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| **UNIT 11: Ratio and Proportion**  |

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**SPECIFICATION REFERENCES**

N11 identify and work with fractions in ratio problems

N13 use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate

R1 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

R2 use scale factors, scale diagrams and maps

R3 express one quantity as a fraction of another

R4 use ratio notation, including reduction to simplest form

R5 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)

R6 express a multiplicative relationship between two quantities as a ratio or a fraction

R7 understand and use proportion as equality of ratios

R8 relate ratios to fractions and to linear functions

R10 solve problems involving direct and inverse proportion, including graphical and algebraic representations

R12 compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors

R13 understand that *X* is inversely proportional to *Y* is equivalent to *X* is proportional to ; interpret equations that describe direct and inverse proportion

R14 interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion

**PRIOR KNOWLEDGE**

Students should know the four operations of number.

Students should have a basic understanding of fractions as being ‘parts of a whole’.

**KEYWORDS**

Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare

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| **11a. Ratio**(N11, N13, R1, R2, R3, R4, R5, R6, R8, R12) | **Teaching time**3-5 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Understand and express the division of a quantity into a of number parts as a ratio;
* Write ratios in their simplest form;
* Write/interpret a ratio to describe a situation;
* Share a quantity in a given ratio including three-part ratios;
* Solve a ratio problem in context:
* use a ratio to find one quantity when the other is known;
* use a ratio to compare a scale model to a real-life object;
* use a ratio to convert between measures and currencies;
* problems involving mixing, e.g. paint colours, cement and drawn conclusions;
* Compare ratios;
* Write ratios in form 1 : *m* or *m* : 1;
* Write a ratio as a fraction;
* Write a ratio as a linear function;
* Write lengths, areas and volumes of two shapes as ratios in simplest form;
* Express a multiplicative relationship between two quantities as a ratio or a fraction.

**POSSIBLE SUCCESS CRITERIA**

Write a ratio to describe a situation such as 1 blue for every 2 red, or 3 adults for every 10 children.

Recognise that two paints mixed red to yellow 5 : 4 and 20 : 16 are the same colour.

Express the statement ‘There are twice as many girls as boys’ as the ratio 2 : 1 or the linear function *y* = 2*x*, where *x* is the number of boys and *y* is the number of girls.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Problems involving sharing in a ratio that include percentages rather than specific numbers, such as: In a youth club the ratio of the number of boys to the number of girls is 3 : 2. 30% of the boys are under the age of 14, and 60% of the girls are under the age of 14. What percentage of the youth club is under the age of 14?

**COMMON MISCONCEPTIONS**

Students find three-part ratios difficult.

Using a ratio to find one quantity when the other is known often results in students ‘sharing’ the known amount.

**NOTES**

Emphasise the importance of reading the question carefully.

Include ratios with decimals 0.2 : 1.

Converting imperial units to imperial units aren’t specifically in the programme of study, but still useful and provide a good context for multiplicative reasoning.

It is also useful generally for students to know rough metric equivalents of commonly used imperial measures, such as pounds, feet, miles and pints.