Acle Academy

KS3 STAGE 7, NUMBER, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
Prior key stage 2 content reviewed using pre-tests and whiteboard work at the start of each topic. Numbers and the number system • Key skills: Place value, whole numbers 10, 100, 1000; multiply and divide; negative numbers; find common multiples of 2 numbers and factors of 2 numbers • Know how to find common multiples of two given numbers • Know how to find common factors of two given numbers • Recall multiplication facts to 12 × 12 and associated division facts Calculating • Key skills: mental arithmetic '-, +,x,÷ to 4 digits; written methods of mixed problems • Fluently recall multiplication facts up to 12 × 12 • Fluently apply multiplication facts when carrying out division • Know the formal written method of long multiplication • Know the formal written method of short division	Numbers and the number system • Key skills: Prime numbers up to 150, highest common factor and lowest common multiple; powers, square & square roots; cube & cube roots • **Multiples, Factors and Primes** • You will learn how to solve problems involving prime numbers, HCF and LCM • Recall prime numbers up to 50 • Know how to test if a number up to 150 is prime • Know the meaning of 'highest common factor' and 'lowest common multiple' • Recognise when a problem involves using the highest common factor of two numbers • Recognise when a problem involves using the lowest common multiple of two numbers • **Powers and roots** • You will explore powers and roots • Understand the use of notation for powers • Know the meaning of the square root symbol (√) • Use a scientific calculator to calculate powers and roots	Lowest common multiple and LCM, Highest common factor and HCF, Power, (Square and cube) root, Triangular number, Square number, Cube number, Prime number, Linear sequence, Positive number, Negative number, Integer, Numerator, Denominator, Improper fraction, Top-heavy fraction, Mixed number, Operation, Inverse, Long multiplication, Short division, Long division, Remainder, Fraction, Improper fraction, Proper fraction, Vulgar fraction, Top-heavy fraction, Percentage, Proportion, Equivalent fraction, Simplify, cancel, lowest terms, Multiplier, Increase , Decrease, Approximate (noun and verb), Round, Decimal place, Check, Solution, Answer, Estimate (noun and verb), Order of magnitude, Accurate , Accuracy, Significant

• Know the formal written method of long division • Convert between an improper fraction and a mixed number Calculating Division • Key skills: Divide a 2, 3 & 4 digit number by a 2 digit number; how to write remainders; solve problems with division Exploring fractions, decimals and percentages • Key skills: Cancelling fractions; compare and order fractions; fractions and their decimal and percentage equivalents • Understand the concept of a fraction as a proportion • Understand the concept of equivalent fractions • Understand the concept of equivalence between fractions and percentages • Order a set of decimals with a mixed number of decimal places (up to a maximum of three) • Order fractions where the denominators are multiples of each other • Order fractions where the numerator is greater than 1 • Know how to simplify a fraction by cancelling common factors Calculating fractions, decimals and percentages	• Make the connection between squares and square roots (and cubes and cube roots) • Identify the first 10 triangular numbers • Recall the first 15 square numbers • Recall the first 5 cube numbers • Use linear number patterns to solve problems Counting and comparing • Key skills: Place order for negative numbers, mixed positive and negative numbers; ordering fractions and mixed fractions, decimals and percentages • **Ordering and comparing numbers** • You will investigate different ways of writing numbers and explore how they compare in size • Place a set of negative numbers in order • Place a set of mixed positive and negative numbers in order • Identify a common denominator that can be used to order a set of fractions • Order fractions where the denominators are not multiples of each other • Order a set of numbers including a mixture of fractions, decimals and negative numbers • Use inequality symbols to compare numbers • Make correct use of the symbols = and ≠ Calculating	figure, Cancel, Inverse, Operation Highlighted words **MUST** be explicitly taught, defined and recorded in student books as they are first met. Other listed words may be introduced verbally or written in a similar format.

• Key skills: Add and subtract fractions with different denominators; Add and subtract mixed numbers; multiply proper fractions by a proper fraction and a whole number; Multiply by decimals -tenth and hundredth; calculate percentages of a quantity • Add and subtract fractions with different denominators • Add and subtract mixed numbers with different denominators • Multiply a proper fraction by a proper fraction • Divide a proper fraction by a whole number • Simplify the answer to a calculation when appropriate • Use non-calculator methods to find a percentage of an amount • Convert between fractions, decimals and percentages Checking approximating and estimating • Key skills: Approximate any number by rounding; use estimating to check a calculation and predict a solution • Understand that negative numbers are numbers less than zero • Approximate any number by rounding to the nearest 10, 100 or 1000, 10 000, 100 000 or 1 000 000	• Key skills: Use place value to multiply and divide by a decimal, order of calculation; use of brackets • **Efficient calculations** • You will practice your multiplication and division skills • Be fluent at multiplying a three-digit or a two-digit number by a two-digit number • Be fluent when using the method of short division • **Place value** • You will calculate accurately with decimals • Use knowledge of place value to multiply with decimals • Use knowledge of place value to divide a decimal • Use knowledge of place value to divide by a decimal • Use knowledge of inverse operations when dividing with decimals • **Order of operations** • You will complete calculations by applying the correct order of operations • Know the order of operations for the four operations • Use brackets in problem involving the order of operations • Understand and apply the fact that addition and subtraction have equal priority	

• Approximate any number with one or two decimal places by rounding to the nearest whole number • Approximate any number with two decimal places by rounding to the one decimal place • Simplify a fraction by cancelling common factors	• Understand and apply the fact that multiplication and division have equal priority Exploring fractions, decimals and percentages • Key skills: explore links between fractions and percentages; write fractions as their lowest term; write percentages as fractions • **Fractions and percentages** • You will explore links between fractions and percentages • Write one quantity as a fraction of another where the fraction is less than 1 • Write one quantity as a fraction of another where the fraction is greater than 1 • Write a fraction in its lowest terms by cancelling common factors • Convert between mixed numbers and top-heavy fractions • Understand that a percentage means 'number of parts per hundred' • Write a percentage as a fraction • Write a quantity as a percentage of another Calculating fractions, decimals and percentages • Key skills: Use calculators to find the percentage of problems; compare 2 quantities using percentages; calculate percentages in problems; add, subtract,	

	divide and multiply fractions, improper fractions and mixed numbers; • **<u>Percentages 7BAM4</u>** • You will learn to calculate with percentages • Use calculators to find a percentage of an amount using multiplicative methods • Identify the multiplier for a percentage increase or decrease • Use calculators to increase (decrease) an amount by a percentage using multiplicative methods • Compare two quantities using percentages • Know that percentage change = actual change ÷ original amount • Calculate the percentage change in a given situation, including percentage increase / decrease • **<u>Fractions 7BAM5</u>** • You will develop your understanding of calculating with fractions • Apply addition to proper fractions, improper fractions and mixed numbers • Apply subtraction to proper fractions, improper fractions and mixed numbers • Multiply proper and improper fractions • Multiply mixed numbers • Divide a proper fraction by a proper fraction • Apply division to improper fractions and mixed numbers	

	Checking, approximating and estimating • Key skills: Rounding up and down; identify first significant number; use estimation to predict; use cancellation to simplify calculations' use inverse operations to check solutions • **Checking calculations** • You will explore ways of approximating numbers and checking answers • Approximate by rounding to any number of decimal places • Know how to identify the first significant figure in any number • Approximate by rounding to the first significant figure in any number • Understand estimating as the process of finding a rough value of an answer or calculation • Use estimation to predict the order of magnitude of the solution to a (decimal) calculation • Estimate calculations by rounding numbers to one significant figure • Use cancellation to simplify calculations • Use inverse operations to check solutions to calculations	

Challenge and Support:	World wide learning/ links to 21st century:	Cultural capital/ Industry/ Enrichment:

• When using Eratosthenes sieve to identify prime numbers, why is there no need to go further than the multiples of 7? If this method was extended to test prime numbers up to 200, how far would you need to go? Convince me.
• Kenny says '20 is a square number because $10^2 = 20$'. Explain why Kenny is wrong. Kenny is partially correct. How could he change his statement so that it is fully correct?
• Always / Sometimes / Never: The lowest common multiple of two numbers is found by multiplying the two numbers together.
• Jenny writes down 0.400 > 0.58. Kenny writes down 0.400 < 0.58. Who do you agree with? Explain your answer.
• Find a fraction which is greater than 3/5 and less than 7/8. And another. And another …
• Convince me that -15 < -3
• Jenny says that 2 + 3 × 5 = 25. Kenny says that 2 + 3 × 5 = 17. Who is correct? How do you know?
• Find missing digits in otherwise completed long multiplication / short division calculations
• Show me a calculation that is connected to 14 × 26 = 364. And another. And another …
• Jenny says '1/10 is the same as proportion as 10% so 1/5 is the same proportion as 5%.' What do you think? Why?
	• Interior designers use square units to work out the area of floors to be tiled or painted. Then they work out how much paint to buy and use the size of tiles to work out how many are needed.
	• Everyone uses numbers on a daily basis often without really thinking about it, shopping, cooking, working out bills, paying for transport and measuring all rely on a good understanding of number and calculation skills.
	• Food technologists analyse the contents of different raw a prepared foods to work out what they contain and how much there is of each ingredient. They use decimal fractions to give the quantities correct to tenths, hundredths or even smaller parts of a gram.
	• Percentages are often used in daily life to express fractions. For example you might see an advert claiming 76% of pets prefer a particular brand of food. Sale prices, reductions, discounts and interest rates are usually given a percentages.
	• Nurses and other medical staff work with fractions, decimals and percentages. They calculate medical doses, convert between measuring systems and set patient's drips. It is essential these calculations are accurate.
		NRICH website – access current articles and enrichment activities. Search tool: secondary, age 11-14, Number
		
		https://nrich.maths.org/public/topic.php?group_id=10
		
		• NRICH provides thousands of free online mathematics resources for ages 3 to 18 - completely free and available to all via their website (nrich.maths.org/). These resources aim to:
		  ○ Enrich and enhance the experience of the mathematics curriculum for all learners
		  ○ Develop mathematical thinking and problem-solving skills

• What is the same and what is different: 1/10 and 10% … 1/5 and 20%? • Show this fraction as part of a square / rectangle / number line / … • Show me a proper (improper) fraction. And another. And another. • Show me a mixed number fraction. And another. And another. • Jenny thinks that you can only multiply fractions if they have the same common denominator. Do you agree with Jenny? Explain your answer. • Benny thinks that you can only divide fractions if they have the same common denominator. Do you agree with Jenny? Explain. • Kenny thinks that $\frac{6}{10} \div \frac{3}{2} = \frac{2}{5}$.Do you agree with Kenny? Explain. • Always/Sometimes/Never: To reverse an increase of x%, you decrease by x% • Lenny calculates the % increase of £6 to £8 as 25%. Do you agree with Lenny? Explain your answer. • Convince me that 39 652 rounds to 40 000 to one significant figure • Convince me that 0.6427 does <u>not</u> round to 1 to one significant figure • What is wrong: $\frac{11 \times 28.2}{0.54} \approx \frac{10 \times 30}{0.5} = 150.$ How can you correct it?	• When you read that 34000 people attended a football match the actual number is likely to be slightly less or slightly more. When you work out an estimate for how much you spent over a weekend or look at an object and guess it is 2.5m long or say “I like about 3km from school you are using estimating and approximating skills.	○ Offer challenging, inspiring and engaging activities • Decades Day – Runaround game (1980s).
Historical, Social, Moral, Spiritual, Cultural context:	**Cross curricular links/ literacy/numeracy:**	**Common misconceptions:**

• Students conducting an opinion survey on a moral issue. • Students having an awareness of sexist or racist, stereotypical bias in materials - e.g. for worksheets to include female builders, male secretaries etc. • Awareness of possible causes of bias in data collection (e.g. race, age, gender). • Students investigating different number sequences and where they occur in the real world. • Students considering the development of pattern in different cultures. • Students developing an understanding of Maths in nature; the golden ratio and Fibonacci patterns. • Students developing awe and wonderment in the size of the universe and looking at cells and inner space (powers of 10). • Allowing discussion and debate on the use and abuse of statistics in the media. • Allowing discussion on the cultural and historical roots of Mathematics e.g. ancient civilizations such as the Egyptians and Greeks. • Students learning how mathematics is relevant in industry and future careers. • Students learning how key areas of Maths are used in running a household and developing personal financial independence. • Probability, gambling and the online gaming industry promoting moral debate. • Interest rates, pay day loans and the banking industry promoting moral debate and a sense of personal financial responsibility.	• It is important that students understand accepted ways to represent numbers dependent on the context. For example, we use fractions, decimals and percentages daily, and each form has its benefits for a given use. But students also need to be able to work with indices, standard form, rounded values, etc, and they need to understand the limitations of these. Which format is chosen should follow common conventions such as those in the sciences, design and technology, and so on.	• Many pupils believe that 1 is a prime number – a misconception which can arise if the definition is taken as ‘a number which is divisible by itself and 1’ • A common misconception is to believe that $5^3 = 5 \times 3 = 15$ • See pedagogical note about the square root symbol too • Some pupils may believe that 0.400 is greater than 0.58 • Pupils may believe, incorrectly, that: • A fraction with a larger denominator is a larger fraction • A fraction with a larger numerator is a larger fraction • A fraction involving larger numbers is a larger fraction • Some pupils may believe that -6 is greater than -3. For this reason ensure

• Students to have the ability to use exchange rates for foreign travel.		pupils avoid saying ‘bigger than’ • The use of BIDMAS (or BODMAS) can imply that division takes priority over multiplication, and that addition takes priority over subtraction. This can result in incorrect calculations. • Pupils may incorrectly apply place value when dividing by a decimal for example by making the answer 10 times bigger when it should be 10 times smaller. • Some pupils may have inefficient methods for multiplying and dividing numbers. • A fraction can be visualised as divisions of a shape (especially a circle) but some pupils may not recognise that these divisions must be equal in size, or that they can be divisions of any shape. • Pupils may not make the connection that a

		percentage is a different way of describing a proportion • Pupils may think that it is not possible to have a percentage greater than 100% • Some pupils may think that you simply can simply add/subtract the whole number part of mixed numbers and add/subtract the fractional art of mixed numbers when adding/subtracting mixed numbers, e.g. $3\frac{1}{3}$ - $2\frac{1}{2}$ = $1\frac{-1}{6}$ • Some pupils may make multiplying fractions over complicated by applying the same process for adding and subtracting of finding common denominators. • Some pupils may think the multiplier for, say, a 20% decrease is 0.2 rather than 0.8 • Some pupils may think that percentage change =

		actual change ÷ new amount • Some pupils may truncate instead of round • Some pupils may round down at the half way point, rather than round up. • Some pupils may think that a number between 0 and 1 rounds to 0 or 1 to one significant figure • Some pupils may divide by 2 when the denominator of an estimated calculation is 0.5

Assessment timeline:

- Topic test assessments (BAM tests) are conducted at the end of each topic. These are roughly after 2 weeks per topic, but this may vary.
- Pre-checks are conducted at the start of the topic to test student prior knowledge. This informs lesson planning and delivery.
- Tracking assessments are conducted once a term with end of year formal exams, for reporting and checking cumulative knowledge.
- Testing data leads to discussions about setting, intervention groups and individual in-class intervention.
- All students have access to a wide range of resources to develop their understanding.

Home learning

- Homework is set weekly for each group. This will often be via interactive websites with immediate feedback and support.
- Teachers have the autonomy to use whichever resource they wish within the criteria set for the topic.
- Students have access to lots of resources at home, including: Kerboodle, MyMaths, Mathswatch, PiXL Maths APP, PiXL Tmes Table App.

Feedback
• Feedback is given after each topic test, tracking assessment and end of year exams. After tracking and end of year exams, this will include “Formative Marking” sheets which give feedback question by question to help support the students with priorities for further work.

Length of unit (duration indicated in lessons)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Unit:																													