Fractals: The Menger Sponge

NAME: ....

CLASS: ....

DATE: ....

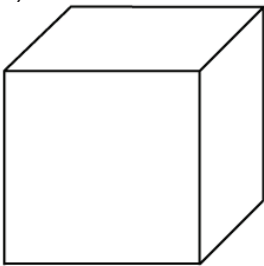**Basic/Core**

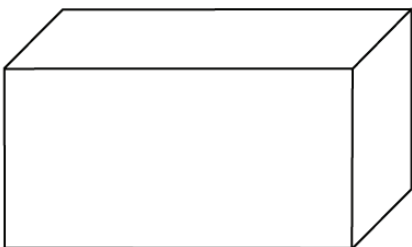1) Give the name and properties of the following shapes:
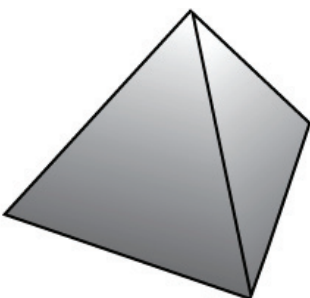
a)

Name:

Number of faces:

Number of edges:

Number of vertices:

Name:
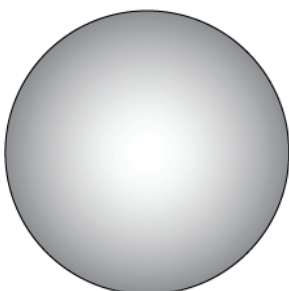
Number of faces:

Number of edges:

Number of vertices:

Name:

Number of faces:

Number of edges:

Number of vertices:

Name:

Number of faces:

Number of edges:

Number of vertices:

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Basic/Core

2) Give the number of faces, vertices, and edges for each of the following Platonic solids:

Platonic Solid	Faces	Vertices	Edges
Tetrahedron			
Cube			
Octahedron			
Dodecahedron			
Icosahedron			

3) Describe the relationship that exists between the sum of the faces and vertices and the number of edges for each of the shapes above.

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Advanced

1) The area of an equilateral triangle can be found using the formula $Area = \dfrac{s^2 \times \sqrt{3}}{4}$

Fill in the table below, calculating the area of an equilateral triangle of the given size. In the last column divide the area of the triangle you are considering by the area of the previous triangle.

Triangle	Length of side (s)	Area	Area ÷ Previous Area
a	1		-------------------------
b	2		
c	4		
d	8		
e	16		

Note and discuss your findings.

2) Fill in the table below calculating the volume of a cube of the given size. In the last column divide the volume of the cube you are considering by the volume of the previous cube.

Cube	Length of side	Volume	Volume ÷ Previous Volume
a	1		-------------------------
b	2		
c	4		
d	8		
e	16		

Note and discuss your findings. Compare your results to the previous table.

3) Give the first five terms of the sequences generated by:

a) $U_n = n^2 + 3$ b) $U_n = n^2 - 4$ c) $U_n = n^3 + 5$ d) $U_n = n^2 + n + 2$

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ANSWERS

Basic/Core

1) a) Cube, 6, 12, 8;   **b) Cuboid, 6, 12, 8;**   **c) Tetrahedron, 4, 6, 4;**   **d) Sphere, 1, 0, 0**

2)

Platonic Solid	Faces	Vertices	Edges
Tetrahedron	4	4	6
Cube	6	8	12
Octahedron	8	6	12
Dodecahedron	12	20	30
Icosahedron	20	12	30

3) Faces + Vertices – Edges = 2

Advanced

1)

Triangle	Length of side (s)	Area	Area ÷ Previous Area
a	1	0.433	-------------------------
b	2	1.732	4
c	4	6.928	4
d	8	27.713	4
e	16	110.851	4

2)

Cube	Length of side	Volume	Volume ÷ Previous Volume
a	1	1	-------------------------
b	2	8	8
c	4	64	8
d	8	512	8
e	16	4,096	8

3) a) 4, 7, 12, 19, 28   **b) -3, 0, 5, 12, 21**   **c) 6, 13, 32, 69, 130**   **d) 4, 8, 14, 22, 32**