Lesson Plan: The Dream Room Designer

Materials Needed:

- Graph paper (1/4 inch grid is ideal)
- Pencil and eraser
- Ruler
- Calculator
- Colored pencils or markers (optional)
- Access to the internet for a brief research extension (optional)
- "Client Brief" and "Materials Price List" printouts (provided below)

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1. Learning Objectives

By the end of this lesson, you will be able to:

- Apply formulas for area and perimeter to solve a real-world design problem.
- Create an accurate scale drawing of a room layout.
- Develop and manage a budget for a design project using multiplication and addition.
- Make creative decisions based on mathematical constraints (space and budget).

2. Introduction: You're the Designer! (10 minutes)

Imagine a client has hired you to design their perfect room. They have specific requirements and a strict budget. Your job is to use your math skills to create a functional and stylish room that meets all their needs without going over budget. Today, you are an architect, an interior designer, and a project manager all in one!

Your First Client Brief:

> **Client:** A 12-year-old who loves gaming and reading.
>
> **Room Dimensions:** The room is a rectangle, 12 feet wide and 15 feet long.
>
> **Must-Have Items:**
>
> - A bed
> - A desk for a computer
> - A comfy chair for reading
> - A bookshelf
>
> **Budget:** You have a total of **$1,500** to spend on flooring and furniture. You must buy flooring for the entire room and all the "must-have" items.
>
> **Goal:** Design a room layout that fits everything comfortably and stays within budget. The client also wants at least 40% of the floor space to remain open for walking around.

3. Skill Warm-Up: The Scale & The Formulas (15 minutes)

Before we start designing, let's review our key tools.

A. Understanding Scale

Our graph paper will be our blueprint. To make the room fit on the paper, we need to use a scale.

- **Our Scale:** 1 square on the graph paper = 1 square foot (1ft x 1ft) in real life.
- First, use your ruler and pencil to draw the outline of the room on your graph paper. Since the room is 12 ft x 15 ft, you will draw a rectangle that is 12 squares by 15 squares.

B. Key Formulas Review

We'll be using these formulas constantly. Let's do a quick calculation for the room itself.

- **Perimeter (distance around the room):** P = 2(length + width)
- **Area (total space inside the room):** A = length × width

Your Task: Calculate the total area of the empty room. This is the amount of flooring you'll need to buy. Write this down on a separate piece of paper, which will become your "Budget Sheet."

4. Main Activity: Design, Calculate, and Create (45-60 minutes)

This is where you bring the room to life. You will choose your items, calculate their costs, and decide where to place them.

Step 1: Go Shopping!

Using the **"Materials Price List"** below, choose one type of flooring and the four "must-have" furniture items. Record your choices and their costs on your Budget Sheet.

Materials Price List

Flooring (Price per Square Foot):

- Cozy Carpet: $2 per sq. ft.
- Sleek Hardwood: $4 per sq. ft.
- Cool Laminate: $3 per sq. ft.

Furniture (Includes Dimensions & Price):

- **Beds:**
  - Twin Bed (3 ft x 6 ft) - $250
  - Full Bed (4 ft x 6 ft) - $350
- **Desks:**
  - Compact Desk (2 ft x 4 ft) - $120
  - Gamer's L-Desk (covers a 4 ft x 4 ft corner) - $200
- **Reading Chairs:**
  - Bean Bag (takes up a 3 ft x 3 ft square) - $75
  - Armchair (2 ft x 3 ft) - $150
- **Bookshelves:**
  - Tall & Skinny (3 ft x 1 ft) - $90
  - Short & Wide (4 ft x 1 ft) - $80

Step 2: Create Your Budget Sheet

On your Budget Sheet, perform the following calculations:

1. **Flooring Cost:** Total Room Area (sq. ft.) × Price per sq. ft. of your chosen flooring.
2. **Furniture Cost:** Add up the price of the 4 items you selected.
3. **Total Project Cost:** Flooring Cost + Furniture Cost.
4. **Check:** Is your Total Project Cost less than or equal to $1,500? If not, you'll have to "return" an item and choose a cheaper option!

Step 3: Draw Your Floor Plan

Now, draw your chosen furniture items to scale inside your room outline on the graph paper. For example, a Twin Bed (3 ft x 6 ft) would be a rectangle of 3 squares by 6 squares. You can label each piece of furniture or use different colors.

Step 4: Check the Open Space Requirement

The client wants at least 40% of the floor space to be open.

1. Calculate the area of each piece of furniture you drew (length x width).
2. Add the areas of all 4 furniture pieces together to find the "Total Furniture Area."
3. Calculate the "Open Floor Space" by subtracting the Total Furniture Area from the Total Room Area.
4. Is your Open Floor Space at least 40% of the Total Room Area?
    - **How to check:** (Open Floor Space ÷ Total Room Area) × 100. If the answer is 40 or more, you succeeded! If not, can you rearrange your furniture or choose smaller items to create more open space?

5. Conclusion & Presentation (10 minutes)

Present your final design! Explain your choices to your "teacher client."

- Show your final, colored floor plan.
- Present your Budget Sheet. How much did you spend in total? How much was left over?
- Explain how you met the "open space" requirement. What was your final percentage?
- Why did you choose the items and layout that you did?

6. Differentiation and Extension

- **For Extra Support:** Focus only on the layout and the budget first. The "open space" percentage can be a secondary goal if the first two parts are challenging. Use pre-cut paper squares for the furniture to make it easier to move them around before drawing.
- **For an Advanced Challenge:**
    - **Add Paint:** Assume the walls are 8 feet high. Calculate the area of the four walls (don't forget to subtract a door and a window!) and budget for paint. (Paint costs $30 a gallon, and one gallon covers 400 sq. ft.).
    - **Irregular Room:** Redraw the initial room as an "L-shape" and recalculate the area by breaking it into two rectangles.
    - **Real-World Research:** Instead of the provided price list, use the internet to find real furniture from a store's website (like IKEA or Target). Use the real prices and dimensions to make your plan even more realistic.