

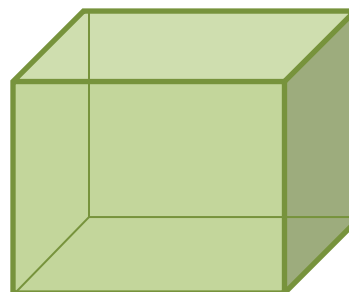
Volume of a Right Rectangular Prism

Guided Notes

Math 5

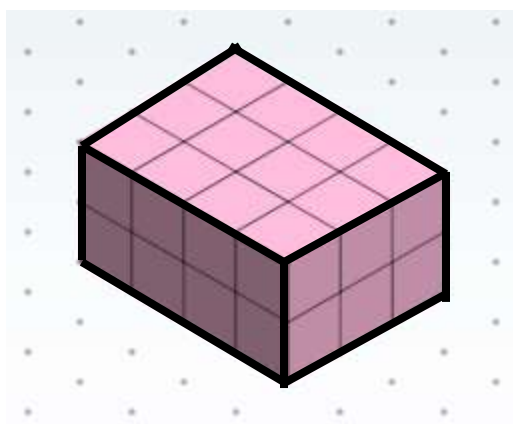
Rectangular Prisms

Rectangular prisms are three-dimensional figures made up of six faces of rectangles. It has dimensions: length, width and height.

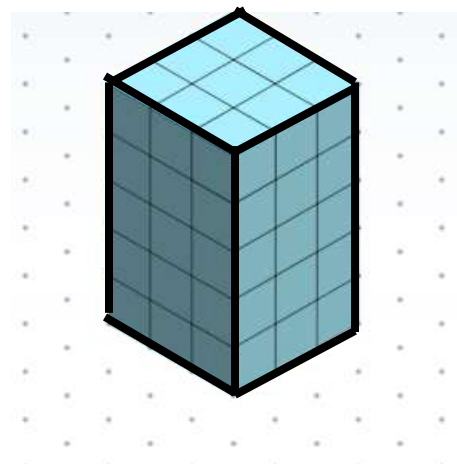


We can construct rectangular prisms by stacking up cubes. Its volume can be determined, given that one small cube is 1 cubic unit.

Example:



This rectangular prism has 24 cubes its volume is **24 cubic units**.



Rectangular prism has 45 cubes so volume of prism is **45 units³**.

Volume of a Right Rectangular Prism

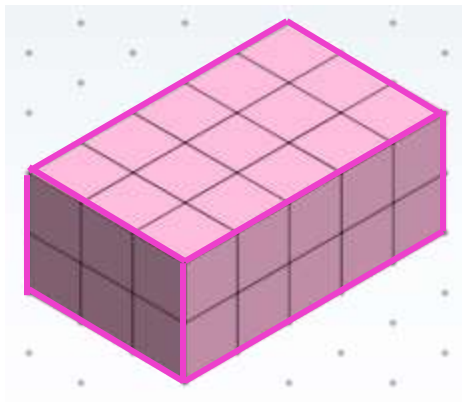
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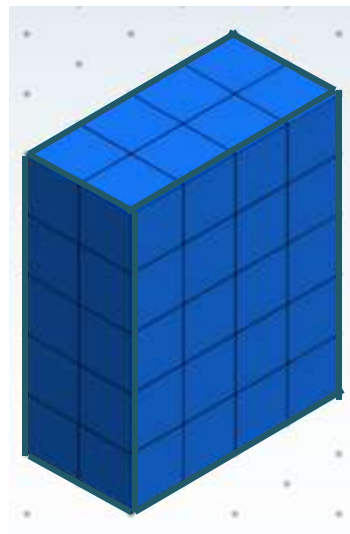
Sample Problem 1:

Find the volume of the following rectangular prisms given that 1 cube has a volume of 1 in^3 .

1.

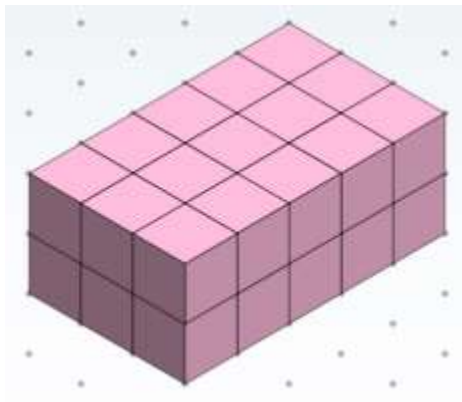


2.



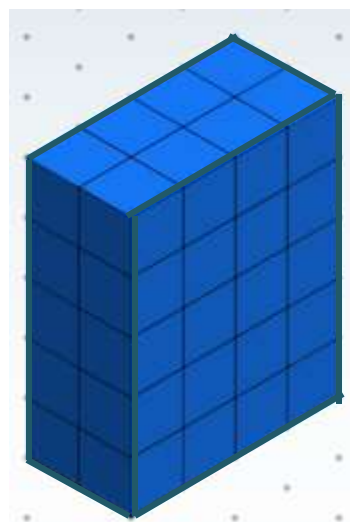
Solution:

1.



Rectangular prism has
30 cubes so volume of
prism is **30 in^3** .

2.



Rectangular prism has
40 cubes so volume of
prism is **40 in^3** .

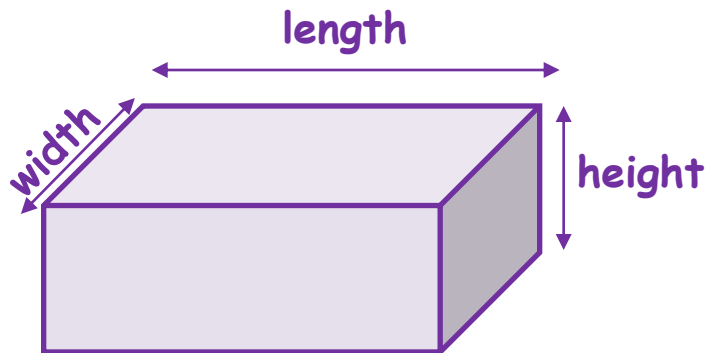
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Dimensions of Rectangular Prisms

Rectangular prisms have three dimensions: length, width, and height as shown below. These measurements can help us find the prism's volume easier.

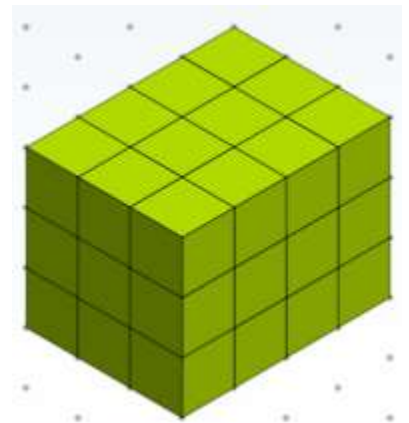


Example:

Given that  = 1 cm^3 , we can find the dimensions of the prism shown below. Since the cube has a volume of 1 cm^3 , this means that one side of the cube is equal to 1 cm.



A cube that has a volume of 1 cm^3 has length, width and height all equal to 1.



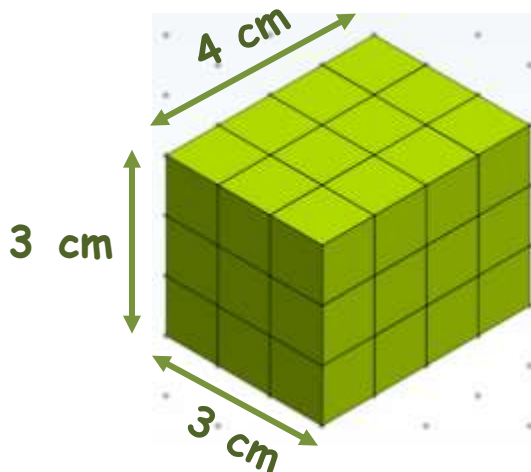
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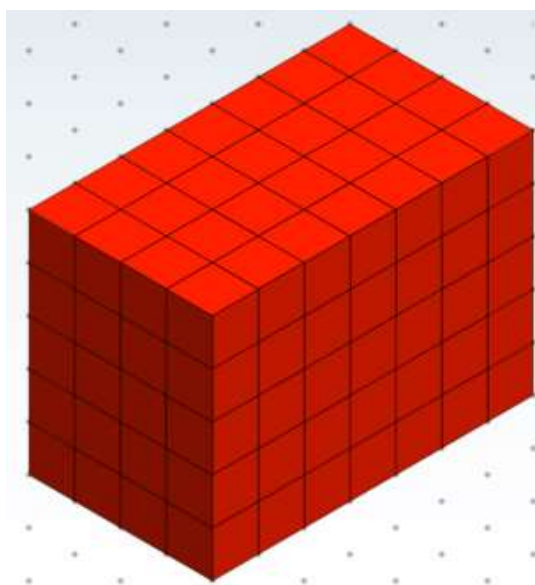
Using the measurement of one side of the cube, then we can find the dimensions of the rectangular prism.

Length: 4 cm
Width: 3 cm
Height: 3 cm



Sample Problem 2:

Find the dimensions of the prism shown below, given that 1 cube has a volume of 1 cm^3 .



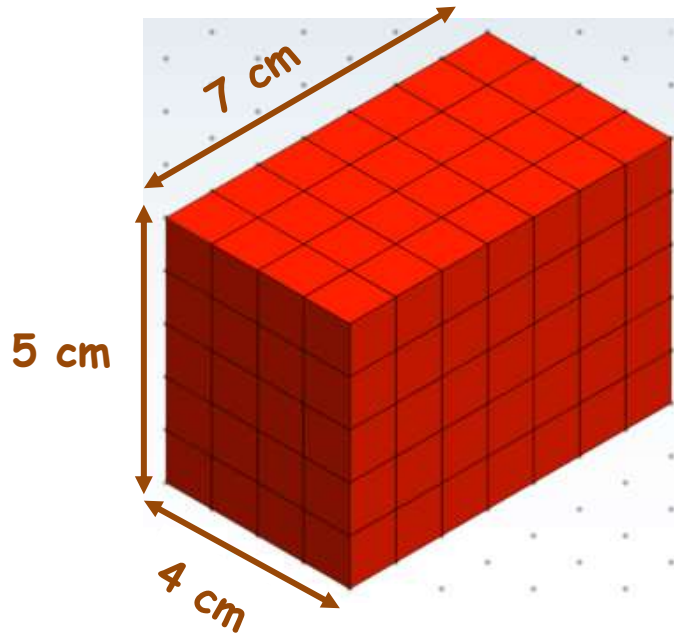
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Solution:

Find the dimensions of the prism shown below, given that 1 cube has a volume of 1 cm^3 .



length = 7 cm

width = 4 cm

height = 5 cm

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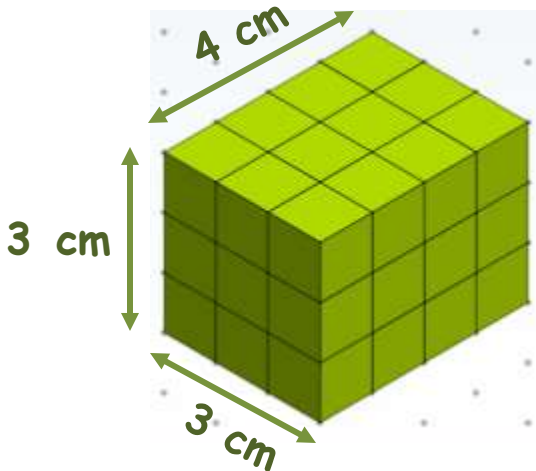
Volume of Rectangular Prisms (Area \times Height)

Another way to find the volume of a prism faster is by finding the area of the base of the prism, then multiplying it by its height.

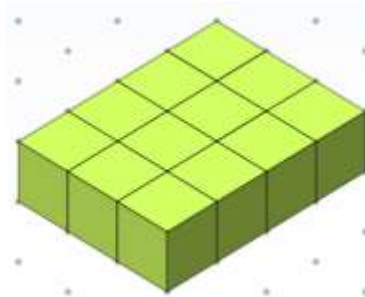
$$\text{Volume} = \text{Base Area} \times \text{Height}$$

Example:

Volume of the prism



Area of the
base



Height of
the base



3 cm

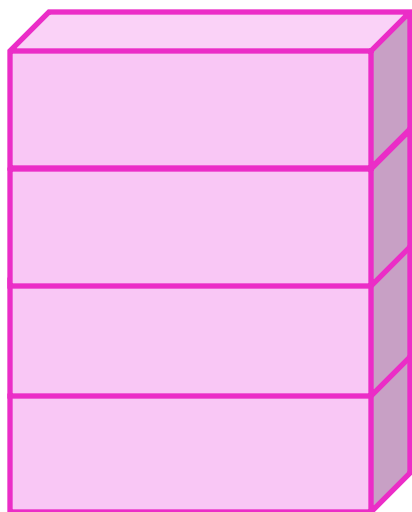
$$\begin{aligned}\text{Volume of the prism} &= (3 \text{ cm} \times 4 \text{ cm}) \times 3 \text{ cm} \\ &= 12 \text{ cm}^2 \times 3 \text{ cm} \\ &= 36 \text{ cm}^3\end{aligned}$$

Volume of a Right Rectangular Prism

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Base Area = 16 cm^2



Height = 4 cm

Volume = Base Area \times Height

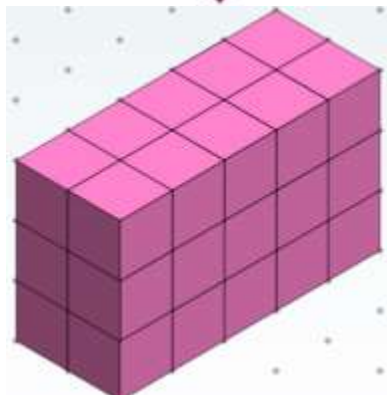
$$= 16 \text{ cm}^2 \times 4 \text{ cm}$$

$$= 64 \text{ cm}^3$$

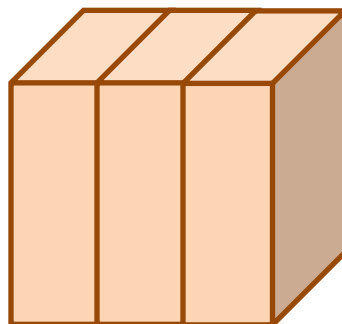
Sample Problem 3:

Find the volume of the following rectangular prisms.

1. 1  $= 1 \text{ in}^3$



2. Base Area = 22 cm^2



Height = 6 cm

Volume of a Right Rectangular Prism

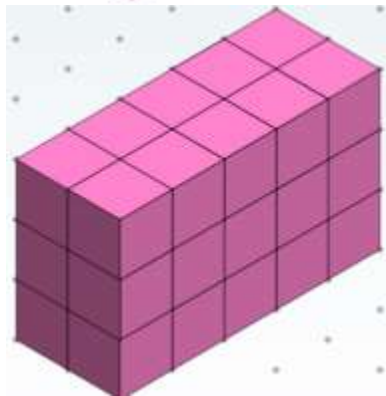
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Solution:

Find the volume of the following rectangular prisms.

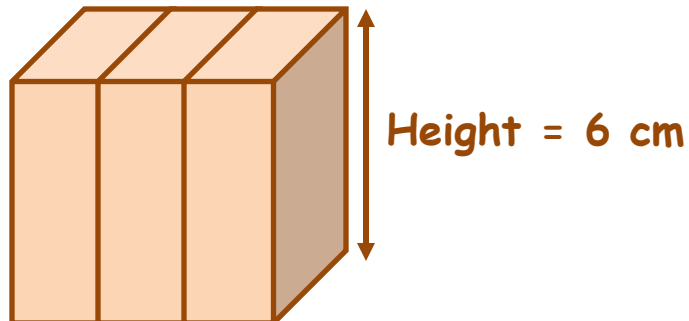
1. 1  = 1 in³



Base Area = 10 in²

Volume = 10 × 3 = 30

2. Base Area = 22 cm²



Base Area = 22 in²

Volume = 22 × 6 = 132 cm³

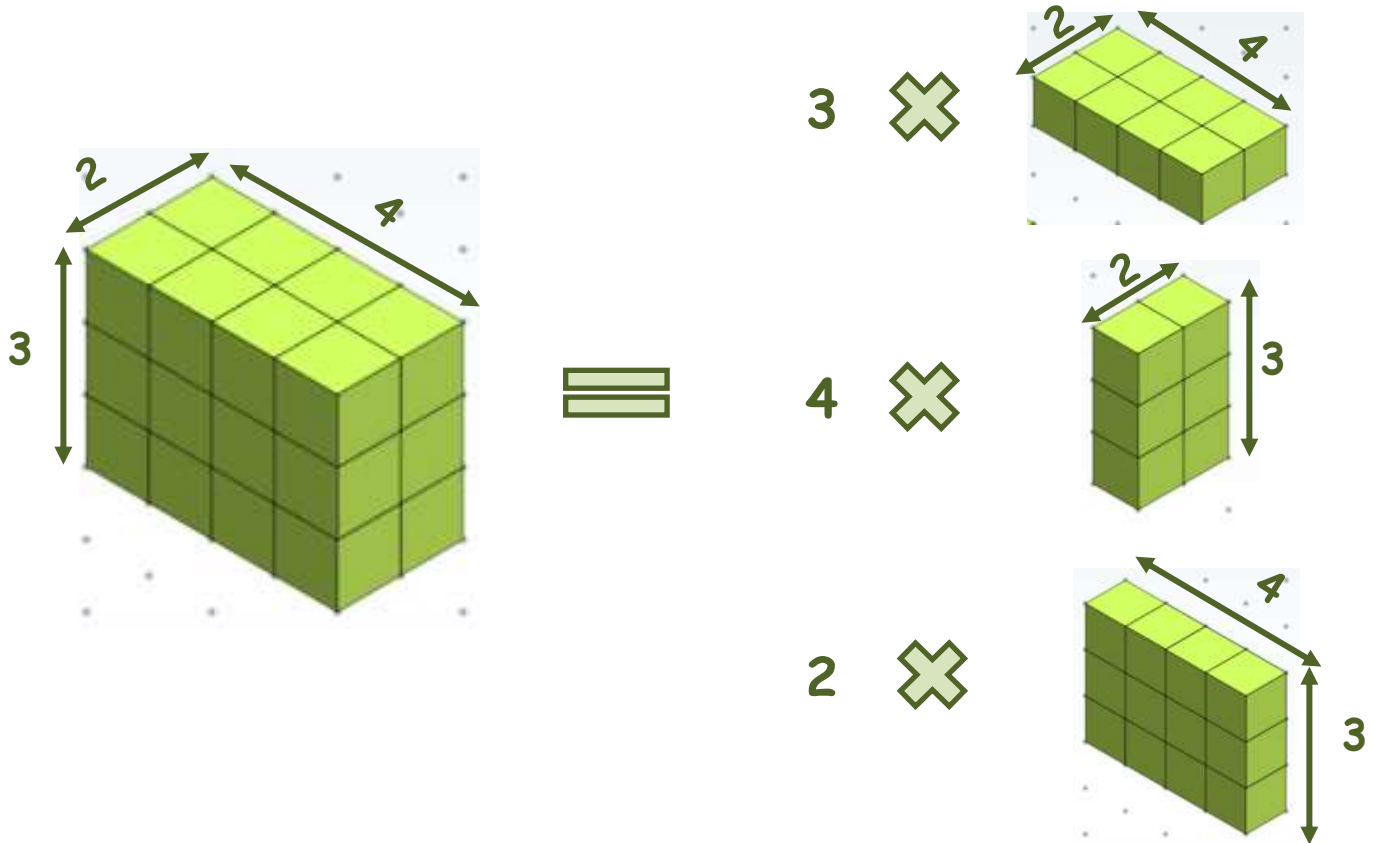
Volume of a Right Rectangular Prism

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Volume of Rectangular Prisms (Length \times Width \times Height)

We can find the volume of the rectangular prisms in three different ways using their base areas and height.



From this particular example, we can see that

$$\text{Volume} = 3 \times 2 \times 4 = 24 \text{ units}^3$$

$$= 4 \times 2 \times 3 = 24 \text{ units}^3$$

$$= 2 \times 4 \times 3 = 24 \text{ units}^3$$

This means that regardless of the order, we'll end up with the same volume when we multiply the dimensions to each other.

Volume of a Right Rectangular Prism

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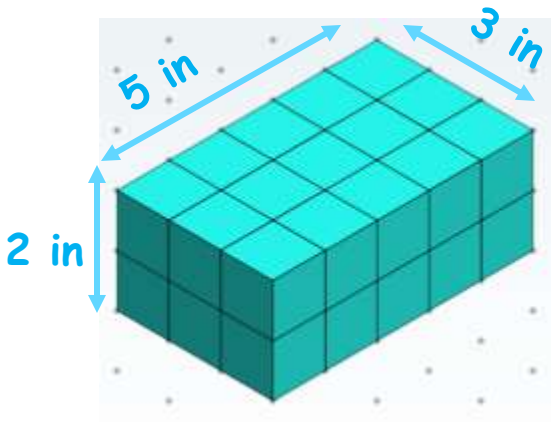
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In general, we can use this formula below when finding the volume of the rectangular prism.

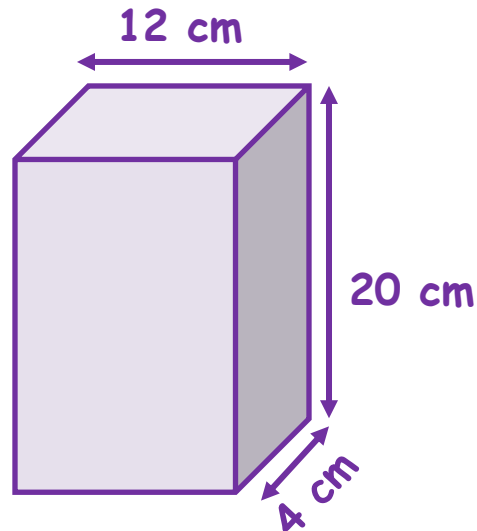
$$\text{Volume} = \text{Length} \times \text{Width} \times \text{Height}$$

$$V = L \times W \times H$$

Example:



$$\begin{aligned}\text{Volume} &= 2 \times 5 \times 3 = 30 \text{ in}^3 \\ &= 5 \times 3 \times 2 = 30 \text{ in}^3 \\ &= 3 \times 5 \times 2 = 30 \text{ in}^3\end{aligned}$$



$$\begin{aligned}\text{Volume} &= 12 \times 20 \times 4 = 960 \text{ cm}^3 \\ &= 20 \times 12 \times 4 = 960 \text{ cm}^3 \\ &= 4 \times 20 \times 12 = 960 \text{ cm}^3\end{aligned}$$

Volume of a Right Rectangular Prism

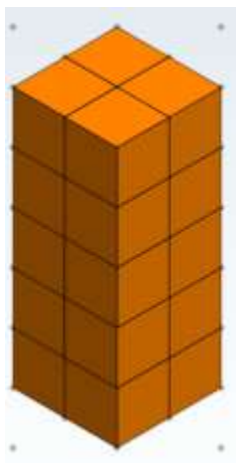
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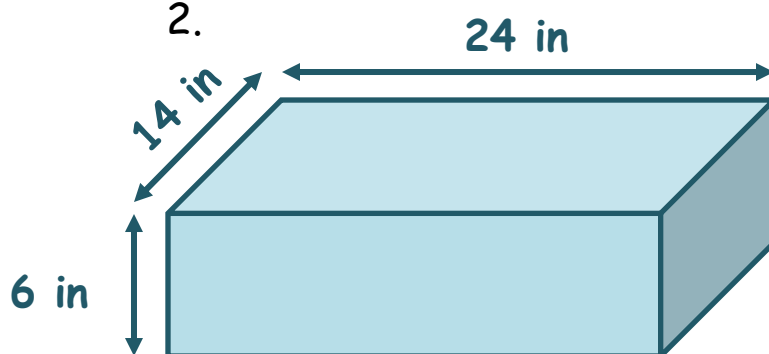
Sample Problem 4:

Find the volume of the figures shown below.

1. 1  = 1 ft³



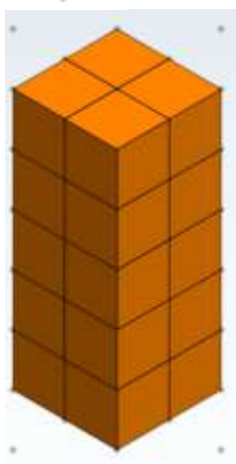
2.



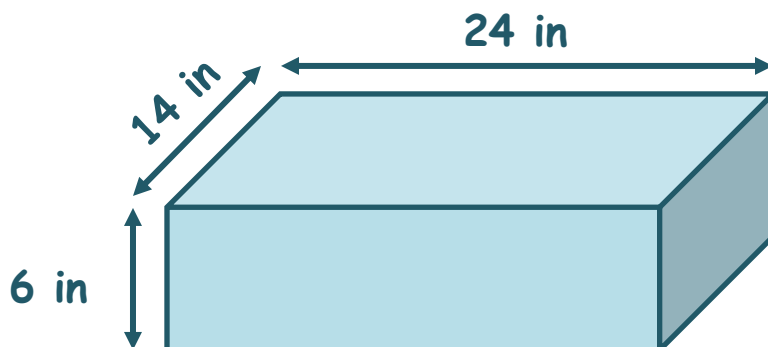
Solution:

Find the volume of the figures shown below.

1. 1  = 1 ft³



2.



Volume = $2 \times 2 \times 5 = 20 \text{ ft}^3$

Volume = $6 \times 14 \times 24 = 2016 \text{ in}^3$