Acle Academy

YEAR 10, FOUNDATION 3 YEAR GCSE, NUMBER, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:
BASIC NUMBER • Order positive and negative integers • Use the symbols =, ≠, <, >, ≤, ≥ • Apply the four operations, including formal written methods, to integers – both positive and negative • Understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals) • Recognise and use relationships between operations including inverse operations (e.g. cancellation to simplify calculations and expressions) • Estimate answers • Check calculations using approximation and estimation, including answers obtained using technology **FACTORS AND MULTIPLES** • Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product	**STANDARD FORM** • Understand and use place value (e.g. when working with very large or very small numbers) • Calculate with and interpret standard form $Ax10^{n}$ where 1≤A<10 and `n` is an integer. **INDICES** • Use positive integer powers and associated real roots (square, cube and higher) • Recognise powers of 2, 3, 4, 5 • Calculate with roots and with integer indices	Standard form, integer, power, large, small, numbers, index number, indices, square, cube, roots 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.

notation, and the unique factorisation theorem • Apply systematic listing strategies and the use of the product rule for counting **BASIC FRACTIONS** • Order positive and negative fractions • Apply the four operations, including formal written methods, to simple fractions (proper and improper) and mixed numbers - both positive and negative • Calculate exactly with fractions **BASIC DECIMALS** • Order positive and negative decimals • Apply the four operations, including formal written methods, to decimals – both positive and negative • Understand and use place value (e.g. when calculating with decimals) • Work interchangeably with terminating decimals and their corresponding fractions **ROUNDING** • Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)		

• Use inequality notation to specify simple error intervals due to truncation or rounding • Apply and interpret limits of accuracy **BASIC PERCENTAGES** • Define percentage as 'number of parts per hundred' • Interpret percentages and percentage changes as a fraction or a decimal and interpret these multiplicatively • Express one quantity as a percentage of another • Compare two quantities using percentages • Work with percentages greater than 100% • Interpret fractions and percentages as operators		
Challenge and Support:	**World wide learning/ links to 21st century:**	**Cultural capital/ Industry/ Enrichment:**
Number Structure and calculation 1. order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, ≥ 2. apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value	• Mathematics needs to be able to describe very small quantities, such as lengths measured in nanometres (0.000000001 m). Without this ability, researchers could not analyse microscopic organisms like viruses. • Financial advisors and investors have to perform calculations involving powers and roots to work out the value of investments. They may use computer technology (apps) to work out	Search Algebra for all ages NRICH website – access current articles and enrichment activities. • NRICH provides thousands of free online mathematics resources for ages

(e.g. when working with very large or very small numbers, and when calculating with decimals) 3. recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions; use conventional notation for priority of operations, including brackets, powers, roots and reciprocals 4. use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem 5. apply systematic listing strategies **including use of the product rule for counting** 6. use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5***;* estimate powers and roots of any given positive number** 7. calculate with roots, and with integer **and fractional** indices 8. calculate exactly with fractions, **surds** and multiples of π**; simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators** 9. calculate with and interpret standard form *A* x 10^n, where 1 ≤ *A* < 10 and *n* is an integer.	different options to help their clients invest their money wisely.	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 • Problem solving opportunities – Applied Mathematics. • Challenge problems. • Extension work. • Assessment sections in texts

Fractions, decimals and percentages 10. work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 or $\frac{3}{8}$)**; change recurring decimals into their corresponding fractions and vice versa** 11. identify and work with fractions in ratio problems 12. interpret fractions and percentages as operators. Measures and accuracy 13. use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate 14. estimate answers; check calculations using approximation and estimation, including answers obtained using technology 15. round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding 16. apply and interpret limits of accuracy**, including upper and lower bounds**		

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	• 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 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

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.		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 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.

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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
Unit:																													