Powers of 10

What is a power of 10?

Look at this pattern:

$$10^1 = 10$$
$$10^2 = 100$$
$$10^3 = 1000$$

What do you notice?

Powers of 10

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

The small digit next to each 10 is called the index number, or the power.

It tells you how many times you should multiply the given number by itself - the given number in this case is 10, as we are looking at powers of 10.

Powers of 10

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

So, in the example of 10^3, we multiply 1 by 10, 3 times.

$$1 \times 10 \times 10 \times 10.$$

This gives us the answer 1000.

Powers of 10

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

For 10^2, we multiply 1 by 10, 2 times.

$$1 \times 10 \times 10.$$

This gives us the answer 100.

Powers of 10

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

For 10^1, we multiply 1 by 10, 1 time.

1×10.

This gives us the answer 10.

Powers of 10

$10^1 = 1 \times 10$ $= 10$ (1 zero)

$10^2 = 1 \times 10 \times 10$ $= 100$ (2 zeros)

$10^3 = 1 \times 10 \times 10 \times 10$ $= 1000$ (3 zeros)

Can you follow this pattern to find 10^4, 10^5 and 10^6?

Adding and Subtracting

When we add or subtract different powers of 10, we start by identifying the correct digit in the number.

Let's look at an example.

Add 1000 to 45 689.

We need to identify the digit in the thousands place, because we are adding 1000.

Which digit is in the thousands place in 45 689?

Adding and Subtracting

By using a place value grid, we can check which digit is in the thousands place.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
		4	5	6	8	9

Adding and Subtracting

In 45 689, the 5 is in the thousands place.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
		4	**5**	6	8	9

Adding and Subtracting

In 45 689, the 5 is in the thousands place.

So, to add 1000, we simply add 1 to the thousands digit.

Can you say what 45 689 add 1000 is?

45 689 add 1000 is 46 689.

We added 1 to the thousands digit.

Adding and Subtracting

Now let's look at this example:

Subtract 100 from 456 721.

First, we identify the digit in the hundreds place.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	4	5	6	7	2	1

Adding and Subtracting

Now let's look at this example:

Subtract 100 from 456 721.

We can see that the 7 is in the hundreds place.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	4	5	6	**7**	2	1

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Adding and Subtracting

Now let's look at this example:

Subtract 100 from 456 721.

We just need to subtract 1 from the hundreds digit.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	4	5	6	**7**	2	1

Adding and Subtracting

Now let's look at this example:

Subtract 100 from 456 721.

So the answer to this calculation is 456 621.

Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
	4	5	6	6	2	1

Adding and Subtracting

The table below shows calculations involving adding and subtracting powers of 10.

Choose 2 of the calculations and solve them.
You can use a place value chart to identify the correct digit.

★	★★	★★★
23 658 - 100	762 198 + 10 000	1 764 357 - 10 000
8746 + 1000	92 857 - 100	7 874 672 + 100 000
76 430 + 10	874 931 + 1000	563 912 + 100

Adding and Subtracting

Check your answers. How did you get on?

★	★ ★	★ ★ ★
23 658 - 100 **= 23 558**	762 198 + 10 000 **= 772 198**	1 764 357 - 10 000 **= 1 754 357**
8746 + 1000 **= 9746**	92 857 - 100 **= 92 757**	7 874 672 + 100 000 **= 7 974 672**
76 430 + 10 **= 76 440**	874 931 + 1000 **= 875 931**	563 912 + 100 **= 564 012**

Forwards and Backwards

We can use our understanding of adding and subtracting powers of 10 in order to count in steps of powers of 10.

Let's use one of the examples from the table we just worked with:

76 430 + 10 = 76 440

We can continue adding 10 to 76 440 to count on in steps of 10.

Can you find the next three numbers if we continue to count on in 10s?

If we continue to count forwards in steps of 10, the next three numbers are:

76 450, 76 460 and 76 470.

Forwards and Backwards

76 430, 76 440, 76 450, 76 460, 76 470...

So far we have just changed the digit in the tens place.

If we keep on counting forwards in steps of 10,
we will eventually cross over into the next set of
hundreds and the digit in the hundreds place will change.

Can you keep counting in steps of 10 until you
cross over into the next set of hundreds?

Forwards and Backwards

76 430, 76 440, 76 450, 76 460, 76 470, **76 480, 76 490, 76 500…**

Once we have crossed over into the next set of hundreds, we can just keep on counting in steps of 10 by simply changing the tens digit again.

…76 510, 76 520, 76 530, 76 540…

Forwards and Backwards

This process is just the same when we count backwards in steps of powers of 10.

Let's try this one:

Starting at 586 271, count backwards in steps of 10 000.

Remember, first identify the digit in the ten thousands place. You can then take one 10 000 off the number by making the ten thousands digit one less each time.

Take care when crossing over into the next set of hundred thousands!

Forwards and Backwards

How did you do?

586 271, 576 271, 566 271, 556 271, 546 271, 536 271, 526 271, 516 271, 506 271, 496 271, 486 271...

Which Power of 10?

Look at each of these sequences. Can you identify in which power of 10 each sequence is counting forwards or backwards?

5 784, 5 884, 5 984, 6 084, 6 184, 6 284...

234 681, 224 681, 214 681, 204 681, 194 681, 184 681...

89 635, 89 625, 89 615, 89 605, 89 595, 89 585, 89 575...

3 226 764, 3 326 764, 3 426 764, 3 526 764, 3 626 764, 3 726 764...

Which Power of 10?

Did you identify the correct direction and power of 10 for each sequence?

5 784, 5 884, 5 984, 6 084, 6 184, 6 284...
Forwards in 100s.

234 681, 224 681, 214 681, 204 681, 194 681, 184 681...
Backwards in 10 000s.

89 635, 89 625, 89 615, 89 605, 89 595, 89 585, 89 575...
Backwards in 10s.

3 226 764, 3 326 764, 3 426 764, 3 526 764, 3 626 764, 3 726 764...
Forwards in 100 000s.