Geometric similarity
Overview of unit

Investigation	Key Mathematical Ideas	Key Technology Experiences
Introduction Welcome to the Graphics Department (15 minutes)	→ Context of the unit: *London Trending* is a digital magazine that is available on many devices. These devices all have different display sizes, hence the need to decide whether a variety of graphics are mathematically similar to each other.	
Investigation 1 Mathematical Similarity (70 minutes)	→ Understanding mathematical similarity helps us communicate with others about key features of things in the world, such as photographs. → The informal definition of mathematical similarity is exactly the same shape, not necessarily the same size. → *Shape* characterises one type of figure (e.g., parallelogram) as opposed to parallelogram versus triangle.	Translate, rotate, and enlarge shapes, show/hide gridlines and shapes.
Investigation 2 On the Grid (65 minutes)	→ Context: The Graphics Department needs to put the same image of the London Eye on several devices (e.g., tablet, computer, phone). → The heights and the widths of mathematically similar rectangles are related by a common multiplier.	Play/pause animation, rotate and translate shapes, and use grid as measurement tool.

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Investigation 3 Scale Factor (100 minutes)	→ Context: The Graphics Department is using a software program that makes enlargements by using scale factor. → Scale factor is the multiplier by which the lengths in the original shape result in the enlargement. → Scale factors greater than 1 result in copies larger than the original; scale factors less than 1 (but greater than 0) result in copies smaller than the original. → Congruence is a special case of similarity, with a scale factor of 1.	Measure sides, colour sides, use scale factor slider, use measurement table, and use snapshot.
Investigation 4 Broken Scale Factor (60 minutes)	→ Context: One of our artists, Eileen, found free software without a scale factor slider but with two strange other sliders. She says that the software can still be used to create mathematically similar copies. → Scaling a shape so that it creates a mathematically similar copy requires that all lengths of the shape be scaled by the same number.	Use sliders and measure sides.
Investigation 5 More Than Lengths of Sides (50 minutes)	→ Context: *London Trending* have a new advertising client whose logo is embedded in a parallelogram. → Equal corresponding angles are necessary for similarity.	Rotate and translate shapes, measure angles, and use angle slider.

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Investigation 6 Ratios (65 minutes)	→ Context: The Graphics Department received directions to make pairs of images in the ratio of 3 to 1. → A ratio shows the multiplicative relationship between two numbers or quantities. → Ratios can be simplified in the same way as fractions. → Two ratios that simplify to the same unitary fraction are equivalent. → *Between* ratios show the relationship between corresponding sides in similar shapes.	Label vertices, colour sides, measure side lengths, and possibly use ratio checker.
Investigation 7 Between Ratios and Within Ratios (95 minutes)	Context: Investigating an animation comparable to the animation starter from Investigation 2: On the Grid. *Within* ratios and *between* ratios are two different ways to compare sides in similar rectangles. *Within* ratios compare sides of the same shape. *Within* ratios are unchanging across a family of similar shapes (i.e., the height:width ratio in a family of rectangles).	Translate and rotate shapes, play/pause animation, use ratio checker, and measure side lengths.
Investigation 8 What Changes and What Stays the Same? (60 minutes)	For a set of similar shapes, the shape and corresponding angles are unchanging. For two similar shapes, the ratios of corresponding sides, the scale factor and the ratios of lengths within a shape are unchanging. For three or more similar shapes, the ratio of lengths within a shape is unchanging, and the scale factor and ratios of corresponding sides vary together.	Translate vertices, translate and rotate shapes, measure sides and angles.
Investigation 9 Build Your Own (40 minutes)	→ Context: *London Trending* needs a new front page. → Using similar shapes can help pupils make a more aesthetically pleasing cover.	Translate and enlarge shapes.

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Investigation 10 Supplementary Activity: So the Angles in Triangles are Important? (55 minutes)	→ Context: The graphics department are keen to know if there is a quicker way using their angle measuring software to check whether triangles are similar or not. → When the three angles in any triangles are the same, then the triangles must be similar. .	Measure angles and sides, use measurement table and snapshot.
Investigation 11 Supplementary Activity: Positioning Images Precisely (55 minutes)	→ Pupils learn about centre of enlargement. → Context: In positioning images on a page, using a coordinate system enables the exact position of the copy to be predicted. → When shapes are enlarged about the origin, there is a multiplicative relationship between the coordinates of the original and the corresponding coordinates of the enlargement. → When shapes are enlarged about a centre that is not the origin, there is a 'two stage' rule that connects the coordinates of the original with the corresponding coordinates of the enlargement.	Play/pause animation, use scale factor slider, and use show/hide.
Investigation 12 Supplementary Activity: Within Ratios in Right-Angled Triangles (61 minutes)	→ This investigation introduces pupils to the foundations of trigonometry. → Within ratios in right-angled triangles are commonly used in mathematics within problem solving. → The most common within ratios are called trigonometric or 'trig' ratios and are used to calculate lengths of missing sides or angles.	Use angle sliders, and measure angles and sides.