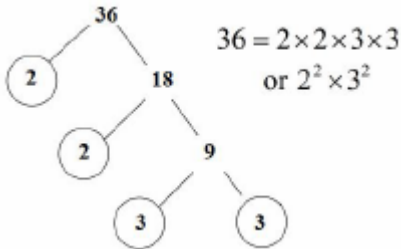
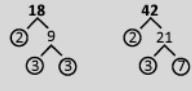
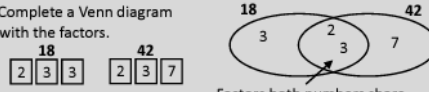


Knowledge Organiser: Number

Topic/Skill	Definition/Tips	Example																																
<u>Integers and Place Value</u>																																		
Integer	A whole number that can be positive, negative or zero.	-3, 0, 92																																
Multiplication	Can be thought of as repeated addition . 'multiply', 'times', 'product'	$3 \times 6 = 6 + 6 + 6 = 18$ <table><tr><th>1,000s</th><th>100s</th><th>10s</th><th>1s</th></tr><tr><td></td><td>3</td><td>1</td><td>2</td></tr><tr><td></td><td></td><td>2</td><td>8</td></tr><tr><td>2</td><td>4</td><td>9</td><td>6</td></tr><tr><td>6</td><td>2</td><td>4</td><td>0</td></tr><tr><td>8</td><td>7</td><td>3</td><td>6</td></tr><tr><td colspan="4">1</td></tr></table> 312×8 312×20	1,000s	100s	10s	1s		3	1	2			2	8	2	4	9	6	6	2	4	0	8	7	3	6	1							
1,000s	100s	10s	1s																															
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8	7	3	6																															
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Division	Splitting into equal parts or groups. The process of calculating the number of times one number is contained within another one . 'divide', 'share'	$20 \div 4 = 5$ $\frac{20}{4} = 5$ Short Division $496 \div 11$ becomes <table><tr><td></td><td>4</td><td>5</td><td>r1</td></tr><tr><td>11</td><td>4</td><td>9</td><td>6</td></tr></table> Answer: $45\frac{1}{11}$ Long division $432 \div 15$ becomes <table><tr><td></td><td>2</td><td>8</td><td>r12</td></tr><tr><td>15</td><td>4</td><td>3</td><td>2</td></tr><tr><td></td><td>3</td><td>0</td><td>0</td></tr><tr><td></td><td>1</td><td>3</td><td>2</td></tr><tr><td></td><td>1</td><td>2</td><td>0</td></tr><tr><td></td><td>1</td><td>2</td><td></td></tr></table>		4	5	r1	11	4	9	6		2	8	r12	15	4	3	2		3	0	0		1	3	2		1	2	0		1	2	
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Rounding	To make a number simpler but keep its value close to what it was. If the digit to the right of the rounding digit is less than 5, round down. If the digit to the right of the rounding digit is 5 or more, round up.	74 rounded to the nearest ten is 70, because 74 is closer to 70 than 80. 152,879 rounded to the nearest thousand is 153,000.
<u>Decimals</u>		
Decimal Place	The position of a digit to the right of a decimal point .	In the number 0.372, the 7 is in the second decimal place. 0.372 rounded to two decimal places is 0.37, because the 2 tells us to round down. Careful with money - don't write £27.4, instead write £27.40
Significant Figure	The significant figures of a number are the digits which carry meaning (ie. are significant) to the size of the number. The first significant figure of a number cannot be zero. In a number with a decimal, trailing zeros are not significant.	In the number 0.00821, the first significant figure is the 8. In the number 2.740, the 0 is not a significant figure. 0.00821 rounded to 2 significant figures is 0.0082. 19357 rounded to 3 significant figures is 19400. We need to include the two zeros at the end to keep the digits in the same place value columns.
Truncation	A method of approximating a decimal number by dropping all decimal places past a certain point without rounding .	3.14159265... can be truncated to 3.1415 (note that if it had been rounded, it would become 3.1416)
Estimate	To find something close to the correct answer .	An estimate for the height of a man is 1.8 metres.
Approximation	When using approximations to estimate the solution to a calculation, round each number in the calculation to 1 significant figure. $\approx$ means 'approximately equal to'	$\frac{348 + 692}{0.526} \approx \frac{300 + 700}{0.5} = 2000$ 'Note that dividing by 0.5 is the same as multiplying by 2'
Upper and Lower Bounds	A range of values that a number could have taken before being rounded or truncated. The lower bound is the smallest value that rounds up to the number. The upper bound is the largest value that rounds down to the number, however the value cannot be 'equal to' this.	0.6 has been rounded to 1 decimal place. The lower bound is 0.55 The upper bound is 0.65

<u>Indices, powers and roots and Standard Form</u>		
Square Number	The number you get when you multiply a number by itself .	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225... $9^2 = 9 \times 9 = 81$
Square Root	The number you multiply by itself to get another number. The reverse process of squaring a number.	$\sqrt{36} = 6$ because $6 \times 6 = 36$
Cube Number	The number you get when you multiply a number by itself and itself again .	1, 8, 27, 64, 125... $2^3 = 2 \times 2 \times 2 = 8$
Cube Root	The number you multiply by itself and itself again to get another number. The reverse process of cubing a number.	$\sqrt[3]{125} = 5$ because $5 \times 5 \times 5 = 125$
Powers of...	The powers of a number are that number raised to various powers .	The powers of 3 are: $3^1 = 3$ $3^2 = 9$ $3^3 = 27$ $3^4 = 81$ etc.
Multiplication Index Law	When multiplying with the same base (number or letter), add the powers . $a^m \times a^n = a^{m+n}$	$7^5 \times 7^3 = 7^8$ $a^{12} \times a = a^{13}$ $4x^5 \times 2x^8 = 8x^{13}$
Division Index Law	When dividing with the same base (number or letter), subtract the powers . $a^m \div a^n = a^{m-n}$	$15^7 \div 15^4 = 15^3$ $x^9 \div x^2 = x^7$ $20a^{11} \div 5a^3 = 4a^8$
Brackets Index Laws	When raising a power to another power, multiply the powers together. $(a^m)^n = a^{mn}$	$(y^2)^5 = y^{10}$ $(6^3)^4 = 6^{12}$ $(5x^6)^3 = 125x^{18}$
Notable Powers	$p = p^1$ $p^0 = 1$ Anything to the power of zero is equal to 1	$8^0 = 1$ $x^0 = 1$
Negative Powers	A negative power performs the reciprocal. $a^{-m} = \frac{1}{a^m}$	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$
Standard Form	$A \times 10^n$ <i>where $1 \leq A < 10$, $n = \text{integer}$</i>	$8400 = 8.4 \times 10^3$ $0.00036 = 3.6 \times 10^{-4}$
Multiplying or Dividing with Standard Form	Multiply: Multiply the numbers and add the powers . Divide: Divide the numbers and subtract the powers .	$(1.2 \times 10^3) \times (4 \times 10^6) = 8.8 \times 10^9$ $(4.5 \times 10^5) \div (3 \times 10^2) = 1.5 \times 10^3$
Adding or Subtracting with Standard Form	Convert in to ordinary numbers, calculate and then convert back in to standard form	$2.7 \times 10^4 + 4.6 \times 10^3$ $= 27000 + 4600 = 31600$ $= 3.16 \times 10^4$

Factors, Multiples, Primes		
Multiple	The result of multiplying a number by an integer. The times tables of a number.	The first five multiples of 7 are: 7, 14, 21, 28, 35
Factor	A number that divides exactly into another number without a remainder. It is useful to write factors in pairs	The factors of 18 are: 1, 2, 3, 6, 9, 18 The factor pairs of 18 are: 1, 18 2, 9 3, 6
Lowest Common Multiple (LCM)	The smallest number that is in the times tables of each of the numbers given.	The LCM of 3, 4 and 5 is 60 because it is the smallest number in the 3, 4 and 5 times tables.
Highest Common Factor (HCF)	The biggest number that divides exactly into two or more numbers.	The HCF of 6 and 9 is 3 because it is the biggest number that divides into 6 and 9 exactly.
Prime Number	A number with exactly two factors . A number that can only be divided by itself and one. The number 1 is not prime , as it only has one factor, not two.	The first ten prime numbers are: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
Prime Factor	A factor which is a prime number.	The prime factors of 18 are: 2, 3
Product of Prime Factors	Finding out which prime numbers multiply together to make the original number. Use a prime factor tree . Also known as 'prime factorisation'.	 $36 = 2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$
HCF and LCM from a Venn Diagram	Create the Venn Diagram from the Product of Prime Factors HCF : Multiply the prime factors in the intersect together LCM: Multiply ALL the prime factors together	EXAMPLE 1) Find the Highest Common Factor (HCF) & Lowest Common Multiple (LCM) of 18 and 42. a) Start by finding the Prime Factors of each number. $18 : 2 \times 3 \times 3$ $42 : 2 \times 3 \times 7$  b) Complete a Venn diagram with the factors.  Factors both numbers share. c) The HCF is the product of the <u>shared</u> factors. HCF = $2 \times 3 = 6$ ✓ d) The LCM is the product of <u>all</u> the factors in the Venn diagram. LCM = $3 \times 2 \times 3 \times 7 = 126$ ✓
Surds		
Surd	The irrational number that is a root of a positive integer , whose value cannot be determined exactly. Surds have infinite non-recurring decimals .	$\sqrt{2}$ is a surd because it is a root which cannot be determined exactly. $\sqrt{2} = 1.41421356 \dots$ which never repeats.
Rules of Surds	$\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$ $a\sqrt{c} \pm b\sqrt{c} = (a \pm b)\sqrt{c}$ $\sqrt{a} \times \sqrt{a} = a$	$\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$ $\sqrt{\frac{25}{36}} = \frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$ $2\sqrt{5} + 7\sqrt{5} = 9\sqrt{5}$ $\sqrt{7} \times \sqrt{7} = 7$