Student Guide

***Achieving Classroom Excellence Act* (ACE)**
End of Course Project
Geometry
Isn't It Amusing?

Project Overview
Design a fictional amusement park. Create a schematic or build a model of the park using an appropriate scale. Use geometric properties to analyze the park.

Directions

1. Read the Project Task, Task Specifications, and Project Representation sections.
2. Read through each of the Project Steps.
3. Review the scoring criteria to determine where you can receive credit for your work. Discuss this information with your Project Coordinator.
4. With your Project Coordinator, determine a timeline for completing the project and enter target dates for completing each of the CHECK POINTS in the space provided.
5. Complete all Project Steps.
6. Complete the Student Learning Reflection.
7. Be sure to check in with your Project Coordinator at the CHECK POINTS listed in the project.
8. Submit the project, including the Student Learning Reflection, for scoring by the due date. All forms, components, and necessary artifacts must be included before the project can be assessed.

Requirements for Submission of the ACE End of Course Project

For submission, a completed ACE End of Course Project must include:

1. Completed Student Planner and Agreement
2. A description of the results or product requested in each of the Project Steps
3. Student Learning Reflection as described in the project
4. Completed Project Submission Form as required for authenticity of the work

Isn't It Amusing?

Project Overview
Design a fictional amusement park. Create a schematic or build a model of the park using an appropriate scale. Use geometric properties to analyze the park.

Task Specifications
You will design a fictional amusement park. Following the Project Steps listed below, you will create a schematic or build a model of the park with all required components. You may build your model or create your schematic using any materials or resources you believe are appropriate as long as you do all of the work yourself. Creativity is encouraged; however, you will not be rewarded for elaborate models or schematics that are not mathematically accurate. In addition, you will answer questions about the design of your park and analyze the geometric properties of your park.

Project Representation
Representation of work may come in a variety of forms, including multi-media presentations, constructed objects, artistic expression, written documents, and verbal expression. Creativity is encouraged!

Project Steps

1. Determine if you will use the metric system or the standard system of measurement. Defend your selection.

2. At its widest points, the amusement park (not including the parking lot) measures 0.25 miles (400 meters) across and 0.4 miles (650 meters) long. Determine the general shape of your fictional amusement park. Determine the scale that would be most appropriate for you to use when drawing a schematic or building a model of your amusement park. Justify your conclusions.

3. Using your scale from Step 2, develop a schematic or construct a model of a fictional amusement park. The park must meet the following requirements:
   - It must have a children's area that includes a circular carousel and a playground.
   - It must have a 70' (21 m) free-fall tower ride.
   - It must have at least three other rides.
   - It must have a ticket booth with at least four stalls, each 4' wide.
   - It must have two restaurants, a theater, an arcade, and four restroom facilities.
   - It must have a garden, pond, lawn, or wooded area with walking trails and picnic tables.
   - It will have a parking lot, but the specifications for the parking lot will not be determined until later. The parking lot will be added to your model or schematic at that time.

CHECK POINT DATE _____ Student Initials___ Coordinator Initials ___

4. Describe the tools and processes you used to ensure that the measurements in your schematic or model are accurate and reasonable.

5. The parking lot must be built according to civil requirements. These requirements state that amusement parks must have one parking space for every 350 square feet of recreational area. Determine how many parking spaces will be needed.

6. Some of the parking spaces within your parking lot will need to be designated as handicapped accessible.
   - Use the table below to determine how many of your parking spaces need to be reserved for accessible parking spaces.
   - Using a regular sized parking space, a handicap accessible parking space, and a driving lane from a real parking lot as guides, determine the total area of your fictional parking lot. Explain your answer.
   - Add your parking lot to your schematic or model.

Total Spaces in Lot	Accessible Spaces Required
1-25	1
26-50	2
51 - 75	3
76-100	4
101-150	5
151-200	6
201-300	7
301-400	8
401-500	9
501-1000	2% of total spaces*
1001 and over	20 + (1 per 100 over 1000)*

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7. Select two surfaces from your ticket booth. Determine if those surfaces area parallel. Use geometric properties to prove whether or not the two surfaces are actually parallel.

8. You are standing 15 feet (4.5 meters) from the free-fall tower ride when you notice your best friend is at the very top of the ride. On a coordinate grid, diagram the angle of eyesight from you to your friend. Label the key coordinates in your diagram.

9. Use trigonometric ratios to determine the angle of eyesight from you to your friend.

10. Calculate the distance from you to your friend. Explain your calculation.

11. On a new coordinate grid, sketch the layout of your amusement park without the parking lot. List the coordinates of the vertices for your favorite ride and describe its shape.

12. In order to make room for an outdoor amphitheater that will attract concert audiences, you need to relocate your favorite ride within your amusement park with as little disruption as possible. Determine the new coordinates for your favorite ride. Explain why you chose the new location for that ride and any other considerations that had to be made for the relocation.

13. Identify the type of transformation that could be used on the vertices of your ride to move it from its original location to its new location.

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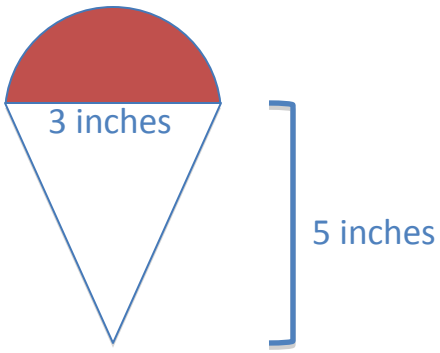
14. You need to know how many children can ride the carousel at one time. Only one child can be on a carousel horse at a time. Carousel horses are approximately 5' in length and 1.5' in width. Determine how many children can ride your carousel at one time based on the size of the carousel in your schematic or model. Explain how you arrived at your answer.

15. Regular park attendees have asked that you replace the playground in the children's area with a ride that is geometrically similar to one of the other rides in the park. Determine the dimensions of a ride that is geometrically similar to one of your other rides and would be appropriate for a child that is 36" tall or shorter. Create a table of dimensions and explain how you arrived at your answers.

16. Your amusement park is known for its amazing snow cones. Add a snow cone stand to your model or schematic. Snow cone cups measure 3" in diameter and 5" tall as shown in the picture below. What volume of ice will be needed to make 1,000 snow cones in one day?



17. Show the steps and explain how you arrived at your answer to Step 16.

18. One of your managers said, “If people are eating snow cones, then it is hot.” Evaluate whether this statement is sometimes true, always true, or never true. Then list and identify the converse, inverse, and contrapositive of this statement.

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Student Learning Reflection

The Student Learning Reflection will be completed in the presence of your Project Coordinator or another certified educator selected by your Project Coordinator. Discuss with your Project Coordinator when and where you should complete your reflection as well as what format you would like your reflection to take. For example, you may choose to write your reflection as if you were writing in a journal, or you may prefer to present your reflection verbally, through a multi-media presentation, or through some other format.

Using a method of your choice, explain how this project has contributed to your learning and ability to apply Geometry skills to the real world. Use the questions below to guide your reflection. You may also reflect on additional topics not listed in the questions. Not all of the questions need to be addressed; however, your reflection illustrates the depth of your learning and needs to be thorough enough for you and your audience to draw an accurate picture.

- What process did you use for planning your project and sticking to your plan?
- What did you learn about geometric properties, processes, and methodologies?
- How well does this project represent your knowledge and understanding of Geometry?
- How well does this project represent your best effort, high-quality work, individuality, and creativity?
- If you were to repeat this project, what would you do differently? Why?
- What were your greatest challenges while completing this project?
- What additional resources would have been helpful in completing this project?
- If you were going to create a similar project for other students to complete, how would you adjust the assignment to better determine their understanding of Geometry?

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Isn't It Amusing? Project Scoring Rubric

PROJECT STEP	STANDARD COMPONENT	SCORING CRITERIA
1. Determine if you will use the metric system or the standard system of measurement. Defend your selection.	Process Standards	0 – No justification or inappropriate reason 1 – Gave a valid reason to support his/her choice
2. At its widest points, the amusement park (not including the parking lot) measures 0.25 miles (400 meters) across and 0.4 miles (650 meters) long. Determine the general shape of your fictional amusement park. Determine the scale that would be most appropriate for you to use when drawing a schematic or building a model of your amusement park. Justify your conclusions.	Process Standards	0 – No scale or explanation given 1 – Determined a shape and an appropriate scale, but little or no explanation provided 2 – Determined a shape and an appropriate scale with a mathematical explanation provided
3. Using your scale from Step 2, develop a schematic or construct a model of a fictional amusement park. The park must meet the following requirements: • It must have a children's area that includes a circular carousel and a playground. • It must have a 70' (21 m) free-fall tower ride. • It must have at least three other rides. • It must have a ticket booth with at least four stalls, each 4' wide. • It must have two restaurants, a theater, an arcade, and four restroom facilities. • It must have a garden, pond, lawn, or wooded area with walking trails and	Process Standards	0 – Schematic or model is not reasonable for an amusement park 1 – Schematic or model is reasonable for an amusement park but only includes the minimum requirements 3 – Schematic or model is reasonable for an amusement park and demonstrates that the student has great creativity or detail in the representation
	Standard 2 Standard 4	0 – Measurements (lengths and angles) in schematic or model are not accurate based on scale and all other information provided 1 – Measurements (lengths and angles) in schematic or model are mostly accurate based on scale and all other information provided 2 – Measurements (lengths and angles) in schematic or model are all accurate based on scale and all other information provided

picnic tables. • It will have a parking lot, but the specifications for the parking lot will not be determined until later. The parking lot will be added to your model or schematic at that time.		
4. Describe the tools and processes you used to ensure that the measurements in your schematic or model are accurate and reasonable.	Standard 2	0 – Tools were inappropriate or no explanation provided of tools and/or processes 1 – Explanation provides evidence that the student can select and use mathematical tools correctly
5. The parking lot must be built according to civil requirements. These requirements state that amusement parks must have one parking space for every 350 square feet of recreational area. Determine how many parking spaces will be needed.	Process Standards Standard 2	0 – Did not determine an accurate number of spaces based on area of amusement park created in Step 3 1 – Accurately determined the number of spaces based on area of amusement park created in Step 3
6. Some of the parking spaces within your parking lot will need to be designated as handicapped accessible. • Use the table below to determine how many of your parking spaces need to be reserved for accessible parking spaces. • Using a regular sized parking space, a handicap accessible parking space, and a driving lane from a real parking lot as guides, determine the total area of your fictional parking lot. Explain your answer. • Add your parking lot to your schematic or model.	Process Standards	0 – Did not do any unnecessary critical thinking, problem solving, and mathematical reasoning 2 – Demonstrated critical thinking, problem solving, and mathematical reasoning skills above those required to answer the questions.
	Standard 1 Standard 2	0 – Did not accurately determine the total area of the parking lot 1 – Accurately determined the total area of the parking lot, but did not explain 1 – Did not accurately determine the total area of the parking lot, but provided a logical explanation of how to calculate the total area 2 – Accurately determined the total area of the parking lot and provided a valid explanation

7. Select two surfaces from your ticket booth. Determine if those surfaces area parallel. Use geometric properties to prove whether or not the two surfaces are actually parallel.	Standard 1 Standard 2 Standard 3	0 – Did not provide a proof or justification that the surfaces are or are not parallel 1 – Provides an informal justification that the surfaces are or are not parallel 2 – Provides a formal proof that the surfaces are or are not parallel
8. You are standing 15 feet (4.5 meters) from the free-fall tower ride when you notice your best friend is at the very top of the ride. On a coordinate grid, diagram the angle of eyesight from you to your friend. Label the key coordinates in your diagram.	Standard 4 Standard 5	0 – Did not create an accurate diagram on a coordinate grid 1 – Created an accurate diagram on a coordinate grid
9. Use trigonometric ratios to determine the angle of eyesight from you to your friend.	Standard 3	0 – Did not calculate the angle correctly or did not provide evidence of using trigonometric ratios 1 – Calculated the angle correctly using trigonometric ratios
10. Calculate the distance from you to your friend. Explain your calculation.	Standard 3 Standard 5	0 – Did not calculate the distance accurately 1 – Calculated the distance accurately 2 – Calculated the distance accurately and provided an appropriate explanation
11. On a new coordinate grid, sketch the layout of your amusement park without the parking lot. List the coordinates of the vertices for your favorite ride and describe its shape.	Standard 5	0 – Did not accurately identify all vertices 1 – Accurately identified all vertices, but did not describe the resulting shape 2 – Accurately identified all vertices and described the resulting shape

12. In order to make room for an outdoor amphitheater that will attract concert audiences, you need to relocate your favorite ride within your amusement park with as little disruption as possible. Determine the new coordinates for your favorite ride. Explain why you chose the new location for that ride and any other considerations that had to be made for the relocation.	Standard 1 Standard 2 Standard 5	0 – Did not accurately identify new coordinates 1 – Accurately identified new coordinates but did not provide an explanation (or explanation is not mathematically appropriate) for the ride's new location 2 – Accurately identified new coordinates and provided a mathematically appropriate explanation
13. Identify the type of transformation that could be used on the vertices of your ride to move it from its original location to its new location.	Standard 5	0 – Did not identify the transformation 1 – Accurately identified the transformation
14. You need to know how many children can ride the carousel at one time. Only one child can be on a carousel horse at a time. Carousel horses are approximately 5' in length and 1.5' in width. Determine how many children can ride your carousel at one time based on the size of the carousel in your schematic or model. Explain how you arrived at your answer.	Standard 2	0 – Does not accurately determine how many children can ride the carousel 1 – Accurately determined how many children can ride the carousel, but did not explain 2 – Accurately determined how many children can ride the carousel and provided a mathematically appropriate explanation 3 – Accurately determined how many children can ride the carousel and provided an explanation demonstrating creative analysis and mathematical reasoning

15. Regular park attendees have asked that you replace the playground in the children's area with a ride that is geometrically similar to one of the other rides in the park. Determine the dimensions of a ride that is geometrically similar to one of your other rides and would be appropriate for a child that is 36" tall or shorter. Create a table of dimensions and explain how you arrived at your answers.	Standard 2 Standard 4	0 – Did not accurately determine dimensions 1 – Accurately determined all dimensions on an appropriate scale but did not provide an explanation 1 – Accurately determined some dimensions on an appropriate scale and provided a mathematically reasonable explanation 2 – Accurately determined all dimensions and provided a mathematically reasonable explanation
16. Your amusement park is known for its amazing snow cones. Add a snow cone stand to your model or schematic. Snow cone cups measure 3" in diameter and 5" tall as shown in the picture below. What volume of ice will be needed to make 1,000 snow cones in one day?	Standard 4	0 – Did not accurately calculate the volume of ice 1 – Accurately calculated the volume of ice for one snow cone 1 – Accurately calculated a partial volume of ice for 1,000 snow cones 2 – Accurately calculated the total volume of ice for 1,000 snow cones
17. Show the steps and explain how you arrived at your answer to Step 16.	Standard 4	0 – Did not show steps and did not provide a logical explanation 1 – Showed steps or provided a logical explanation, but not both 2 – Showed steps and provided a logical explanation
18. One of your managers said, "If people are eating snow cones, then it is hot." Evaluate whether this statement is sometimes true, always true, or never true. Then list and identify the converse, inverse, and contrapositive of this statement.	Standard 1	0 – Does not list and identify the conditional statements 1 – Correctly evaluates the truth of the given statement 2 – Correctly evaluates the truth of the given statement and lists the conditional statements 3 – Correctly evaluates the truth of the given statement and lists and identifies the conditional statements