Place Value of Numbers with up to Three Decimal Places

Key NC Statement

Read, write, order and compare numbers with up to 3 decimal places

Related NC Statements

- recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- read and write decimal numbers as fractions [for example, 0.71 = 71/100]
- round decimals with two decimal places to the nearest whole number and to one decimal place
- solve problems involving number up to three decimal places

Key Concepts

Pupils build on their understanding of place value and the base-10 number system extending to numbers with up to 3 decimal places. Pupils will have already met the concept of decimal numbers in Year 4 but may need further opportunities to understand the value of the digits to the right of the decimal point. They should develop a visual understanding of the relationship between decimal numbers in order to accurately compare and order them and they will also need the opportunity to discuss the common misconception that 3.4 is smaller than 3.35 and reason why this is incorrect through applying their understanding of place value.

Linking understanding of decimals to learning about fractions helps pupils assimilate their understanding of parts out of 10, 100 or 1000.

Application of place value understanding will then enable pupils to round decimal numbers to the nearest whole number. This learning is secured by making connections to real life contexts, such as money and recording pictorial jottings to help justify responses.

Steps within the Learning Sequence

Step 1: Recognising and comparing tenths and hundredths

Step 2: Comparing numbers with up to 2 decimal places

Step 3: Read, write and compare numbers with up to 3 decimal places

Step 4: Ordering numbers with up to 3 decimal places

Step 5: Rounding decimals (2 decimal places to the nearest whole number and to 1 decimal place)

Destination Questions

1

True or false?

$0.5 = \frac{1}{5}$

Explain your thinking.

2

Which decimal number is equal to twenty-five hundredths?

Can you draw it on a 10x10 grid?

3

Which calculations are complements to 1?

0.15 + 0.75

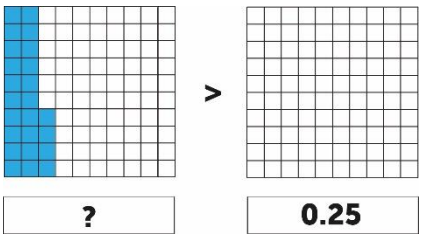
0.23 + 0.47

0.99 + 0.1

0.05 + 0.95

4

Complete the image



?

0.25

5

Order these decimal numbers from smallest to largest.

3.45, 3.5, 3.05, 3.005, 34.5, 3.55, 3.9, 3.09

Now, round them to the nearest whole number and order them from smallest to biggest again.

Did any of the numbers change order? Why?

6

Kate rounded a number to the nearest whole number and the answer was 4.

Which numbers, with 2 decimal places, could she have started with?

7

8

Who is correct?
Explain your answer.

5.124 is more than 5.142

5.124 is less than 5.142

9

$0.289 = \frac{\square}{1000}$

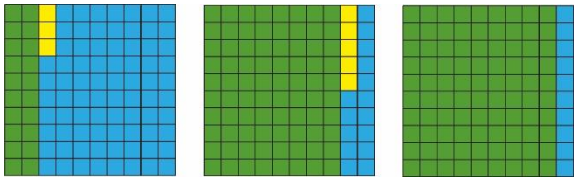
$\frac{55}{\square} = 0.55$

$0.4\square5 = \frac{425}{\square}$

Step one

Recognising and comparing tenths and hundredths

Display a selection of images and abstract numbers up to 2 decimal places. Ask pupils to match them. For example:



0.76

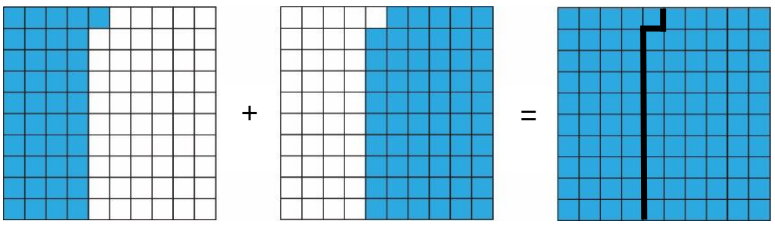
0.23

0.90

I know that 0.90 has 9 green rods which means that there are nine tenths and zero hundredths.

Teacher reinforces the language of tenths and hundredths. Take care with pronunciation to minimise confusion with tens and hundreds. Rehearse reading numbers with up to 2 decimal places aloud.

Pupils explore creating complements to 1 using base-10 equipment and connect with their understanding of whole numbers. Teacher models recording both the abstract notation as well as the pictorial representation.



0.41 + 0.59 = 1

3

- 0.15 + 0.75
- 0.23 + 0.47
- 0.99 + 0.1
- 0.05 + 0.95

Which calculations are complements to 1? How do you know?

Establish that decimals are still within the base-10 number system just like whole numbers. Explain that we can write decimals as a fraction and refer to them as 'decimal fractions'. Model how to convert a decimal into a fraction. For example, 0.41 = $\frac{41}{100}$ and link to tenths 0.4 = $\frac{4}{10}$.

Pupils rehearse this to reinforce decimal fractions as parts of 10, 100 or 1000 and solve problems. For example, destination questions:

1 2

Play 'Decimal Race' (Handout_5LS3_step1_decimal_race) using handout_5LS3_step1_speaking_frame to support pupils. This is a game for 2 players. The winner is the first player to reach 5.

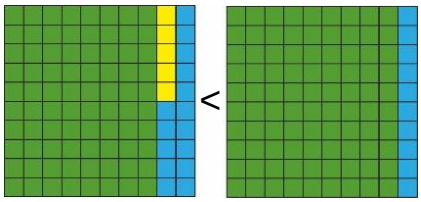
Rules:

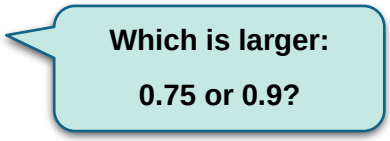
- Take it in turns to roll a dice twice.
- Use the dice to create a number with 2 decimal places. For example: 4 and 3 on the dice would create the number 0.43.
- On the handout, shade this number in on the hundred grid.
- Repeat, adding to the previous total each time.

Step two

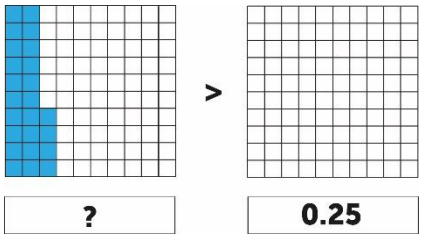
Comparing numbers with up to 2 decimal places

Pupils apply their knowledge of the < > symbols to make comparisons between numbers with up to 2 decimal places drawing upon learning from the previous step. For example:





4



It is important that pupils have secured the skill of comparison before moving onto ordering decimal numbers.

Activities for exploring ideas at greater depth

Use the six, digit cards below to make a number which meet the following criteria:

- Smallest number
- Largest number
- A number less than 0.5

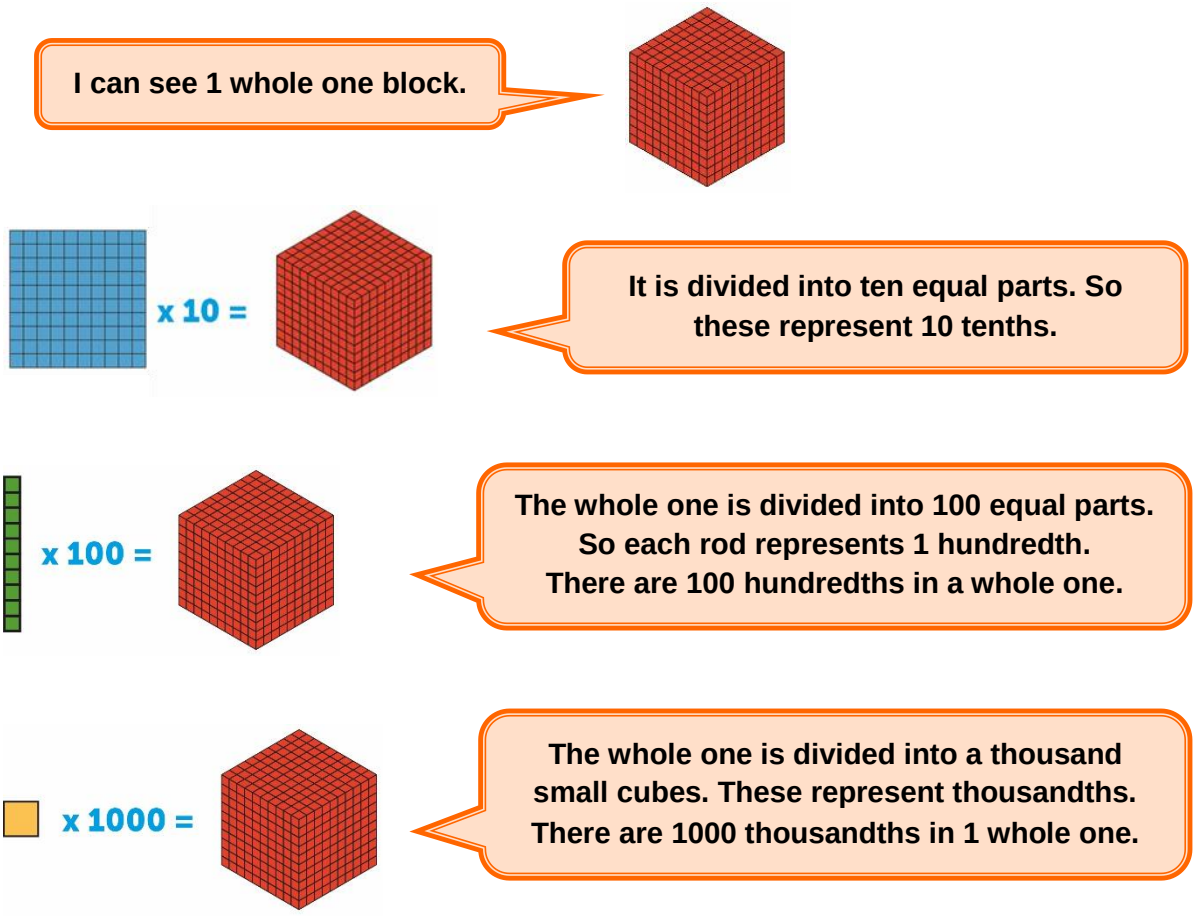
Look at the different units of measurement below. Explain how much is the '6' worth in each of the contexts stated below?

- 3.**6** m
- 4.0**6** km
- 5.**6** cm
- 5.17**6** kg
- 3.46**7** litres

Step three

Read, write and compare numbers with up to 3 decimal places

Ask pupils to visualise tenths and hundredths and describe the image as 'parts of a hundred'. What would this look like if there were thousandths? Relate to the cube in the base-10 equipment and provide the opportunity to explore the language involved using handout_5LS3_step3_speaking_frame.



Alongside the concrete resource, pupils should record the abstract decimal notation, as well as the fraction to reinforce their understanding of thousandths.

For example: $0.349 = \frac{349}{1000}$

Play 'Digit Placement' game using handout_5LS3_step3_digit_placement to practise writing, reading and comparing numbers with 3 decimal places.

Discuss conversation cartoon (Handout_5LS3_step3_conversation_cartoon) to expose common misconceptions when comparing decimals.

8 9

Step four

Ordering numbers with up to 3 decimal places

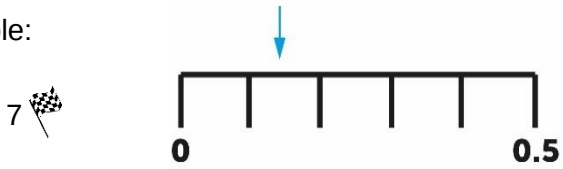
Use a counting stick to count, forwards and backwards in decimals. Start by counting in tenths and then extend into numbers with up to 3 decimal places. Ensure pupils are exposed to counting over the tenth, hundredth and thousandth boundaries. For example:

Display a set of three numbers with up to 3 decimal places and discuss how they can be ordered. Reinforce the value of each digit place and the process of comparing digits from left to right to identify which is the largest and to identify the most significant digit.

Pupils practise ordering sets of numbers with a range of different number of digits.
For example: 3.5, 3.051, 3.03, 3.322.

Once pupils are secure with the process of ordering numbers. Ask them to place these on a number line. First, use an empty number line to encourage approximate distances between the numbers and then move onto pre-determined number lines on which there are missing parts.

For example:



Activities for exploring ideas at greater depth

Provide a set of completed number lines with decimals placed incorrectly.

Ask pupils to identify the errors and justify how they know and what they would need to do to correct them.

Good mistakes:

Why is it a good mistake to say that 0.5 is smaller than 0.29?

Step five

Rounding decimals (2 decimal places to the nearest whole number and to 1 decimal place)

Always, sometimes or never true?

You always round up when the last digit is a 5.

Teacher collects thoughts and explanations from pupils. Draw attention to it being dependent upon the value you were rounding to.

2.15 to the nearest whole number would round down to 2.

2.15 to the nearest tenth would round up to 2.2.

Use the context of money to help pupils understand that £2.15 is closer to £2 rather than £3.

Teacher models rounding numbers with 2 decimal places to the nearest whole number using the context of money as a memory hook for pupils. Pupils should record their solutions on a number line marking the mid-way point to reinforce the benchmark.

6

Kate rounded a number to the nearest whole number, the answer was 4. What number with 2 decimal places could she have started with?

Teacher models rounding a number with 2 decimal places to 1 decimal place in the same way and provides opportunities for pupils to apply rounding to the nearest whole number and to 1 decimal place. Questions could include:

5

Order these decimal numbers from smallest to largest.

3.45, 3.5, 3.05, 3.005, 34.5, 3.55, 3.9, 3.09

Now, round them to the nearest whole number and order them from smallest to biggest again.

Did any of the numbers change order? Why?

Other than money, can you think of a real life context where you would need to round a decimal number?

Summarise and consolidate learning of this sequence by playing the game 'Decimal Range' (Handout_5LS3_step5_decimal_range).