



6th
Basic

7th
Advanced

Helping With Math

USA
GRADES

Word Problems Involving Volumes of Solid Shapes

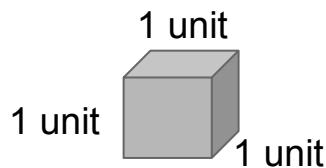
Suitable for students
aged 10-12




This pack is suitable for learners aged 10-12 years old or 6th to 7th graders (USA). The content covers fact files and relevant basic and advanced activities involving word problems about the volume of solid shapes.

Volume refers to the capacity (amount) of a space occupies with a 3 dimensional objects.

It is measured in "cubic" units. The volume of a figure is equal to the number of cubes required to fill it completely, like blocks in a box.



How many of this  can fit in a cube whose dimensions are 12 ft, 10 ft, and 5 ft?

SOLID FIGURES



Solid figures are three-dimensional figures that have length, width and height.



CONCEPTS



Cube

A solid object bounded by six square faces, facets or sides, with three meeting at each vertex.

$$V = s^3$$

where s is equal to the measurement of a side of the cube.



Rectangular Prism

It is a polyhedron with exactly two rectangular faces/bases that are congruent and parallel. Other faces are called lateral faces.

$$V = LWH$$

where L = length, W = width, and H = height.



Pyramid

It is a polyhedron in which one face, can be any polygon. The other faces are triangular sides that meet at a common vertex.

$$V = \frac{1}{3} BH$$

Where B = area of the base and H = height



SAMPLE/APPLICATION



Cone

It is a solid figure that has a circular base connected to a vertex.

$$V = \frac{1}{3} \pi r^2 h$$

where r = length of the radius and h = height.



Sphere

$$V = \frac{4}{3}(\pi r^3)$$

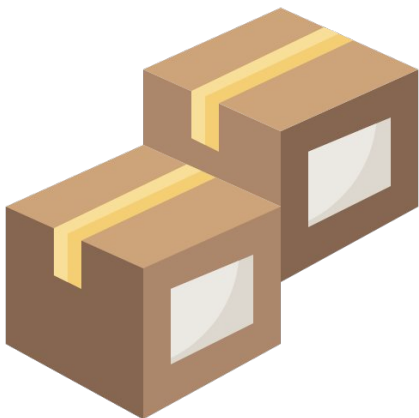
It is a figure with a curved surface in which all points on the surface are equidistant from the center.



Cylinder

$$V = \pi r^2 h$$

It is a solid figure that has two congruent or equal circular bases that are parallel.

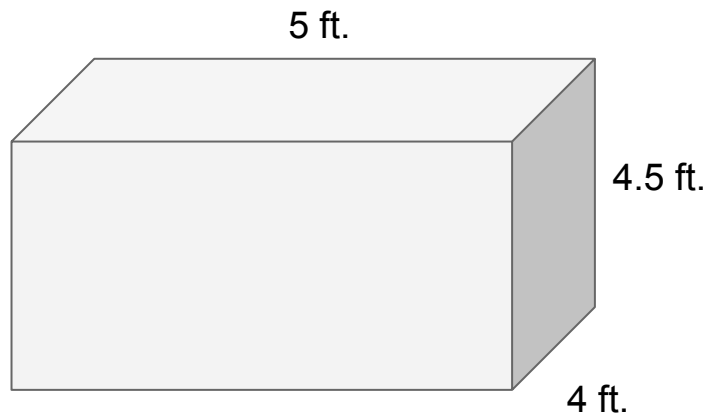
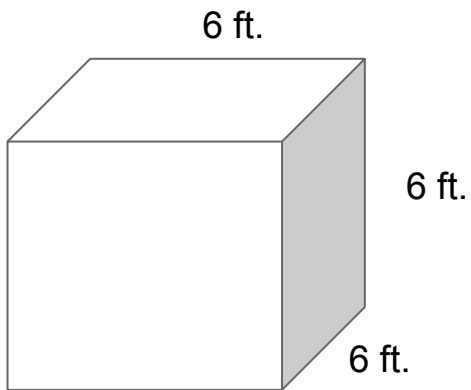


Two cargo boxes arrived at Dr. Atkins' vet clinic. One cargo is a cube-shaped box with a side that measures 6 ft. The other one is shaped like a rectangular prism with the following dimensions, 4 ft, 5 ft, 4.5 ft.



SAMPLE/APPLICATION

A. Sketch the two cargo boxes with their corresponding dimensions.



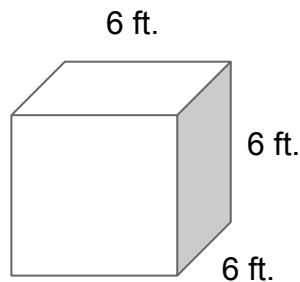
B. Solve for the volume of the two cargo boxes.

The first cargo is a cube so the formula to be used is $V = s \times s \times s$ or s^3

Since $s = 6$ ft,

$$V = 6 \text{ ft} \times 6 \text{ ft} \times 6 \text{ ft} = 216 \text{ ft}^3$$

The volume of the cargo is 216 ft^3 .



B. Solve for the volume of the two cargo boxes.

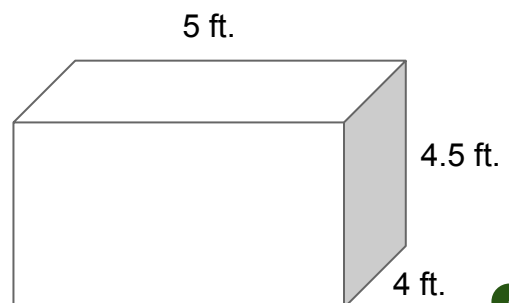
The second cargo is a rectangular prism so the formula to be used is

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

Since $L = 5$ ft, $W = 4$ ft, $H = 4.5$ ft

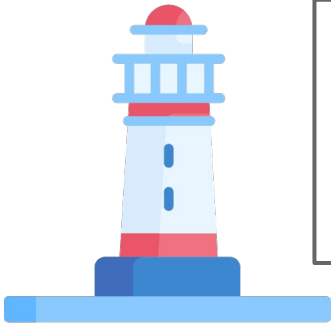
$$V = 5 \text{ ft} \times 4 \text{ ft} \times 4.5 \text{ ft} = 90 \text{ ft}^3$$

The volume of the cargo is 90 ft^3 .

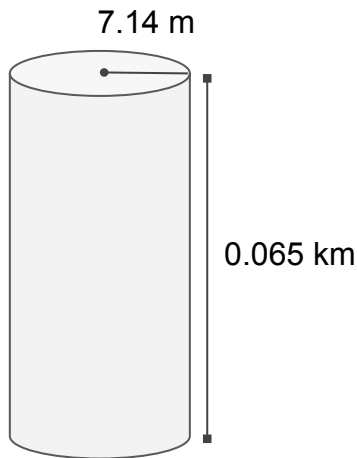


SAMPLE/APPLICATION

Another example:



At the airport, Dr. Atkins notices that the lighthouse's lower base is cylindrical in shape. Its radius measures 7.14 m and its height is 0.065 km. Compute how many metric feet the cylindrical lighthouse can handle.



Let $r = 7.14$ m and $h = 0.065$ km or 65 m, $\pi = 3.14$

$$V = \pi r^2 h$$

$$V = (3.14)(7.14 \text{ m})^2 (65 \text{ m})$$

$$V = 10,404.94 \text{ m}^3$$

The volume of the cylindrical lower base of the lighthouse is **10,404.94 m³**

The radius of the sphere is 11.25 ft.



The radius is 17 in and the height is 45 in.



TABLE OF ACTIVITIES

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THE DOG CAGE

G6
Basic

Dr. Atkins is a famous veterinarian in town. He is offering free dog cage to some pet owners who cannot afford to buy one. Using your learning about cube, answer the following problems.

1. The first cage that is nearest to the vet clinic door is a cube in shape. If the height of the cage is 1 foot, compute for the volume of the cage in inches.

2. The volume of the large-sized cage is 15.625 m^3 . Given the indicated volume, what is the length of the cage if it is in the shape of a cube?

3. Another cube-shaped cage is about to be delivered, what is its volume if the width measures 13.2 inches?



FIRST AID TOOLKIT

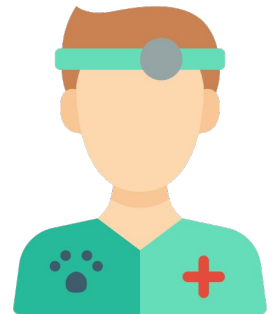
G6
Basic

Dr. Atkins' first aid toolkits come in different sizes. Refer to the given below and answer each. (Round off your answer to the nearest hundredths)



1. The largest toolkit is like a rectangular prism and it has the following dimensions: 3.75 ft, 2.15 ft, and 1.5 ft. What is its volume?

2. The medium toolkit is also a rectangular prism and has the following dimensions: 2.75 ft, 1.15 ft, and .5 ft. What is its volume?



3. If the volume of the smallest toolkit is 0.96 cu. ft, calculate for its height if the length and width is 1.2 ft and 12 inches respectively.



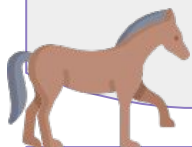
NEIGH ROOF

G6
Basic

Dr. Atkins visited a barn in the nearest farm land in his town. He checked the health of the horses and find out that the upper part of the barn needs renovation. Refer to the given below and solve each word problem.

1. The shape of the barn's upper part is a pyramid. The given dimensions are the following: rectangular base with an area of 120 sq. m and the height is 5.2 m. Compute for the volume.

2. If the upper part of the barn is a rectangular pyramid and has a volume of 216 cu. meters, compute for the area of the base given that the height of the pyramid is 4.5 m.



3. If the upper part of the barn is a rectangular pyramid and has a volume of 1280 cu. ft, compute for the height of the pyramid given that the area of the base is 320 sq. ft.

4. The shape of the barn's upper part is a triangular pyramid. The given dimensions are the following: the base is 3.2 m long and is 4.38 m wide and the pyramid's height is 3.8 m. Compute for the volume.



ANIMAL THERAPY

G6
Basic

One of the tools that is being used in Dr. Atkins' vet clinic is cone. Cone is important for animal therapy. Using your understanding of volume of a cone, solve the following.



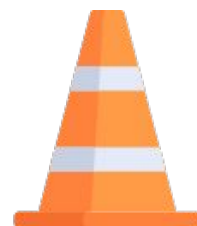
1. Find the volume of a cone whose radius is 6 cm and the height is 5 cm. Express your answer in terms of π .

2. Dr. Atkins requested for a cone whose volume is greater than 500 cu. units. Which among the two cones is he referring to?

Let $\pi = 3.14$.

Cone A: $r = 12$ $h = 3.4$

Cone B: $r = 3.4$ $h = 12$



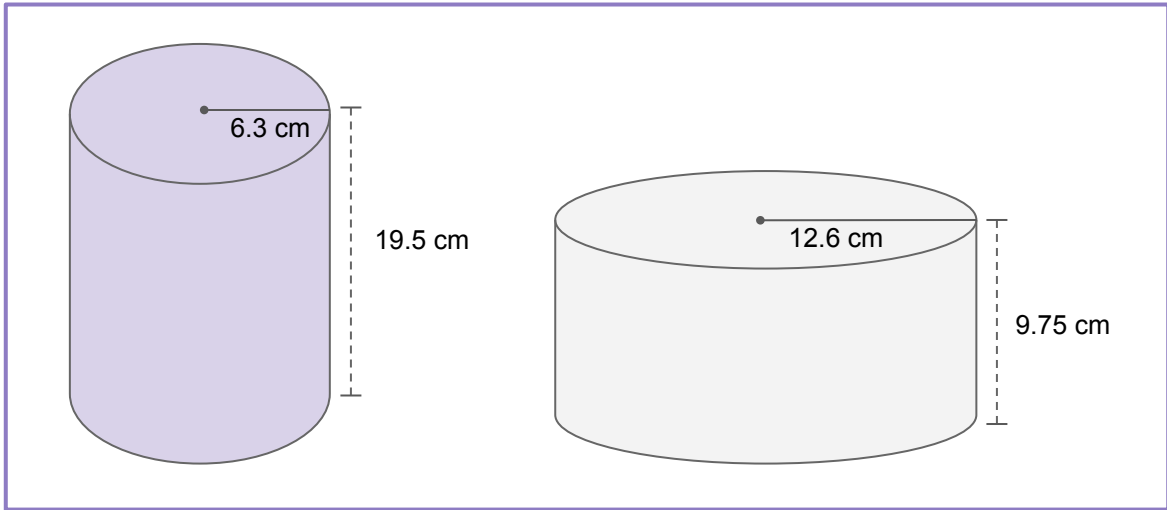
3. How does the volume of a cone and cylinder related?



VET TASK: FINDING CYLINDER

G6
Basic

Help Wendy, Dr. Atkins' assistant to do some vet tasks. Use your understanding of volume of cylinder to answer each given.



1. What do you notice on the dimensions of the two cylinders? What relationship do they have?

2. Compute for each cylinder's volume. Compare the value that you obtain. What is the effect of the relationship of its dimensions to the computed volume? Let $\pi = 3.14$.



Apply the necessary remedies to these sick animals by solving the following problems.

1. What is the volume of a cube whose side measures $2x$?



2. If the volume of the cube is $27a^3$, how long is its side?



3. If the measurement of the side of a cube is doubled, how much would it affect its computed volume?



THE AQUARIUM

G7
Advanced

Refer to the following aquarium below. Then, use your understanding of rectangular prism to answer each question.

1. The dimensions of a large aquarium are 5 yards by 15 ft by 36 inches. What is its volume in ft³?

2. A fish tank with the following dimensions of 50 cm, 10 cm, and 30 cm, is $\frac{2}{5}$ full of water. Find the volume of water needed to fill the tank completely.

Illustrate the situation in item no. 3 here.

3. If an aquarium stands 12 in high, 10 in wide, and 24 in long, find the volume of water needed to fill $\frac{3}{4}$ of the aquarium.



ALL ABOUT PYRAMID

G7
Advanced

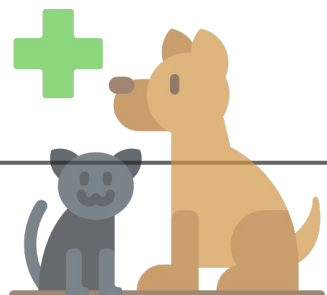
Here are some word problems related to pyramid. The 3rd question is an act of caring for animals. Make sure to answer them all!

1. The area of the base of a triangular pyramid is 18 inches more than twice of its given height. What is its volume?
2. A square pyramid has an unknown volume. The only given information is that the side of its base is $12\frac{1}{3}$ in long and the height of the pyramid is $4a$ in. What is the figure's volume?
3. A tea infuser is being sold by Mr. Wong so that he can raise a fund to help the stray animals in his neighborhood. The infuser is in a shape of a right rectangular pyramid. It is 8.5 cm tall and the base is 5.2 cm long and 4.8 cm wide. If $\frac{4}{5}$ of the infuser is needed to be filled with water, how much water is needed?

1.

2.

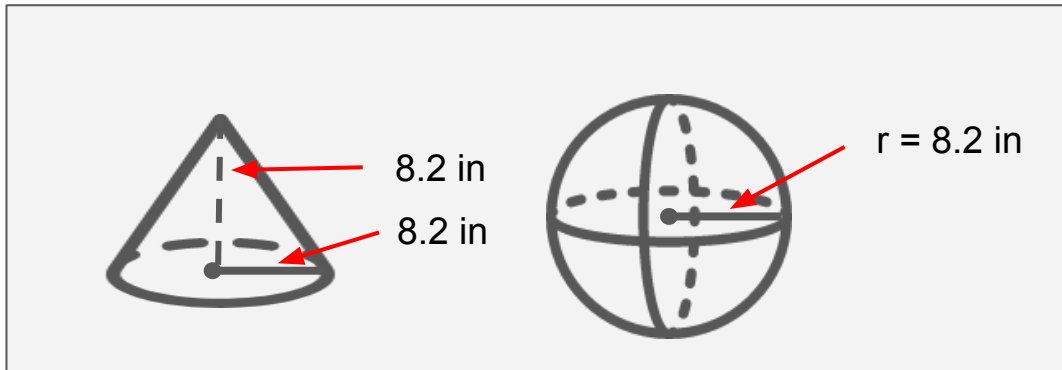
3.



TOYS FOR THE PETS

G7
Advanced

Lenard would like to buy toys for his pets. He is curious about the two toys below. Answer the questions that follow.



1. Lenard said that since the two figures have the same radius and height, it means that they have the same volume? Is his statement valid? Why or why not? Use the concept of volume to prove your answer.

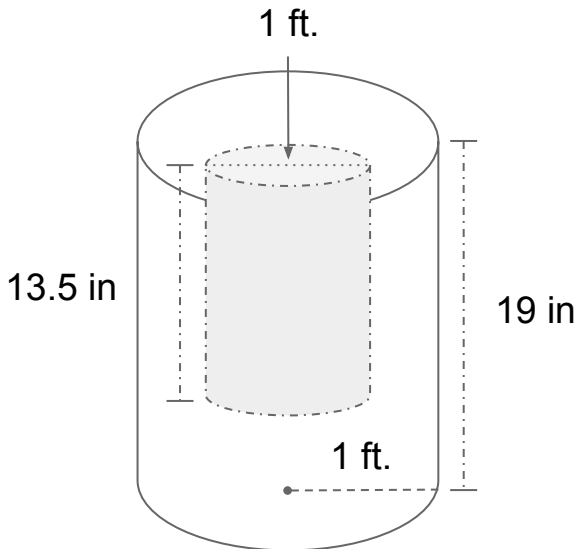
2. Which toy has a larger volume? By how much?



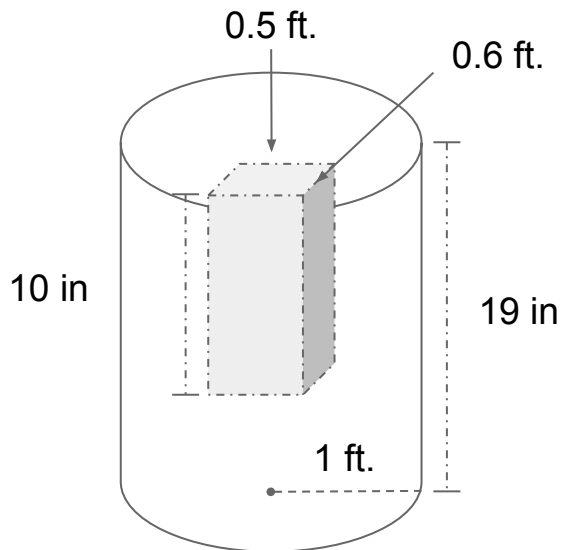
CYLINDRICAL TASKS

G7
Advanced

The following are some figures that can be found inside the vet clinic. What is the volume of the empty space?



Solution:



Solution:



ANSWER GUIDE

Activity 1

1. 1728 cubic inches
2. 2.5 m
3. 2299.968 cubic in

Activity 2

1. 12.09 cubic ft
2. 1.58 cubic m
3. 0.8 in

Activity 3

1. 208 cubic m
2. 144 sq. m
3. 12 ft.
4. 17.75 cubic m

Activity 4

1. 60π cubic cm
2. A = 512.45 cubic units B = 145.19 cubic units
3. The formula of getting the volume of a cone is $\frac{1}{3}$ of getting the volume of cylinder.

Activity 5

1. The dimensions of the cylinder on the left is half of the dimensions of the other cylinder or the dimensions of the cylinder on the right is twice the dimensions of the other cylinder.
2. A = 2430.22 cu. cm
B = 4860.44 cu. Cm
The volume is doubled. It has a direct relationship.



ANSWER GUIDE

Activity 6

1. $8x^3$ units
2. Its side is $3a$
3. If the side of a cube is doubled, its volume will be larger 8 times the original volume.

Activity 7

1. 675 cu. ft
2. 9000 cu. Cm
3. 2160 cu. in

Activity 8

1. Let x = height and $18 + 2x$ = base
 $V = \frac{1}{3} BH = \frac{1}{3} (18+2x)(x) = \frac{1}{3} (18x + 2x^2)$
2. $V = \frac{1}{3} BH = \frac{1}{3} (12 \frac{1}{3})(4a)$
 $= 12(4/3a) = 16a$ cu. In.
3. $B = 24.96$ $h = 8.5$
 $V = \frac{1}{3} BH = \frac{1}{3} (24.96)(8.5) = 70.72$ cu. cm

Activity 9

1. The volumes of the two figures are not the same because the cone is 577.10 cu. In while the sphere is 2308.39 cu. in.
2. The toy with a sphere-like shape has a larger volume by almost four times than the cone.

Activity 10

To answer these type of problems, get the difference of the two computed volumes.

1. Larger figure = 8591.04 cu. In. Smaller figure = 1526.04 cu. In
Empty space = $8591.04 - 1526.04 = 7065$ cu. in
2. Larger figure = 8591.04 cu. In. Smaller figure = 432 cu. In
Empty space = $8591.04 - 432 = 8159.04$ cu. in



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