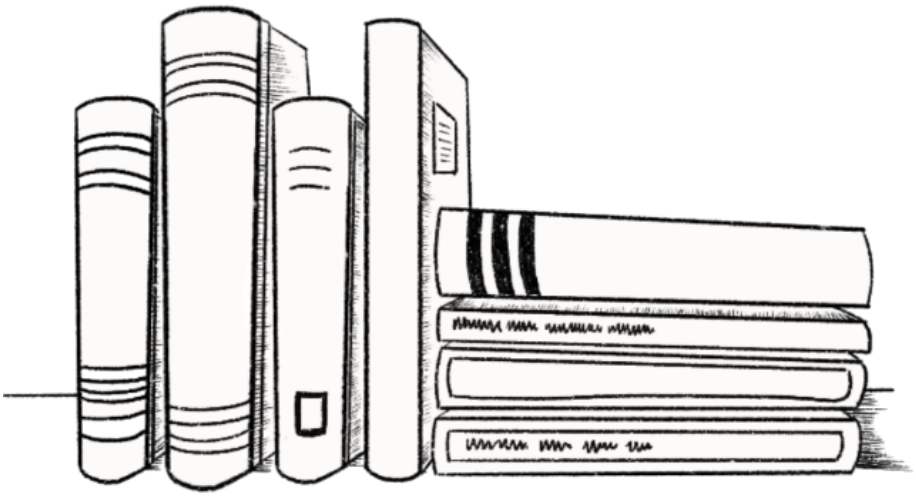

An Indigenous Knowledge Mobilization Packsack:

Utilizing Indigenous Learning Outcomes to Promote and Assess Critical Thinking and Global Citizenship

APPENDIX

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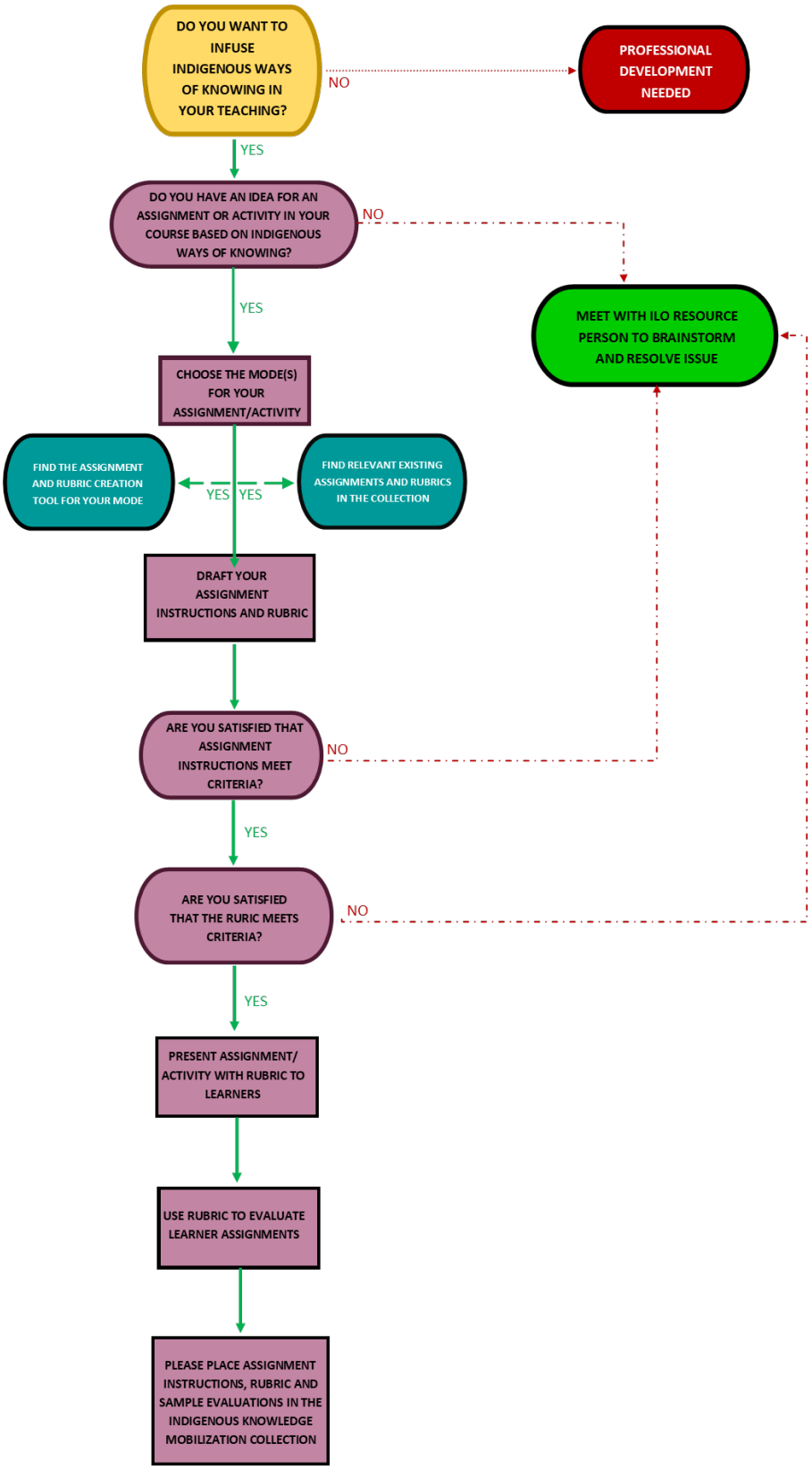
Appendix A: Indigenous Rubric, Phase One

	Emerging	Developing	Demonstrating	Exemplifying
	The learner is unsure of what they need to do and they meet little or none of the criteria. They require support and direction. There are errors and missing details. Ideas are difficult to follow.	The learner understands what they need to do but requires some assistance to meet the criteria. There are some errors and the work lacks some important details. Ideas are not always expressed clearly.	The learner understands what they need to do, and they require little or no support while consistently meeting criteria. The work is detailed and has few errors. Ideas are clearly expressed.	The learner understands what they need to do and exceeds criteria with no assistance. They have gone above and beyond the requirements with no errors. Ideas are clearly expressed, thorough and original.
Reflection The learner demonstrates *reflection* when they consider the relationship between a topic, their own position (and knowledge, experience and beliefs) and Indigenous experiences.	*Demonstrates a limited ability to express their own thoughts and beliefs about the topic* *Shows no ability to relate the topic to their own position* *Shows no ability to identify connections between the topic and Indigenous experiences/knowledges*	*Demonstrates some ability to express their own thoughts and beliefs about the topic* *Shows a limited ability to identify a relationship between the topic and their own position* *Begins to identify that there are connections between the topic and Indigenous experiences/ knowledges*	*Demonstrates an ability to clearly express their thoughts and beliefs about the topic* *Identifies relationships between a topic and their own position* *Identifies connections between the topic and Indigenous experiences/knowledges*	*Demonstrates an ability to thoroughly and articulately express their own thoughts and beliefs about the topic* *Clearly explains relationships between a topic and their own position* *Examines the relationships between the topic and Indigenous experiences/knowledges*
Respect The learner applies *respect* by researching and examining a topic holistically and in relation to Indigenous knowledge.	*Seeks out no new sources of knowledge* *Identifies no Indigenous sources of knowledge* *Shows a limited ability to apply a holistic lens or to see relationships between information or ideas*	*Seeks out a few different sources of knowledge* *Includes few Indigenous sources of knowledge related to the topic* *Begins to apply a holistic lens and identify relationships between some information and ideas*	*Seeks out multiple different sources of knowledge* *Includes adequate Indigenous sources of knowledge related to the topic* *Applies a holistic lens and illustrates relationships between most of information and ideas*	*Seeks out multiple and diverse sources of knowledge* *Includes multiple and diverse Indigenous sources of knowledge that are relevant to the topic* *Thoroughly applies a holistic lens and describes relationships and interconnectedness of all of information and ideas*

Realization The learner demonstrates *realization* when they have come to a new understanding of the topic, after integrating their original position and knowledge with new sources including Indigenous knowledge(s).	*Shows no ability to integrate new information with original knowledge and position about the topic* *Includes no exploration of Indigenous knowledges in their understanding of the topic* *Shows no consideration of Indigenous knowledge(s) within their conclusions*	*Begins to integrate new information with original knowledge and position of the topic* *Begins to explore Indigenous knowledge(s) in their new understanding of the topic* *Demonstrates some evidence of the application of Indigenous knowledge(s) within their conclusions*	*Integrates new information with original knowledge and position to come up with a more informed perspective of the topic* *Includes an examination of Indigenous knowledge(s) in their new understanding of the topic* *Illustrates ways that their conclusions align with Indigenous knowledge(s)*	*Synthesizes new information with original knowledge and position, resulting in new realizations about the topic* *Fully integrates Indigenous knowledge throughout their new understanding of the topic* *Distinguishes how Indigenous knowledge(s) informs their conclusions*
Responsibility The learner practices *responsibility* when they take action that is informed by all that they have learned and that considers the impact on past, present and future generations and that is in line with principles of reciprocity.	*Suggests no decisions or actions based on conclusion* *Demonstrates no awareness of responsibilities to past, present and/or future generations in conclusions or actions* *Shows no consideration of principles of reciprocity in conclusions or actions*	*Unclear about how their conclusions might guide future decisions or action* *Shows some awareness of responsibilities to past, present and/or future generations in conclusions of actions* *Shows some consideration of principles of reciprocity when considering actions or making decisions*	*Suggests how conclusion can guide future decisions and actions* *Illustrates awareness of responsibilities to past, present and/or future generations in conclusions and actions* *Aligns actions and decisions with principles of reciprocity*	*Integrates conclusions in planning for meaningful actions and decisions* *Thoroughly integrates consideration of all generations in conclusions and actions* *Creates actions and decisions that are informed by principles of reciprocity*

Appendix B: Indigenous Knowledge Mobilization Packsack Flowchart



Appendix C: Experiential Learning Mode Assignment and Rubric Creation Tool

The Learner Achieves	The Teacher Creates	The Assignment Directs	The Rubric Assesses
➢ The learner engages in hands-on, applied and holistic learning. ➢ The learner is required to perform a task or create something based on prior observation of behaviours/skills modelled by the teacher (or suitable alternative). ➢ If feasible, the learner applies learning from a land-based activity. ➢ If not from a land-based activity, the learner is required to apply learning from a practical activity (e.g., case study, demonstration lab, etc.) that is relevant to their context and learning objectives. ➢ The learner uses their challenges in completing the assigned tasks to develop their problem-solving skills. ➢ The learner acquires applicable skills that enable them to add to their experience/learning over time, even after leaving their formal education (lifelong learning).	➢ The teacher creates instructions or guidelines for presenting the assignment (especially if other faculty are using the same assignment). ➢ Prior to giving the assignment, the teacher demonstrates or models activities with the required behaviours/skills for the students who will be reproducing these activities. ➢ Whenever possible, the teacher introduces land-based activities in the assignment. ➢ Whenever possible, the teacher introduces contextual, local and contemporary content in the assignment. ➢ The teacher incorporates self-awareness in the learning, with the opportunity to revise and correct problems to be solved. ➢ Ideally, the teacher provides more than one opportunity to repeat the activity, with a chance to evaluate errors and improve each time around.	➢ The assignment contains descriptive language that reinforces the use of skills related to hands-on, applied and holistic learning. ➢ The assignment requires a learner or learners (e.g., in a group assignment) to repeat actions and demonstrate behaviours/skills modelled by the teacher. **OR** ➢ The instructions require a learner or learners (e.g., in a group assignment) to repeat actions and demonstrate behaviours/skills modelled by a knowledge-holder. ➢ The assignment requires the learner to solve a problem based on a real-world narrative or a hands-on requirement (e.g., to build, fix or make something).	➢ The rubric evaluates the success of the learner in reproducing behaviours/skills demonstrated by a teacher or knowledge-holder. ➢ The rubric may give some weight to the learner's ability to reflect on the learning process, including a description of challenges encountered and how the student learned from them. ➢ If the assignment is land based, the rubric evaluates the learner's understanding of natural law during completion of the assignment and their understanding of their responsibility towards the land. ➢ The rubric may give some weight to assessing the learner's ability to reflect on how the skills acquired can be applied in continued or lifelong learning.

Appendix D: Interdependent Thinking Mode Assignment and Rubric Creation Tool

The Learner Achieves	The Teacher Creates	The Assignment Directs	The Rubric Assesses
➢ The learner addresses a topic or issue (in written or oral format) based on an informed understanding of a credible conversation surrounding that topic. ➢ The learner performs research based on appropriate use of existing knowledge sources. ➢ The learner is required to clearly express their comprehension of a credible conversation and to introduce their own interpretation in some way. ➢ The learner is expected to consult more than one type of knowledge source (e.g., library) AND knowledge-holders AND personal experience. ➢ The learner reflects on the process of obtaining their knowledge and how its reliability is ensured through communicative relationships.	➢ Prior to giving the assignment, the teacher establishes an effective context for the learner to practice interdependent thinking. ➢ The teacher creates instructions or guidelines for presenting the assignment (especially if other faculty are using the same assignment). ➢ Whenever possible, the teacher encourages learners to use contextual, local and personal knowledge in the assignment. ➢ The teacher strongly encourages the learner's sense of themselves as an interdependent thinker grounded in and shaped by the world of ideas/knowledge and experience. ➢ The teacher offers positive interventions as the learner perform tasks or activities to help facilitate their academic development.	➢ The instructions contain descriptive language that reinforces the use of appropriate, effective and active skills for acquiring knowledge from diverse sources. ➢ The instructions reinforce the importance of communicative skills (such as reading and writing comprehension) to interdependent thinking. ➢ The instructions reinforce the learner's responsibility as the practice becoming knowledge-holders. ➢ The instructions include an opportunity for the teacher to demonstrate or model how to seek knowledge in an interdependent fashion.	➢ The rubric evaluates the learner's ability to use diverse sources to understand and articulate a credible conversation about a topic or issue. ➢ The rubric measures the breadth and completeness of the learner's research, particularly as this relates to the use of non- conventional sources (within a western framework). ➢ The rubric evaluates how the learner ensures the reliability of sources while valuing each source based on its own standards. ➢ The rubric evaluates the learner's growing ability to introduce their own voice into a credible conversation. ➢ The rubric evaluates the success of the learner in reflecting on the process of obtaining knowledge.

Appendix E: Practising Humility Mode Assignment and Rubric Creation Tool

The Learner Achieves	The Teacher Creates	The Assignment Directs	The Rubric Assesses
➢ The learner actively questions their own assumptions, values and acquired teachings and to examine their roots. ➢ The learner identifies their position in the world and to engage with more than one alternative perspective to their own. ➢ The learner develops and uses the skills of empathy in imagining the experiences and viewpoints of other beings. ➢ The learner approaches their learning process for the assignment with a sense of respect for and openness to more than one possible outcome. ➢ The learner is encouraged to appreciate the knowledge that has been shared with them and the knowledge they will continue to acquire.	➢ Prior to giving the assignment, the teacher establishes an effective context that encourages the practice of humility. ➢ The teacher creates instructions or guidelines for presenting the assignment (especially if other faculty are using the same assignment). ➢ The teacher demonstrates or models how they are always learning and striving to improve their teaching practice. ➢ Whenever possible, the teacher introduces contextual, local and contemporary content in the assignment. ➢ The teacher incorporates an aspect of self-reflection in their teaching practice, with the goal of practicing humility. ➢ The teacher offers positive interventions as the students perform tasks or activities.	➢ The instructions contain descriptive language that reinforces the role of practising humility in the assignment. ➢ The instructions may require a learner or learners (e.g., in a group assignment) repeating actions or demonstrating skills and attitudes modelled by the teacher. **OR** ➢ The instructions may require a learner or learners (e.g., in a group assignment) to repeat actions or demonstrate skills and attitudes modelled by a knowledge-holder. ➢ The instructions incorporate an element of accountability or responsibility — of the learner for themselves and their own learning, to their community and to their chosen field.	➢ The rubric evaluates the success of the learner in questioning their assumptions, values and acquired teachings. ➢ The rubric evaluates whether or not the learner has succeeded in identifying their position in the world. ➢ The rubric evaluates whether or not the learner has identified, and accurately and fairly described an alternative position to their own. ➢ The rubric measures the success of the learner as they attempt to appreciate the experiences and viewpoints of other beings. ➢ The rubric may give some weight to how well the learner has attempted to acquire attitudes of respect, openness and appreciation.

Appendix F: Storytelling Mode Assignment and Rubric Creation Tool

The Learner Achieves	The Teacher Creates	The Assignment Directs	The Rubric Assesses
➢ The learner engages in a learning process related to a story about a subject either of their choosing or the teacher's choosing. ➢ The learner may explore existing stories on a subject. ➢ The learner evaluates an existing western story from the viewpoint of an Indigenous story. ➢ The learner may explore stories related to some aspect of land or natural law. ➢ To promote creativity, the learner may have the option of presenting their finished product in the form of a story (written, oral, visual or multimedia).	➢ Prior to giving the assignment, the teacher provides a context for the assignment that is grounded in storytelling. ➢ The teacher creates a story that provides instructions or guidelines for presenting the assignment (especially if other faculty are using the same assignment). ➢ Prior to giving the assignment, the teacher demonstrates storytelling in their teaching. ➢ Whenever possible, the teacher encourages learners to use contextual, local and contemporary content in the assignment. ➢ The teacher incorporates an appreciation of the power and relevance of story into the assignment. ➢ The teacher offers positive interventions as the learner develops their own storytelling voice.	➢ The assignment contains descriptive language that reinforces the importance of storytelling to acquiring knowledge. ➢ The assignment is structured around a learner or learners (e.g., in a group assignment) sharing stories or teachings modelled by the instructor. **OR** ➢ The assignment is structured around a learner or learners (e.g., in a group assignment) sharing stories or teachings given by knowledge-holders in their lives. **OR** ➢ The assignment is structured around a learner or learners (e.g., in a group assignment) sharing stories or teachings that resonate with them and lead them to their own voice.	➢ The rubric evaluates how successfully the learner has used story to learn about a topic. ➢ The rubric measures the breadth and completeness of the stories explored by the learner. ➢ The rubric measures the learner's success in comparing two divergent stories (i.e., one western and one Indigenous). ➢ The rubric may give some weight to evaluating the learner's growing understanding of natural law via storytelling. ➢ The rubric may give some weight to the learner's efforts to produce their own story and to their enthusiasm for developing their storytelling voice.

Appendix G: Understanding the Four Modes in Relation to Critical Thinking with Examples

Mode	Skills Acquired towards Indigenous Ways of Knowing	Corresponding Skills	Example of Activity and Evaluation Method for the Mode	How the Activity Connects to the Mode
Experiential Learning **(Relationship-based learning)**	• Taking in and interpreting information in a way that is applied, hands on, in process and lifelong • Using all of the self (wholistic, embodied) • Learning by doing (modelling, copying)	• Appreciating knowledge as an ongoing process — the idea that knowledge is never final • Developing the ability to apply learning/principles to new situations, i.e., learning how to learn • Making connections to current situations/events, seeing the connections between the abstract and the specific • Problem-solving, revising, being allowed to fail • Observing, modelling	Activity: Peer editing of paragraph or research paper (May or may not connect to Indigenous-specific content depending on topic of paper) Evaluation: some marks from total for written assignment allocated for peer evaluation piece. Peers must evaluate according to established criteria	• Involves hands-on marking up of peer paper • Will involve making independent connections between different areas of learning (grammar, reading comprehension, argument structure) in context of paper • May involve using modelling to show peer solutions • May involve self-corrective thinking • Students attempt to learn from mistakes in non-judgmental environment • Students understand that making mistakes in part of the process of learning and knowledge is in a constant process of revision
Interdependent Thinking **(Relationship-based verification)**	• Checking on the validity of knowledge in a way that is based in reciprocity • Acquisition of skills from relevant traditions • Respect for the strengths of various types of knowledge,	• Demonstrating how evidence from multiple sources is acquired, assessed, weighed, verified • Comparing, analyzing arguments • Testing arguments with logic • Testing evidence against reality	Activity: Reading comprehension assignment Evaluation: Questions prompt reflection on author's intended or unintended meaning. Questions may also invite critique of method, structure, themes, depending on content of the reading	• Will involve analyzing and assessing info, using appropriate research skills (based in a relational and ethical definition of research) • Requires students to gain an understanding of a "credible conversation" (verification) • Understanding of content requires analytical skills

Mode	Skills Acquired towards Indigenous Ways of Knowing	Corresponding Skills	Example of Activity and Evaluation Method for the Mode	How the Activity Connects to the Mode
	including that of elders/knowledge-holders	• Understanding that all truth is provisional and open to question		• Analysis of the piece could require skepticism towards some statement of fact or argument
Storytelling **(Relationship-based communication)**	• Sharing knowledge and wise practices in narrative format • Valuing narrative approaches • Land- and community-grounded respect for oral tradition • Non-hierarchical approach • Relevant, contextual and local	• Maintaining, encouraging, expanding skills of communication (especially listening), memory and understanding • Learning to recognize and critique discourses conveyed through various storytelling forms • Understanding that there is more than one way of knowing • Appreciating that the body/senses are the root of knowledge/science • Finding meaning in the personal, local, emotional, subjective.	Activity: Discussion (could be land based) or short reflection paragraph Evaluation: Students receive marks for participation in discussion, demonstration of comprehension	• Will involve discussing viewpoints with peers • Will involve respectful discourse and an understanding that all voices are equal (non-hierarchical) • Will involve effective communication • May involve sharing personal histories, prior learning, etc. (students practice their own storytelling skills) • Students practice developing opinions but also testing them through conversations with peers and knowledge-holders
Practicing Humility **(Relationship-based reflection)**	• Coming to new realization in a way that is reflective, embodied • Acquiring a sense of wonder, gratitude, acceptance and curiosity about the world (realizing	• Maintaining curiosity and skepticism, exhibiting tolerance for complexity, contradiction • Developing ability to engage in metacognition • Developing awareness of subjectivity (and the conceptual different between objectivity and subjectivity)	Research paper (may or may not connect to Indigenous-specific content depending on topic of paper)	• Research = acquiring new info = assessing facts • Students must be tolerant of complexity — topics are not straightforward and both sides of issue need to be presented • Students should be aware of own bias • Hopefully research will result in new knowledge that will

Mode	Skills Acquired towards Indigenous Ways of Knowing	Corresponding Skills	Example of Activity and Evaluation Method for the Mode	How the Activity Connects to the Mode
	just how much you don't know) • Openness towards different perspectives	• Understanding that knowledge is grounded in culture		promote self-reflection, leading to sense of wonder etc. • Students begin to see the importance of seeking multiple and diverse sources of knowledge

Appendix H: Mathematics Assignment in the Practicing Humility Mode

The Un-Pythagorean Theorem Learning Activity

[STUDENTS WOULD ANSWER THESE REFLECTIVE QUESTIONS BEFORE PROCEEDING TO READ THE SHORT ARTICLE BEGINNING ON THE NEXT PAGE].

1. Where do you think math came from? Was it …
   a) a discovery
   b) an invention
   c) a language
   d) a need
   e) all of the above
   f) other (please describe)

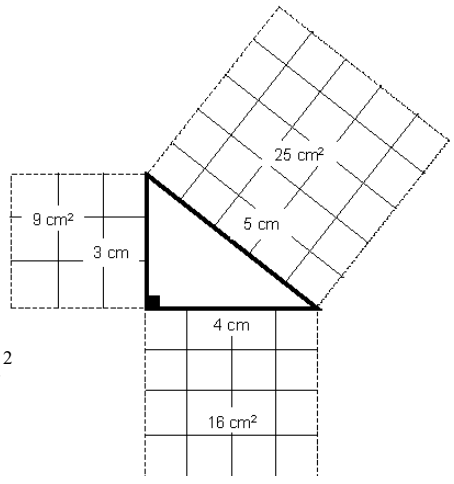
2. Who do you think first used math? In other words, who or what group of people do you think "invented" math? If you don't know or you've never thought about it, take a guess.

3. Please read the short article that begins on the next page, then answer the questions after it.

The Un-Pythagorean Theorem

For hundreds of years, western cultures believed that Greek thinkers like Aristotle and Pythagoras invented reasoning and thinking. The skill and know-how of Indigenous cultures is often ignored. A good example of this is the Pythagorean Theorem. The Greek philosopher Pythagoras supposedly discovered the mathematical theorem: $c^2 = a^2 + b^2$. You learned this theorem in geometry. Builders use the Pythagorean Theorem all the time. It helps them make corners square and lines parallel. It helps them decide how long a wall should be or how tall to build a building. It seems to be important for any culture when building things, yet for a long time, people have assumed that this idea came only from a guy named Pythagoras. In fact, scientists now think Indigenous cultures all over the world used the Pythagorean Theorem before Pythagoras was even born.

Do you remember the Pythagorean Theorem? It says that the square of the diagonal of a right-angled triangle is equal to the square of both of the triangle's sides added together.



$$c^2 = a^2 + b^2$$
$$25\,cm^2 = 9\,cm^2 + 16\,cm^2$$

BCE means Before the Common Era. BCE dates count backwards from the year Jesus was born according to the Christian calendar.

Around 750 BCE, Mayan people built large temples so well that we find it hard to rebuild them using modern tools (Hinkle, 2011). Scientists think the Mayans must have known the Pythagorean Theorem to build so precisely. Pythagoras lived around 500 BCE.

Figure 1. Tikal was one of the largest sites of the Mayan civilization before Europeans made contact in the Americas. It is located in what is now northern Guatemala.
Chensiyuan

The Mayans built the temples over 2000 years before any Europeans arrived in the Americas and 250 years before Pythagoras was born. In other words, it looks like the Mayans figured out geometry without Pythagoras' or the Europeans' help.

How could the Indigenous ancient Egyptians build their amazing pyramids without using $c^2 = a^2 + b^2$? The Great Pyramid of Khufu was the tallest man-made structure on earth for over 3,800 years. The pyramid is 756 feet long on each side, 481 feet high and made of 2.3 million stones. To build their pyramids, ancient Egyptian builders made the bases square. They planned the height and slope of the walls. This means that the ancient Egyptians probably used geometry and the Pythagorean Theorem.

Figure 2. The Great Pyramid of Khufu which contains the burial chamber of King Khufu.
Jerome Bon from Paris, France

It is hard to build a peaked roof without knowing the Pythagorean Theorem, yet the Indigenous Xinle people in China built houses with peaked

Figure 3. Here is an example of the peaked roofs built by the Xinle culture in China.
Mjb1981 at English Wikipedia

roofs as far back as 5500 BCE (Stark, 2006). This was 4950 years before the existence of the Pythagorean School!

It looks like the Indigenous Babylonians also knew about the Pythagorean Theorem (Burkert,1972). The Babylonian culture existed as far back as 1800 BCE. Scientists found Babylonian clay tablets that describe several mathematical ideas. They talk about fractions, roots, algebra, quadratic equations, cubic equations and, you guessed it, the Pythagorean Theorem (Rudman, 2010). Yet the Babylonians made these tablets 1000 years before the Greeks even knew what geometry was (O'Connor & Robertson, 2000). In fact, the Greeks may have learned a lot of their math from the Babylonians (Farrington, 2000).

Here is the writing on one of the tablets (O'Connor & Robertson, 2000):

4 is the length and 5 the diagonal. What is the breadth?
Its size is not known.

4 times 4 is 16.

5 times 5 is 25.

You take 16 from 25 and there remains 9.

What times what shall I take in order to get 9?

3 times 3 is 9.

3 is the breadth.

Figure 4. One of four Babylonian tablets.
Public Domain

Can you see that the words on this clay tablet are similar to the Pythagorean Theorem? Is it possible that Pythagoras simply showed the Greeks something he learned from the Indigenous Babylonians?

It seems Indigenous cultures like the Mayans, ancient Egyptians, Xinle people in China, and the Babylonians knew $c^2 = a^2 + b^2$ before it was called the Pythagorean Theorem. The Indigenous Babylonians even described the theorem on their clay tablets. Maybe the Pythagorean Theorem should be called The Indigenous Theorem instead? In a recent article, Tracy Shields, an Academic Upgrading teacher, asks mathematicians "to be mindful and dutiful that due credit is given to Indigenous cultures" that have made major contributions to the field of mathematics. What do you think?

Questions:

1. In the article, several different cultures developed and used the Pythagorean Theorem. These cultures were separated by time and location. How do you think that happened?

2. In the essay, we learn that the need to build structures lead to the discovery of the Pythagorean Theorem by several different cultures.

   Describe another situation that would cause a community of people to use math. Use your imagination. To start, pick an environment the community lives. Here are some ideas: desert, lakeside, oceanside, topical forest, tundra etc.

   Environment:

   Situation:

3. What do you think math is?

   a) a discovery

   b) an invention

   c) a language

   d) a need

   e) all of the above

f) other (please describe)

Has your opinion changed from when you answered this question before doing the reading?

4. Different cultures have different versions of math. Do you think one culture's version is better than another culture's version? Explain.

5. Other cultures used the Pythagorean Theorem before the Greeks and Pythagoras. Why do you think the theorem is still named after him?

6. Why do you think Indigenous cultures haven't been recognized for their knowledge? How does that make you feel?

7. Do you think Canadian students should learn about math from non-western cultures? Why or why not?

8. What most surprised you in this essay?

9. Have your ideas about Indigenous knowledge changed? Explain.

Bonus Mark: Did the essay make you want to know more? Research your question for a bonus mark.

Appendix I: The Un-Pythagorean Theorem Student Evaluation Form

Student Name:

Criterion	Numeric Grade	Feedback/Comments
Reflecting: ***What is math and how does it vary from culture to culture?***	**/3**	
Reflecting: ***Similar ideas expressed different cultures***	**/3**	
Understanding: ***Different systems of knowledge***	**/3**	
Realizing: ***Individuals learn a version of math that belongs to their culture and knowledge system***	**/3**	
Realizing: ***Power imbalance***	**/3**	
Responding: ***Responds or plans an action***	**/3**	
TOTAL	**/18**	

Appendix J: Un-Pythagorean Theorem Assignment Rubric

CRITERIA	Excellent (4)	Very Good (3)	Satisfactory (2)	Needs Improvement (0-1)
Appreciating *what math is/does (perhaps for the first time)*	• Learner clearly appreciates that math is created by people so they can use numbers for practical (real-life) applications such as building, farming and craft traditions	• Learner appreciates that math is created by people as a way to use numbers for practical (real-life) situations **BUT** • The learner does not demonstrate this idea by connecting it to specific applications of math/numbers	• Learner suggests or implies that math is created by people **BUT** • The learner does not express that math is a practical application of numbers	• Learner does not understand the purpose or nature of math (as conveyed by the reading) **OR** • Learner only expresses an incorrect understanding (based on the reading) of what math is
Understanding *how different cultures have their own versions of math (or the Pythagorean Theorem) that work for that culture*	• Learner clearly understands that the "Pythagorean Theorem" is just the Greek version of a useful idea found in other cultures. **AND** • Learner understands that the way that this idea evolves and gets used will vary according to the needs of that culture **AND** • Learner explores or at least suggests the factors (geographic, demographic, etc.) that determine need. They may do this by giving examples from different contexts	• Learner understands that the "Pythagorean Theorem" is just the Greek version of a useful idea found in other cultures. **BUT** • The learner does not connect this understanding to the notion that different cultures have different needs, depending on context and history.	• Learner understands that the Pythagorean Theorem is found in different cultures **BUT** • The learner does not understand that these are different versions of the same idea	• Learner does not understand the point that the author is trying to make about other cultures having the Pythagorean Theorem.
Recognizing *the existence of different systems of knowledge (western and Indigenous)*	• Learner clearly recognizes that there is an Indigenous knowledge system and a western knowledge system **OR** • Learner (as an Indigenous person) may realize that the knowledge	• Learner recognizes that there is an Indigenous knowledge system and a western knowledge system **BUT** • Learner does not understand that these are equally valid ways of	• Learner can say that "different cultures have different ways" (i.e., some vague statement appreciating difference) **BUT**	• Learner does not or cannot question the assumption that there is only one (correct) way of doing math or of knowing things **OR**

CRITERIA	Excellent (4)	Very Good (3)	Satisfactory (2)	Needs Improvement (0-1)
	system they received from their family or community IS a knowledge system alongside the western one **AND** • Learner clearly understands that neither system is "better" or "worse" than the other — just different	knowing things (i.e., it could be implied but not explicitly stated)	• Learner does not distinguish between "culture/society", and the knowledge system(s) that may belong to a culture. **OR** • Learner, explicitly or implicitly, restates the idea that some cultures/systems of knowledge are more "advanced" than others (entirely missing the point)	• Learner may assume that western system is superior or more advanced **OR** • Learner may restate the idea that "the Greeks get the credit because they invented the theorem"
Realizing *that individuals learn a version of math that belongs to their culture and knowledge system, i.e., the learner discovers their positionality*	• Learner clearly realizes that they have been studying and learning (positioned) within a western (Canadian) system of knowledge **OR** • Learner (as an Indigenous person) may realize that they have been learning within two different systems of knowledge at the same time (and perhaps struggling to reconcile them) **AND** • Learner realizes that this context (position) has a significant impact on how they think/learn	• Learner realizes that they have been studying and learning (positioned) within a western (Canadian) system of knowledge. **BUT** • Learner does not realize or appreciate how this position shapes their thinking/learning	• Learner expresses that their education is restricted or incomplete because of "the system" **BUT** • Learner does not connect these limitations to their position within a knowledge system	• Learner does not realize their own position as a learner within a specific system of knowledge
Analyzing *the way that power imbalances between cultures (i.e., western and Indigenous) affect how different knowledge systems are treated*	• Learner successfully analyzes how western culture presents itself as the correct way of knowing things, whether it is or not, in contrast to other ways of knowing. **AND**	• Learner analyzes how western culture presents itself as the correct way of knowing things, whether it is or not, in contrast to other ways of knowing **BUT** • Learner doesn't understand how a power imbalance between cultures	• Learner can describe how western culture presents itself as the correct way of knowing things **BUT** • Learner does not question whether or not this is true	• Learner accepts (assumes) that western culture is the correct way of knowing things **OR** • Learner accepts (assumes) that western culture is the

CRITERIA	Excellent (4)	Very Good (3)	Satisfactory (2)	Needs Improvement (0-1)
	• Learner analyzes how the neglect of other (i.e., Indigenous) ways of knowing is due to relationships where one society has power over another (colonialism)	is relevant to the information in the reading		only valid way of knowing things
BONUS: *From their new understanding, the learner responds with a sense of the importance of "getting it right" and the harm caused by "getting it wrong". Learner wishes to investigate further and/or plan an action.*	• The learner investigates similar examples of Indigenous contributions to knowledge that have been uncovered **AND** • Learner is upset or outraged by the unfairness they have encountered in the reading. **AND** • Learner suggests some actions to remedy this sense of injustice. Actions can be personal, academic, intellectual, political, etc.	• The learner expresses curiosity about similar examples of Indigenous contributions to knowledge that have been uncovered **AND** • Learner is upset or outraged by the unfairness they have encountered in the reading **BUT** • Learner does not undertake or suggest any action in response to their sense of injustice	• The learner expresses curiosity about similar examples of Indigenous contributions to knowledge that have been uncovered **BUT** • Learner does not express upset or outrage in response to the unfairness they have encountered in the reading	• The learner expresses disinterest in the assignment and its purpose. **OR** • The learner declines to learn more.