

Large Structures Pack



PITSCO
EDUCATION

Cautionary and Warning Statement

- This kit is designed and intended for educational purposes only.
- Use only under the direct supervision of an adult who has read and understood the instructions provided in this user guide.
- Read warnings on packaging and in manual carefully.

Materials Included

- 120 large chenille stems, assorted colors
- 180 AP Rocket Tubes

Items Required (not included)

- Wire cutters (for activity extension)
- Scissors (for activity extension)

Basic Construction Techniques

Three-way Joint

1. Fold the chenille stem in half. Hold the chenille stem about one-third of the way up from the folded end. Spread the two loose legs apart from each other about 90 degrees (Figure 1).
2. Twist the two loose legs together just above the place you are holding the chenille.
3. Fold the end of each loose leg toward the middle. This will form a T shape (Figure 2).
4. Place a tube on each of the three legs (Figure 3).



Figure 1



Figure 2



Figure 3

Four-way Joint

1. Cross two chenille stems in the middle to form a plus sign (Figure 4).
2. Twist the chenille stems together at their midpoints (Figure 5).
3. Bend each leg in half toward the center of the two joined chenille stems (Figure 6).
4. Place a tube on the end of each leg. Adjust the legs so they form the appropriate angles.



Figure 4



Figure 5



Figure 6

Five-way Joint

1. Fold a chenille stem to form a three-way joint.
2. Wrap a second chenille stem twice around the center of the three-way joint (Figures 7-8).
3. Fold the two arms in half so the ends meet at the center (Figure 9).
4. Place a tube on each leg and adjust them to form the appropriate angles.

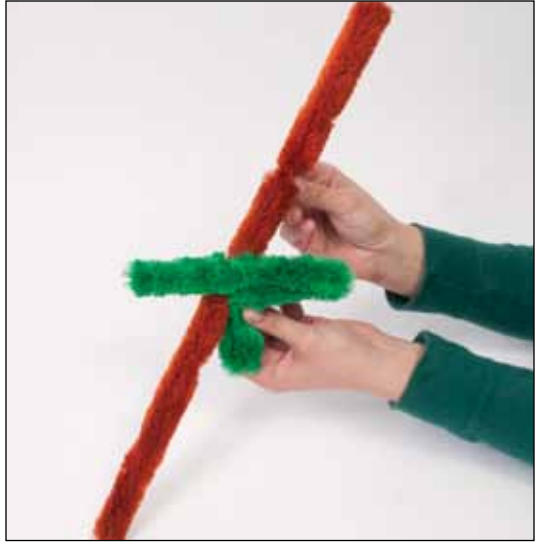


Figure 7



Figure 8



Figure 9

Glossary

- angle – a figure composed of two lines or rays with a common end point (the vertex of the angle)
- area – the size of an enclosed region
- edge – the set of points where the faces of a geometric solid intersect
- face – a planar surface of a geometric solid
- polyhedra – the plural of polyhedron; three-dimensional figures with many faces
- solid geometry – the branch of mathematics dealing with three-dimensional shapes
- surface area – for a polyhedron, the sum of the area of all the faces
- tetrahedron – a polyhedron with four triangular faces
- three-dimensional (3-D) – having length, width, and depth
- vertices – the plural of vertex; the set of all the points of intersection of a geometric solid's edges
- volume – the amount of space occupied by a three-dimensional object

Activities

Two-dimensional Shapes

1. Have students or teams of students (up to three students per team) construct triangles, squares, and pentagons using the large chenille stems and tubes.
2. Introduce the concept of a vertex and side in relationship to shapes. Also introduce the concept of regular in terms of geometric figures. Have students identify and count the number of vertices and sides for each shape and record their answers on a worksheet.
3. Have students stand each constructed shape on one side and test its stability/rigidity by pressing on different sides or points. Students should observe what happens and write one or two sentences about their observations for each shape.

Activities continued

Three-Dimensional Shapes

1. Introduce the concept of three-dimensional shapes as opposed to two-dimensional shapes. Have students identify various two-dimensional and three-dimensional shapes that can be found in your classroom.
2. Have students or teams of students (up to three students per team) construct tetrahedrons, cubes, and rectangular prisms using the large chenilles and tubes.
3. Introduce the concept of faces in relationship to three-dimensional figures.
4. Have students count the number of vertices, sides, and faces for each of the shapes they constructed and record their answers on a worksheet.
5. Have students stand each shape on one face and test its stability/rigidity by pressing on different sides and vertices. Students should observe what happens and write one or two sentences about their observations for each shape.

Modeling

Have students model a structure using the large chenilles and tubes. Options include but are not limited to bridges, buildings, and playground equipment or have them create something from their imaginations. If imaginative creations are constructed, be sure that the students provide a story or logical reason for each structure.

Extensions

1. Have students research examples of three-dimensional geometric shapes and model one of them. Have them count the number of vertices, sides, and faces of the structure and determine if the figure is regular.
2. Have students research Euler's formula and apply it to the geometric figures they have constructed. Have them determine if the formula holds true for each of the figures.
3. Have students construct irregular geometric figures by cutting the chenilles to length with wire cutters and by cutting tubes with scissors.
Caution: Cut chenille stems might have sharp ends. Construct longer members by taping two tubes together and cutting them to the desired length.
4. Have students research how many regular three-dimensional figures are possible and what the name of this group of figures is called.



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