

## Answer on Question #53225 – Math – Geometry

### Question

A cuboid of dimensions 70 cm by 50 cm by 30 cm has "square holes" measuring 10 cm by 10 cm in the centers of the faces of the cuboid. The holes cut through the length of each face of the solid. Calculate the volume and the surface area of the solid.

### Solution

Calculation of volume:

1. Volume of the cuboid:  $70 * 50 * 30 = 105000 \text{ cm}^3$ .
2. Volumes of the "square holes":  
 $10 * 10 * 70 = 7000 \text{ cm}^3$   
 $10 * 10 * 50 = 5000 \text{ cm}^3$   
 $10 * 10 * 30 = 3000 \text{ cm}^3$   
respectively.
3. Volume in the center (intersection of "square holes"):  $10 * 10 * 10 = 1000 \text{ cm}^3$ .
4. Volume of the solid:  
Volume of cuboid – Volumes of "square holes" + Overcounted volume of "square holes".  
In our case Overcounted volume of "square holes" = Volume in the center \* 2(Number of intersected "square holes" - 1).  
 $105000 - (7000 + 5000 + 3000) + 1000 * 2 = 92000 \text{ cm}^3$

Calculation of surface area:

1. Surface of the cuboid:  $70 * 50 * 2 + 70 * 30 * 2 + 50 * 30 * 2 = 14200 \text{ cm}^2$ .
2. Surface of the "square holes":  
 $10 * 10 * 2 + 10 * 70 * 4 = 3000 \text{ cm}^2$   
 $10 * 10 * 2 + 10 * 50 * 4 = 2200 \text{ cm}^2$   
 $10 * 10 * 2 + 10 * 30 * 4 = 1400 \text{ cm}^2$   
respectively.
3. Overcounted surface in the center for one "square hole":  
 $10 * 10 * 4 = 400 \text{ cm}^2$
4. Surface of outer faces for one "square hole":  $10 * 10 * 2 = 200 \text{ cm}^2$ .
5. Surface area of the solid:  
Surface area of the cuboid + Surface area of "square holes" – Overcounted surface in the center of "square holes" – Surface of outer faces of the "square holes".  
 $14200 + (3000 + 2200 + 1400) - (400 * 3) - (200 * 3) = 19000 \text{ cm}^2$

**Answer:**

Volume of the solid is  $92000 \text{ cm}^3$ . Surface area of the solid is  $19000 \text{ cm}^2$ .