**Geometry-21 Midterm Mapping & Khan Academy Tutorials**

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| **Modeling with Geometry and Definitions** |
| **Essential Questions**   * How do geometric relationships and measurements help us to solve problems and make sense of our world? * How do mathematical ideas interconnect and build on one another to produce a coherent whole? * How does geometry model the physical world? * How can the language of geometry be used to communicate mathematical ideas coherently and precisely? * How does the language of geometry provide immediate experience with the physical world? |
| **Big Ideas**   * Understanding the language of geometry is essential to reasoning and making connections. * Working with a variety of tools enhances understanding of geometric relationships. * Geometric objects can have different definitions. Some are better than others, and their worth depends both on context and values. * Definitions in geometry are of two distinct types: definition *by genesis* (how you can create the object) and definition *by property* (how you can characterize the object in terms of certain feature). * Building definitions requires moving back and forth between verbal and the visual. * Naming is not just about nomenclature: it draws attention to properties and objects of geometric interest. |
| *Learning Expectations*   1. Make formal constructions with a variety of tools and methods (for example compass, straightedge, string, reflective devices, paper folding, software) (G-CO.12) 2. Know precise definitions of angle and line segment based on the undefined notions of point, line, plane, and distance along a line (length of a segment) (G-CO.1) |
| **Khan Academy Tutorials**  [Intro-to-Euclidian-geometry](https://www.khanacademy.org/math/geometry/intro_euclid/v/euclid-as-the-father-of-geometry)  https://www.khanacademy.org/math/geometry/intro\_euclid/v/euclid-as-the-father-of-geometry  [Angle-basics](https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/Angle_basics/v/angle-basics)  https://www.khanacademy.org/math/basic-geo/basic-geo-angles/basic-geo-angle-basics/v/angle-basics  [Constructing-a-perpendicular-bisector-using-a-compass-and-straightedge](https://www.khanacademy.org/math/geometry/geometric-constructions/geo-bisectors/v/constructing-a-perpendicular-bisector-using-a-compass-and-straightedge)  https://www.khanacademy.org/math/geometry/geometric-constructions/geo-bisectors/v/constructing-a-perpendicular-bisector-using-a-compass-and-straightedge |
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| **Rigid Motions** |
| **Essential Questions**   * How do transformations provide a way of studying figures? * How does the geometric principle of congruence apply to the real world? |
| **Big Ideas**   * Transformations assist students in developing knowledge of congruence. |
| *Learning Expectations*   1. Verify experimentally that a dilation of a line segment is longer or shorter in the ration given by the scale factor (G-SRT.1b) 2. Describe the rotations and reflections that carry a given rectangle, parallelogram, trapezoid or regular polygon onto itself 3. Develop definitions of rotations, reflections, and translations (G-CO.4) 4. Specify the sequence of transformations that will carry a given figure onto another (G-CO.2) 5. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure (G-CO.6) 6. 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. (G-CO.7) |
| **Khan Academy Tutorials**  [Rigid motions introduction](https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/translations-of-polygons)  https://www.khanacademy.org/math/geometry/transformations/rigid-transformations-intro/v/translations-of-polygons  [Translations](https://www.khanacademy.org/math/geometry/transformations/hs-geo-translations/v/translations-of-polygons)  https://www.khanacademy.org/math/geometry/transformations/hs-geo-translations/v/translations-of-polygons  [Rotations](https://www.khanacademy.org/math/geometry/transformations/hs-geo-rotations/v/performing-a-rotation-to-match-figures)  https://www.khanacademy.org/math/geometry/transformations/hs-geo-rotations/v/performing-a-rotation-to-match-figures  [Reflections](https://www.khanacademy.org/math/geometry/transformations/hs-geo-reflections/v/reflection-and-mapping-points-example)  https://www.khanacademy.org/math/geometry/transformations/hs-geo-reflections/v/reflection-and-mapping-points-example  [Properties-definitions-of-translations](https://www.khanacademy.org/math/geometry/transformations/properties-definitions-of-translations/v/rotating-segment-about-orgin-example)  https://www.khanacademy.org/math/geometry/transformations/properties-definitions-of-translations/v/rotating-segment-about-orgin-example  [Symmetry](https://www.khanacademy.org/math/geometry/transformations/transformations-symmetry/v/axis-of-symmetry)  https://www.khanacademy.org/math/geometry/transformations/transformations-symmetry/v/axis-of-symmetry  [Dilations-or-scaling-around-a-point](https://www.khanacademy.org/math/geometry/transformations/dilations-scaling/v/scaling-down-a-triangle-by-half)  https://www.khanacademy.org/math/geometry/transformations/dilations-scaling/v/scaling-down-a-triangle-by-half |
| **Geometric Relationships and Properties** |
| **Essential Questions**   * How do geometric relationships and measurements help us to solve problems and make sense of our world? * How do mathematical ideas interconnect and build on one another to produce a coherent whole? * How do reasoning and proofs provide the ideas and concepts that lead to an understanding of the deductive nature of geometry? * How can various types of reasoning be used to make, investigate, and prove mathematical conjectures? * How does the geometric principle of congruence in triangles apply to the real world? * How do parallel lines, transversals, and related angles model the physical world? * How does the geometric principle of congruence in triangles apply to the real world? * How do triangles, their sides, angles, and special segments model the physical world? |
| **Big Ideas**   * Geometric ideas are supported and derived using theorems, postulates, definitions, and properties. * Formal proofs are created using a variety of formats. * A written proof is the endpoint of the process of proving. |
| *Learning Expectations*   1. Know the precise definition of perpendicular line and parallel line based on the undefined notions of point, line, plane, and distance along a line (length of a segment) (G-CO.1) 2. Develop an understanding of conditionals, converses, and definitions and how they are used in proofs (G-CO-Fairfield.1) 3. Prove theorems about lines and angles (G-CO.9) 4. Prove theorems about triangles (G-CO.10) 5. Prove theorems about parallelograms (G-CO.11) 6. Show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are also congruent (G-CO.7) 7. Explain how the criteria for triangle congruence (ASA, SAS, & SSS) follow from the definition of congruence in terms of rigid motions (G-CO.8) |
| **Khan Academy Tutorials**  [Parallel-and-perpendicular-lines](https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/ang_intro/v/angles-at-the-intersection-of-two-lines)  https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/ang\_intro/v/angles-at-the-intersection-of-two-lines  [Proof-sum-of-measures-of-angles-in-a-triangle-are-180](https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/triang_prop_tut/v/proof-sum-of-measures-of-angles-in-a-triangle-are-180)  https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/triang\_prop\_tut/v/proof-sum-of-measures-of-angles-in-a-triangle-are-180  [Complementary-and-supplementary-angles](https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/complementary-supplementary-angl/v/complementary-and-supplementary-angles)  https://www.khanacademy.org/math/geometry/parallel-and-perpendicular-lines/complementary-supplementary-angl/v/complementary-and-supplementary-angles  [Perpendicular-bisectors](https://www.khanacademy.org/math/geometry/triangle-properties/perpendicular_bisectors/v/circumcenter-of-a-triangle)  https://www.khanacademy.org/math/geometry/triangle-properties/perpendicular\_bisectors/v/circumcenter-of-a-triangle  [Angle-bisectors](https://www.khanacademy.org/math/geometry/triangle-properties/angle_bisectors/v/point-line-distance-and-angle-bisectors)  https://www.khanacademy.org/math/geometry/triangle-properties/angle\_bisectors/v/point-line-distance-and-angle-bisectors  [Triangle-medians-and-centroids](https://www.khanacademy.org/math/geometry/triangle-properties/medians_centroids/v/triangle-medians-and-centroids)  https://www.khanacademy.org/math/geometry/triangle-properties/medians\_centroids/v/triangle-medians-and-centroids  [Altitudes](https://www.khanacademy.org/math/geometry/triangle-properties/altitudes/v/proof-triangle-altitudes-are-concurrent-orthocenter)  https://www.khanacademy.org/math/geometry/triangle-properties/altitudes/v/proof-triangle-altitudes-are-concurrent-orthocenter  [Transformations-congruence](https://www.khanacademy.org/math/geometry/congruent-triangles/transformations-congruence/v/testing-congruence-by-transformations-example)  https://www.khanacademy.org/math/geometry/congruent-triangles/transformations-congruence/v/testing-congruence-by-transformations-example  [Congruent-triangles-and-SSS](https://www.khanacademy.org/math/geometry/congruent-triangles/cong_triangle/v/congruent-triangles-and-sss)  https://www.khanacademy.org/math/geometry/congruent-triangles/cong\_triangle/v/congruent-triangles-and-sss  [Congruent-legs-and-base-angles-of-isosceles-triangles](https://www.khanacademy.org/math/geometry/congruent-triangles/isoscleles_equil/v/congruent-legs-and-base-angles-of-isosceles-triangles)  https://www.khanacademy.org/math/geometry/congruent-triangles/isoscleles\_equil/v/congruent-legs-and-base-angles-of-isosceles-triangles |