

Year 6 Autumn 1

Unit 1: Place Value

Lesson 4: Identify, represent and estimate numbers on a number line 0 to 10,000,000 and a number line 0 to 1 where the number lines have ten demarcations.

Lesson Objectives:

Identify, represent and estimate numbers on a number line.

Lesson Focus:

This lesson moves the learning on from comparing and ordering numbers to positioning numbers on a number line, appreciating how they relate to other numbers. Children will be applying their knowledge of number lines, finding the value of the intervals through division and relating numbers to others. They will continue to apply their knowledge of identifying halfway, one quarter and three quarters of the way between given intervals to then place other numbers.

Starter (No more than 10 minutes)

Manipulate the parts in an addition equation to make the calculation more efficient.

Show page 1 of the SMART Notebook file.

- How can you calculate the answer efficiently? How can you use partitioning one of the numbers?

Share ideas and steer children to noticing that 586 is close to 600

- How can 586 be changed into 600? Add 14

- Where can this 14 come from? Partition 1,034 into 1,020 and 14

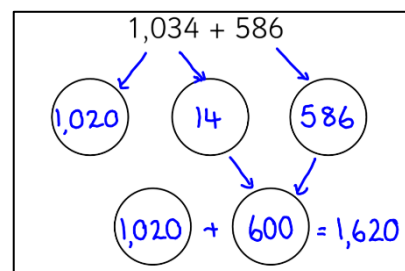
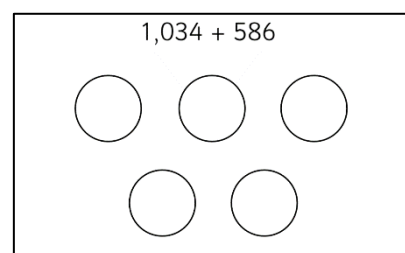
Write 1,020 in the first circle of the top row, 14 in the second and 586 in the third.

- What has the calculation become now? 1,020 and 14 and 586 then 1,020 and 600

- What numbers should we write in the circles at the bottom? 1,020 and 600

- What is the answer to $1,034 + 586$? 1,620

See image on the right.



Ask the children to answer the addition calculations on pages 2, 3 and 4 on their whiteboards.

Numbers should be partitioned as:

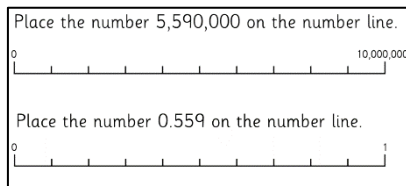
$$2,278 + 362 = 2,278 + 22 + 340 = 2,300 + 340 = 2,640$$

$$1,850 + 764 = 1,850 + 150 + 614 = 2,000 + 614 = 2,614$$

$$34.7 + 58.9 = 33.6 + 1.1 + 58.9 = 33.6 + 60 = 93.6$$

Initial Problem

Show page 5 of the SMART Notebook file with the initial problem. Provide children with a copy of the number line to annotate when placing the given number. Read the prompts.



Scaffold

What is the total value of the number line? 10,000,000

How many intervals are along the line? 10 intervals

What is each interval worth? 1,000,000 because 10,000,000 divided by 10 is 1,000,000

Share ideas for each number on the number lines although Guided Learning 1 and 2 will begin with each of these.

Extension

What do you notice about where the two numbers are on each number line? Explain why this happens.

Guided Learning

Show page 6 and move the screen shade down to reveal the first three questions.

- What is the total value of the number line? 10,000,000
- How many equal intervals is this split into? 10 equal intervals
- What is each interval worth? 1,000,000

Write these answers on the page as shown here.

Remove the screen shade to reveal the next two questions.

- What is halfway between 5 and 6? 5.5 is halfway between 5 and 6
- What is halfway between 5,000,000 and 6,000,000? 5,500,000 is halfway between 5,000,000 and 6,000,000

Write these answers on the page.

- What is the same about each of these answers? Why? Halfway between both numbers is the first number followed by a digit 5 after the most significant place because halfway between any adjacent multiples of 1, 10, 100 etc. is a number with 5 in the next most significant place.

- Where is 5,000,000? Label it on the number line.
- Where is 6,000,000? Label it on the number line.
- So where will 5,590,000 be placed on the number line?

Share ideas and agree that it will be around halfway between 5,000,000 and 6,000,000. Label it on the number line as shown here.

Show page 7 and provide children with the Guided Learning Questions resource.

- Work in pairs to place these numbers on the number line.
- What numbers could you place first to make this easier?

After sufficient time, share strategies on the page and explanations where each number should be placed.

- What number can be placed first?

7,000,000 is the seventh interval line as it is counting up in steps of 1,000,000

1,500,000 is halfway between 1,000,000 and 2,000,000

4,250,000 is halfway between 4,000,000 and 4,500,000 or one quarter of the way between 4,000,000 and 5,000,000

Show these on the page.

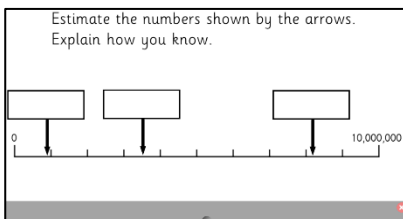
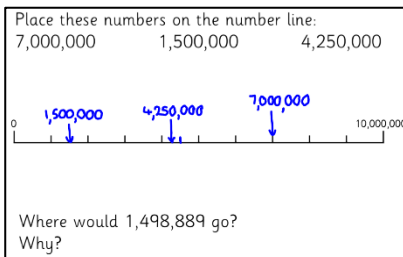
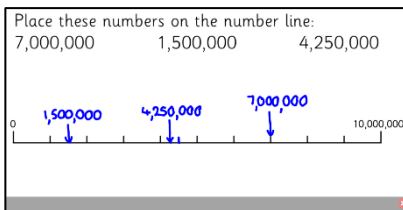
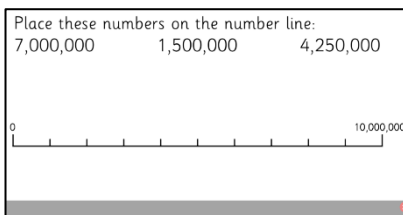
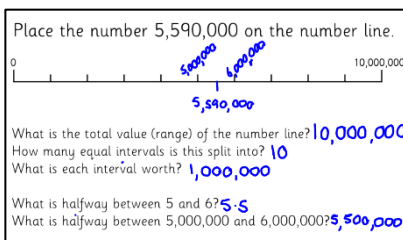
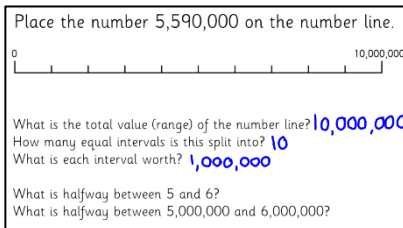
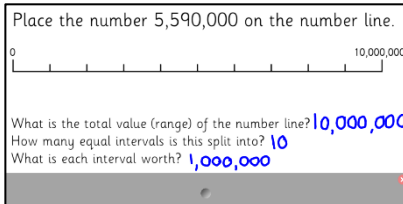
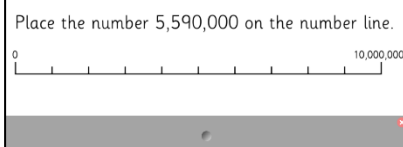
Remove the screen shade to reveal the question.

- Where would 1,498,889 go? 1,498,889 is almost 1,500,000 so it would be just less than 1,500,000 but the scale is too large to be able to show this accurately.

Show page 8 and ask children to look back at the Guided Learning Questions resource.

- Work in pairs to estimate these numbers on the number line.
- What number could you estimate most accurately first?

After sufficient time, share strategies on the page and explanations for each estimated number.



- *What number could you estimate most accurately first?* The middle number is halfway between 3,000,000 and 4,000,000 so is 3,500,000

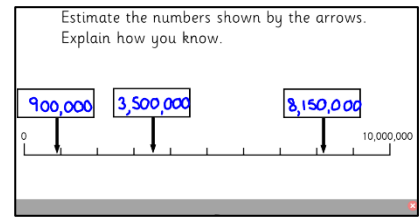
Write this on the page.

The first number is just less than 1,000,000 so could be any number from 800,000 to 950,000

Write 900,000 on the page.

The last number is just more than 8,000,000 so could be any number from 8,100,000 to 8,200,000

Write 8,150,000 on the page.

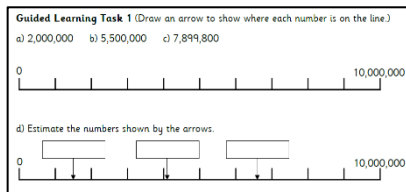


Remove the screen shade to reveal the questions.

- *How accurate should our answers be? Why?*

Discuss and agree that estimates do not have to be precise and that there will be a range of correct answers especially when the scale of the number line is so great. Using clues such as halfway, one quarter or three quarters of the way between intervals can help.

Ask children to complete **Guided Learning Task 1** (draw an arrow to show where each number is).



Circulate and support as necessary.

Extension:

- *Explain how you have estimated the third number in question d.*

Guided Learning 2 extends the positioning of numbers to a 0 to 1 number line with numbers to two decimal places, but follows the same modelling.

Show page 10 (with part 2 of the Initial Problem) and move the screen shade down to reveal the first two questions.

- *What is the total value (range) of the number line?* 1
- *How many equal intervals is this split into?* 10 equal intervals
- *What is each interval worth?* 1 tenth or 0.1

Write these answers on the page as shown here.

Remove the screen shade to reveal the next two questions.

- *What is halfway between 5 and 6?*
5.5 is halfway between 5 and 6
- *What is halfway between 0.5 and 0.6?*
0.55 is halfway between 0.5 and 0.6

Write these answers on the page.

- *What is the same about each of these answers? Why?* Halfway between both numbers is the first number followed by a digit 5 after the most significant place that isn't 0 because halfway between any adjacent multiples of 0.1, 1, 10, 100 etc. is a number with 5 in the next most significant place.

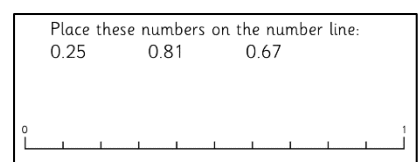
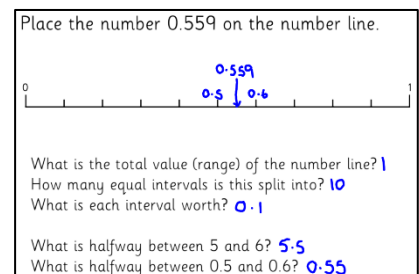
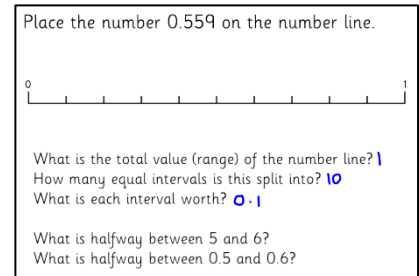
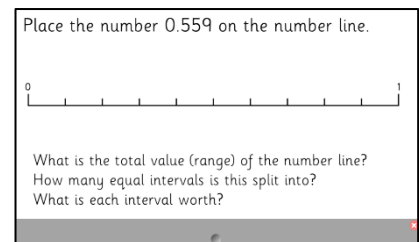
- *Where is 0.5?* Label it on the number line.
- *Where is 0.6?* Label it on the number line.
- *So where will 0.559 be placed on the number line?*

Share ideas and agree that it will be around halfway between 0.5 and 0.6

Label it on the number line as shown here.

Show page 11 and ask children to look back at the Guided Learning Questions resource.

- *Work in pairs to place these numbers on the number line.*



- What numbers could you place first to make this easier?

After sufficient time, share strategies on the page and explanations where each number should be placed.

- What number can be placed first?

0.25 is halfway between the second (0.2) and third (0.3) intervals as it is counting up in steps of 0.1

0.81 is just more than the eighth (0.8) interval line.

0.67 is just over halfway between the sixth (0.6) and seventh (0.7) intervals because halfway would be 0.65

Show these on the page.

Show page 12 and ask children to look back at the Guided Learning Questions resource.

- Work in pairs to estimate these numbers on the number line.

- What number could you estimate most accurately first?

After sufficient time, share strategies on the page and explanations for each estimated number.

- What number could you estimate most accurately first? The last number is halfway between 0.8 and 0.9 so is 0.85

Write this on the page.

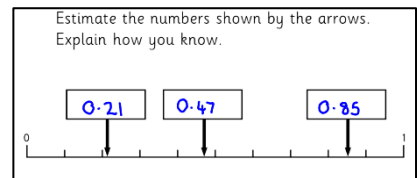
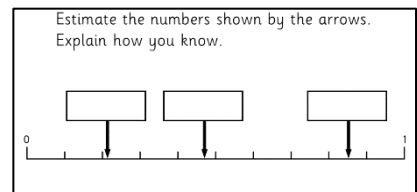
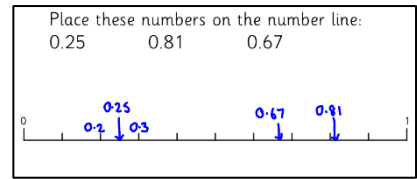
The first number is just more than 0.2 so could be any number from 0.21 to 0.22

Write either of these on the page.

The middle number is between 0.4 and 0.5, over halfway between them but just closer to 0.45 than 0.5

The best estimate is 0.47

Write 0.47 on the page.



Ask children to complete **Guided Learning Task 2** (draw an arrow to show each number).

Guided Learning Task 2 (Draw an arrow to show where each number is on the line.)

a) 0.4 b) 0.65 c) 0.83

d) Estimate the numbers shown by the arrows.

e) What do you notice about the answers in Guided Task 1 question d and Guided Task 2 question h?

Circulate and support as necessary.

Extension:

- Explain how you would position 0.77 on a blank number line with 0 and 1 at each end.

This is to check children's understanding of finding halfway points between given numbers and relating other numbers to these new reference points.

Independent Learning

Independent Learning Tasks

Draw an arrow to show where each number is on the line.

j) 750,000 k) 2,250,000 l) 8,010,320

m) Estimate the numbers shown by the arrows.

Here are the populations of some major European cities in 2021:

City	Population
London	8,799,800
Berlin	3,677,472
Paris	2,154,907
St Petersburg	5,376,672
Madrid	3,305,408

Graph showing the population of five major European cities.

n) Label the bars on the graph with the correct city names and draw the bar for the missing city.

o) Estimate the height of each of these animals in metres, using the metre stick.

The first two questions replicate the Guided Tasks with the first number to place being three-quarters of the way between 0 and 1,000,000 and the other two numbers related to halfway between 2,000,000 and 2,500,000 and being just over 8,000,000

In question m, children should recognise that the first missing number is halfway between two intervals, the second number is just more than a given interval and last number is just more than halfway between two given intervals.

In question n, the children need to apply their knowledge of numbers on a number line to reading off a scale on a graph.

This continues in question o, but with children having to apply their knowledge of number lines to measurement using a metre stick and estimating heights in metres (using decimal notation).

Deeper Learning

When tackling this problem, children need to consider what parts of each number are given to identify unknown parts / letters.

The first number has 1 unit and the last number has 5 units. Halfway between 1 and 5 is 3. **Therefore C must be 3.**

The final number must now be 5.3D

If A is 1, 2, 3 or 4, children could substitute each digit in as A in both the first and second numbers and check whether this would create the centre number to be halfway between the first and last.

However, as the approximate difference between the first and second numbers, and the second and third numbers is 2, and the third number is 5.3, it would be useful to start with 2 or 4 as the trial digit. It cannot be 3 because C is 3.

If A was 2 then the middle number would be 3.22. The first number would be 1.2B and the last number 5.3D

The greatest difference between 1.2B and 3.22 is 2.01 if B was 1 and if this difference was then added to 3.22 it would total 5.23 which is not the last number.

1.21 ← 2.01 → **3.22** ← 2.01 → **5.23** **Incorrect**

1.41 ← 2.01 → **3.42** ← 2.01 → **5.43** **Incorrect but the difference can be made smaller using the hundredths**

1.45 ← 1.97 → **3.42** ← 1.97 → **5.39** **Correct**

A = 4, B = 5, C = 3, D = 9

1.46 ← 1.96 → **3.42** ← 1.96 → **5.38** **Correct**

A = 4, B = 6, C = 3, D = 8

1.47 ← 1.95 → **3.42** ← 1.95 → **5.37** **Correct**

A = 4, B = 7, C = 3, D = 7

1.48 ← 1.94 → **3.42** ← 1.94 → **5.36** **Correct**

A = 4, B = 8, C = 3, D = 6

1.49 ← 1.93 → **3.42** ← 1.93 → **5.35** **Correct**

A = 4, B = 9, C = 3, D = 5

The number in the middle is exactly halfway between the other two numbers.

Each letter is a digit from 1 to 9

A is less than 5

Work out the value of each letter.

1.AB C.A2 5.CD

Key Outcomes

Children can identify and represent numbers on a 0 to 10,000,000 and a 0 to 1 number line with ten demarcations.

Children know to find halfway points between given numbers and to estimate numbers by relating them to given intervals, halfway and one quarter and three quarters of the way between given points.

Resources

Whiteboards and pens

Guided Learning Questions Resource (one per pair)

Children's task sheets copied (one per child)