

N1 • Ordering fractions and decimals

Mathematical goals

To help learners to:

- interpret decimals and fractions using scales and areas;
- find equivalent fractions;
- relate fractions and decimals;
- order fractions and decimals;

These goals may be adapted for learners aiming at lower level qualifications. For example, you may decide to focus just on interpreting and ordering decimals.

and to reflect on and discuss these processes.

Starting points

Learners will have met these concepts before. Many, however, may still have misconceptions and difficulties. Typically, these include:

- confusing decimal and fraction notation (e.g. $\frac{1}{4}$ is confused with 1.4 or 0.4);
- believing that the magnitude of a decimal depends on the number of digits it contains (e.g. $0.62 > 0.8$ because $62 > 8$, or $0.4 < 0.32$ because 0.4 is in tenths and 0.32 is in hundredths);
- ignoring numerators when comparing fractions (e.g. $\frac{1}{4} > \frac{3}{5}$ because quarters are greater than fifths).

During the session, learners will confront and discuss such misconceptions. Also, many learners associate fractions with part/whole areas and decimals with number lines. This activity aims to build a more connected understanding of all these ideas.

Materials required

For each learner you will need:

- mini-whiteboard.

For each small group of learners you will need:

- Card set A – *Decimals*;
- Card set B – *Fractions*;
- Card set C – *Areas*;
- Card set D – *Scales*.

For learners who struggle, keep in reserve Card set E – *Areas* and Card set F – *Scales*.

For learners aiming at lower levels, use Card sets E (instead of C) and F (instead of D).

Each card set includes one blank for learners to use when creating their own cards.

Time needed

Between 30 minutes and 1 hour, though this will vary depending on the learners involved.

Suggested approach

For learners aiming at lower levels, you could just use question 1.

Beginning the session

Write the following two questions on the board:

- Write down these decimals in order of size, from smallest to largest. Underneath, describe and explain your method for doing this.

0.75 0.04 0.375 0.25 0.4 0.125 0.8

- Write down these fractions in order of size from smallest to largest. Again, describe and explain your method.

$\frac{3}{4}$ $\frac{3}{8}$ $\frac{2}{5}$ $\frac{8}{10}$ $\frac{1}{4}$ $\frac{1}{25}$ $\frac{1}{8}$

Ask learners to write down their answers and methods, on their own, without discussion. Allow about five minutes for this. The intention is to expose learners' existing interpretations and misconceptions, not to put them right. The rest of the session should enable learners to answer the questions correctly.

Sometimes, surprising responses are revealed:

e.g. 0.375, 0.125, 0.75, 0.25, 0.04, 0.4, 0.8

I know this because they work like fractions, 0.4 is like a quarter. The more digits there are, the smaller the decimal is.

e.g. 0.125, 0.375, 0.04, 0.25, 0.75, 0.4, 0.8

Tenths are bigger than hundredths and thousandths, so longer decimals are smaller.

Working in groups

Ask learners to sit in pairs or threes (with learners who disagree sitting next to each other to encourage more discussion) and give each group of learners Card sets A, B, C and D.

For learners aiming at lower levels, you could just use Card sets A, E and F.

Ask learners to take it in turns to match pairs of cards and place them on the table, side by side (not on top of one another, or later pairings will be more difficult). As they do this they must explain how they know that the cards make a pair. When they have given their explanation, their partner(s) should either challenge what they have said or say why they agree.

As you go round the room, listen to learners' explanations. Note down any obvious misconceptions that emerge, for whole group discussion at the end of the session. Encourage learners to explain carefully why pairs of cards match each other.

If you see learners in difficulty, give them Card sets E and F. These have areas and scales divided into hundredths and tenths. Learners may find these easier to match. When they have done this, remove Card sets E and F and ask learners to return to the original challenge.

When learners are happy with their final matching, ask them to place the cards in order of size, smallest to largest.

Learners who find the activity straightforward may be asked to make new cards that fit between the pairs of cards they have put in order.

When learners have completed the activity, ask them to revisit the answers they wrote down at the beginning of the lesson. Did they make any mistakes? Encourage them to write down and explain any faults in their initial reasoning.

Reviewing and extending learning

Hold a whole group discussion about what has been learned, drawing out common misconceptions and discussing them explicitly.

Follow up with questions using mini-whiteboards. Choose questions carefully, so that they range in difficulty. Target them at individuals at an appropriately challenging level. For example:

Show me ...

- a number between 0.5 and 0.6; between 0.5 and 0.51 ...
- a fraction between $\frac{1}{8}$ and $\frac{1}{4}$; $\frac{2}{5}$ and $\frac{3}{5}$; $\frac{1}{3}$ and $\frac{2}{7}$...
- a fraction equal to 0.1, 0.2, 0.3, 0.4, ...; 0.25, 0.5, 0.75 ...
- a decimal equal to $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, ...; $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{3}$, ...
- an area diagram showing $\frac{1}{2} + \frac{1}{3}$; now a number line diagram ...

Ask learners to make notes on what they have learned and on how they felt about learning in this way.

Learners could play 'guess my number'. One learner thinks of a number and the other learners in the group have to guess what it is. After each guess, the first learner replies 'too big' or 'too small'. Start with whole numbers. Later, try decimals, fractions and negative numbers.

This type of activity may be used in any topic where a range of representations is used. Examples in this pack include:

N5 Understanding the laws of arithmetic;

A1 Interpreting algebraic expressions;

SS6 Representing 3D shapes.

You could ask learners aiming at lower levels to continue decimal sequences, such as:
0.2, 0.4, 0.6, ...
0.3, 0.6, 0.9, ...

What learners might do next

Further ideas

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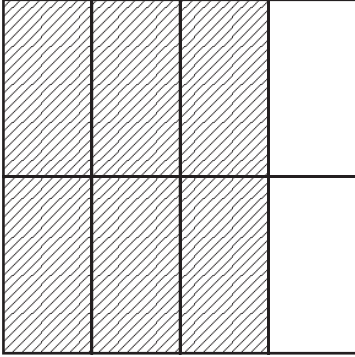
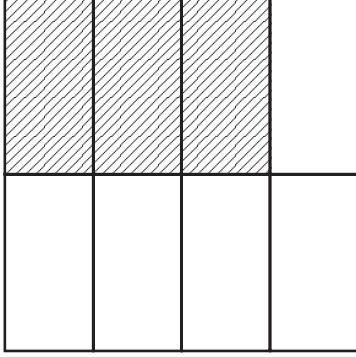
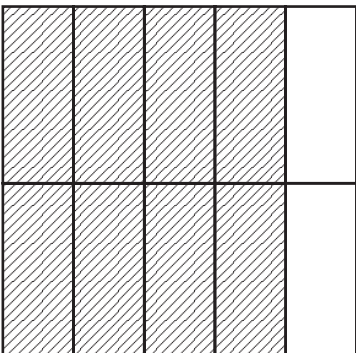
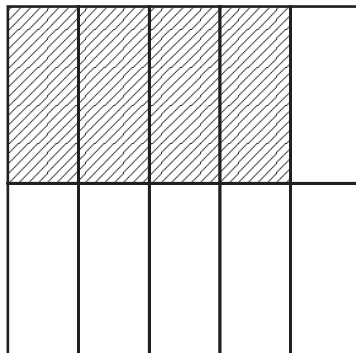
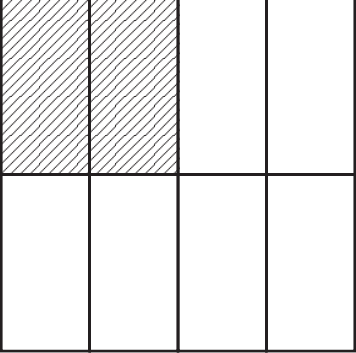
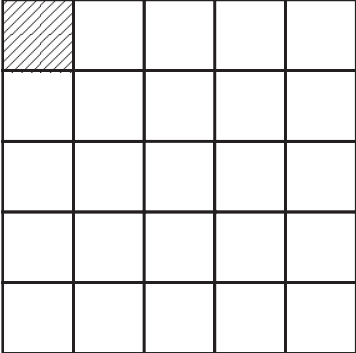
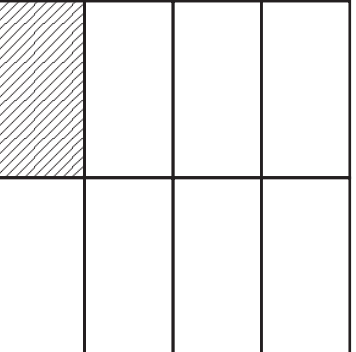

N1 Card set A – *Decimals*

0.8	0.04
0.25	0.375
0.4	0.125
0.75	

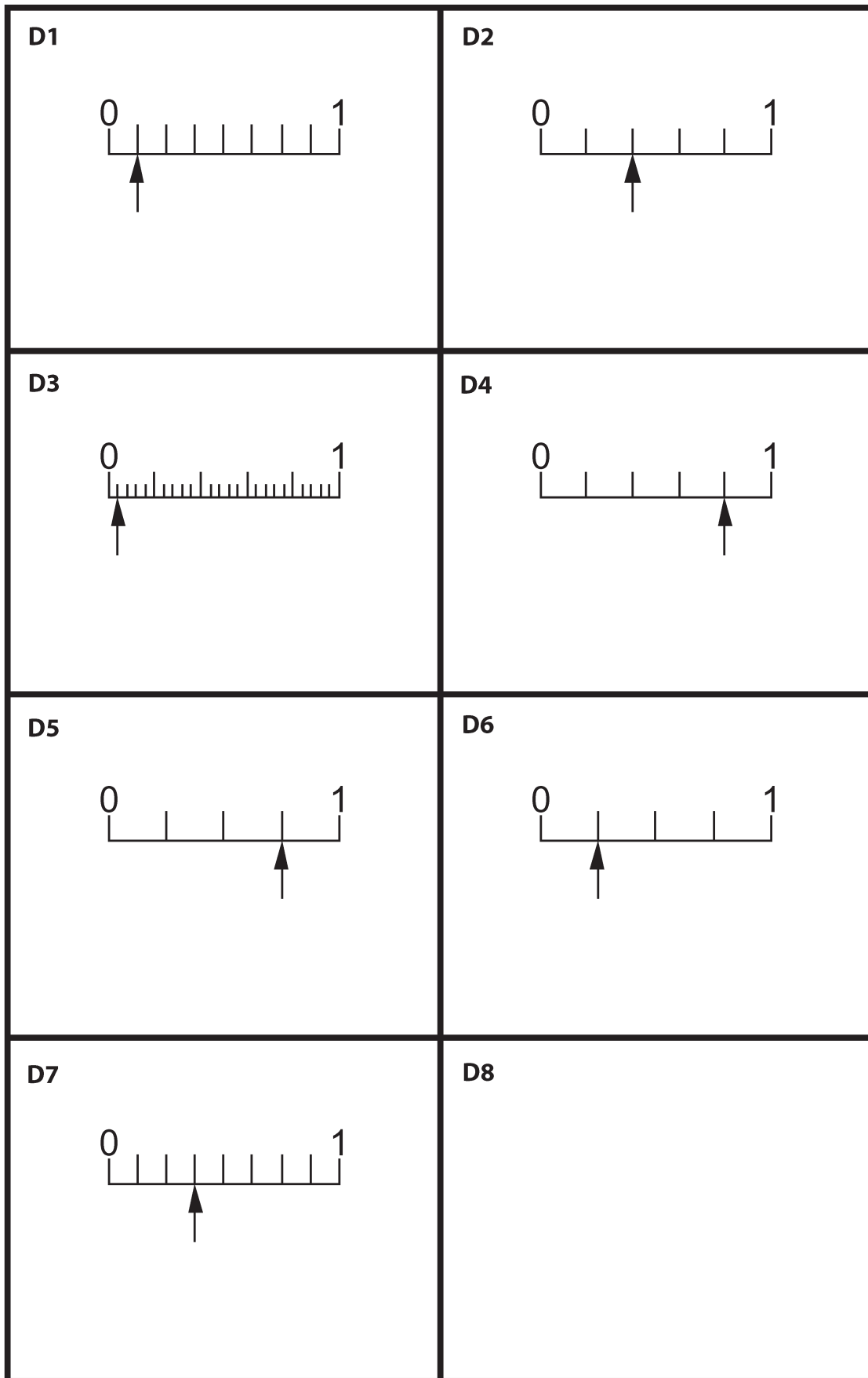
N1 Card set B – Fractions

$\frac{3}{8}$	$\frac{2}{5}$
$\frac{1}{4}$	$\frac{3}{4}$
$\frac{8}{10}$	$\frac{1}{25}$
$\frac{1}{8}$	

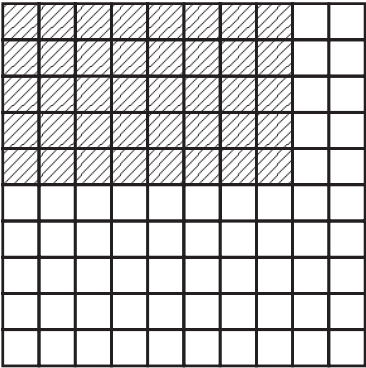
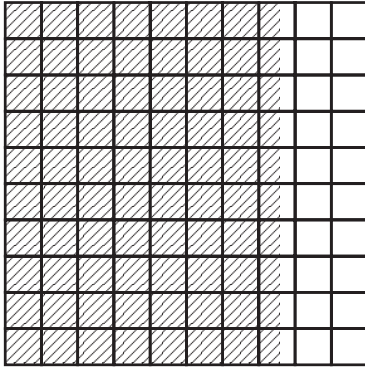
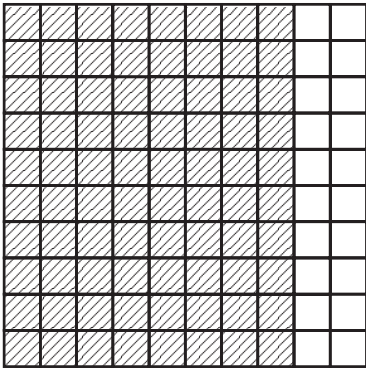
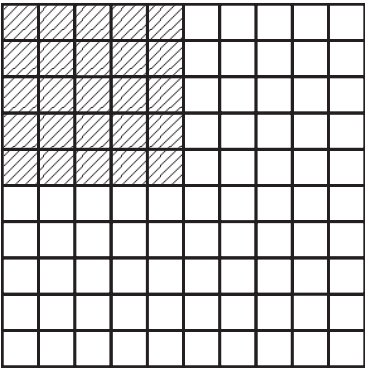
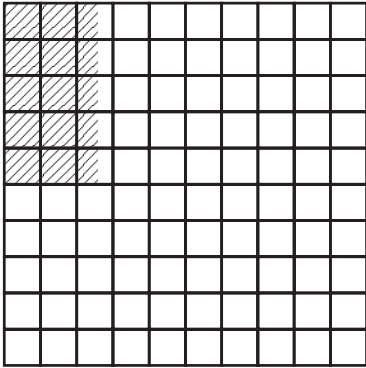
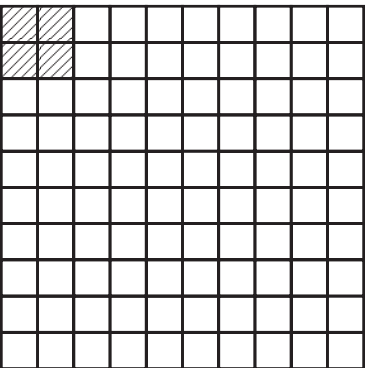
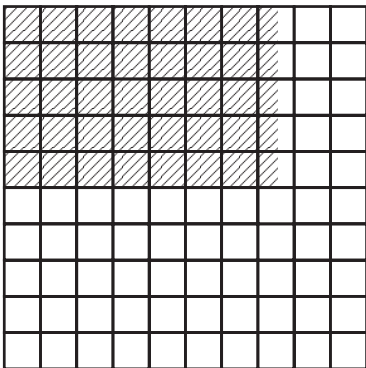

N1 Card set C – Areas

<p>C1</p> 	<p>C2</p> 
<p>C3</p> 	<p>C4</p> 
<p>C5</p> 	<p>C6</p> 
<p>C7</p> 	<p>C8</p> 

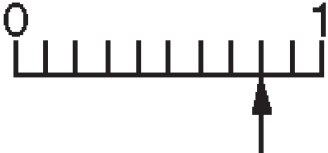
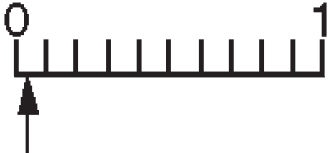
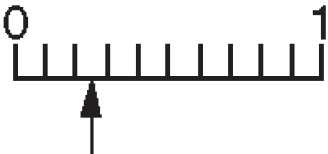
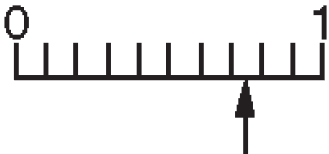
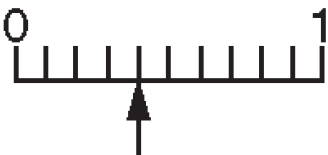
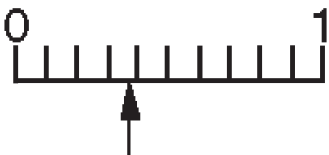
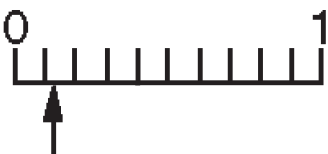
N1 Card set D – Scales



N1 Card set E – Areas

E1 	E2 
E3 	E4 
E5 	E6 
E7 	E8 

N1 Card set F – Scales

<p>F1</p> 	<p>F2</p> 
<p>F3</p> 	<p>F4</p> 
<p>F5</p> 	<p>F6</p> 
<p>F7</p> 	<p>F8</p>