



EXPLORING 3D TECH: FOLDABLE CREATIONS

Grade Level: 4th

Duration: 2-3

PROJECT DESCRIPTION

In this project, students will explore 3D printing and core math concepts. Students will learn about geometric shapes, measurements, fractions, area, volume, and spatial reasoning through interactive tasks and foldable templates. They will also use their creativity to design and build their own foldable creations.

STEM & ACADEMIC CONCEPTS



SCIENCE



ENGINEERING



MATH



WRITING

OBJECTIVES

- Students will understand the concept of 3D printing
- Learn about its applications in various mathematical concepts including geometry, measurement, fractions, area, volume, and spatial reasoning.
- Engage in a hands-on activity to create 3D-like foldable objects, reinforcing their math skills.

MATERIALS

- Foldable templates
- Rulers
- Scissors

STANDARDS



STEM

Problem-Resolution Skills

- 1) Use content-specific and precise vocabulary when communicating ideas related to STEM content



ENGINEERING

4.ETS2: Links Among Engineering, Technology, Science, and Society: 1) Use appropriate tools and measurements to build a model.



ART

- 4 4.VA.Cr1.A Brainstorm original approaches to an art or design problem.



MATH

4.MD.A.1 Measure and estimate to determine relative sizes of measurement units within a single system of measurement involving length, liquid volume, and mass/weight of objects using customary and metric units.



WRITING

4.W.TP.2.g: Write informative/explanatory texts to examine a topic and convey ideas and information. Use precise language and domain-specific vocabulary to inform about or explain the topic.



VOCABULARY

- **3D Printing:** It is a way to make things by adding layers of material on top of each other.
- **Geometric Shapes:** These are shapes that have flat sides and straight edges. Some examples are squares, circles, and triangles.
- **Measurement:** It is the process of finding out how big, long, or heavy something is.
- **Fractions:** These are parts of a whole. They can be written as a fraction like $\frac{1}{2}$ or $\frac{3}{4}$.
- **Area:** This is the amount of space inside a flat shape. It is usually measured in square units.
- **Volume:** This is the amount of space inside a three-dimensional shape. It is usually measured in cubic units.
- **Spatial Reasoning:** This is the ability to imagine how things would look in different positions or from different angles.
- **Angles:** These are the spaces between two lines that meet at a point. Angles can be measured in degrees.
- **Perimeter:** This is the total length of all the sides of a shape.

HOMEMADE THERMOMETER

SCIENCE - MATH



Engage (Duration: 15 minutes)

- Begin by discussing with students what they know about geometric shapes and measurements. Ask questions like, "What are some 3D shapes you know?" and "How do we measure the size of objects?"
- Show students a [video](#) of a 3D printer in action.
- Ask students what they think 3D printing is and how it works.



Reflection Exercise: Write a list of 3 creations that you could make with a 3D printer, then write a short paragraph about each one. Explain how you would make it and what materials you would need.



Explore (Duration: 30 minutes)

- Present a brief recap of what a 3D printer is and its applications.
- [Show images of 3D-printed geometric shapes](#) and objects used for measurement. Discuss their significance.



Explain (Duration: 20 minutes)

- Review the concepts discussed in the previous session, particularly focusing on geometry, measurement, fractions, area, volume, and spatial reasoning.
- Introduce the hands-on activity: creating 3D-like objects without a 3D printer using foldable templates related to the math concepts.



Elaborate (Duration: 40 minutes)

- Distribute different 3D printable templates to each student, including pencil box, mask, and gift boxes.
- Guide students through cutting, folding, and assembling their templates.
- Explain that they will measure certain attributes of their creations (e.g., side lengths, angles, areas) using a ruler or other measurement tool.
- Encourage students to explore how these attributes change as they manipulate the templates.



Evaluate (Duration: 15 minutes)

- Have students present their foldable creations and share what they learned about the geometric shapes, fractions, and other math concepts.
- Guide a discussion on their measurement findings, asking questions like, "How did the attributes change when you manipulated the template?"
- Connect the activity to real-world scenarios, such as how objects they use everyday like pencil holders, toys, etc. are made using 3D models to make these items.



CHECK FOR UNDERSTANDING

NAME: _____ Date: _____ Class: _____

1: How does a 3D printer shape things?

- (A) It removes chunks of material until it is in the desired shape.
- (B) It adds just enough material to make the same shape as a sculptor.
- (C) It uses a hot extruder nozzle to squeeze out liquid plastic layer by layer.
- (D) It uses a computer program to tell the printer where to put the material.

2: What are some of the materials that a 3D printer can print with?

- (A) Plastic, ceramics, glass, metal
- (B) Biological tissue, pizza, houses, dental implants
- (C) Anything that can be drawn in a computer program
- (D) Only plastic

3: How does the printer know how to print the exact shape of my cat toy?

- (A) The computer program tells the printer where to put the material.
- (B) The printer has a built-in sensor that can detect the shape of the object.
- (C) The printer uses a laser to scan the object and create a digital model.
- (D) The printer uses a robotic arm to move the material around.

4: What are some of the possible applications of 3D printers?

- (A) Printing houses, dental implants, complex bridges, even pizza!
- (B) Printing anything that can be drawn in a computer program
- (C) Printing objects that are too small or too complex to be made by traditional manufacturing methods
- (D) All of the above

5. A 3D printer is used to print a cube that is 3 inches on each side. What is the volume of the cube?

- (A) 3 cubic inches
- (B) 9 cubic inches
- (C) 27 cubic inches
- (D) 81 cubic inches

6: A 3D printer is used to print a rectangular prism that is 4 inches long, 2 inches wide, and 3 inches high. What is the volume of the rectangular prism?

- (A) 24 cubic inches
- (B) 36 cubic inches
- (C) 72 cubic inches
- (D) 144 cubic inches



Answer Key

CHECK FOR UNDERSTANDING

1: How does a 3D printer shape things?

- (A) It removes chunks of material until it is in the desired shape.
- (B) It adds just enough material to make the same shape as a sculptor.
- (C) It uses a hot extruder nozzle to squeeze out liquid plastic layer by layer.**
- (D) It uses a computer program to tell the printer where to put the material.

Answer: The correct answer is (C). A 3D printer uses a hot extruder nozzle to squeeze out liquid plastic layer by layer. The computer program tells the printer where to put the material, so that it can create the desired shape.

2: What are some of the materials that a 3D printer can print with?

- (A) Plastic, ceramics, glass, metal**
- (B) Biological tissue, pizza, houses, dental implants (
- C) Anything that can be drawn in a computer program
- (D) Only plastic

Answer: The correct answer is (A). A 3D printer can print with a variety of materials, including plastic, ceramics, glass, and metal. Some scientists have even found a way to print with biological tissue.

3: How does the printer know how to print the exact shape of my cat toy?

- (A) The computer program tells the printer where to put the material.**
- (B) The printer has a built-in sensor that can detect the shape of the object.
- (C) The printer uses a laser to scan the object and create a digital model.
- (D) The printer uses a robotic arm to move the material around.

Answer: The correct answer is (A). The computer program tells the printer where to put the material, so that it can create the desired shape. The computer program gets this information from the digital model of the object, which is created by the user.

4: What are some of the possible applications of 3D printers?

- (A) Printing houses, dental implants, complex bridges, even pizza!
- (B) Printing anything that can be drawn in a computer program
- (C) Printing objects that are too small or too complex to be made by traditional manufacturing methods
- (D) All of the above**

Answer: The correct answer is (D). 3D printers can be used to print a wide variety of objects, including houses, dental implants, complex bridges, and even pizza! They can also be used to print objects that are too small or too complex to be made by traditional manufacturing methods.

I hope this quiz helps you to understand how 3D printers work and their possible applications.

5. A 3D printer is used to print a cube that is 3 inches on each side. What is the volume of the cube?

- (A) 3 cubic inches
- (B) 9 cubic inches
- (C) 27 cubic inches (**
- D) 81 cubic inches

Answer: The correct answer is (C). The volume of a cube is the length x width x height. In this case, the length, width, and height are all 3 inches, so the volume is $3 \times 3 \times 3 = 27$ cubic inches.

6: A 3D printer is used to print a rectangular prism that is 4 inches long, 2 inches wide, and 3 inches high. What is the volume of the rectangular prism?

- (A) 24 cubic inches
- (B) 36 cubic inches
- (C) 72 cubic inches
- (D) 144 cubic inches

Answer: The correct answer is (B). The volume of a rectangular prism is the length x width x height. In this case, the length is 4 inches, the width is 2 inches, and the height is 3 inches, so the volume is $4 \times 2 \times 3 = 24$ cubic inches.