Archimedes' principle and buoyancy: exercises

<u>TASK 1.</u> Solve the following guided exercises.

Exercise 1

An object weighs 20N in the air. When placed in a can full of water it weighs only 15N. What is the size of the upthrust of the object?

<u>GUIDED SOLUTION</u>

Numbers:

Upthrust = weight of an object in air – weight of an object in water _____

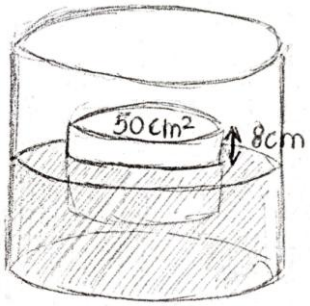
According to Archimedes Principle, Upthrust on the object = to the weight of the fluid displaced. _____

Exercise 2

In figure, a cylinder is immersed in water. If the height of the cylinder is 20cm, the density of the cylinder is 1200kg/m³ and the density of the liquid is 1000 kg/m³, find:

a. The weight of the object

b. The buoyant force



(sketch by the author)

<u>GUIDED SOLUTION</u> Draw the forces on the cylinder

a. Volume of the cylinder, V = _____

Density of the cylinder, d_c = _____

Gravitational Field Strength, g = _____

Weight of the cylinder, W = _____

b. Volume of the displaced water = _____

Density of the water, d_W=_____

Upthrust, F = _____

<u>TASK2.</u> Now try these on your own!

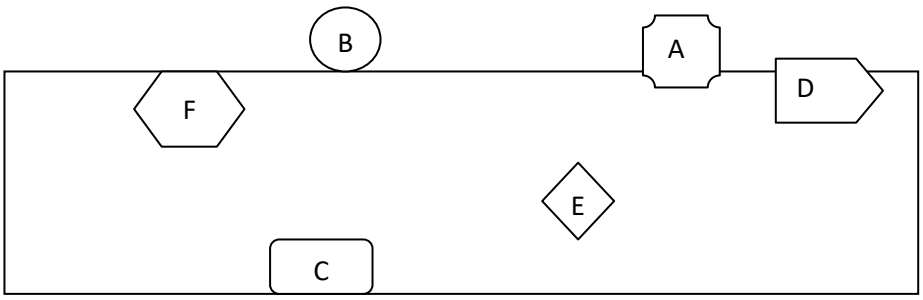
1) A ship weighing 46 328t is lowered into water. What weight of water would it displace?

2) A ball of mass 2kg having a diameter of 50cm falls in the swimming pool. Calculate its buoyant force and volume of water displaced.

3) A standard basketball (mass = 624 grams; 24.3 cm in diameter) is held fully under water. Calculate the buoyant force and weight.
When released, does the ball sink to the bottom or float to the surface?

- If it floats, what percentage of it is sticking out of the water?
- If it sinks, what is the normal force, F_N with which it sits on the bottom of the pool?

4) Six objects (A-F) are in a liquid, as shown. None of them are moving. Arrange them in order of density, from lowest to highest.



(image by the author)