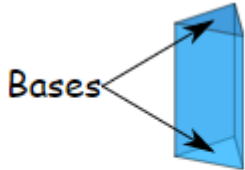

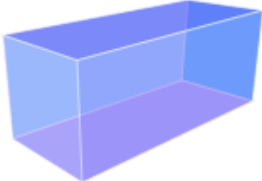
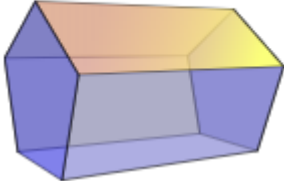
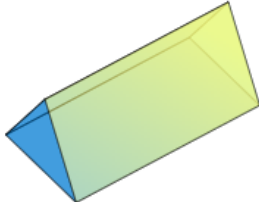






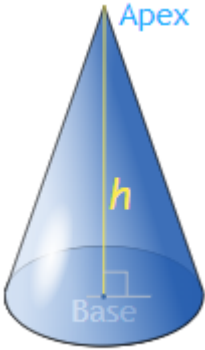
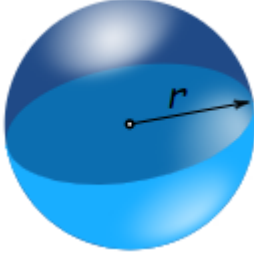


VOLUME and SURFACE AREA

Volume: The amount of space occupied by an object **Possible Units**: cm^3 , m^3 , L, in^3
Surface Area: The measure of the area of all the faces of an object. **Possible Units**: cm^2 , m^2 , in^2

Let's review the shapes we will deal with:

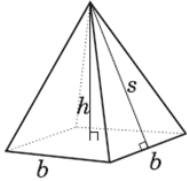
PRISM	PYRAMID
<div style="text-align: center;">  <p>Bases</p> </div> <p>The ends of a prism are parallel and each one is called a base.</p> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>Cube:</p>  </div> <div style="text-align: center;"> <p>Square Prism:</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>Pentagonal Prism:</p>  </div> <div style="text-align: center;"> <p>Triangular Prism:</p>  </div> </div>	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> <p>Pyramid</p>  </div> <div style="text-align: center;"> <p>Base</p>  </div> </div> <div style="margin-bottom: 10px;"> <p><u>Triangular Pyramid:</u></p> </div> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;"> <p><u>Square Pyramid:</u></p>  </div> <div style="text-align: center;">  </div> </div> <div> <p><u>Pentagonal Pyramid:</u></p>  <div style="display: flex; justify-content: space-around; margin-top: 10px;">  </div> </div>
CONE	SPHERE
<div style="text-align: center;">  <p>Apex</p> <p>Base</p> <p>Right</p> </div>	<div style="text-align: center;">  <p>r</p> </div>

HOW TO FIND THE SURFACE AREA OF A PRISM or PYRAMID

Follow these steps to find the surface area of most 3D shapes:

- 1) Draw each shape separately
- 2) Calculate the area of each shape
- 3) Add up all the areas

Square-based Pyramid



$$A_{base} = b^2$$

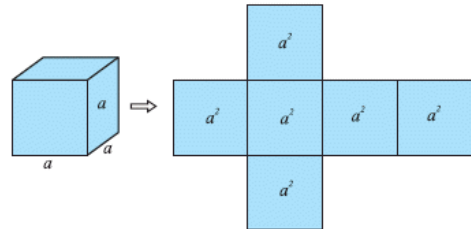
$$A_{triangle} = \frac{bs}{2}$$

$$A_{total} = A_{base} + 4A_{triangle}$$

$$= b^2 + 2bs$$

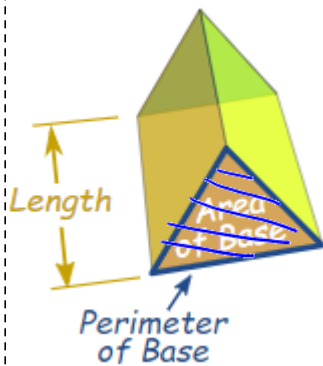
Surface Area of a Cube = $6a^2$

where a is the edge of the cube.



HOW TO FIND THE VOLUME OF A PRISM vs PYRAMID

To calculate the volume of a prism, multiply the base area by its length (height).



Volume = Base Area × Length

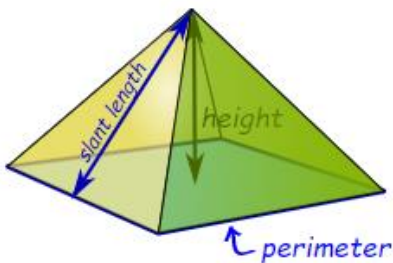
Example: What is the volume of a prism where the base area is 25 m^2 and which is 12 m long:

$$V = 25 \times 12$$

$$= 300 \text{ m}^3$$

To calculate the volume of a pyramid, multiply the base area by its height, then divide by three.

VOLUME = $\frac{1}{3}$ Base x Height



Example: What is the volume of a pyramid where the base area is 25 m^2 and has a height of 12 m .

$$V = \frac{1}{3} \text{ Base Area} \times \text{Height} \quad \text{OR} \quad V = \text{Base Area} \times \text{height} \div 3$$


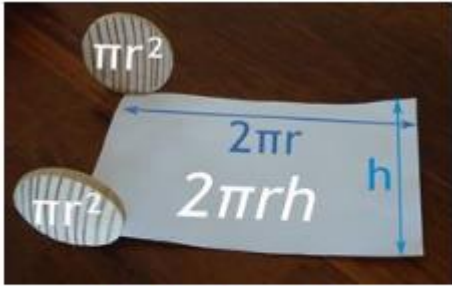
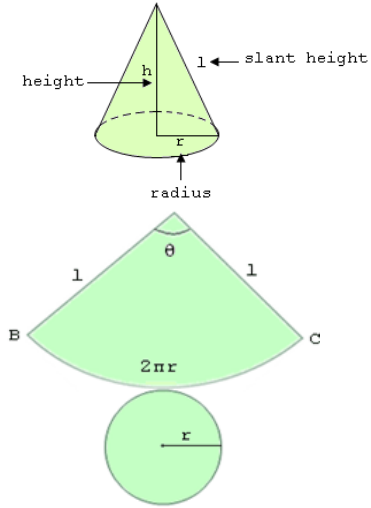
$$V = \frac{1}{3} \times 25 \times 12$$

$$V = \underline{100} \text{ m}^3$$

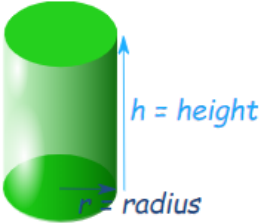
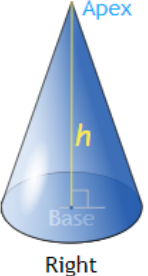

2) HOW TO FIND THE SURFACE AREA OF A CYLINDER and CONE

Follow these steps to find the surface area of most 3D shapes:

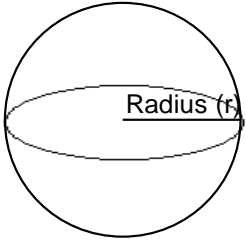


- 1) Draw each shape separately
- 2) Calculate the area of each shape
- 3) Add up all the areas

CYLINDER	CONE
<p>Surface Area = 2 × area of circle + area of rectangle Surface Area = $2\pi r^2 + 2\pi rh$ where r is the radius and h is the height.</p>  <p style="text-align: center;">Side area = $2\pi rh$</p>  <p style="text-align: center;">Total Surface Area = $2(\pi r^2) + 2\pi rh$</p>	<p>The surface Area has two parts: The Base Area = πr^2 The Side Area = πrl</p> <p style="text-align: center;">S.A = $\pi r^2 + \pi rs$</p> 

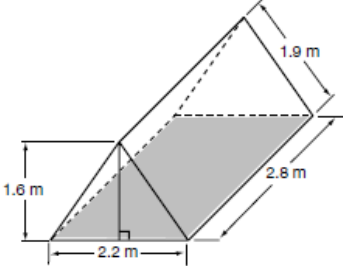
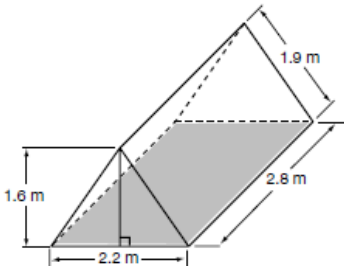
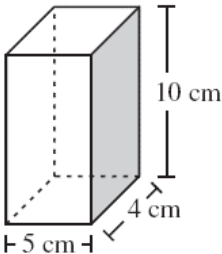
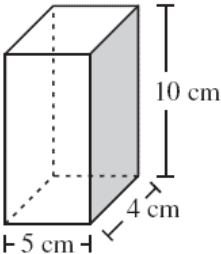
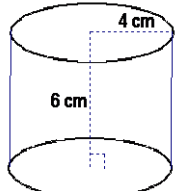
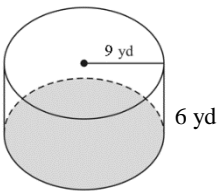
HOW TO FIND THE VOLUME OF A CYLINDER and CONE:

<p>To calculate the volume we multiply the area of the base by the height of the cylinder:</p> <ul style="list-style-type: none"> • Area of the base: $\pi \times r^2$ • Height: h <p>And we get: Volume = $\pi \times r^2 \times h$</p> 	<p>To calculate the volume we multiply the area of the base by the height of the cone then divide by 3:</p> <ul style="list-style-type: none"> • Area of the base: $\pi \times r^2$ • Height: h <p>And we get: Volume = $1/3 \times \pi \times r^2 \times h$</p> 
<p>Example: What is the volume of a cylinder with a radius of 3 cm and height of 10 cm?</p> <p>Solution:</p> 	<p>Example: What is the volume of a cone with a radius of 3 cm and height of 10 cm?</p> <p>Solution:</p>

SPHERE:

VOLUME	SURFACE AREA
 $V = \frac{4\pi r^3}{3}$	<p>The surface area of a sphere is four times the surface area of one cross section through the centre of the sphere.</p> $A = 4\pi r^2$
<p><i>Example:</i> Determine the volume of this basketball if the radius is 15 cm.</p> 	<p><i>Example:</i> Determine the surface area of the basketball if the radius is 15 cm.</p> 

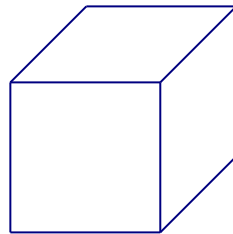
PRACTICE: Calculate the indicated:

<p>VOLUME</p> 	<p>SURFACE AREA</p> 
<p>VOLUME</p> 	<p>SURFACE AREA</p> 
<p>Determine the surface area of this drinking glass. (Be careful...it is a glass. It has no top)</p> 	<p>Determine the volume of this cylinder in yd³.</p> 

Volume and Surface Area of Prisms - Practice

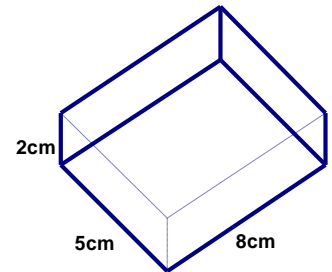
Find the volume & surface area of the following shapes (round to 1d.p. where needed):

a. cube

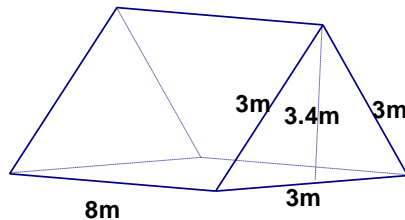


3.5in

b.



c.

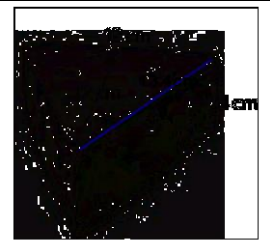


d. A rectangular prism has a length of 16cm and a height of 12m. If the surface area of this prism is 664m^2 , determine the width and volume.

e. A toy chest is in the shape of a rectangular prism. Determine the surface area of the toy chest.



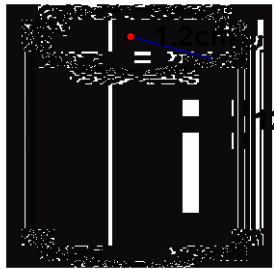
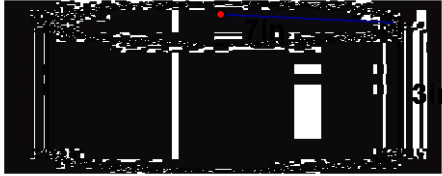
f. A piece of cheese is in the shape of an isosceles triangular prism. The cheese needs to be wrapped with saran wrap. Determine the surface area of the cheese to find out how much wrap would cover this cheese.



ANSWERS: a. 73.5in^2 , b. 132cm^2 , c. 82.2m^2 , d. 5m, e. 55.5ft^2 , f. 299.2cm^2

Surface Area of Cylinders – Practice

Find the surface area of the following shapes. Round answers to 1d.p. where necessary. Use 3.14 or the pi button for π .

<p>a. Find the surface area of a cylinder with a height of 3m and a diameter of 3m</p>	<p>b.</p> 
<p>c.</p> 	<p>d. If a cylinder has a surface area of 178.98cm^2, and a radius of 3cm, determine the height of the cylinder.</p>
<p>ANSWERS: a. 42.4m^2, b. 99.5cm^2, c. 439.6in^2, d. $h=6.5\text{cm}$</p>	