The Painted Cube

Activity 1 - How many faces are painted yellow?

Using 1-centimeter white cubes, Sally builds a 3 x 3 x 3 cube. Sally paints all of the faces of the big cube with yellow paint. Then she breaks it back down into 1-centimeter cubes.

How many of the 1-centimeter cubes have no yellow faces at all?

Exactly one face painted yellow?

Exactly two faces painted yellow?

Exactly three faces painted yellow?

More than three faces painted yellow?

How do you know your conclusions are correct? Explain.
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Activity 2 - What if the cube was bigger or smaller?

Fill in the table below with your findings from Activity 1 for a cube that is 3 x 3 x 3, then explore cubes with different side lengths and complete the rest of the table.

<table>
<thead>
<tr>
<th>Length of the Sides (x)</th>
<th>Number of cubes with 0 faces painted</th>
<th>Number of cubes with 1 face painted</th>
<th>Number of cubes with 2 faces painted</th>
<th>Number of cubes with 3 faces painted</th>
<th>Number of cubes with more than 3 faces painted</th>
<th>Total number of 1-cm cubes in larger cube</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
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<td>4</td>
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<td>5</td>
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</tr>
</tbody>
</table>

What patterns do you notice after all the information is filled in?
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Activity 3 - A closer look at 2 faces painted

1. How many cubes would have 2 faces painted if the cube was 10 x 10 x 10?

2. Can you create a rule that would predict how many 1 cm cubes would have 2 faces painted if the side length of the cube was any number (n)?

3. Use graph paper to graph the information you gathered for cubes that have 2 faces painted. Put the length of sides on the x-axis and the number of cubes with 2 faces painted on the y-axis.
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**Activity 4 – A closer look at 1 face painted**

1. How may cubes would have 1 face painted if the cube was 10 x 10 x 10?

2. Can you create a rule that would predict how many 1 cm cubes would have 1 face painted if the side length of the cube was any number (n)?

3. Use graph paper to graph the information you gathered for cubes that have 1 face painted. Put the length of sides on the x-axis and the number of cubes with 1 face painted on the y-axis.
Activity 5 - Comparing Your Graphs

Compare the graphs that you made in Activity 3 and Activity 4.

1. How are they the same?

2. How are they different?
