Overview of Proportional Reasoning and Multiplicative Thinking

	Found-ation	Lower Primary	Middle Primary	Upper Primary	Lower Secondary	Middle Secondary
Fractions		• identify halves and quarters of an object	• make halves, thirds and quarters of objects and sets • compare, add and subtract fractions using linear or area models • use equivalent fractions • use half & quarter turns	• put fractions on number line • add, subtract and multiply fractions • link ÷ 8 with ×1/8, etc. • quantify chance	• divide by fractions • convert between fractions, decimals, ratios and percentages • use fractions for probabilities	• recognise rational numbers as a subset of the real numbers • decimal expansion of rational and irrational numbers • rationalise surd fractions
Multiplication		• skip count by 2s, 5s, 10s	• multiplication as repeated addition • learn × tables • build new facts from known facts and number properties • use array model	• multiply by single digits, tens, powers of ten • multiplication as enlargement and reduction • units for area	• multiply by integers	• calculations with powers and exponents and scientific notation
Division			• recognise situations of partition and quotition division • divide by single digit numbers using multiplication facts	• interpret remainders in context • divide by single digit numbers • can't divide by zero		• divide by decimals and two digit whole numbers
Ratios				• use ratios to describe relative sizes • equivalent ratios	• link ratios, fractions, decimals and percents	• solve ratio problems with any numbers • solve triangles with trigonometry • use similar triangles
Rates				• use rates (e.g. speed) with whole numbers in problem contexts	• use more complex or abstract rates (e.g. L/100 km, slope)	• solve rate problems with any numbers in many contexts
Percentages				• recognise percent as fraction out of 100	• estimate and calculate with percent • know common %	• solve problems involving markups, discounts, percent errors • to add percent is to multiply, e.g. +26% is ×1.26 • recognise constant % change as exponential
	Found-ation	**Lower Primary**	**Middle Primary**	**Upper Primary**	**Lower Secondary**	**Middle Secondary**