Acle Academy

KS3 STAGE 8, 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: Know the meaning of a prime number, recall prime numbers up to 50 • Understand the use of notation for powers • Know how to round to the nearest whole number, 10, 100, 1000 and to decimal places • Multiply and divide numbers by powers of 10 • Know how to identify the first significant figure in any number and approximate by rounding to the first significant figure in any number. Calculating • Key skills: Fluently recall and apply multiplication facts up to 12 × 12 • Know and use column addition and subtraction • Know the formal written method of long multiplication • Know the formal written method of short division • Apply the four operations with fractions and mixed numbers	Numbers and the number system Key skills: **Prime Factors** • Recall prime numbers up to 100 • Understand the meaning of prime factor • Write a number as a product of its prime factors • Use a Venn diagram to sort information • Use prime factorisations to find the highest common factor of two numbers • Use prime factorisations to find the lowest common multiple of two numbers **Standard Form** • You will learn how scientists write very large or very small numbers • Know how to identify any significant figure in any number • Approximate by rounding to any significant figure in any number • Write a large (small) number in standard form • Interpret a large (small) number written in standard form	• Prime, Prime factor, Prime factorisation, Product, Venn diagram, Highest common factor, Lowest common multiple, Standard form and Significant figure. • Negative number, Directed number, Improper fraction, Top-heavy fraction, Mixed number, Operation, Inverse, Long multiplication, Short division, Power, Indices and Roots. • Fraction, Mixed number, Top-heavy fraction, Percentage, Decimal, Proportion, Terminating, Recurring, Simplify and Cancel

• Convert between an improper fraction and a mixed number • Know the order of operations for the four operations and brackets Exploring fractions, decimals and percentages • Key skills: Understand that fractions, decimals and percentages are different ways of representing the same proportion, Convert between mixed numbers and top-heavy fractions and write one quantity as a fraction of another. Calculating fractions, decimals and percentages • Key skills: Apply the four operations to proper fractions, improper fractions and mixed numbers • 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 • Know that percentage change = actual change ÷ original amount	Calculating Key skills: **Negative Numbers** • Add or subtract from a negative number. • Add (or subtract) a negative number to (from) a positive number. • Add (or subtract) a negative number to (from) a negative number. • Multiply with negative numbers. • Divide with negative numbers. • Know how to square (or cube) a negative number. • Substitute negative numbers into expressions. • Enter negative numbers into a calculator. • Use a scientific calculator to calculate with fractions, both positive and negative. • Interpret a calculator display when working with negative numbers. **Order of Operations** • Understand how to use the order of operations including powers. • Understand how to use the order of operations including roots.	• Proper fraction, improper fraction, mixed number, Simplify, cancel, lowest terms, Percent, percentage, Percentage change, Original amount, Multiplier, (Simple) interest and Exact 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.

•	Exploring fractions, decimals and percentages Key Skills: **<u>Equivalent fractions, decimals and percentages</u>** • Identify if a fraction is terminating or recurring • Recall some decimal and fraction equivalents (e.g. tenths, fifths, eighths) • Write a decimal as a fraction • Write a fraction in its lowest terms by cancelling common factors • Identify when a fraction can be scaled to tenths or hundredths • Convert a fraction to a decimal by scaling (when possible) • Use a calculator to change any fraction to a decimal • Write a decimal as a percentage • Write a fraction as a percentage Calculating fractions, decimals and percentages Key skills: **<u>Fractions and Percentages</u>** • Recognise when a fraction (percentage) should be interpreted as a number • Recognise when a fraction (percentage) should be interpreted as an operator	

	• Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100% • Use calculators to increase an amount by a percentage greater than 100% • Solve problems involving percentage change • Solve original value problems when working with percentages • Solve financial problems including simple interest • Understand the meaning of giving an exact solution • Solve problems that require exact calculation with fractions	
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?	• 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.	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

• 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? • 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	• 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. • 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.	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 ○ Offer challenging, inspiring and engaging activities • Decades Day – Runaround game (1980s).

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?		
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.	• 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	• 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 $5^3 = 5 \times 3 = 15$

• 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. • Students to have the ability to use exchange rates for foreign travel.	those in the sciences, design and technology, and so on.	• 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 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:																													