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ACTIVITIES

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DISCOVERY WITH CUBES

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Teacher's Guide

Grade level: 6-12

Materials: Student worksheets

Objectives: Students will visualize three-dimensional figures, construct a table, discover patterns in the table, and use patterns to make predictions.

Directions: Make copies of the tear-out pages for students. Divide the class into groups of two each, and let them work together to solve this exercise. It would be quite helpful if the teacher had a set of cubes that were colored as stated in activities 1–3. In this way, students could verify their results.

After completing activity 4, students should record their results in the table (activity 6) found on worksheet 3. Check the table with the class to insure that all students have the correct values, since predictions will be made on the basis of their data. Students should then sketch or construct a 6 × 6 cube as indicated in activity 5 and add its data to the table.

Few students will be able to complete the table for a 10 × 10 × 10 cube unless some patterns have been identified. Ask, "Are there any constants in a column? Any multiples?" Encouraging pupils to keep track of the factors used in the table aids pattern recognition. For example, 0, 6, 24, 54, and 96 are the first five values for one of the columns. A pattern is more discernible when these values are written as 0, 6 × 1, 6 × 4, 6 × 9, and 6 × 16.

Here is a question that might be used to culminate this activity: "Let the length of one side of the cube be N. When you complete this row of the table, is the sum of these values N^3?"

Solutions:

Activity 1: a. 8; b. 8; c. 0; d. 0; e. 0; f. 8; g. equal

Activity 2: a. 27; b. 8; c. 12; d. 6; e. 1; f. 27; g. equal

Activity 3: a. 64; b. 8; c. 24; d. 24; e. 8; f. 64; g. equal

Activity 4: a. 125; b. 8; c. 36; d. 54; e. 27; f. 125; g. equal

SHEET 1 Name_____

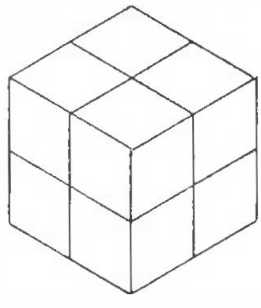
DISCOVERY WITH CUBES

Small cubes have been stacked and glued together to form these larger cubes.

Activity 1

a. How many small cubes are in the large cube? _____

If this large cube is dropped into a bucket of paint and completely submerged:



b. How many of the smaller cubes are painted on three sides? _____

c. How many on only two sides? _____

d. How many on only one side? _____

e. How many on zero sides? _____

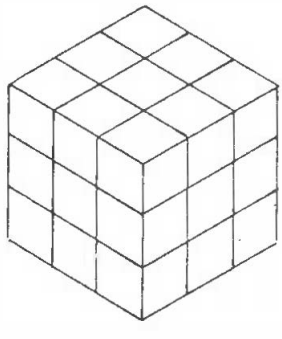
f. What is the sum of your answers in b, c, d, and e? _____

g. How does your answer to f compare to a? _____

Activity 2

a. How many small cubes are in the large cube? _____

b. How many of the smaller cubes are painted on three sides? _____



c. How many on only two sides? _____

d. How many on only one side? _____

e. How many on zero sides? _____

f. What is the sum of your answers in b, c, d, and e? _____

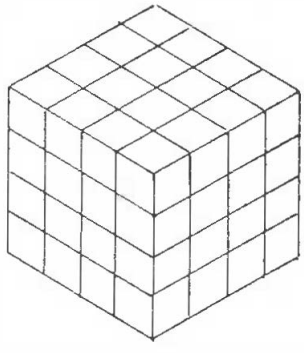
g. How does your answer to f compare to a? _____

SHEET 2

Activity 3

a. How many small cubes are in this large cube?_____

If this large cube is dropped into a bucket of paint and completely submerged:



b. How many of the smaller cubes are painted on three sides? _____

c. How many on only two sides?_____

d. How many on only one side?_____

e. How many on zero sides?_____

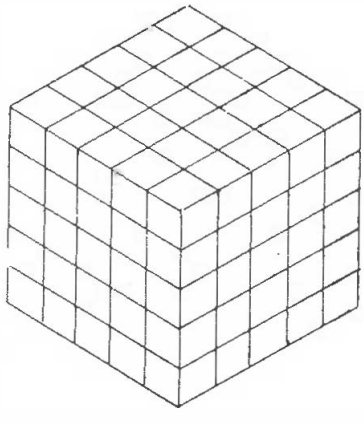
f. What is the sum of your answers in b, c, d, and e?_____

g. How does your answer to f compare to a?_____

Activity 4

a. How many small cubes make up this large cube?_____

If this large cube is dropped into a bucket of paint and completely submerged:



b. How many of the smaller cubes are painted on three sides?_____

c. How many on only two sides?_____

d. How many on only one side?_____

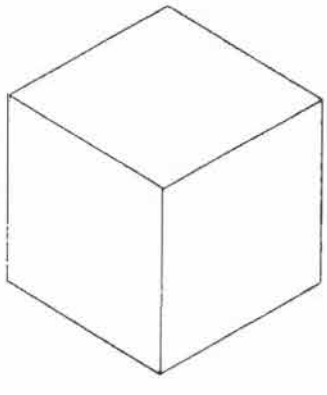
e. How many on zero sides?_____

f. What is the sum of your answers in b, c, d, and e?_____

g. How does your answer to f compare to a? _____

Activity 5

Suppose your cube was 6x6x6. Complete this model by sketching a 6x6x6 cube. Use it to determine the total number of cubes as well as the number of faces with zero, one, two, three and four sides painted.



SHEET 3

Activity 6

Now that you have solved several problems with the cubes, record this information in the Table:

Length of Side of Cube	Number of Painted Sides 0	1	2	3	4	Total Number of Cubes
2						
3						
4						
5						
6						

Do you observe any patterns? __________ If so, complete the Table for a 7x7x7 cube. If not, sketch or construct a cube and then complete the Table.

Have you really got the idea? If you think so, try to complete the Table for a 10x10x10 cube.

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