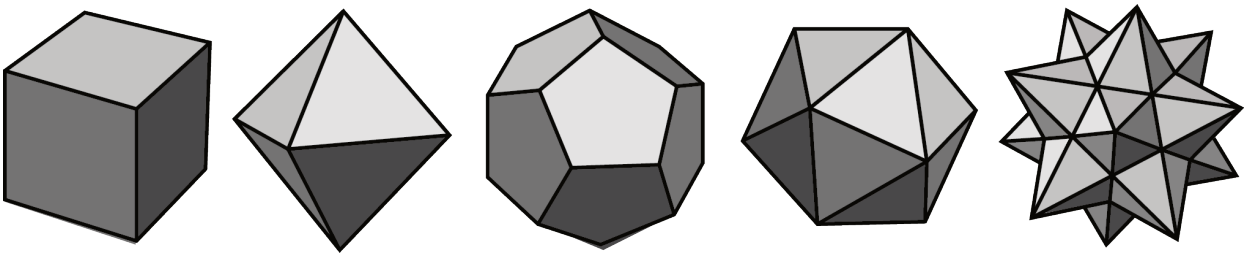
# Lesson 11: Polyhedra and Nets

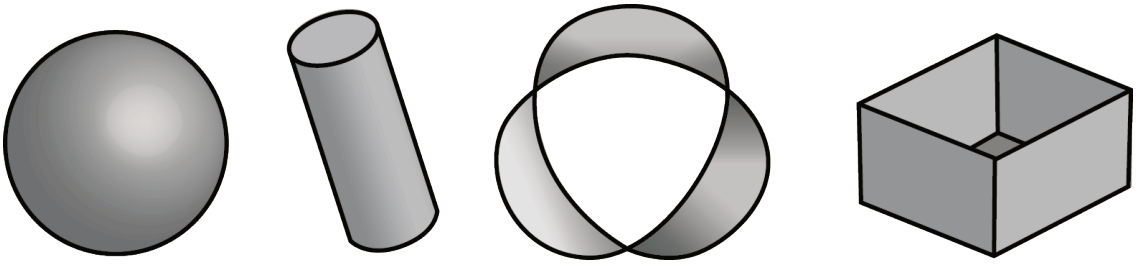
Let's use nets to find the surface area of polyhedra.

## 11.1: What are Polyhedra?

Here are pictures that represent **polyhedra**:



Here are pictures that do *not* represent polyhedra:



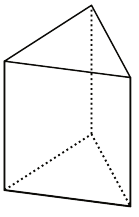
1. Your teacher will give you some figures or objects. Sort them into polyhedra and non-polyhedra.

2. What features helped you distinguish the polyhedra from the other figures?

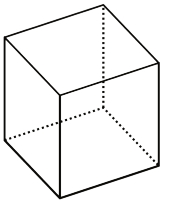
# 11.2: Prisms and Pyramids

1. Here are some polyhedra called **prisms**.

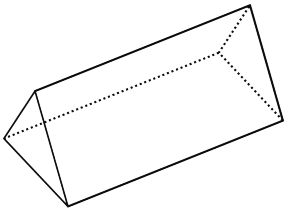
A



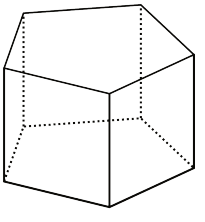
B



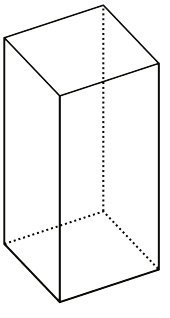
C



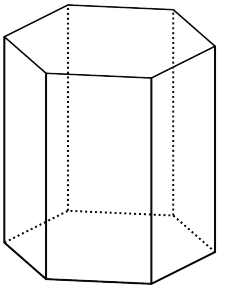
D



E

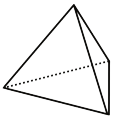


F

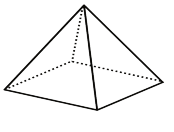


Here are some polyhedra called **pyramids**.

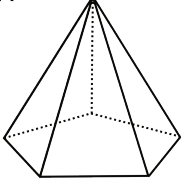
P



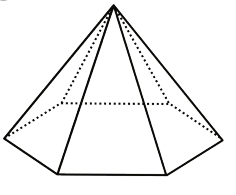
Q



R



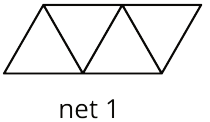
S



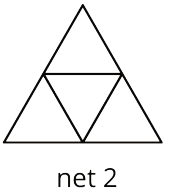
a. Look at the prisms. What are their characteristics or features?

b. Look at the pyramids. What are their characteristics or features?

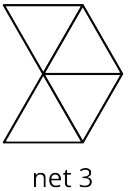
2. Which of these **nets** can be folded into Pyramid P? Select all that apply.



net 1



net 2



net 3

3. Your teacher will give your group a set of polygons and assign a polyhedron.

    a. Decide which polygons are needed to compose your assigned polyhedron. List the polygons and how many of each are needed.

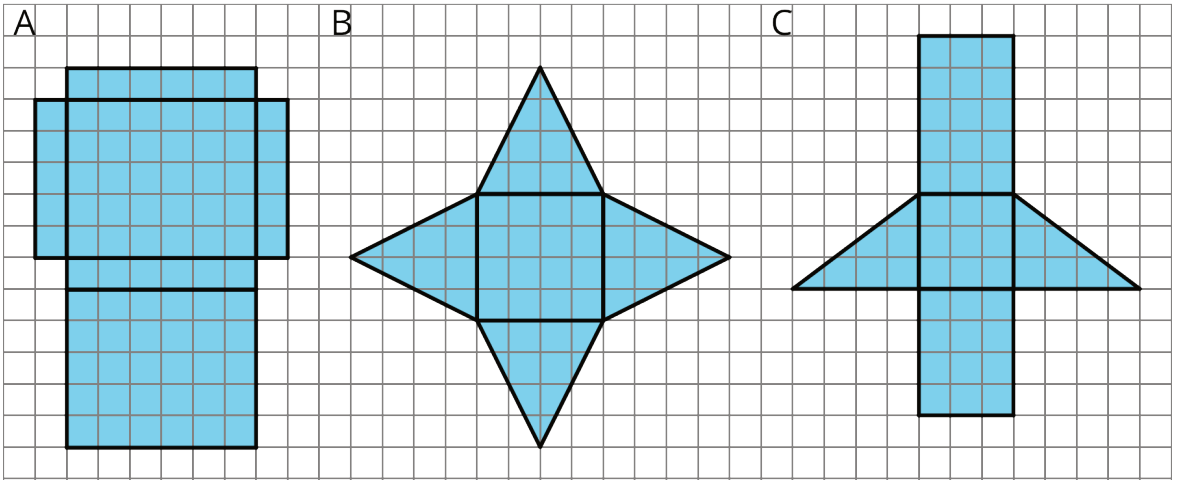
    b. Arrange the cut-outs into a net that, if taped and folded, can be assembled into the polyhedron. Sketch the net. If possible, find more than one way to arrange the polygons (show a different net for the same polyhedron).

### Are you ready for more?

What is the smallest number of faces a polyhedron can possibly have? Explain how you know.

# 11.3: Using Nets to Find Surface Area

1. Name the polyhedron that each net would form when assembled.

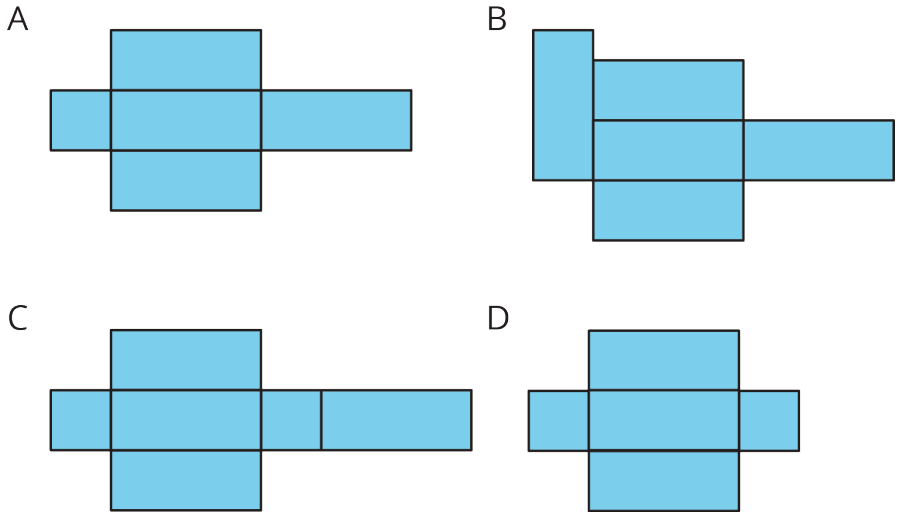



2. Your teacher will give you the nets of three polyhedra. Cut out the nets and assemble the three-dimensional shapes.

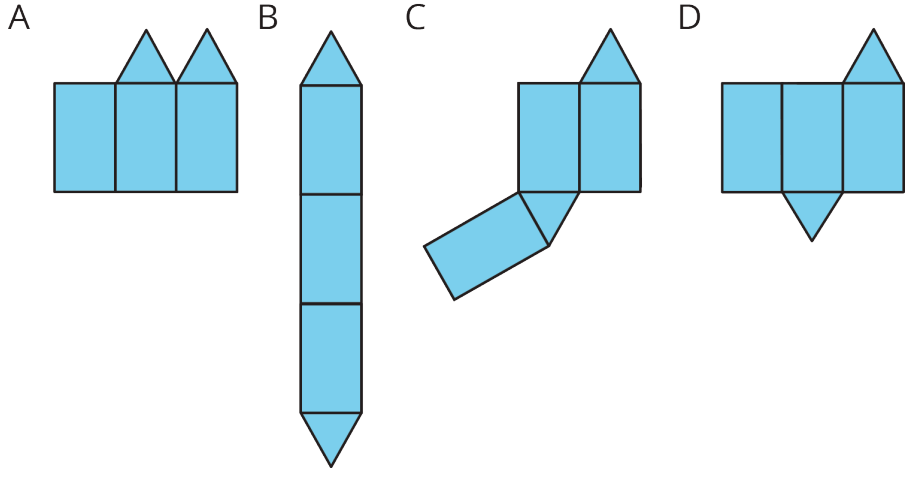
3. Find the **surface area** of each polyhedron. Explain your reasoning clearly.

## Are you ready for more?

1. For each net, decide if it can be assembled into a rectangular prism.

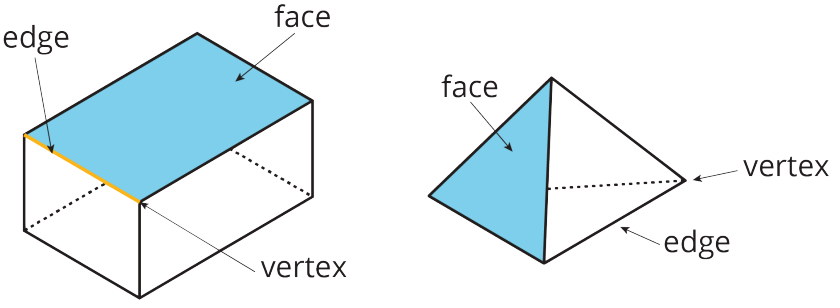



2. For each net, decide if it can be folded into a triangular prism.



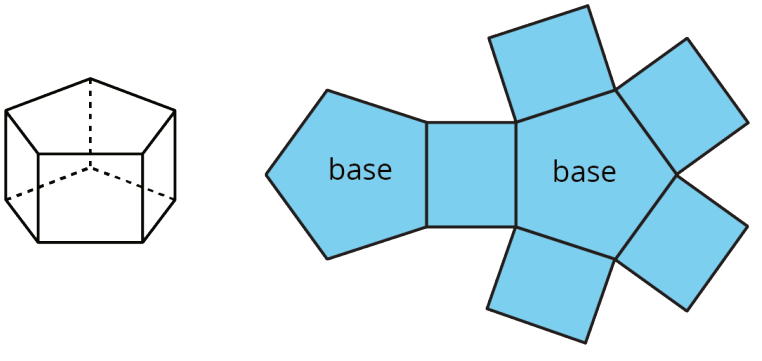

## Lesson 11 Summary

A **polyhedron** is a three-dimensional figure composed of faces. Each face is a filled-in polygon and meets only one other face along a complete edge. The ends of the edges meet at points that are called vertices.



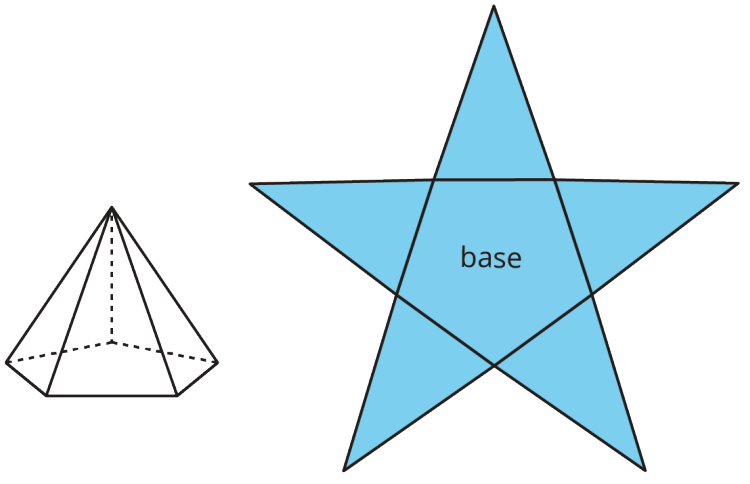

A **prism** is a type of polyhedron with two identical faces that are parallel to each other and that are called **bases**. The bases are connected by a set of rectangles (or sometimes parallelograms). A prism is named for the shape of its bases. For example, if the base is a pentagon, then it is called a "pentagonal prism."

A **net** is a two-dimensional representation of a polyhedron. It is composed of polygons that form the faces of a polyhedron. A net of a prism has two copies of the polygon that is the base. The rest of the polygons are rectangles. A pentagonal prism and its net are shown here.

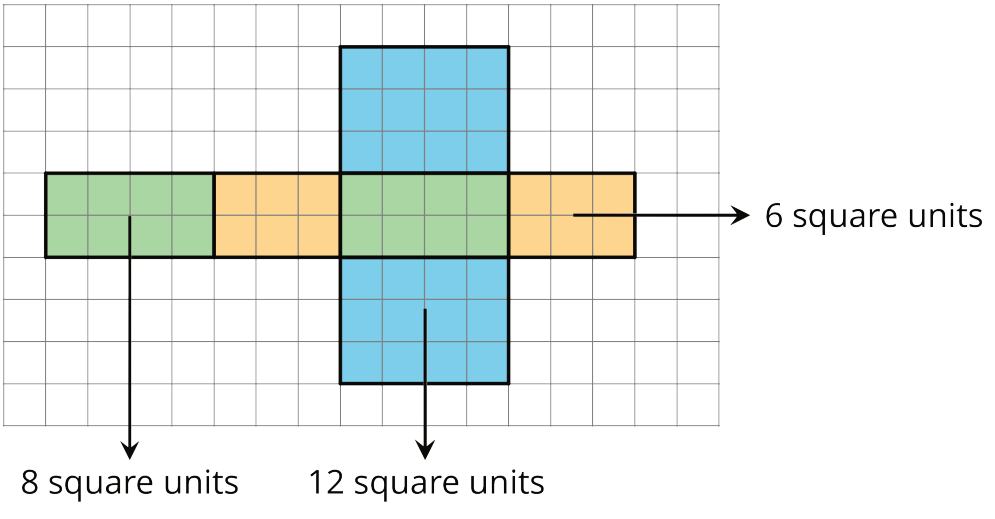



A **pyramid** is a type of polyhedron that has one special face called the base. All of the other faces are triangles that all meet at a single vertex. A pyramid is named for the shape of its base. For example, if the base is a pentagon, then it is called a "pentagonal pyramid."

A net of a pyramid has one polygon that is the base. The rest of the polygons are triangles. A pentagonal pyramid and its net are shown here.




Because a net shows all the faces of a polyhedron, we can use it to find its surface area. For instance, the net of a rectangular prism shows three pairs of rectangles: 4 units by 2 units, 3 units by 2 units, and 4 units by 3 units.




The **surface area** of the rectangular prism is 52 square units because $8 + 8 + 6 + 6 + 12 + 12 = 52$.