My 3-D Geometry Packet
Dr. A and Ms. C's Math Class

Name: _____

Block: _____

Rules for 3D Geometry Stations

- You may work alone or with a partner.
- You have 3 days to complete all of the stations. You may move at your own pace, but you should complete at least 2 stations each day.
- You must do Station 2 before Station 3
- At each station, complete the task and fill out the correct worksheet from this packet.
- There may not be more than 4 people at 1 station at a time.
- After completing a station, check your work with a teacher before moving on to the next station.
- Leave each station as you found it. Take apart any work that you have done before the next group comes in.
- Stations 1 – 8 are required. You must finish them by the end of the 3 days. Station 9 is a bonus station. You may not start this station until you have finished all other stations and have had them all checked by a teacher.

Stations List

1) 3D Geometry

2) Views 1 and 2: Building Towers

3) Drawing Towers

4) Volume of 3D Shapes

5) Nets: Folding Shapes and Pentaminoes

6) Surface Area of 3D Shapes

7) Building Blocks

8) Building Regular Polyhedrons

9) Building Regular Polyhedrons (Bonus)

Station # 1
3D Geometry

1) Match the 3D shapes at the station with their name on the list below. Refer to the vocabulary list for help.

Rectangular prism: _____

Cone: _____

Cylinder: _____

Triangular prism: _____

Triangular pyramid: _____

Hexagonal prism: _____

Sphere: _____

Rectangular pyramid: _____

Cube: _____

2) Fill in the following table for the polyhedrons that you labeled. Use the models to help.

Polyhedron	Shape of Base(s)	Shape of Faces	Number of Bases	Number of Faces	Number of Edges	Number of Vertices
Rectangular Prism						
Triangular Prism						
Hexagonal Prism						
Cube						
Rectangular Pyramid						
Triangular Pyramid						

3) Do you see any patterns in the number of faces of the prisms?

4) Do you see any patterns in the number of bases of the prisms?

5) Do you see any patterns in the number of edges of the prisms?

6) Do you see any patterns in the number of vertices of the prisms?

7) Do you see any patterns in the number of faces of the pyramids?

8) Do you see any patterns in the number of bases of the pyramids?

9) Do you see any patterns in the number of edges of the pyramids?

10) Do you see any patterns in the number of vertices of the pyramids?

Station # 2
Views 1 and 2: Building Towers

- This station has 2 different tasks, Views 1 and Views 2. You may do them in either order.
- Take one set of cards and some blocks. Using the 4 cards, build the structure according to the directions.
- Check your answer to the problem with the teacher and get her signature *before* moving on to the other set.
- Answer the following questions after building the structures.

1) How would you explain to somebody else what the dotted lines on the cards mean?

2) How would you explain to somebody else what the solid lines on the cards mean?

3) What are the five views that you can use to build a structure and how did you use them to build your structure?

Teacher's Signature

Views #1: _____

Views #2: _____

Station # 3
Drawing 3D Shapes

1) Using the blocks, build any structure with the following properties:

    a) It should be irregular (like the shapes in Station #2).
    b) It may not be a prism.
    c) It must contain a maximum of 15 blocks.

    Do not take your structure apart until *after* you have finished and your work has been checked.

2) Using the grid paper, draw and label the North, South, East, West and Top views of your structure. Make sure to use dotted and solid lines in your drawing to indicate edges.

3) Explain how you used your structure to draw your picture.

Station # 4
Volume of 3D Shapes

Volume is the amount of a substance a 3D figure can hold.

1) Using the inch cubes, build a structure that is the same size and shape as the rectangular prism. The volume of this prism is the number of cubes used to build your structure. What is the volume of the rectangular prism?

2) How many cubes does it take to make up the base of the rectangular prism?

3) How is the number of cubes in the base related to the entire volume of the rectangular prism?

4) Using the inch cubes, build a structure that is the same size and shape as the cube. What is the volume of your structure?

5) How many cubes make up the base of the large cube?

6) How is the number of cubes in the base of the large cube related to the volume of the cube?

7) What do you think the formula (in words or symbols) for any solid with two identical bases is? Explain your answer.

8) Using your formula, find the volume of the triangular prism.

9) Find the volume of the cylinder.

Station # 5
Nets: Folding Shapes and Pentominoes

A **Net** is a flat pattern that can be folded to make a 3D figure.

1) Using the Folding Geometric Shapes, match the nets to their polyhedron.

Cube: _____

Rectangular Prism: _____

Triangular Prism: _____

Rectangular Pyramid: _____

Triangular Pyramid: _____

Cone: _____

Octagonal Prism: _____

Cylinder: _____

Pentominoes are an arrangement of 5 squares that are joined along their edges. There are 12 different pentominoes.

2) Using pentominoes A – F, determine which ones are nets for open cubes (a box with no top). Draw these pentominoes on a piece of one-inch graph paper.

- If you can't do them in your head, draw them on one-inch graph paper, cut them out, and fold them.
- WORK WITH YOUR PARTNER!

Station # 6
Surface Area of 3D Shapes

Surface Area the amount of exposed area of an object. To find the surface area of an object, you need to find the total area of each side.

1) Measure and list the area of each face of the cube in square inches.

2) To find the total surface area, add up the areas of each face. What is the total surface area of the cube?

3) Find an easier way to find the surface area, other than adding up all of the sides. What is it?

4) Using the inch cubes, build the large cube, and prove your answer to a teacher.

5) Measure and list the area of each face of the rectangular prism in square inches.

6) To find the total surface area, add up the areas of each face.
What is the total surface area of the rectangular prism?

7) Find an easier way to find the surface area, other than adding up all of the sides. What is it?

8) Do you think that your easier method will work for different prisms? What kind of prisms will it work for?

9) Find the surface area of Triangular Prism using your method.

10) Can you find a formula that can be used with any prism?

Station # 7
Building Blocks

1) There are four different rectangular prisms that contain exactly 12 cubes. Using the blocks on the table, build each of them, and then show them to a teacher. List the dimensions of the prisms below.

2) What are the dimensions of the different rectangular prisms that you can construct with exactly 8 cubes?

3) What are the dimensions of the different rectangular prisms that you can construct with exactly 20 cubes?

4) How could you determine all of the rectangular prisms that have the same volume without using cubes?

Station #8
Building Regular Polyhedrons

A **regular polyhedron**, or **Platonic Solid**, is a polyhedron where all faces are the same regular polygon.

A **regular polygon** is a polygon that is both equilateral (all sides have the same length), and equiangular (all angles have the same measure).

1) There are only five Platonic Solids. Using the pieces at the station, build the following three Platonic Solids. Show each one to a teacher. Then fill in the table below with the name of the solid, the number of vertices, and the number of edges

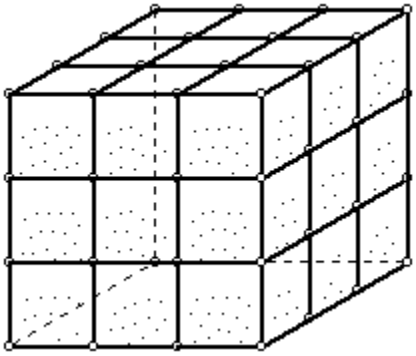
a) A polyhedron made from four triangles.
b) A polyhedron made from six squares.
c) A polyhedron made from eight triangles.

	Name of Platonic Solid	Number of Vertices	Number of Edges
a			
b			
c			

Station # 9 (bonus)

Painted Cubes

1) Jamie is finishing her art project. She takes 27 small cubes and puts them together to create a larger cube. She then paints the whole cube yellow. Build her cube, and then answer the questions below.



How many cubes are painted on only 1 side?

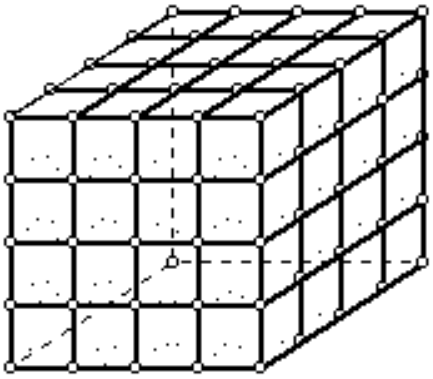
How many cubes are painted on exactly 2 sides?

How many cubes are painted on exactly 3 sides?

How many cubes are not painted at all?

What is the surface area of the large cube?

2) For John's project, he uses 64 cubes to make his larger cube. He then paints his large cube green. Build his cube, and then answer the questions below.



How many cubes are painted on only 1 side?

How many cubes are painted on exactly 2 sides?

How many cubes are painted on exactly 3 sides?

How many cubes are not painted at all?

What is the surface area of the large cube?

3) Do you see a pattern in the number of cubes that have exactly 3 sides painted?

4) Do you see a pattern in the number of cubes that have exactly 2 sides painted?

5) Do you see a pattern in the number of cubes that have exactly 1 side painted?