Pensieve header: January 20: The 1206 Riddle.

```
Tuples[{1, -1}, 3]
```

```
{{1, 1, 1}, {1, 1, -1}, {1, -1, 1}, {1, -1, -1},
 {-1, 1, 1}, {-1, 1, -1}, {-1, -1, 1}, {-1, -1, -1}}
```

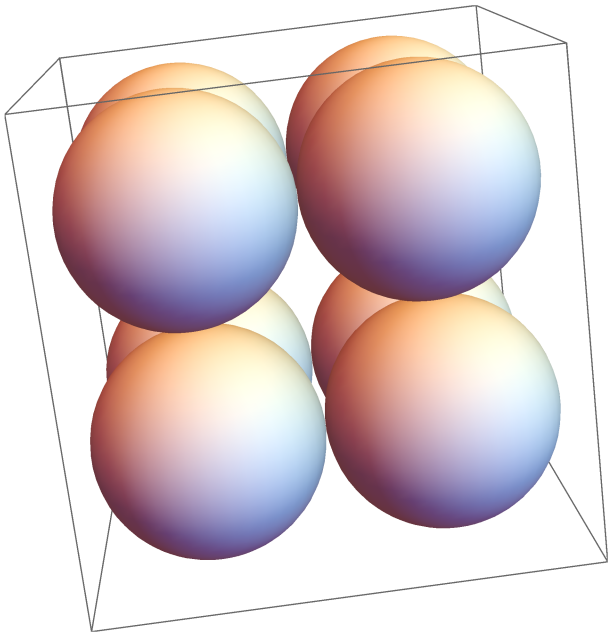
```
? Ball
```

Ball[p] represents the unit ball centered at the point p.

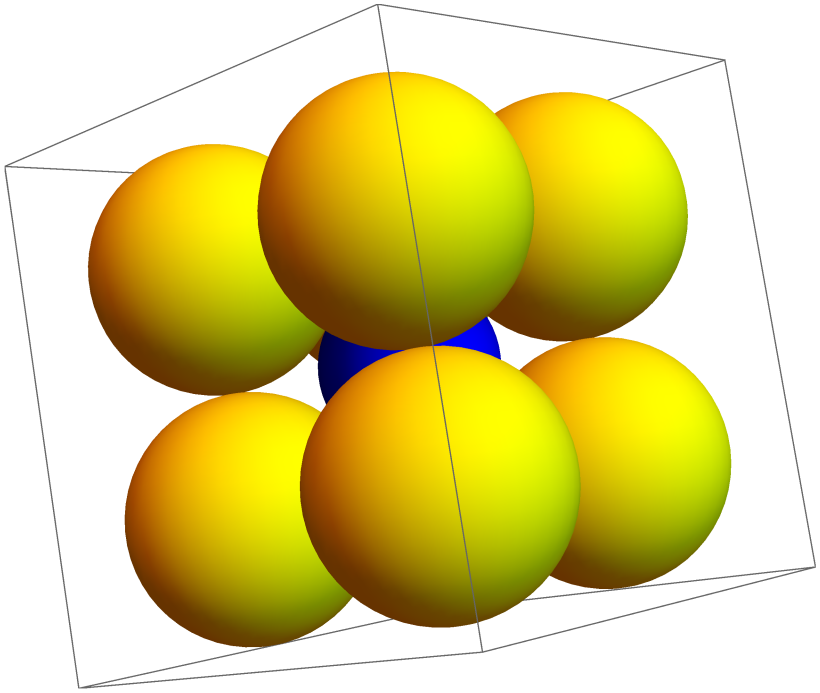
Ball[p, r] represents the ball of radius r centered at the point p.

Ball[{p_1, p_2, …}, r] represents a collection of balls of radius r. ≫

```
Graphics3D[Ball /@ Tuples[{1, -1}, 3]]
```



```
Graphics3D[{Yellow, Ball /@ Tuples[{1, -1}, 3], Blue, Ball[{0, 0, 0}, √3 - 1]}]
```



What's the volume of a ball »

ball (solid) [volume]

$$\text{Function}\left[\dot{a}, \frac{4\,\pi\,\dot{a}^3}{3}\right]$$

$Aborted

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

(assuming radius *r*)

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

$$\frac{2\,\pi^{n/2}\,r^n}{n\,\text{Gamma}\left[\frac{n}{2}\right]}$$

```
r[n_] := N[ 2 π^(n/2) (√n - 1)^n / (n Gamma[n/2]) / 4^n ]
```

```
r[2]
```

```
0.0336883
```

```
r[3]
```

```
0.0256763
```

```
Table[r[n], {n, 2, 10}]
```

```
{0.0336883, 0.0256763, 0.0192766, 0.0148324,
 0.0117012, 0.00942996, 0.00773623, 0.0064424, 0.00543354}
```

```
Table[r[n], {n, 2, 100}]
```

```
{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}
```

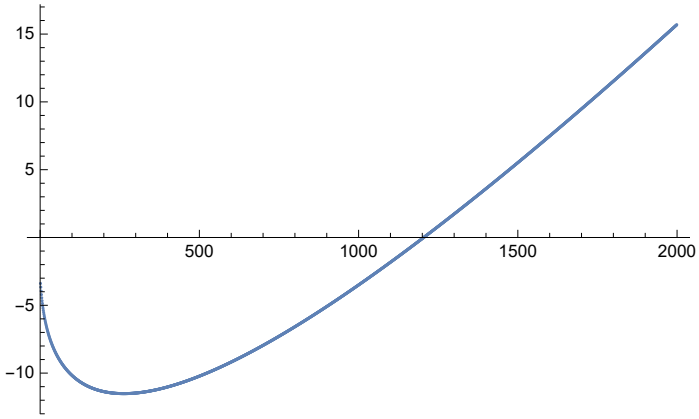
```
r[1 000 000]
```

$$2.65126839417620 \times 10^{13\,739}$$

```
r[1000]
```

```
0.0297237
```

```
ListPlot[Table[r[n] // Log, {n, 2, 2000}]]
```




```
n = 2; While[r[n] < 1, ++n]; n
```

```
1206
```