**Geometry in Construction UNIT 1 Lesson Plans**

**Day 1**

1) Ice Breaker Activity: Birthday Line-Up

2) Review class procedures & policies, collect relevant information from students, and pass out required material

3) Team Building Activity: Tarp Flipping Activity

4) Lesson: Fractions with Construction

*Objective:* The students will review adding, subtracting, multiplying, & dividing mixed numbers

5) Classwork: Fractions in Construction W.S.

**Day 2**

1) Team Building Activity: Name Game

2) Lesson: Measurement in Construction

*Objective:* The students will review how to measure using rulers and tape measures in construction

3) Team Building Activity: River Crossing

4) Classwork: The Ruler Game

**Day 3**

1) Lesson: Tools for Geometry

 *Objective:* Students will learn how to use a compass and protractor to take measurements and perform basic geometric definitions and constructions.

2) Assessment: Fractions in Construction Quiz

3) Team Building Activity: Washer & String Lifting

4) Lesson: Algebra Review

 *Objective:* Students will review skills from Algebra including solving an equation, graphing lines in the coordinate plane, and key algebraic terms

5) Classwork: Algebra Review Packet

[CCSS.MATH.CONTENT.HSG.CO.A.1](http://www.corestandards.org/Math/Content/HSG/CO/A/1/)

Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

[CCSS.MATH.CONTENT.HSG.CO.D.12](http://www.corestandards.org/Math/Content/HSG/CO/D/12/)

Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).*Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line*.

**Day 4**

1) Team Building Activity: Building Blocks Activity

*Objective:* Students will use stations for different marking of cuts using adding, subtracting, multiplying, and dividing fractions

2) Lesson: Measuring and Marking a Board

*Objective:* Students will use stations for different marking of cuts using adding, subtracting, multiplying, and dividing fractions

3) Lesson: Miter Saw Safety Demo/Video

*Objective:* Students will cut their marked piece & will review Miter Saw Safety Packet

4) Classwork: Miter Saw Safety Packet

**Day 5**

1)Lesson: Key Geometric Terms

*Objective:* Students will write definitions for line segment, ray, angle, altitude, median, angle, etc.

2) Activity: Picture matching activity with definitions

3) Team Building Activity: Square Activity

4) Lesson: Area of Parallelograms

*Objective:* The students will review what area is along with units & find areas breaking down picture into rectangles; the student will review solving algebraic equations

5) Classwork: Key Geometric Terms W.S. & Area of Parallelogram W.S.

[CCSS.MATH.CONTENT.HSG.CO.A.1](http://www.corestandards.org/Math/Content/HSG/CO/A/1/)

Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

**Day 6**

1) Classwork: Nailing an Inch

2) Lesson: Measuring and Marking a Sheet of Plywood

*Objective:* Students will use a tape measure and a chalk line to mark out a sheet of plywood to cut.

3) Team Building Activity: Building Perspective

4) Lesson: Circular Saw Safety Demo/Video

*Objective:* Students will learn how to properly use a circular saw and make a practice cut.

5) Classwork: Circular Saw Safety Packet

**Day 7**

1) Lesson: Area of Parallelograms, Triangles, Trapezoids, and Circles

*Objective:* The students will find the area of parallelograms, triangles, trapezoids, and circles in problem solving situations.

2) Activity: Students will be given an outline of a house and a lawn and will need to determine price for treatment of grass and price to dig for foundation of house.

2) Team Building Activity:Minefield Activity

3) Lesson: Area of Polygons

*Objective:* The students will define an apothem and will find the area of polygons

4) Classwork: Window Area Worksheet

[CCSS.MATH.CONTENT.HSG.GMD.A.1](http://www.corestandards.org/Math/Content/HSG/GMD/A/1/)
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*.

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

**Day 8**

1) Team Building Activity:Egg Drop Activity

2) Classwork: Stair Building

**Day 9**

1) Lesson: Surface Area of a Sphere

*Objective:* Students will find the surface area of a sphere.

2) Activity:

Students will measure the circumference of an orange. The will then use that to find the radius of the circle. Student will then create 6 circle on a sheet of paper with the same radius.

Once the students have constructed the circles they should peel the orange and fill in the circles with the peels. (Larger peels work best). After they are done they should look at other groups, and estimate how many circles should have been filled.

3) Team Building Activity: Recall Game

4) Activity: Students will calculate total perimeter & area of various house designs and material costs for fencing, floors, roofing, walls, etc. Students will create a cost analysis of materials to stay within a budget.

[CCSS.MATH.CONTENT.HSG.GMD.A.1](http://www.corestandards.org/Math/Content/HSG/GMD/A/1/)
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*.

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)
Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

**Day 10**

1) Team Building Activity:Triangle Building

2) Classwork: Stair Building

**Day 11**

1) Lesson: Geometric Constructions

 *Objective:* Students will learn how to perform basic geometric constructions including parallel and perpendicular lines

2) Activity: Students will design a patio using various shapes and will given a budget and restrictions for building. Students will create patio design that stays within budget and meets the requirements.

3) Team Building Activity: Survival Scenario

 *Students will work together to determine the twelve most useful objects in a plane crashing scenerio*

4) Classwork: Algebra Review W.S.

#### [CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

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[CCSS.MATH.CONTENT.HSG.CO.D.12](http://www.corestandards.org/Math/Content/HSG/CO/D/12/)

Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).*Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line*.

#### [CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

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**Day 12**

1) Lesson: Reading and Using an Architect’s Scale

*Objectives*

 The students will explore the use of an architect’s scale to measure existing lines and create new lines.

*Activity*

 Students will use an architect’s scale to measure various lines using various scales.

2) Lesson: Introduction to Blueprint Reading

**Day 13**

1) Assessment: Area of 2D Figure Formative Assessment

2) Lesson: Surface Area of 3D Figures

*Objective*

 Students will use nets to find the area of a 3D figure & will design 3D figures with a given area. Figures include prism, cone, cylinder, and pyramid.

3) Activity: Students will be given various 3D shapes and will be required to find the shapes with the figure and the total surface area.

3) Classwork: Area of 3D Figures W.S.

[CCSS.MATH.CONTENT.HSG.GMD.A.1](http://www.corestandards.org/Math/Content/HSG/GMD/A/1/)
Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*.

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)
Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

**Day 14**

1) Lesson: Blueprint Reading

*Activity: Blueprint Scavenger Hunt*

2) Lesson: Introduction to Balsa Wood House

**Day 15**

1) Lesson: Surface Area of 3D Figures

*Objective*

 Students will create nets of 3D figures under given circumstances for area

2) Activity:The students will be given cardboard to create a 3D figure under given circumstances for dimensions and area. Students will present their designs to the class.

3) Algebra Review Continued

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)
Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

**Day 16**

1) Classwork: Balsa Wood House

**Day 17**

1) Lesson: Surface Area of 3D Figures (continued)

*Objective*

 Students will create nets of 3D figures under given circumstances for area

2) Activity:The students will be given cardboard to create a 3D figure under given circumstances for dimensions and area. Students will present their designs to the class.

3) Lesson: Perimeter and Area of Polygons in the Coordinate Plane

*Objective*

The students will use coordinates to find the perimeter and area of 2D & 3D shapes in the coordinate plane.

4) Activity: Students will use overhead pictures of various chicago locations and their ipads to place pictue in coordinate plane to estimate the perimeter and/or area of the location; students will preview scale factor

5) Classwork: Area & Perimeter in Coordinate Plane W.S.

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)
Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)
Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

[CCSS.MATH.CONTENT.HSG.GPE.B.7](http://www.corestandards.org/Math/Content/HSG/GPE/B/7/)

Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.\*

**Day 18**

1) Classwork: Balsa Wood House

**Day 19**

1) Lesson: Ratios and Proportions

*Objectives*

The students will use ratios, proportions, and dilations to find unknown heights and dimensions of objects

*Activity*

The students will be given pictures that are similar and will create the criteria for similarity. The students will take pictures with taller objects and will use proportions and scale factor to find the height of the object.

2) Classwork: Shape Activity with Similarity

3) Lesson: Similar Triangles

*Objectives*

The students will explore the properties of similarity and similar triangles. Students will use theorems to prove two triangles are similar.

*4)* Classwork: Similar Triangles W.S.

[CCSS.MATH.CONTENT.HSG.SRT.A.1](http://www.corestandards.org/Math/Content/HSG/SRT/A/1/)
Verify experimentally the properties of dilations given by a center and a scale factor:

[CCSS.MATH.CONTENT.HSG.SRT.A.1.A](http://www.corestandards.org/Math/Content/HSG/SRT/A/1/a/)
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.

[CCSS.MATH.CONTENT.HSG.SRT.A.1.B](http://www.corestandards.org/Math/Content/HSG/SRT/A/1/b/)
The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

[CCSS.MATH.CONTENT.HSG.SRT.A.2](http://www.corestandards.org/Math/Content/HSG/SRT/A/2/)
Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

**Day 20**

1) Classwork: Balsa Wood House

**Day 21**

1) Lesson: Similarity in Triangles

*Objectives:*

Students will apply properties of similar triangles and what other figures are similar. (rectangles, squares, trapezoids, circles, and regular polygons)

2) Classwork: Proving triangles and shapes similar W.S.

3) Activity

Students will use properties of similar triangles and shadows/mirrors to find the height of an object outside. light pole, bleaches, tree, building, ext.

4) Classwork: Finding Missing Sides and Angles of Similar Figures W.S.

[CCSS.MATH.CONTENT.HSG.SRT.A.2](http://www.corestandards.org/Math/Content/HSG/SRT/A/2/)
Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

[CCSS.MATH.CONTENT.HSG.SRT.A.3](http://www.corestandards.org/Math/Content/HSG/SRT/A/3/)
Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

[*CCSS.MATH.CONTENT.HSG.SRT.B.5*](http://www.corestandards.org/Math/Content/HSG/SRT/B/5/)Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

**Day 22**

1) Classwork: Balsa Wood House

**Day 23**

1) Lesson: Similarity in Triangles & Shapes

 *Objective:* Students will use the similarity criteria to prove that two shapes are similar

2) Activity: Students will be given models of buildings and actual dimensions to determine similarity; students will then look at triangles in construction plans to determine if the triangles are similar.

3) Lesson: Finding missing sides and angles in problem solving situations

 *Objective:* Students will use similarity to find missing sides and angles in problem solving situations

4) Activity: Students will read blue print and directions to find actual dimensions and scaled dimension.

5) Classwork: Students will use tools to draw floor plan of a home to scale.

[CCSS.MATH.CONTENT.HSG.SRT.A.2](http://www.corestandards.org/Math/Content/HSG/SRT/A/2/)
Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

[CCSS.MATH.CONTENT.HSG.SRT.A.3](http://www.corestandards.org/Math/Content/HSG/SRT/A/3/)
Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

[*CCSS.MATH.CONTENT.HSG.SRT.B.5*](http://www.corestandards.org/Math/Content/HSG/SRT/B/5/)Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)

Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)

Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

**Day 24**

1) Classwork: Balsa Wood House

**Day 25**

1) Lesson: The relationship between sides and area of similar figure

*Objective:*

The students will explore the relationship between the side lengths and areas of similar figures.

2) Activity:

Step 1 Give students the 12 by 5 rectangle and have them calculate the area. Show the students a rectangle with double the dimensions and have them estimate what they think the area will be.

After the discussion have them calculate the area – but don’t give them the relationship yet.

Step 2 Have the students calculate ratio of sides of similar figures and then find the ratio of the area of similar figures. Ask students to find the pattern

3) Classwork: Area of Similar Figures W.S.

4) Activity: Students will determine cost of an area for materials based on a blue print drawing

[CCSS.MATH.CONTENT.HSG.SRT.A.2](http://www.corestandards.org/Math/Content/HSG/SRT/A/2/)
Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

[CCSS.MATH.CONTENT.HSG.SRT.A.3](http://www.corestandards.org/Math/Content/HSG/SRT/A/3/)
Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

*[CCSS.MATH.CONTENT.HSG.SRT.B.5](http://www.corestandards.org/Math/Content/HSG/SRT/B/5/)*Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

[CCSS.MATH.CONTENT.HSG.MG.A.3](http://www.corestandards.org/Math/Content/HSG/MG/A/3/)

Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

[CCSS.MATH.CONTENT.HSG.MG.A.1](http://www.corestandards.org/Math/Content/HSG/MG/A/1/)

Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

**Day 26**

1) Classwork: Balsa Wood House

**Day 27**

1) Classwork: Complete and share floor plan design; students will provide feedback and determine if drawing is properly scaled and will determine materials cost based on design.

2) Assessment: Similarity Quiz

2) Classwork: Slope and Linear Equations Review W.S.

**Day 28**

1) Classwork: Quarter 1 Project - Bean Bag Boards

**Day 29**

1) Lesson: Coordinate Proofs

 *Objective:* Students will use coordinates to prove that two lines are parallel or perpendicular to each other.

2) Activity: Matching activity where students will match slopes, lines, and relationship.

3) Lesson: Coordinate Proofs

 *Objective:* Students will use coordinates and theorems to prove that two triangles are similar to each other.

4) Classwork: Figures in the coordinate plane W.S.

[CCSS.MATH.CONTENT.HSG.GPE.B.4](http://www.corestandards.org/Math/Content/HSG/GPE/B/4/)

Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

[*CCSS.MATH.CONTENT.HSG.GPE.B.5*](http://www.corestandards.org/Math/Content/HSG/GPE/B/5/)

Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

[CCSS.MATH.CONTENT.HSG.GPE.B.6](http://www.corestandards.org/Math/Content/HSG/GPE/B/6/)

Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

**Day 30**

1) Classwork: Quarter 1 Project - Bean Bag Boards

**Day 31**

1) Assessment: Similarity Proofs in the Coordinate Plane

2) Review & Enrichment

**Day 32**

1) Classwork: Quarter 1 Project - Bean Bag Boards

**Day 33**

1) Review & Enrichment

**Day 34**

1) Classwork: Quarter 1 Project - Bean Bag Boards

**Day 35**

Unit Assessment: Area & Similarity