

Lesson Plan: Designing and Building a Mini City with 3D Shapes

Grade Level: 6-7

Subject: Mathematics

Duration: 3-4 class periods (40-60 minutes each)

Objectives:

- Students will design and create a mini city using 3D shapes.
- Students will apply formulas to calculate the surface area and volume of various 3D shapes.
- Students will demonstrate creativity and critical thinking in their design process.

Materials Needed:

- Student packets
- Access to Cricut Design Space
- Construction paper
- Scissors
- Glue
- Rulers
- Markers/colored pencils
- Calculators (optional)

Standards:

- Understand concepts of volume and surface area.
- Apply mathematical reasoning in real-world contexts.
- Engage in the design process through creative expression.

Lesson Outline

Day 1: Introduction to 3D Shapes and Planning

Introduction (10-15 mins)

- Discuss the concept of 3D shapes (cubes, rectangular prisms, cylinders, cones, spheres).
- Show examples of buildings that use various shapes.

Mini City Design (30 mins)

- Instruct students to sketch their mini city on page 2 of their packet.
- Remind them to include a minimum of 5 buildings, utilizing a mix of the 3D shapes discussed.

Group Discussion (10-15 mins)

- Share designs with a partner and provide feedback.
- Encourage students to think about how their buildings might look in real life.

Day 2: Preparing for Construction

Choosing Shapes (15 mins)

- Model how to search for images in Cricut Design Space.
- Guide students in selecting the 3D shapes they will use from the Cricut Design Space images.

Cricut Design Space (30 mins)

- Demonstrate how to add shapes to their workspace.
- Allow students to explore the software and prepare their designs.

Cutting Shapes (15 mins)

- Supervise as students send their designs to the Cricut machine for cutting.
- Help students remove their shapes from the cutting mat.

Day 3: Building and Designing the City

Assembly (30 mins)

- Distribute cut shapes and construction paper.
- Instruct students to assemble their buildings, adding windows and doors creatively.

Calculating Surface Area and Volume (30 mins)

- Guide students through the calculations using the formulas for surface area and volume.
- Have students fill in the tables on pages 3 and 4, showing their work on pages 5-6.

Day 4: Finalizing and Presenting the Mini City

Total Calculations (20 mins)

- Instruct students to calculate the total surface area using the appropriate formula for each shape.
- Instruct students to calculate the volume using the appropriate formula for each shape.
- Instruct students to calculate the total surface area and volume of their entire mini city and record it.

Presentations (20-40 min) *OPTIONAL

- Allow students to prepare a short presentation of their mini city, explaining their design choices and calculations.
- Students present their mini cities to the class, highlighting creativity, math skills, and what they learned throughout the process.

Assessment:

- Evaluate student designs for creativity and adherence to the project guidelines.
- Assess calculations for accuracy and completeness.

Criteria	Excellent	Good	Fair	Needs Improvement
Creativity and Originality	Highly imaginative design with unique features. Demonstrates exceptional creativity in building shapes and layout.	Good design with some unique elements. Shows creativity but may rely on common ideas.	Design is somewhat generic or lacks originality. Limited creative thinking is evident.	Design is unoriginal or copied. Little to no creativity shown.
3D Shape Construction	All chosen shapes from Cricut Design Space are creatively selected and accurately cut and assembled. Excellent craftsmanship in construction.	Most shapes are well-chosen and accurately cut and assembled. Good craftsmanship with minor errors.	Some chosen shapes are inappropriate or inaccurately cut/assembled. Noticeable errors in craftsmanship.	Many chosen shapes are inappropriate or poorly constructed. Significant craftsmanship issues.
Volume Calculations	Volume calculations are completely accurate and well-documented.	Most volume calculations are correct with minor errors. Documentation is mostly clear.	Some volume calculations are incorrect. Documentation is unclear or incomplete.	Many volume calculations are incorrect. Documentation is missing or poorly done.
Surface Area Calculations	Surface area calculations are completely accurate and well-documented.	Most surface area calculations are correct with minor errors. Documentation is mostly clear.	Some surface area calculations are incorrect. Documentation is unclear or incomplete.	Many surface area calculations are incorrect. Documentation is missing or poorly done.
Presentation	Presentation is engaging, well-organized, and clearly explains the design process and calculations.	Presentation is clear and organized, with minor lapses in engagement.	Presentation is somewhat disorganized or lacks clarity. Limited engagement with audience.	Presentation is poorly organized or unclear. Little to no engagement with audience.

Mini City Street

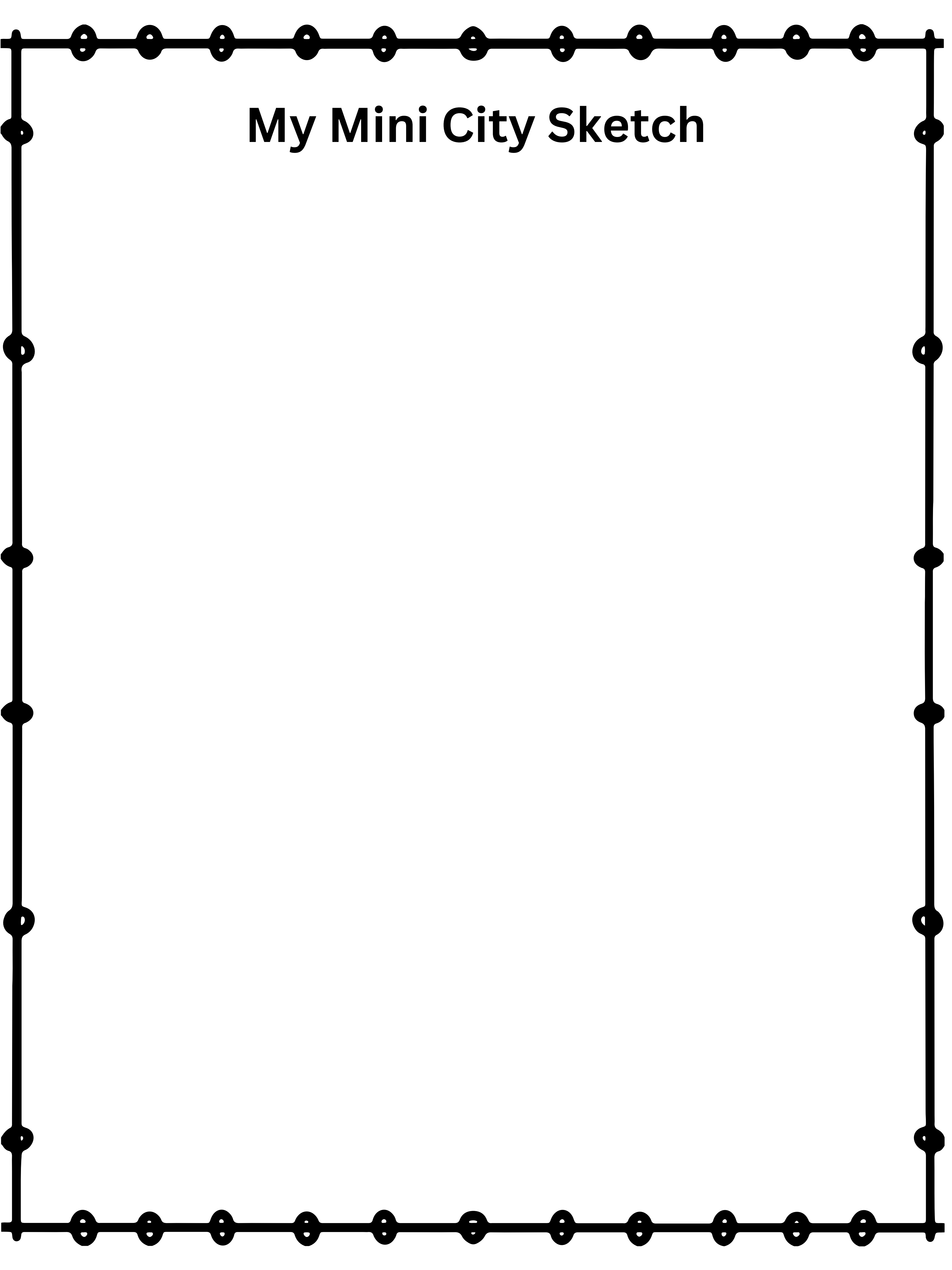
Design and Build Project

You will be designing and building a mini city using the 3D nets of a variety of shapes.

1. Design and sketch a mini city on **page 2** of this packet. Your mini city should have a minimum of 5 buildings. It should be a mixture of all four 3D shapes.
2. Choose the 3D shapes, from the image options on Cricut Design Space, that you want to use to build your city.
3. Add the shapes to your workspace on Cricut Design Space.
4. After Cricut cuts out the shapes, design the buildings by adding windows and doors, and assemble your 3D shapes on construction paper.
5. Use the tables on **pages 3 and 4** to identify each part of your mini city, the shape of that part, and the formula you will use to calculate the surface area and volume.
6. Calculate the surface area and volume of each shape and record it on **pages 3 and 4**. Show your work using the worksheets on pages **5-6** of this packet.
7. Calculate the total surface area and volume of your mini city. Record it on the bottom of **pages 3 and 4**.



My Mini City Sketch



Mini City Calculations: Surface Area

Part of Mini City	Shape	Surface Area

Total Surface Area of Mini City: _____

Mini City Calculations: Volume

Part of Mini City	Shape	Volume

Total Surface Area of Mini City: _____

Calculations Work Page

Calculations Work Page
