

Construct 3D Model

STRAND: Measurement and Geometry

STRAND CONCEPT: Plane (2D) and Solid Figures (3D) –Compare, Contrast, and Construct

SOL 8.8

Remediation Plan Summary

Students construct a three-dimensional model, given the front, side, and top views.

Common Misconceptions

Students have a difficult time understanding how a solid figure can be drawn on a flat surface. They can't translate the 2D drawing into a 3D shape.

Materials

- Cubes (linking or non-linking)
- Isometric dot paper
- Copies of the attached "Orthogonal Views: 2-D to 3-D" worksheet

Introductory Activity

Discuss the meaning of the work *orthogonal* in preface to having students practice drawing orthogonal views. Distribute isometric dot paper to students, and ask them to explain how this paper is different from regular graph paper. Have students practice drawing single cubes, and discuss sketching strategies. One method is to draw a Y in the center and circumscribe a hexagon around it. A method for sketching a cube on plain paper is to draw two squares and connect corresponding vertices of the squares. Have them label the vertices of one cube with different capital letters. Then, have students use their cube sketch as a reference to name the following:

- a pair of parallel lines
- a pair of perpendicular lines
- a pair of skew lines
- a square
- a right angle
- a face diagonal
- a diagonal of the cube

Plan for Instruction

1. Before class, use eight cubes to create a 3-D model, draw the top view of it on the board, showing how many blocks are in each stack, and hide the model away.
2. Give each student eight cubes, and ask them to use their cubes to build a model of the object shown in your drawing, as seen from the top view.
3. Next, ask students to draw the top, side, and front views of their model.

AR Remediation Plan – Plane (2D) and Solid Figures (3D)-Compare, Contrast, and Construct

4. Bring out your 3-D model, and check student models and sketches for accuracy. Discuss the term “perspective” and how the various views represent the same object from various perspectives. For students who have trouble visualizing, have them look at the model at eye level and at close range, focusing only on one view at a time. Ask students what the volume of the object would be in cubic units.
5. Distribute additional cubes and copies of the "Orthogonal Views: 2-D to 3-D" worksheet. Have students build the 3-D models from the orthogonal views and complete the worksheet. Have each student explain one model to the class.

Pulling It All Together (Reflection)

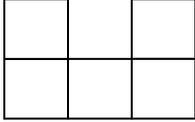
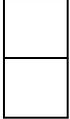
Think-Pair-Share: Have student pairs discuss which model was most difficult to construct from the views, explaining their reasoning and identifying the strategy that helped most in building the model. Have pairs join a second pair to share strategies for building their most challenging model. Have groups report strategies to the class. List these on the board, and have students record effective strategies in their math logs to use in future constructions.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

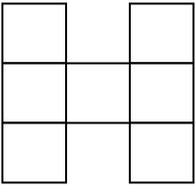
Name: _____

Orthogonal Views: 2-D to 3-D

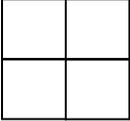
For each of the following questions, use the three orthogonal views to build each figure with cubes. Record the total number of cubes used for each figure and the volume of each cube.

1. **Top View**  **Front View**  **Right Side View** 

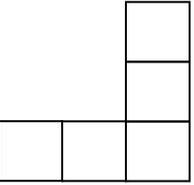
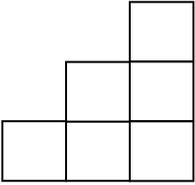
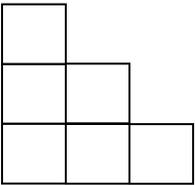
Total number of cubes: _____ Volume in cubic units: _____

2. **Top View**  **Front View**  **Right Side View** 

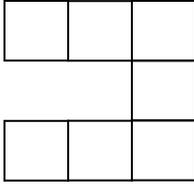
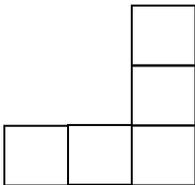
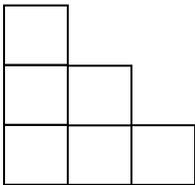
Total number of cubes: _____ Volume in cubic units: _____

3. **Top View**  **Front View**  **Right Side View** 

Total number of cubes: _____ Volume in cubic units: _____

4. **Top View**  **Front View**  **Right Side View** 

Total number of cubes: _____ Volume in cubic units: _____

5. **Top View**  **Front View**  **Right Side View** 

Total number of cubes: _____ Volume in cubic units: _____