

USING AUTO CADD TO DRAW A STAINED GLASS WINDOW

Performance Standard 9B.H

Create a scale drawing using Auto CADD and then determine the actual size of pieces of a stained glass window:

- *Mathematical knowledge:* measure drawing, use proportional reasoning to determine measurements of actual figure.
- *Strategic knowledge:* solve problem using proportions, tables or charts.
- *Explanation:* explain completely what was done and why it was done.

Procedures

1. ***In order to identify, describe, classify and compare relationships using points, lines, planes and solids (9B)***, provide students with sufficient learning opportunities to develop the following:

- Create and analyze scale models using proportional reasoning.
- Solve problems involving similar figures.

The use of Auto CADD in the drafting field is critical. Many functions employed include the use of line commands, object snaps, limits and units controls, polygon options and measurement tools. There are also times when more visual display is applicable by using the fill and color commands to apply color to the work. This assessment aligns with computer aided drafting (CAD) standards within the Architectural Drafting Cluster and Mechanical Drafting Cluster occupational skill standards. It also addresses International Technology Education Association (ITEA) Standards #3 (Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study), #8 (Students will develop an understanding of the attributes of design) and #19 (Students will develop an understanding of and be able to select and use manufacturing technologies.)

2. Provide students with “The Stained Glass Window” task sheet. Have students work individually. Calculators may be used.

Use appropriate CADD measurement techniques and units control to an accuracy of one decimal place. Recreate the diagram of a stained-glass window to the largest scale that would fit on an ‘A’ size sheet of paper. The stained glass window should be created within a square known to have a dimension of 36 in. by 36 in. Now, what is the measure of one side of the smaller regular decagon in the center of the real window? What is the length of one side of the larger decagon near the exterior of the window? What is the diameter of the circle chosen to create the larger decagon? Should the decagon be created inscribed or circumscribed around the construction circle? Explain your reasoning. How many times larger is one side of the big decagon to one side of the smaller decagon? If you were to create another decagon, inside the smaller decagon, can you predict what the approximate length of one of the sides would be?

3. Use the standard scoring rubric. Give each student a score in each of the three categories. A score of 4 should indicate completely correct solutions to all parts of the problem, with complete and correct justifications of their reasoning. A 3 should represent correct or nearly correct solutions to all parts, with only minor computational errors making their solutions inaccurate. Their rationale should be sound but may not be completely explained. A 2 would indicate that students have some idea about how to answer the questions but make major errors in computation and or reasoning that affects their answers. A 1 may have a correct answer for one part, but generally shows little understanding in their rationale for their procedures and processes. A score of 0 generally reflects no correct responses and no logical rationale for their procedures and processes.
4. Minor errors in computation include making errors in the actual addition or multiplication or rounding incorrectly. Major errors include using the wrong operations or formulas to relate terms.
5. The window pictured measures 36 in. x 36 in. The inner decagon measures 3.6 inches per side. The larger decagon would have a side measuring about 11.3 inches in the original window. The diameter of the circle chosen to create the larger decagon should be 36 in. and the decagon should have been created inscribed within this circle. The predicted length of one side of the third decagon should be approximately 1.5 in. Students should show some sort of proportional reasoning to arrive at these answers, either by actually setting up proportions and solving or by using tables or charts and patterns to help. In any case, a written explanation of what they are doing and a justification for why they set up the proportion or table, etc., is also needed. This should include a description about what each quantity represents as well as the relationship between the quantities.

Examples of Student Work

- [Meets](#)
- [Exceeds](#)

Time Requirements

- Two class periods

Resources

- Copies of “The Stained Glass Window” task sheet
- Auto CADD or other similar CADD program
- Writing utensil
- Calculators
- Mathematics Rubric

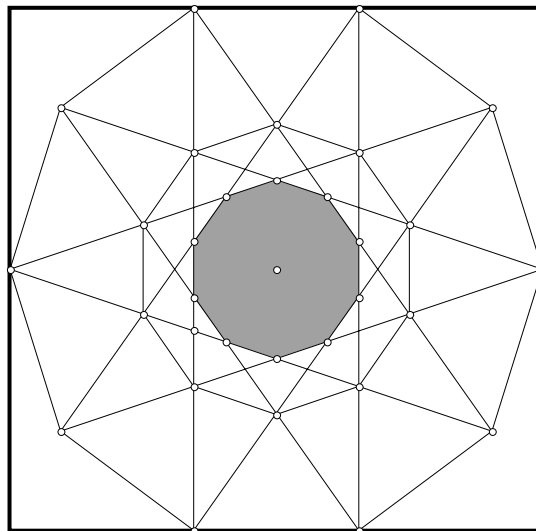
NAME _____ DATE _____

THE STAINED GLASS WINDOW

Student Task Sheet

Use appropriate CADD measurement techniques and units control to an accuracy of one decimal place. Recreate the diagram of a stained-glass window to the largest scale that would fit on an 'A' size sheet of paper. The stained glass window should be created within a square known to have a dimension of 36 in. by 36 in.

1. What is the measure of one side of the smaller regular decagon in the center of the real window?
2. What is the length of one side of the larger decagon near the exterior of the window?
3. What is the diameter of the circle chosen to create the larger decagon?
4. Should the decagon be created inscribed or circumscribed around the construction circle? Explain your reasoning.
5. How many times larger is one side of the big decagon to one side of the smaller decagon?
6. If you were to create another decagon, inside the smaller decagon, can you predict what the approximate length of one of the sides would be?



MATHEMATICS RUBRIC

NAME _____ DATE _____

- Exceeds standard (must receive a 4 in each area)
- Meets standard (must receive all 3's or a combination of 3's and 4's)
- Approaches standard (must receive all 2's or any combination which may include a 3 or a 4)
- Begins standard (has no 3's or 4's but not all 1's)
- Absent (has all 1's and 0's)

	Mathematical Knowledge	Strategic Knowledge	Explanation
4	<ul style="list-style-type: none"> • Wrote the right answer. • Used math words correctly to show understanding of how math works. • Worked it out with no mistakes. • Used the right math words and labeled the answers. 	<ul style="list-style-type: none"> • Identified all the important parts of the problem, and knew how they went together. • Showed all the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote what was done and why it was done. • If a drawing was used, all of it was explained in writing.
3	<ul style="list-style-type: none"> • Knew how to do the problem, but made small mistakes. 	<ul style="list-style-type: none"> • Identified most of the important parts of the problem. • Showed most of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote mostly about what was done. • Wrote a little about why it was done. • If a drawing was used most of it was explained in writing.
2	<ul style="list-style-type: none"> • Understood a little, but made a lot of big mistakes. 	<ul style="list-style-type: none"> • Identified some of the important parts of the problem. • Showed some of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote some about what was done or why it was done but not both. • If a drawing was used, some of it was explained in writing.
1	<ul style="list-style-type: none"> • Tried to do the problem, but didn't understand it. 	<ul style="list-style-type: none"> • Identified almost no important parts of the problem. • Showed almost none of the steps used to solve the problem. 	<ul style="list-style-type: none"> • Wrote or drew something that didn't go with the answer. • Wrote an answer that was not clear.
0	<ul style="list-style-type: none"> • No answer attempted. 	<ul style="list-style-type: none"> • No strategy shown. 	<ul style="list-style-type: none"> • No written explanation.
Score			