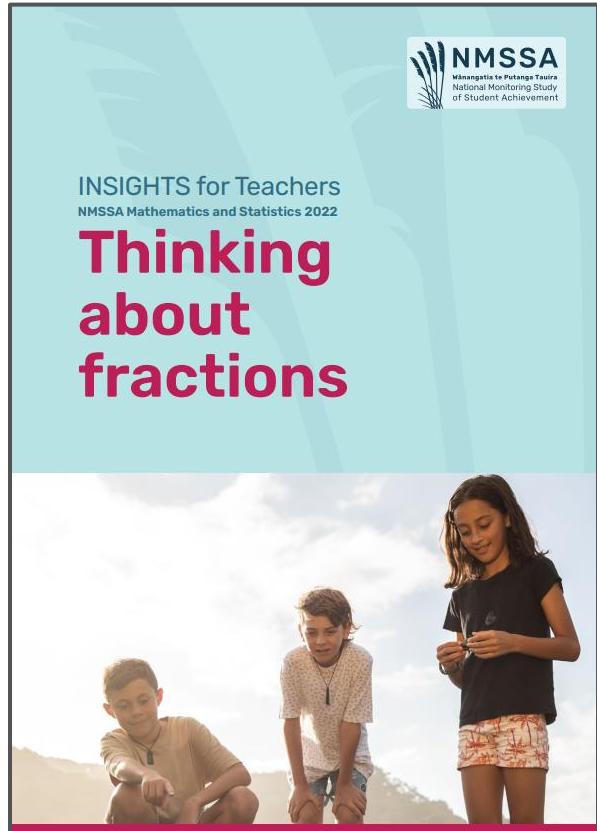


Arohia eats 2 pieces, Brice eats 3 pieces, and Caleb eats 4 pieces. Yet Arohia eats the most pizza of the three, and Caleb eats the least pizza.

How can that be true?



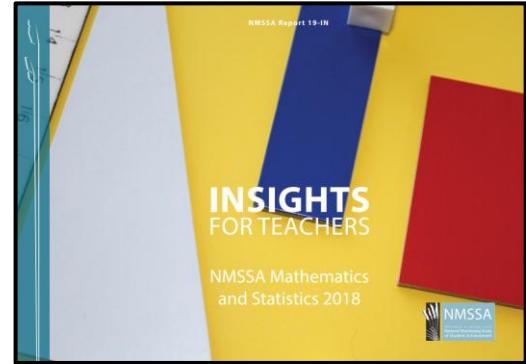
Research links



Thinking about
Fractions.
NMSSA 2022

This image shows a page from the journal. At the top, there is a large, colorful geometric model composed of various colored triangles (red, orange, yellow, blue, purple, green). Below the model, the title 'Using Models to Build Fraction Understanding' is written in a large, light blue font. A sub-headline reads 'Ponder how a sequence of representations can help create an evolving comprehension of unit, partitioning, and order.' The authors' names, 'Debra Monson, Kathleen Cramer, and Sue Ahrendt', are listed. The text then discusses how third and fourth graders might respond to a word problem involving fractions. It includes a list of questions for teachers to consider and a note about the task's purpose. At the bottom, it says 'MATHEMATICS TEACHER LEARNING & TEACHING 17(1)' and 'Volume 113 Issue 01 February 2020'.

Mathematics Teacher:
Learning and Teaching
Published February 2020



NMSSA Insights for
Teachers
Published 2020



Conceptual maps

ARB Concept Map
Fractional Thinking

References

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ARBS Concept Map - Fraction Thinking

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National Monitoring Study of Student Achievement. NMSSA. (2022). Insights for teachers: Thinking about Fractions.

https://nmssa-production.s3.amazonaws.com/documents/NMSSA_2022_Insights_Fractions.pdf