

Key Vocabulary	
Negative number	A negative number is a number less than zero
Directed number	Directed numbers are numbers which are either positive or negative
Operation	<p>There are four main mathematical operations</p> <p>Addition + Subtraction - Multiplication x Division ÷</p> <p>Pus indices/roots</p>
Indices, powers, index/power $7^4 = 7 \times 7 \times 7 \times 7$	The number times itself that many times is the index/power
Roots $\sqrt{64} = 8$ (as $8^2 = 64$) $\sqrt[3]{27} = 3$ (as $3^3 = 27$)	The opposite of operation of raising to a power
Order of Operations BIDMAS	The order of you MUST follow when applying mathematical operations

Key facts / Diagrams														
<p>BIDMAS – the order of operations</p> <table border="1"> <tr> <td>B</td> <td>Brackets</td> <td rowspan="6"> First ↓ Last </td> </tr> <tr> <td>I</td> <td>Indices</td> </tr> <tr> <td>D</td> <td>Division</td> </tr> <tr> <td>M</td> <td>Multiplication</td> </tr> <tr> <td>A</td> <td>Addition</td> </tr> <tr> <td>S</td> <td>Subtraction</td> </tr> </table>		B	Brackets	First ↓ Last	I	Indices	D	Division	M	Multiplication	A	Addition	S	Subtraction
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<p>Rules for negative numbers</p> <table border="1"> <tr> <td> Addition/subtraction $3 + -2 = 1$ $3 --2 = 5$ $-5 + -2 = -7$ $-5 --2 = -3$ </td> <td> $+- = -$ $-+ = -$ $-- = +$ </td> </tr> <tr> <td> Multiplication/division $+ve \times -ve = -ve$ $-ve \times +ve = -ve$ $-ve \times -ve = +ve$ $+ve \div -ve = -ve$ $-ve \div +ve = -ve$ $-ve \div -ve = +ve$ </td> <td></td> </tr> </table>		Addition/subtraction $3 + -2 = 1$ $3 --2 = 5$ $-5 + -2 = -7$ $-5 --2 = -3$	$+- = -$ $-+ = -$ $-- = +$	Multiplication/division $+ve \times -ve = -ve$ $-ve \times +ve = -ve$ $-ve \times -ve = +ve$ $+ve \div -ve = -ve$ $-ve \div +ve = -ve$ $-ve \div -ve = +ve$										
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<p>Squaring and cubing negative numbers</p> <p>Always use brackets with negative numbers to avoid mistakes</p> <table border="1"> <tr> <td> $(-3)^2 = -3 \times -3 = 9$ $(-5)^3 = -5 \times -5 \times -5 = -125$ </td> <td> A negative number squared is positive A negative number cubed is negative </td> </tr> </table>		$(-3)^2 = -3 \times -3 = 9$ $(-5)^3 = -5 \times -5 \times -5 = -125$	A negative number squared is positive A negative number cubed is negative											
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Common misconceptions	
<ul style="list-style-type: none"> Some pupils may use a rule stated as 'two minuses make a plus' and make many mistakes as a result; e.g. $-4 + -6 = 10$ The order of operations is often not applied correctly when squaring negative numbers. As a result pupils may think that $x^2 = -9$ when $x = -3$. The fact that a calculator applies the correct order means that $-3^2 = -9$ and this can actually reinforce the misconception. In this situation brackets should be used as follows: $(-3)^2 = 9$. 	
Worked examples	
<p>1. Calculate</p> <p>a) $15 + -7 = 15 - 7 = 8$</p> <p>b) $27 - -8 = 27 + 8 = 35$</p> <p>c) $7 \times -4 = -28$</p> <p>d) $-48 \div -6 = 6$</p> <p>2. Calculate</p> <p>a) $(49 + 7) \div (10 - 8)^3$</p> $56 \div 2^3$ $56 \div 8 = 7$ <p>b) $\frac{\sqrt{22+3^3}}{2} = \frac{\sqrt{22+27}}{2} = \frac{\sqrt{49}}{2} = \frac{7}{2} = 3.5$</p> <p>c) $\sqrt[3]{(83 + 45) \div 2} = \sqrt[3]{128 \div 2} = \sqrt[3]{64} = 4$</p>	