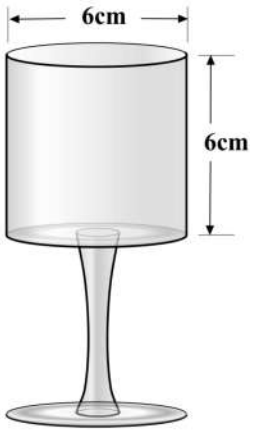
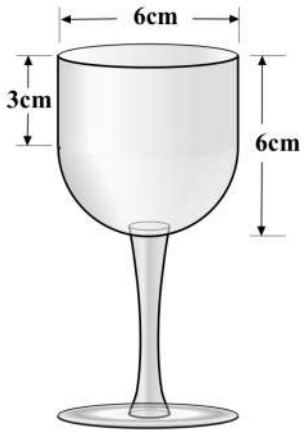
# Glasses

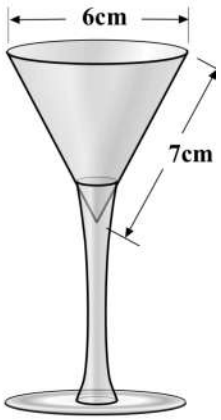
**Glass 1**




**Glass 2**




**Glass 3**




This picture shows three glasses.

The measurements are all in centimeters.
The bowl of Glass 2 has a cylindrical top and a hemispherical base.
The bowl of Glass 3 goes down into the stem.

1. Calculate the volume of liquid that would fill the bowl of each glass.
   Show all your calculations and explain your reasoning.

a) Glass1

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b) Glass 2

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c) Glass 3

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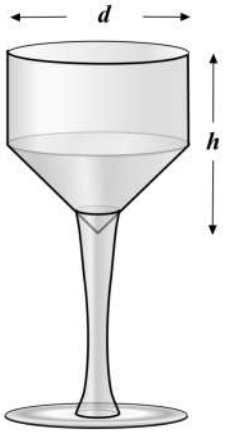
2. Find the height of liquid in Glass 2 when it is half full.
   Show how you figure it out

3. Glass 4 is shown in the diagram.
   One of the following formulae gives the volume of Glass 4.
   Which is it?

$\frac{1}{6}\pi d^2 h$ $\frac{1}{6}\pi dh$ $\frac{1}{6}\pi dh^2$ $\frac{1}{6}\pi d^2 h^2$



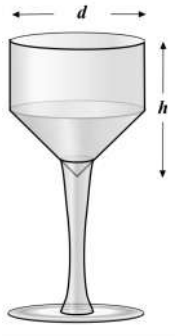

Glass 4

Explain how you can tell by just looking at the form of these expressions.

# Glasses: Extension questions

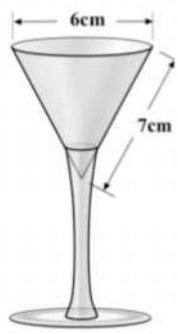
1. Explain how you can tell when a formula represents a length, an area or a volume.

2. Show step by step how a formula for the volume of Glass 4 may be derived.




Glass 4

3. Find the height of liquid in Glass 3 when it is half full.
   Explain your answer.

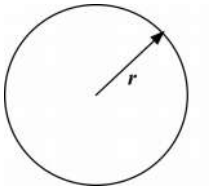



Glass 3

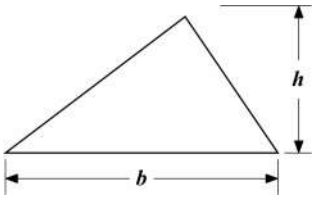
4. On a separate sheet of paper, make up your own Glass question and solve it.
   Try to make your problem challenging, but solvable!
   Now give it to someone else in your class to solve.

# Formula Sheet

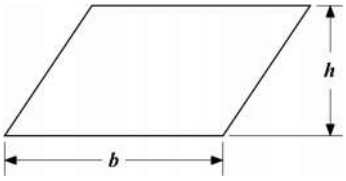
Area of a circle: $\pi r^2$



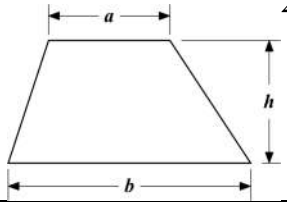

Area of a triangle: $\frac{bh}{2}$




Area of a parallelogram: $bh$

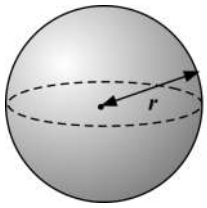



Area of a trapezoid: $\frac{1}{2}(a+b)h$

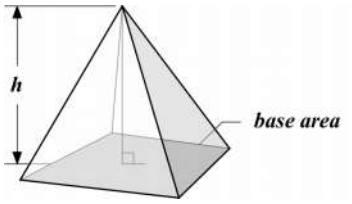



Surface area of a sphere: $4\pi r^2$

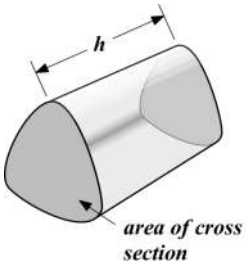
Volume of a sphere: $\frac{4}{3}\pi r^3$




Volume of a pyramid: $\frac{1}{3}$ *base area* $\times h$

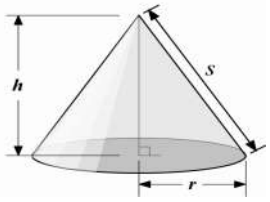



Volume of a prism: area of cross section × height



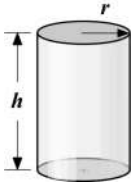

Volume of a cone: $\frac{1}{3}\pi r^2 h$

Curved surface area of cone: $\pi rs$




Volume of a cylinder: $\pi r^2 h$

Curved surface area of cylinder: $2\pi rh$




Volume of a rectangular prism: $lwh$

Surface area of rectangular prism: $2(wh + lh + wl)$