N-Dimensional Cubes

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N-Dimensional Cube Terminology and Formulas

Base Terminology:
haha
For Dimension n; Side lenght a
Used Formulas:
- Equation for verticies count: 2^n
- Equation for edge count: 2^n

0-Cube

Vertices; Edges; Faces; Cell count for 0-Cube:

- Vertices count: 1
- Edges count: 0
- Faces count: 0
- Cells count: 0

Solid values for 0-Cube:

- None

1-Cube

Vertices; Edges; Faces; Cell count for 1-Cube:

- Vertices count: 2

- Edges count: 1

- Faces count: 0

- Cells count: 0

Solid values for 1-Cube:

- **Lenght:** a

- Lenght for lenght $a = 1$: 1

- Lenght for lenght $a = 2$: 2

2-Cube (Square)

Vertices; Edges; Faces; Cell count for 2-Cube:

- Vertices count: 4

- Edges count: 4

- Faces count: 1

- Cells count: 0

Solid values for 2-Cube:

- **Area:** a^2

- Area for side lenght $a = 1$: 1

- Area for side length $a = 2$: 4

- **Perimeter:** $4a$

- Perimeter for side lenght $a = 1$: 4

- Perimeter for side lenght $a = 2$: 8

- **Diagonal:** $a\sqrt{2}$

- Diagonal for side lenght $a = 1$: $1\sqrt{2} \quad ; \quad 1,414214...$

- Diagonal for side lenght $a = 2$: $2\sqrt{2} \quad ; \quad 2,828427...$

3-Cube (Cube)

Vertices; Edges; Faces; Cell count for 3-Cube:

- Vertices count: 8

- Edges count: 12

- Faces count: 6

- Cells count: 1

Solid values for 3-Cube:

- **Volume:** a^3

- Volume for side lenght $a = 1$: 1

- Volume for side length $a = 2$: 8

- **Surface:** $6a^2$

- Surface for side lenght $a = 1$: 6

- Surface for side lenght $a = 2$: 24

- **Diagonal:** $a\sqrt{3}$

- Diagonal for side lenght $a = 1$: $1\sqrt{3} \quad ; \quad 1,732051...$

- Diagonal for side lenght $a = 2$: $2\sqrt{3} \quad ; \quad 3,464102...$

4-Cube (Hypercube)

Vertices; Edges; Faces; Cell count for 4-Cube:

- Vertices count: 16
- Edges count: 32
- Faces count: 24
- Cells count: 8

Solid values for 4-Cube:

- **Volume:** a^4
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 16

- **Surface:** $8a^3$
- Surface for side lenght $a = 1$: 8
- Surface for side lenght $a = 2$: 64

- **Diagonal:** $a\sqrt{4} \quad ; \quad 2a$
- Diagonal for side lenght $a = 1$: $1\sqrt{4} \quad ; \quad 2$
- Diagonal for side lenght $a = 2$: $2\sqrt{4} \quad ; \quad 4$

5-Cube

Vertices; Edges; Faces; Cell count for 5-Cube:

- Vertices count: 32
- Edges count: 80
- Faces count: 80
- Cells count: 40

Solid values for 5-Cube:

- **Volume:** a^5
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 32

- **Surface:** $10a^4$
- Surface for side lenght $a = 1$: 10
- Surface for side lenght $a = 2$: 160

- **Diagonal:** $a\sqrt{5}$
- Diagonal for side lenght $a = 1$: $1\sqrt{5} \quad ; \quad 2,236068...$
- Diagonal for side lenght $a = 2$: $2\sqrt{5} \quad ; \quad 4,472136...$

6-Cube

Vertices; Edges; Faces; Cell count for 6-Cube:

- Vertices count: 64
- Edges count: 192
- Faces count: 240
- Cells count: 160

Solid values for 6-Cube:

- **Volume:** a^6
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 64

- **Surface:** $12a^5$
- Surface for side lenght $a = 1$: 12
- Surface for side lenght $a = 2$: 384

- **Diagonal:** $a\sqrt{6}$
- Diagonal for side lenght $a = 1$: $1\sqrt{6} \quad ; \quad 2,449490...$
- Diagonal for side lenght $a = 2$: $2\sqrt{6} \quad ; \quad 4,898979...$

7-Cube

Vertices; Edges; Faces; Cell count for 7-Cube:

- Vertices count: 128
- Edges count: 448
- Faces count: 672
- Cells count: 560

Solid values for 7-Cube:

- **Volume:** a^7
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 128

- **Surface:** $14a^6$
- Surface for side lenght $a = 1$: 14
- Surface for side lenght $a = 2$: 896

- **Diagonal:** $a\sqrt{7}$
- Diagonal for side lenght $a = 1$: $1\sqrt{7} \quad ; \quad 2,645751...$
- Diagonal for side lenght $a = 2$: $2\sqrt{7} \quad ; \quad 5,291503...$

8-Cube

Vertices; Edges; Faces; Cell count for 8-Cube:

- Vertices count: 256
- Edges count: 1024
- Faces count: 1792
- Cells count: 1792

Solid values for 8-Cube:

- **Volume:** a^8
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 256

- **Surface:** $16a^7$
- Surface for side lenght $a = 1$: 16
- Surface for side lenght $a = 2$: 2048

- **Diagonal:** $a\sqrt{8}$
- Diagonal for side lenght $a = 1$: $1\sqrt{8} \quad ; \quad 2,828427...$
- Diagonal for side lenght $a = 2$: $2\sqrt{8} \quad ; \quad 5,656854...$

9-Cube

Vertices; Edges; Faces; Cell count for 9-Cube:

- Vertices count: 512

- Edges count: 2304

- Faces count: 4608

- Cells count: 5376

Solid values for 9-Cube:

- **Volume:** a^9

- Volume for side lenght $a = 1$: 1

- Volume for side length $a = 2$: 512

- **Surface:** $18a^8$

- Surface for side lenght $a = 1$: 18

- Surface for side lenght $a = 2$: 4608

- **Diagonal:** $a\sqrt{9} \quad ; \quad 3a$

- Diagonal for side lenght $a = 1$: $1\sqrt{9} \quad ; \quad 3$

- Diagonal for side lenght $a = 2$: $2\sqrt{9} \quad ; \quad 6$

10-Cube

Vertices; Edges; Faces; Cell count for 10-Cube:

- Vertices count: 1024
- Edges count: 5120
- Faces count: 11520
- Cells count: 15360

Solid values for 10-Cube:

- **Volume:** a^{10}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 1024

- **Surface:** $20a^9$
- Surface for side lenght $a = 1$: 20
- Surface for side lenght $a = 2$: 10240

- **Diagonal:** $a\sqrt{10}$
- Diagonal for side lenght $a = 1$: $1\sqrt{10} \quad ; \quad 3,162278...$
- Diagonal for side lenght $a = 2$: $2\sqrt{10} \quad ; \quad 6,324555...$

11-Cube

Vertices; Edges; Faces; Cell count for 11-Cube:

- Vertices count: 2048
- Edges count: 11264
- Faces count: 28160
- Cells count: 42240

Solid values for 11-Cube:

- **Volume:** a^{11}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 2048

- **Surface:** $22a^{10}$
- Surface for side lenght $a = 1$: 22
- Surface for side lenght $a = 2$: 22528

- **Diagonal:** $a\sqrt{11}$
- Diagonal for side lenght $a = 1$: $1\sqrt{11} \quad ; \quad 3,316625...$
- Diagonal for side lenght $a = 2$: $2\sqrt{11} \quad ; \quad 6,633250...$

12-Cube

Vertices; Edges; Faces; Cell count for 12-Cube:

- Vertices count: 4096
- Edges count: 24576
- Faces count: 67584
- Cells count: 112640

Solid values for 12-Cube:

- **Volume:** a^{12}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 4096

- **Surface:** $24a^{11}$
- Surface for side lenght $a = 1$: 24
- Surface for side lenght $a = 2$: 49152

- **Diagonal:** $a\sqrt{12}$
- Diagonal for side lenght $a = 1$: $1\sqrt{12} \quad ; \quad 3,464102...$
- Diagonal for side lenght $a = 2$: $2\sqrt{12} \quad ; \quad 6,928203...$

13-Cube

Vertices; Edges; Faces; Cell count for 13-Cube:

- Vertices count: 8192
- Edges count: 53248
- Faces count: 159744
- Cells count: 292864

Solid values for 13-Cube:

- **Volume:** a^{13}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 8192

- **Surface:** $26a^{12}$
- Surface for side lenght $a = 1$: 26
- Surface for side lenght $a = 2$: 106496

- **Diagonal:** $a\sqrt{13}$
- Diagonal for side lenght $a = 1$: $1\sqrt{13} \quad ; \quad 3,605551...$
- Diagonal for side lenght $a = 2$: $2\sqrt{13} \quad ; \quad 7,211103...$

14-Cube

Vertices; Edges; Faces; Cell count for 14-Cube:

- Vertices count: 16384
- Edges count: 114688
- Faces count: 372736
- Cells count: 745472

Solid values for 14-Cube:

- **Volume:** a^{14}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 16384

- **Surface:** $28a^{13}$
- Surface for side lenght $a = 1$: 28
- Surface for side lenght $a = 2$: 229376

- **Diagonal:** $a\sqrt{14}$
- Diagonal for side lenght $a = 1$: $1\sqrt{14} \quad ; \quad 3,741657...$
- Diagonal for side lenght $a = 2$: $2\sqrt{14} \quad ; \quad 7,483315...$

15-Cube

Vertices; Edges; Faces; Cell count for 15-Cube:

- Vertices count: 32768
- Edges count: 245760
- Faces count: 860160
- Cells count: 1863680

Solid values for 15-Cube:

- **Volume:** a^{15}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 32768

- **Surface:** $30a^{14}$
- Surface for side lenght $a = 1$: 30
- Surface for side lenght $a = 2$: 491520

- **Diagonal:** $a\sqrt{15}$
- Diagonal for side lenght $a = 1$: $1\sqrt{15} \quad ; \quad 3,872983...$
- Diagonal for side lenght $a = 2$: $2\sqrt{15} \quad ; \quad 7,745967...$

16-Cube

Vertices; Edges; Faces; Cell count for 16-Cube:

- Vertices count: 65536
- Edges count: 524288
- Faces count: 1966080
- Cells count: 4587520

Solid values for 16-Cube:

- **Volume:** a^{16}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 65536

- **Surface:** $32a^{15}$
- Surface for side lenght $a = 1$: 32
- Surface for side lenght $a = 2$: 1048576

- **Diagonal:** $a\sqrt{16} \quad ; \quad 4a$
- Diagonal for side lenght $a = 1$: $1\sqrt{16} \quad ; \quad 4$
- Diagonal for side lenght $a = 2$: $2\sqrt{16} \quad ; \quad 8$

17-Cube

Vertices; Edges; Faces; Cell count for 17-Cube:

- Vertices count: 131072
- Edges count: 1114112
- Faces count: 4456448
- Cells count: 11141120

Solid values for 17-Cube:

- **Volume:** a^{17}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 131072

- **Surface:** $34a^{16}$
- Surface for side lenght $a = 1$: 34
- Surface for side lenght $a = 2$: 2228224

- **Diagonal:** $a\sqrt{17}$
- Diagonal for side lenght $a = 1$: $1\sqrt{17} \quad ; \quad 4,123106...$
- Diagonal for side lenght $a = 2$: $2\sqrt{17} \quad ; \quad 8,246211...$

18-Cube

Vertices; Edges; Faces; Cell count for 18-Cube:

- Vertices count: 262144
- Edges count: 2359296
- Faces count: 10027008
- Cells count: 26738688

Solid values for 18-Cube:

- **Volume:** a^{18}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 262144

- **Surface:** $36a^{17}$
- Surface for side lenght $a = 1$: 36
- Surface for side lenght $a = 2$: 4718592

- **Diagonal:** $a\sqrt{18}$
- Diagonal for side lenght $a = 1$: $1\sqrt{18} \quad ; \quad 4,242641...$
- Diagonal for side lenght $a = 2$: $2\sqrt{18} \quad ; \quad 8,485281...$

19-Cube

Vertices; Edges; Faces; Cell count for 19-Cube:

- Vertices count: 524288
- Edges count: 4980736
- Faces count: 22413312
- Cells count: 63504384

Solid values for 19-Cube:

- **Volume:** a^{19}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 524288

- **Surface:** $38a^{18}$
- Surface for side lenght $a = 1$: 38
- Surface for side lenght $a = 2$: 9961472

- **Diagonal:** $a\sqrt{19}$
- Diagonal for side lenght $a = 1$: $1\sqrt{19} \quad ; \quad 4,358899...$
- Diagonal for side lenght $a = 2$: $2\sqrt{19} \quad ; \quad 8,717798...$

20-Cube

Vertices; Edges; Faces; Cell count for 20-Cube:

- Vertices count: 1048576
- Edges count: 10485760
- Faces count: 49807360
- Cells count: 149422080

Solid values for 20-Cube:

- **Volume:** a^{20}
- Volume for side lenght $a = 1$: 1
- Volume for side length $a = 2$: 1048576

- **Surface:** $40a^{19}$
- Surface for side lenght $a = 1$: 40
- Surface for side lenght $a = 2$: 20971520

- **Diagonal:** $a\sqrt{20}$
- Diagonal for side lenght $a = 1$: $1\sqrt{20} \quad ; \quad 4,472136...$
- Diagonal for side lenght $a = 2$: $2\sqrt{20} \quad ; \quad 8,944272...$