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Online
Numicon 5 Sample

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Numicon 5 Teaching Progressions

Strand and Activity Group Number		Activity Group Title
Getting Started		Getting started with apparatus and imagery
Numbers and the Number System	1	Working with numbers up to a million
Numbers and the Number System	2	Exploring equivalence with fractions
Numbers and the Number System	3	Understanding decimals
Geometry	1	Measuring angles
Calculating	1	Developing fluency with adding and subtracting calculations and understanding inverse relationships
Calculating	2	Strategies for bridging when adding and subtracting mentally
		NPC Milestone 1
Numbers and the Number System	4	Estimating and rounding
Calculating	3	Further strategies for adding and subtracting
Pattern and Algebra	1	Exploring sequences and number patterns
Geometry	2	Transformations
Numbers and the Number System	5	Working with negative numbers
Calculating	4	Developing fluency with multiplying and dividing
		NPC Milestone 2
Numbers and the Number System	6	Comparing and ordering fractions
Pattern and Algebra	2	Using inverse relationships to solve problems
Calculating	5	Written methods of adding
Calculating	6	Written methods of subtracting
Calculating	7	Multiplying and dividing by 10, 100 and 1000
		NPC Milestone 3
Measurement	1	Metric and imperial units
		GMS Milestone 1

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Strand and Activity Group Number		Activity Group Title
Pattern and Algebra	3	Properties of number
Calculating	8	Using mental methods for multiplying and dividing
Calculating	9	Division with remainders
Geometry	3	Exploring angles
Calculating	10	Proportion and ratio
Calculating	11	Percentages
		NPC Milestone 4
Measurement	2	Interpreting charts and graphs
Numbers and the Number System	7	Solving problems with fractions, decimals and percentages
Pattern and Algebra	4	Looking for patterns and generalizing
Measurement	3	Calculating area and perimeter
		GMS Milestone 2
Calculating	12	Written methods of multiplying
Measurement	4	Estimating volume and capacity
Calculating	13	Written methods of dividing
Calculating	14	Calculating fractions of amounts
		NPC Milestone 5
Measurement	5	Working with area and perimeter
		GMS Milestone 3
Measurement	6	Scale drawing
Calculating	15	Calculating with fractions
Calculating	16	Solving problems involving several steps
Measurement	7	Solving problems involving time, money and measures
		GMS Milestone 4
Pattern and Algebra	5	Using equivalence to solve problems
Pattern and Algebra	6	Logic and reasoning
		NPC Milestone 6

Numbers and the Number System 6: Comparing and ordering fractions

Key mathematical ideas Fractions, Equivalence, Ordering, Mathematical thinking and reasoning

Educational context

This activity group develops work from Numbers and the Number System 2 and from the *Number, Pattern and Calculating 4 Teaching Resource Handbook*. Essentially, the activities are about using fractions to describe proportions, recognizing that a variety of equivalent fractions can be used to describe the same proportion, and that proportions expressed as fractions can be ordered. Children are thus using fractions to develop their communicating about proportions, both within specific contexts and more generally. Later, in Calculating 10, children will explore similar activities to help them make connections between proportion and ratio.
At the heart of this work, children are developing ways of recognizing and finding equivalent fractions. They then use these to compare fractions and order them by size. These ideas are both important and challenging. Give children plenty of time and encourage discussion and illustration to help them develop their communicating about fractions and proportions.

Learning opportunities

- To compare and order fractions whose denominators are all multiples of the same number.
- To use < and > signs to record the ordering of fractions.
- To simplify fractions to their lowest terms by finding common factors.
- To use equivalent fractions to scale up or down in context.

Terms for children to use

part-whole relationship, comparing, equivalence, equivalent fractions, denominator, numerator, proportion, 'in every', 'for every', unit fraction, proper fraction, improper fraction, mixed number, factor, common factor, divisible by, multiple, times, divide, scale down, scale up, simplest form, common denominator

Assessment opportunities

Look and listen for children who can:
- Use the terms for children to use effectively.
- Compare fractions whose denominators are multiples of the same number.
- Use knowledge of multiples to find equivalent fractions and illustrate this with structured apparatus.
- Compare fractions and order them using < and > symbols.
- Make connections between scaling up and multiplying, and scaling down and dividing, as inverses.
- Use knowledge of multiples and factors to simplify fractions to their lowest terms.

NPC Milestone 3

- Use knowledge of factors and multiples to find equivalent fractions and to simplify fractions to their lowest terms (NPC 5:3a)
- Compare and order fractions with denominators which are multiples of the same number (NPC 5:3b)

Explorer Progress Book 5b, pp. 4–5

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance.

Explore More Copymaster 13: Who Gets More?

After completing work on Activity 3, give children Explore More Copymaster 13: Who Gets More?

Pupil Book 5, pp. 50–53

These pages in the Pupil Book provide further practice and challenging questions. You can use them to follow up the activities and deepen the learning.

Focus activities

1. Comparing and ordering proper fractions whose denominators are multiples of the same number
2. Comparing and ordering proper fractions by finding a common denominator
3. Using greater than and less than signs to record comparisons of fractions
4. Simplifying fractions by finding common factors
5. Simplifying fractions to their lowest terms

Key Mathematical Ideas provide a summary of the important concepts covered this week

Learning Opportunities are linked with the Assessment opportunities, detailing the range of Focus Activities for this week

Assessment is supported by Explorer Progress activities at the end of the week or later. These are recorded along with the Milestones to provide a record of learning that is stored in the assessment Tracker

1: Comparing and ordering proper fractions whose ... - part 1

Quit activity

Intro | Links | 1 | 2 | 3 | 4 | 5

Learning opportunities:

- See all learning opportunities

Terms for children to use:

part-whole relationship, comparing, equivalence, equivalent fractions, denominator, numerator, proportion, 'in every', 'for every', unit fraction, proper fraction, improper fraction, mixed number, factor, common factor, divisible by, multiple, times, divide, scale down, scale up, simplest form, common denominator

Have ready:

- Numicon Shapes
- Numicon Coloured Counters
- Numicon Fraction Number Line Laminates
- dry-wipe pens
- number rods

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Practice and discussion: Whole-class

- Discuss with children how and when the mathematics they have been learning could help them in solving problems.
- Give 'scores' in fraction form, e.g. $\frac{8}{10}$ and $\frac{17}{20}$. Ask children which is the better score. Talk about sports results, e.g. if Team A has won $\frac{12}{15}$ of its games and Team B has won $\frac{9}{12}$ which team is doing better?
- Ask children to use the > and < symbols to show the relationships between pairs of fractions with denominators that are multiples of the same number, e.g. $\frac{2}{8}$ and $\frac{4}{12}$.
- Use fractions where the denominators are multiples of the same number and play higher/lower than games.
- Ask children to find equivalent fractions in a list where the denominators are all multiples of the same number.
- Give equivalent fraction statements for children to identify a missing numerator or denominator, e.g. $\frac{5}{8} = \frac{\square}{24}$ or $\frac{3}{9} = \frac{4}{\square}$.
- Ask children to find common factors of two numbers.
- Ask children to continue a list of equivalent fractions, e.g. $\frac{3}{5}, \frac{6}{10}, \frac{9}{15}$ and to simplify fractions, e.g. $\frac{15}{35}$.

1: Comparing and ordering proper fractions whose ... - part 1

Quit activity

Intro | Links | 1 | 2 | 3 | 4 | 5

Links:

- Full activity group overview
- Starter image
- Whole-class practice and discussion
- Photocopy masters
- Implementation guide
- Pupil Book 5 opening questions p. 50
- Pupil Book 5 Answer Book
- IWB Software
- MyMaths

Next steps:

- Explorer Progress Book 5b, pp. 4–5
- Explore More Copymaster I3: Who Gets More?
- Numicon 5 Milestone Assessment cards (NPC 5:3a, 5:3b)
- Numicon 5 Milestone Tracking chart

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Implementation Guide

Fractions and equivalence

Fractions involve a complex set of relationships and, confusingly for many children, there are several different symbolic ways of representing what are essentially the same numbers, e.g. = 915 = 0·6 = 60% = 3:5 = 3 ÷ 5. One of the key challenges for teachers at this stage is to guide children to understanding that common fractions, decimal fractions, percentages, ratios and dividing calculations, are essentially different forms of notation for expressing the same 'rational' numbers, and that 'ratio' is at the heart of multiplicative thinking.

Typically for children, fractions of things arise in measuring situations, which importantly include 'sharing'. The measuring of continuous quantities, such as time, length or chocolate and so on is always approximate and for this reason we commonly find ourselves needing parts of whole units to describe amounts accurately. The moral imperative for fair shares usually draws children easily to the view that fractions are, and indeed should be, about equal parts (or proportions) of a whole.

The two main ways in which children experience fractions initially in Numicon activities are therefore as 'operators' and as 'descriptors'– fraction words used as verbs and as adjectives. An initial invitation to 'halve twenty-six' would be an invitation actively to find 'half' of 26 – the fraction word is used as part of an instruction to do something. Then, to describe the outcome of some measuring tasks, or of some dividing calculations, children would use fraction words as adjectives, for example in the description 'twenty-six-and-a-half somethings', or as the description of a relative distance, for example as 'halfway' between 26 and 27 on a measuring scale.

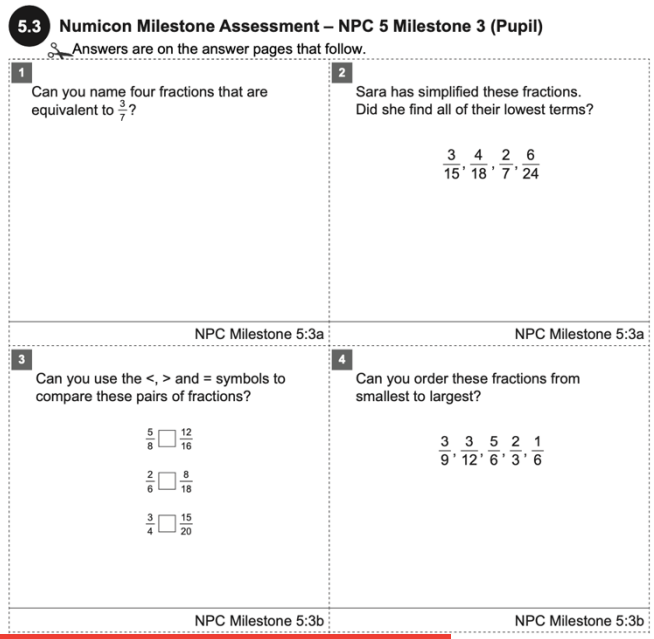
In the Number, Pattern and Calculating 5 Teaching Resource Handbook, work continues with recognizing equivalence between common fractions, and also now between improper fractions and mixed numbers, between common fractions and decimal fractions, and between common fractions, decimal fractions and percentages.

There is also increasing illustration of written 'column' methods of adding and subtracting with base-ten apparatus. Teachers need to be very clear that we do not want children to think that they have to actually 'do their sums' with this apparatus. The use of these materials is purely to illustrate

Focus activities

1. Comparing and ordering proper fractions whose denominators are multiples of the same number
2. Comparing and ordering proper fractions by finding a common denominator
3. Using greater than and less than signs to record comparisons of fractions
4. Simplifying fractions by finding common factors
5. Simplifying fractions to their lowest terms

Milestone
ASSESSMENT CARDS



5.3 Numicon Milestone Assessment – NPC 5 Milestone 3 (Pupil)

Answers are on the answer pages that follow.

1 Can you name four fractions that are equivalent to $\frac{3}{7}$?

NPC Milestone 5:3a

2 Sara has simplified these fractions. Did she find all of their lowest terms?

$\frac{3}{15}, \frac{4}{18}, \frac{2}{7}, \frac{6}{24}$

NPC Milestone 5:3a

3 Can you use the <, > and = symbols to compare these pairs of fractions?

$\frac{5}{8} \square \frac{12}{16}$

$\frac{2}{6} \square \frac{8}{18}$

$\frac{3}{4} \square \frac{15}{20}$

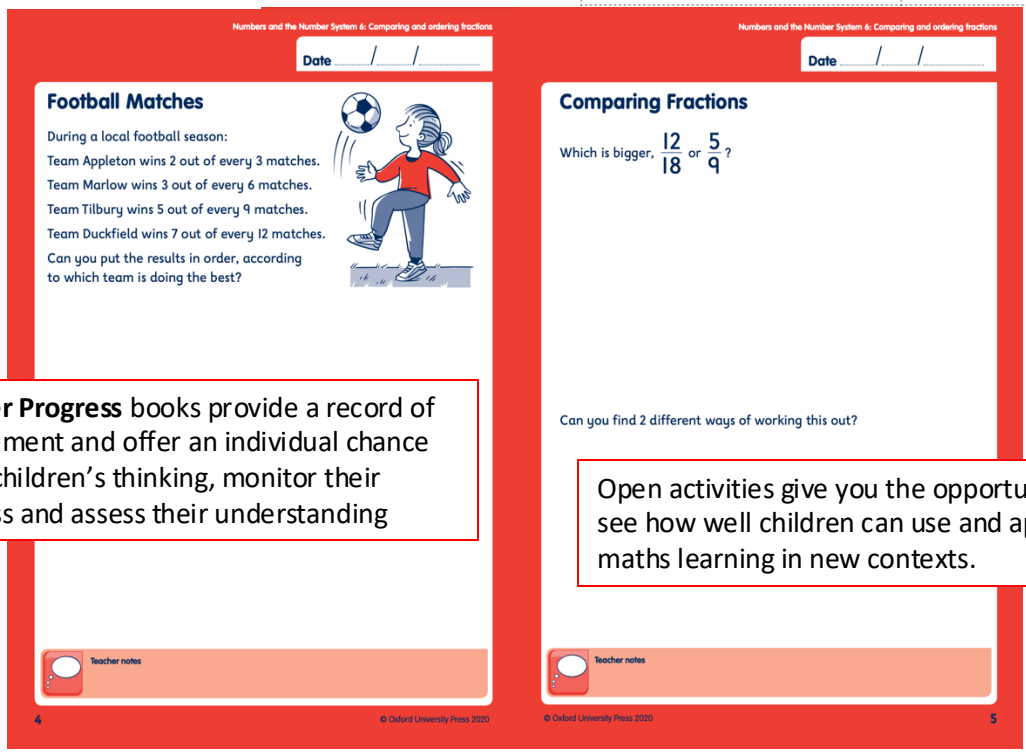
NPC Milestone 5:3b

4 Can you order these fractions from smallest to largest?

$\frac{3}{9}, \frac{3}{12}, \frac{5}{6}, \frac{2}{3}, \frac{1}{6}$

NPC Milestone 5:3b

Explorer Progress
– weekly assessment tool



Numbers and the Number System 6: Comparing and ordering fractions

Date ___/___/___

Football Matches

During a local football season:
Team Appleton wins 2 out of every 3 matches.
Team Marlow wins 3 out of every 6 matches.
Team Tilbury wins 5 out of every 9 matches.
Team Duckfield wins 7 out of every 12 matches.
Can you put the results in order, according to which team is doing the best?

Teacher notes

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Numbers and the Number System 6: Comparing and ordering fractions

Date ___/___/___

Comparing Fractions

Which is bigger, $\frac{12}{18}$ or $\frac{5}{9}$?

Can you find 2 different ways of working this out?

Teacher notes

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Explorer Progress books provide a record of achievement and offer an individual chance to see children's thinking, monitor their progress and assess their understanding

Open activities give you the opportunity to see how well children can use and apply the maths learning in new contexts.

Assessment Tracker
– weekly assessment tool

Number, Pattern & Calculating 5 Milestone 5						Started	Not started
By this point, children should be able to:						2 out of 8	0 out of 8
• Know percentage equivalents of commonly used fractions, e.g. 1/2, 1/4, 3/4	NPC5:5a	NPC	NNS	NNS7	Fractions		
• Use percentages to express simple proportions, e.g. 24 out of 32 as 75%	NPC5:5b	NPC	NNS	NNS7	Fractions		
• Find percentages of amounts, including measures	NPC5:5c	NPC	NNS	NNS7	Fractions		
• Know and be able to use simple tests of divisibility	NPC5:5d	NPC	P&A	P&A4	Multiplication & division		
• Explain what square and cube numbers are	NPC5:5e	NPC	P&A	P&A4	Multiplication & division		
• Use efficient written methods to multiply numbers with up to 4 digits by 2-digit numbers	NPC5:5f	NPC	C	C12	Multiplication & division		
• Choose appropriate and effective mental or written methods to divide numbers with up to 4 digits by single-digit numbers	NPC5:5g	NPC	C	C13	Multiplication & division		
• Calculate fractions of amounts in practical problem-solving contexts	NPC5:5h	NPC	C	C14	Fractions		

GREEN – Achieved
ORANGE – on the way
RED – to target
WHITE – not started

Explorer Progress Books

Activities for class and home offer further opportunities for children to explore maths in an engaging way.

Who Gets More?

How this will help your child

- This activity will allow your child to understand the size of different fractions and the relationship between them.
- It will also help them to describe parts of a whole as fractions.

Words and phrases to use

equal, greater than (>), less than (<), more, bigger, less, smaller, fraction, half, third, quarter, sixth, eighth, twelfth, larger than (>), smaller than (<)

You will need

- Scissors

During the activity, look at what your child can do

- Find, write and say fractions that are parts of a whole.
- Compare fraction amounts.
- Recognize equivalent fractions.

What to do

- Cut out the fraction strips, fraction and symbol cards and game board from the Who Gets More? sheet. The fraction strips will all be the same length when cut out.
- Shuffle the fraction cards and share them out between you and your child. Put a pile, face down, in front of each player.
- Explain to your child that the cards show different fractions.
- Ask your child to take the first card from the top of their pile, e.g. $\frac{1}{3}$, and to say the name of the fraction on the card, e.g. 'one-third'. Ask them to place the card on the shaded box on the left-hand side of the game board.
- You then select your first fraction card, e.g. $\frac{4}{8}$. Read the name of the fraction out to your child, e.g. 'four-eighths', and place the card on the right-hand side of the game board.
- Ask your child to say which fraction is the largest or smallest, or if they are equal. Ask them to place the correct symbol on the game board between the fraction cards to show this. Remind them that the wide part of the symbol points at the larger amount. 1
- Check that the correct symbol has been used by folding the fraction strips to show each amount and then comparing them. 2
- The player whose fraction represents the most, wins the two cards. If the fractions are equal, these cards are put aside and are out of the game.
- Keep taking turns to choose a card first until all the cards have been used up. The player with the most fraction cards is the winner.

A clear guide and suggestions on how to extend the activity

One-third is less than four-eighths.
Four-eighths is greater than one-third. 1

2

Next steps ...

- Try playing the game without using the fraction strips.
- Create your own fraction strip and cards of different fractions ($\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{10}$, etc.) to extend the game.
- Talk about and compare fractions in everyday life, e.g. when cutting up fruit, or sharing out food between people.

Name ..... Date ...../...../..... 13

Who Gets More?

Halves

Thirds

Quarters

Sixths

Eighths

Twelfths

$\frac{4}{12}$	$\frac{3}{6}$	$\frac{8}{12}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{2}{6}$
$\frac{10}{12}$	$\frac{5}{6}$	$\frac{6}{12}$	$\frac{2}{12}$	$\frac{4}{6}$	$\frac{2}{3}$
$\frac{2}{4}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{6}{8}$	$\frac{3}{4}$	$\frac{5}{8}$
$\frac{1}{4}$	$\frac{4}{8}$	=	<	>	

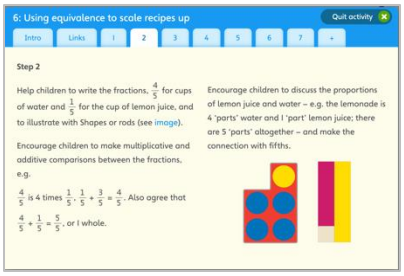
Game Board

Practical real-life contexts help children think about how maths can be used and applied

Step 1

Remind children about the lemonade from Numbers and the Number System 2, Activity 6. Ask them if one lemonade recipe used 2 cups of lemon juice in every 5 cups and another 3 cups of lemon juice in every 5 cups, which would taste stronger.

Look and listen for children who can reason that having more lemon juice in the lemonade would give a stronger lemony taste. Help children to compare the recipes with fractions. Agree that we could write that one recipe is $\frac{2}{5}$ lemon juice and the other $\frac{3}{5}$.



Number of jugs	Lemon juice	Water
1	$\frac{1}{5}$	$\frac{4}{5}$
2	$\frac{2}{10}$	$\frac{8}{10}$
3	$\frac{3}{15}$	$\frac{12}{15}$
4	$\frac{4}{20}$	$\frac{16}{20}$
5	$\frac{5}{25}$	$\frac{20}{25}$
10	$\frac{10}{50}$	$\frac{40}{50}$

Step 2

Encourage children to illustrate these relationships on a number line (see image).

Help them to understand that 5 cups of lemon juice in every 5 cups is purely lemon juice; locate this on the number line as $\frac{5}{5}$ or 1 whole. Similarly, locate pure water on the same line as $\frac{0}{5}$ or 0. Agree that, the stronger the lemon juice, the closer the fraction will be to $\frac{5}{5}$.

Agree that $\frac{3}{5}$ is closer than $\frac{2}{5}$ so the recipe made with 3 cups of lemon juice in every 5 cups is stronger.

Step 3

Next, ask children to compare recipes using 4 cups of lemon juice in every 5 cups and 6 cups of lemon juice in every 10 cups. Help children to recognize that we could write $\frac{4}{5}$ and $\frac{6}{10}$ to represent the amount of lemonade. Look and listen for children who can explain that these fractions are both more than $\frac{1}{2}$.

Agree that it is not so easy to compare these fractions directly because they have different denominators.

Step 4

Ask children to use, draw or write anything that might help them to compare these fractions.

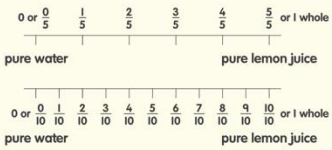
Look and listen for children trying out their own ideas, before asking them if finding equivalent fractions or using apparatus and number lines might be useful.

Look and Listen for... points help you assess how children are responding to the activities and indicate their learning

Step 5

Encourage children to explore how they could represent $\frac{4}{5}$ and $\frac{6}{10}$ on number lines or with apparatus (see image).

I: Comparing and ordering proper fractions whose denominators are multiples of the same number - part 2



Learning opportunities:

- See all learning opportunities

Terms for children to use:

part-whole relationship, comparing, equivalence, equivalent fractions, denominator, numerator, proportion, 'in every', 'for every', unit fraction, proper fraction, improper fraction, mixed number, factor, common factor, divisible by, multiple, times, divide, scale down, scale up, simplest form, common denominator

Have ready:

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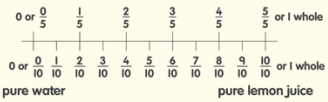
- Numicon Shapes
- Numicon Coloured Counters
- Numicon Fraction Number Line Laminates
- dry-wipe pens
- number rods

Step 6

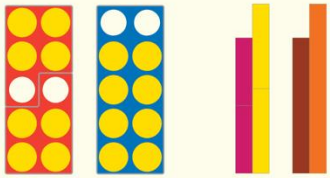
Show children how a double number line can be useful here, using a Fraction Number Line Laminate. Agree that $\frac{4}{5}$ is equivalent to $\frac{8}{10}$ and closer to 1 than $\frac{6}{10}$ (see image).



Step 7

Help children also to use Shapes and Counters or rods to illustrate that $\frac{4}{5}$ is equivalent to $\frac{8}{10}$ (see image).

Look and listen for children who can now explain that if two recipes are $\frac{6}{10}$ and $\frac{8}{10}$ of lemon juice, the one with $\frac{8}{10}$, or 8 cups on every 10 cups, will be stronger.



Concrete materials help illustrate children's thinking and reasoning

Step 8

Repeat the activity with other pairs of fractions, e.g. $\frac{2}{3}$ and $\frac{5}{6}$.

Look and listen for children who realize that they can compare the fractions as the denominators are multiples of the same number.

Step 9

Provide an example like $\frac{4}{6}$ and $\frac{4}{12}$. Encourage children to explain that these can be compared in two ways: as sixths ($\frac{4}{6}$ and $\frac{2}{6}$) and as twelfths ($\frac{8}{12}$ and $\frac{4}{12}$).

Agree that this is not, the case for, e.g. $\frac{4}{6}$ and $\frac{5}{12}$.

Help children explain why not, with reference to the numerators.

Paired or individual work

Have ready: Numicon Fraction Number Line Laminates, pairs of fractions with denominators that are multiples of the same number, e.g. $\frac{4}{6}$ and $\frac{9}{18}$, dry-wipe pens

Ask children to select a pair of fractions and compare them by illustrating on a double number line.

Numicon Pupil Book 5 pp. 50–53
Numicon Pupil Book 5 Answer Book pp. 31–32

Numbers and the Number System 6·1

Using proper fractions

Practice

1 One jug of lemonade was made using $\frac{1}{3}$ lemon juice, and the rest was water. Another jug was made using $\frac{1}{2}$ lemon juice, and the rest was water.

a Which do you think tasted stronger and why?

b How much of the weaker lemonade was water?

Your next steps…

Find out how Numicon can make a difference in your school and discover Numicon's potential, **arrange an appointment, or Professional Development with us:**

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Email: info@numicon.co.nz

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