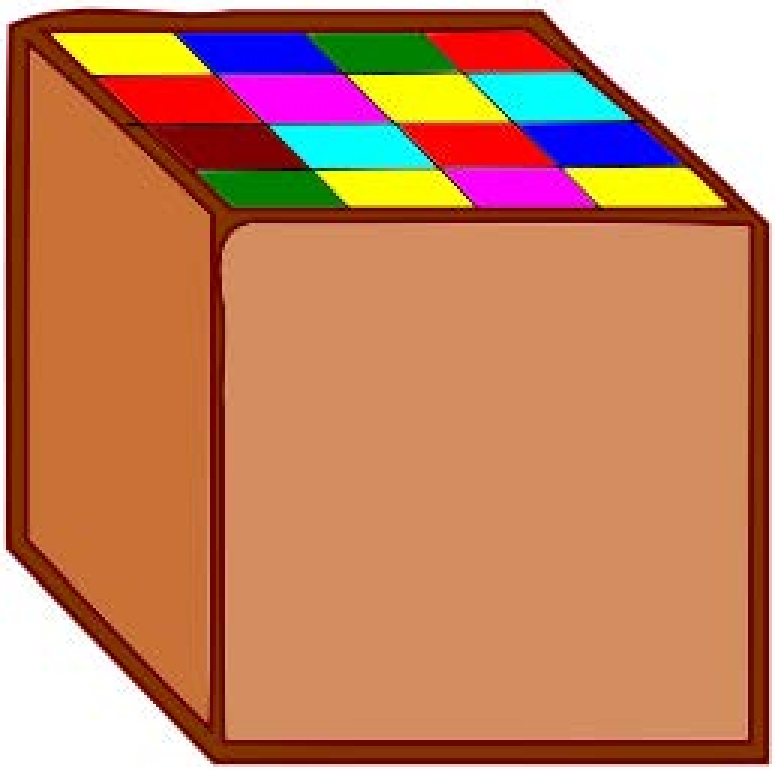
Puzzle of the Week
Boxed Blocks

THE CHALLENGE: There is a wooden box, without a lid, holding a 4 x 4 x 4 collection of 64 blocks. How many of the blocks touch some part of the box?



EXPLORATION: What happens for a 5 x 5 x 5 collection of 125 blocks in a bigger box? What about other sizes of boxes? How do these answers change if the boxes have a lid that touches the top row of blocks?

Puzzle of the Week
Boxed Blocks – Notes

THE CHALLENGE: There are different ways to go about solving this problem.

1. Think of the 2 x 2 x 3 = 12 core of blocks that don't touch the sides.
2. If it had a lid, there would be 2 x 2 x 2 = 8 blocks not touching the box. In addition to those 8, there would be 2 x 2 x 1 = 4 blocks only touching the lid.
3. You can add up the blocks along the sides and subtract them from the 4 x 4 x 4 = 64 total. This is the hardest way. There are 4 x 4 x 1 = 16 blocks on the bottom of the box. There are 3 x 12 = 36 blocks around the sides that don't touch the bottom. Therefore, there are 64 - (16 + 36) = 12 blocks on the inside.

EXPLORATION: Look at these only using the first method.

5 x 5 x 5. Without a lid, there are 3 x 3 x 4 = 36 blocks not touching the box. With a lid, there are 3 x 3 x 3 = 27 blocks not touching.

a x b x c, where c is the height. Assume these numbers are each at least three. Without a lid, a and b are reduced by 2 and c by 1, so there are $(a - 2) \times (b - 2) \times (c - 1)$ blocks. With a lid, $(a - 2) \times (b - 2) \times (c - 2)$ blocks not touching.