Road Map for Similarity

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┌──────────────┐   ┌──────────────────┐
│  Proportions │   │ Congruent triangles │
└──────────────┘   └──────────────────┘
                    │
        ┌───────────────────┐
        │  Similar triangles │
        └───────────────────┘
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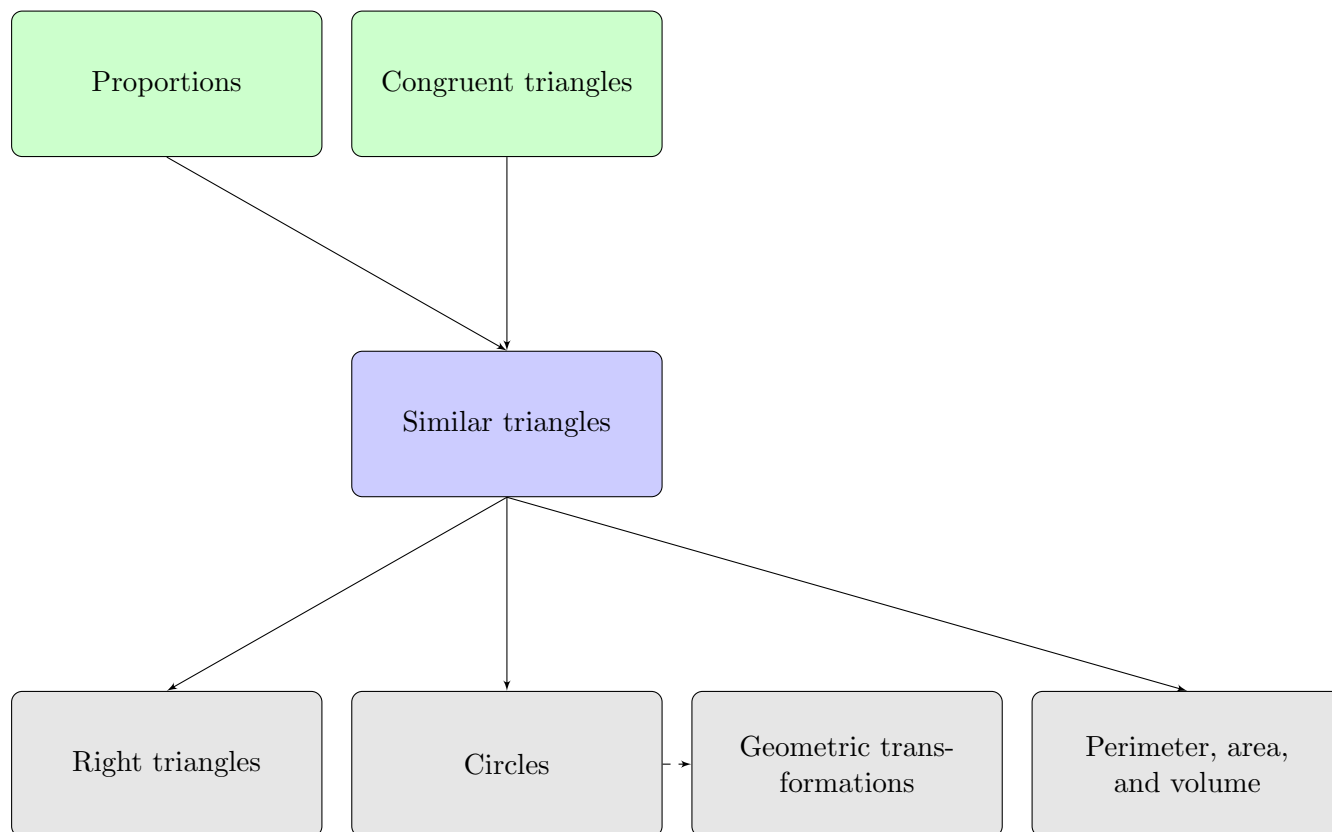| Right triangles | Circles | Geometric transformations | Perimeter, area, and volume |

You've learned about congruent figures: figures that can be moved to coincide with one another. Because triangles are the building blocks of all polygons, we have developed four criteria, SSS, SAS, ASA/AAS, and "ASS," to test whether triangles are congruent.
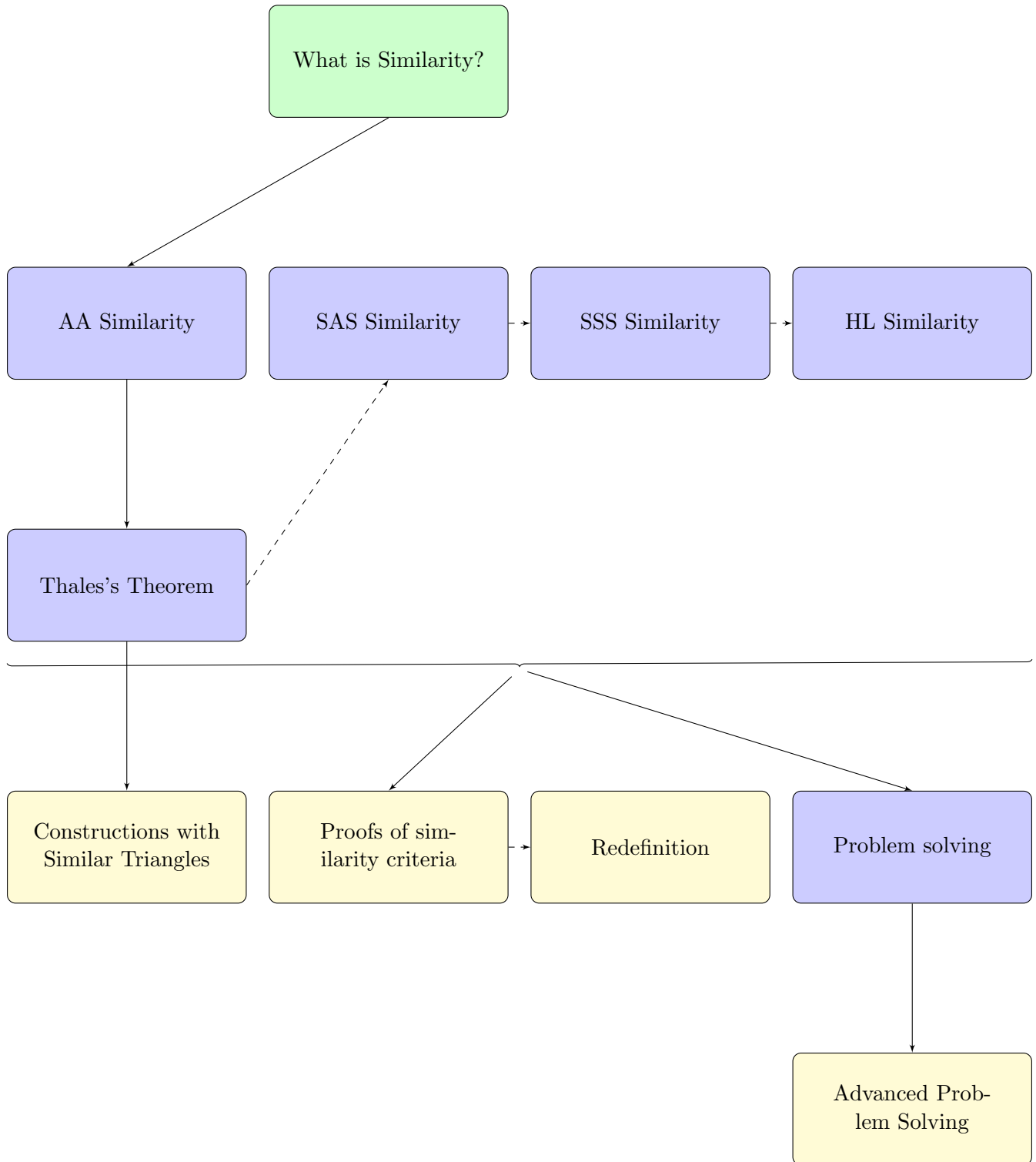
However, many objects in real life are the same *shape* and not the same *size*. For instance, if three roads make a triangle on a map, then they make a triangle in real life – just a triangle that's much, much bigger!

In this chapter you will learn how to relate figures that are the same shape but not the same size – called *similar* figures – using proportions. Similar triangles allow you to calculate heights and distances you can't measure directly. You will learn how to calculate the height of a tree by measuring its shadow, and how the mathematician Thales calculated the distance of ships from shore 2600 years ago.
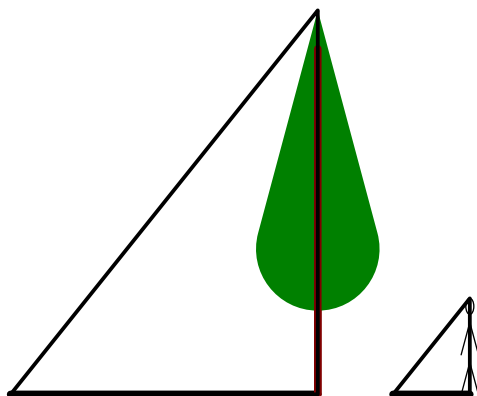
You will combine your knowledge of *proportions* and the *theory of congruent triangles* to discover and prove 4 criteria for similar triangles. In the process, you will increase your problem-solving repertoire, with techniques such as *point redefinition*. You will learn to tackle increasingly complicated problems involving overlapping triangles, and even create similar triangles in problems that don't seem to have a triangle at all! In the future, you will see that similar triangles is one of the essential ingredients in trigonometry – which allows you to find missing angles and side lengths in any given triangle.

Start with the "What is Similarity?" cell. After that you can tackle the four criteria for similar triangles. A special cell explores one of the most useful setups involving similar triangles, parallel lines. After you have learned all four criteria, try to tackle the problem-solving section. This Cluster includes four optional cells: constructions with similar triangles (using similarity to divide segments into ratios), proofs of all similarity theorems, the technique of point redefinition, and an advanced problem-solving section.

GLIYA

What is Similarity?

AA Similarity

SAS Similarity

SSS Similarity

HL Similarity

Thales's Theorem

Constructions with Similar Triangles

Proofs of similarity criteria

Redefinition

Problem solving

Advanced Problem Solving

Note that the lines point out the suggested order in which to go through the lessons, and do not point out the dependencies in the proofs of the criteria.