**TEMPLATE: Contextualized Learning Activities (CLAs)**

| Contact Information | |
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| **Board** | **Waterloo Catholic District School Board** |
| **Development date** | **June 29-July 3, 2009** |
| **Contact person** | **Gord Burnett, Don Cleverley** |
| **Position** | **Mathematics Teachers** |
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| **Specialist High Skills Major** | *Construction and Manufacturing* |
| **Course code and course title** | MCT4C Mathematics for College Technology |
| **Name of contextualized learning activity** | *Mathematics required for the design of a bungalow* |
| **Brief description of contextualized learning activity** | The activity will allow students to explore the mathematics related to designing a bungalow. They will use Geometer's Sketchpad and online resources to help them accomplish this task. This activity covers the expectations in the Applications of Geometry strand section 2. |
| **Duration** | *6-9 hours* |
| **Overall expectations** | *MCT4C: Applications of Geometry: By the end of the course, students will:*<br>*Solve problems involving two-dimensional shapes and three-dimensional figures arising from real-world applications.*<br>*Selecting Tools and Computational Strategies: select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems.* |
| **Specific expectations** | *D.2.2.1 Gather and interpret information about real-world applications of geometric shapes and figures in a variety of contexts in technology-related fields (e.g. Product design, architecture) and explain these applications*<br><br>*D.2.2.2 Perform required conversions between the Imperial system and the metric system using a variety of tools (e.g. Tables, calculators, online conversion tools) as necessary within applications*<br><br>*D.2.2.3 Solve problems involving the areas of rectangles, parallelograms, trapezoids, triangles and circles, and of related composite shapes, in situations arising from real-world applications.*<br><br>*D.2.2.4 Solve problems involving the volumes and surface areas of spheres, right prisms, and cylinders, and of related composite figures, in situations arising from real-world applications.* |

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| **Catholic graduate expectations (if applicable)** | **CGE4f** -applies effective communication, decision-making, problem-solving, time and resource management skills;<br>**CGE3c** -thinks reflectively and creatively to evaluate situations and solve problems;<br>**CGE2b** -reads, understands and uses written materials effectively;<br>**CGE5g** -achieves excellence, originality, and integrity in one's own work and supports these qualities in the work of others; |
| **Essential Skills and work habits** | **Essential Skills**<br>➢ Reading Text<br>➢ Writing<br>➢ Document Use<br>➢ Computer Use<br>➢ Oral Communication<br>Numeracy<br>➢ Money Math:<br>➢ Scheduling or Budgeting and Accounting:<br>➢ Measurement and Calculation:<br>➢ Numerical Estimation:<br>Thinking Skills<br>➢ Job Task Planning and Organizing<br>➢ Decision Making<br>➢ Problem Solving .<br>➢ Finding Information<br>**Work habits**<br>➢ Teamwork<br>➢ Reliability<br>➢ Organization<br>➢ Working Independently<br>➢ Initiative<br>➢ Self-advocacy |

## Instructional/Assessment Strategies

**Teacher's notes :**
Start with a question(s) that engages the students and gets them thinking.

e.g. How many of you live in a new home? How many of you have seen renovations done to your present home? What information did your parents need to have to buy a new home or renovate an existing home? What math did they need to know to design and cost a new home or renovations?

Use this question to connect the activities in the unit. Post it on the board or on a Word Wall and leave it up during the activity.

Share the overall plan of the activity with the class. Hand out portfolios. You may wish to have these made up with everything in them. This will give students an opportunity to grasp the whole project. It will also help keep them organized. Collect portfolios at the end of each day.

Day 1: Work through lesson (included). Before Day 2, look over their 'Minds On' work and see where they are with conversions and what you need to do next for students who are having difficulty. Remind students that they need to have the Home Activity from Day 1 completed and that you will be "marking it". If they have questions, they need to ask today.

Day 2, 3: Computer lab Go over basic functions of GSP as a demo and outline the task. Teachers may use the floor plan included in the GSP instructions (provided) or have students source their own. Give students some time to "play" with the program. However, explain that there will be only two days in the lab, so they need to make sure they use their time efficiently. This includes getting prices for flooring, paint and shingles.

Day 4: Guest speaker: Choose a student to introduce and another student to thank the speaker.
Give time for students to complete their reflection at the end of the period. The template for this has been included.

Day 5 Complete calculations needed for costing sheet. Write a short report summarizing what you have learned. Hand in completed portfolio.

Jazz Day(s) (as necessary to a max of two)

**Context**

Designing a bungalow. Costing flooring, painting and shingling.
Applicable to construction and manufacturing sectors.

**Strategies**

- ***Introduce guiding question (big idea) that will identify the purpose for the activity***
- ***Review prerequisite skills and concepts, namely area, perimeter, volume and conversion of units between Imperial and metric***
- ***Provide familiar contexts as a starting point e.g. Measurement of the classroom***
- ***Use three part lesson (Minds On, Action, Consolidate Debrief as a way of building structure and giving variety to the delivery) incorporating both teacher instruction and student-centred collaborative learning models.***
- ***Collect work at the end of each period and use it to gather formative assessment data and give timely feedback to students***
- ***Provide necessary supports by way of handouts and coaching for students experiencing difficulty***
- ***Day to day student conferencing will help ensure students are on-track and moving successfully through the activity. Students will also have a portfolio with a***

***checklist in it to self-monitor their progress.***

- ***An assessment rubric is provided for the summative activity at the end of the CLA.***
- ***Accommodations will be made to fit students' needs regarding readiness and ability. Alternate ways of demonstrating the expectations will be available as options for teachers to use.***

## Assessment and Evaluation of Student Achievement

| **Strategies/Tasks** | **Purpose** |
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| 1. Keep a portfolio of the work done during this activity | Assessment for Learning: diagnostic and formative<br>Assessment of Learning: summative |
| 2. Provide a checklist of work to be done and include a copy on the cover of the portfolio. | Assessment as Learning:<br>Students can chart their own progress as work completion. (reflective process; how doing so far?; what do I have left to do? |
| 3. Sentence starters or guiding questions for reflection on guest spe | Assessment for Learning: formative<br>Assessment as Learning: self-assessmer |
| 4. Completed activity with all relevant worksheets, reflection (journa entry), GSP drawings and costing | Assessment of Learning: summative |

**Assessment tools**

*BLM # 1 & 2 Worksheets with calculations (formative)*
*Rubric provided for GSP sketch & Word printouts and for BLM #3 Costing sheets (formative)*
*Reflection on guest speaker (formative)*
*Completed portfolio (summative)*

## Additional Notes/Comments/Explanations

Timing for each lesson is approximate. Students should be able to work through the activity at their own pace with limited teacher intervention in 6-8 days.

Day 1 models a three-part TIPS4RM style lesson. Remaining lessons are not included, but could be designed in this style.

Having a skill-building Minds ON activity to lead into the main activity or to recap important concepts from the previous day(s) is an excellent way to start each day. We have left this open to your creativity.

Be sure to have time at the end of the period for a consolidate and debrief session. This reminds students of what they should have learned or been working on during the period and gives an opportunity to introduce tomorrow's work. This is also a good time for timeline reminders.

**Teacher To Do List:**

Book computer lab time. (2 days)

Photocopy worksheets ahead of time.

If you are not a frequent user of Geometer's Sketchpad, go over the activity to make sure you are comfortable with it. (It is very approachable.)

Solutions to Minds On and Home Activity questions are provided.

Book guest speaker. Arrange for small gift (e.g. coffee mug, T-shirt, Tim Horton's gift certificate)

Formula sheet for perimeter, area, volume (provided on BLM #1 & 2, but the grade 9 academic EQAO ones are good also and can easily be downloaded from the EQAO website and copied for everyone)

## Resources

*Internet access; GSP Geometer's Sketch Pad*

**Authentic workplace materials**
*Floor plans for houses; pricing for flooring, paint and shingles*

**Human resources**
*Guest speaker from either construction industry or interior design.*

**Print**
*BLM #1,#2,#3; GSP instructions (with house floor plan); Portfolio Checklist; Reflection questions/sentence-starters for guest speaker visit;*

**Video**
**N/A**

**Software**
**GSP (Geometer's Sketch Pad)**

**Websites**
*A list of "help" sites is provided. Students are to search for and use a website showing bungalow floor plans. One suggested site is*: **www.houseplans.com**

**Other**
*Questions for 'Minds On' for Day 2,3,4,5 (created by the teacher)*

## Accommodations

Differentiated Instruction Suggestions:

1. Manipulatives should be available for students to build the shape. (eg. linking cubes, tiling blocks)
2. Have a couple alternate floor plans with straightforward dimensions to help students get started.
3. Students could draw a proper scale drawing with pencil and paper in place of the GSP activity, if they have difficulty working with GSP.
4. Have selected rooms (with dimensions) and costs of materials available so that students can simply do the calculations. This works well for students who have attendance or time-management issues or for students who have difficulty staying on-task when they go online.
5. Have an overhead/hard copies of examples to show to students. (What is the target? Where are we going with this?)
6. Additional accommodations as required by a student's need, readiness and interest.

## List of Attachments

***A/*** *Introduction for Students*
***B/*** *"Support Documents" including:*
*An initial and Day 1 planning guideline for the teacher*
*Portfolio Checklist (as an aid for student & teacher)*
*GSP instructions (2 sheets) & sheet of suggested help sites plus assessment rubric*
*BLM #1 (Minds On), #2 (Home Activity), & #3 (2 Costing Sheets)*
*Reflection questions/sentence starters for guest speaker visit.*
***C/*** *Solutions for BLM #1 & 2, plus Additional/Extra GSP work – some suggested solutions*

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**CLA for Construction Major in MCT4C Geometry**: A note on the use of commercial resources:
All of the work and diagrams in this CLA are original, except for two diagrams in the Geometer's Sketchpad assignment. Permission was supplied to use these 2 diagrams, as indicated in the following email exchange:

Good afternoon Don,
Thank you for your email and request for permission. For educational purposes, you have permission to use the sketch and floor plan images for house plan 18-1039 for the purpose of your paper. Good luck and have a great Summer.
Arend Spaeth
Houseplans.com
Sales and Customer Service Manager
1-888-705-1300

On Tue, Jun 30, 2009 at 7:51 AM, Don Cleverley <Don.Cleverley@wcdsb.ca> wrote:
Hi - I'm wondering if I can have permission to use your sketch and floor PLAN # 18-1039 for some curriculum work I'm doing (in Kitchener, Ontario, Canada). The paper will be used for a grade 12 Math course, and is purely for educational purposes. It has to be approved by our Ministry of Education, who require confirmation that you have given permission.
Address: http://www.houseplans.com/728-square-feet-2-bedroom-1-bathroom-Bungalow-House-Plans-0-garage-(1018)
Hoping that is OK, and with thanks.
Don Cleverley