Name _____

Slicing and Dicing

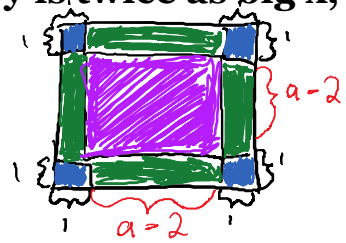
Tim has a solid wooden cube with whole number dimensions. He paints the entire surface of the cube red. Then, with slices parallel to the faces of the cube, Tim cuts the cube into 1x1x1 cubes.

let each dimension of ...whole equal sides) represented by a.

Let x be the number of the small cubes that are completely free of paint.
Let y be the number of small cubes that are painted red on only one side.

If y is twice as big x, what was Tim's original cube size?

Break up each Face:



8 Corners → will have 3 sides painted

edges → will have 2 sides painted
12 edges

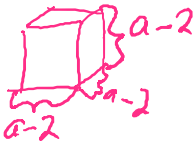
total with 2 sides $12(a-2)$

Faces → will have 1 Side painted
6 Faces

→ total $(a-2)^2$

total with 1 side Painted $y = 6(a-2)^2$

"Cube inside cube" → totally free of paint



total with no paint $x = (a-2)^3$

$y = 2x$

$$\frac{6(a-2)^2}{(a-2)^2} = \frac{2(a-2)^3}{(a-2)^2}$$

$$\frac{3\cancel{6}}{\cancel{2}} = \frac{2(a-2)}{2}$$

$3 = a-2$
$+2 \quad +2$

$a = 5$

original cube size $5 \times 5 \times 5$

What if x is twice as big as y?

What would Tim's original cube size be then?

Do you think it will be the same size?

$x = (a-2)^3 \qquad y = 6(a-2)^2$

$x = 2y$

$(a-2)^3 = 2(6(a-2)^2)$

$\frac{(a-2)^3}{(a-2)^2} = \frac{12(a-2)^2}{(a-2)^2}$

$a - 2 = 12$

$+2 \quad +2$

$\boxed{a = 14}$

the original box size would then be $14 \times 14 \times 14$

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