



## EXEMPLAR 7:

### 2-D Representation of Simple Solids

**Objective:** To explore and sketch the 2-D representations of simple solids

**Key Stage:** 3

**Learning Unit:** Introduction to Geometry

**Materials Required:** (1) Computer Software – *Poly*  
(2) A model and a framework of a regular tetrahedron

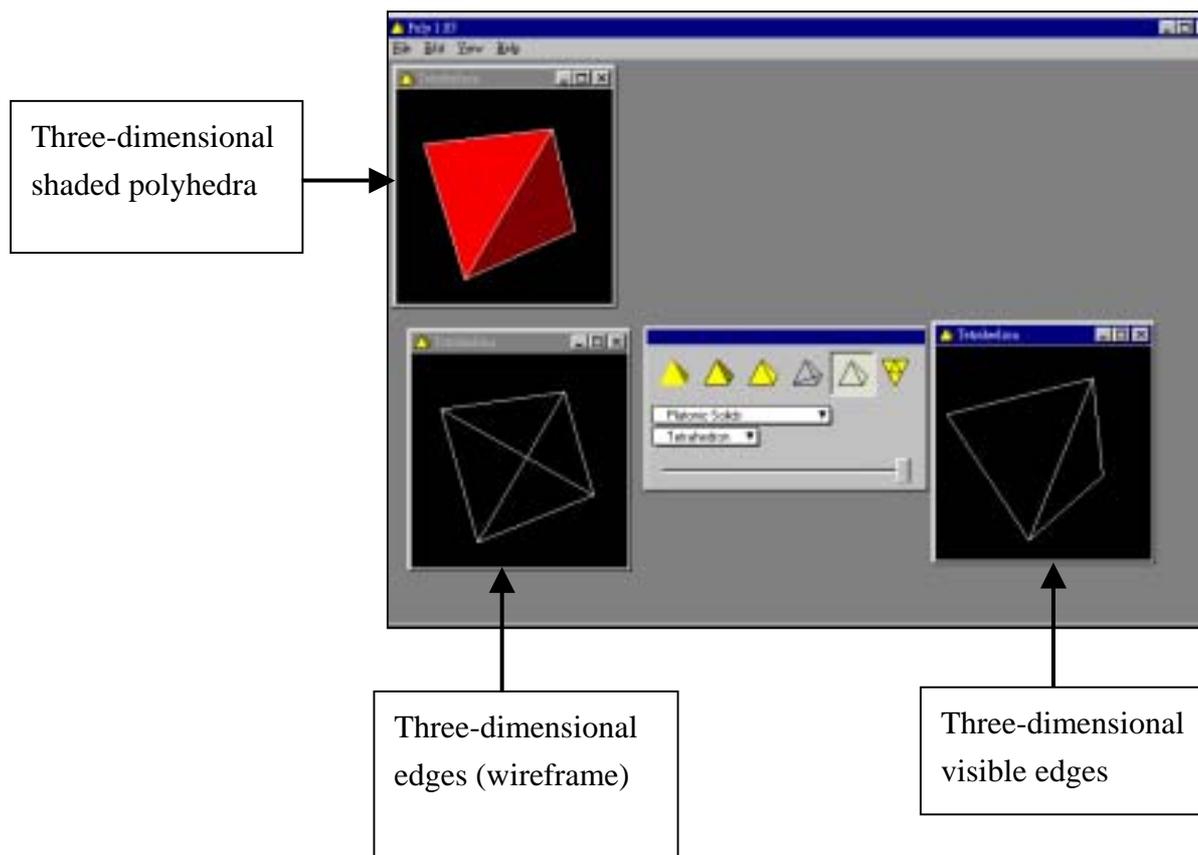
**Prerequisite Knowledge:** Simple ideas of Platonic Solids

#### Description of the Activities:

##### *Activity 1: 2-D representations of a regular tetrahedron*

1. At the beginning of the lesson, the teacher shows a model and a framework of a regular tetrahedron to students.
2. The teacher distributes Worksheet 1 to students. Students are asked to draw a 2-D representation of the tetrahedron on the worksheet.
3. Students compare their 2-D figures with those drawn by other classmates.
4. The teacher launches the computer program *Poly* and selects **Tetrahedron** from the category **Platonic Solids**. Choose **Three-dimensional shaded polyhedra** in the View Modes of **File | Preference** to view the solid.
5. The teacher uses the program to rotate the tetrahedron to demonstrate the effect of rotation on a 3-D solid.
6. The teacher opens two new windows and selects **Tetrahedron** for both windows but in different view modes. One is **Three-dimensional edges (wireframe)** and the other is **Three-dimensional visible edges**. The teacher may refer to the figure on next page. Students can use different view modes to visualize the same solid.

7. The teacher should point out to students that, in the **Three-dimensional visible edges** View Mode, there may be a hidden edge on the screen.
8. Students are asked to complete the Table of Worksheet 1. Students need to draw different 2-D representations of the tetrahedron with the help of the software. The teacher can make remarks on the use of a dotted line to represent an invisible edge in drawing the 2-D representation of a 3-D solid.
9. The teacher discusses with students the best 2-D representation of the tetrahedron.



*Activity 2 : 2-D representation of simple solids*

10. The teacher distributes Worksheet 2 to students.
11. Students need to make use of the software *Poly* to visualize the specified 3-D solids and their 2-D representations. As there are many 2-D representations, students have to choose an appropriate one and draw it in the Table of the Worksheet.
12. Students should be encouraged to discuss the discrepancies among their drawings.
13. The teacher guides students to draw the conclusions.

**Worksheet 1: 2-D representation of a regular tetrahedron**

1. Draw a 2-D representation of the tetrahedron in the space provided. Compare your figure with your classmates.

2-D representation of the regular tetrahedron

2. With the help of the program *Poly*, draw as many 2-D representations of the tetrahedron as you can in the Table below. Use a dotted line to represent a hidden edge in the drawing.

2-D representation of the regular tetrahedron	

Table

**Worksheet 2: 2-D representations of simple solids**

1. Launch the program *Poly*.
2. Use the program to draw the solids listed in the Table on next page. Drag the solid on the screen to rotate it. As there maybe a lot of 2-D representations for each solid, you should choose an appropriate 2-D representation and draw them in the Table on next page.
3. Note that you can find the specified solid from the following table of category.

Solid	Category
Cube	Platonic Solids
Triangular Prism	Prism and Anti-Prisms
Pentagonal Prism	Prism and Anti-Prisms
Square Pyramid [J1]	Johnson Solids
Elongated Square Pyramid [J8]	Johnson Solids

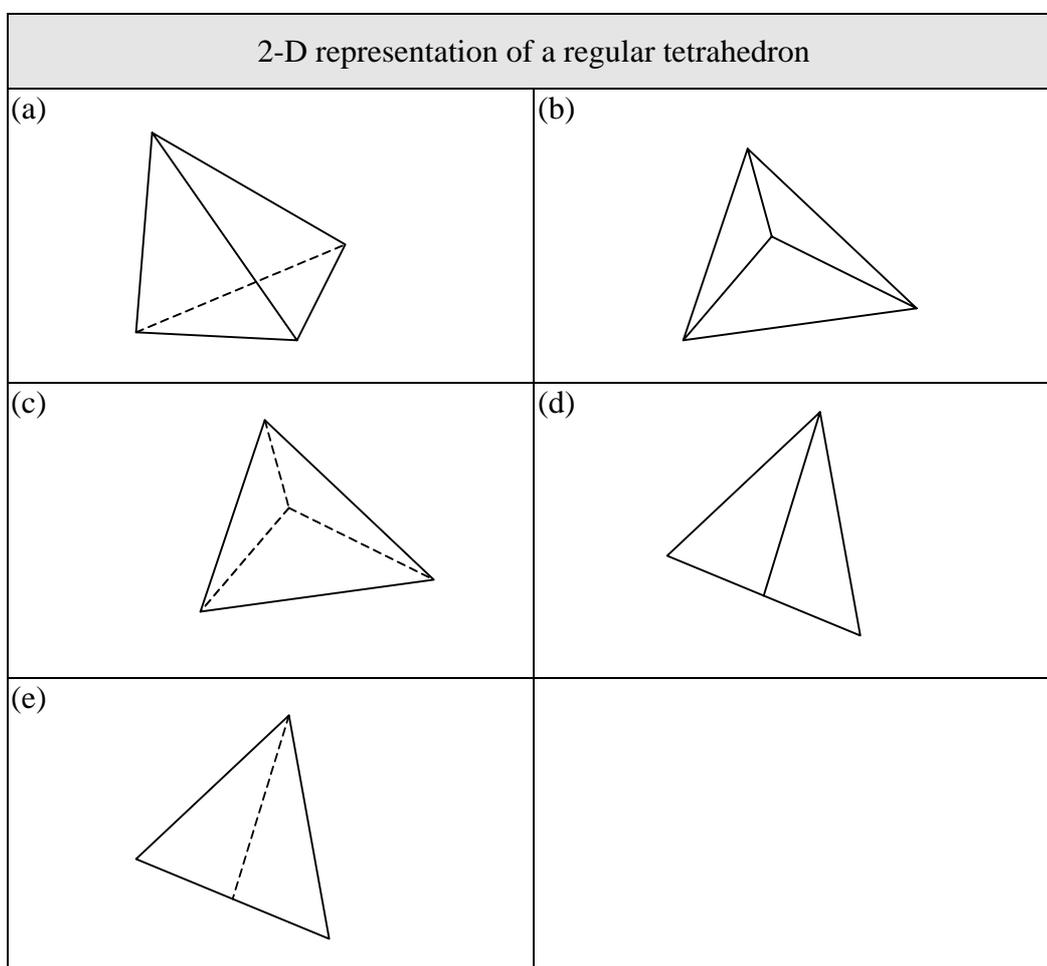
4. Compare and discuss your answers with your classmates if there are any discrepancies.

Solid	2-D representation
Cube	
Triangular Prism	
Pentagonal Prism	
Square Pyramid	
Elongated Square Pyramid	

Table

**Notes for Teachers:**

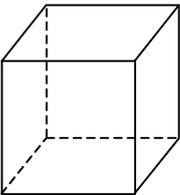
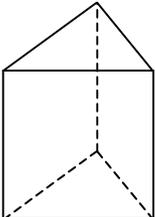
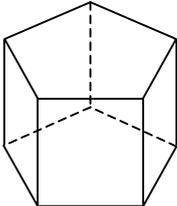
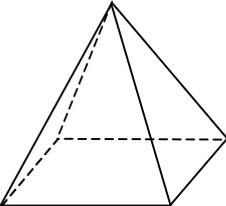
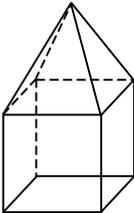
1. In the exemplar, all the faces of the solids are regular polygons.
2. Before the lesson, the teacher should prepare a model and a framework of a regular tetrahedron for demonstration.
3. For the Operation Procedure, please refer to the Exemplar 7 in "Teaching Package on S1-5 Mathematics (1): Use of Information Technology" produced by the Mathematics Section of the Education Department in 2001.
4. Answers to Worksheet 1:



5. When the teacher asks students which of the above representations can “best” illustrate a tetrahedron, an ideal 2-D illustration should consist of visible edges and dotted lines representing the “hidden” edges. Figure (a) and (c) are two examples can be introduced.

6. The teacher can use the program *Poly* to produce the net for making the model of a regular tetrahedron before the lesson. Alternatively, the teacher may find the net from Appendix A.

7. Answer to Worksheet 2:

Solid	2-D representation
Cube	
Triangular Prism	
Pentagonal Prism	
Square Pyramid	
Elongated Square Pyramid	

8. The teacher can use other models for the 2-D representations of simple solids in Worksheet 2 such as cylinder or cone but these kinds of solids are not provided in the program *Poly*.