Acle Academy

YEAR 11, FOUNDATION 3 YEAR GCSE, RATIO, PROPORTION AND RATES OF CHANGE, MATHS

Rationale and Context of Unit:	Core curriculum content:	Tier 2 & Tier 3 vocabulary explicitly taught:

CALCULATING WITH PERCENTAGES
• Solve problems involving percentage change, including:
  • percentage increase / decrease problems
  • original value problems
  • simple interest, including in financial mathematics
	DIRECT AND INVERSE PROPORTION
	• Solve problems involving direct and inverse proportion, including graphical and algebraic representations
	• Understand that x is inversely proportional to y is equivalent to x is proportional to $\frac{1}{y}$
	• Interpret equations that describe direct and inverse proportion
	• Recognise and interpret graphs that illustrate direct and inverse proportion
	
	GROWTH AND DECAY
	• Set up, solve and interpret the answers in growth and decay problems, including compound interest
		Proportion, direct, inverse, notation, interpret, growth, decay, percentage, compound interest.
		
		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.

Challenge and Support:	**World wide learning/ links to 21st century:**	**Cultural capital/ Industry/ Enrichment:**
Ratio, proportion and rates of change 1. change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts	• Proportional reasoning is very common in daily life. You use proportional reasoning when you mix ingredients for a recipe, convert between units of measurement or work out costs per unit. It is an area of maths where you can use many different methods to solve particular problems.	Search Algebra for all ages NRICH website – access current articles and enrichment activities.

2. use scale factors, scale diagrams and maps
3. express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1
4. use ratio notation, including reduction to simplest form
5. divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
6. express a multiplicative relationship between two quantities as a ratio or a fraction
7. understand and use proportion as equality of ratios
8. relate ratios to fractions and to linear functions
9. 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%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics
	• Many real-life situations involve growth (increase) and decay (decrease) as time passes. Population numbers, growth of bacteria, disease infection rates, world temperature patterns and the value of money or possessions may all increase or decrease over time.	• 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
		  ○ Offer challenging, inspiring and engaging activities
		• Problem solving opportunities – Applied Mathematics.
		• Challenge problems.
		• Extension work.
		• Assessment sections in texts

10. solve problems involving direct and inverse proportion, including graphical and algebraic representations 11. use compound units such as speed, rates of pay, unit pricing, density and pressure 12. compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors 9 13. understand that *X* is inversely proportional to *Y* is equivalent to *X* is proportional to $\frac{1}{Y}$; **construct and** interpret equations that describe direct and inverse proportion 14. interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion 15. **interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts** 16. set up, solve and interpret the answers in growth and decay problems, including compound interest **and work with general iterative processes.**		

Historical, Social, Moral, Spiritual, Cultural context:	Cross curricular links/ literacy/numeracy:	Common misconceptions:
• Ratio is used in many different real life situations. Converting between different currencies, working out which packet of crisps is the best value, mixing cement and scaling up a recipe all involve using ratios	• Science: science can provide the context for many basic ratio problems such as concentration of substances within a chemical compound. • Geography: **statistics** on populations in different parts of the world at different periods, given as ratios and categorised according to the requirements/limitations of the data. • Art: see **proportion wheel** for creating art cards of different sizes by reducing pictures in different proportions. • Literacy: Interpretation of written problems with conversion between these types of problems to pictorial and number representation. • Correct use of specialised vocabulary.	• Some pupils may think that a:b always means part:part • Some pupils may try to simplify a ratio without first ensuring that the units of each part are the same • Many pupils will want to identify an additive relationship between two quantities that are in proportion and apply this to other quantities in order to find missing amounts

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.

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:																													