Edward Peake Church of England Middle School			
Topic: Standard index form	**Year: 8**	**NC Strand: Number**	

What should I already know?

- How to write 1, 10, 100, 1000, etc as powers of ten
- How to write positive integers in the form A X $[\![10]\!]$^n
- How to write negative powers of ten
- How to write decimals in the form A X $[\![10]\!]$^n
- **How to add and subtract numbers given in standard form**

What will I know by the end of the unit?

- How to write positive powers of ten
- How to work with numbers greater than 1 in standard form
- How to write negative powers of ten
- How to work with numbers between 0 and 1 in standard form
- How to compare and order numbers in standard form
- How to mentally calculate with numbers in standard form
- How to add and subtract numbers in standard form
- How to multiply and divide numbers in standard form
- How to use a calculator to work with numbers in standard form
- How to use negative indices
- How to use fractional indices

Vocabulary

Base	Exponent	Place value	Reciprocal
Index	Standard form	Commutative	Zero
Indices	Base	Scientific notation	Root
Power	Negative	SCI/EXP	

Investigate/Homework tasks

- Homework will be set by your teacher using google classroom
- You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home
- Additional work you could complete:
  - Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/
- To challenge yourself: Answer the key questions to deepen your knowledge
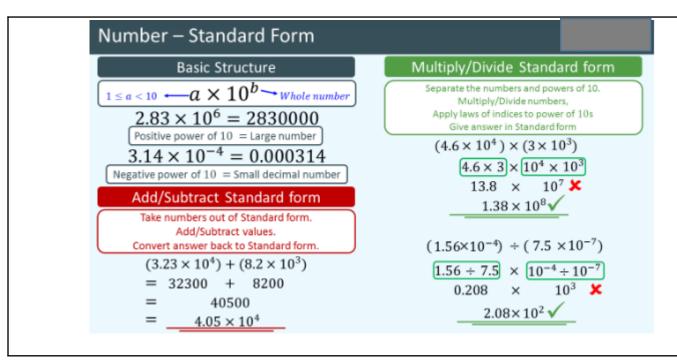
Key Information/Diagrams

Number – Standard Form

Basic Structure

$1 \le a < 10 \longleftarrow a \times 10^b \longrightarrow$ Whole number

$2.83 \times 10^6 = 2830000$

Positive power of 10 = Large number

$3.14 \times 10^{-4} = 0.000314$

Negative power of 10 = Small decimal number

Add/Subtract Standard form

Take numbers out of Standard form.
Add/Subtract values.
Convert answer back to Standard form.

$(3.23 \times 10^4) + (8.2 \times 10^3)$

$= \quad 32300 \quad + \quad 8200$

$= \quad\quad 40500$

$= \quad\quad 4.05 \times 10^4$

Multiply/Divide Standard form

Separate the numbers and powers of 10.
Multiply/Divide numbers,
Apply laws of indices to power of 10s
Give answer in Standard form

$(4.6 \times 10^4) \times (3 \times 10^3)$

$\boxed{4.6 \times 3} \times \boxed{10^4 \times 10^3}$

$13.8 \quad \times \quad 10^7$ ✗

$\underline{1.38 \times 10^8}$ ✓

$(1.56 \times 10^{-4}) \div (7.5 \times 10^{-7})$

$\boxed{1.56 \div 7.5} \times \boxed{10^{-4} \div 10^{-7}}$

$0.208 \quad \times \quad 10^3$ ✗

$\underline{2.08 \times 10^2}$ ✓

Key Questions

How many times bigger than 1000 is 10^8?
Why are (e.g.) $(10^2)^3$ and $10^2 \times 3$ different?
Is there a simpler way to write (e.g.) 10000×100000?
What calculations could give an answer of (e.g.) 10^{12}?

What is one gigabyte (1 GB) written in standard form?
What is the same and what is different about how 75 000 and 70 000 are written in standard form?
Why is it more efficient to write 4×10^{50} in standard form rather than as an ordinary number?

How many different ways can you write 0.001?
How could you show 10^{-2} on a place value grid?
What is the value of 10^0? What is the value of 8^0?
What is x^0 for any value of x?

What is the same and what is different about (e.g.) 3×10^{-4} and 3×10^4?
Explain why (e.g.) 4×10^{-3} is greater than 5×10^{-4}.
Are negative powers of 10 always, sometimes or never negative numbers?

How can we compare a fraction, a decimal and a number written in standard form? What could you do to make it easier?
What do you look at first when comparing numbers written in standard form? Why?

Why isn't (e.g.) 200×10^6 in standard form? How could rewriting 200 help us?
Explain how 0.2×10^4 and 0.2×10^{-4} can be written in standard form. What is the same and what is different?
Why is $6 \times (5 \times 10^3)$ more difficult than $4 \times (2 \times 10^3)$?

Is it easier to add the numbers as they are or convert them to ordinary numbers first?
What do we do if the total isn't in standard form?
What is (e.g.) $10^{-3} + 10^3$ as an ordinary number?

How many different ways can you write (e.g.)
$(3 \times 10^4) \times (2 \times 10^4)$?
Describe the steps you need to take to multiply/divide a pair of numbers in standard form.
When can we write a division as a fraction?

Explain how to input (e.g.) 2.4×10^5 on a calculator. What would be different inputting 2.4×10^{-5}?
What button on your calculator converts an answer into standard form.
How do you round a number in standard form to 1/2/3 significant figures?

Will a number raised to a negative power always, sometimes or never have a negative value?
How does working out negative powers relate to the subtraction law for dividing indices?
How do you enter negative powers on a calculator?

How does the addition law for indices help us work out the meaning of "to the power half"?
Give an example to show "to the power half" is not the same as "divide by 2"?