

UNIT 14: SOLIDS

I can define, identify and illustrate the following terms:

Face	Height	Scale factor	Sphere
Edge	Surface area	Dimensional change	Hemisphere
Vertex	Lateral surface area	Pyramid	
Cross section	Net	Cone	
Prism	Volume	Slant height	

Pyramids, Cones, and Spheres - Examples

Pyramid Formulas: LSA = _____, SA = _____, V = _____

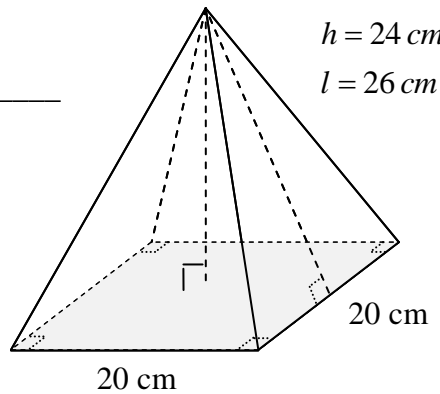
What is the height of the pyramid? _____

What is the slant height of the pyramid? _____

What is the base shape? _____

What does B stand for? _____

What does P stand for? _____



LSA = _____

SA = _____

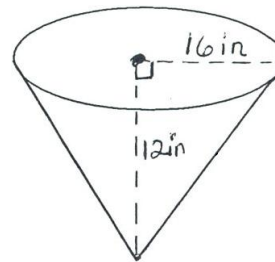
V = _____

Cone Formulas: LSA = _____, SA = _____, V = _____

What is the height of the cone? _____

What is the radius of the base? _____

What is the slant height of the cone? _____

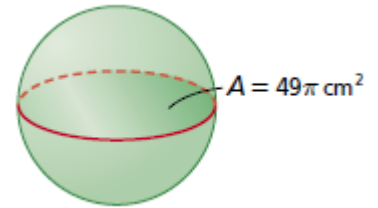
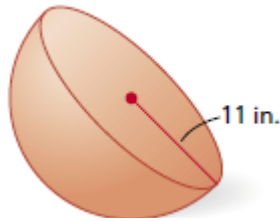
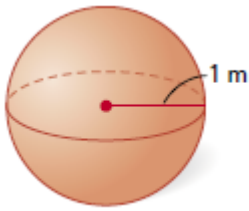


LSA = _____

SA = _____

V = _____

Sphere Formulas: Surface Area = _____, Volume = _____
Sphere examples:

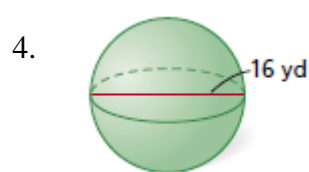
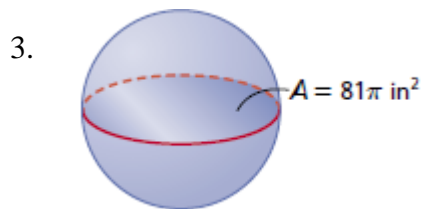
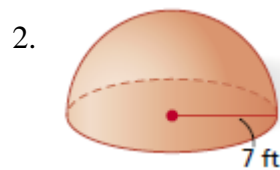
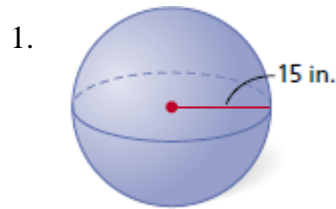


Find the circumference of a sphere with a surface area of $60\pi \text{ in}^2$.

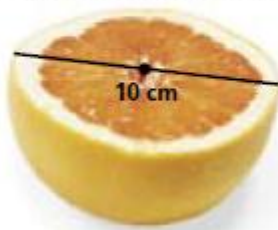
Find the volume of a sphere with surface area $6724\pi \text{ ft}^2$

Surface Area & Volume of Spheres - Assignment Part 3

For 1 – 4 find the surface area and volume.



5. **Food** Approximately how many times as great is the volume of the grapefruit as the volume of the lime?



6. Find the volume of a sphere with surface area $625\pi \text{ m}^2$

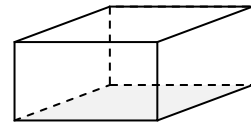
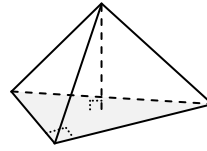
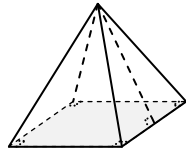
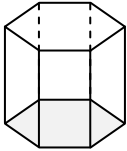
7. Find the volume of a sphere with a circumference of $36\pi \text{ ft}$.

Solids Basics Notes

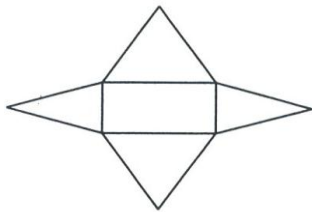
Three – dimensional (solid) figures include _____, _____, _____, _____, and _____.

Characteristics:

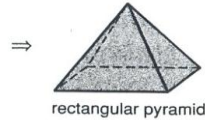
- Three-dimensional figures, or solids, can have _____ or _____ surfaces.
- Prisms and pyramids are **named** by the shapes of their _____.



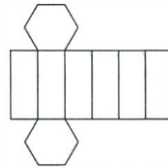
- A _____ is a diagram of the surfaces of a three-dimensional figure. It can be folded to form the three-dimensional figure.



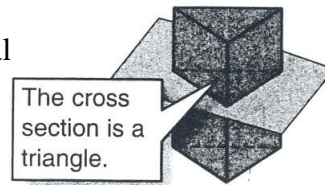
net of rectangular pyramid



rectangular pyramid



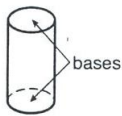
- A _____ is the intersection of a three-dimensional figure and a plane.



The cross section is a triangle.

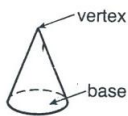
- Solid figures have **edges, faces, and vertices**. The plural of “vertex” is “vertices”

Cylinder

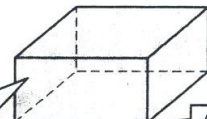


Neither cylinders nor cones have edges.

Cone



Each flat surface is called a **face**.



An **edge** is the segment where two faces intersect.

A **vertex** is the point where three or more faces intersect. In a cone, it is where the curved surface comes to a point.

- _____ show three-dimensional objects from six different perspectives.

Top

Picture yourself directly above the figure and looking straight down.



Bottom

Picture yourself directly underneath the figure and looking straight up.



Left

Picture walking around the corner to the left side of the figure and looking straight at it.



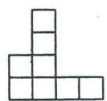
Right

Picture walking around to the right side of the figure and looking straight at it.



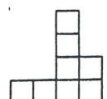
Back

Picture walking around to the back of the figure and looking straight at it.



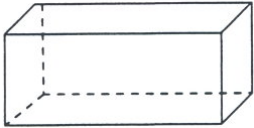
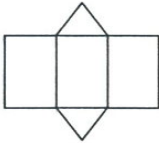
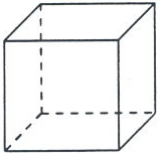
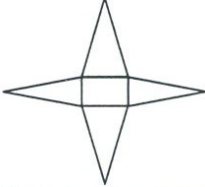
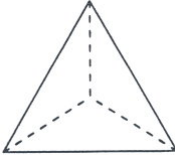
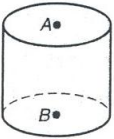
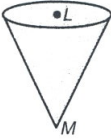
Front

Choose one side of the figure to be the front. Visualize looking straight at the figure.

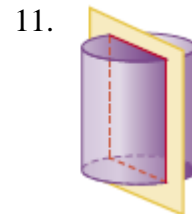
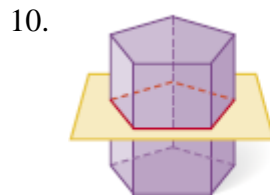
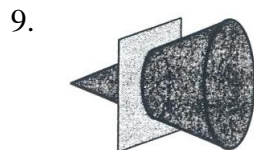
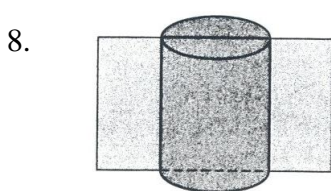


Solids Examples

I. Classify each solid and tell how many faces, edges, and vertices.

Type	Picture of Solid	Properties
1.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
2.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
3.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
4.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
5.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
6.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices
7.		How many of each? <ul style="list-style-type: none"> • Faces • Edges • Vertices

II. Describe each cross section.



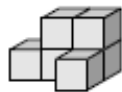
Views and Nets Practice

1. Which is a true statement about the figure?



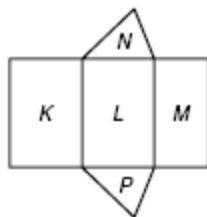
- A The top view is a rectangle.
- B A side view is a rectangle.
- C A side view is a triangle.
- D The front view is a triangle.

3. Which drawing best represents the top view of the three-dimensional figure? Assume there are no hidden cubes.



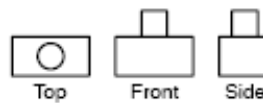
- A
- B
- C
- D

5. Which can be a true statement about the triangular prism whose net is shown?



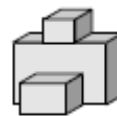
- F Faces L and M are perpendicular.
- G Faces N and P are perpendicular.
- H Faces K and L are parallel.
- J Faces N and P are parallel.

2. Which three-dimensional figure has these three views?



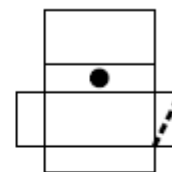
- F
- G
- H
- J

4. Which drawing best represents the side view of the building shown?



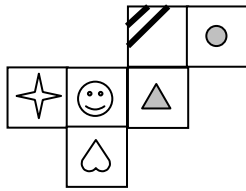
- F
- G
- H
- J

6. Which three-dimensional figure does the net represent?



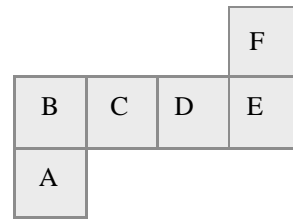
- A
- B
- C
- D

7. The net below can be folded to form a cube. Which cube could be formed from this net?



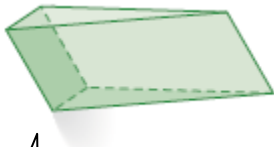
- A.
- B.
- C.
- D.

8. Which of the following is a true statement about the net of the rectangular prism shown?



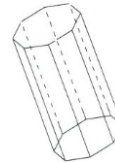
- A. Faces C and D are parallel.
- B. Faces B and E are parallel.
- C. Faces F and A are parallel.
- D. Faces C and E are perpendicular.

9. Which net does NOT represent the right triangular prism shown below?



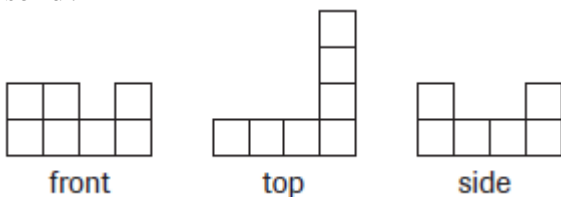
- A.
- B.
- C.
- D.

10. Which net best represents the octagonal prism shown below?



- A.
- B.
- C.
- D.

11. The front, side, and top views of a solid built with cubes are shown below. How many cubes are needed to construct this solid?



- A. 10
- B. 11
- C. 13
- D. 20

12. This is a wafer head screw. Which of the following best represents a front, a side, or a top view of this screw?



- A.
- B.
- C.
- D.

Surface Area and Volume of Prisms and Cylinders – Notes & Examples

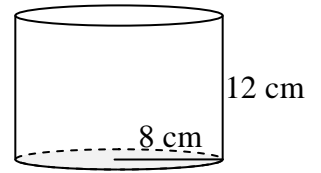
→ The _____ of a solid is how much they can hold.

→ It is measured in _____ units.

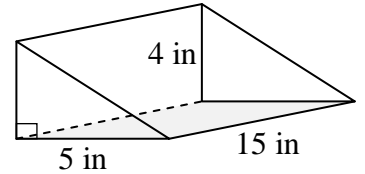
→ The formula for a prism or a cylinder is _____.

The **B** stands for the _____ of the _____ and the **h** stands for the _____.

$V = \underline{\hspace{2cm}}$



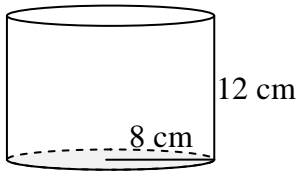
$V = \underline{\hspace{2cm}}$



There are two _____ of a solid. The _____ surface area is the amount of surface on the _____ of the solid. This does NOT include the _____.

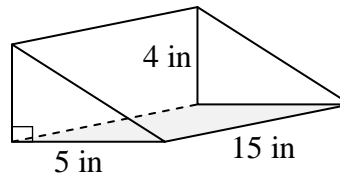
The _____ surface area is the amount of surface on _____ faces.

The formulas for a **prism** are _____ and _____.



LSA = _____
SA = _____

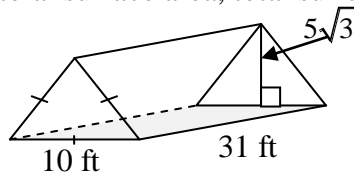
The formulas for a **cylinder** are _____ and _____.



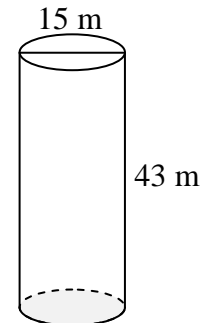
LSA = _____
SA = _____

Your turn: Find lateral surface area, total surface area, and volume.

LSA = _____
SA = _____
V = _____

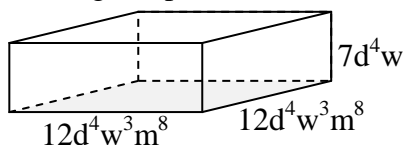


LSA = _____
SA = _____
V = _____



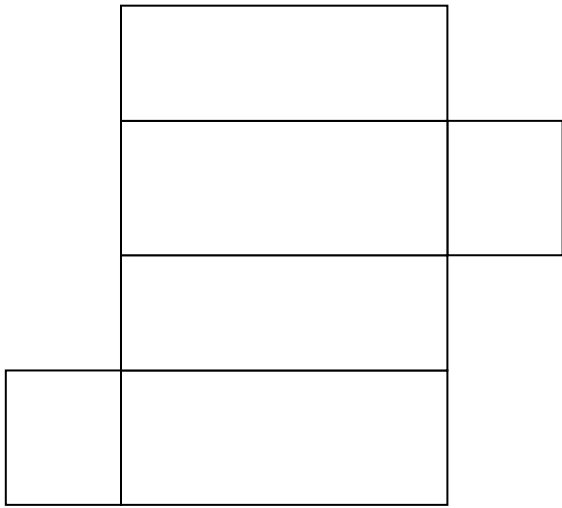
Find the volume of the rectangular prism (includes variables)

$V = \underline{\hspace{2cm}}$



Measuring to Find Surface Area and Volume

22. Please measure to the nearest tenth of a centimeter.



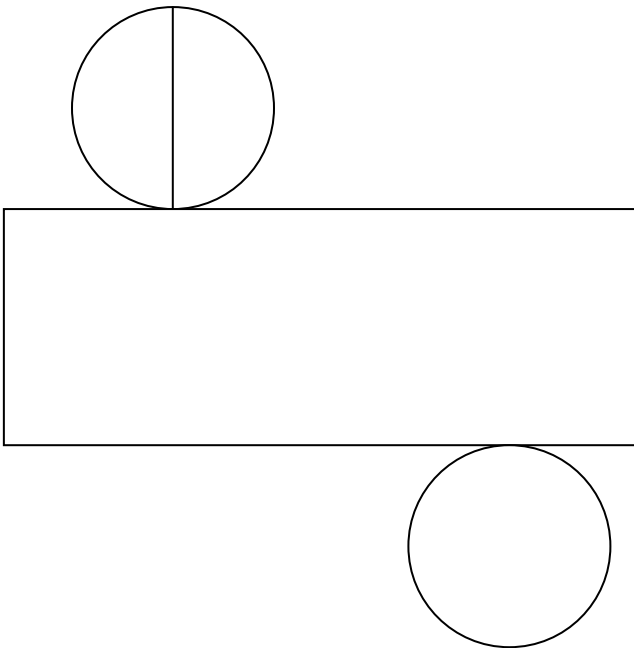
Dimensions: _____, _____, _____

LSA = _____

SA = _____

V = _____

23. Please measure to the nearest $\frac{1}{4}$ of an inch.



Dimensions: _____, _____, _____

LSA = _____

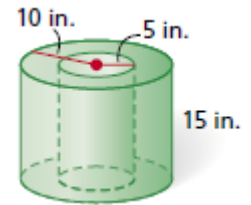
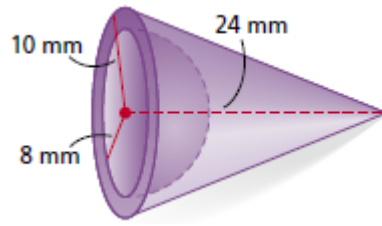
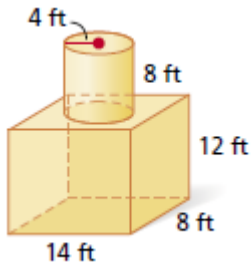
SA = _____

V = _____

Composite Figures

Composite Examples:

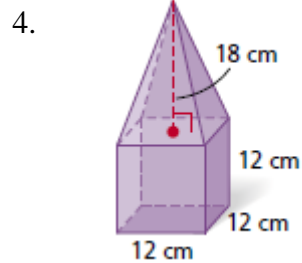
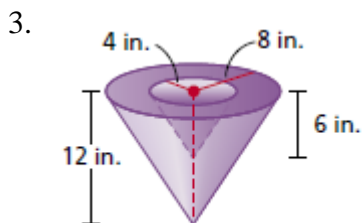
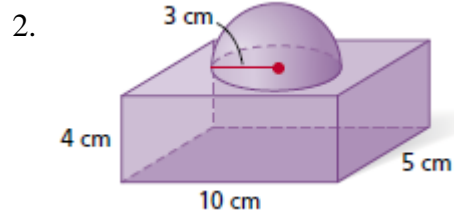
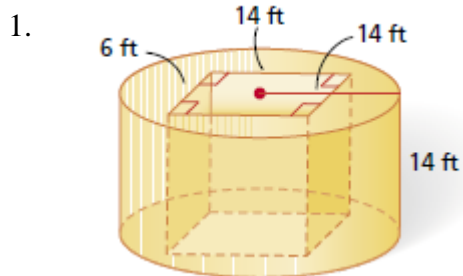
Find the volume and total surface area of the composite figures below.



Composite Assignment

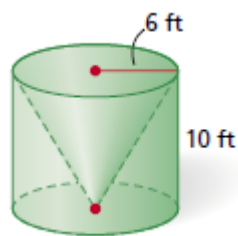
3/28-29 and 3/30

Find the total surface area of the composite figures below.

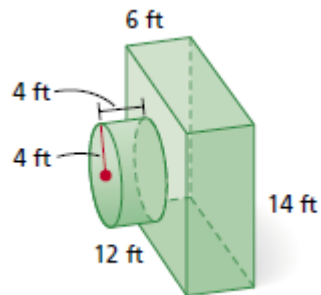


Find the volume of these composite figures.

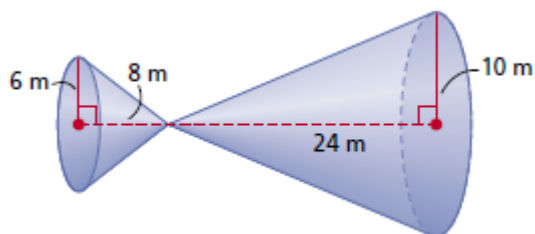
5.



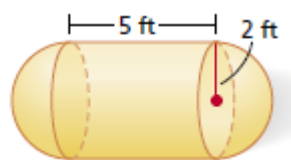
6.



7.



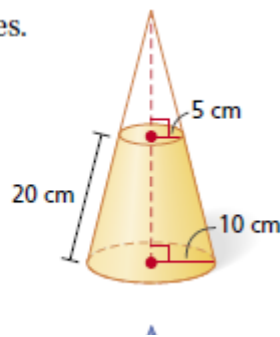
8.



9.

A *frustum* of a cone is a part of the cone with two parallel bases. The height of the frustum of the cone is half the height of the original cone.

- Find the surface area of the original cone.
- Find the lateral area of the top of the cone.
- Find the area of the top base of the frustum.
- Use your results from parts **a**, **b**, and **c** to find the surface area of the frustum of the cone.



10.

Which expression represents the volume of the composite figure formed by a hemisphere with radius r and a cube with side length $2r$?

- A** $r^3\left(\frac{2}{3}\pi + 8\right)$ **C** $2r^2(2\pi + 12)$
 B $\frac{4}{3}\pi r^3 + 2r^3$ **D** $\frac{4}{3}\pi r^3 + 8r^3$



Dimensional Changes Worksheet

1. A pentagon has a perimeter of 20 ft. If every side is halved, find the new perimeter.
2. The perimeter of a triangle is 12 in. After a dilation the perimeter is 16 in. What is the scale factor of the dilation?
3. Describe the effect on the area of a circle when the radius is tripled.
4. Tony and Edwin each built a rectangular garden. Tony's garden is twice as long and twice as wide as Edwin's garden. If the area of Edwin's garden is 600 square feet, what is the area of Tony's garden?
5. The ratio of two similar polygons is 3:5. The perimeter of the larger polygon is 150 centimeters. What is the perimeter of the smaller polygon?
6. The scale of two similar quadrilaterals is 1:4. The perimeter of the smaller quadrilateral is 80 centimeters. What is the perimeter of the larger quadrilateral?
7. If the dimensions of a rectangle with a perimeter of 24 inches are tripled, what will be the perimeter in inches of the new rectangle?
8. If the volume of a cube is increased by a factor of 8, what is the change in the length of the sides of the cube?

2003 9th grade

9. Describe the effect on the area of a circle when the radius is doubled.
F The area is reduced by $\frac{1}{2}$.
G The area remains constant.
H The area is doubled.
J The area is increased four times.

2004 9th grade

10. The scale factor of two similar polygons is 2:3. The perimeter of the larger polygon is 150 centimeters. What is the perimeter of the smaller polygon?
A 100 cm **C** 50 cm
B 75 cm **D** 150 cm

2003 Exit

11. A rectangular solid has a volume of 24 cubic decimeters. If the length, width, and height are all changed to $\frac{1}{2}$ their original size, what will be the new volume of the rectangular solid?
A 3 dm³ **C** 6 dm³
B 4 dm³ **D** 12 dm³

2006 Exit Modified

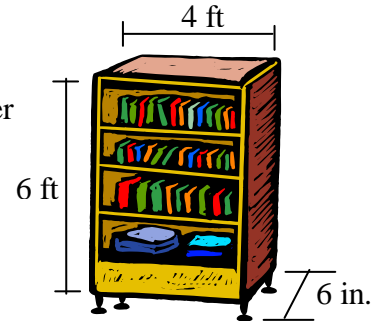
12. Campbell's manufactures a cylindrical soup can that has a diameter of 6 inches and a volume of 226 in³. If the stays height the same and the diameter is doubled, what will happen to the can's volume?
A It will remain the same.
B It will double.
C It will triple.
D It will quadruple.

Surface Area and Volume Supplement

Solve the following application problems. Draw a picture to help you. You will need extra paper.

1. Campbell's soup company is having a contest for students at AHS to redesign the label for the chicken noodle soup. If the diameter of the can is 3 in, and the height is 4 in, how much paper do students need to create their design?

2. Michael is refinishing the bookcase pictured to the left. A pint of stain covers $30 - 35 \text{ ft}^2$. How many cans of stain will Michael need to buy to cover the left side, right side, and back of the book case with two coats?



5. Susan has a fish tank in the shape of a cylinder that is 26 inches tall. The diameter of the tank is 12 inches. If there are 2 inches of rocks in the bottom, how much water is needed to fill the tank?

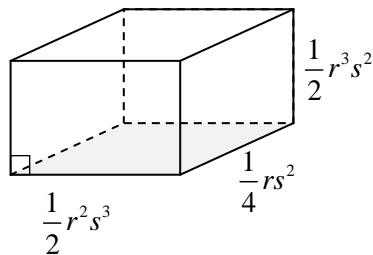
6. The Imaginary Toy Company has increased their size of the "Creativity Doll". The packaging department has calculated that they need to add 3 inches to each of the dimension of the original packaging. What is the new amount of cardboard needed to package one doll?



II. For the following solids find the volume and surface area.

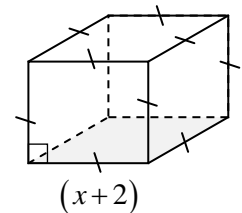
11. $V =$ _____

SA= _____



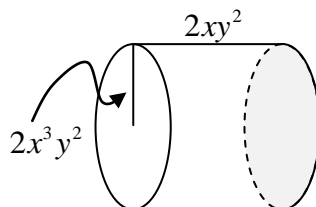
12. $V =$ _____

SA= _____



13. $V =$ _____

SA= _____



14. $V =$ _____

SA= _____

