

| Contact Information | |
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| Board | Waterloo Catholic District School Board |
| Development date | July 2011 |
| Contact person | Michael Sullivan Susan Sawchuk |
| Position | Technology teacher Mathematics teacher |
| Phone | (519) 621-4050 ext. 676 (519) 621-4050 ext. 616 |
| Fax | (519) 621-4057 |
| E-mail | michael.sullivan@wcdsb.ca susan.sawchuk@wcdsb.ca |
| SHSM sector | Manufacturing |
| Course code and course title | MCF3MI Functions and Applications |
| Name of CLA | Trigonometry for the Manufacturing Sector |
| Brief description of CLA | This CLA focuses on solving trigonometric problems using primary trigonometric ratios, the sine law and the cosine law. SHSM students will solve real-world application problems relating to the Manufacturing sector. Students will communicate their thinking and show mathematical reasoning as they solve problems. |
| Key Search Terms (Do not use SHSM, CLA, Course Code or Sector) | trigonometry, sine law, cosine law, calculations |
| Duration | eight 76-minute periods totalling 608 minutes |
| Overall expectations | TRIGONOMETRIC FUNCTIONS By the end of this contextualized learning activity, students will: 1. solve problems involving trigonometry in acute triangles using the sine law and the cosine law, including problems arising from real-world applications |
| Specific expectations | TRIGONOMETRIC FUNCTIONS By the end of this contextualized learning activity, students will: 1.1 solve problems, including those that arise from real-world applications (e.g., surveying, navigation), by determining the measures of the sides and angles of right triangles using the primary trigonometric ratios 1.2 solve problems involving two right triangles in two dimensions 1.4 describe conditions that guide when it is appropriate to use the sine law or the cosine law, and use these laws to calculate sides and angles in acute triangles 1.5 solve problems that require the use of the sine law or the cosine law in acute triangles, including problems arising from real-world applications (e.g., surveying, navigation, building construction) |

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| <p>Catholic graduate expectations (if applicable)</p> | <p>The Catholic graduate is expected to be a “Discerning Believer Formed in the Catholic Faith Community” who:</p> <p>CGE2a -listens actively and critically to understand and learn in light of gospel values</p> <p>CGE2b -reads, understands and uses written materials effectively</p> <p>CGE2c -presents information and ideas clearly and honestly and with sensitivity to others</p> <p>CGE4e -sets appropriate goals and priorities in school, work and personal life</p> <p>CGE4f -applies effective communication, decision-making, problem-solving, time and resource management skills</p> |
| <p>Essential Skills and work habits</p> | <p style="text-align: center;">Essential Skills</p> <ul style="list-style-type: none"> ✓ Reading Text ✓ Writing <input type="checkbox"/> Document Use <input type="checkbox"/> Computer Use <input type="checkbox"/> Oral Communication <p>Numeracy</p> <ul style="list-style-type: none"> <input type="checkbox"/> Money Math <input type="checkbox"/> Scheduling or Budgeting and Accounting ✓ Measurement and Calculation <input type="checkbox"/> Data Analysis <input type="checkbox"/> Numerical Estimation <p>Thinking Skills</p> <ul style="list-style-type: none"> ✓ Job Task Planning and Organizing <input type="checkbox"/> Decision Making ✓ Problem Solving <input type="checkbox"/> Finding Information <p style="text-align: center;">Work Habits</p> <ul style="list-style-type: none"> ✓ Working Safely <input type="checkbox"/> Teamwork <input type="checkbox"/> Reliability ✓ Organization ✓ Working Independently ✓ Initiative <input type="checkbox"/> Self-advocacy <input type="checkbox"/> Customer Service <input type="checkbox"/> Entrepreneurship |

Instructional/Assessment Strategies

Teacher's notes

The Mathematics teacher should communicate with the Technology teacher on a regular basis. Both teachers should be kept up to date on developments that correspond to each other's courses.

The teacher should become familiar with the use of mathematics in the Manufacturing course.

Providing applicable real life examples from the manufacturing sector can be beneficial for student learning.

Constant diagnostic and formative feedback is important for consistent learning and student development (ie. through use of student worksheets).

Lesson 1:

Before class starts, print one copy of the "Practice with SOH CAH TOA" handout for each student.

Lesson 2:

Before class starts, print one copy of the "Applying Trigonometry" handout for each student.

Before class starts, print one copy of the "SOH CAH TOA Quiz" for each student.

At the end of this class, collect student quizzes for formative assessment.

Lesson 3:

Before class starts, select practice problems from the textbook or other sources that require use of the sine law.

Lesson 4:

Before class starts, select word problems from the textbook or other sources that require use of the sine law.

Before class starts, print one copy of the "Sine Law Quiz" for each student.

At the end of this class, collect student quizzes for formative assessment.

Lesson 5:

Before class starts, select practice problems from the textbook or other sources that require use of the cosine law.

Lesson 6:

Before class starts, select word problems from the textbook or other sources that require use of the cosine law.

Before class starts, print one copy of the "Cosine Law Quiz" for each student.

At the end of this class, collect student quizzes for formative assessment.

Lesson 7:

Before class starts, select a variety of word problems from the textbook or other sources that require use of the primary trigonometric ratios, sine law and cosine law.

Lesson 8:

Before class starts, print one copy of the "Summative In Class Assignment" for each student.

At the end of this class, collect student work for summative assessment.

Alternatively, co-ordinate a suitable time for SHSM students to work on the "Summative Performance Task" in the Manufacturing classroom.

Context

This CLA ensures students have the ability to solve trigonometric problems using primary trigonometric ratios, the sine law, and the cosine law since this type of problem will definitely be encountered in workplace scenarios. A practical use in the Manufacturing field would be calculation of side lengths and/or angles prior to the manufacture of a part or tool at a tool and die shop.

Strategies

Day 1:

-review prior knowledge of primary trigonometric ratios, focussing on conventions for labelling sides of triangle

Day 2:

-reinforce and expand on knowledge of primary trigonometric ratios through continued practice using these ratios to solve for required information in a right triangle
-administer formative quiz on primary trigonometric ratios

Day 3:

-return and discuss solutions to formative quiz on primary trigonometric ratios
-discuss situations that do not involve right triangles
-introduce sine law and conditions for its use
-model use of sine law to solve for missing information in an acute triangle

Day 4:

-reinforce and expand on knowledge of sine law through continued practice solving application problems with real world contexts
-administer formative quiz on sine law

Day 5:

-return and discuss solutions to formative quiz on sine law
-introduce cosine law and conditions for its use
-model use of cosine law to solve for missing information in an acute triangle

Day 6:

-reinforce and expand on knowledge of cosine law through continued practice solving application problems with real world contexts
-administer formative quiz on cosine law

Day 7:

-return and discuss solutions to formative quiz on cosine law
-review criteria for use of primary trigonometric ratios, sine law and cosine law to solve for required information in an acute triangle

Day 8:

-administer summative evaluation to assess students' achievement of the desired learning

Assessment and Evaluation of Student Achievement

| Strategies/Tasks | Purpose |
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| 1. Review conventions for labelling the sides of a right triangle. | Assessment for learning |
| 2. Review ratios for sine, cosine, and tangent in terms of opposite, adjacent, and hypotenuse. | Assessment for learning |
| 3. Practice solving for missing information in a right triangle. | Assessment as learning |
| 4. Apply primary trigonometric ratios to real world contexts. | Assessment as learning |
| 5. Complete SOH CAH TOA Quiz. | Formative assessment |
| 6. Discuss situations that do not involve right triangles. | Assessment for learning |

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| 7. Introduce criteria for using the Sine Law. | Assessment for learning |
| 8. Practice solving for missing information using the sine law. | Assessment as learning |
| 9. Apply sine law to real world contexts. | Assessment as learning |
| 10. Complete Sine Law Quiz. | Formative assessment |
| 11. Introduce criteria for using the Cosine Law. | Assessment for learning |
| 12. Practice solving for missing information using the cosine law. | Assessment as learning |
| 13. Apply cosine law to real world contexts. | Assessment as learning |
| 14. Complete Cosine Law Quiz. | Formative assessment |
| 15. Complete Summative In Class Assignment and/or Performance Task | Summative assessment |
| Assessment tools <ul style="list-style-type: none"> ✓ SOH CAH TOA Quiz ✓ Solutions to SOH CAH TOA Quiz ✓ Sine Law Quiz ✓ Solutions to Sine Law Quiz ✓ Cosine Law Quiz ✓ Solutions to Cosine Law Quiz ✓ In Class Assignment ✓ Performance Task | |
| Differentiation | |
| Differentiation will be based on: <ul style="list-style-type: none"> ✓ Readiness ✓ Learner Profile ✓ Interest Differentiation will take place through: <ul style="list-style-type: none"> ✓ Content ✓ Process Product Learning Environment | |
| Additional Notes/Comments/Explanations | |
| <p>Although this contextualized learning activity has been designed for students in the Manufacturing SHSM, all students enrolled in MCF3M could work through this CLA. The application questions in this package certainly have a manufacturing focus but there are also word problems that pertain to topics such as transportation. In fact, there are not any questions related to manufacturing on the summative assignment. The summative performance task, however, is designed exclusively for the SHSM Manufacturing student.</p> | |

Resources

Authentic workplace materials

Human resources

Print resources

Brusic, Sharon A., Fales, James F., and Kuetemeyer, Vincent F. Technology Engineering & Design. McGraw-Hill: 2008.

Krar, Steve F., Gill, Arthur R., and Smid, Peter. Workbook for Technology of Machine Tools. McGraw-Hill: 2005.

Small, Marion et al., Functions and Applications 11. Nelson: 2007.

Video resources

Software

Websites

<http://www.europacprecision.com/customer-support/contact-us.html>
http://www.subtool.com/tp/9128-30_taft-peirce_steel_vee_blocks.html

Other resources

Accommodations

- Individual Education Plans (IEP) should be followed at all times. Be sure to consult the SERT for additional information and suggestions;
- Additional time may be needed for diagnostic, formative and summative assignments;
- The activities and lessons outlined in this CLA allow for flexibility in the delivery of the material. Alternating teaching strategies can help students who are not progressing at the appropriate level;
- Font can be increased for those students that have vision problems;
- Class rules, behaviours, and due dates should be posted in the classroom and talked about so that all students are aware of the expectations;
- If possible, more individual instruction time can be allotted to students in need;
- Account for student work habits when considering assignments;
- Provide opportunities for enrichment for exceptional students;
- Provide time for peer-to-peer teaching;
- Use audio aids if needed;
- Provide alternate assessment opportunities that are geared towards students strengths or areas of interest;
- Provide alternate location and quiet setting to work if needed;
- If available, many computer programs can be used to supplement student learning.

List of Attachments

Day 1 – Solving for Unknown Angles and Sides Using Primary Trig Ratios
Day 1 – Practice with SOH CAH TOA Handout
Day 2 – Applications of Primary Trig Ratios
Day 2 – Applying Trigonometry Handout
Day 2 – SOH CAH TOA Quiz
Day 2 – Solutions – SOH CAH TOA Quiz
Day 3 – The Sine Law
Day 4 – Applications of the Sine Law
Day 4 – Sine Law Quiz
Day 4 – Solutions – Sine Law Quiz
Day 5 – The Cosine Law
Day 6 – Applications of the Cosine Law
Day 6 – Cosine Law Quiz
Day 6 – Solutions – Cosine Law Quiz
Day 7 – Sine Law and Cosine Law
Day 8 – Summative Assessment Day
Day 8 – Summative In Class Assignment
Day 8 – Rubric for Summative In Class Assignment
Day 8 – Summative Performance Task

Approval for Use of Pictures/Materials from Other Sources

Tim Allen [tallen@subtool.com]

To: Michael Sullivan

Cc:

Wednesday, July 06, 2011 2:55 PM

You replied on 7/6/2011 2:59 PM.

Scott-

Please feel free to use the art work. Would you like me to send you a higher resolution version?? If so, what model #?

**Tim Allen
President
Suburban Tool, Inc.**