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

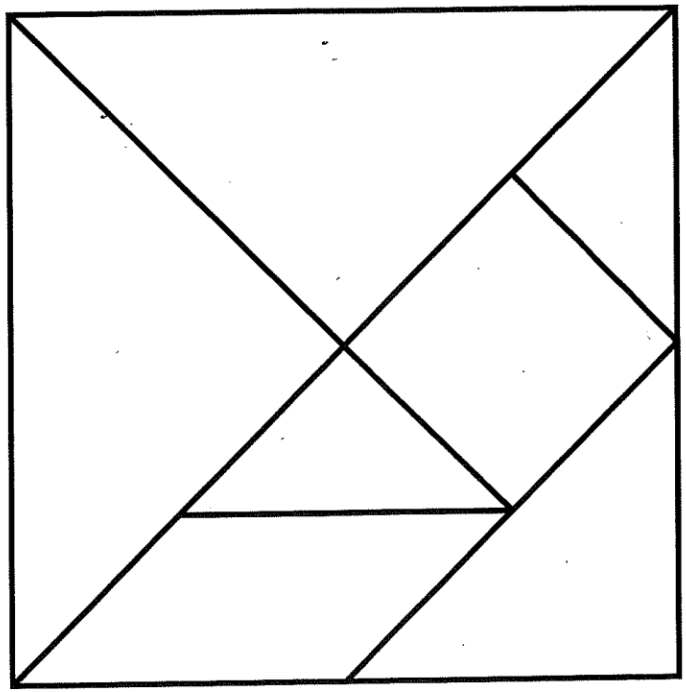
Fractional Thinking

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**).

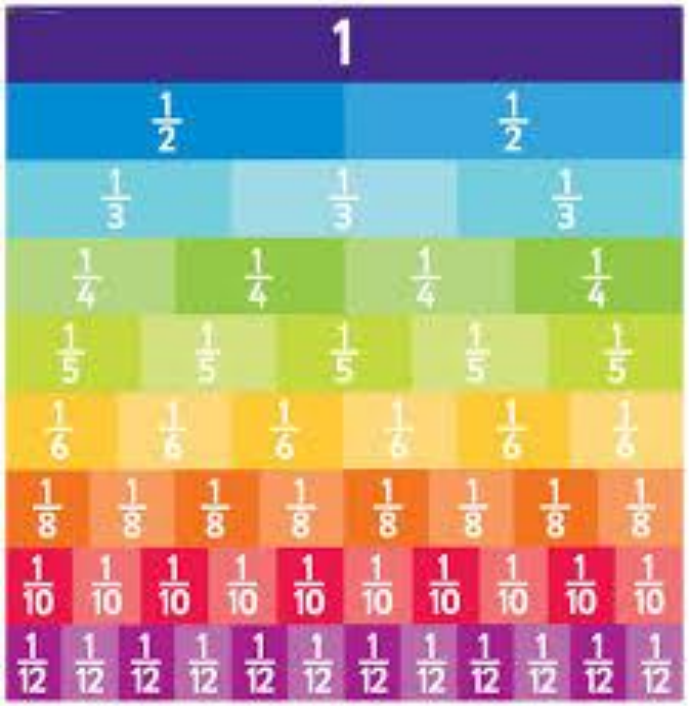
ARB: Fractional Thinking Concept Map - Introduction

Representations

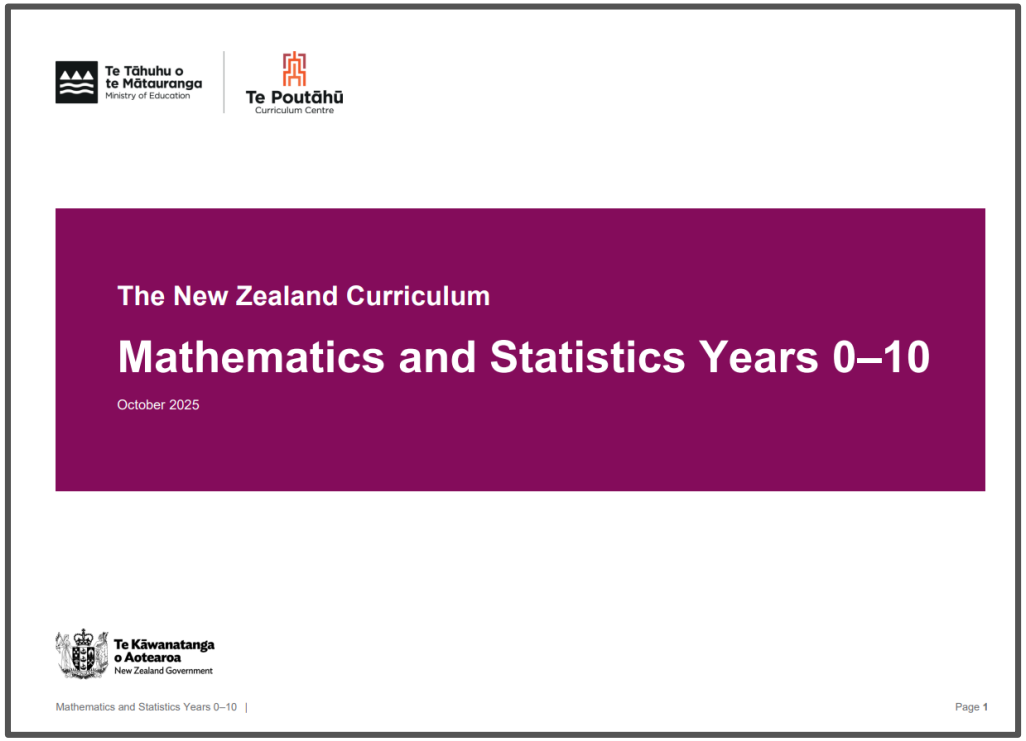
Tangrams



Fraction wall and fraction strips



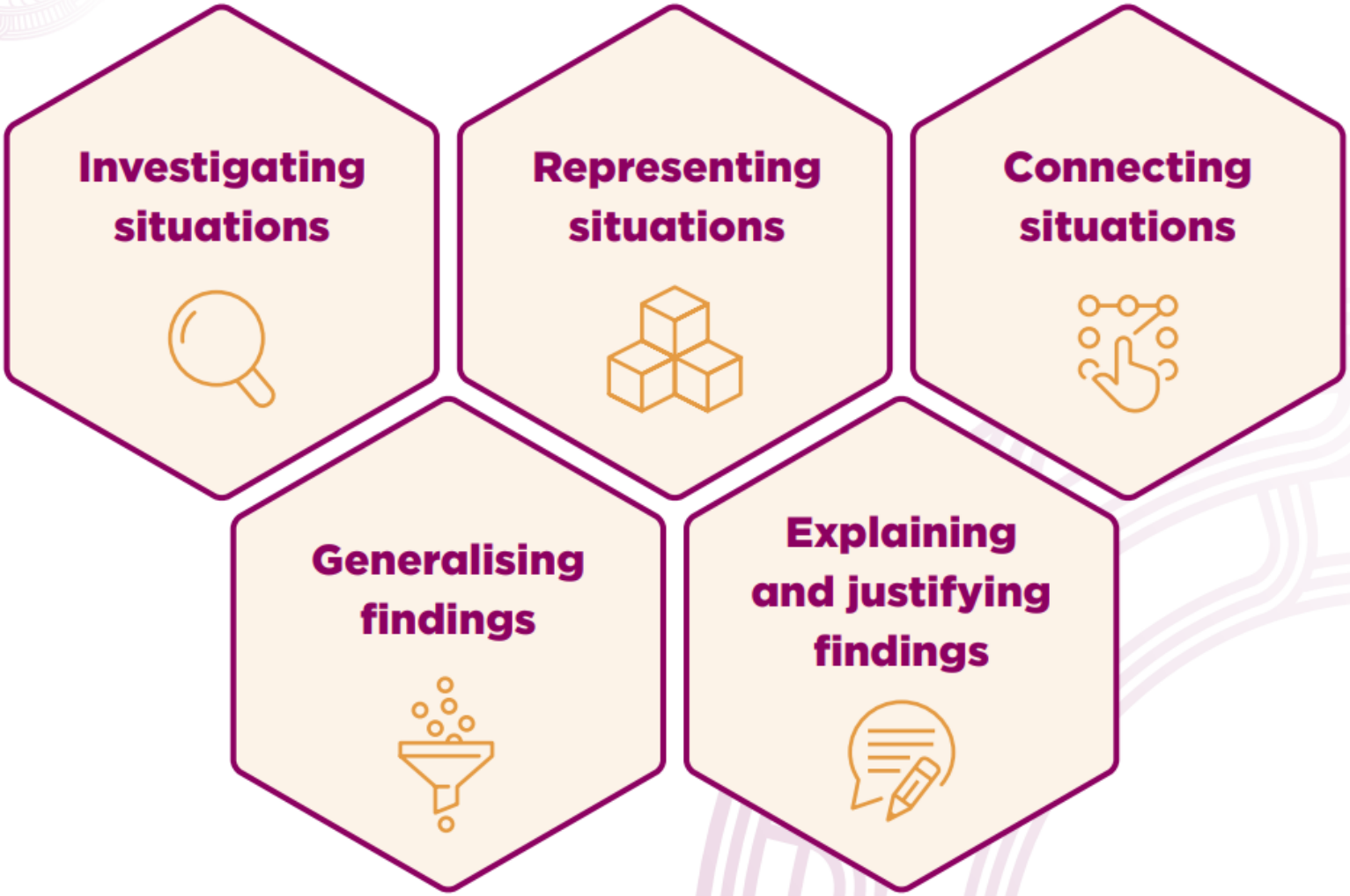
Mathematics Knowledge and Practice



NZCER
Rangahau Mātauranga o Aotearoa

Mathematics and Statistics DO Processes

Te Tāhuhu o te Mātauranga Ministry of Education | Te Poutāhū Curriculum Centre | Te Kāwanatanga o Aotearoa New Zealand Government



Fractions tasks

Task	Focus	Phase
Tangram relationships - Making a tangram - Relationships among the tangram pieces	Identifying fraction parts of a whole Relationships among fractions	Phase 2
Equality statements - 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)

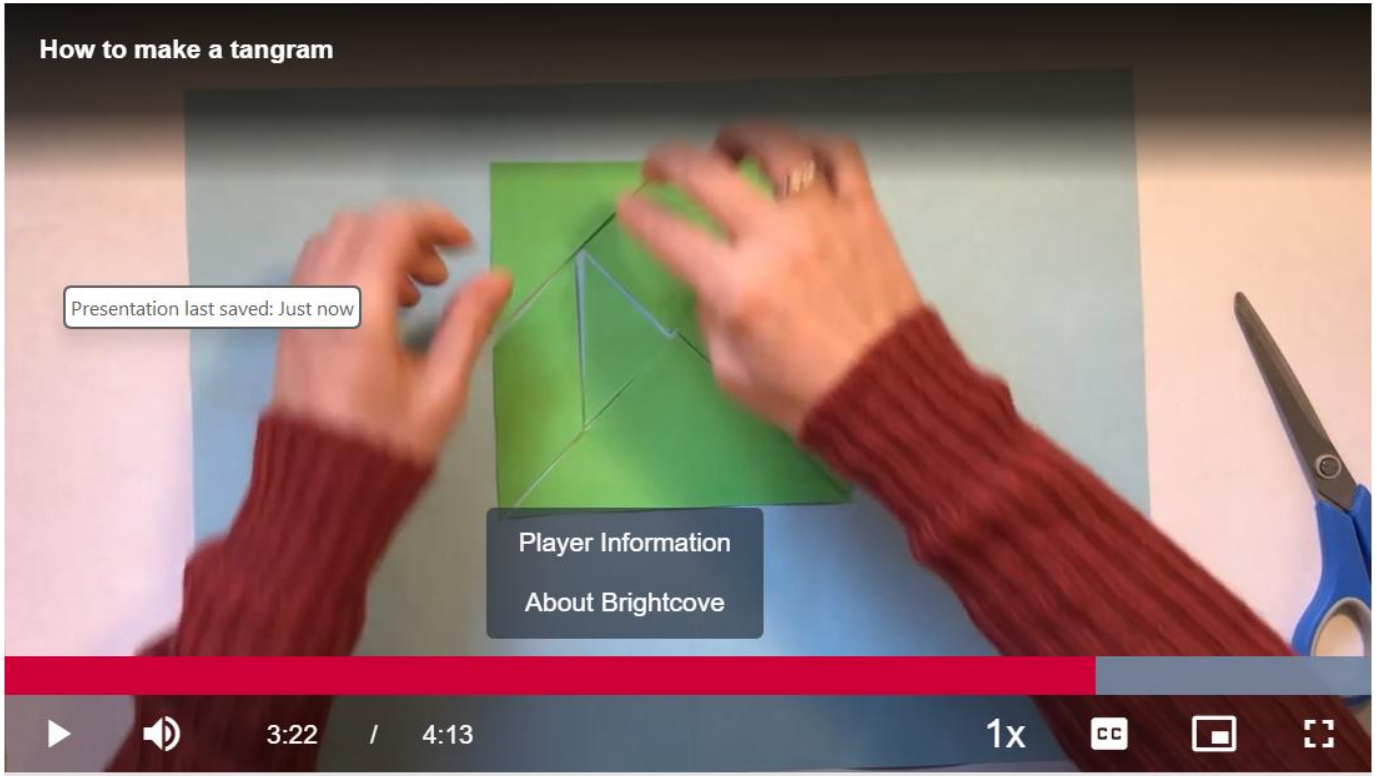
Each player gets two cards and creates a fraction.

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



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

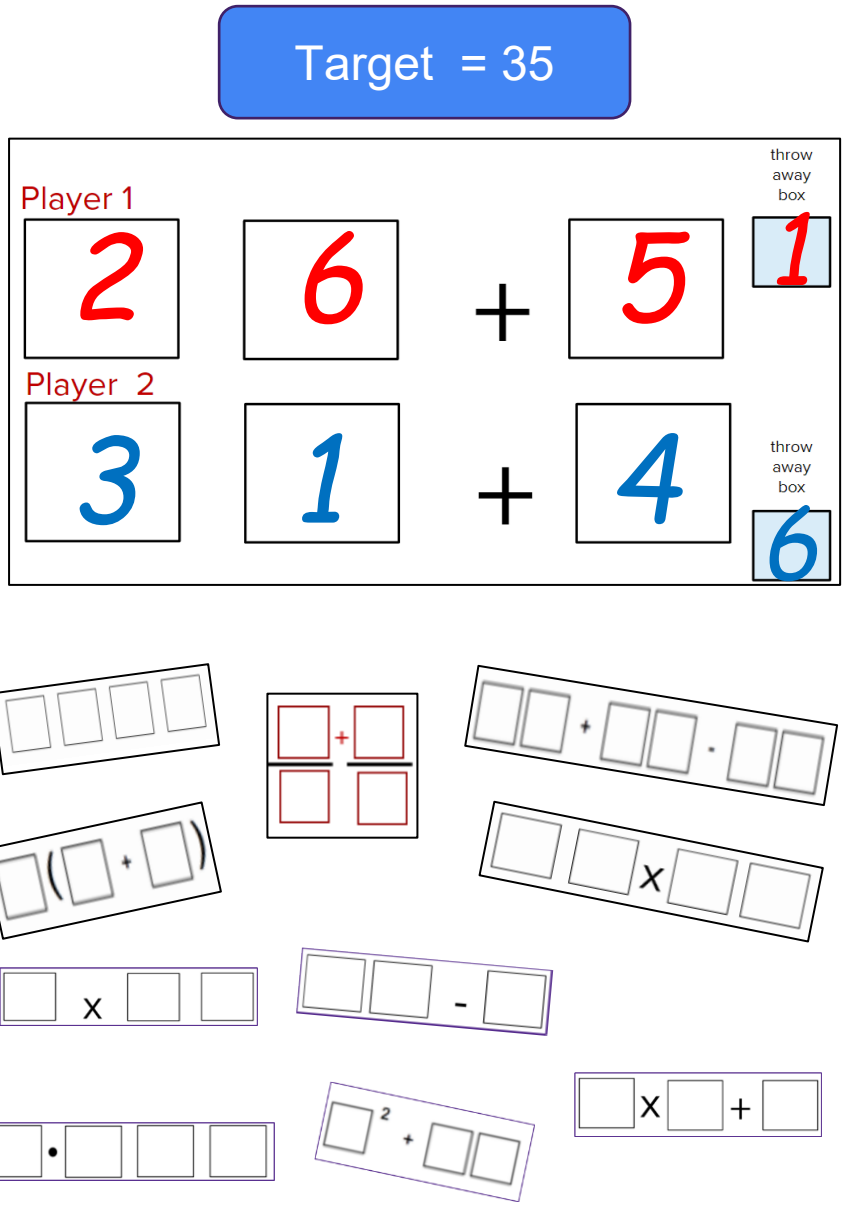
- Practise and deepen the fluency of key skills and concept (includes games)
- Sequenced exercises with a focus on appropriateness of strategy
- Initially individual then come together for number talk

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



Number Boxes

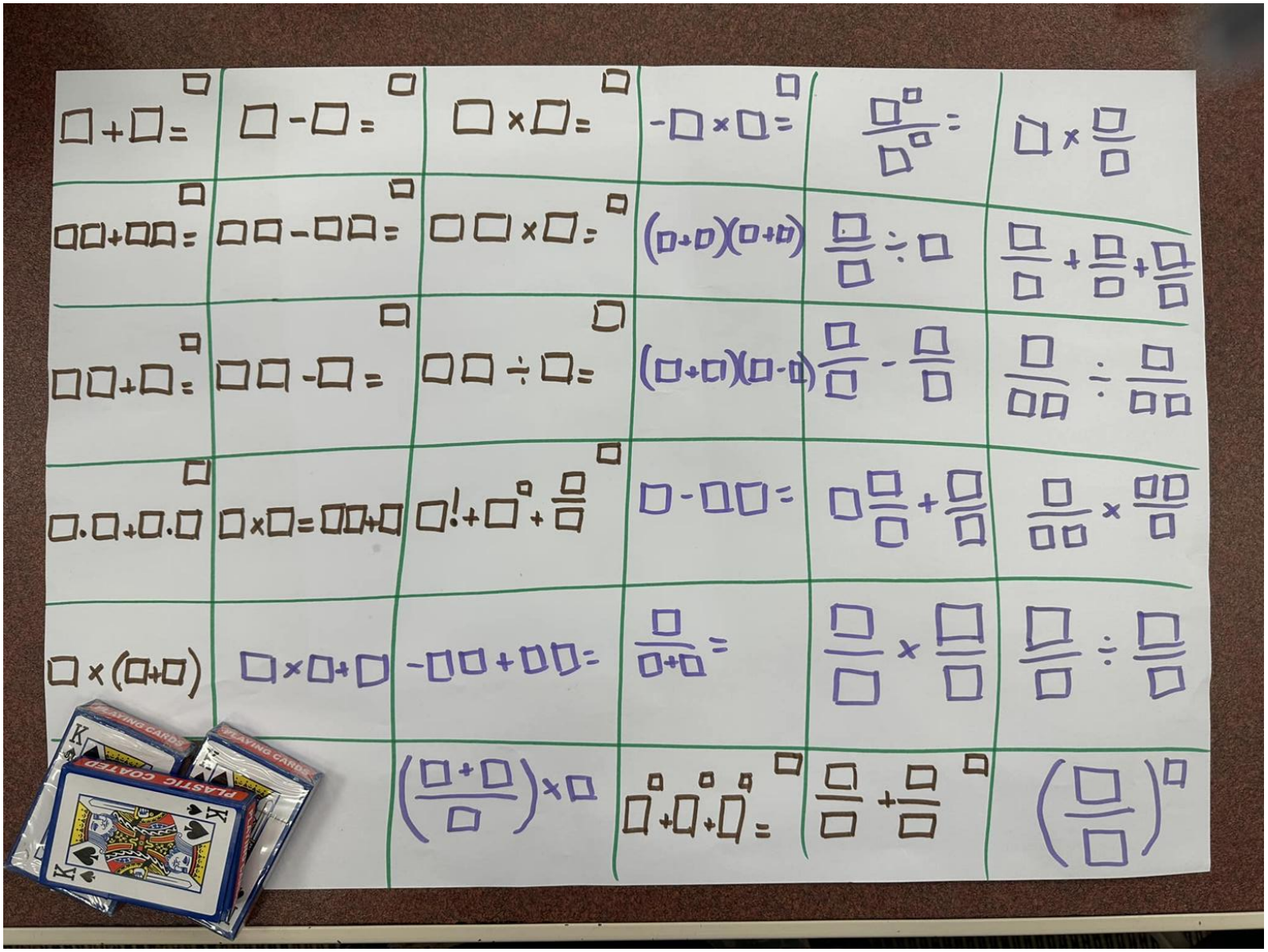
Years 1 to 8

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).*

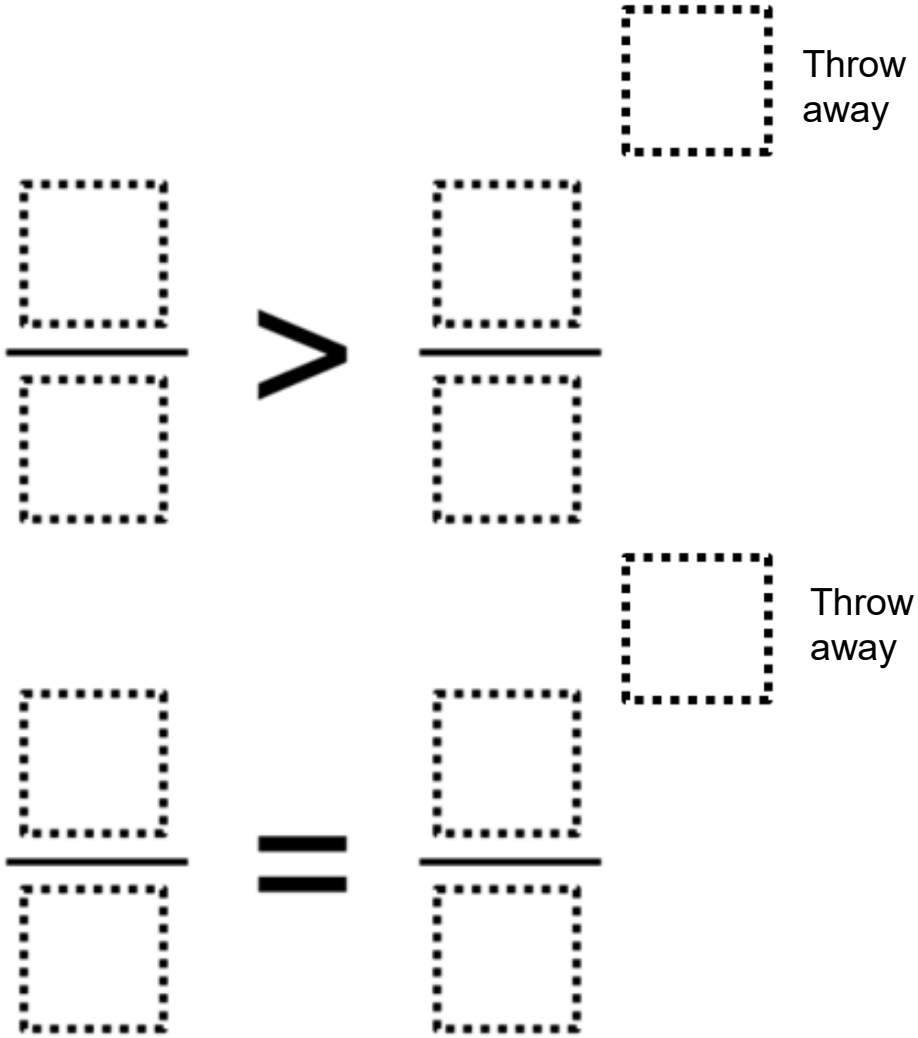


True statements

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).



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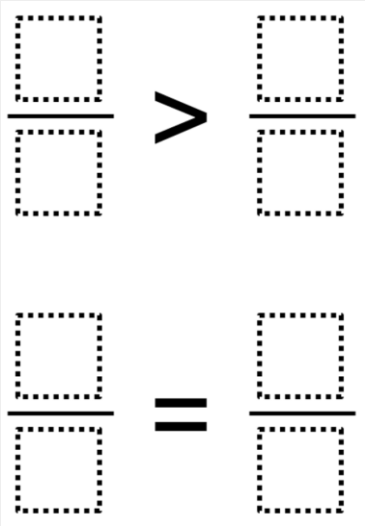
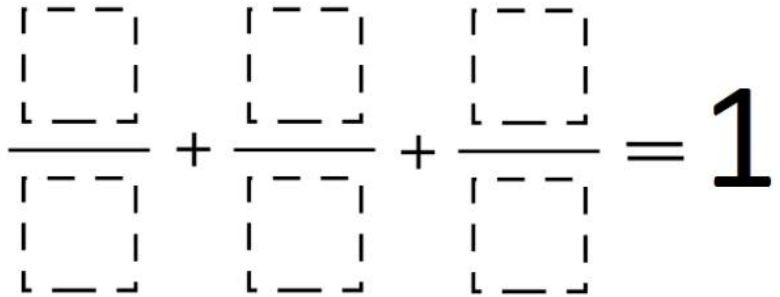
What accommodations can be used to enable students to access the learning in this task?		How can you extend and challenge student thinking with this task?

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

Robert Kaplinsky task examples

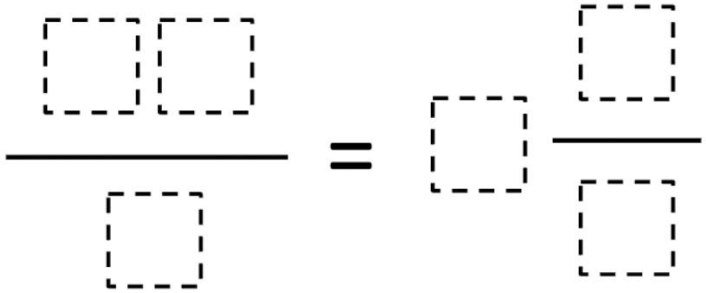
ADDING FRACTIONS 4

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



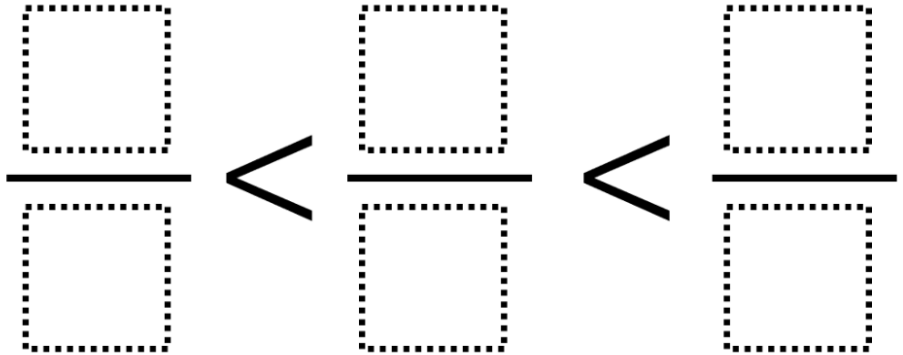
MIXED NUMBER AND FRACTION GREATER THAN ONE

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



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.



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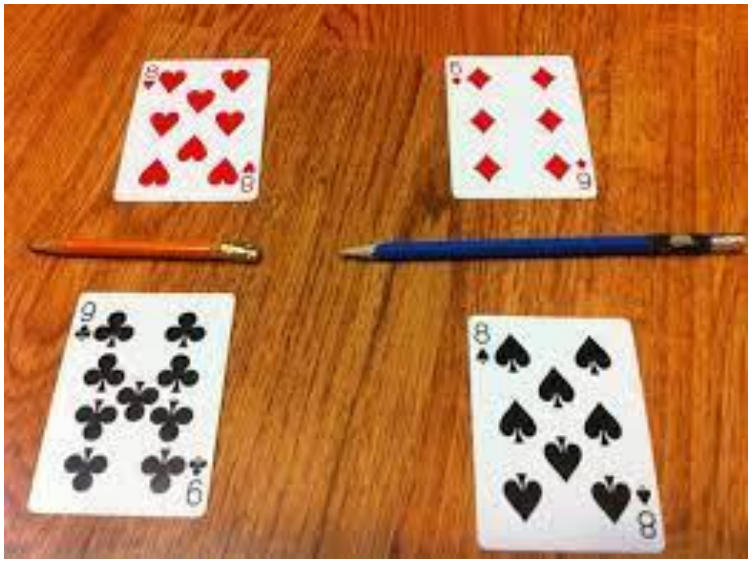

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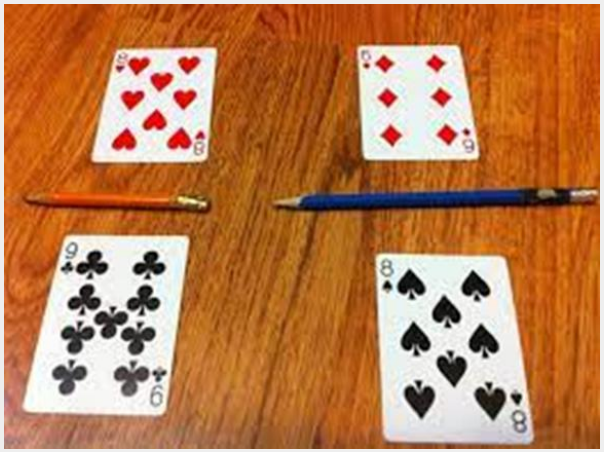
What accommodations can be used to enable students to access the learning in this task?		How can you extend and challenge student thinking with this task?

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

Colour Fraction wall game

You will need:

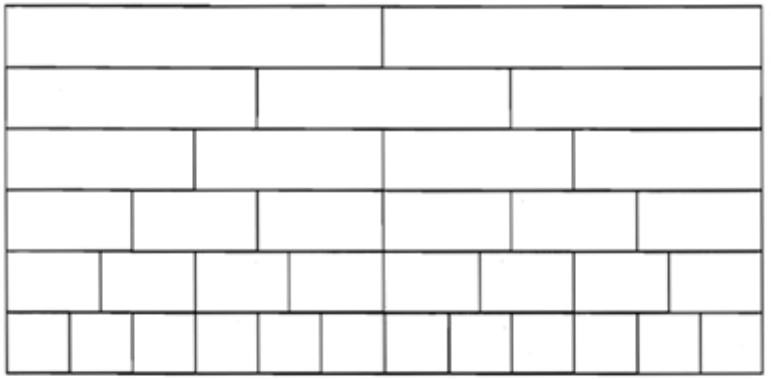
Pens

Fraction wall gameboard

Dice

Play in pairs

Winner is…



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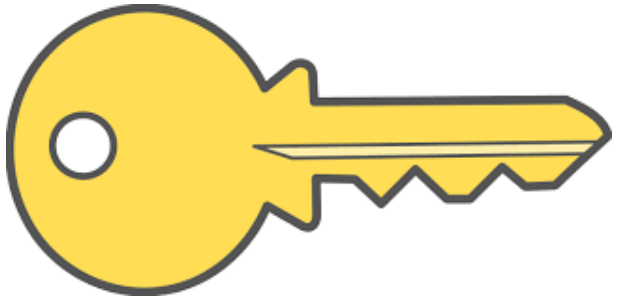
Key ideas

- 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)

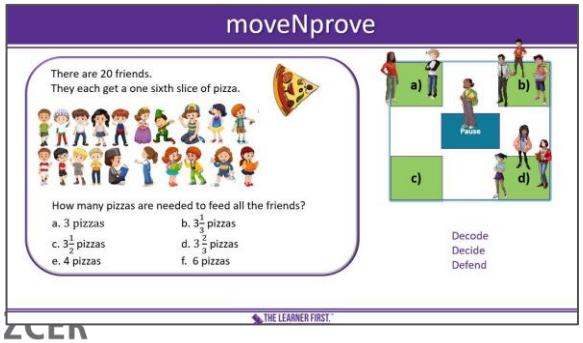
Kaupae i muri

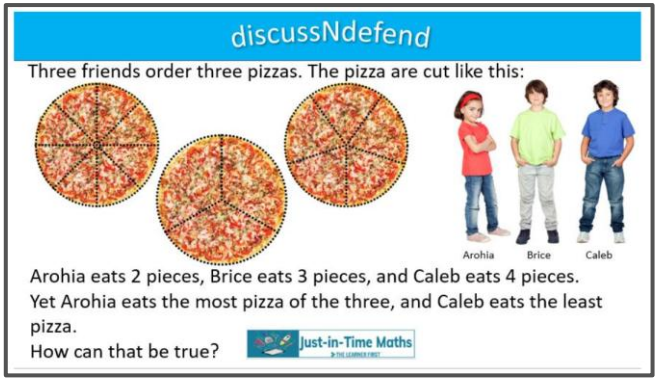
(next steps)

Kei te mīharo au

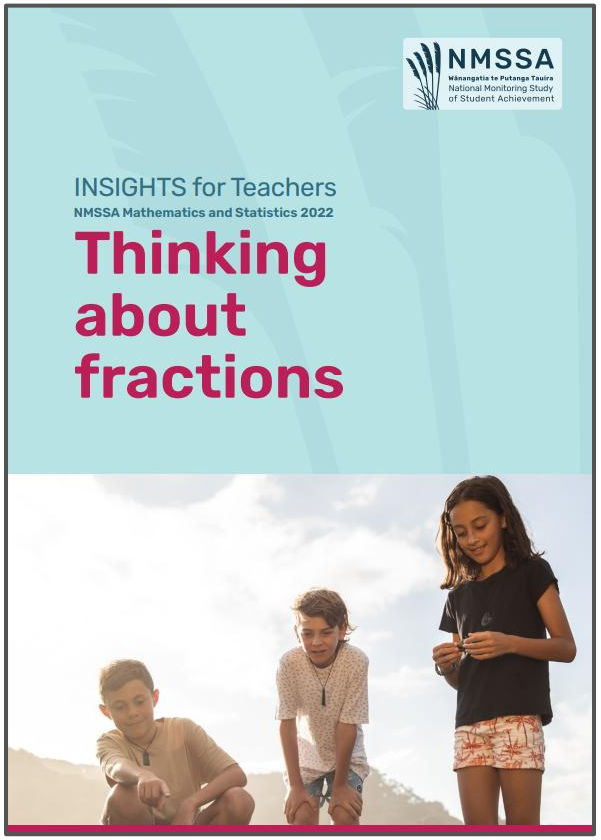
(wondering, thinking about)

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

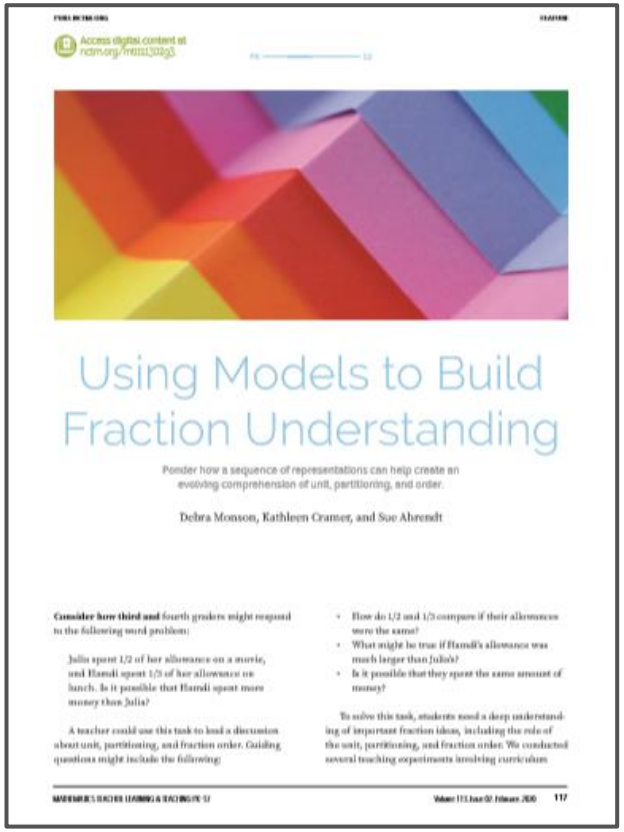




Research links



Thinking about Fractions.
NMSSA 2022



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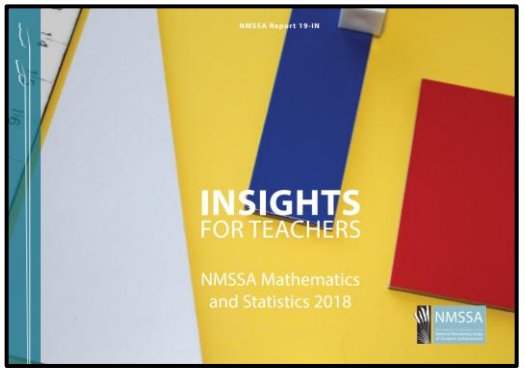

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ASSESSMENT RESOURCE BANKS

ARB Concept Map
Fractional Thinking

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References

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ARBS Concept Map - Fraction Thinking

Fazio, L. & Siegler, R. (2011). Teaching Fractions | Educational Practice Series 22. International Academy of Education and International Bureau of Education, Paris, UNESCO.

National Monitoring Study of Student Achievement. NMSSA. (2018). Insights for teachers: NMSSA mathematics and statistics 2018 (Report 19-IN). https://nmssa.otago.ac.nz/insights/INSIGHTS_Mathematics_2018.pdf

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