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Resource ID#: 72180

Primary Type: Formative Assessment

Softball Complex

Students are asked to solve a design problem in which a softball complex is to be located on a given tract of land subject to a set of specifications.

General Information

Subject(s): Mathematics

Grade Level(s): 9, 10, 11, 12

Intended Audience: [Educators](#)

Freely Available: Yes

Keywords: MFAS, modeling, quarter circles

Instructional Component Type(s): [Formative Assessment](#)

Resource Collection: MFAS Formative Assessments

Attachment

[MFAS_SoftballComplexWorksheet.docx](#)

[MFAS_SoftballComplexWorksheet.pdf](#)

Formative Assessment Task

Instructions for Implementing the Task

This task can be implemented individually, with small groups, or with the whole class.

1. The teacher asks the student to complete the problems on the Softball Complex worksheet.
2. The teacher asks follow-up questions, as needed.

TASK RUBRIC

Getting Started

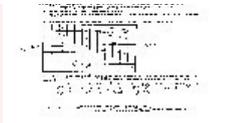
Misconception/Error

The student is unable to sketch a diagram that is consistent with the specifications.

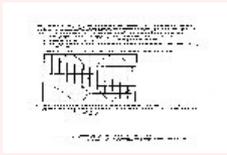
Examples of Student Work at this Level

The student does one or more of the following:

- Does not construct softball fields with the correct shape or dimensions.



- Draws a multipurpose building that is not circular or is not close to the optimal size.



- Orients the quarter-circle fields without regard to maximizing the area of the multipurpose building.



- Does not account for the 25 feet clearance from the boundary of the tract.



Questions Eliciting Thinking

What is the shape of each softball field?

What is the shape of the multipurpose building?

What is the distance between gridlines on the grid that is provided?

Where should you start your sketch?

Instructional Implications

Carefully review the specifications with the student. Ask the student whether it would be better to have the centers of the quarter-circle fields near the corners of the tract or near the center of the tract. Point out that having the centers near the center of the tract leaves little room for the multi-purpose building since the empty space is scattered into the four corners of the tract. Guide the student to begin the sketch by drawing lines that satisfy the requirement that the fields must be 25 feet from the tract boundary. Ask the student to draw the softball fields using a compass and noting that the radii of the quarter-circles must be 250 feet. Prompt the student to locate the center of the multi-purpose building at the center of the tract, where the diagonals of the square tract intersect. Ask the student to construct the largest circle for the multipurpose building, ensuring that the building remains 50 feet from each of the fields. Then ask the student to review the specifications to ensure that all have been met.

After revising his or her diagram, guide the student to calculate the diagonal of the 550 square foot usable tract. Then ask the student to calculate the diameter of the multipurpose building that maximizes its footprint.

Making Progress

Misconception/Error

The student is unable to determine the maximum diameter of the multipurpose building.

Examples of Student Work at this Level

The student draws a diagram that meets all of the specifications but is unable to correctly determine the diameter of the multipurpose building that maximizes its footprint (e.g., the student uses the sketch to estimate diagonal lengths and the diameter).



Questions Eliciting Thinking

How did you determine the optimal size for the multipurpose building?

What are the usable dimensions of the tract after accounting for the 25 foot buffer zone?

How can you calculate the length of the diagonal of the usable tract?

Instructional Implications

Review the Pythagorean Theorem and its application in this problem. Guide the student to first find the diagonal distance of the usable tract (778 feet). Then ask the student to use this length and other known lengths in his or her sketch to determine the maximum diameter of the circular multipurpose building. Remind the student, if

necessary, to account for the 50 foot required clearance between the building and each field.

Provide additional opportunities to use geometric methods to model and solve design problems.

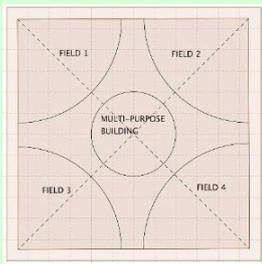
Got It

Misconception/Error

The student provides complete and correct responses to all components of the task.

Examples of Student Work at this Level

The student provides a sketch such as the following:



and determines the maximum diameter of the multipurpose building:

The dimensions of the tract are 550 feet by 550 feet. This allows the configuration of the softball fields as indicated (with a field at each corner), including the 50 foot gap between the fields. The diagonal distance of the usable portion of the field is 778 feet. Subtracting 500 feet for two fields and another 100 feet for spacing around the building results in a maximum diameter of 178 feet for the building.

Questions Eliciting Thinking

Could a square building result in a building with a larger area?

Instructional Implications

Provide additional classroom activities in which the student is asked to use geometric methods to model and solve design problems. Ideally, provide fewer details than those given in this task. The specifications might be more general (e.g., do not describe the size and shape of the fields and describe given distances between fields as "convenient" or "safe"). Perhaps students could be asked to construct a design that includes four fields with parking and then determine the needed dimensions of the tract of land.

Accommodations & Recommendations

Special Materials Needed:

- Softball Complex worksheet
- Straight edge and compass

Source and Access Information

Contributed by: MFAS FCRSTEM

Name of Author/Source: MFAS FCRSTEM

District/Organization of Contributor(s): Okaloosa

Is this Resource freely Available? Yes

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Aligned Standards

Name	Description
MAFS.912.G-MG.1.3:	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). ★