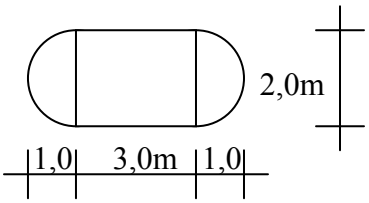
Fundamentals of Structures Blackboard exercise No1 11.02.2014

Dimensions and units

Quantities we will use	Symbol	Dimension	Units we use
Length	l	(length)	m, cm, mm
Area	A	length^2	m^2, cm^2, mm^2
Volume	V	length^3	m^3, cm^3, mm^3
Mass of an object	m	mass	kg, g, …
Weight of an object	$G = m \cdot a_g$	mass · length / (time^2)	kg·m/s^2 = N, kN, …
Density of a material	ρ (rho) = m / V	mass / volume	kg/m^3, g/cm^3, …
Specific weight of a material	γ(gamma)= G/V		kN/m^3, N/mm^3, …
Weight per unit length	g = G / l		kN/m, N/mm, …
Weight per unit area	g = G / A		N/m^2, …

Where: $a_g = 9{,}81$ m/s^2 : gravitational constant
N : "Newton"

1) The density of water is $\rho = 1{,}00$ g/cm^3.
   a) Change the unit of ρ to kg/m^3.
   b) γ_{water} =? (in kN/m^3).
   c) Calculate the weight per unit surface of water of depth 1,5 m.
   d) A pool has the following geometry.



height: 1,5 m

   How much is the total mass of water?
   e) How much is the total weight of water?

2) Determine the specific weight, the weight per unit length and the total weight of the following elements! Use the following units: kN/m^3, kN/m, kN.
   a) 100/150 × 3m pine beam, $\rho_{pine} = 0{,}65$ g/cm^3.
   b) Standard "I-200" steel beam length 3m, $\rho = 7{,}85$ g/cm^3, A = 33,4 cm^2.