

Task:

How many square inches of a material needed to create an open top rectangular solid whose volume is 54 cubic inches? Assume that the length and width are of the same measurement and that the height is twice the length.

Solution:

Let the length of solid is x , considering that the length and width are of the same measurement the width of solid is x too, and considering that the height is twice the length the height is $2 \cdot x$.

Volume of rectangular solid is given by next formula:

$$V = l \cdot w \cdot h$$

Where l – length, h – height, w – width.

From this follows next: $V = x \cdot x \cdot 2 \cdot x = 2 \cdot x^3$.

Since the volume is equal to 54 cubic inches, we obtain the equation:

$$2 \cdot x^3 = 54$$

Solve it:

$$x^3 = 27$$

$$x = \sqrt[3]{27}$$

$$x = 3$$

So we get that length = width = 3 inches, height = $2 \cdot 3$ inches = 6 inches.

Because we need a rectangular solid with an open top, then we need the right and left walls, front and back walls and one bottom wall, their area of $2 \cdot w \cdot h$, $2 \cdot l \cdot h$ and $w \cdot l$ square inches respectively.

We need the amount of material equal to the sum of that squares:

$$S = 2 \cdot w \cdot h + 2 \cdot l \cdot h + w \cdot l$$

$$S = 2 \cdot 3 \cdot 6 + 2 \cdot 3 \cdot 6 + 3 \cdot 3$$

$$S = 36 + 36 + 9$$

$$S = 81$$

So we need 81 square inches of a material to create an open top rectangular solid.

Answer: 81 square inches.