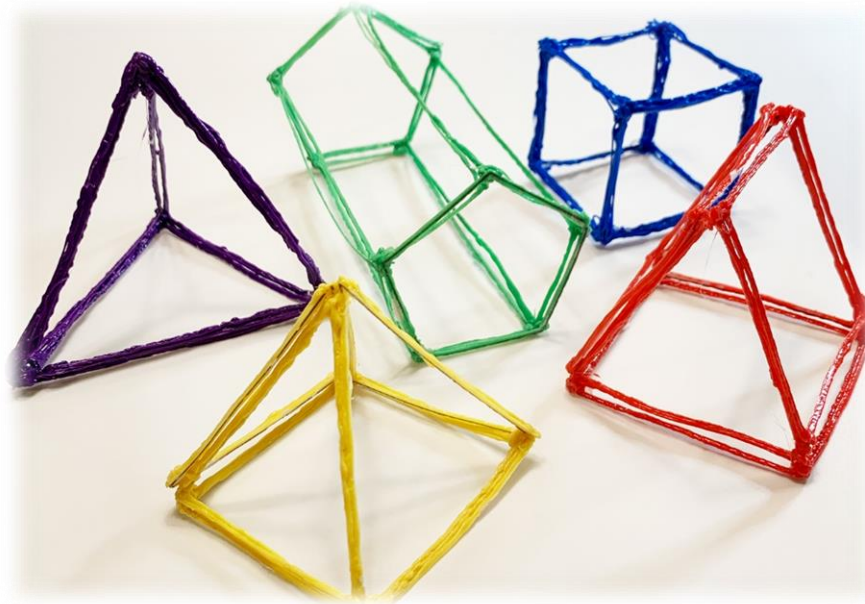


Mathematics! What is it all about? It is the study of topics such as quantity (numbers), structure, space, and change. If you love to create and build, then mathematics is one of your best friends! It is convenient to be able to use number language to communicate things like dates, time, distances, amounts etc. Have you ever tried to go through a day without using any reference to a number? (See if you can wake up on time without a number helping you).

The projects you will be doing involve creating geometric shapes. Geometric shapes can be flat like a circle or a square having length and width. Mathematicians call these flat shapes two dimensional. What happens when we add height to the shape? The shape comes to life and enters the third dimension or 3D!

It is time to build geometric shapes in 3D.

## Five 3D Geometric Shape Projects Plus Three Design Your Own Projects



Building geometric shapes will challenge you. How?

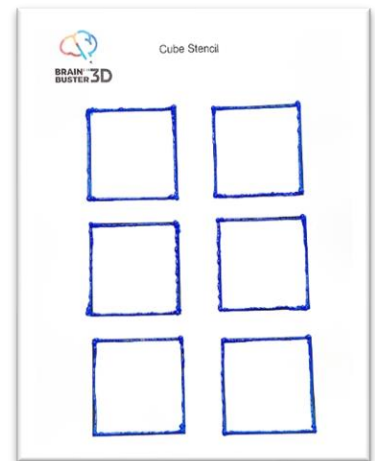
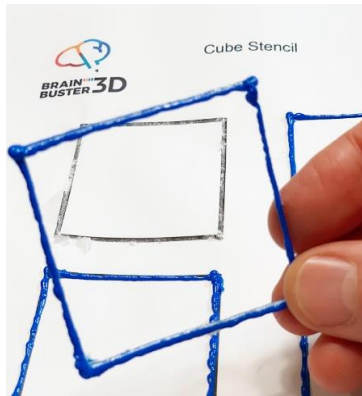
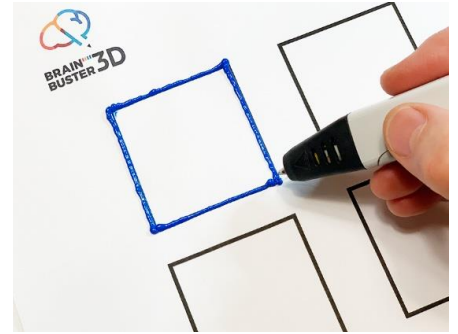
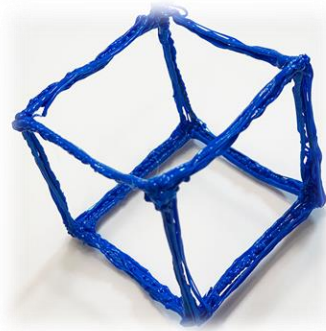
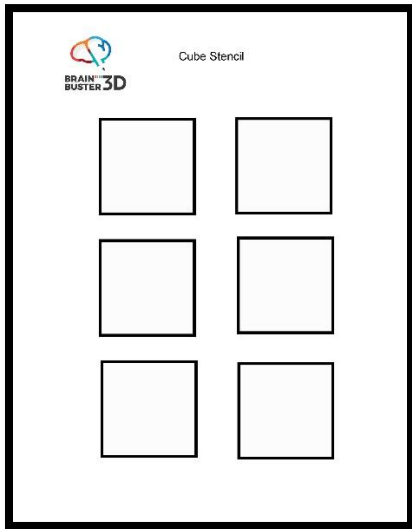
- You will use stencils to make five geometric shapes in 2D.
- You will take the 2D shapes from the stencil and arrange them to build the 3D geometric shape.
- You will weld the shapes together to build the five 3D geometric objects. (Cube, Triangle-Based Pyramid, Square-Based Pyramid, Triangular Prism and Pentagonal Prism).
- Design your own stencils for a cube, triangular pyramid and hexagonal prism and test out your design ideas with the 3D pen.

**Materials Needed:** Five Geometric Shape Stencils, Three Design Your Own Stencils, 3D Pen, 3+ colors of PLA filament, scissors, silicon thumb & finger protectors, a paper towel or napkin.

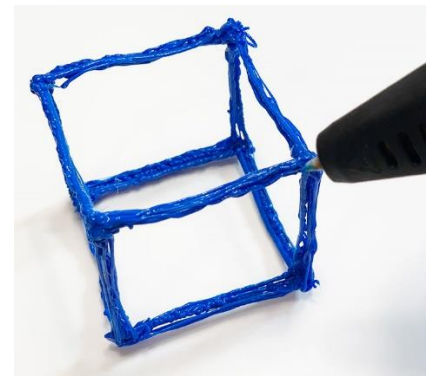
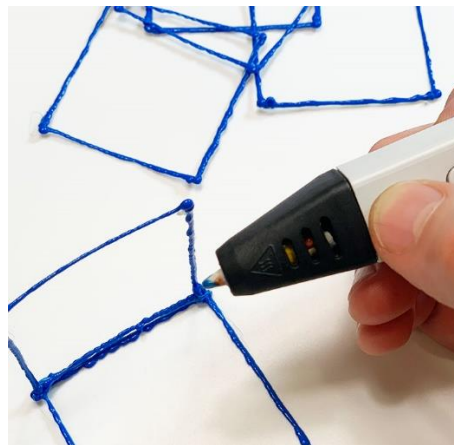
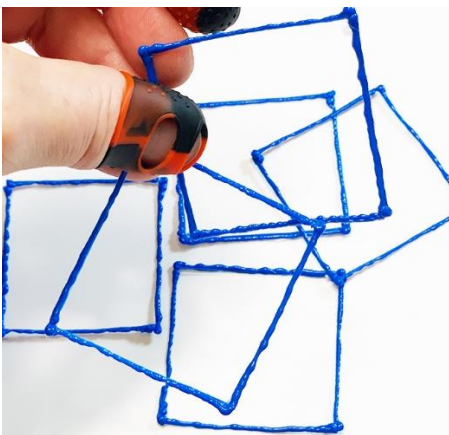
Optional: To keep your stencil intact, place it in a plastic sheet protector.



## CUBE:



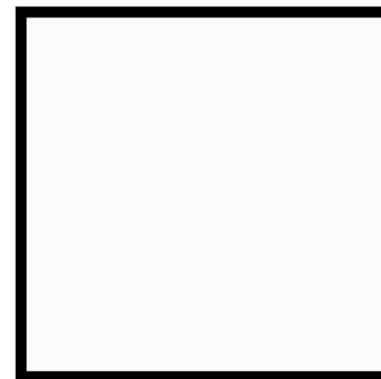
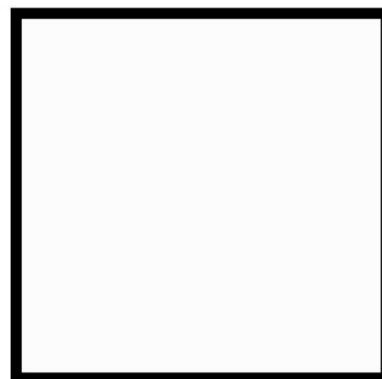
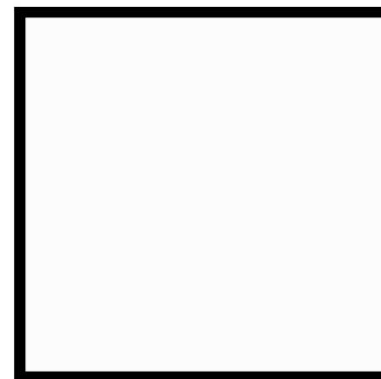
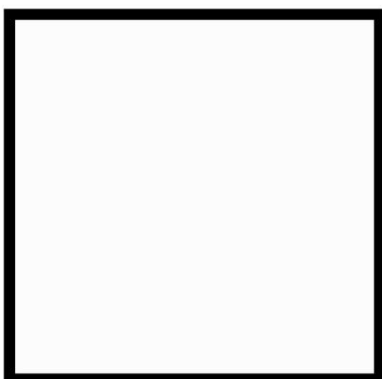
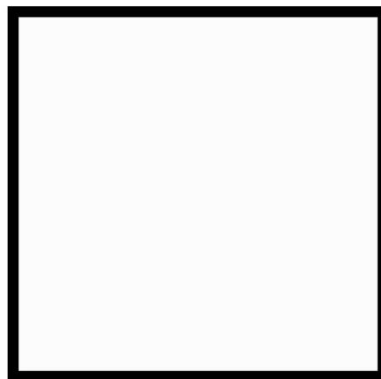
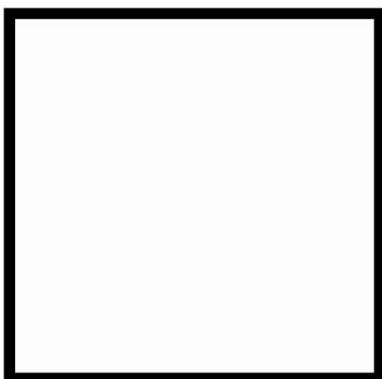
Find a starting point to anchor your filament. Move your 3D pen to outline the squares. Carefully remove the squares from the stencil. If you use a plastic sheet protector, the squares should peel off the stencil easily. If you made the squares by extruding the filament directly on the paper stencil, some of the paper will stick. Do not worry about this. To remove the paper, rinse with warm water and dry with a paper towel.



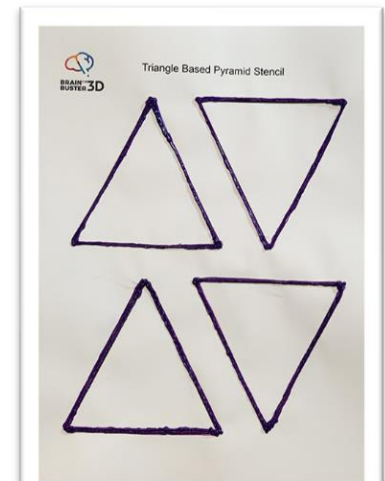
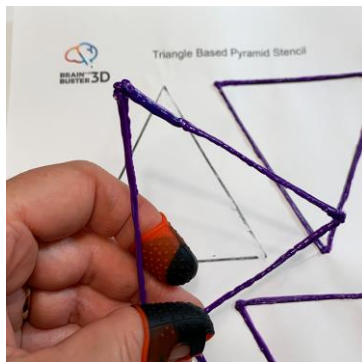
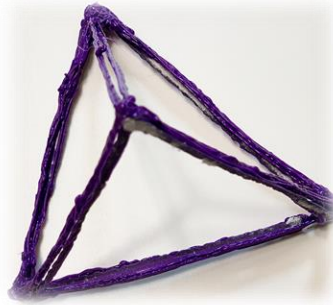
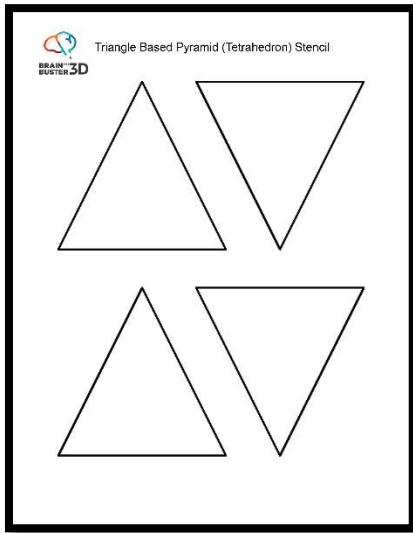
Arrange the squares by placing them side to side at a 90-degree angle. Weld where the two sides meet as pictured above. Reinforce all the sides along the exterior with extra filament. Your cube is finished!



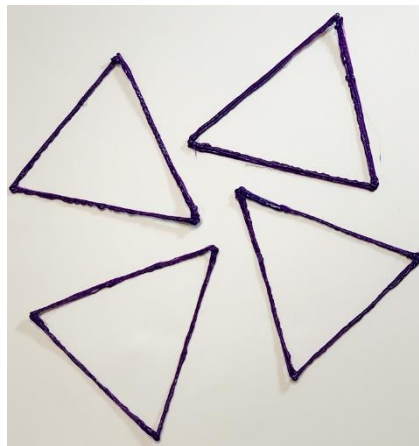
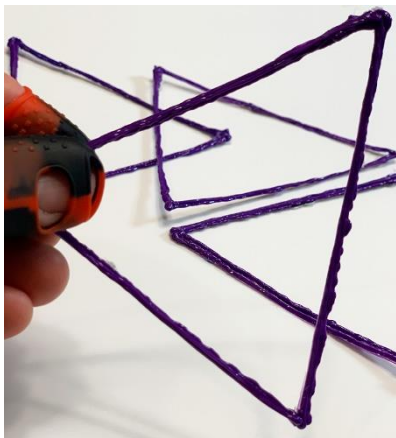
## Cube Stencil



## TRIANGLE BASED PYRAMID:



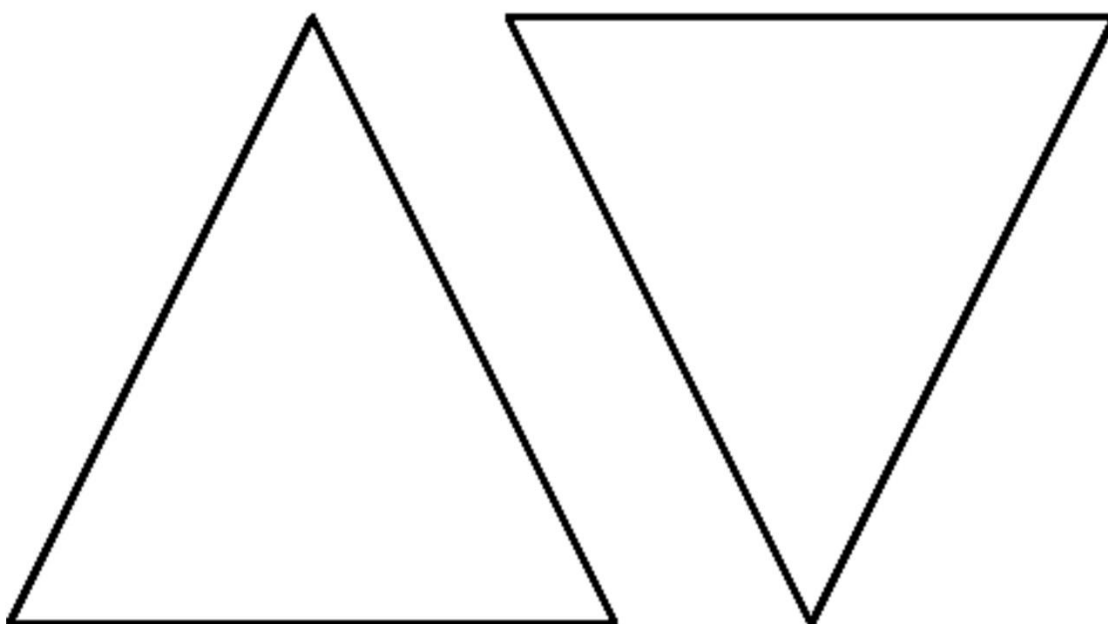
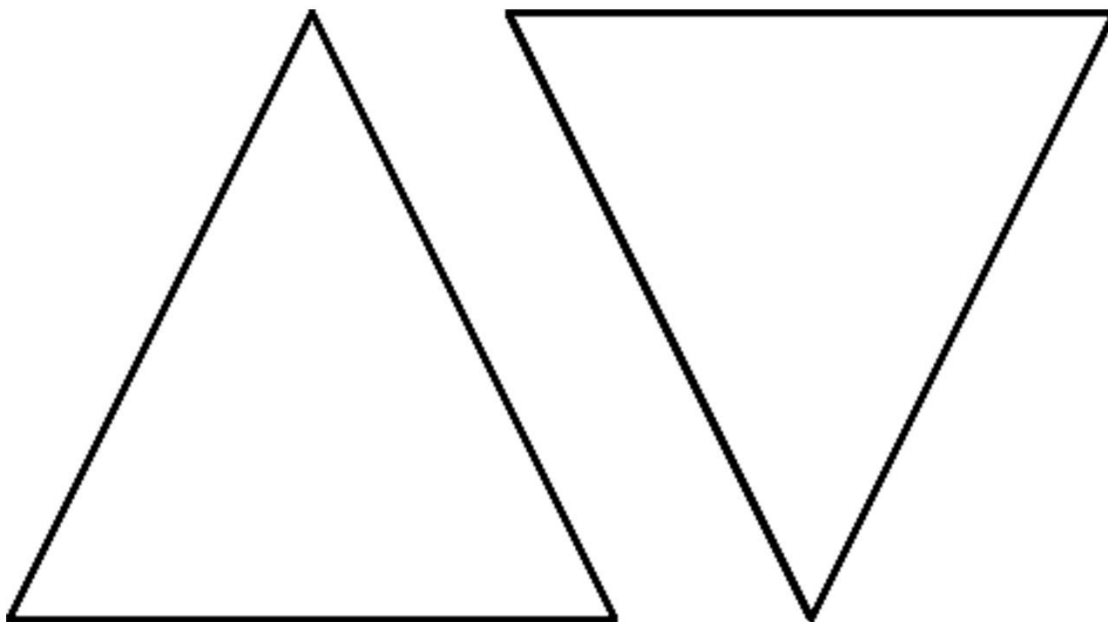
Find a starting point to anchor your filament. Move your 3D pen to outline the triangles. Carefully remove the triangles from the stencil. If you use a plastic sheet protector, the triangles should peel off the stencil easily. If you made the triangles by extruding the filament directly on the paper stencil, some of the paper will stick. Do not worry about this. To remove the paper, rinse with warm water and dry with a paper towel.



Arrange the triangles by placing them side to side at 60-degree angles. Weld where the two sides meet. Reinforce all the sides along the exterior with extra filament. Your triangle-based pyramid is finished!

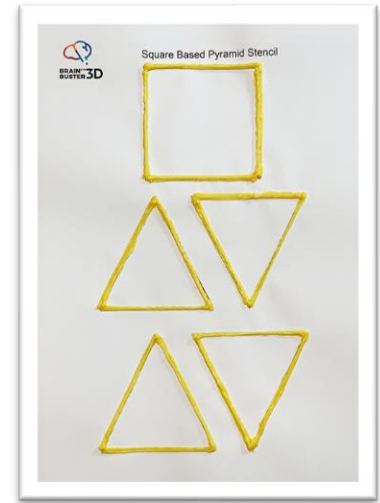
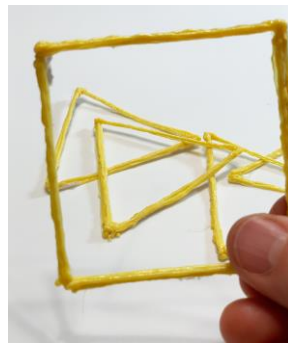
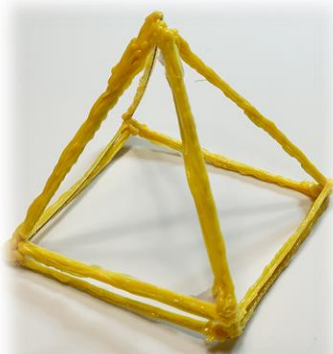
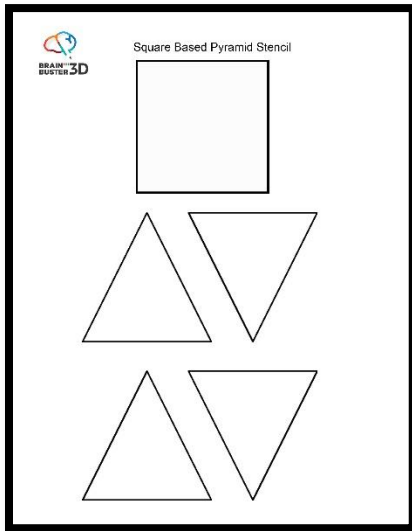


## Triangle Based Pyramid (Tetrahedron) Stencil

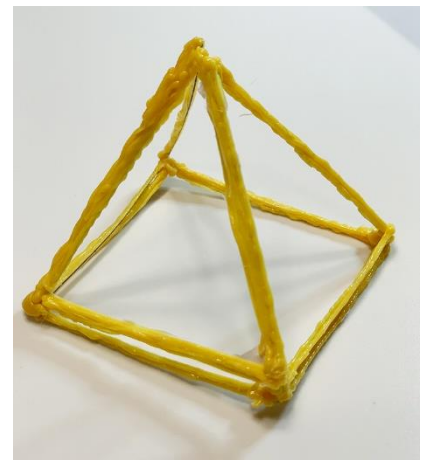
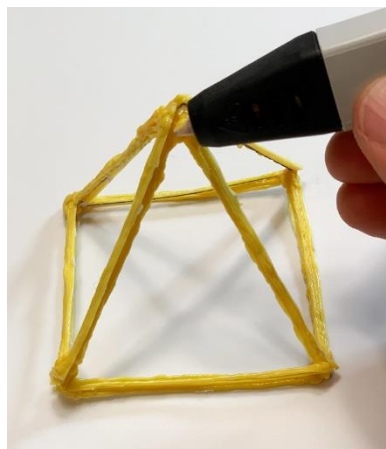
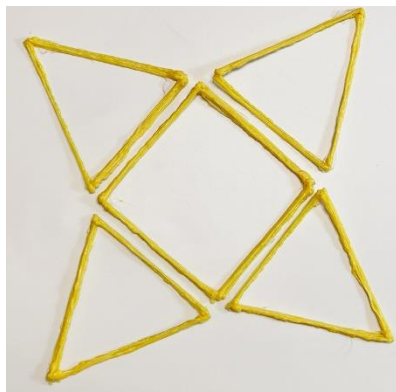




## SQUARE BASED PYRAMID:



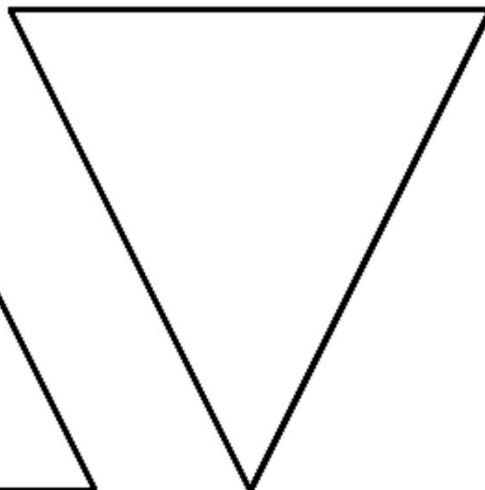
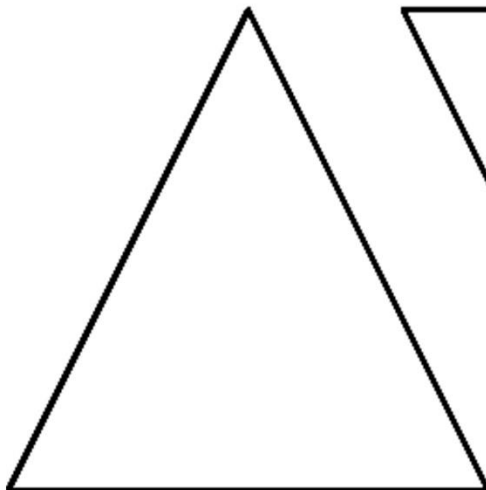
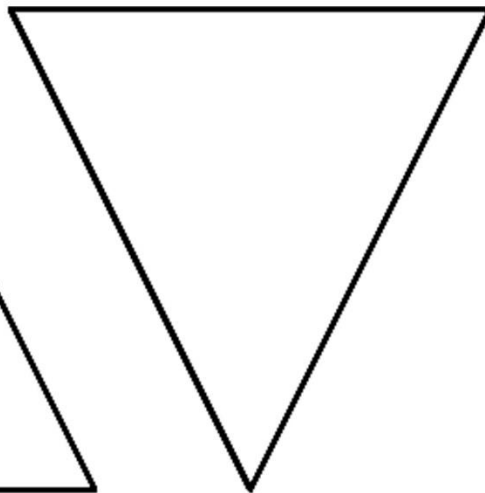
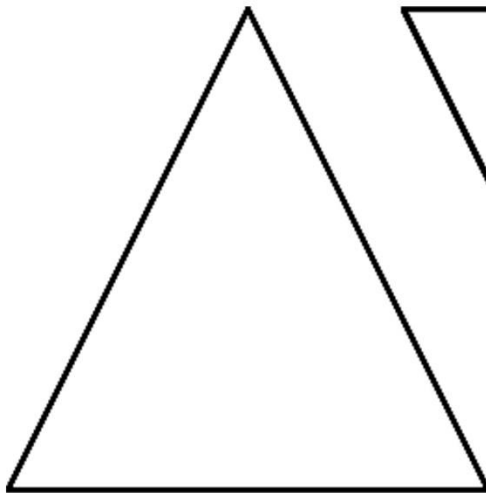
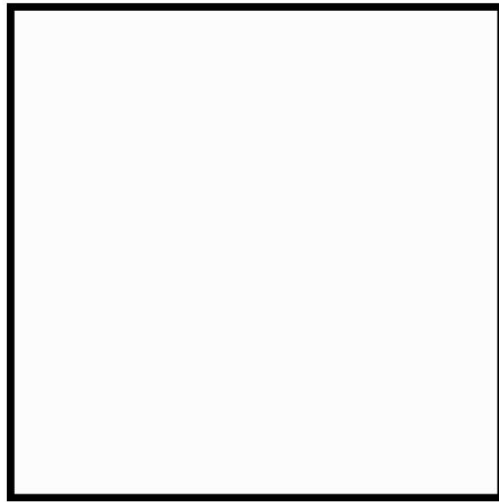
Find a starting point to anchor your filament. Move your 3D pen to outline the triangles and square. Carefully remove the shapes from the stencil. If you use a plastic sheet protector, the shapes should peel off the stencil easily. If you made the shapes by extruding the filament directly on the paper stencil, some of the paper will stick. Do not worry about this. To remove the paper, rinse with warm water and dry with a paper towel.



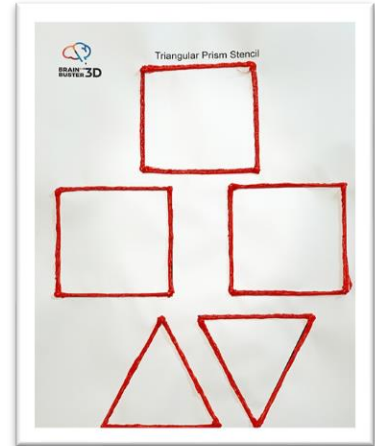
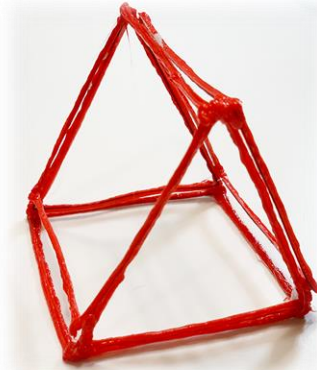
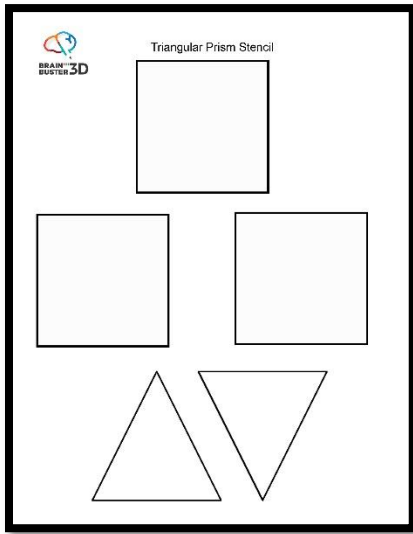
Arrange the triangles by placing them side to side at 60-degree angles. Weld the triangles to the square where the two sides meet. Weld the triangle sides. Reinforce all the sides along the exterior with extra filament. Your square-based pyramid is finished!



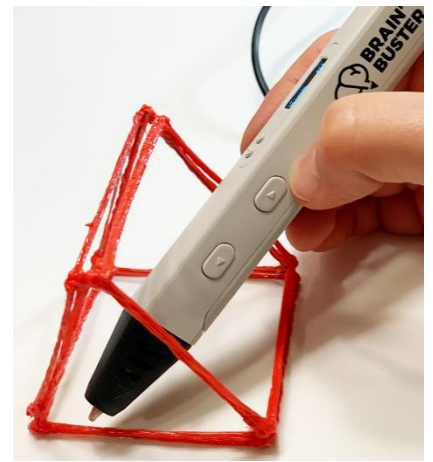
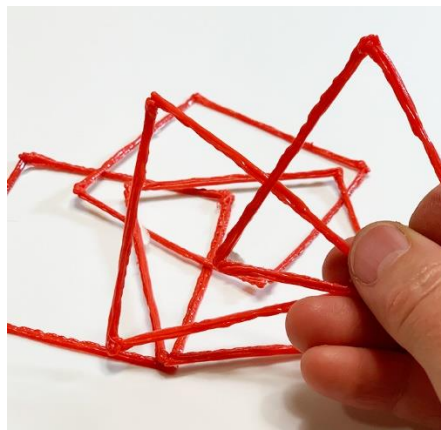
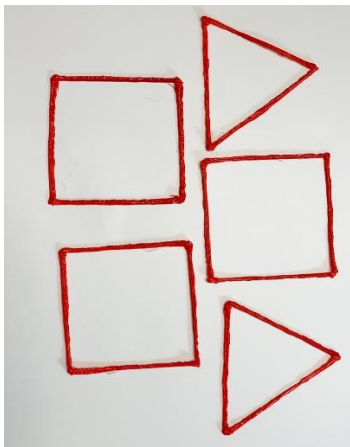
## Square Based Pyramid Stencil



## TRIANGULAR PRISM:



Find a starting point to anchor your filament. Move your 3D pen to outline the triangles and squares. Carefully remove the shapes from the stencil. If you use a plastic sheet protector, the shapes should peel off the stencil easily. If you made the shapes by extruding the filament directly on the paper stencil, some of the paper will stick. Do not worry about this. To remove the paper, rinse with warm water and dry with a paper towel.

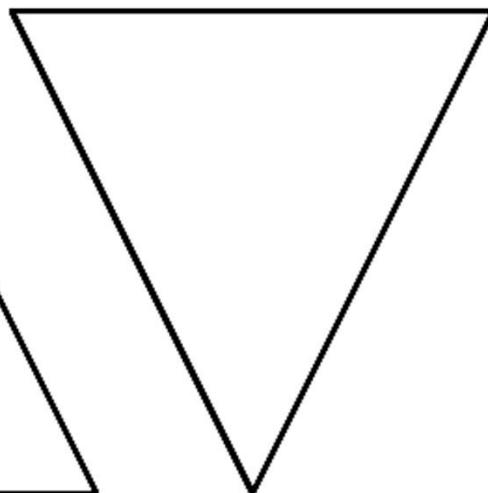
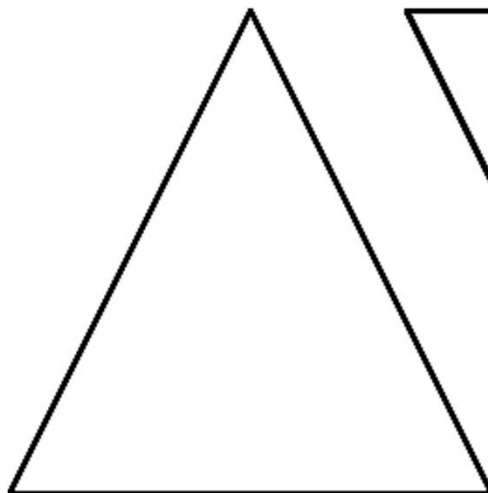
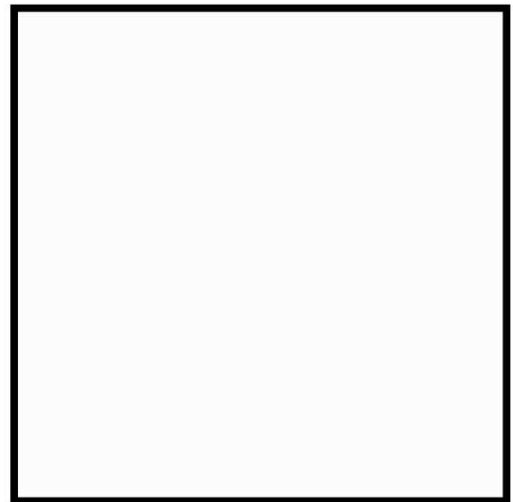
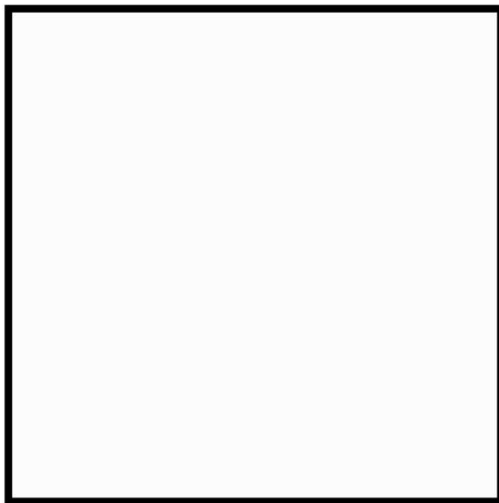
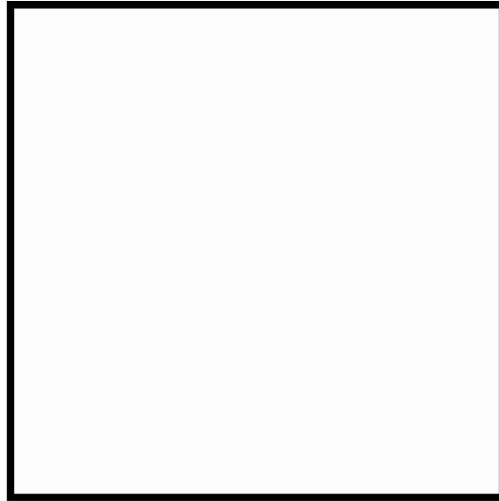


Arrange the squares by placing them side by side. Weld two squares at 60-degree angles to the square at the base. Weld the two triangles at each end. Reinforce all the sides along the exterior with extra filament. Your triangular prism is finished!

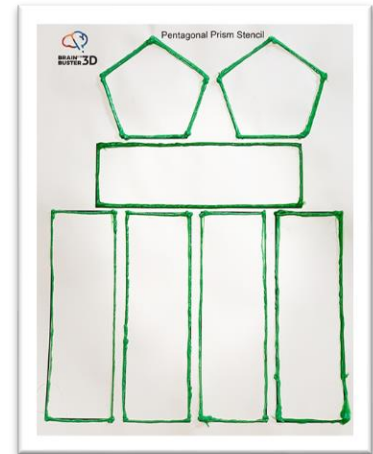
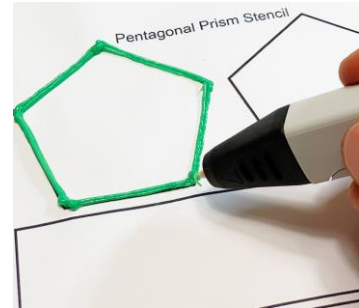
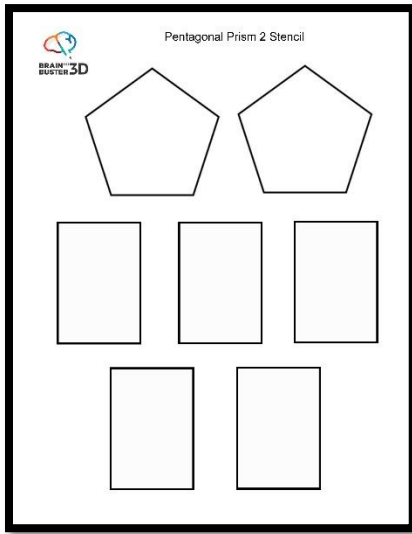




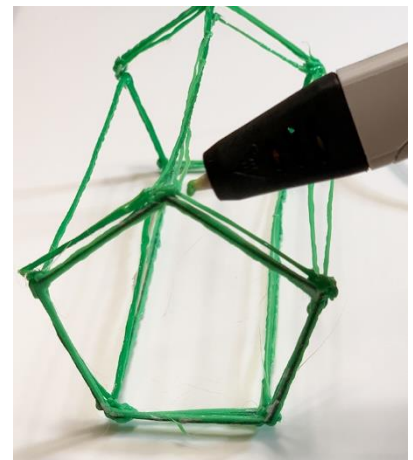
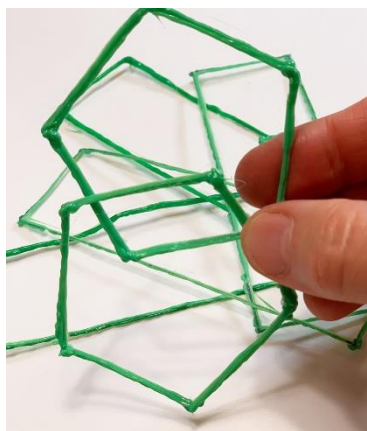
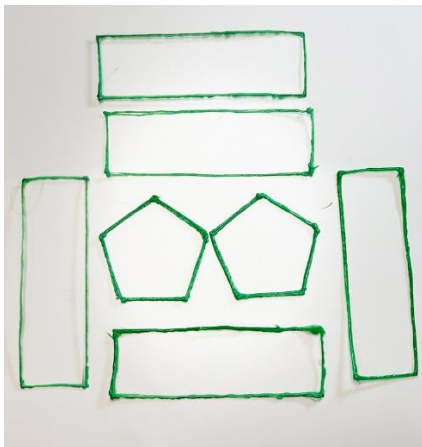
## Triangular Prism Stencil



## PENTAGONAL PRISM:



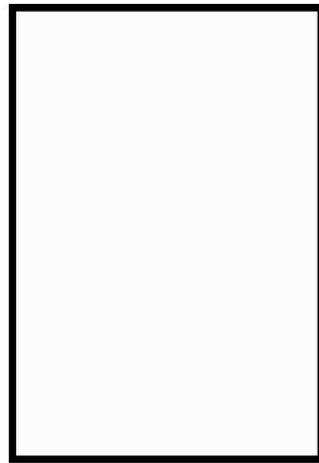
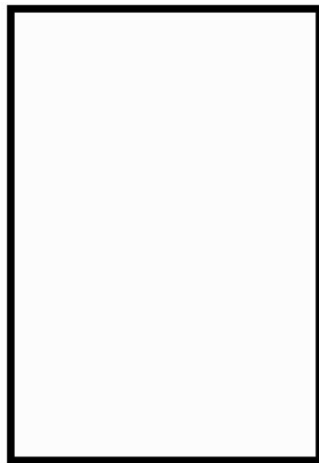
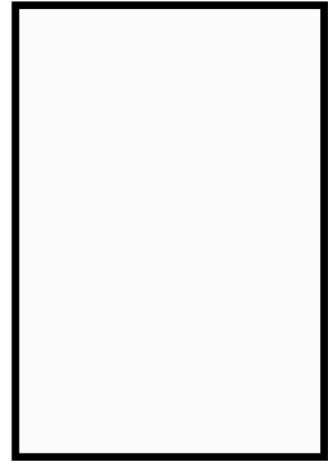
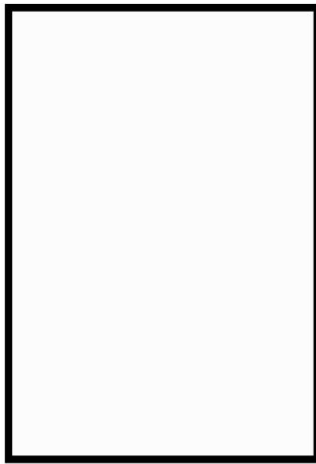
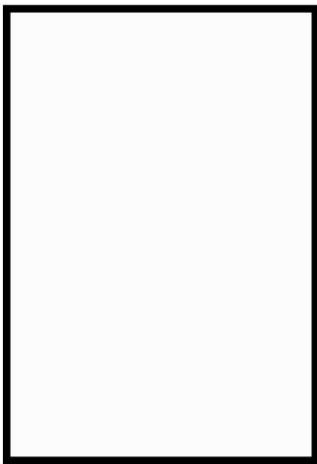
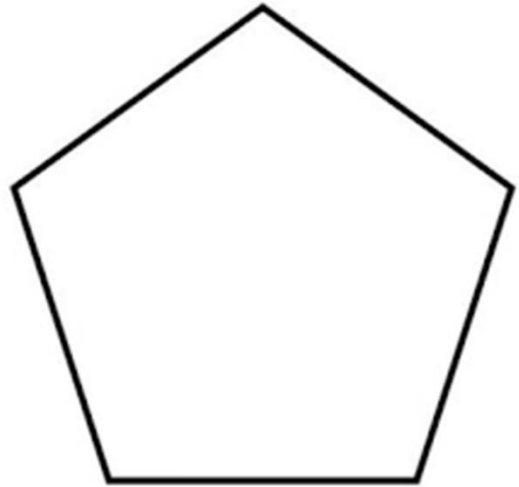
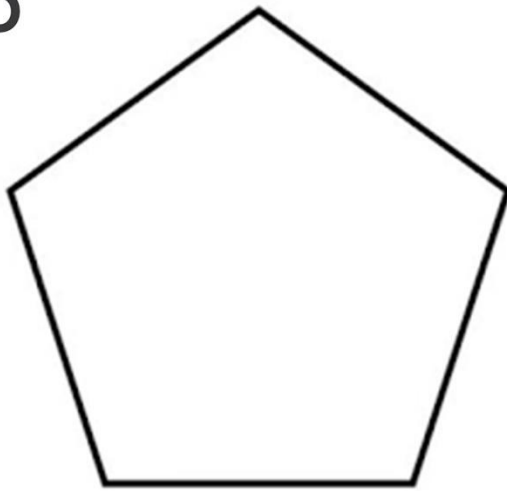
Find a starting point to anchor your filament. Move your 3D pen to outline the pentagon and rectangles. Carefully remove the shapes from the stencil. If you use a plastic sheet protector, the shapes should peel off the stencil easily. If you made the shapes by extruding the filament directly on the paper stencil, some of the paper will stick. Do not worry about this. To remove the paper, rinse with warm water and dry with a paper towel.



Arrange the rectangles by placing them side to side at 60-degree angles. Weld the pentagons to each end. Reinforce all the sides along the exterior with extra filament. Your pentagonal prism is finished!



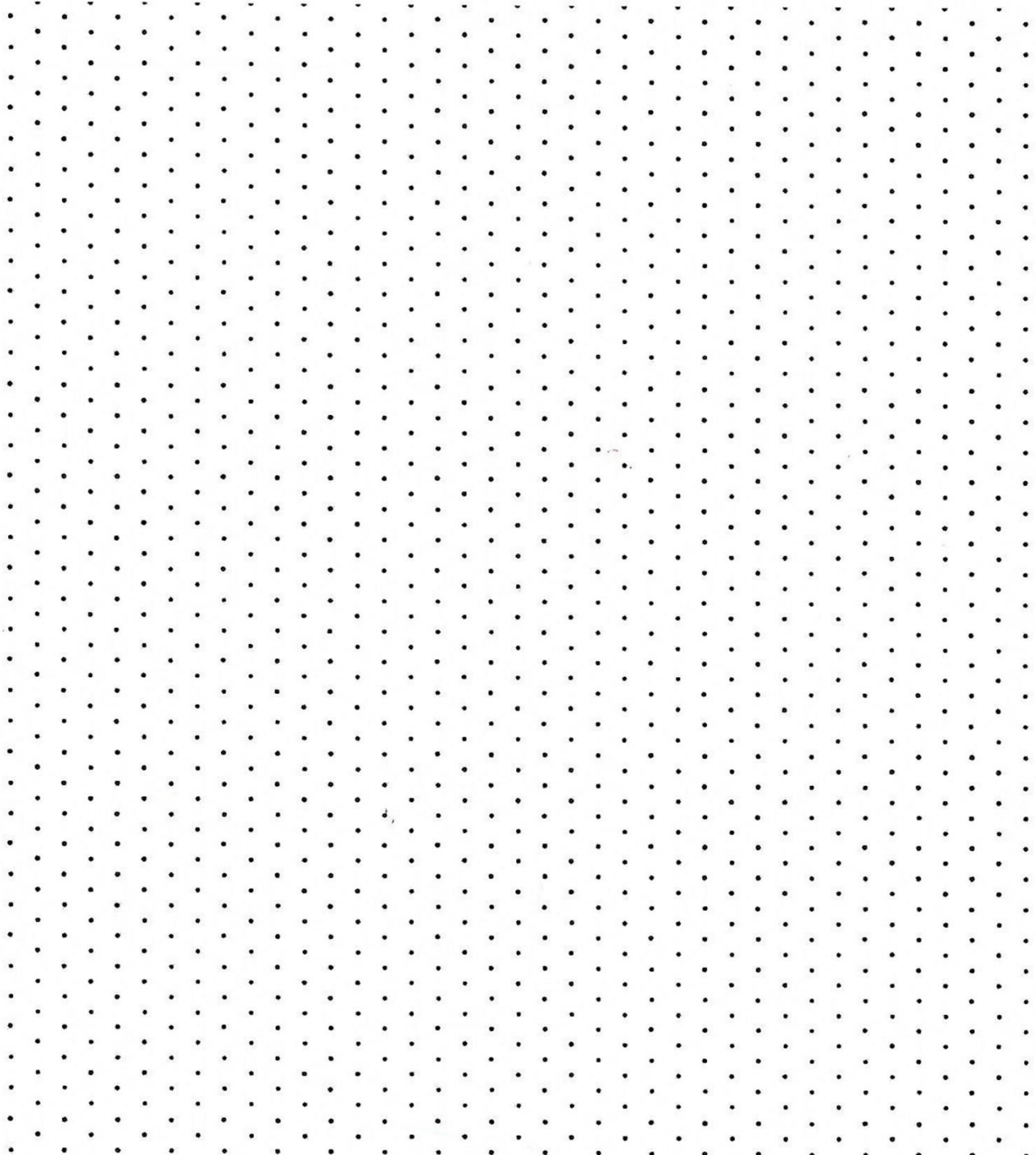
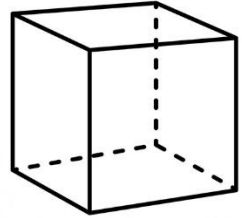
## Pentagonal Prism 2 Stencil





## Make Your Own Cube Stencil

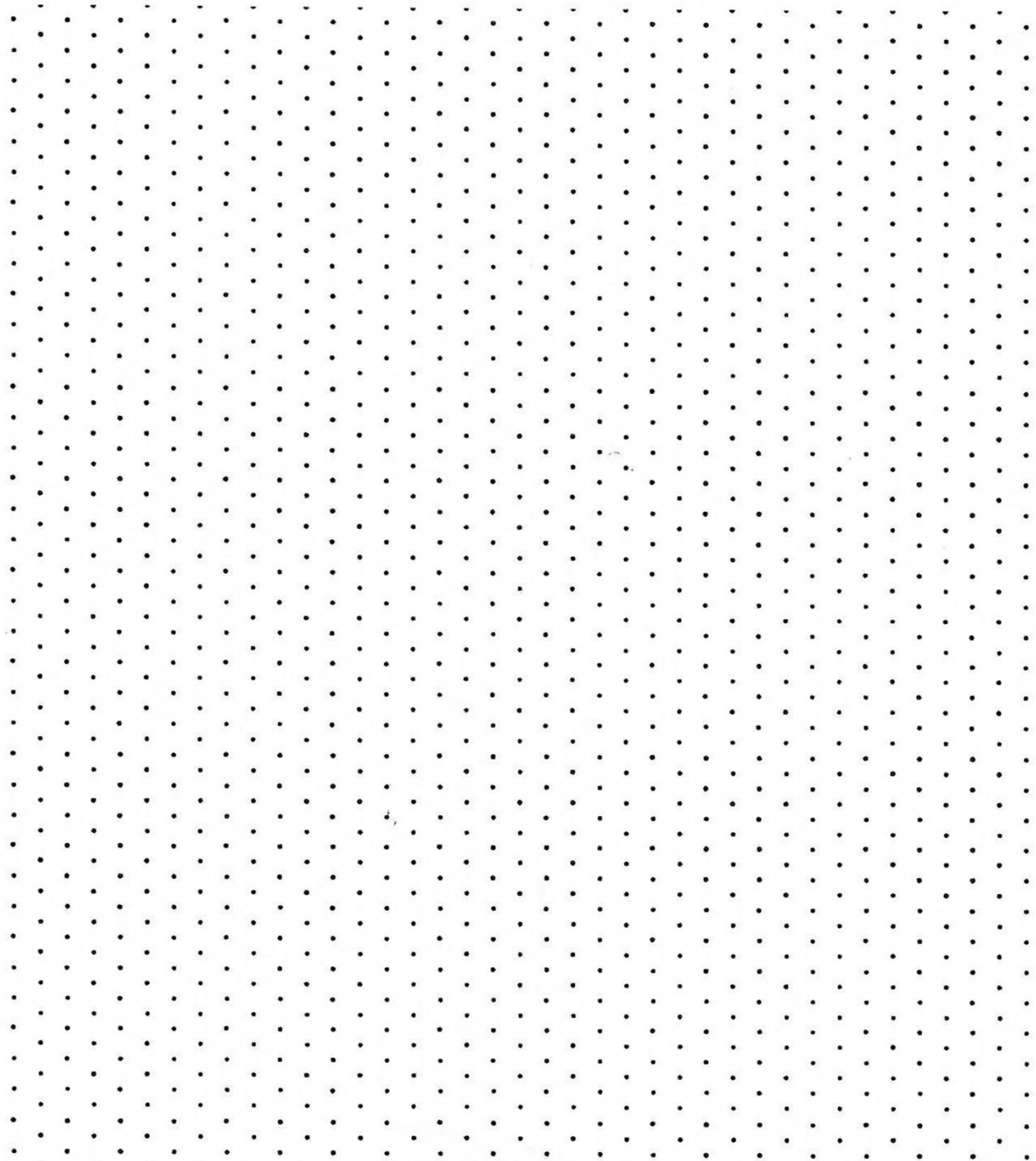
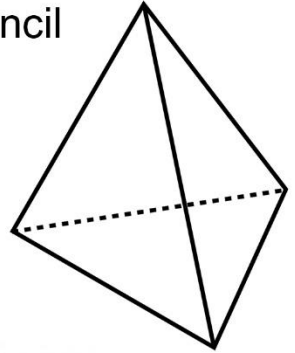
Come up with your own design ideas for constructing a cube. Draw a stencil. trace your design with your 3D Pen and test your design. Challenge yourself to make as many designs as you can.





## Make Your Own Triangular Pyramid Stencil

Come up with your own design ideas for constructing a triangular pyramid. Draw a stencil, trace your design with your 3D Pen and test your design. Challenge yourself to make as many designs as you can.







## Make Your Own Pentagonal Prism Stencil

Come up with your own design ideas for constructing a pentagonal prism. Draw a stencil, trace your design with your 3D Pen and test your design. Challenge yourself to make as many designs as you can.

