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# Lost Cities Math: Lesson 1 - Mapping the Ruins of Geometria

### Materials Needed:

- **Explorer's Journal:** A blank notebook or journal.
- **Graph Paper:** At least two large sheets (11x17 if possible, or tape four standard sheets together for a large workspace).
- **Pencils and an Eraser:** For mapping and calculations.
- **Colored Pencils or Markers:** To decorate the final map.
- **A Ruler:** For drawing straight lines.
- **Scissors**
- **Tape or a Glue Stick**
- **Handout 1: Top Secret Mission Briefing** (You will create this. See text below.)
- **Handout 2: Fragmented Map Pieces** (You will create this. See instructions below.)

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### Lesson Plan and Activities

#### Part 1: The Mission Briefing (5-10 minutes)

**Goal:** To engage the student and set the stage for the project with a fun narrative.

1. **Prepare the "Top Secret Mission Briefing":** Before the lesson, write or type the following message on a sheet of paper. To make it more fun, you can make the paper look old by crumpling it or staining it with a teabag.

    > ***TOP SECRET MEMORANDUM***
    > ***To:*** *Lead Explorer [Student's Name]*
    > ***From:*** *The International Society of Forgotten Places*
    > ***Subject:*** *Discovery of the Lost City of Geometria*
    >
    > *Congratulations, Explorer! Our satellite imaging has confirmed your discovery: the ruins of a city completely unknown to modern history. We are calling it "Geometria" because its layout appears to be based entirely on mathematical principles. Unfortunately, the only map we could recover was torn into pieces during its extraction.*
    >
    > *Your mission is to reconstruct the map, determine the true size of the city's structures, and begin documenting your findings. The world is counting on you to unlock the secrets of Geometria. Good luck.*

2. **Present the Mission:** Give the student the "Mission Briefing" and their "Explorer's Journal." Explain that their first task as Lead Explorer is to piece together the ancient map.

#### Part 2: Reconstructing the Map (15-20 minutes)

**Goal:** To practice coordinate grid skills and spatial reasoning in a hands-on way.

1. **Prepare the "Fragmented Map Pieces":**
    - Take one sheet of graph paper. Draw a simple city layout using basic geometric shapes
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    (squares, rectangles, circles, triangles).
    - Label a few key locations like "The Sunstone Circle," "The Great Pyramid," and "The Rectangular Forum."
    - Draw an X and Y axis along the edges of the paper and number them (e.g., 0 to 20 on each axis).
    - **Crucially, in one corner, draw a scale key: 1 grid square = 5 meters.**
    - Now, cut the map into 5-6 irregular pieces.
2. **The Challenge:** Give the student the map pieces and the large, blank sheet of graph paper. Their task is to use the grid lines and coordinates to reassemble the pieces correctly, taping or gluing them onto the larger sheet. Encourage them to talk through their process. "*This piece has a corner of the Forum, which looks like it should connect to this other edge...*"

Part 3: Understanding Scale and Calculating Dimensions (20-25 minutes)

Goal: To apply the concepts of scale, ratio, perimeter, and area to a real-world problem.

1. **Discovering the Scale:** Once the map is assembled, point out the scale key. Discuss what it means. Ask guiding questions:
    - "If one square on our map represents 5 meters in the real city, how long would a wall be if it's 4 squares long on the map?" (Answer: 4 squares x 5 meters/square = 20 meters).
    - "How would we figure out the real-life width of the Great Pyramid?"
2. **Log Book Entry - The Buildings of Geometria:** Instruct the student to open their Explorer's Journal. They will choose **three** different buildings from their reconstructed map. For each building, they must:
    a. Write down the name of the building.
    b. Count the dimensions (length and width) in grid squares.
    c. Use the scale (1 square = 5m) to calculate the building's **real-life dimensions** in meters.
    d. Calculate the **real-life perimeter** of the building. (Perimeter = 2 x length + 2 x width for a rectangle).
    e. Calculate the **real-life area** of the building. (Area = length x width).
    f. Encourage them to draw a small sketch of the building next to their calculations.

Part 4: Creative Extension - Designing a New Discovery (10-15 minutes)

Goal: To foster creativity and solidify understanding by having the student apply the lesson's concepts in a design of their own.

1. **The Task:** Tell the explorer, "Your team has funding to excavate and restore a new part of the city. You get to design it!"
2. On a blank section of their large map, the student must design a new building or feature for Geometria. It could be a library, a garden, an observatory, or anything they imagine.
3. They must draw it on the map using geometric shapes.
4. In their Explorer's Journal, they will name their new discovery and perform the same calculations as in Part 3: find the real-life dimensions, perimeter, and area based on the map's scale.

Part 5: Mission Debrief (5 minutes)

Goal: To review the concepts learned and foreshadow the next lesson.

1. Have the student share their favorite discovery of the day (either a calculated area or their own creative design).
2. Review the key vocabulary: **scale, perimeter, and area**. Ask them to explain in their own words what each one means.
3. **Look Ahead:** Conclude the lesson by saying, "Excellent work, Explorer. Your map is the first

step. Our next mission is to decode the strange geometric patterns carved into the walls of these buildings. We believe they hold the key to the language and culture of Geometria."

Differentiation and Support

- **For Extra Support:** Use only squares and rectangles on the map. Use a simpler scale (1 square = 1 meter). Work through the first building's calculations together step-by-step.
- **For an Extra Challenge:** Include composite shapes (L-shaped buildings) or triangles on the map and challenge the student to find their area (Area of triangle = ½ x base x height). Use a more complex scale (e.g., 2 squares = 7 meters) that requires division. Ask them to calculate the potential population of the city if each person requires 10 square meters of living space.

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