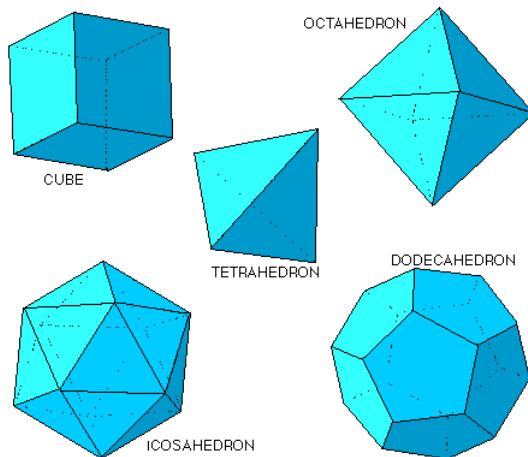# Polyhedra

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February 25, 2018

A polyhedron is a geometric 3-dimensional shape made up of several faces, straight edges, and vertices.

- A vertex is a point which is at the corner of a polyhedron.

- An edge is a line segment that connects two vertices.

- A face is a polygon that is bounded by several edges of the polyhedron.
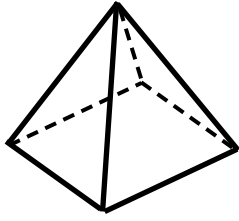
Below are some examples of polyhedra.

1. What is the smallest number of vertices and edges you need to make a face?

   We need at least 3 vertices and 3 edges to make a face

2. Answer the questions below about the polyhedron:

(a) How many vertices are there?

5 vertices

(b) How many edges are there?

8 edges

(c) How many faces are there?

5 faces

3. Answer the following questions about polyhedra:

(a) Can a polyhedron have 3 vertices? Why or why not?

No. We need a minimum of 3 vertices to create a face, but a polyhedron needs to have multiple faces, hence 3 is not enough.

(b) What is the smallest number of vertices a polyhedron can have?

Four. We can make a tetrahedron with 4 vertices.

(c) What is the smallest number of edges a polyhedron can have. Why is it that number and not another?

We also need at least 6 edges to make a polyhedron. Like for the number of vertices, we need at least 3 edges to make a face, but a tetrahedron is the smallest polyhedron, which has 6 edges.

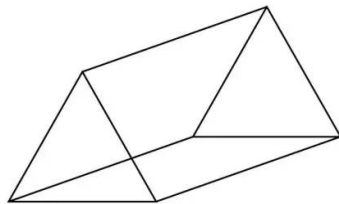(d) What is the smallest number of faces a polyhedron can have?

Four, since a tetrahedron has 4 faces.

#	Polyhedron	Vertices	Edges	Faces
1	Cube	8	12	6
2	Triangular Prism	6	9	5
3	5-Prism	10	15	7
4	Pyramid	5	8	5
5	Tetrahedron	4	6	4
6	Octahedron	6	12	8
7	"Tower"	9	16	9
8	Cube with a Cut Corner	10	15	7
9	(Your Own)			

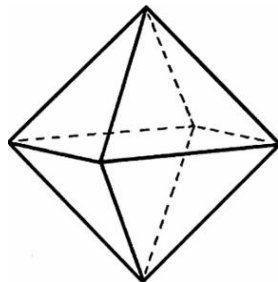Use this space to sketch the above shapes
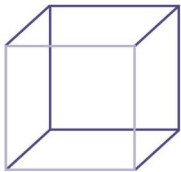
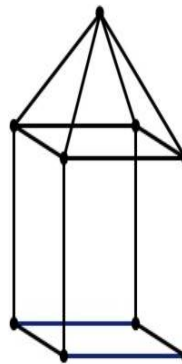1. Cube   2. Triangular Prism   3. 5-Prism   4. Pyramid
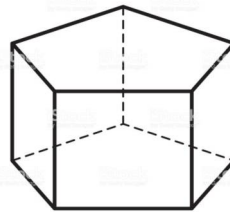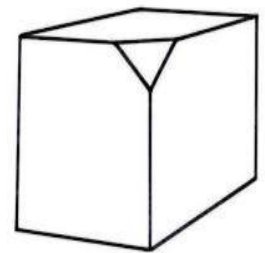
Pentagonal prism
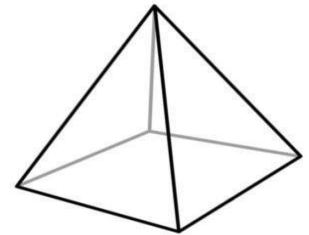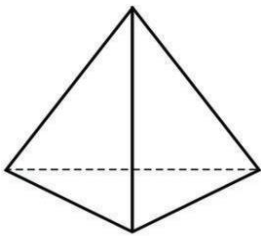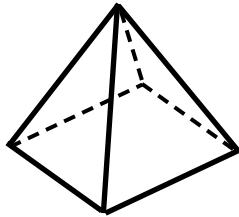
5. Tetrahedron   6. Octahedron   7. Tower   8. Cube with a Cut Corner

Pyramids

A pyramid is a type of polyhedra that has the following properties:

- The base is a polygon

- All the vertices of the base are connected with a special vertex called an apex.

Circle the Apex of the pyramid below:

1. If a pyramid has 10 vertices, how many edges does it have? How many faces does it have?
   10 vertices --> 9 vertices-polygon-base --> 18 edges total and 10 faces

2. If a pyramid has 20 edges, how many vertices and faces does it have?
   20 edges --> 10 vertices-polygon-base --> 11 vertices and 11 faces

3. A pyrmiad has F faces. How many edges does it have?
   F faces --> F vertices --> F-1 vertices-polygon-base --> 2F - 2 edges

4. Is it possible for a pyramid to have 2015 vertices?
   Yes, 2015 vertices --> 2014 vertices-polygon-base --> 4028 edges total and 2015 faces

5. Is it possible for a pyramid to have 2015 edges?
   No. 2015 edges --> 2015/2 vertices-polygon-base: NOT POSSIBLE

1. Identify which of the following nets can be folded into a pyramid. Circle the correct ones:
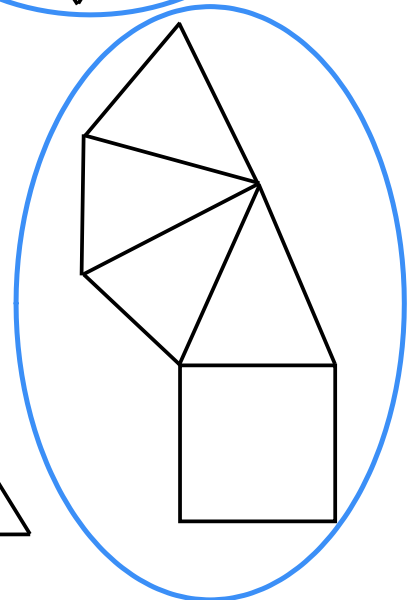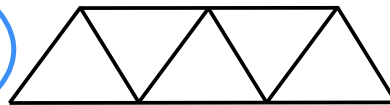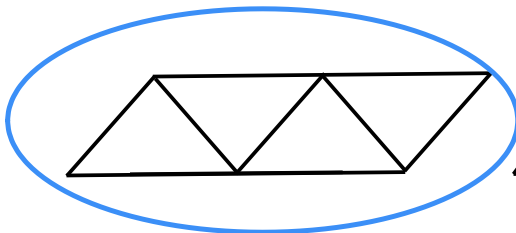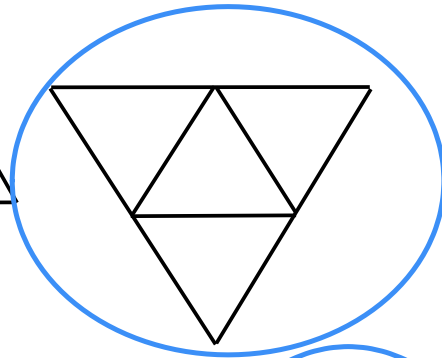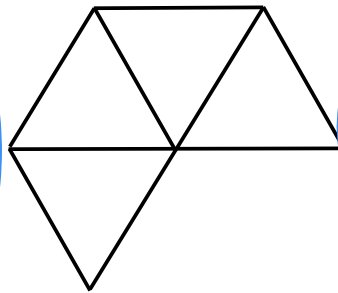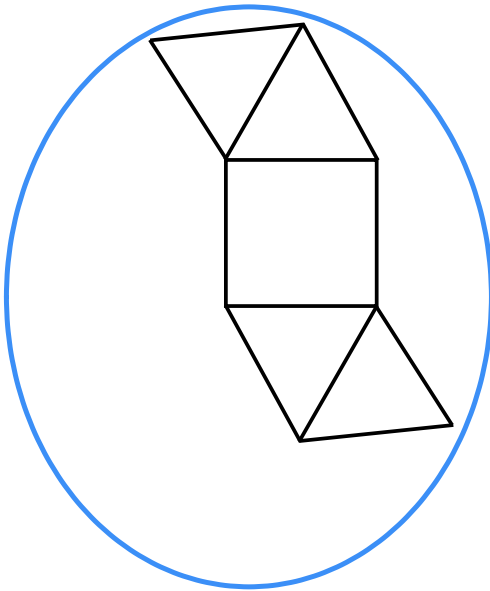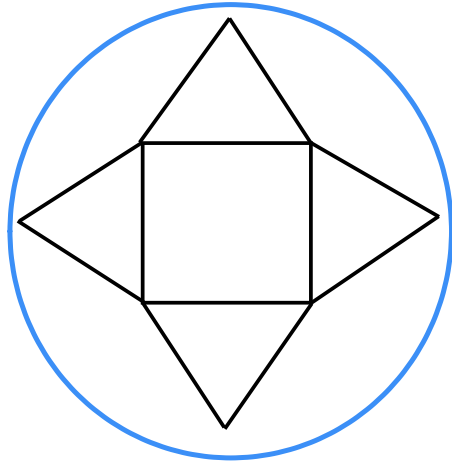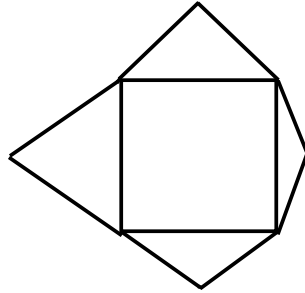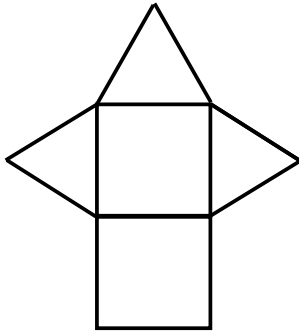
2. Identify which of the following nets can be folded into a cube. Circle the correct ones:
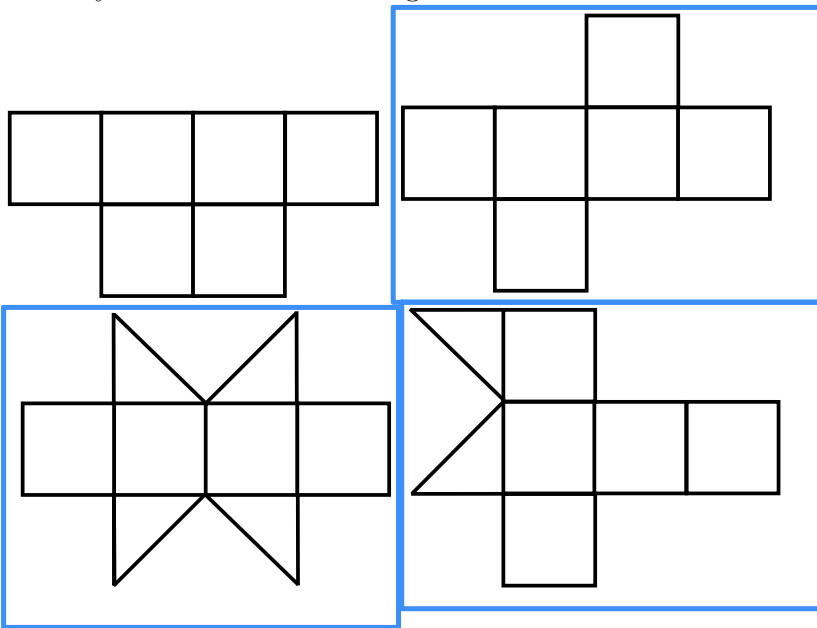
3. Identify which of the following nets can be folded into a rectangular box. Circle the correct ones: