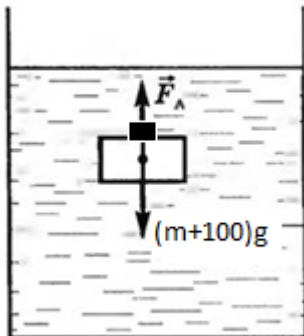A wooden cube is floating in water with 2cm of it above the water level. As 100g mass is placed on its surface, the cube goes down by 1cm. Determine the mass of the cube.

1) Archimedes force acting upwards and weight cube - operates down
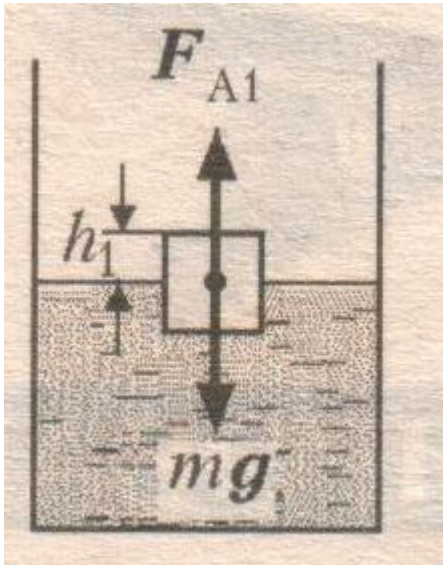
$$m_1 g = \rho g V_1$$
$$h_1 = 2 \text{ cm}$$
$$V_1 = (x - 2)x^2$$
$$m_1 = \rho(x - 2)x^2$$

2) If 100g mass is placed on its surface, weight $= m_2 + 100$

$$(m_2 + 100)g = \rho g V_2$$
$$V_2 = x^3$$
$$m_2 + 100 = \rho x^3$$

3) $m_1 = m_2$ (in the first case and the second weight blocks were the same)

$$m_1 = m_2$$
$$\rho(x - 2)x^2 + 100 = \rho x^3$$
$$2\rho x^2 = 100$$
$$\rho = 1 \frac{g}{sm^3}$$
$$x = \sqrt{50}$$

$$m = \rho(x - 2)x^2 = 50(\sqrt{50} - 2) = 253.6 \; g$$

Answer: $m = 253.6 \; g$