

# Year 6 Unit 10: Proportion problems (2 weeks)

## Representing ratio and proportion

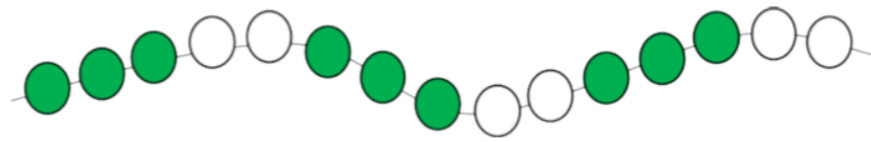
It is important that pupils develop a conceptual understanding of ratio and proportion so that calculating with these is not simply a procedure. Cuisenaire rods are a particularly useful resource in showing the 'for every' relationship. Cubes and counters along with representations used for fractions are useful in showing proportion. Bar models are used throughout the unit to represent problems and support pupils in seeing connections between parts, knowns and unknowns.

## Ratio or proportion?

This NRICH [article](#) explores the connections between ratio and proportion including some useful feedback points.

### Before you start...

- How secure are pupils in using fractions and percentages?
- How familiar are pupils with representing a range of problems pictorially, such as with bar models?



The whole is 15.  $\frac{9}{15}$  of the beads are green.  $\frac{6}{15}$  of the beads are white.  $\frac{3}{5}$  of the beads are green and  $\frac{2}{5}$  of the beads are white.

For every three green beads there are two white beads. The ratio of green to white is 3:2.

### Makes 2 bracelets

- 50 cm elastic
- 20 blue beads
- 10 red beads
- 10 purple beads
- 6 star beads

What would be needed to make 12 bracelets?

## Understanding proportion and ratio

- L1 Use fractions to express proportion
- L2 Use ratio to express the relationship between two quantities

Pupils develop an understanding of proportion by applying fraction knowledge to describing parts of sets. The focus here is on describing fractional parts of a given whole, before exploring how this is affected if the whole is larger. Exploring proportion as fractions allows opportunities to simplify fractions and consolidate this skill. Lesson 2 introduces and explores ratio using the same patterns of lesson 1 to support pupils in making links between ratio and proportion. The term 'for every' is key in developing understanding of the relationship between two quantities and this can be linked with the formal a:b notation for ratio. The focus of both lessons should be on pupils verbally describing relationships and using the new terminology.

? What key language structures will pupils use and how will you model this?

## Using scale factor for shape and number

- L3&4 Solve problems involving scale factor of shapes
- L5&6 Solve problems involving scale factor of number

Pupils apply their understanding of ratio and proportion to scaling problems, first with shape and then with number. Through exploring similar shapes, pupils explore enlarging by scale factors including fractional scale factors. They make connections with this and multiplicative relationships. When pupils solve problems involving scale factors of number, they explore contexts including scaling recipes and other instructions e.g. a recipe that makes 2 cakes, how much is needed for 10 cakes. In lesson 6, the focus is relationships which are not multiplicative e.g. using the above instructions to make nine bracelets, meaning multi-step procedures are needed to solve problems. You may wish to adapt this lesson to consolidate learning in lesson 5.

? What contexts might you use in lesson 5 and 6 that pupils are familiar with?

Lesson 10 is a suggested consolidation lesson. Consider where this is best placed to support the needs of pupils.

For every two old songs, five new songs are played. How many old songs are played in 56 songs?



## Solving proportion problems

- L7 Solve problems involving ratio
- L8&9 Solve problems involving unequal sharing

Pupils apply their understanding of ratio and proportion to a range of problem-solving contexts. In lesson 7, pupils focus on ratio by finding proportional parts, or finding a whole if the parts are known. Fraction understanding is applied in lesson 8 and 9, to solve a range of problems involving unequal sharing, including those similar in style to KS2 assessments. Connections are made between ratio and proportion to describe relationships between quantities. Throughout these lessons, encourage pupils to represent problems pictorially (e.g. through bar models) to better understand what the problem requires them to do. Take time to model your thinking aloud using representations to support pupils' understanding.