In each of the following exercises, a solid region S is described. Calculate the volume of S using a double integral.

1. S is the solid tetrahedron in the first octant, bounded by the three coordinate planes and the plane where $x + 2y + z = 3$.
2. S is the solid region bounded by $z = x^2 + y^2$ and $z = 4$.
3. S is the solid region, which is in the first octant, bounded by $y^2 = 4x$, $2x + y = 4$, $z = y$, and $y = 0$.
4. S is the solid region, which is in the first octant, bounded by $x^2 + y^2 = a^2$ and $z = x + y$.
5. S is the solid region enclosed by $y = x^2$, $y = 4$, $z = x^2$ and $z = 0$.
6. S is the solid region which is under the surface $z = xy$ and above the triangle with vertices $(1, 1, 0)$, $(4, 1, 0)$, and $(1, 2, 0)$.
7. S is the solid region bounded by $z = x^2 + y^2$ and $z = y$.
8. S is the solid region bounded by $4x^2 + y^2 = 4z$ and $z = 2$.
9. S is the solid region bounded by $x + y + z = \frac{3}{2}$ and $z = (x - \frac{1}{2})^2 + (y - \frac{1}{2})^2$.
10. S is the solid region, which is in the first octant, bounded by $y^2 = 4x$, $2x + y = 4$, $z = y$, and $y = 0$.
11. S is the solid region, which is in the first octant, bounded by $x + y + z = 9$, $2x + 3y = 18$, and $x + 3y = 9$.
12. S is the solid region which is below the graph of $z = 1 - x^2 - y^2$ and above the triangle with vertices $(0, 0, 0)$, $(1, 0, 0)$ and $(0, 1, 0)$.

Note: After we go over triple integrals, you can come back here and do these problems using triple integrals.