1. Introduction: If $D$ is a solid and $f(x, y, z)$ is the density around $(x, y, z)$ then $\int \int \int_D f(x, y, z) \, dV$ represents the mass of $D$. This idea applies to any density sort of thing, like electrical charge density, for example. The question is how to evaluate this.

2. This depends on how $D$ is described. For 14.4 we assume $D$ is between $F_1(x, y)$ and $F_2(x, y)$ and above the region $R$ in the $xy$-plane where $R$ is either vertically or horizontally simple. If $D$ is described as such then:

   (a) If $R$ is VS then
   $$\int \int \int_D f(x, y, z) \, dV = \int_a^b \int_{B(x)}^{T(x)} \int_{F_1(x,y)}^{F_2(x,y)} f(x, y, z) \, dz \, dy \, dx$$

   (b) If $R$ is HS then
   $$\int \int \int_D f(x, y, z) \, dV = \int_c^d \int_{L(y)}^{R(y)} \int_{F_1(x,y)}^{F_2(x,y)} f(x, y, z) \, dz \, dx \, dy$$

Example: Find the mass of $D$ where is between $z = x^2 + y^2$ and $z = 1 + x^2 + y^2$ and above $R$ the triangle in the $xy$-plane with corners $(0, 0), (0, 1), (1, 0)$ and the density is $f(x, y, z) = xz$.

3. I then commented that volume is $\int \int \int_D 1 \, dV$ and why.

   Example: Find the volume of $D$ the wedge under $x + 2y + z = 6$ and in the first octant.