

ELEMENTS OF GEOMETRY

	Student Text	Practice Book	Teacher Resource Edition Activities & Projects
Number and Quantity			
1. Extend understanding of irrational and rational numbers by rewriting expressions involving radicals, including addition, subtraction, multiplication, and division, in order to recognize geometric patterns.	141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 172, 173, 177, 178, 180, 185	151, 152, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181	Ch28, Ch30, Ch34, Ch35, Ch36
2. Use units as a way to understand problems and to guide the solution of multi-step problems.	100, 101, 102, 103, 104, 112	102	
a. Choose and interpret units consistently in formulas.	100, 101, 102, 103, 104, 112	102	
b. Choose and interpret the scale and the origin in graphs and data displays.	100, 101, 102, 103, 104, 112	102	
c. Define appropriate quantities for the purpose of descriptive modeling.	100, 101, 102, 103, 104, 112	102	
d. Choose a level of accuracy appropriate to limitations of measurements when reporting quantities.	100, 101, 102, 103, 104, 112	102	
Focus 1: Measurement			
16. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	170, 175, 179, 181	160, 161	Ch 33, Ch34, Ch35, Ch36

17. Model and solve problems using surface area and volume of solids, including composite solids and solids with portions removed.	141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 154, 155, 172, 173, 177, 178, 180, 185	151, 152, 154, 155, 156, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181	Ch26, Ch28, Ch30, Ch34, Ch35, Ch36
a. Give an informal argument for the formulas for the surface area and volume of a sphere, cylinder, pyramid, and cone using dissection arguments, Cavalieri's Principle, and informal limit arguments.	182, 183, 184, 185	182, 183, 184, 185	Ch36
b. Apply geometric concepts to find missing dimensions to solve surface area or volume problems.	141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 154, 155, 172, 173, 177, 178, 180, 182, 183, 184, 185	151, 152, 154, 155, 156, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185	Ch26, Ch28, Ch30, Ch34, Ch35, Ch36
18. Given the coordinates of the vertices of a polygon, compute its perimeter and area using a variety of methods, including the distance formula and dynamic geometry software, and evaluate the accuracy of the results.	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124	Ch13, Ch14, Ch15, Ch16, Ch17, Ch18, Ch21, Ch22, Ch23, Ch29, Ch30, Ch33, Ch34, Ch35, Ch36

19. Derive and apply the relationships between the lengths, perimeters, areas, and volumes of similar figures in relation to their scale factor.	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185	Ch32
20. Derive and apply the formula for the length of an arc and the formula for the area of a sector.	154, 155	154, 155, 156	Ch26, Ch30
Focus 2: Transformations			
21. Represent transformations and compositions of transformations in the plane (coordinate and otherwise) using tools such as tracing paper and geometry software.	10, 11, 12, 13, 14, 15, 16	10, 11, 13	Ch2, Ch3, Ch6
a. Describe transformations and compositions of transformations as functions that take points in the plane as inputs and give other points as outputs, using informal and formal notation.	10, 11, 12, 13, 14, 15, 16	10, 11, 13	Ch2, Ch3, Ch6
b. Compare transformations which preserve distance and angle measure to those that do not.	10, 11, 12, 13, 14, 15, 16	10, 11, 13	Ch2, Ch3, Ch6

22. Explore rotations, reflections, and translations using graph paper, tracing paper, and geometry software.	12, 15, 27, 28, 29, 30, 31	16, 19, 27, 28, 29, 30, 31, 32	Ch2, Ch9, Ch25, Ch26, Ch29, Ch33
a. Given a geometric figure and a rotation, reflection, or translation, draw the image of the transformed figure using graph paper, tracing paper, or geometry software.	45, 49, 54, 57, 59, 60, 65, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97	45, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 83, 87, 89, 90, 91, 92, 93	Ch2, Ch29, Ch30, Ch33
b. Specify a sequence of rotations, reflections, or translations that will carry a given figure onto another.	45, 49, 54, 57, 59, 60, 65, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97	45, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 83, 87, 89, 90, 91, 92, 93	Ch2, Ch29, Ch30, Ch33
c. Draw figures with different types of symmetries and describe their attributes.	45, 49, 54, 57, 59, 60, 65, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97	45, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 83, 87, 89, 90, 91, 92, 93	Ch2, Ch29, Ch30, Ch33
23. Develop definitions of rotation, reflection, and translation in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	12, 15, 27, 28, 29, 30, 31	16, 19, 27, 28, 29, 30, 31, 32	Ch2, Ch9, Ch25, Ch26, Ch29, Ch33
24. Define congruence of two figures in terms of rigid motions (a sequence of translations, rotations, and reflections); show that two figures are congruent by finding a sequence of rigid motions that maps one figure to the other. <i>Example: $\triangle ABC$ is congruent to $\triangle XYZ$ since a reflection followed by a translation maps $\triangle ABC$ onto $\triangle XYZ$.</i>	136, 137, 138	45, 57, 61, 62	Ch9, Ch19
25. Verify criteria for showing triangles are congruent using a sequence of rigid motions that map one triangle to another.	45, 95, 96, 97, 98	45, 47, 48, 50, 51, 52, 95, 96, 97, 98	Ch10, Ch19

a. Verify that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	45, 95, 96, 97, 98	45, 47, 48, 50, 51, 52, 95, 96, 97, 98	Ch10, Ch19
b. Verify that two triangles are congruent if (but not only if) the following groups of corresponding parts are congruent: angle-side-angle (ASA), side-angle-side (SAS), side-side-side (SSS), and angle-angle-side (AAS). <i>Example: Given two triangles with two pairs of congruent corresponding sides and a pair of congruent included angles, show that there must be a sequence of rigid motions will map one onto the other.</i>	45, 95, 96, 97, 98	45, 47, 48, 50, 51, 52, 95, 96, 97, 98	Ch10, Ch19
26. Verify experimentally the properties of dilations given by a center and a scale factor.	186	186	Ch2
a. Verify that a dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	186	186	Ch2
b. Verify that the dilation of a line segment is longer or shorter in the ratio given by the scale factor.	186	186	Ch2
27. Given two figures, determine whether they are similar by identifying a similarity transformation (sequence of rigid motions and dilations) that maps one figure to the other.			
28. Verify criteria for showing triangles are similar using a similarity transformation (sequence of rigid motions and dilations) that maps one triangle to another.			

a. Verify that two triangles are similar if and only if corresponding pairs of sides are proportional and corresponding pairs of angles are congruent.			
b. Verify that two triangles are similar if (but not only if) two pairs of corresponding angles are congruent (AA), the corresponding sides are proportional (SSS), or two pairs of corresponding sides are proportional and the pair of included angles is congruent (SAS). <i>Example: Given two triangles with two pairs of congruent corresponding sides and a pair of congruent included angles, show there must be a set of rigid motions that maps one onto the other.</i>			
Focus 3: Geometric Arguments, Reasoning, and Proof			
29. Find patterns and relationships in figures including lines, triangles, quadrilaterals, and circles, using technology and other tools.	6, 7, 8, 9, 10, 12, 22, 23, 24, 26, 34, 35, 36, 37, 38, 39, 40, 42, 45, 49, 54, 58, 59, 65, 68, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97, 99, 102, 110, 114, 119, 127, 131, 132, 150, 151, 152	7, 8, 9, 10, 11, 12, 13, 21, 22, 23, 24, 25, 37, 38, 39, 41, 43, 47, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 82, 83, 87, 89, 90, 91, 92, 93, 99, 102, 104, 110, 121, 127, 128, 129, 130, 156, 157, 159	Ch2, Ch7, Ch8, Ch9, Ch25, Ch29, Ch30, Ch33
a. Construct figures, using technology and other tools, in order to make and test conjectures about their properties.	6, 7, 8, 9, 10, 12, 22, 23, 24, 26, 34, 35, 36, 37, 38, 39, 40, 42, 45, 49, 54, 58, 59, 65, 68, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97, 99, 102, 110, 114, 119, 127, 131, 132, 150, 151, 152	7, 8, 9, 10, 11, 12, 13, 21, 22, 23, 24, 25, 37, 38, 39, 41, 43, 47, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 82, 83, 87, 89, 90, 91, 92, 93, 99, 102, 104, 110, 121, 127, 128, 129, 130, 156, 157, 159	Ch2, Ch7, Ch8, Ch9, Ch25, Ch29, Ch30, Ch33

<p>b. Identify different sets of properties necessary to define and construct figures.</p>	<p>6, 7, 8, 9, 10, 12, 22, 23, 24, 26, 34, 35, 36, 37, 38, 39, 40, 42, 45, 49, 54, 58, 59, 65, 68, 70, 73, 75, 78, 80, 83, 85, 89, 90, 91, 92, 93, 97, 99, 102, 110, 114, 119, 127, 131, 132, 150, 151, 152</p>	<p>7, 8, 9, 10, 11, 12, 13, 21, 22, 23, 24, 25, 37, 38, 39, 41, 43, 47, 49, 51, 53, 55, 57, 58, 59, 60, 62, 65, 66, 77, 78, 82, 83, 87, 89, 90, 91, 92, 93, 99, 102, 104, 110, 121, 127, 128, 129, 130, 156, 157, 159</p>	<p>Ch2, Ch7, Ch8, Ch9, Ch25, Ch29, Ch30, Ch33</p>
<p>30. Develop and use precise definitions of figures such as angle, circle, perpendicular lines, parallel lines, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.</p>	<p>7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31</p>	<p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32</p>	<p>Ch2, Ch3, Ch4, Ch5, Ch10, Ch19</p>
<p>31. Justify whether conjectures are true or false in order to prove theorems and then apply those theorems in solving problems, communicating proofs in a variety of ways, including flow chart, two-column, and paragraph formats.</p>	<p>7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31</p>	<p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32</p>	<p>Ch2, Ch3, Ch4, Ch5, Ch10, Ch19</p>
<p>a. Investigate, prove, and apply theorems about lines and angles, including but not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; the points on the perpendicular bisector of a line segment are those equidistant from the segment's endpoints.</p>	<p>7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31</p>	<p>1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32</p>	<p>Ch2, Ch3, Ch4, Ch5, Ch10, Ch19</p>

b. Investigate, prove, and apply theorems about triangles, including but not limited to: the sum of the measures of the interior angles of a triangle is 180°; the base angles of isosceles triangles are congruent; the segment joining the midpoints of two sides of a triangle is parallel to the third side and half the length; a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem using triangle similarity.	33, 34, 35, 36, 37	34, 35, 36, 37, 38, 64, 65, 66, 67, 68	Ch7, Ch13, Ch19
c. Investigate, prove, and apply theorems about parallelograms and other quadrilaterals, including but not limited to both necessary and sufficient conditions for parallelograms and other quadrilaterals, as well as relationships among kinds of quadrilaterals. <i>Example: Prove that rectangles are parallelograms with congruent diagonals.</i>	39, 40, 41, 42, 43, 44, 45, 46, 48, 49, 50, 52, 53, 54, 55, 56, 57	39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 59	Ch8, Ch10, Ch12, Ch18
32. Use coordinates to prove simple geometric theorems algebraically.	189		
33. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. <i>Example: Find the equation of a line parallel or perpendicular to a given line that passes through a given point.</i>			
Focus 4: Solving Applied Problems and Modeling in Geometry			
35. Discover and apply relationships in similar right triangles.	37, 47, 51, 52, 53, 56, 66, 67, 115, 116, 117	35, 37, 37, 38	Ch5, Ch7, Ch10, Ch19
a. Derive and apply the constant ratios of the sides in special right triangles (45°-45°-90° and 30°-60°-90°).	37, 47, 51, 52, 53, 56, 66, 67, 115, 116, 117	35, 37, 37, 38	Ch5, Ch7, Ch10, Ch19

b. Use similarity to explore and define basic trigonometric ratios, including sine ratio, cosine ratio, and tangent ratio.	37, 47, 51, 52, 53, 56, 66, 67, 115, 116, 117	35, 37, 37, 38	Ch5, Ch7, Ch10, Ch19
c. Explain and use the relationship between the sine and cosine of complementary angles.			
d. Demonstrate the converse of the Pythagorean Theorem.	35, 36, 47, 51, 52, 65, 66, 67	34, 35, 36, 37, 38, 64, 65, 66, 67, 68	Ch7, Ch19
e. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems, including finding areas of regular polygons.	35, 36, 47, 51, 52, 65, 66, 67	34, 35, 36, 37, 38, 64, 65, 66, 67, 68	Ch7, Ch19
36. Use geometric shapes, their measures, and their properties to model objects and use those models to solve problems.	27, 28, 126, 127, 128, 129, 130, 136, 137, 142, 143, 151, 154, 155	131, 132, 133, 134, 135, 136, 137, 138, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156	Ch25, Ch26, Ch27, Ch28, Ch30
37. Investigate and apply relationships among inscribed angles, radii, and chords, including but not limited to: the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	129, 130, 132, 133, 134, 135, 150, 151, 152, 153, 154, 155	153, 154, 155, 156	Ch26, Ch30, Ch36

<p>38. Use the mathematical modeling cycle involving geometric methods to solve design problems. <i>Examples: Design an object or structure to satisfy physical constraints or minimize cost; work with typographic grid systems based on ratios; apply concepts of density based on area and volume</i></p>			<p>Ch1, Ch2, Ch3, Ch4, Ch5, Ch6, Ch7, Ch8, Ch9, Ch16, Ch18, Ch20, Ch21, Ch23, Ch26, Ch32, Ch33, Ch34, Ch35, Ch36</p>
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