

Building a Small Castle

Key Stage: 1

Strand:

Mathematics: Shape and Space (Learning Unit: 2S1 3-D Shapes (II), 3M1 Length and distance (IV))

General Studies: Science and Technology in Everyday Life

- Objectives:**
- (i) To further recognise different 3-D shapes (prisms, cylinders, pyramids, cones and spheres)
 - (ii) To design and produce 3-D shapes by using 3-D design software and 3-D printing technology

Prerequisite Knowledge: Identifying different 3-D shapes (prisms, cylinders, pyramids, cones and spheres) intuitively, and performing the interconversion between millimetre and centimetre.

Resources Required: 3-D printer, 3-D design software (e.g. Tinkercard, SketchUp)

Description of the Activity:

Activity 1

The teacher shows some models, photos or pictures of castles for students to identify intuitively the 3-D shapes that form the castle. The teacher may also introduce briefly the functions of a castle.

Questions for discussion:

1. Can you identify any 3-D shapes from these castles? What are they?
2. What are the characteristics of the 3-D shapes that help you identify them?

Notes for Teachers:

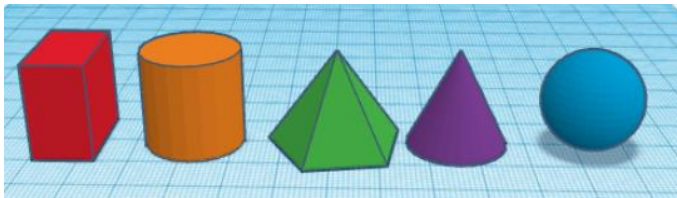
1. The teacher may show students some photos of toy castles or castles from different places of the world. The teacher may also show some pictures of castles captured from electronic games.
2. The teacher should select castles with simpler structure for students to identify the 3-D shapes intuitively.

Activity 2

The teacher may demonstrate how to use a 3-D design software to:

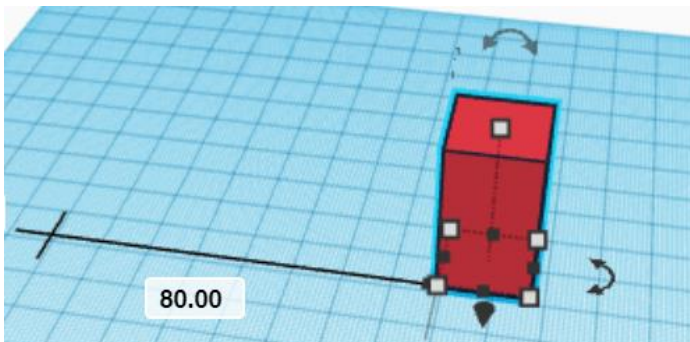
- construct different 3-D shapes (prisms, cylinders, pyramids, cones and spheres)
- move a 3-D shape
- rotate a 3-D shape
- change the dimensions of a 3-D shape
- change the number of sides of the base of a prism/pyramid
- adjust the viewpoint

Figures 1 – 6 are shown below for reference



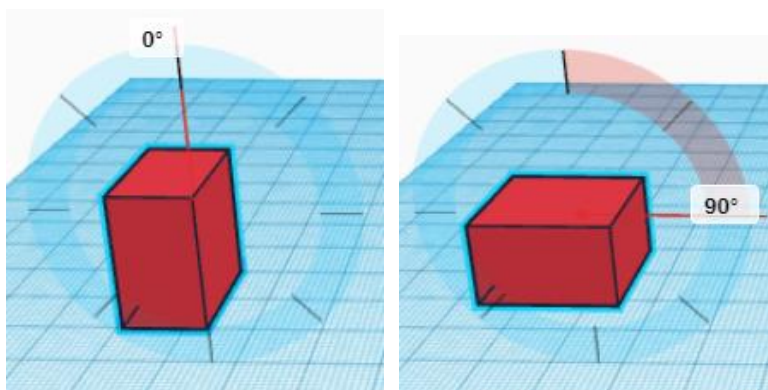
Construct different 3-D shapes

(Figure 1)



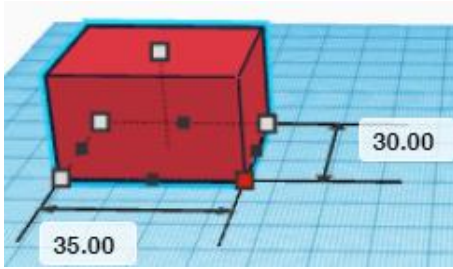
Move a 3-D shape

(Figure 2)



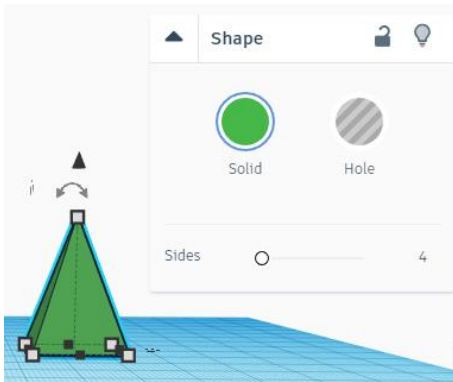
Rotate a 3-D shape

(Figure 3)



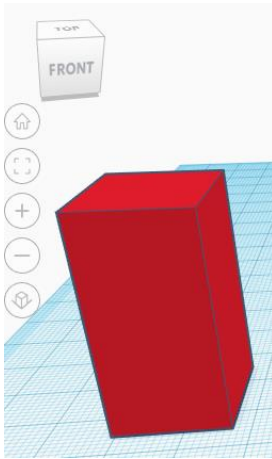
Change the dimensions of a 3-D shape

(Figure 4)



Change the number of sides of the base of a pyramid

(Figure 5)



Adjust the viewpoint

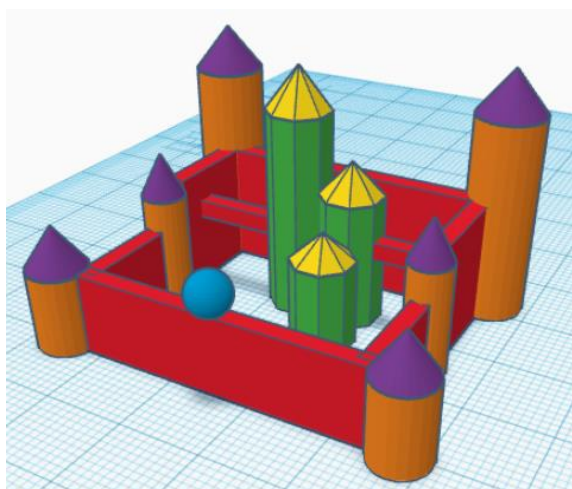
(Figure 6)

Notes for Teachers:

1. Students should be reminded that millimeter is commonly used as the unit of length in design software.
2. The angle of rotation is shown when a 3-D shape is rotated. The teacher may ask students to ignore the readings for the time being. According to students' abilities, the teacher may also introduce the related basic concept in brief to students.

Activity 3

The teacher guides students to work in groups to design a castle with the length, width and breadth all not exceeding 10 cm (Figure 7 is shown as an example) by using the 3-D design software. The teacher collect students' work and export to 3-D printers for output.



(Figure 7)

Notes for Teachers:

1. Students should be reminded that millimeter is used as the unit of length in the software.
2. Before printing, the teacher should ask students to check whether their designs are practical for output, for example, the dimensions of the model should not exceed the limit set by the 3-D printers, and the parts of the model should be connected.

Activity 4

The teacher asks students to observe the works of their classmates and identify 3-D shapes from the models. The teacher may also let students introduce their designs to classmates.

This example mainly involves the following generic skills:

1. Collaborative Skills
 - Collaborate in groups
2. Creativity
 - Construct castles by using different 3-D shapes.

3. Problem Solving Skills

- Construct castles by using the five types of 3-D shapes (prisms, cylinders, pyramids, cones and spheres) only.