Amarillo ISD— **Geometry Standards**

Amarillo Independent School District follows the Texas Essential Knowledge and Skills (TEKS). All of AISD curriculum and documents and resources are aligned to the TEKS.

The State of Texas State Board of Education has defined the focal points for Geometry in mathematics in the first paragraph of the introduction to the Texas Essential Knowledge and Skills.

Foundation concepts for high school mathematics. As presented in Grades K-8, the basic understandings of number, operation, and quantitative reasoning; patterns, relationships, and algebraic thinking; geometry; measurement; and probability and statistics are essential foundations for all work in high school mathematics. Students will continue to build on this foundation as they expand their understanding through other mathematical experiences.

Unit 1 – Reasoning
Unit 2 – Basics of Geometry
Unit 3 – Lines and Angles
Unit 4 – Triangles
Unit 5 – Right Triangles and Trigonometry
Unit 6 – Polygons / Quadrilaterals
Unit 7 – Circles
Unit 8 – 2-Dimensional
Unit 9 – Solids / 3-Dimensional
Unit 10 – Transformations
### Second Semester ONLY

#### Unit 5 – Right Triangles and Trigonometry 3 Weeks

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Expected Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.02 Geometric structure. The student analyzes geometric relationships in order to make and verify conjectures. The student is expected to:</td>
<td>(A) use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and (B) make conjectures about angles, lines, polygons, circles, and three-dimensional figures and determine the validity of the conjectures, choosing from a variety of approaches such as coordinate, transformational, or axiomatic</td>
<td></td>
</tr>
<tr>
<td>G.04 Geometric structure. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to select an appropriate representation (concrete, pictorial, graphical, verbal, or symbolic) in order to solve problems.</td>
<td>(A) use numeric and geometric patterns to develop algebraic expressions representing geometric properties</td>
<td></td>
</tr>
<tr>
<td>G.05 Geometric patterns. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to:</td>
<td>(D) identify and apply patterns from right triangles to solve meaningful problems, including special right triangles (45-45-90 and 30-60-90) and triangles whose sides are Pythagorean triples.</td>
<td></td>
</tr>
<tr>
<td>G.08 Congruence and the geometry of size. The student uses tools to determine measurements of geometric figures and extends measurement concepts to find perimeter, area, and volume in problem situations. The student is expected to:</td>
<td>(C) derive, extend, and use the Pythagorean Theorem;</td>
<td></td>
</tr>
<tr>
<td>G.11 Similarity and the geometry of shape. The student applies the concepts of similarity to justify properties of figures and solve problems. The student is expected to:</td>
<td>(C) develop, apply, and justify triangle similarity relationships, such as right triangle ratios, trigonometric ratios, and Pythagorean triples using a variety of methods;</td>
<td></td>
</tr>
</tbody>
</table>
### New TEKS to Bridge for Unit 5

<table>
<thead>
<tr>
<th>G.07  <strong>Similarity, proof, and trigonometry.</strong></th>
<th>(A) apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student uses the process skills in applying similarity to solve problems. The student is expected to:</td>
<td>(B) identify and apply the relationships that exist when an altitude is drawn to the hypotenuse of a right triangle, including the geometric mean, to solve problems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G.08  <strong>Similarity, proof, and trigonometry.</strong></th>
<th>(A) determine the lengths of sides and measures of angles in a right triangle by applying the trigonometric ratios sine, cosine, and tangent to solve problems; and</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. The student is expected to:</td>
<td>(B) apply the relationships in special right triangles 30°-60°-90° and 45°-45°-90° and the Pythagorean theorem, including Pythagorean triples, to solve problems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G.09  <strong>Similarity, proof, and trigonometry.</strong></th>
<th>(A) use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student uses the process skills to understand and apply relationships in right triangles. The student is expected to:</td>
<td>(B) make conjectures about angles, lines, polygons, circles, and three-dimensional figures and determine the validity of the conjectures, choosing from a variety of approaches such as coordinate, transformational, or axiomatic</td>
</tr>
</tbody>
</table>

### Unit 6 – Polygons/Quadrilaterals  3 Week

<table>
<thead>
<tr>
<th>G.02  <strong>Geometric structure.</strong></th>
<th>(A) The student uses a variety of representations to describe geometric relationships and solve problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student analyzes geometric relationships in order to make and verify conjectures. The student is expected to:</td>
<td>(A) use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G.04  <strong>Geometric structure.</strong></th>
<th>(A) The student uses a variety of representations to describe geometric relationships and solve problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to select an appropriate representation (concrete, pictorial, graphical, verbal, or symbolic) in order to solve problems.</td>
<td>(A) use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and</td>
</tr>
</tbody>
</table>

| --- | --- |
### Amarillo ISD— Geometry Standards

| G.05  | Geometric patterns. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to: | (B) use numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles |
| G.09  | Congruence and the geometry of size. The student analyzes properties and describes relationships in geometric figures. The student is expected to: | (B) formulate and test conjectures about the properties and attributes of polygons and their component parts based on explorations and concrete models |
| G.11  | Similarity and the geometry of shape. The student applies the concepts of similarity to justify properties of figures and solve problems. The student is expected to: | (A) use and extend similarity properties and transformations to explore and justify conjectures about geometric figures; (B) use ratios to solve problems involving similar figures; |

#### New TEKS to Bridge for Unit 6

| G.05  | Logical argument and constructions. The student uses constructions to validate conjectures about geometric figures. The student is expected to: | (A) investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools; (B) construct congruent segments, congruent angles, a segment bisector, an angle bisector, perpendicular lines, the perpendicular bisector of a line segment, and a line parallel to a given line through a point not on a line using a compass and a straightedge; (C) use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and |
| G.06  | Proof and congruence. The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow | (C) apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles; (E) prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals and apply these relationships-to solve problems. |
### G.07 Similarity, proof, and trigonometry.
The student uses the process skills in applying similarity to solve problems. The student is expected to:

- **(A)** apply the definition of similarity in terms of a dilation to identify similar figures and their proportional sides and the congruent corresponding angles; and

### Unit 7 – Circles  3 Weeks

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G.02</strong> Geometric structure. <strong>(B)</strong></td>
<td>The student analyzes geometric relationships in order to make and verify conjectures. The student is expected to:</td>
</tr>
<tr>
<td><strong>G.04</strong> Geometric structure. <strong>(A)</strong></td>
<td>The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to select an appropriate representation (concrete, pictorial, graphical, verbal, or symbolic) in order to solve problems.</td>
</tr>
<tr>
<td><strong>G.05</strong> Geometric patterns. <strong>(B)</strong></td>
<td>The student uses numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles.</td>
</tr>
<tr>
<td><strong>G.08</strong> Congruence and the geometry of size. <strong>(A)</strong></td>
<td>The student uses tools to determine measurements of geometric figures and extends measurement concepts to find perimeter, area, and volume in problem situations. The student is expected to:</td>
</tr>
<tr>
<td><strong>G.09</strong> Congruence and the geometry of size. <strong>(C)</strong></td>
<td>The student analyzes properties and describes relationships in geometric figures. The student is expected to:</td>
</tr>
</tbody>
</table>

- **(B)** make conjectures about angles, lines, polygons, circles, and three-dimensional figures and determine the validity of the conjectures, choosing from a variety of approaches such as coordinate, transformational, or axiomatic
- **(A)** The student uses a variety of representations to describe geometric relationships and solve problems
- **(B)** use numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles
- **(A)** find areas of regular polygons, circles, and composite figures
- **(B)** find areas of sectors and arc lengths of circles using proportional reasoning;
- **(C)** formulate and test conjectures about the properties and attributes of circles and the lines that intersect them based on explorations and concrete models; and
### Amarillo ISD— Geometry Standards

#### New TEKS to Bridge for Unit 7

<table>
<thead>
<tr>
<th>G.05 Logical argument and constructions. The student uses constructions to validate conjectures about geometric figures. The student is expected to:</th>
<th>(A) investigate patterns to make conjectures about geometric relationships, including angles formed by parallel lines cut by a transversal, criteria required for triangle congruence, special segments of triangles, diagonals of quadrilaterals, interior and exterior angles of polygons, and special segments and angles of circles choosing from a variety of tools;</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.12 Circles. The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. The student is expected to:</td>
<td>(A) apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems; (B) apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems; (C) apply the proportional relationship between the measure of the area of a sector of a circle and the area of the circle to solve problems; (D) describe radian measure of an angle as the ratio of the length of an arc intercepted by a central angle and the radius of the circle; and (E) show that the equation of a circle with center at the origin and radius $r$ is $x^2 + y^2 = r^2$ and determine the equation for the graph of a circle with radius $r$ and center $(h, k)$, $(x - h)^2 + (y - k)^2 = r^2$.</td>
</tr>
</tbody>
</table>

#### Unit 8 – 2-Dimensional 2 Weeks

| G.08 Congruence and the geometry of size. The student uses tools to determine measurements of geometric figures and extends measurement concepts to find perimeter, area, and volume in problem situations. The student is expected to: | (A) find areas of regular polygons, circles, and composite figures; (E) use area models to connect geometry to probability and statistics; and (F) use conversions between measurement systems to solve problems in real-world situations. |

---

2011-12 Amarillo ISD Math Curriculum
### G.10 Two-dimensional and three-dimensional figures.
The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. The student is expected to:

| (B) | determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change. |

### G.11 Two-dimensional and three-dimensional figures.
The student uses the process skills in the application of formulas to determine measures of two- and three-dimensional figures. The student is expected to:

| (A) | apply the formula for the area of regular polygons to solve problems using appropriate units of measure; |
| (B) | determine the area of composite two-dimensional figures comprised of a combination of triangles, parallelograms, trapezoids, kites, regular polygons, or sectors of circles to solve problems using appropriate units of measure; |

### G.13 Probability.
The student uses the process skills to understand probability in real-world situations and how to apply independence and dependence of events. The student is expected to:

| (B) | determine probabilities based on area to solve contextual problems; |

### Unit 9 – Solids / 3-Dimensional 3 Weeks

| (C) | compare and contrast the structures and implications of Euclidean and non-Euclidean geometries. |

### G.01 Geometric structure.
The student understands the structure of, and relationships within, an axiomatic system. The student is expected to:

| (C) | compare and contrast the structures and implications of Euclidean and non-Euclidean geometries. |

### G.06 Dimensionality and the geometry of location.
The student analyzes the relationship between three-dimensional geometric figures and related two-dimensional representations and uses these representations to solve problems. The student is expected to:

| (A) | describe and draw the intersection of a given plane with various three-dimensional geometric figures; |
| (B) | use nets to represent and construct three-dimensional geometric figures; and |
| (C) | use orthographic and isometric views of three-dimensional geometric figures to represent and construct three-dimensional geometric figures and solve problems. |

### G.08 Congruence and the geometry of size.
The student uses tools to determine

| (D) | find surface areas and volumes of prisms, pyramids, spheres, cones, cylinders, and composites of these figures in problem situations; |
measurements of geometric figures and extends measurement concepts to find perimeter, area, and volume in problem situations. The student is expected to:

<table>
<thead>
<tr>
<th>G.09 Congruence and the geometry of size.</th>
<th>(D) analyze the characteristics of polyhedra and other three-dimensional figures and their component parts based on explorations and concrete models.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student analyzes properties and describes relationships in geometric figures. The student is expected to:</td>
<td>(D) describe the effect on perimeter, area, and volume when one or more dimensions of a figure are changed and apply this idea in solving problems</td>
</tr>
</tbody>
</table>

**New TEKS to Bridge for Unit 9**

<table>
<thead>
<tr>
<th>G.04 Logical argument and constructions.</th>
<th>(D) compare geometric relationships between Euclidean and spherical geometries, including parallel lines and the sum of the angles in a triangle.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student uses the process skills with deductive reasoning to understand geometric relationships. The student is expected to:</td>
<td>(A) identify the shapes of two-dimensional cross-sections of prisms, pyramids, cylinders, cones, and spheres and identify three-dimensional objects generated by rotations of two-dimensional shapes; and</td>
</tr>
<tr>
<td></td>
<td>(B) determine and describe how changes in the linear dimensions of a shape affect its perimeter, area, surface area, or volume, including proportional and non-proportional dimensional change.</td>
</tr>
<tr>
<td>G.10 Two-dimensional and three-dimensional figures. The student uses the process skills to recognize characteristics and dimensional changes of two- and three-dimensional figures. The student is expected to:</td>
<td>(C) apply the formulas for the total and lateral surface area of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure; and</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Unit 10  Transformations  2 Weeks

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G.04  Geometric structure.</strong> The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to select an appropriate representation (concrete, pictorial, graphical, verbal, or symbolic) in order to solve problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G.05  Geometric patterns.</strong> The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to:</td>
<td>(C) use properties of transformations and their compositions to make connections between mathematics and the real world, such as tessellations; and</td>
<td></td>
</tr>
<tr>
<td><strong>G.10  Congruence and the geometry of size.</strong> The student applies the concept of congruence to justify properties of figures and solve problems. The student is expected to:</td>
<td>(A) use congruence transformations to make conjectures and justify properties of geometric figures including figures represented on a coordinate plane; and</td>
<td></td>
</tr>
<tr>
<td><strong>G.11  Similarity and the geometry of shape.</strong> The student applies the concepts of similarity to justify properties of figures and solve problems. The student is expected to:</td>
<td>(A) use and extend similarity properties and transformations to explore and justify conjectures about geometric figures;</td>
<td></td>
</tr>
</tbody>
</table>

### New TEKS to Bridge for Unit 10

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
<th>Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G.03  Coordinate and transformational geometry.</strong> The student uses the process skills to generate and describe rigid transformations (translation, reflection, and rotation) and non-rigid transformations (dilations that preserve similarity and reductions and enlargements that do not preserve similarity). The student is</td>
<td>(A) describe and perform transformations of figures in a plane using coordinate notation; (B) determine the image or pre-image of a given two-dimensional figure under a composition of rigid transformations, a composition of non-rigid transformations, and a composition of both, including dilations where the center can be any point in the plane; (C) identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and (D) identify and distinguish between reflectional and rotational symmetry in a plane figure.</td>
<td></td>
</tr>
</tbody>
</table>
### Amarillo ISD— Geometry Standards

<table>
<thead>
<tr>
<th>expected to:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G.06 Proof and congruence.</strong> The student uses the process skills with deductive reasoning to prove and apply theorems by using a variety of methods such as coordinate, transformational, and axiomatic and formats such as two-column, paragraph, and flow chart. The student is expected to:</td>
<td>(C) apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;</td>
</tr>
</tbody>
</table>
Amarillo ISD—Geometry Standards

To ensure that every student has an opportunity to learn, understand and demonstrate the Texas Essential Knowledge and Skills. Amarillo Independent has adopted the following protocols for teachers, curriculum and others to use in reference to Curriculum, Instruction and Assessment.

**Curriculum**
1) Prioritize essential learning based on AISD written curriculum and adhere to the scope and sequence.
2) Develop deep understandings of the AISD written curriculum with an emphasis on the essential learning outcomes.
3) Create relevant learning environments in every classroom using the AISD written curriculum.
4) Analyze vertical and horizontal alignment to ensure grade level curriculum is being taught.

**Instruction**
1) Common lessons are developed based on strategically selected grade level TEKS and include learning opportunities for students that:
   - are at the expected level of thinking and rigor
   - utilize research based instructional strategies
   - are actively engaging
   - have real world applications
2) Collaboratively align instruction to assessment.
3) Individual student instructional needs are considered and addressed in the lessons.
4) Strategic re-teaching when students do not understand.
5) Common lessons are analyzed and strengthened through a continuous improvement process such as the Professional Teaching Model, Lesson Study or other method for collaborative study and sharing.

**Assessment**
1) Collaboratively align all assessment to the AISD written curriculum and reflect appropriate rigor.
2) Collaboratively engage in purposeful dialogue about assessment tied to clearly defined essential learning outcomes.
3) Continuously improve and adjust instruction based on common assessment results and student work.
4) Provide feedback to the annual curriculum feedback and revision process.