Questions about Density and the Principle of Archimedes

Remember that the weight of a 1kg mass is (about) 10N.

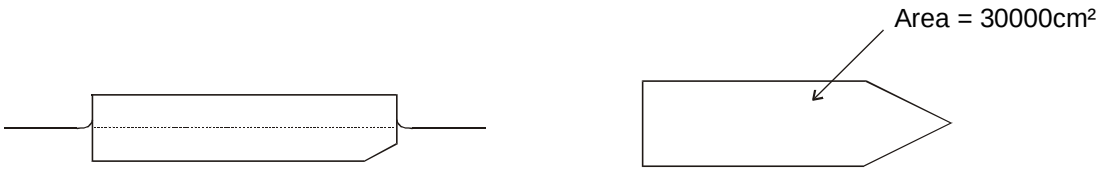
1. A piece of metal has a volume of 40 cm^3 and its mass is 108g.
   a) Calculate the density of the metal.
   b) What type of metal is it ?

2. A steel ball has a diameter of 1cm. If the density of steel is 7·8 $g.cm^{-3}$, calculate the mass of the ball. Volume of a sphere is $(4/3)\pi r^3$.

3. A piece of metal is 2cm × 3cm × 6cm and its mass is 270g.
   a) Calculate the weight of the piece of metal.
   b) Calculate its apparent weight when it is completely immersed in *salt* water of density 1·2 $g.cm^{-3}$.

4. A person tries to sell you a piece of metal, claiming that it is gold. It *looks like* gold but you have doubts ! You find that the real weight of the piece of metal is 2·5 N and that its apparent weight when completely under water is 2 N. Should you buy the piece of metal ? Explain.

5. The diagrams below represent a small boat. The area of the boat is 30000 cm^2.



Side view Top view

   a) A person of mass 60kg steps into the boat. Calculate how far the boat will move down (into the water) when the person steps in.
   b) A second boat has the same area *at the present level of the water* but has a slightly different shape (see diagrams below).

Side view Top view

   If the same person steps into this boat, will it move down more or less than the first one ? Explain.