M1.7 Congruence

• Specify sequences of rigid motions that will carry a figure onto another.
• Understand that there can be more than one sequence of rigid motions that carries a figure onto another figure.
• Use the definition of congruence in terms of rigid motions to decide if two figures are congruent.
• Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent (CPCTC).
• Be able to explain how the criteria for triangle congruence follow from the definition of congruence in terms of rigid motions.
• Prove theorems about lines and angles.
• Prove theorems about parallelograms.
• Prove base angles of isosceles triangles are congruent.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

In the preceding unit, students built on their middle grades experiences with geometry. They made formal geometric constructions and developed definitions for rigid motions (translations, rotations, reflections) and several key geometric terms. Students examined the effects of single rigid motions on figures,

considering rigid motions as mappings of the coordinate plane to itself. Given simple figures, they described symmetries of those figures—the rotations and reflections that mapped the figures onto themselves. In this unit, students build on their understanding of rigid motions to strengthen the understanding of congruence that they developed in grade 8. Students use this definition to show that two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. They use these criteria to prove theorems about triangles, lines, angles, and parallelograms. In the next unit, students extend their knowledge of transformations to include dilations. They explore properties of dilations, use this knowledge to understand similarity in triangles and other shapes in terms of transformations, and use this understanding to solve problems.

M1.7.0 Pre-unit diagnostic assessment

Assess students' ability to

- **make formal geometric constructions (parallel and perpendicular lines;**
- **construct a square and explain why the construction yields a square.**

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

M1.7.1 Sequences of rigid motions

- **Specify sequences of rigid motions that will carry a figure onto another.**
- **Find different ways to transform one figure into another.**
- **Given a sequence of rigid motions, try to find a shorter sequence of rigid**

motions with the same outcome.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

M1.7.2 Defining Congruence

• Use the definition of congruence in terms of rigid motions.
• Use the definition of congruence to decide if two figures are congruent or not.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

M1.7.3 Triangle Congruence Criteria

• Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent (CPCTC).
• Explain how the criteria for triangle congruence follow from the definition of congruence.
• Prove that base angles of isosceles triangles are congruent.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

M1.7.4 More Congruence Theorems

• Prove theorems about lines and angles.
• Prove theorems about parallelograms.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.

M1.7.5 Summative Assessment

Assess students' ability to

• show and explain sequences of rigid motions and analyze different sequences of rigid motions that carry one shape to another;
• explain the criteria for triangle congruence and whether given triangles are congruent or not;
• understand and explain that opposite sides of a parallelogram are congruent;
• explain that vertical angles are congruent;

• explain that when a transversal crosses parallel lines, alternate interior and corresponding angles are congruent.

Students build on their understanding of rigid motions to formalize the definition of congruence that they developed in grade 8. They specify a series of rigid motions that carries one figure onto another and use the definition to determine whether two objects are congruent. Students show two triangles are congruent if and only if corresponding pairs of sides and angles are congruent. They explain how the criteria for triangle congruence (ASA, SAS, SSS) follow from the definition of congruence in terms of rigid motions. Armed with these criteria, students are able to prove theorems about triangles, lines, angles, and parallelograms.