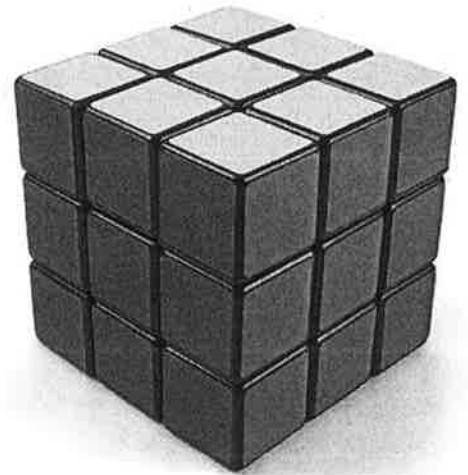Consider a standard 3x3x3 Rubik's cube. It can be thought of as a painted cube cut down each edge into three equal parts.

In the ideal case, a cube sliced evenly in this fashion will fall apart into a number of smaller cubes.

Part 1: How many of these small cubes are there?

Explain how you arrived at this number.

Every cube has six faces. If we look at each of the small cubes, some will have painted faces.

Part 2: What are the possible numbers of painted faces? Explain how you arrived at these numbers.

Part 3: Count the number of cubes with each possible number of painted faces. Explain how you arrived at these numbers.

Extension 1: Consider instead a cube cut down each edge into 4 equal parts.

Part 1: How many of these small cubes are there?

If we look at these small cubes, they will have various faces with paint on them.

Part 2: What are the possible numbers of painted faces?

Part 3: Count the number of cubes with the number of painted faces. Explain how you arrived at these numbers.

Extension 2: Consider instead a cube cut down each edge into 4 equal parts.

Part 1: How many of these small cubes are there?

If we look at these small cubes, they will have various faces with paint on them.

Part 2: What are the possible numbers of painted faces?

Part 3: Count the number of cubes with the number of painted faces. Explain how you arrived at these numbers.

Critiquing student work. Another student, Santos L Halper, tried this problem. He didn't do very well.

1. ___ Read through and paraphrase (explain) Santos' arguments in your own words.
2. ___ Find where Santos has flaws in his reasoning.
3. ___ Write down any questions you would ask him to clarify his approach to this problem.

SANTOS

Consider a standard 3x3x3 Rubik's cube. It can be thought of as a painted cube cut down each edge into three equal parts.

In the ideal case, a cube sliced evenly in this fashion will fall apart into a number of smaller cubes.

Part 1: How many of these small cubes are there?

Explain how you arrived at this number.

27 because there are 9 on the top row and 9 in the middle and 9 on the bottom.
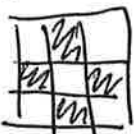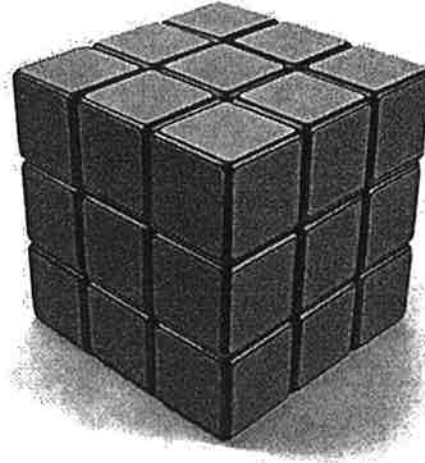
Every cube has six faces. If we look at each of the small cubes, some will have painted faces.

Part 2: What are the possible numbers of painted faces? Explain how you arrived at these numbers.

Up to 6. Because there's 6 side on a cube.

Part 3: Count the number of cubes with each possible number of painted faces. Explain how you arrived at these numbers.

1. Painted 6 because there's one on each side.

2 Painted 24 because 4 on each side and 6×4=24

3 Painted 8 Corners total

4 Painted?

see Part 1

6+24+8 = 38 too many in HELP! should be 27