Plans of the CSS *Neuse (*Math)

Lesson Overview:
The CSS *Neuse* was a Confederate ironclad built in Whitehall, North Carolina, (today Seven Springs) during the Civil War. Students will use copies of original drawings of the CSS *Neuse* to determine the angles on the casemate of the ironclad. For more information on the CSS *Neuse*, look at this background information from the site's website.

Lesson Essential Question:
- How can the students use the theorems when a transversal crosses parallel lines to determine the measure of angles?
- How can student use inscribed angles in a circle to determine distance along an arc?

Common Core Standards:

Prove geometric theorems
CCSS.MATH.CONTENT.HSG.CO.C.9
Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints*.

Experiment with transformations in the plane
CCSS.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.

Understand and apply theorems about circles
CCSS.MATH.CONTENT.HSG.C.A.1
Prove that all circles are similar.
CCSS.MATH.CONTENT.HSG.C.A.2
Identify and describe relationships among inscribed angles, radii, and chords. *Include 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.*

Find arc lengths and areas of sectors of circles
CCSS.MATH.CONTENT.HSG.C.B.5
Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

North Carolina Standards

Math III

G.CO.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.

G.C.5
Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
All circles are similar (G.C.1). Sectors with the same central angle have arc lengths that are proportional to the radius. The radian measure of the angle is the constant of proportionality.

G.CO.9
Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints*.

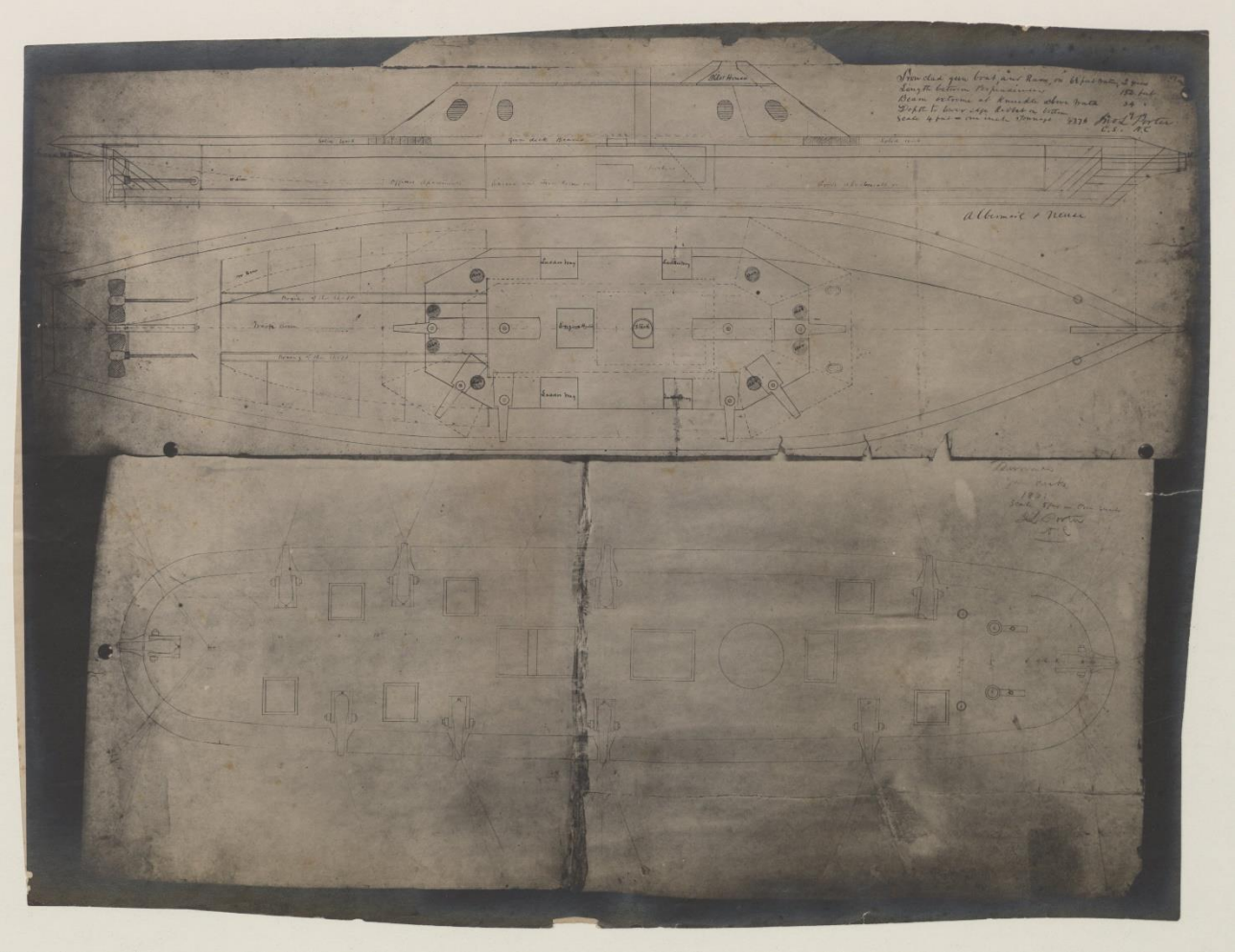
Language Demands:
Angle, vertical angles, alternate interior angles, supplementary angles, corresponding angles, parallel line, line, modeling, arc, circle, inscribed angle

Tasks:

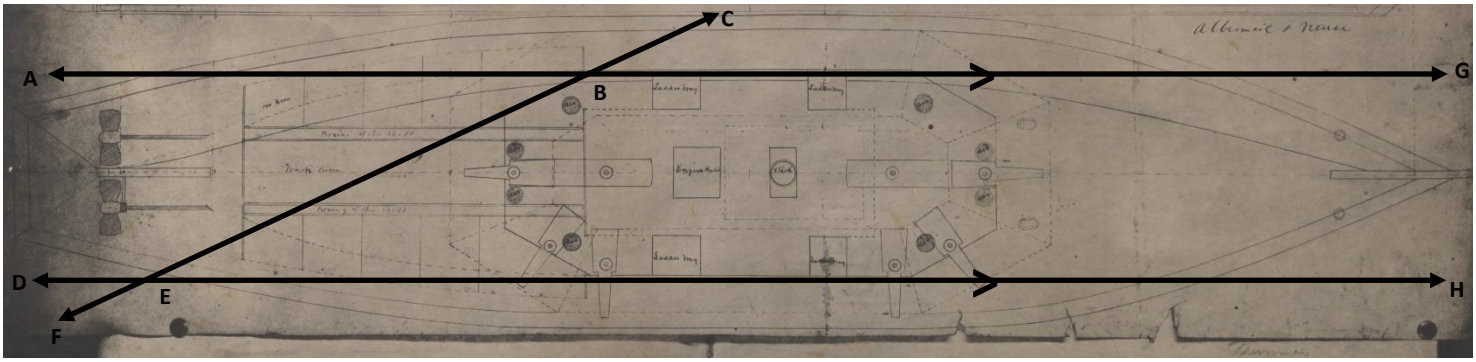
The teacher will:
- Review the vocabulary from the language demands.
- Provide students with the worksheet(s).
- Review the answers to the worksheet(s).

The students will:
- Listen to the teacher's review of the vocabulary.
- Complete the worksheet(s).
- Answer the teacher's questions during the review.

Original Drawings of the CSS *Neuse*



Activity 1: Sketches of the CSS *Neuse*



Questions

1) What is the measure of $< ABC$?

2) Without measuring the angle, find the $m < FBG$.

    a. What theorem did you use to determine the $m < FBG$

3) Without measuring the angle, find the $m < ABF$.

    a. What theorem or definition did you use to determine the $m < ABF$?

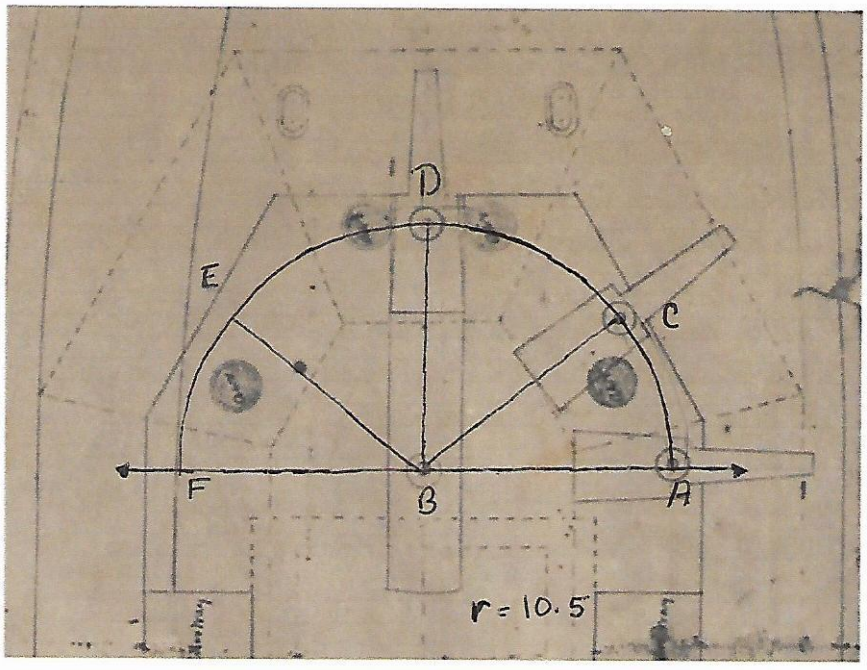
4) Without measuring the angle, find the $m < DEC$.

    a. What theorem did you use to determine the $m < DEC$.

Answers:

1) $m < ABC \approx 155°$
2) $m < FBG \approx 25°$
    a. Vertical angles are congruent
3) $m < ABF \approx 155°$
    a. $< ABF$ and $< ABC$ are supplementary angles, which means they add to equal 180°.
4) $m < DEC \approx 155°$
    a. Since $\underset{AG}{\leftrightarrow}$ and $\underset{DH}{\leftrightarrow}$ are parallel lines cut by the transversal $\underset{FC}{\leftrightarrow}$, $< ABC$ and $< DEC$ are corresponding angles, and therefore, $< ABC$ and $< DEC$ are congruent.

Activity 2: Gun Carriages on the CSS *Neuse*



On the CSS *Neuse*, one 6.4 inch Brooke rifle was placed on each end of the casemate. The Brooke rifles were positioned on each side so that the cannons could be pivoted to five gun ports. In this activity, you will determine the distance the front of the cannon will travel to each gun port.

1) Find the measure of the angles:

$m < ABC$ _____

$m < ABD$ _____

$m < ABE$ _____

$m < ABF$ _____

For the following problems, use a radius of 10 ½ ft.

2) Find the distance that the cannon travels from point A to point C on the arc _____ .

3) Find the distance that the cannon travels from point A to point D on the arc _____.

4) Find the distance that the cannon travels from point A to point E on the arc _____.

5) Find the distance that the cannon travels from point A to point F on the arc _____.

Answers

1) Find the measure of the angles:
    a. $m < ABC$ _40°___
    b. $m < ABD$ _90°___
    c. $m < ABE$ _140°__
    d. $m < ABF$ _180°__
2) Find the distance that the cannon travels from point A to point C on the arc. 7.33 ft.
3) Find the distance that the cannon travels from point A to point D on the arc. 16.49 ft.
4) Find the distance that the cannon travels from point A to point E on the arc. 25.66 ft.
5) Find the distance that the cannon travels from point A to point F on the arc. 32.99 ft.