Smothered in Chocolate! Level 1, Sample 1

A

Exemplar Task

Smothered In Chocolate!

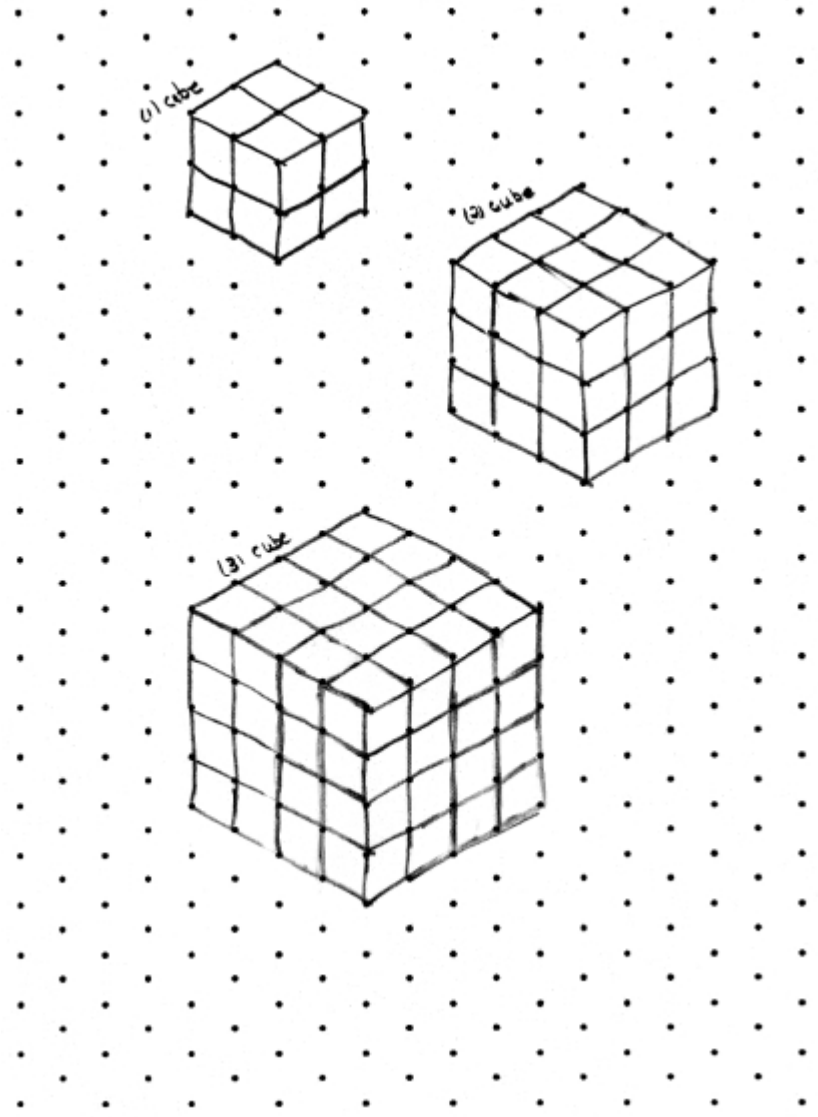
Imagine that each individual cube is a piece of toffee.

1 piece of toffee

Pieces of toffee are joined together to form cubes.
The cubes will then be completely dipped in chocolate.

1. Build three cubes of different sizes using interlocking cubes. Sketch the three cubes on the isometric paper provided at the end of this package.

B

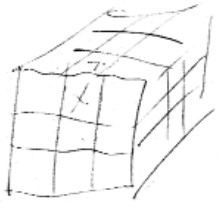


C

2. For each of your three cubes you have just built, your task will be to determine the total number of cubes required for each structure you have built, and that have chocolate on exactly:
   a) 3 faces
   b) 2 faces
   c) 1 face
   d) 0 faces.

Present your data so that someone looking at the way you organize your work will be able to see how you solved the problem.

1st cube	3 faces all covered
2nd Cube	3 faces covered on the corners and the middle of the surface, and no 1 face covered in the center of the cube faces covered
3rd cube	cubes in the center of the edges covered twice, in the middle Once, corners three times



D

b) Describe all of the patterns you observe by looking at the data.

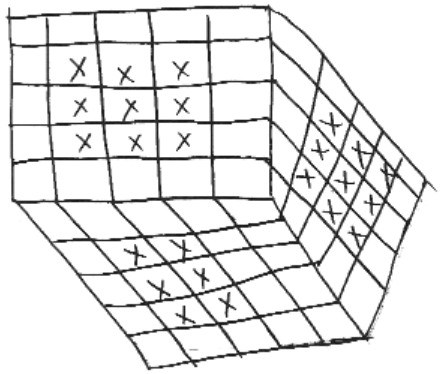
The patterns that I have observed are that the 3×3 cube had a couple of cubes that never get faces covered on all the cubes I have learned that most of the cubes that are near the edges are that most of them have 3 or 2 faces covered. Another thing is that when you get closer to the middle the faces are only covered Once.

E

3. A number of unit cubes are put together to form a larger cube which was then painted. The larger cube is subsequently taken apart and it is discovered that 27 of the smaller cubes have no paint on them. How big was the original cube and how many of the smaller cubes had paint on only:

   i) one face
   ii) two faces
   iii) three faces

The original cube was 98+27 = 125 in the original cube this was the 125 cubes =5X5 that is the only way the 27 cubes could be covered 98 of the cubes had paint on them only.
①56 cubes had only one face covered
② 8 cubes get covered in three faces



F

4. If you had a large cube made from unit cubes such that the dimensions of the large cube are $n \times n \times n$, how many pieces would be covered in chocolate on exactly three faces, exactly two faces, exactly one face and no faces if the entire cube was covered with chocolate?
   Justify your answer.

There would be eight that get covered in, three faces because you multiply 4x2=8 cubes
2 faces: Would be 3 x 4 = 12 cubes
0 faces: Would be 27 cubes

The reasons why I have chosen these answers are because I added all the cubes it took to answer how many cubes were covered

Teacher's Notes

Problem Solving

– The student selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution (e.g., in question 2, creates a chart that categorizes the pattern of the cubes rather than the number of unit cubes with 3, 2, 1, and 0 faces covered in chocolate).

Understanding of Concepts

– The student demonstrates a limited understanding of algebraic patterns (e.g., in question 2b, describes simple patterns related to the general location of the unit cubes with 3, 2, 1, and 0 face(s) covered).

Application of Mathematical Procedures

– The student applies mathematical procedures with many errors and/or omissions when analysing the data (e.g., in question 3, uses rudimentary procedures and makes many errors, such as identifying a 5 x 5 dimension rather than a 5 x 5 x 5 dimension; identifies the correct number of unit cubes with 3 faces covered in paint but not those with 1 or 2 covered faces).
– The student states generalizations and/or algebraic expressions for the *n*th terms that include many errors and/or omissions (e.g., in question 4, describes the number of cubes with 3 faces covered with a simple mathematical statement: "4 x 2 = 8 cubes").

Communication of Required Knowledge

– The student uses mathematical language and/or algebraic notation with limited clarity to explain and justify generalizations based on the model (e.g., in questions 2b and 3, uses notations 3 x 3 and 5 x 5, rather than 3 x 3 x 3 and 5 x 5 x 5, to describe volume; in question 4, uses rudimentary language without evidence of mathematical terminology to describe patterns and procedures: "The reasons why I have chosen these answers are because I added all the cubes it took to answer how many cubes were covered").

Comments/Next Steps

– The student needs to use manipulatives when problem solving to consolidate his or her understanding.
– The student should organize his or her data by using charts or systematic lists to help identify patterns.
– The student needs additional practice in identifying and recording patterns.

Smothered in Chocolate! Level 1, Sample 2

A

Exemplar Task

Smothered In Chocolate!

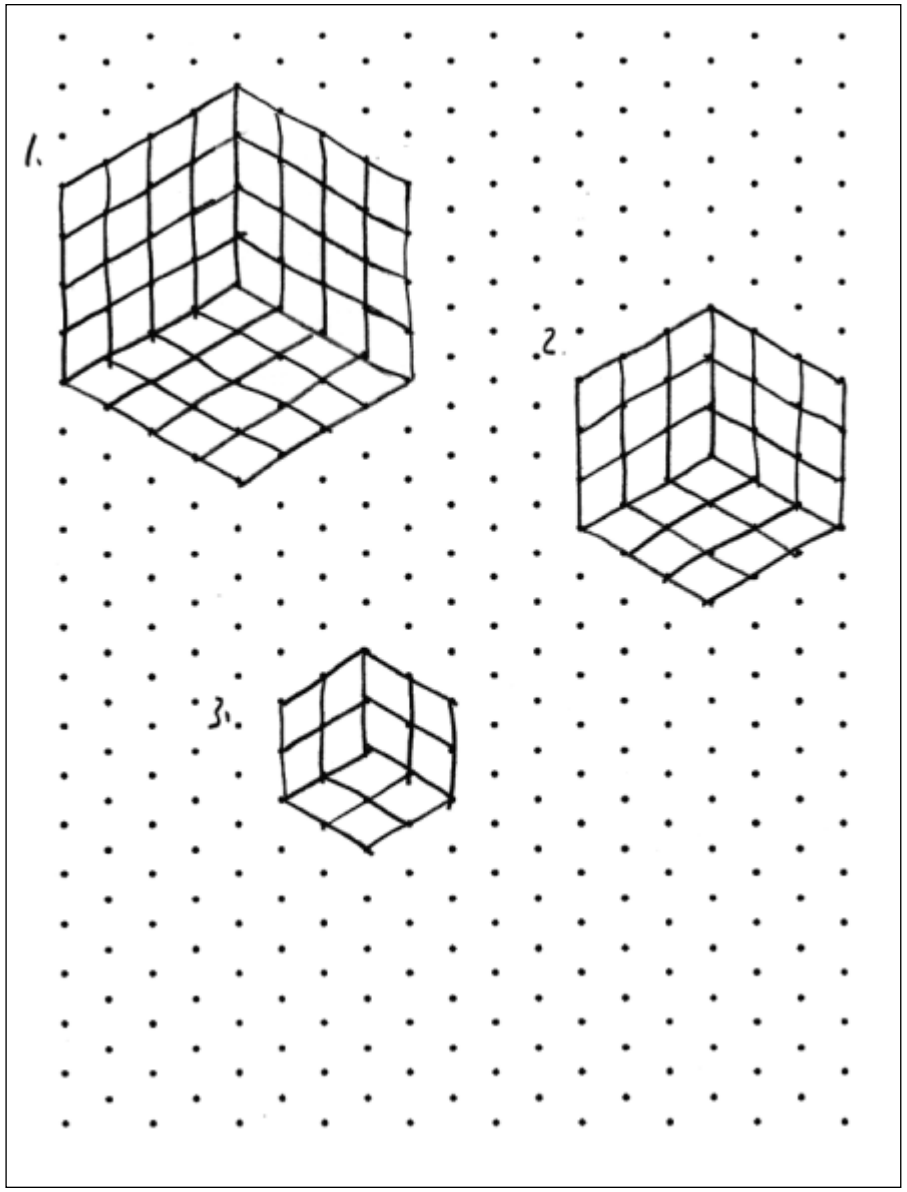
Imagine that each individual cube is a piece of toffee.

1 piece of toffee

Pieces of toffee are joined together to form cubes.
The cubes will then be completely dipped in chocolate.

1. Build three cubes of different sizes using interlocking cubes. Sketch the three cubes on the isometric paper provided at the end of this package.

B



C

2. For each of your three cubes you have just built, your task will be to determine the total number of cubes required for each structure you have built, and that have chocolate on exactly:
   a) 3 faces
   b) 2 faces
   c) 1 face
   d) 0 faces.

   Present your data so that someone looking at the way you organize your work will be able to see how you solved the problem.

cube 1 has 64 cubes.
cube 2 has 27 cubes.
cube 3 has 8 cubes

a) 3 faces: on 8 corners of each cube
b) 2 faces: cube 1 has 16, cube 2 has 12 + cube 3 has none.
c) 1 face: in the middle of the sides.
d) 0 faces: in the middle of the cube.

D

b) Describe all of the patterns you observe by looking at the data.

I noticed that the you always get 8 corners with 3 faces covered, that you would get different numbers with 2, 1 and 0 faces.

E

3. A number of unit cubes are put together to form a larger cube which was then painted. The larger cube is subsequently taken apart and it is discovered that 27 of the smaller cubes have no paint on them. How big was the original cube and how many of the smaller cubes had paint on only:

   i) one face
   ii) two faces
   iii) three faces

   Show how you arrived at your answer.

The original cube is 4x4x4 or 64 cubes.

i) 30 cubes had one face covered.
ii) 16 cubes had two faces covered.
iii) 8 cubes had three faces covered

F

4. If you had a large cube made from unit cubes such that the dimensions of the large cube are $n \times n \times n$, how many pieces would be covered in chocolate on exactly three faces, exactly two faces, exactly one face and no faces if the entire cube was covered with chocolate?
   Justify your answer.

In a cube that has 64 cubes of 4x4x4 there would be 8 cubes with 3 faces, 16 with 2 faces, 20 with one face, and 8 with none.

You would have to know the size of n to do more examples.

Teacher's Notes

Problem Solving

– The student selects and applies a problem-solving strategy that leads to an incomplete or inaccurate solution (e.g., in question 3, appears to have guessed at a 4 x 4 x 4 cube, and has not used the numbers of covered faces to support his or her answer).

Understanding of Concepts

– The student demonstrates a limited understanding of algebraic patterns (e.g., in question 2b, lists only one pattern, and vaguely explains the other patterns).

Application of Mathematical Procedures

– The student applies mathematical procedures with many errors and/or omissions when analysing the data (e.g., in question 3, does not attempt to use the number of uncovered cubes to arrive at the size of cube needed).
– The student states generalizations and/or algebraic expressions for the *n*th terms that include many errors and/or omissions (e.g., in question 4, uses a specific example with errors and attempts to explain the generalization, but does not see how to apply it to the *n*th term).

Communication of Required Knowledge

– The student uses mathematical language and/or algebraic notation with limited clarity to explain and justify generalizations based on the model (e.g., in question 2b, "I noticed that the you always get 8 corners with 3 faces covered, that you would get different numbers with 2, 1 and 0 faces").

Comments/Next Steps

– The student needs to use manipulatives when problem solving to consolidate his or her understanding.
– The student should organize data by using charts and/or systematic lists to help identify patterns.
– The student needs to begin using algebraic expressions and symbols.