

## Early Elementary Week 4: Nets

November 1, 2015

1. Take a look at a cube and answer the questions below:
  - (a) How many faces does a cube have?
  - (b) How many edges does a cube have?
  - (c) How many vertices does a cube have?
  - (d) How many edges are connected at a vertex?   
Is the answer the same for all the vertices?
  - (e) How many faces have a common edge?   
Is the answer the same for all the edges?

2. Take a look a cube.

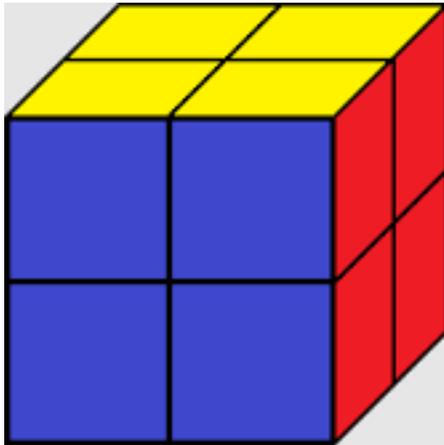
What is the biggest number of faces you can see at the same time?

Draw the cube showing as many faces as possible. Use dashed lines to show the edges that you cannot see.

3. Bob has a box full of cubes with side length 1 centimeter. He wants to put several cubes together to make a cube with side length 2 centimeters.

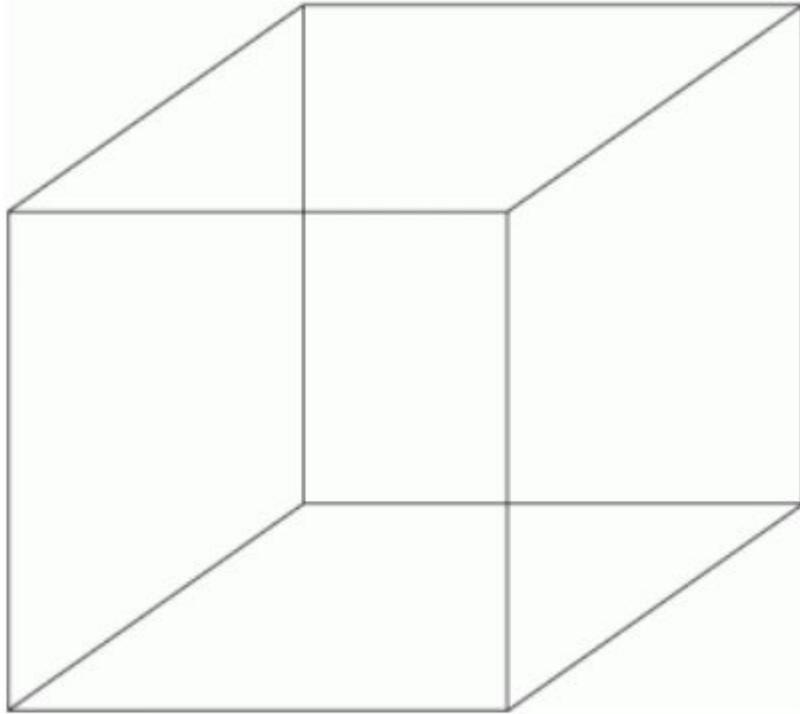
How many small cubes does he need?

Make a picture to help you answer the question.



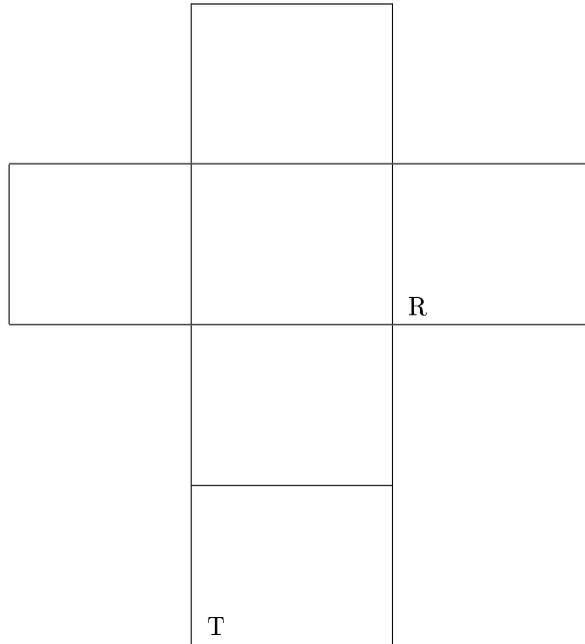
1. Lisa has a wooden cube with side length 2 centimeters. She paints the cube red. After that, she saws (cuts) the cube into smaller cubes with side length 1 centimeters.

(a) Show how the cube is cut on the picture below



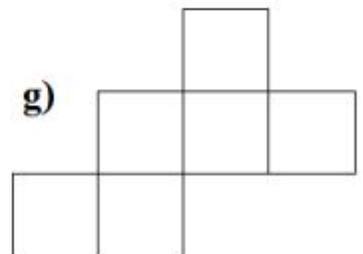
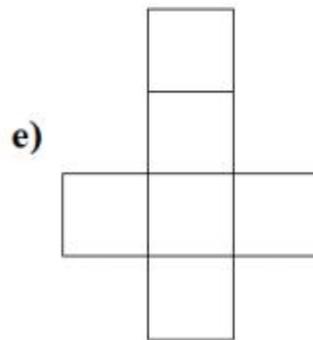
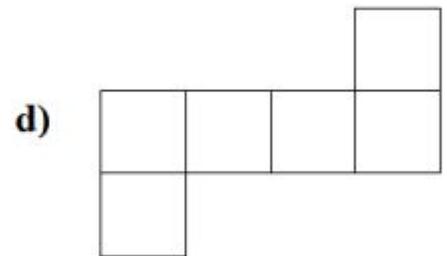
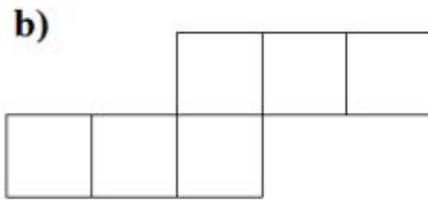
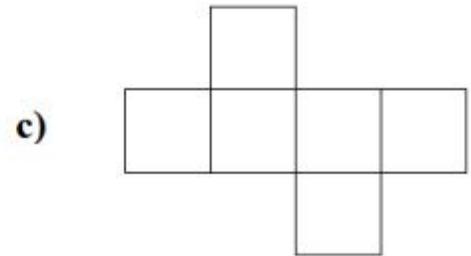
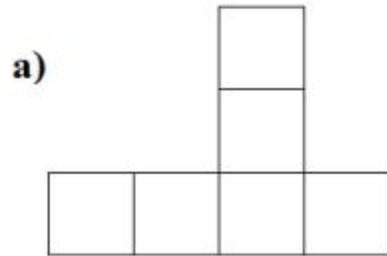
- (b) How many faces will be painted red in each of the smaller cubes?
- (c) How many faces of the small cubes will be painted red in all?
- (d) Are there more faces of the small cubes that are red or that are not painted?
- (e) If you answered yes to part (d), how many are there?

2. Here is a net of a cube.

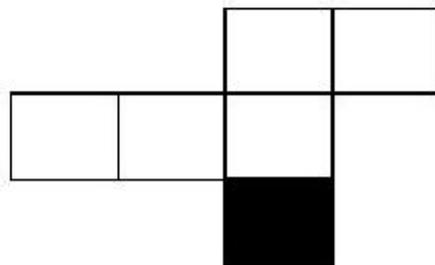
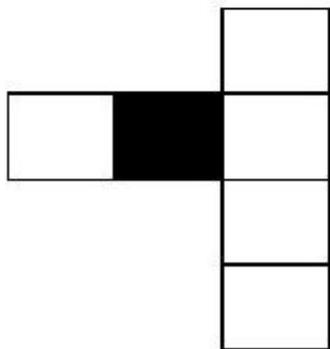
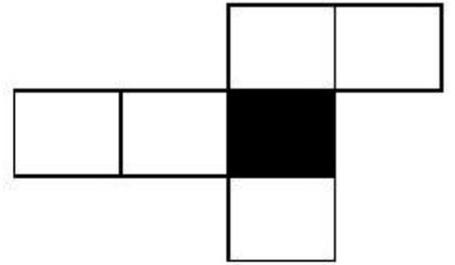
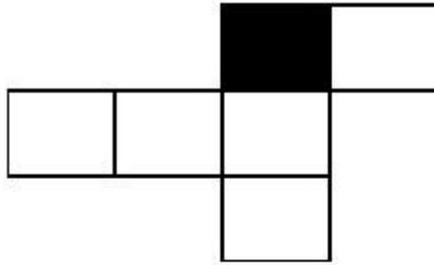


- (a) Imagine how a cube is made out of this net.
- (b) The top face of the cube is labeled with the letter U. Label the bottom face with the letter D.
- (c) The right face of the cube is labeled with the letter R. Label the left face of the cube with the letter L.
- (d) Label the front face of the cube with the letter F. Label the back face of the cube with the letter B.

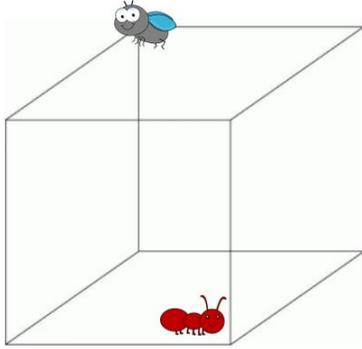
3. Which of the following shapes can be folded to make a cube? Circle all that are possible.



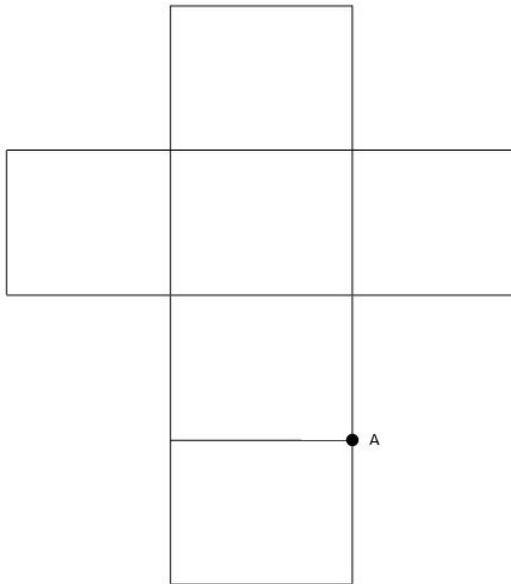
4. On the nets of the cube below, one of the faces is shaded. Shade the opposite face. Also remember to label each of the faces (U, D, L, R, F, B).



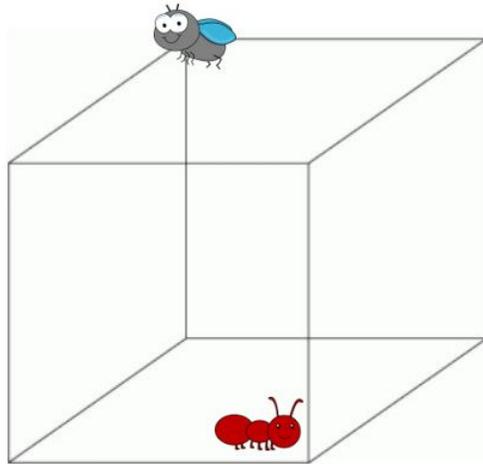
1. An Ant (point A) and a Bug (point B) sit at the opposite corners of a cube as shown below:



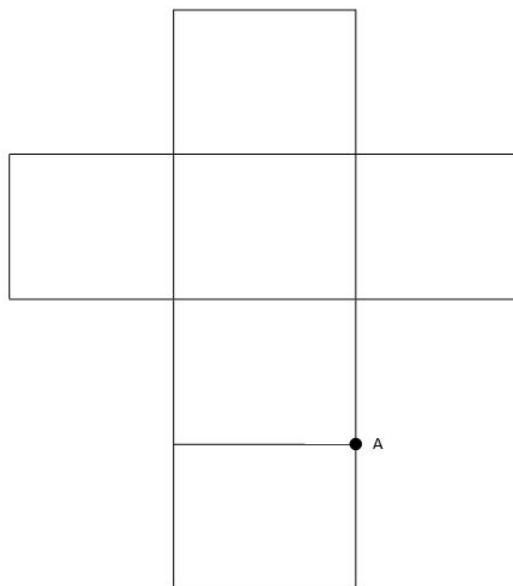
Position of the ant is marked on the net below with a letter A. Find the position of the bug on the net and mark it with a letter B.



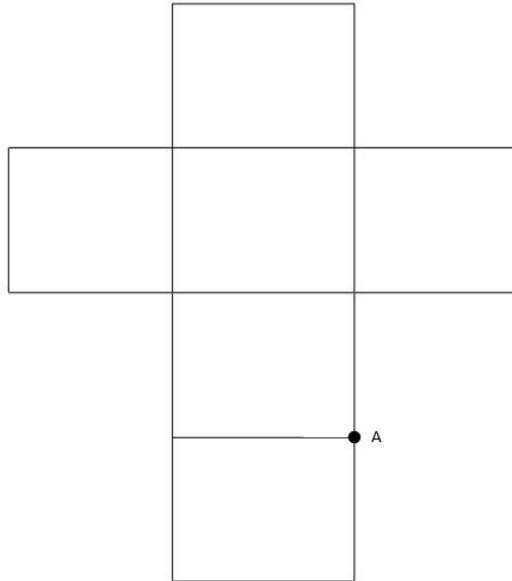
2. The Ant wants to visit the Bug. The Ant wants to go to Bug's vertex in a shortest possible way.
- (a) Can you draw what you think is the shortest route from A to B on the cube?



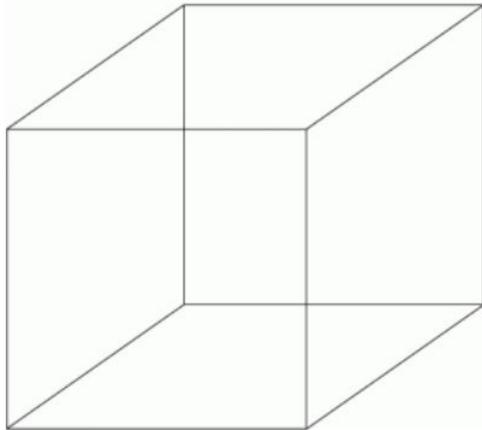
Can you draw this route on the net?



3. Connect two opposite corners (points A and B) by a shortest possible route on the net.



Now draw how this route looks like on the cube.



Go back to the problem about the Ant who visits the Bug. Was your route the shortest possible?

4. Tara has a box full of cubes with side length 1 centimeter. She wants to put several cubes together to make a cube with side length 3 centimeters. How many small cubes does she need?
5. Chris takes a cube with side length 3 cm and paints it green. After that, Chris saws (cuts) the cube into cubes with side length 1cm.
- (a) How many small cubes will have exactly one face painted green?
  - (b) How many small cubes will have exactly two faces painted green?
  - (c) How many small cubes will have exactly three faces painted green?

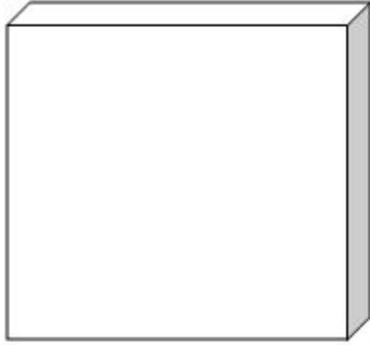
- (d) Will there be any small cubes that are not painted at all? If so, how many?

### CHALLENGE PROBLEMS:

6. Bobby has a cube with side length of 4 cm.
  - (a) Bobby cuts this cube into smaller cubes, each with a side length of 1 cm. How many cubes does he have?
  
  
  
  
  
  
  
  
  
  
  - (b) Bobby takes another cube of side length 4 cm, and cuts this cube into smaller cubes, each with a side length of 2 cm. How many cubes does he have now?
  
  
  
  
  
  
  
  
  
  
  - (c) Compare your answer from part (a) to your answer from part (b). Which is greater?
  
  
  
  
  
  
  
  
  
  
  - (d) What can you say about the relationship between the size of the cubes Bobby cuts and the number of cubes he cuts?

7. Let's say that Jared has a cube with a side length of 6 cm. He paints it orange. After that, he plans to saw (cut) the cube into smaller cubes of different side lengths.
- (a) If Jared wants to cut the big cube into smaller cubes of side lengths of 1 cm, how many cubes will be painted on at least one side?
  
  
  
  
  
  
  
  
  
  
  - (b) If Jared wants to cut the big cube into smaller cubes of side lengths of 2 cm, how many cubes will be painted on at least one side?
  
  
  
  
  
  
  
  
  
  
  - (c) 3 cm?

8. Let's say you have the 3D shape pictured below. It is a square. The length of each side is 4 cm.



- (a) Jessica cuts this shape into equal sized squares, each having a side length of 1 cm. Can you figure out how many small pieces she can cut from this large 3D shape?
  
- (b) Jessica cuts this shape into equal sized squares, each having a side length of 2 cm. How many pieces can she cut?
  
- (c) What about if she just wanted side length of 4 cm? How many pieces can she cut? Is she able to cut?

(c) We can use a function machine chart to predict the number of pieces that can be cut, provided that the side length is a number that can be divided evenly into the number 4. Fill in the following chart with your answers from parts (a), (b), and (c).

<b>Input (side length of squares she wants)</b>	<b>Output (number of squares she can cut)</b>

(d) Can you find a rule for this function machine?

Name: \_\_\_\_\_

## HOMEWORK: Nets

1. What is the shortest path between the ant and the fly if they are positioned this way? Draw it on the cube. (Hint: use the net like we did in class!)

