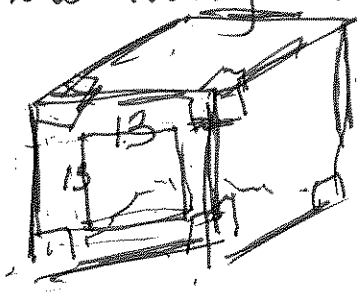
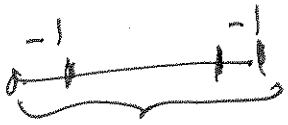
How many little cubes get some paint?



$15 \times 15 \times 15 = 15^3$ ← # of cubes

How many get no paint

Unpainted inner core $= 13 \times 13 \times 13 = 13^3$



$15 - 2 = 13$

are painted $= 15^3 - 13^3$ get some paint

(8) cubes that get 3 sides painted

How many get 2 sides painted?

12 lines, each has $(15-2)$

Answer: 12×13 ← get 2 sides colored

Lastly:

How many get just one side colored:

$(13 \times 13) \times 6$

get 1 side colored ←

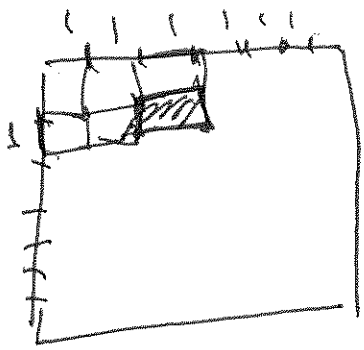
on each side # sides

Check:

Some paint $15^3 - 13^3$

got 3 colors	got 2 colors	1 color
8	12×13	$13 \times 13 \times 6$

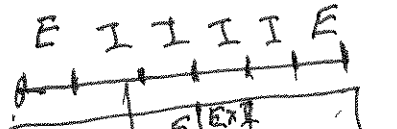
$$15^3 - 13^3 = 8 + 12 \times 13 + 13 \times 13 \times 6$$

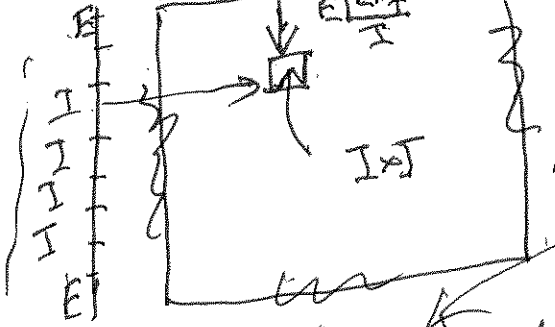


$(1+1+\cdots+1)$ $(1+1+1+\cdots+1)$
l w

$A = lw$

$V = lwh$

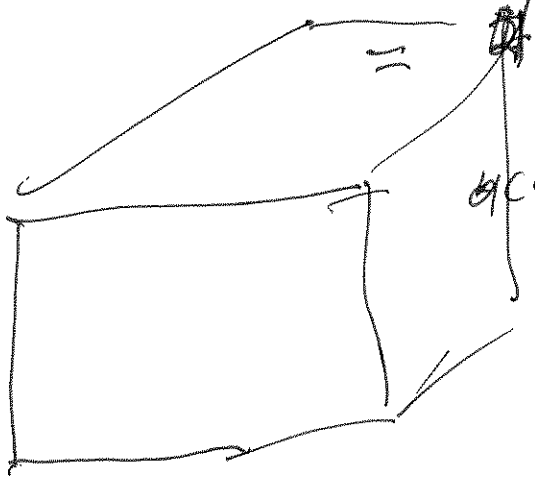




$(E+I+I+\cdots+I+E)$ $(E+I+I+\cdots+I+E)$
l w

$= (2E+(l-2)I)(2E+(w-2)I)$

$= E^2 + (2E)(w-2)I + (l-2)I(2E) + (l-2)(w-2)I^2$



E^2 ← corner.

$(l-2)(w-2)I^2$ ← completely interior

(2

$V = l\,w\,h$

$$(2E+(l-2)I)(2E+(w-2)I)(2E+(h-2)I)$$

$(2E)(2E)(2E) = 8E^3$

coef of E^3

coef E^2I

8 on the corners

For a cube $l = w = h$

$$(2E+(l-2)I)^3$$

$$= (2E)^3 + \binom{3}{1}(2E)^2((l-2)I)^1 + \binom{3}{2}(2E)^1((l-2)I)^2 + ((l-2)I)^3$$

$$= 8E^3 + 3\cdot 4(l-2)E^2I^1 + 3\cdot 2\cdot(l-2)^2 E^1 I^2 + ((l-2)I)^3$$

$8E^3$: 3 sides painted

$3\cdot 4(l-2)E^2I$: 2 sides painted

$3\cdot 2\cdot(l-2)^2 E^1I^2$: $6(l-2)^2$, 1 side painted

$((l-2)I)^3$: $(l-2)^3$, no paint

$l=15$: $12\cdot 13$

$l=15$: $6\cdot 13^2$

$l=15$: 13^3