§111.41. Geometry, Adopted 2012 (One Credit).	Student Text	Practice Book	Teacher Resource: Activities and Projects
(c) Knowledge and skills.			
(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:			
(A) apply mathematics to problems arising in everyday life, society, and the workplace;	1-6, 10-16, 18-20, 23-25, 28, 30, 31, 41, 44, 46, 50, 55, 62, 68, 73, 78, 83, 88, 92, 93, 99, 100, 101, 104, 107-109, 114, 119, 122, 124, 126-129, 137, 139-141, 143-148, 150, 152, 153, 157-159, 161-166, 168, 174, 177, 178, 182, 184, 186	1, 50, 78, 83, 87, 99, 104, 128, 159, 160, 168	Ch1-36
(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;	30, 68, 73, 78, 83, 93, 99, 101, 104, 107, 108, 109, 114, 119, 124, 129, 139, 141, 143-149, 162-168, 171-174, 176-178, 180, 182-185	77, 78, 82, 83, 87, 99, 102, 104, 162-185	Ch1, Ch2, Ch8, Ch9, Ch14-23, Ch26-36
(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;	31, 128	32, 128	Ch1-36
(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;	1-186	1-185	Ch1-36
(E) create and use representations to organize, record, and communicate mathematical ideas;	2-31, 33-62, 64-93, 95-124, 126-155, 157-186	1-185	Ch1-30
(F) analyze mathematical relationships to connect and communicate mathematical ideas; and	2-31, 33-62, 64-93, 95-124, 126-155, 157-186	1-185	Ch1-30
(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.	2-31, 33-62, 64-93, 95-124, 126-155, 157-186	1-185	Ch1-30
(2) Coordinate and transformational geometry. The student uses the process skills to understand the connections between algebra and geometry and uses the one- and two-dimensional coordinate systems to verify geometric conjectures. The student is expected to:			
(A) determine the coordinates of a point that is a given fractional distance less than one from one end of a line segment to the other in one- and two-dimensional coordinate systems, including finding the midpoint;	7	6	Ch36

(B) derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines; and	12, 15, 19, 21, 40, 41, 45, 46, 48, 49, 50, 53, 54, 55, 57, 58, 59, 60, 62, 189, 191	12, 15, 19, 21, 40, 41, 45, 46, 48, 49, 50, 53, 54, 55, 57, 58, 59, 60, 62, 189, 191	Ch3
(C) determine an equation of a line parallel or perpendicular to a given line that passes through a given point.	189	189	
(3) Coordinate and transformational geometry. 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 expected to:			
(A) describe and perform transformations of figures in a plane using coordinate notation;	187	187	Ch2
(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;	187	187	Ch2
(C) identify the sequence of transformations that will carry a given pre-image onto an image on and off the coordinate plane; and	187	187	Ch2
(D) identify and distinguish between reflectional and rotational symmetry in a plane figure.	187	187	Ch2
(4) Logical argument and constructions. The student uses the process skills with deductive reasoning to understand geometric relationships. The student is expected to:			
(A) distinguish between undefined terms, definitions, postulates, conjectures, and theorems;	7-16, 191	1191	
(B) identify and determine the validity of the converse, inverse, and contrapositive of a conditional statement and recognize the connection between a biconditional statement and a true conditional statement with a true converse;	191	191	
(C) verify that a conjecture is false using a counterexample; and	191	191	
(D) compare geometric relationships between Euclidean and spherical geometries, including parallel lines and the sum of the angles in a triangle.	191	191	

(5) 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;	21, 45, 49, 54, 60, 61, 62, 65, 187, 188	21, 45, 49, 57, 60, 61, 62, 187, 188	Ch9, Ch10
(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;	21, 45, 49, 54, 60, 61, 62, 65, 187, 188	21, 45, 49, 57, 60, 61, 62, 187, 188	Ch9, Ch10
(C) use the constructions of congruent segments, congruent angles, angle bisectors, and perpendicular bisectors to make conjectures about geometric relationships; and	21, 45, 49, 54, 60, 61, 62, 65, 187, 188	21, 45, 49, 57, 60, 61, 62, 187, 188	Ch9, Ch10
(D) verify the Triangle Inequality theorem using constructions and apply the theorem to solve problems.		188	
(6) 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 chart. The student is expected to:			
(A) verify theorems about angles formed by the intersection of lines and line segments, including vertical angles, and angles formed by parallel lines cut by a transversal and prove equidistance between the endpoints of a segment and points on its perpendicular bisector and apply these relationships to solve problems;	12, 14, 16, 19-31, 33-62, 65-67, 93, 95, 153-155	20-32, 33-63, 65-68, 93-95, 125, 126, 153-155	Ch4, Ch5, Ch7, Ch9, Ch10, Ch11, Ch12, Ch19, Ch30
(B) prove two triangles are congruent by applying the Side-Angle-Side, Angle-Side-Angle, Side-Side-Side, Angle-Angle-Side, and Hypotenuse-Leg congruence conditions;	188	188	
(C) apply the definition of congruence, in terms of rigid transformations, to identify congruent figures and their corresponding sides and angles;	19, 20, 44, 45, 49, 54, 60, 62, 136, 137, 138, 159, 161, 172	21, 45, 49, 57, 60-62, 138, 164, 166	Ch4, Ch9, Ch10
(D) verify theorems about the relationships in triangles, including proof of the Pythagorean Theorem, the sum of interior angles, base angles of isosceles triangles, midsegments, and medians, and apply these relationships to solve problems; and	35-37, 47, 51, 52, 59, 67, 95-99	35-38, 51, 67, 95-98	Ch7

(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.	40-62	37, 39-63, 65	Ch9, Ch10
(7) 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	188	188	Ch2
(B) apply the Angle-Angle criterion to verify similar triangles and apply the proportionality of the corresponding sides to solve problems.	188	188	
(8) Similarity, proof, and trigonometry. 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:			
(A) prove theorems about similar triangles, including the Triangle Proportionality theorem, and apply these theorems to solve problems; and	65		
(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.	66, 67, 95, 104, 188	66, 67, 95, 96, 188	Ch19
(9) Similarity, proof, and trigonometry. The student uses the process skills to understand and apply relationships in right triangles. The student is expected to:			
(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	37, 66, 67, 95, 130	36, 38, 57, 66, 67	Ch26, Ch30
(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.	67, 95, 96,188	67, 95, 188	Ch7, Ch13, Ch19
(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:			
(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	158-185	158-166	Ch32-36

(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.	96-124, 157, 158, 162-168, 172-174, 177, 178, 180, 182, 183, 185	97-104, 107-112, 114, 117-119, 123, 124, 146-152,158, 162-183, 184, 185	Ch19-23, Ch29, Ch30, Ch 32, Ch33, Ch34, Ch35, Ch36
(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;	96-124	97-104, 107-112, 114, 117-119, 123, 124, 146-152	Ch19-23, Ch29, Ch30
(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;	47, 51, 95-124, 146-151, 153	97, 98, 100-104, 107, 110-114, 117-119, 123, 124,146-152	Ch19-23, Ch29, Ch30
(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	103, 171, 176, 184	171, 176, 184, 185	Ch33, Ch34, Ch35, Ch36
(D) apply the formulas for the volume of three-dimensional figures, including prisms, pyramids, cones, cylinders, spheres, and composite figures, to solve problems using appropriate units of measure.	157, 158, 162-168, 172-174, 177, 178, 180, 182, 183, 185	158, 162-170, 172-183	Ch32-36
(12) Circles. The student uses the process skills to understand geometric relationships and apply theorems and equations about circles. The student is expected to:			
(A) apply theorems about circles, including relationships among angles, radii, chords, tangents, and secants, to solve non-contextual problems;	27, 29, 31, 125-155	27, 33, 40, 44, 127-156	Ch25, Ch26, Ch27, Ch29, Ch30
(B) apply the proportional relationship between the measure of an arc length of a circle and the circumference of the circle to solve problems;	130, 151, 152	130-133, 143-145, 153, 154	
(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;	130, 150, 151, 153	151, 152	
(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	152		
(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), $(x - h)^2 + (y - k)^2 = r^2$.	128		

(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:			
(A) develop strategies to use permutations and combinations to solve contextual problems;	190		
(B) determine probabilities based on area to solve contextual problems;	190		
(C) identify whether two events are independent and compute the probability of the two events occurring together with or without replacement;	190		
(D) apply conditional probability in contextual problems; and	190		
(E) apply independence in contextual problems.	190		

Source: The provisions of this §111.41 adopted to be effective September 10, 2012, 37 TexReg 7109.