A Gr8 Metropolis!

All of the Grade 8 students at Britannia are a community and as a community, you are going to build a city! We are going to look at the elements of a city and as a class decide what kinds of buildings we think are essential to a thriving city. With a single partner or alone, you will create a building. As a class, we will create a city and as a group of classes (okay, only 2 classes) we will build a metropolis.

You and your partner will need to agree on the type of building you wish to create and check the city development plan to ensure that your building meets the requirements of the city. We need to make sure that our city has the "right number" of all the different types of buildings needed by a city. For example, we need a hospital but we don't need four hospitals.

You may use any materials you want to create your buildings (boxes, clean food containers such as cans and yogurt tubs etc). Each group will get a "building lot" that is 40 cm by 40 cm. This means that the "footprint" or base of your building cannot be any larger than this. The building can be as tall as you want but not taller than the height of a standard classroom door.

Step 1: Design and construction

Determine the shapes that your building will be made of. You must include at least 2 of the following shapes:

- Rectangular prism
- Triangular prism
- Cylinder
- Square pyramid
- Other shape that you get **pre-approved** by your teacher

Decide on and obtain the necessary materials for your building.

Construct your building. Your building must be sturdy enough to carry from one classroom to another.

Decorate the outside of your building. You might want to paint it or cover it with paper. Draw on or attach features such as windows, doors, flowerboxes, shingles, etc.

Step 2: 3-D Views and Nets

Build an architectural plan by creating isometric drawing (with measurements) (https://www.britannica.com/topic/isometric-drawing) of your building to show the front, back, top and side views. (Bonus)

Draw the nets for all of the shapes included in your building.

Measure and record the dimensions of each part of your building. Include these dimensions on your drawings and the nets.

Step 3: Calculating Volume and Surface Area

Calculate the total volume of your building. This represents the total space that will need to be heated/cooled in the building. Make sure to include all of the shapes. This must be written on a separate piece of paper. All calculations need to be shown. Please label each calculation, using diagrams if necessary, so that anyone who looks at your paper can follow your steps.

Calculate the total surface area of your building. This represents the total area that must be painted and/or covered with siding and/or covered with roofing material. Remember to subtract the parts of the building that would not be painted etc. Which parts are they?

This must be written on a separate piece of paper. All calculations need to be shown. Again, please label each calculation, using diagrams if necessary, so that anyone who looks at your paper can follow your steps.

Step 4: Reflection

Answer the following questions and hand them in with your Step 3 Calculations:

1. What went well? What didn't go well? Give detailed answers. Describe what you would do the same way if you had a similar project in the future. Describe how you would change things if you had a similar project in the future.
2. What surprised you about this project?
3. Explain how your understanding of surface area and volume has been affected by this project.
4. How has this project affected your perception of how mathematics is used in the real world?

Step 5: Presentation

When our buildings are complete, we will be setting up our city in Room 305 and inviting the rest of the school to look at it. The day after the presentation has been set up, the written work from Step 3, Step 4, and the Self-Evaluation will be due. You will receive rubrics to use as checklists to ensure that your project is complete.

Marking Rubric for A Gr8 Metropolis **Name: _____**

Partner: _____

Criterion	3	2	1	0
Building meets the size criteria		All criteria met	Some criteria met	No criteria met
Building is sturdy enough to move from place to place		Building was easily moved without damage	Some damage occurred when moved	Building fell apart when moved
Exterior of the building has realistic features (doors, windows, etc)	Many features; all are detailed and carefully designed	Few features; all are detailed and carefully designed or many features but not all are detailed and/or carefully designed	Few features; generally are not detailed or carefully designed	No exterior features
Overall appearance	Excellent	Good	Average	Below Expectations
First 3-D shape: net with measurements	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
First 3-D shape: volume calculation	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
First 3-D shape: surface area calculation (x2)	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
Second 3-D shape: net	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
Second 3-D shape: volume calculation	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
Second 3-D shape: surface area calculation (x2)	Detailed and accurate	Accurate or detailed	Submitted	Not submitted
Reflection	Complete and thoughtful	Complete or thoughtful	Submitted	Not submitted
Self-Evaluation	Complete and thoughtful	Complete or thoughtful	Submitted	Not submitted

Self-Evaluation for A Gr8 Metropolis **Name: _____**

Part I: Curricular Competencies

Content Outcome	**Personal Mastery Level**	**Evidence from Project** Which parts of your project & solution show that you have mastery of this learning outcome? You **MUST** include written parts or pictures of your solution.
3-1. Draw and construct nets for 3D objects	M PM NI	
3-2. Find the surface area of regular right prisms and square pyramids: -rectangular (boxes) -triangular (tents) -Circular (cylinders) -square pyramid	M PM NI	

Learning Outcome	**Personal Mastery Level**	**Evidence from Project** Which parts of your project & solution show that you have mastery of this learning outcome? You **MUST** include written parts or pictures of your solution.
3-3. Find the volume of regular right prisms and square pyramids: -rectangular (boxes) -triangular (tents) -Circular (cylinders) -square pyramid	M PM NI	
3-5. Find the surface area of regular right prisms -rectangular (boxes) -triangular (tents) -Circular (cylinders)	M PM NI	

Check all parts of the project that YOU worked on, either alone or collaboratively with your group.

O Creating prisms and 3D objects out of cardboard / other materials	O Determining SA that would be painted
O Designing and constructing building out of the 3D objects	O Determining SA that would be roofed
O Decorating building	O Determining Volume of building(s)
O Measuring dimensions of building and 3D objects using rulers, calipers, tape measure	O Determining total SA of building

2. Check all parts of the project that you did not work on (i.e. other group members worked on):

O Creating prisms and 3D objects out of cardboard / other materials	O Determining SA that would be painted
O Designing and constructing building out of the 3D objects	O Determining SA that would be roofed
O Decorating building	O Determining Volume of building(s)
O Measuring dimensions of building and 3D objects using rulers, calipers, tape measure	O Determining total SA of building

3. For the parts of the project that you did not work on, what DID you do to make sure you understood those parts of your group's solution by the due date? Be detailed! (If you did not do anything, leave it blank, don't lie! You still have a chance to do something☺)

4. For the parts of the project that you did not work on, what WILL you do to make sure you understood those parts of your group's solution by the time I talk to you? Be detailed!