Grade 6 Target H

Domain, Target, Standards, DOK, Vertical Alignments, Achievement Levels, Evidence Required, Vocabulary, Response Types, Materials, Attributes, Question Types, and Question Banks (Examples)

Content Domain: Geometry

Target H [s]: 6.G.A Solve real-world and mathematical problems involving area, surface area, and volume.

Standards included in Target G: 6.G.A, 6.G.A.1, 6.G.A.2, 6.G.A.3, 6.G.A.4

6.G.A Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = bh to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

6.G.A.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

6.G.A.4 Represent three-dimensional figures using nets made up of rectangles and triangles,

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and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Vertical Alignment

Related Grade 5 standards

5.MD.C Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubit ft, and improvised units.

5.MD.C.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas V = l x w x h and V = b x h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.

Related Grade 7 Standards

7.G.A Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing at a different scale.

7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures or angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

7.G.B Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

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Achievement Level Descriptors

Level 1 Students should be able to find areas of right triangles; draw polygons with positive coordinates on a grid with a scale in one-unit increments, given nonnegative integer-valued coordinates for the vertices; and find the volume of right rectangular prisms with one side expressed as a fraction or a mixed number in halves or fourths.

Level 2 Students should be able to find areas of special quadrilaterals and triangles; draw polygons in the four-quadrant coordinate plane with scales in one-unit increments, given integer-valued coordinates for the vertices; and find the volume of right rectangular prisms with one side expressed as a fraction or a mixed number.

Level 3 Students should be able to solve problems that involve finding areas of polygons and special quadrilaterals and triangles and find the volume of right rectangular prisms with all sides expressed as a fraction or a mixed number. They should be able to solve problems by drawing polygons in the four-quadrant coordinate plane with scales in various integer increments, given integer-valued coordinates for the vertices or coordinates containing a mix of integers and half, quarter, or tenth units.

Level 4 Students should be able to solve problems by finding surface areas of three-dimensional shapes composed of rectangles and triangles. They should be able to find the volume of a compound figure composed of right rectangular prisms to solve problems.

Evidence Required

1. The student determines the area of triangles, special quadrilaterals, and polygons using composition and decomposition in solving real-world and mathematical problems.

2. The student determines the volume of right rectangular prisms with fractional edge lengths in solving real-world and mathematical problems.

3. The student draws polygons in the coordinate plane, given coordinates for the vertices in the context of solving real-world and mathematical problems.

4. The student determines the length of a side of a polygon in the coordinate plane, given coordinates for the vertices in the context of solving real-world and mathematical problems.

5. The student determines the surface area of three-dimensional figures formed by nets of polygons in the context of solving real-world and mathematical problems.

Vocabulary

coordinate, ordered pair, coordinate plane, compose/decompose, vertices, right triangle, unit fraction, edge length, area, surface area, volume, nets, faces, edges, vertices

Response Types

Equation/Numeric; Graphing

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Materials
coordinate planes, diagrams representing two– and three– dimensional figures

Attributes
Given dimensions should be positive integers, decimals, or fractions; radicals should not be used as given dimensions. Nets must only be composed of rectangles, triangles, or a combination of both.

Claim 1: Concepts and Procedures (DOK 1, 2) Question Banks
Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Claim 1 6.G.A.1 DOK Level 1

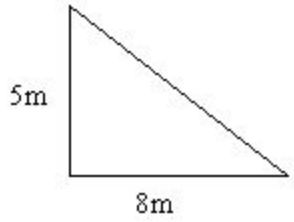
Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Evidence Required

The student determines the area of triangles, special quadrilaterals, and polygons using composition and decomposition in solving real-world and mathematical problems.

Question Type 1: The student is presented with a mathematical problem involving triangles.

1. Consider this figure.



Enter the area of the right triangle in square meters.

Rubric: (1 point) Student enters the correct area of the figure (e.g., 20). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeri

Question Type 2: The student is presented with a mathematical or realworld problem involving composition or decomposition of a triangle, special quadrilateral, or other polygon.

1. Consider this figure.

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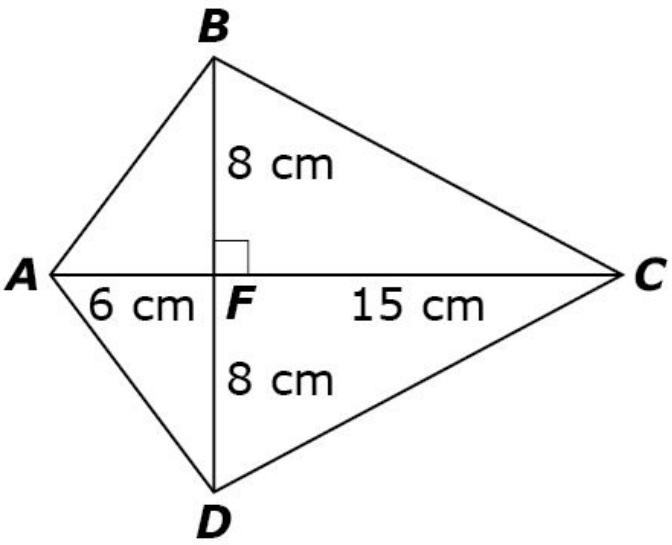
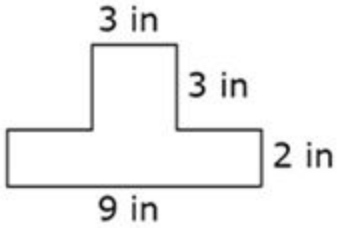


Enter the total area, in square centimeters, of kite ABCD.

2. Figure A is composed of two shapes.

- A rectangle with length 9 inches and width 2 inches
- A square with side length 3 inches



Enter the total area, in square inches, of the Figure A.

Rubric: (1 point) Student enters the correct area of the figure (e.g., 168; 27). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeric

Claim 1 6.G.A.2 DOK Level 1

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = bh to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Evidence Required

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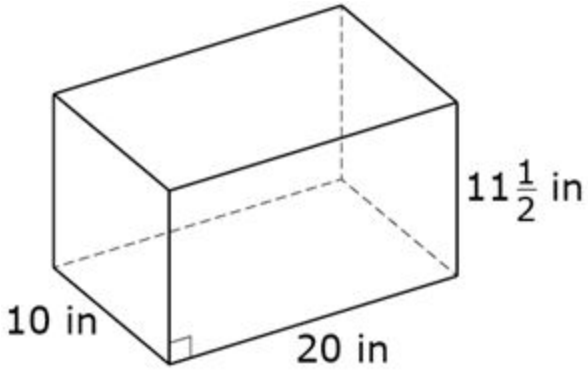
The student determines the volume of right rectangular prisms with fractional edge lengths in solving real-world and mathematical problems.

Question Type 1: The student is presented with a right rectangular prism with fractional edge lengths in the context of a mathematical or real-world problem.

1. Consider this figure.



Enter the volume, in cubic inches, of the right rectangular prism.

Rubric: (1 point) Student enters the correct volume (e.g., 2300). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeric

Claim 1 6.G.A.2 DOK Level 2

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = bh to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Evidence Required

The student determines the volume of right rectangular prisms with fractional edge lengths in solving real-world and mathematical problems.

Question Type 1: The student is presented with a compound figure composed of right rectangular prisms in the context of a mathematical or real-world problem.

1. This figure was created by joining two right rectangular prisms.

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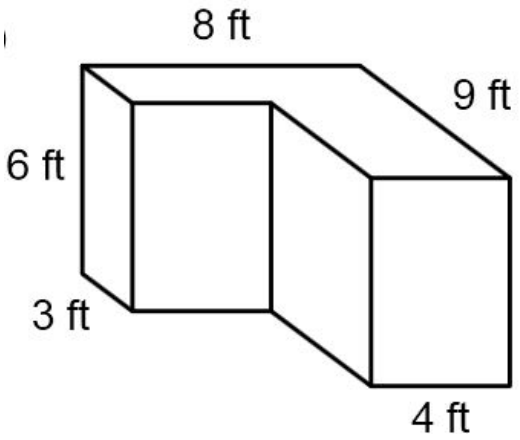


Enter the volume, in cubic feet, of the figure.

Rubric: (1 point) Student enters the correct volume (e.g., 309). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeric

Claim 1 6.G.A.3 DOK Level 1

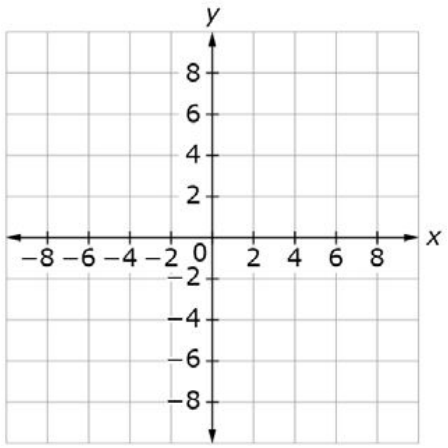
Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Evidence Required

The student draws polygons in the coordinate plane, given coordinates for the vertices in the context of solving real-world and mathematical problems.

Question Type 1: The student is presented with the vertices of a polygon in the context of a real-world or mathematical problem.
Example Stem: Consider these ordered pairs.

Point A: (3, 2)
Point B: (–3, 2)
Point C: (3, –2)



Use the Connect Line tool to form triangle ABC.

Interaction: The student is given the Connect Line, Add Point, and Delete tools to draw the polygon in the coordinate plane.

Rubric: (1 point) Student plots all given points and connects the lines correctly.

Response Type: Graphing

Claim 1 6.G.A.3 DOK Level 2

Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Evidence Required

The student determines the length of a side of a polygon in the coordinate plane, given coordinates for the vertices in the context of solving real-world and mathematical problems.

Question Type 1: The student is presented with coordinates for the side of a polygon in the coordinate plane with either the same first coordinate or the same second coordinate in the context of a mathematical or real-world problem.

1. A triangle has these coordinates:

Point A: (–5, 2) Point B: (–5, 6) Point C: (7, 2)

Enter the length of side AC.

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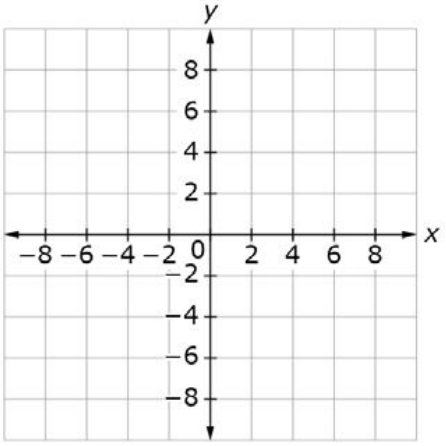
2. Refer to the map as a coordinate grid.

On the map, the library is located at (–5, 2), the bus station is located at (–5, 6), and the courthouse is located at (7, 2). Each square unit in the grid represents 1 square kilometer.



Enter the distance, in kilometers, from the courthouse to the library.

Rubric: (1 point) Student enters the correct length (e.g., 12; 12). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeric

Claim 1 6.G.A.4 DOK Level 2

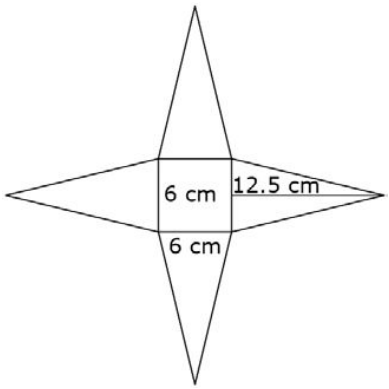
Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Evidence Required

The student determines the surface area of three-dimensional figures formed by nets of polygons in the context of solving real-world and mathematical problems.

Question Type 1: The student is presented with a net composed of rectangles, triangles, or a combination of the two in the context of a real-world or mathematical problem.

1. Susan is painting the outside of a square pyramid. The net for the pyramid is shown.



Enter the total surface area, in square centimeters, of the pyramid that Susan will paint.

Rubric: (1 point) Student enters the correct surface area (e.g., 186). Correct answer should be a single numerical value and units should be assumed from the stem.

Response Type: Equation/Numeric

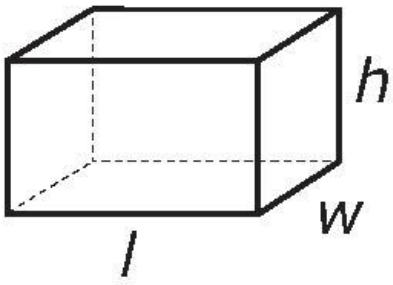
Claim 3 Communicating Reasoning Question Banks

Claim Descriptors and Targets

Students can clearly and precisely construct viable arguments to support their own reasoning and to critique the reasoning of others.

Example 1

A right rectangular prism has a height of 5 centimeters. Is it possible that the volume of the prism is 42 cubic centimeters?



(Not drawn to scale)

If it is possible:Enter a possible length and width, in cm, of a prism with a height of 5 cm in two response boxes.

If it is not possible:
Enter a possible volume (in cubic centimeters) and the corresponding length and width (in centimeters) in the response boxes.

Rubric: (1 point) The student enters dimensions that are possible (e.g., any two numbers whose product is 8.4).

Response Type: Equation/Numeric (2 response boxes)

Commentary: This item addresses the misconception that the side-lengths of a right rectangular prism must be whole numbers or the related misconception that if the product of two numbers is a whole number then each factor