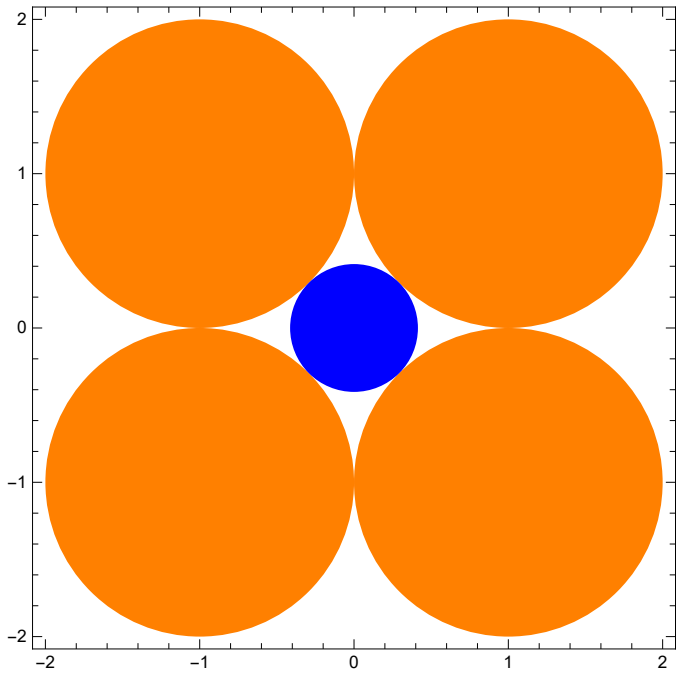
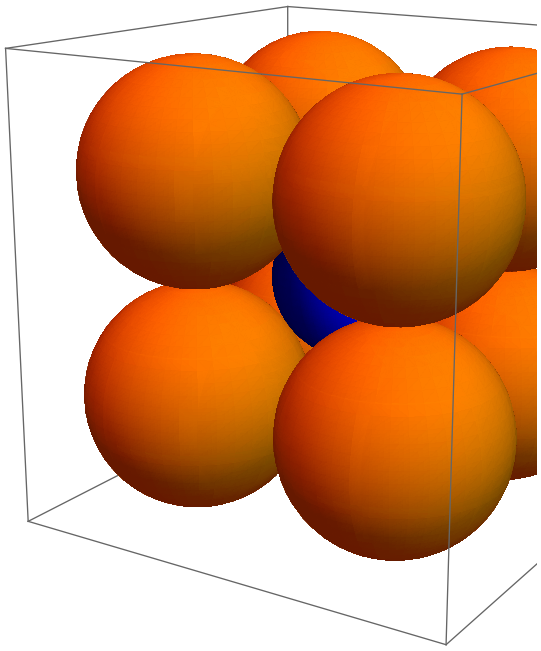
Pensieve header: February 9: The 1206 Riddle.

```
GraphicsRow[{
  Graphics[
   {Orange, Disk /@ Tuples[{1, -1}, 2], Blue, Disk[{0, 0}, √2 - 1]}, Frame -> True],
  Graphics3D[{Orange, Ball /@ Tuples[{1, -1}, 3], Blue, Ball[{0, 0, 0}, √3 - 1]}]
 }, ImageSize → 720]
```





Volume of an n – dimensional ball

Result

$$\frac{2\,\pi^{n/2}\,r^n}{n\,\Gamma\left(\frac{n}{2}\right)} \approx \frac{2\times 3.14159^{n/2}\,r^n}{n\,\Gamma\left(\frac{n}{2}\right)}$$

(assuming radius r)

$$r[\mathrm{n\_}] = N\left[\left(\frac{2\,\pi^{n/2}\left(\sqrt{n}-1\right)^n}{n\,\Gamma\left(\frac{n}{2}\right)}\right)\Big/ 4^n\right]$$

$$\frac{2.^{1.-2.\,n}\;3.14159^{0.5\,n}\left(-1.+\sqrt{n}\right)^n}{n\;\mathrm{Gamma}[0.5\,n]}$$

```
Table[r[n], {n, 1, 100}]
```

```
{0., 0.0336883, 0.0256763, 0.0192766, 0.0148324, 0.0117012, 0.00942996, 0.00773623,
 0.0064424, 0.00543354, 0.00463295, 0.00398795, 0.00346144, 0.00302666,
 0.00266395, 0.00235862, 0.00209949, 0.00187795, 0.00168729, 0.0015222,
 0.00137845, 0.00125265, 0.00114203, 0.00104435, 0.000957722, 0.000880619,
 0.000811745, 0.00075002, 0.000694528, 0.000644493, 0.000599253, 0.000558243,
 0.000520974, 0.000487026, 0.000456033, 0.000427678, 0.000401685, 0.00037781,
 0.00035584, 0.000335588, 0.000316888, 0.000299594, 0.000283573, 0.000268712,
 0.000254905, 0.000242061, 0.000230097, 0.000218937, 0.000208516, 0.000198772,
 0.000189652, 0.000181105, 0.000173087, 0.000165558, 0.000158481, 0.000151822,
 0.00014555, 0.000139638, 0.000134059, 0.000128792, 0.000123813, 0.000119104,
 0.000114646, 0.000110423, 0.000106419, 0.00010262, 0.0000990137, 0.000095587,
 0.0000923293, 0.00008923, 0.0000862796, 0.0000834692, 0.0000807905,
 0.0000782359, 0.0000757982, 0.0000734706, 0.0000712471, 0.0000691218,
 0.0000670894, 0.0000651446, 0.0000632829, 0.0000614998, 0.0000597912,
 0.0000581532, 0.0000565821, 0.0000550745, 0.0000536273, 0.0000522374,
 0.000050902, 0.0000496183, 0.000048384, 0.0000471966, 0.000046054, 0.0000449539,
 0.0000438944, 0.0000428737, 0.00004189, 0.0000409416, 0.0000400269, 0.0000391445}
```

```
ListPlot[Table[Log[r[n]], {n, 1, 2000}]]
```