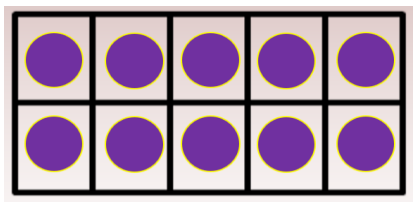
Planning Overview
Year 6 Place Value

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit
Round any whole number to a required degree of accuracy
Use negative numbers in context, and calculate intervals across zero
Solve number and practical problems that involve all of the above

6NPV–1 Understand the relationship between powers of 10 from 1 hundredth to 10 million, and use this to make a given number 10, 100, 1,000, 1 tenth, 1 hundredth or 1 thousandth times the size (multiply and divide by 10, 100 and 1,000).
6NPV–2 Recognise the place value of each digit in numbers up to 10 million, including decimal fractions, and compose and decompose numbers up to 10 million using standard and non-standard partitioning.
6NPV–3 Reason about the location of any number up to 10 million, including decimal fractions, in the linear number system, and round numbers, as appropriate, including in contexts.
6NPV–4 Divide powers of 10, from 1 hundredth to 10 million, into 2, 4, 5 and 10 equal parts, and read scales/number lines with labelled intervals divided into 2, 4, 5 and 10 equal parts.

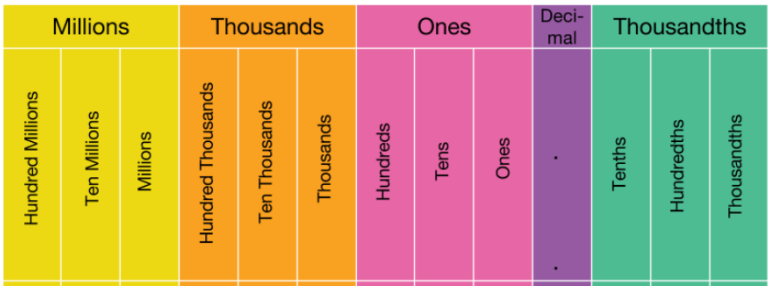
	Teaching and Learning
Numbers to ten million **Understanding and counting in Powers of 10**	0 . 0 1 one hundredth 0 . 1 one tenth 1 one 1 0 ten 1 0 0 one hundred 1 , 0 0 0 one thousand 1 0 , 0 0 0 ten thousand 1 0 0 , 0 0 0 one hundred thousand 1 , 0 0 0 , 0 0 0 one million 1 0 , 0 0 0 , 0 0 0 ten million *Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.* Encourage children to look at how the numbers are constructed and to look at what is the same and what is different.  Reinforce the importance of 10. 10 ones make a ten 10 tens make 100 10 hundreds make 1,000 10 hundreds make a 1,000 10 thousands make 10,000 10 ten thousands make 100,000 10 one hundred thousands make 1,000,000 10 one millions make 10,000,000

…is equal to…
… is ten times the size of…
…is one tenth the size of…
Use these sentence stems to compare the different Powers of 10.

Children build on this knowledge to compare numbers from different powers of ten. They should be able to use these sentence stems to continue to compare different powers of 10.

…is one hundred times the size of …
…is one hundredth times the size of…
…is one thousand times the size of…
…is one thousandth times the size of…

Show the children a place value chart and model how to read numbers up to 10,000,000. Discuss the value of digits in different columns and highlight how the pattern of hundreds, tens and ones is repeated in each section.



Children to make numbers on a place value chart and be able to read and write these.
e.g. 11,232,324

Ensure children are familiar with the terms value and digit.
What is the value of the digit 7 in the number 67,855,348?
What digit is in the thousands column?

Play the Place Value game.
2 children play competitively. Each child has a set of digit cards from 0-9 in a pile face down. Child A chooses a card at random and decides where on their template to place this number. Child B will do the same thing.

Child A

		3				

Child B

9						

Each child will repeat this 5 times but ultimately they will create a 7 digit number by using zeros as place holders.

Children will be aiming for their number to meet a certain criteria e.g. Largest number, an even number in both hundreds and thousands etc. What numbers can the children make, and can they make their own criteria. What's the same and what's different about the numbers?

Look at a number and consider what individual digits are worth. Encourage the children to divide by 100 and say what the digit is worth now. What would they need to divide it by to make it 10,000 less? Use a place value chart or Gattegno Chart (see below) to fill in the sentence stems below.

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1000	2000	3000	4000	5000	6000	7000	8000	9000
10000	20000	30000	40000	50000	60000	70000	80000	90000
100000	200000	300000	400000	500000	600000	700000	800000	900000
1000000	2000000	3000000	4000000	5000000	6000000	7000000	8000000	9000000

... is ten times the size of...

...is one tenth the size of...

... is one hundred times the size of...

...is one hundredth times the size of...

... is one thousand times the size of...

...is one thousandth times the size of...

Complete a range of fluency questions to ensure children have secured their understanding of place value and how Powers of 10 link to x and ÷ by 10, 100, 1,000.

6NPV–1 Example assessment questions

1. Complete the sentences.
   a. 500 made 1,000 times the size is _____.
   b. 0.7 made 100 times the size is _____.
   c. 800,000 made 10 times the size is _____.
   d. 4,000,000 made one-thousandth times the size is _____.
   e. 9,000 made one-hundredth times the size is _____.
   f. 3 made one-tenth times the size is _____.
2. The distance from London to Bristol is about 170km. The distance from London to Sydney, Australia is about 100 times as far. Approximately how far is it from London to Sydney?
3. A newborn elephant weighs about 150kg. A newborn kitten weighs about 150g. How many times the mass of a newborn kitten is a newborn elephant?

	Mastery Think about the number 34 567 800. Say this number aloud. Round this number to the nearest million. What does the digit '8' represent? What does the digit '7' represent? Divide this number by 100 and say your answer aloud. Divide this number by 1000 and say your answer aloud. Using a place value chart and counters, ask children to create the number 7,552,549. Ask them to add a counter to a column. What digit changes? Do any others change? Why? e.g. 7,592,559 + 1,000 = What would happen if you add one to the ones column or the ten thousands column? Why is this? e.g. 7,552,549 + 1 = 7,592,559 + 10,000 = Repeat with subtraction. Ask the children to take one from the thousands column. Why is this challenging? What happens if there is nothing in the column you want to take from? e.g. 7,590,557 – 1,000 = Place Value Calculator Game. In pairs, children have a calculator. One child types a 7-digit number into the calculator. They then pass the calculator to their partner. Partner one asks them to change one of the digits. e.g. Change the digit in the thousands column to a 9. Partner two then needs to complete this using addition and subtraction on the calculator. The children then switch roles.  *'I have changed the 6 in the thousands column to a 9 by adding 3 thousands. 6 thousands and 3 thousands is 9 thousands. I can also change the 6 thousands to 9 thousands by subtracting 7 thousands.'*

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Ask children to complete and extend sequences counting in Powers of 10 – forwards and backwards

Spot the mistake
489,632, 499,632, 500,632, 501,632, 502,632

Always, Sometimes or Never
When you add a Power of 10, it is only the column that you are adding to that changes.
When you subtract a Power of 10, it is only the column that you are taking away from that changes.

<table>
<tr><th>Start from</th><th>600 less</th><th>1000 more</th><th>200000 more</th><th>80000 less</th></tr>
<tr><td>379,436</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1,963,025</td><td></td><td></td><td></td><td></td></tr>
<tr><td>450,852</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2,023,876</td><td></td><td></td><td></td><td></td></tr>
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Look at range of strategies that can be used to tackle addition and subtraction questions that can be solved by using place value.
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<td>Partitioning in standard and non-standard ways</td>
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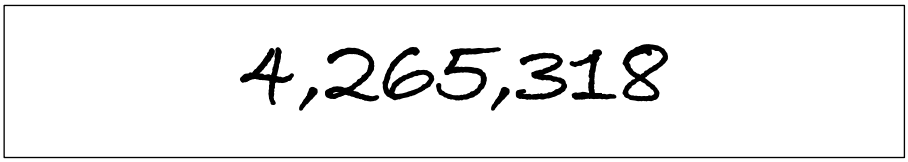
Look at how numbers can be partitioned into different ways. Use the part/part/whole model to record children's findings.
e.g.
A number is partitioned like this:
4,000,000 + 200,000 + 60,000 + 5,000 + 300 + 10 + 8
Write the number. Now read it to a partner.

Play zap the digit.
Write a number on the board.


Children say a digit to splat. Cover this digit and ask the children to write this out as a partitioned number.
If they splat the digit 6, they would record this as 4,205,318 + 60,000.
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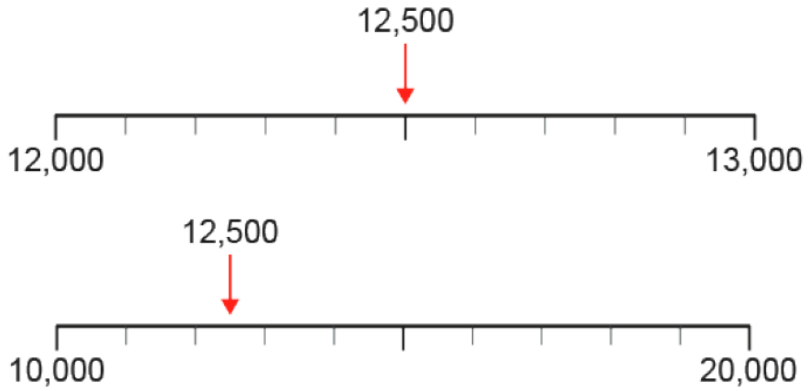
</tr>
</table>

	Challenge children to think of different ways to partition the number. e.g. 4,000,000 + 260,000 + 5,300 + 18 3,000,000 + 1,260,000 + 5,200 + 118 How can we describe 580,500? It has _ hundred thousands. It has _ ten thousands. It has _ hundreds. It is made of 580,000 and _ together
Compare and order numbers	Have children retained skills and reasoning about how to order numbers from Year 5? Can they apply this to numbers between 1,000,000 and 10,000,000 and explain which is the larger of two numbers? Can they order sets of 5 numbers? (Use a mixture of 5, 6 and 7 digits. Can they order sets of 5 numbers that all have 7-digits with similar digits repeated? Can they create a set of 5 numbers that would be tricky for their partner to order? Can they explain why were they difficult to order? Choose four 0-9 cards. Place them on a place value grid. Use place holders to fill the rest of the grid to make a 7-digit number. Rearrange the digits to make 6 more numbers. Can you order the numbers? Which numbers were easy to order? Why? Which were more difficult? Why? Which number is closest to 5 million? How do you know? *'How many ways can you arrange these digit cards so that the inequality is true?'* 1 3 4 7 4 □ 3 □ 2 0 0 < □ 6 □ 2 1 0 0 NCETM PD materials.

	Fill in the empty boxes so that the numbers are in order from smallest to largest. Encourage children to reason about what the largest and smallest digit could be in each of the sections and why. Look into capacity of theme parks in England and America. How do they compare? What is the total capacity of the major theme parks in England and America? Can you order them in descending order?
Understanding the position of any 7 digit number on a range of number lines	Pupils need to be able to identify or place numbers with up to 7 digits on marked number lines with a variety of scales, for example placing 12,500 on a 12,000 to 13,000 number line, and on a 10,000 to 20,000 number line. *Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.* It is important for pupils to be able to divide powers of 10 into 2, 4, 5 or 10 equal parts because these are the intervals commonly found on measuring instruments and graph scales. Pupils have already learnt to divide 1, 100 and 1,000 in this way and must now extend this to larger powers of 10. Pupils should be able to make

2		4	7	1
2	5		3	1
	5	4	5	6
3		8	2	5
3			2	6



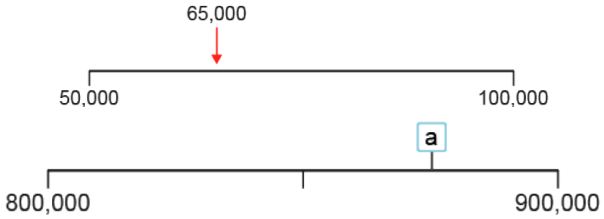
connections between powers of 10, for example, describing similarities and differences between the values of the parts when 1 million, 1,000 and 1 are divided into 4 equal parts.

1,000,000			
250,000	250,000	250,000	250,000

1,000			
250	250	250	250

1			
0.25	0.25	0.25	0.25

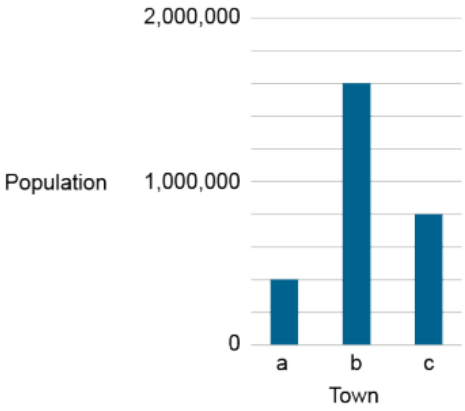
Pupils need to be able to estimate the value or position of numbers on unmarked or partially marked numbers lines, using appropriate proportional reasoning.



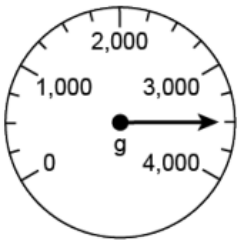
Mathematics guidance: key stages 1 and 2 Non-statutory guidance for the national curriculum in England.

Children to work through a range of number line questions with increasing difficulty. Relate to different areas of mathematics but exemplify how this is basic number line work skills

6. The bar chart shows the approximate populations of 3 different towns. What are the populations?



7. What mass does each scale show?



<table>
<tr><td></td><td>Ask the children to generate six 8-digit numbers throwing a dice or following the rules

• All numbers are 8 digits long
• Their digit total is 45.
• At least two numbers are even.
• There is a pair of consecutive numbers in each number.

Once completed, can the children place the numbers on a number line? What will their scale be?</td></tr>
<tr><td>Round numbers</td><td>Ensure children are confident with the rules of rounding and understand that they have to find the multiples of the Power of 10 before and after the number that they are rounding to. Look back at Year 5 to clarify these steps.

Can children round confidently?
<table>
<tr><th>Number</th><th>Nearest 1000</th><th>Nearest 10 000</th><th>Nearest 100 000</th><th>Nearest 1 000 000</th></tr>
<tr><td>534,645</td><td></td><td></td><td></td><td></td></tr>
<tr><td>756,309</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1,703,458</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2,289,042</td><td></td><td></td><td></td><td></td></tr>
</table>

Give children spot the mistake questions and encourage them to explain what the mistake is.

Encourage the children to write 3 numbers that would round to 30,000 and explain why.

'Use the digit cards zero to nine to create two numbers. You may use each card only once.
The first number rounds to thirteen thousand when rounded to the nearest thousand.'
 

'The second number rounds to thirty thousand when rounded to the nearest ten thousand.'
 

NCETM PD materials.

Ask the children to write 3 numbers that round to both 400,000 and 420,000 when rounded to a different degree of accuracy.</td></tr>
</table>

Can the children think of two numbers that when rounded to the nearest 100,000 would give them the largest difference? Is there more than one possible answer?

Sam says, 'The difference between the smallest and largest number will always be the same no matter what number you are rounding to.' Is he correct? Can the children investigate this?

Children will need to be given time to practise how to use rounding to help them to estimate the answers to questions. They will need to know whether to round to the nearest 10, 100, 1000 etc.

Mastery

Estimate the answer to 4243 + 1734 by rounding the numbers to:

- the nearest 1000
- the nearest 100
- the nearest 50
- the nearest 10.

The population of Shanghai is 21 million, to the nearest million. Each person weighs on average 70 kg.

Estimate the total weight of all the people in Shanghai.

Do you think your answer is more or less than the actual answer you'd get if you weighed everyone in Shanghai accurately?

Mastery with Greater Depth

Three pupils are asked to estimate the answer to the sum 4243 + 1734.

Andrew says, 'To the nearest 100, the answer will be 5900.'

Bilal says, 'To the nearest 50, the answer will be 6000.'

Cheng says, 'To the nearest 10, the answer will be 5970.'

Do you agree with Andrew, Bilal or Cheng?

Can you explain their reasoning?

Mastery with Greater Depth

Miss Wong, the teacher, has four cards. On each card is a number:

59 996	59 943	60 026	62 312

She gives one card to each pupil. The pupils look at their card and say a clue.

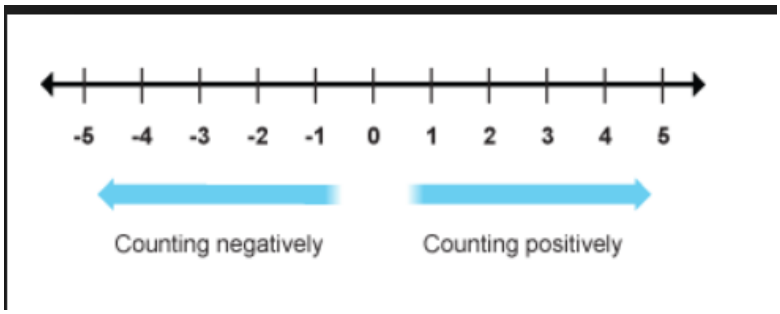
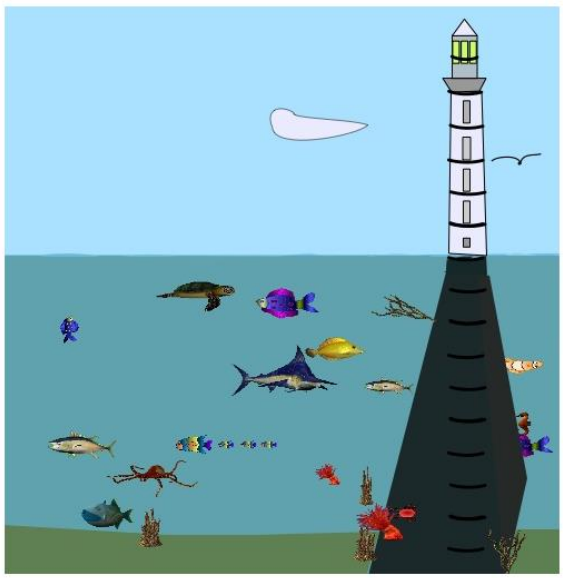
Anna says, 'My number is 60 000 to the nearest 10 thousand.'

Bashir says, 'My number has exactly 600 hundreds in it.'

Charis says, 'My number is 59900 to the nearest hundred.'

David says, 'My number is 60 000 to the nearest 10.'

Can you work out which card each pupil had? Explain your choices.

Negative Numbers **Calculate intervals between negative and positive numbers**	Examine negative numbers in context e.g. lifts in hotels, bank balances and temperature. Can they represent these on a number line? Good examples at http://www.bbc.co.uk/skillswise/factsheet/ma05nega-e2-f-using-negative-numbers  Ensure children can efficiently calculate the difference between a positive and negative number reinforcing bridging techniques from Year 5. Encourage children to look for patterns when counting in 1s from a positive number to a negative number. What about if we count in 10s? 100s? Complete NRICH problem **Sea Level** Age 7 to 11 ★  Look at calculating the difference between a negative number and a positive number on a number line. What do the children notice about the numbers and the difference?

Repeat for different combinations of positive and negative numbers.

Mastery

A scientist measures the depth of some objects below the surface of the sea. She records her measurements using negative numbers.

Object	Depth
Coral reef	–2 m
Shipwreck	–11 m
Pirate treasure	four times as deep as the coral reef
Sleeping shark	3 metres above the shipwreck

Which object is deepest? Explain your choice.

Is the sleeping shark deeper than the pirate treasure? Explain your reasoning.

A seagull is hovering 1 m above the surface of the sea. How far apart are the seagull and the coral reef?

Mastery with Greater Depth

A scientist measured the temperature each day for one week at 06:00.

On Sunday the temperature was 1·6°C.
On Monday the temperature had fallen by 3°C.
On Tuesday the temperature had fallen by 2·1°C.
On Wednesday the temperature had risen by 1·6°C.
On Thursday the temperature had risen by 4·2°C.
On Friday the temperature had fallen by 0·9°C.
On Saturday the temperature had risen by 0·2°C.

What was the temperature on Saturday?

Extra challenge for children to consider.

Complete NRICH problem Negative Dice.