Constructions Unit:

MGE.ALT 5: I am able to use a variety of tools and methods to construct basic geometric figures.

Each student will create a journal of all the constructions defined in the long-term and supporting learning targets. This journal will include the constructions with a step-by-step explanation and can be used during assessments.

The summative judgment for this long-term learning target will be based on the following collection of evidence.

1. Each student's journal will be evaluated on whether all the constructions are included, the quality of the constructions and the clarity of the explanations.
2. Each student will be asked to do at least one construction on-demand. Each student will be asked to demonstrate his/her understanding of constructions through doing one randomly chosen construction in front of a small group of peers.
3. Each student will complete an assessment where he/she completes and explains a construction.

To demonstrate **proficiency**, all the constructions below should include all construction marks and an explanation of how they are completed with an unmarked straightedge and a compass. To demonstrate **highly proficient**, the student must include explanations of how the constructions are completed with string, a reflective devices, paper folding or dynamic geometric software. Plus, the student must be able to demonstrate his/her understanding by completing at least one randomly chosen construction in an individual on-demand assessment.

1. Copying a segment
2. Copying an angle
3. Bisecting a segment
4. Bisecting an angle
5. Constructing perpendicular lines, including the perpendicular bisector of a line segment.
6. Constructing a line parallel to a given line through a point not on the line.
7. Constructing a median of a triangle.
8. Constructing the centroid of a triangle.
9. Constructing the circumcenters of a triangle.
10. Constructing the orthocenter of a triangle.
11. Constructing the incenters of a triangle.
12. Constructing an equilateral triangle, square and regular hexagon inscribed in a circle.
13. Inscribe a circle in a triangle.
14. Circumscribe a circle about a triangle.

Vocabulary:

New Terms:
Compass
Straightedge
Construction (classical meaning with an unmarked straightedge and compass)
Centroid
Circumcenters
Orthocenter
Incenters
Inscribe
Circumscribe

Review the following terms:
Segment
Angle
Bisecting
Perpendicular
Parallel
Square
Equilateral Triangle
Regular Hexagon
(The last two terms may be new depending on the placement of this unit and previous units covered.)

Build a word wall as the unit progresses.

Block Schedule Plan:

Day 1

MGE.ALT 5: I am able to use a variety of tools and methods to construct basic geometric figures.

MGE.ALT 5.1: I can demonstrate my understanding of formal geometric constructions by performing and explaining each step.

Materials:
Teacher provided:
Compass, unmarked straightedge (rulers okay, if unmarked straightedge is not available), unlined paper, Constructions Exploration Record Sheet, exit ticket.
Student provided:
Pencil, eraser, notebook

Guiding Question:

How can I construct the following with only a compass and a straightedge?

a. Copy a segment
b. Copy an angle
c. Bisect a segment
d. Bisect an angle
e. Construct perpendicular lines, including the perpendicular bisector of a line segment.
f. Construct a line parallel to a given line through a point not on the line.

Tasks:

1. Constructions Exploration Record Sheet (*See attached*)

2. Share ideas
   a. *Create twelve or more groups of two to four, so that at least two groups have a construction in common.*
   Each small group will share their ideas of how to complete their assigned construction with the other group(s) in the class assigned the same construction. The large group should choose the best method and explain why it works and why it is the best.
   b. One representative from each large group will share their best method, other alternatives explored and why this was the best choice for the construction they were assigned.
   c. As each group presents, the rest of the class should be asking clarifying questions and probing questions to determine if the method works and why it was the best choice.

d. As a class, decide if the method is the best way to do the construction.

3. Every student should copy all the methods into his/her notebook with step-by-step explanation.

4. Exit slip to rate your understanding of the constructions we did today. (*See attached sheet.)*

Note: Explain criteria for demonstrating **highly proficient**.
Students who wish to try to demonstrate **highly proficient** on this target will need to do some research and complete tasks outside of the class. The additional tasks and explanations should be added to their construction notebooks each day as we progress.

Day 2

MGE.ALT 5: I am able to use a variety of tools and methods to construct basic geometric figures.

MGE.AST 5.2: I can apply and construct triangle properties including medians, centroids, circumcenters, orthocenters, and incenters.
MGE.AST 5.4: I can construct the inscribed and circumscribed circles of a triangle.

Materials:
Teacher provided:
Compass, unmarked straightedge (rulers okay, if unmarked straightedge is not available), unlined paper.
Student provided:
Pencil, eraser, notebook, McDougal-Littell Geometry Textbook

Tasks:

1. Create groups that mix the students according to their responses on the exit tickets. The group should have at least one person who rated their understanding as high for each construction. Have the group share their notebooks and provide feedback on each construction (rubric provided). If there is a construction that most of the classes rated their understanding as low, review it as a large group.

2. Construction unit worksheet 2.

3. Add the following constructions to your notebook. Make sure each step is explained.
    a. Median
    b. Centroids
    c. Circumcenters
    d. Orthocenters
    e. Incenters

4. Exit slip to rate your understanding of the constructions we did today. (*See attached sheet.)*

Day 3

MGE.ALT 5: I am able to use a variety of tools and methods to construct basic geometric figures.

MGE.AST 5.3: I can construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
MGE.AST 5.4: I can construct the inscribed and circumscribed circles of a triangle.

Materials:
Teacher provided:
Compass, unmarked straightedge (rulers okay, if unmarked straightedge is not available), unlined paper.
Student provided:
Pencil, eraser, notebook, McDougal-Littell Geometry Textbook

Tasks:

1. Create groups that mix the students according to their responses on the exit tickets. The group should have at least one person who rated their understanding as high for each construction. Have the group share their notebooks and provide feedback on each construction (rubric provided). If there is a construction that most of the classes rated their understanding as low, review it as a large group.

2. Constructions Unit Worksheet 3 (*See attached sheet*). The students will work at their table groups, or in small groups randomly selected, to complete the worksheet.

3. Constructions Unit Worksheet 4 (*See attached sheet*).
a. Divide the class into groups of six. In their groups, have them pair up. Each pair will work on one of the three constructions explored on the worksheet. In other words, have two students do problems 1a and 1b, two others will do 2a and 2b, and the last pair will work on 3a and 3b. Have them work individually first, and then share as a pair. Then the group of six will discuss each construction.
b. Randomly choose (or circulate why they are working and strategically pick) students to share the responses to the questions on the worksheet.

4. Have the students add the constructions to their constructions notebooks.

Reminder to students: Make sure your construction notebook is complete. There will a couple of assessments next class meeting.

Day 4

MGE.ALT 5: I am able to use a variety of tools and methods to construct basic geometric figures.

MGE.ALT 5.1: I can demonstrate my understanding of formal geometric constructions by performing and explaining each step.
MGE.AST 5.2: I can apply and construct triangle properties including medians, centroids, circumcenters, orthocenters, and incenters.
MGE.AST 5.3: I can construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.
MGE.AST 5.4: I can construct the inscribed and circumscribed circles of a triangle.

Materials:
Teacher provided:
Compass, unmarked straightedge (rulers okay, if unmarked straightedge is not available), unlined paper.
Student provided:
Pencil, eraser, constructions notebook

Tasks:

1. Group assessment:
    a. Students will be divided into groups of five to seven.
    b. Each student will randomly choose a construction to complete.
    c. One at a time the student will complete all the steps of the construction explaining their work verbally or in writing as they go.
    d. The other group members score the student on the rubric.
    e. Rotate.
    f. Each student gathers their work with the other student's scoring rubrics and turns it in with their construction notebooks.

2. Individual assessment: Student's may use their construction notebooks.

3. The final summative score on MGE.ALT 5 will be based on the collection of evidence from the group assessment, individual assessment and constructions notebook. Students will have other opportunities to demonstrate proficiency on this target on other assessments throughout the year.