

Publisher Questions to the Western and Northern Canadian Protocol (WNCP) Mathematics Team

Publishers' Meeting Tuesday, November 6, 2007

General

1. When will information be released to publishers regarding time lines and CFR?
WNCP Response: Proposed time lines and the plans for calls were shared and discussed at the Publishers' Meeting on November 6, 2007. Time lines will be further discussed at the Publishers' Meeting in January 2008 and published in the calls.
2. Is there any intent to change any of the requirements for submission based on feedback?
WNCP Response: Feedback was gathered at the Publishers' Meeting on November 6, 2007. The requirements for submission will be published in the calls.
3. Will reference or evaluation material received by reviewers be made available to publishers?
WNCP Response: The calls contain the evaluation criteria.
4. Can you describe the call process for new resources and will there be distinct call parameters for the different streams.
 - o What will be the timing and process?
 - o Will expected course enrollment numbers affect the call process?**WNCP Response: Based on feedback gathered at the November 6, 2007 Publishers' Meeting, this question will be addressed at the next Publishers' Meeting in January 2008.**
5. Will WNCP be supporting the development of French resources and how will this be handled?
WNCP Response: Based on feedback gathered at the November 6, 2007 Publishers' Meeting, this question will be addressed at the next Publishers' Meeting in January 2008.

<p>Please note: "the resource" means the student resource along with the teacher's resource (the essential parts of the resource that are subject to review).</p>
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6. If an AI has not been included in the resource, will this be an issue during the evaluation process?
WNCP Response: If the understanding reflected by the achievement indicator (AI) is not included within the resource, it will be noted. AIs do not need to be covered like a checklist; however, they do define the breadth and depth of the outcome, so any part of the outcome understanding reflected by an AI is expected to be reflected in the resource. If the intent of the AIs is not reflected in the treatment of the topic in the resource, the treatment will not be considered sufficient.

7. It is noted that set of indicators **may** be used to determine whether students have met the corresponding specific outcome. If we include an “AI” that is not on the list, is this considered extraneous content?
WNCP Response: It would be extraneous only if it increased the breadth and depth of the outcome as defined by the CCF AIs. If the AI increases the depth, it could be included in the teacher resource as an extension.
8. Must all of the “e.g.s” be included in the resource?
WNCP Response: The intent of what the examples convey should be included in the resource. The exact example may not necessarily be included.
9. Have the Specific Outcomes been ordered in an “expected” or preferred developmental sequence?
WNCP Response: No – in fact, it is hoped that the resources will reflect integration and revisiting of outcomes in different contexts throughout the resource. We would encourage connections between topics whenever possible.
10. What are the significant dates for the revised curriculum including implementation time frames?
- When will the curriculum be finalized?
WNCP Response: January 2008 is the expected sign-off date.
 - Will the curriculum implementation be phased with an optional year prior to mandatory?
WNCP Response: This is a jurisdictional decision: September 2010 is the mandatory implementation of Grade 10 in BC, Alberta, NWT, Nunavut, YT and Manitoba. Manitoba will have two years of voluntary implementation for Grade 10 previous to the 2010 date. Each subsequent grade follows in successive years. Saskatchewan has not made a final decision as of this time.
 - Will the implementation dates be mandated across WNCP, or will provinces have jurisdiction over this issue?
WNCP Response: Provinces and territories will have jurisdiction over this issue.
11. What percentage of students (by grade) is expected to track into the different streams?
WNCP Response: Acceptance by post-secondary institutions and the current economic situation will impact the distribution of students. We are unable to make accurate predictions on the distribution of students.
- Can you describe the expected student audience for each course?
**WNCP Response: Apprenticeship and Workplace: Pathway is intended for students who may want to pursue post-secondary studies in trades or certified occupations or enter directly into the workplace.
Foundations of Mathematics: Pathway is intended for students who may want to pursue post-secondary studies in programs that do not require calculus.
Pre-calculus: Pathway is intended for students who may want to pursue post-secondary studies in programs that may require calculus.**
12. Has there been any collaboration with post-secondary institutions regarding prerequisite requirements for admission to programs?
WNCP Response: Yes. Please refer to the initial consultation report, *Consultation with Post-Secondary Institutions, Business and Industry Regarding Their Requirements for High School Mathematics: Final Report on Findings*, at www.wncp.ca. Jurisdictions are continuing the dialogue with post-secondary institutions.

- What are the time lines for identifying the prerequisites?
WNCP Response: This is a post-secondary decision that varies by institution.
13. To what degree will individual jurisdictions modify the common framework?
WNCP Response: The resource is to be based on the framework. Each jurisdiction is preparing their curriculum documents based on the outcomes and achievement indicators in the common curriculum framework.
- Could you clarify Alberta's position on this curriculum framework?
WNCP Response: Alberta will adopt the CCF for 6 out of 8 courses, but will develop its own versions of the Foundations of Mathematics for Grades 11 and 12. It is anticipated that approximately 70% of the content will be consistent with the WNCP CCF.
14. What is the status of the Publishers' Draft Curriculum? How much change is possible going forward and, if input is being solicited, how is this being gathered?
WNCP Response: It is done. It was published in September 2007 and posted on the Internet. There may be minimal change to this draft as a result of feedback from stakeholders. These changes will be completed by November 9, 2007. After translation and final editing, the document will be sent for ADM sign-off (anticipated January 2008) and then posted on the WNCP Web site.
- As publishers, we have concerns about the scope and length of resources that would be needed to fully cover the curriculum for Foundations and Pre-calculus at grades 11 and 12. Is it possible that any topics will be removed before development must start or a final curriculum is issued?
WNCP Response: No further topics will be removed. The topics that have been removed from the current CCF should allow sufficient time for the development of conceptual understanding. By developing conceptual understanding, each new concept should require less review time and allow for richer integration and transfer of knowledge.
15. Will WNCP revisit the extraneous content restrictions?
WNCP Response: It is desirable that the student resource for all pathways include vignettes of mathematical history and mathematics in society as it relates to the content. This will not be considered extraneous content.
- Some SOs require previous knowledge not indicated in the curriculum at any level. For example, to address Foundations 11, p. 61, Statistics 1, students need to know what is meant by a frequency distribution and to have drawn histograms. Will publishers be penalized if this necessary prerequisite material is included?
WNCP Response: Higher level questions that access prior knowledge could be included in the student resource and review of previous knowledge could be included in the teacher's resource to foster differentiated instruction and assessment for learning. However, multiple pages of blackline masters of review material will not be accepted.

- What are acceptable ways of reviewing essential prior knowledge? For example, in Foundations 11, p. 57, Geometry 3, to teach the sine and cosine laws, it is desirable to set the mathematical context, so is a review of trigonometric ratios for acute angles acceptable?
WNCP Response: Higher level questions that access prior knowledge could be included in the student resource and review of previous knowledge could be included in the teacher's resource to foster differentiated instruction and assessment for learning. However, multiple pages of blackline masters of review material will not be accepted.
16. Will there be specific requirements regarding Aboriginal content and/or perspectives?
WNCP Response: Yes. It is intended that the resource reflect the population of Western and Northern Canada as indicated in the philosophy section of the front end of the CCF. This will be addressed at the next publisher's meeting.
 17. Will there be any guidelines for publishers around time allocations (percent of course time) for the different strands within the various courses?
WNCP Response: No.
 18. Many specific outcomes are very general, starting "Solve problems ..." and do not clearly identify "specific knowledge, skills and understandings" (p. 16). Sometimes, it is the AIs and not the SOs that appear to define the math required. For example, solve a quadratic equation by factoring and using the quadratic formula in Foundations 11 are AIs (p. 64). Since several AIs are like this, would WNCP consider the placement of these AIs as SOs?
WNCP Response: No. The AIs clarify the SO and provide an indication of the breadth and depth of the SO.
 19. Some SOs that do not have T in the list of processes could involve cumbersome calculations. Is it expected that all students have access to a scientific calculator, and may use it at any time? How is T in a list of processes to be interpreted?
WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.
The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.
The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.
 20. Market feedback indicates that many students and teachers rely on explicit instructions for a computer or a graphing calculator, to enable them to use the technology effectively. What is the WNCP policy concerning providing explicit instruction on the use of technology?
WNCP Response: Explicit instruction should go in the teachers' resource or be Web based if it is needed.
References to technology in the resource should be generic in nature rather than referring to specific brands.

21. What level of support is expected in a published resource for the Mathematical Research Project in the Foundations Courses?

WNCP Response: Project ideas, assessment strategies and a sample final product could be in the teacher resource with very little in the student resource. Web-based links for student research and teacher use may be helpful.

It is desirable that the student resource for both grades include vignettes of mathematical history, mathematics in society, etc., related to the projects.

Apprenticeship and Workplace Mathematics – Grade 10

Measurement

- The outcomes related to games/puzzles state they are to be integrated throughout the courses. Does this mean truly integrated (appearing constantly throughout each chapter) or can they be addressed intermittently (e.g., once per chapter or every couple of chapters)?

WNCP Response: It could be either. The mathematics related to the game or puzzle should be made explicit. Other examples of games and puzzles could be in the teacher or Web-based resource.
- SO 1, bullet 2: Why is technology not included as a process – particularly as it relates to unit conversions? In general, why are there so few technology references in this program, when these are the students who struggle the most with mathematics?

WNCP Response: The technology that would be used is not about the outcome, but about speeding up incidental calculations based upon prior learning. Therefore, students should not be assessed on “how would you do these unit conversions on your calculator,” but instead it should be on “how would you do these unit conversions, why, and what are they?” Students should be allowed to use a calculator to determine the final answers, but they shouldn’t be using a conversion program or conversion keys on a calculator.
- SO 3, AI 3.5-3.7: Please clarify whether it’s an example or i.e.

WNCP Response: In AI 3.5, “length + width + height” is only used in shipping and air travel so it is not an example but a definition. There are no examples or i.e. in 3.6 and 3.7. Please clarify your question.
- SO 4: Do you intend that students will use fractional measurements with SI units?

WNCP Response: The use of fractions is intended for imperial measurements and the use of decimals is intended for SI measurements, as appropriate.
- SO 4, AI 4.8: Please clarify what tables are expected.

**WNCP Response: Please see the final CCF where this AI has been changed to:
Solve a problem using formulas for determining the areas of regular, composite and irregular 2-D shapes, including circles.**
- SO 4, AI 4.9: Does this include non-right prisms and cones?

**WNCP Response: No. Please see the final CCF where this AI has been changed to:
Solve a problem that involves determining the surface area of 3-D objects, including right cylinders and cones.**

Geometry

- SO 2, AI 2.2: There is no T in the outcome, yet is referenced in the AI. Please clarify.

WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.

The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.

The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.

2. SO 2, bullets 3 & 4: What is the difference between these two statements?
WNCP Response: When solving a problem, the application of the formula may not be the only step.
3. SO 3, AI 3.2: This is not always true. Example: convex vs. concave irregular pentagon.
**WNCP Response: Please see the final CCF where this SO has been changed to:
Demonstrate an understanding of similarity of convex polygons, including regular and irregular polygons.**
4. SO 3, AI 3.7: Why has the word “contextual” been added in this specific case?
WNCP Response: Contextual has been added to emphasize that we want the problem in trade, occupation and workplace contexts.
5. SO 4, AI 4.5: How many triangles are to be included?
WNCP Response: Generally, two triangles are sufficient but there may be contexts where three triangles are needed. The problems should involve realistic and relevant contexts.

Number

1. SO 1: Why is technology not referenced as a process here?
WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.
The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.
The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.
2. SO 1: Why is T not included here?
WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.
The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical

understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.

The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.

3. SO 2, AI 2.7: CRA provides downloadable applications that do this and online calculators that use current tax information. Can these be used instead of “tables” or must both be used?

WNCP Response: Students can calculate net pay in three ways: using tables, using online calculators or using the approximate percentages. Students should be able to answer questions using any of the three methods.

Please see the final CCF where this AI has been changed to:

Determine the Canadian Pension Plan (CPP), Employment Insurance (EI) and income tax deductions for a given gross pay.

Algebra

1. SO 1: Why must the students manipulate the formula when they can substitute in the known values and solve for the unknown? i.e., this is a process they have used and the other requires solving literal equations.

WNCP Response: Post-secondary feedback has indicated this is an essential skill that needs to be developed. This also allows for the development of personal strategies.

Apprenticeship and Workplace Mathematics – Grade 11

Measurement

1. SO 2, AI 2.1: What do you see as the difference between volume and capacity? The definitions require consistency.
WNCP Response: Volume is a measurement of space occupied and capacity is how much can be held. This is consistent with the use of the terms in the K–9 CCF.
2. SO 2, AI 2.4: Does this imply American and British units are used throughout the units as in Grade 10?
WNCP Response: This should be consistent with Grade 10.

Geometry

1. SO 1: Does this imply that problems involving three right triangles are not required?
**WNCP Response: Please see the final CCF where this SO has been changed to:
Solve problems that involve two and three right triangles.**
2. SO 3: Why is T not included here?
WNCP Response: There is no expectation that students are to use technology for this outcome.
3. SO 3, AI 3.7 & 3.8: This can be very complex. Are you expecting 1- and 2-point perspective? Is this to be a full-blown drafting approach?
**WNCP Response: A one-point perspective is sufficient. No, this is not a full-blown drafting approach. The use of isometric dot paper is intended.
Please see the final CCF where AI 3.7 has been changed to:
Identify the point of perspective of a given one-point perspective drawing of a 3-D object.
Please see the final CCF where AI 3.8 has been changed to:
Draw a one-point perspective view of a given 3-D object.**
4. SO 4, All AIs: This implies a formal drafting approach—very difficult. Math teachers are generally not trained in this type of work (except for drafting teachers). Is there a T missing for this (as in CAD programs)?
**WNCP Response: The intention is for students to draw exploded diagrams of simple objects, such as shelves. There is no formal drafting approach expected.
Please see the final CCF where this SO has been changed to:
Draw and describe exploded views, component parts and scale diagrams of simple 3-D objects.
This note has also been added to the AIs:
It is intended that the simple 3-D objects come from contexts, such as flat-packed furniture or sewing patterns.**

Number

1. SO 3, AI 3.3: Using technology makes this relatively simple; can we expand beyond one specific formula?
**WNCP Response: Please see the final CCF where this AI has been changed to:
Solve, using a formula, a contextual problem that involves compound interest.**
2. SO 3, AI 3.4: Is this limited to discrete time intervals (as compared to continuous compounding)?
WNCP Response: Yes.
3. SO 4: Why is T included here when the students (according to the AIs) are only “describing” or “identifying”?
WNCP Response: It is included because students need to use technology to access the information to allow them to describe and identify.
4. SO 5: Does this mean that “credit cards” and “loans” do not have to be addressed?
**WNCP Response: Please see the final CCF where this SO has been changed to:
Demonstrate an understanding of credit options, including:**
 - credit cards
 - loans.

Algebra

1. SO 2, AI 2.3: What applications did you have in mind?
WNCP Response: Please clarify your question.
2. SO 2, AI 2.6: Have these students learned how to find inverse trig function values?
WNCP Response: Yes, in Grade 10 when students solve right angle triangles.
3. SO 2, AI 2.7: Please provide clarification.
**WNCP Response: Please see the final CCF where this AI has been changed to:
Explain the implications, such as safety and functionality, of different slopes in a given context.**
4. SO 3, AI 3.4: Should technology be included?
**WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.
The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.
The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.**

Apprenticeship and Workplace Mathematics – Grade 12

Measurement

1. SO 1: What is your expectation for students? Are they to describe or calculate uncertainty, or something else?
WNCP Response: Calculation of uncertainty is not an expectation. Students are to see the relationship between accuracy and uncertainty and explain it in a context.

Geometry

1. SO 2: What is the limitation in terms of n in an n -gon?
WNCP Response: The problems should involve realistic and relevant contexts.
2. SO 3: What do you expect students to be doing with this outcome?
WNCP Response: Please clarify this question.
3. SO 3, AI 3.8: Is this projection geometry? What kinds of 3-D objects are envisioned here?
WNCP Response: A dilation is a transformation that produces an image that is the same shape as the original, but is a different size. The description of a dilation includes the scale factor and the centre of the dilation. Projection geometry includes dilations as well as matrices and the notion of being orthogonal, which is way beyond the outcome. Keep the 3-D objects simple and within context.

Algebra

1. SO 1, AI 1.3: When have students been formally exposed to the terms and concepts related to direct or partial variation?
WNCP Response: This is the concept being developed in this outcome.
2. SO 1, AI 1.9: The outcome references linear relations, so why is this included?
WNCP Response: The use of examples and non-examples helps to develop an in-depth understanding of a concept. We want students to recognize that although linear relationships can occur in collected data, not all data can be represented by linear relationships, and some may not even have any discernable relationship. It is important to emphasize that the sorting is into linear, non-linear and no trend, not linear, quadratic, cubic or exponential, etc.

Statistics

1. SO 1: Should technology be included here?
WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.

The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.

The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.

2. SO 2, AI 1.1: Are students expected to calculate percentiles?

WNCP Response: No. Therefore, it was not included in either the outcome or the AIs.

Probability

1. SO 1, AI 1.1: Is the resource expected to include all of these examples? If not, what are the ones that should/must be included?

WNCP Response: A variety of examples is expected. However, this list is neither exhaustive nor prescriptive.

Foundations of Mathematics and Pre-calculus – Grade 10

Measurement

1. SO 1, AI 1.5: Is this intended to be in both SI and imperial units? Does this include micrometers?
WNCP Response: The outcome specifies both SI and imperial units, and the AI doesn't restrict it, so yes to both. Micrometers could be included since they are an instrument used to determine linear measure and the list in the AI is preceded by "such as" not "limited to."
2. SO 3: Should technology be included?
WNCP Response: It is expected that students will have access to technology, including calculators and computers. If T is included in the outcome, then it is one of the processes required in the teaching, learning and assessing of the outcome. The exclusion of T in the outcome does not preclude its use for computations or determining trigonometric and logarithmic values.
The use of technology does not replace mathematical understanding. Instead, technology should be used as one of a variety of approaches for developing mathematical understanding. Where technology plays a supporting role (e.g., finding the sine of 20 degrees), its use is assumed.
The processes identified in each outcome are the ones that are the primary focus of teaching, learning and assessment. Other processes may also be included in the learning of the outcome.
3. SO 4, AI 4.4: Do these types of problems have to include all aspects as described?
**WNCP Response: Please see the final CCF where this AI has been changed to:
Solve a problem that involves one or more right triangles by applying the primary trigonometric ratios or the Pythagorean Theorem.**

Algebra and Number

1. SO 1, AI 1.4: Are other methods permitted? e.g., calculator or multiplication.
WNCP Response: This AI is there to explicitly emphasize that students must have an understanding of the concrete representation of perfect squares and perfect cubes. However, the activity exploring this idea could be extended, making a link between the concrete models and students' more abstract strategies for determining square roots and cube roots as in AI 1.5.
2. SO 2: Is this the same as "expressing in reduced form"?
WNCP Response: Please clarify the question.
3. SO 4: Does multiplication of a trinomial by a trinomial have to be represented concretely, pictorial, and symbolically? Are you assuming that the trinomials are quadratic? Question applies to SO 5 as well.
WNCP Response: Indicators 4.1, 4.2 and 4.3 would be the only ones that are stated to include representations and they refer only to binomial by binomial multiplication. The indicators and the note above the indicators clarify that concretely and pictorially is not intended for trinomial by trinomial multiplication.

Yes, trinomials are assumed to be quadratic if the trinomials use only one variable. In S0 5 it is only trinomials that are explicitly noted in the indicators as being factored concretely or pictorially.

Relations and Functions

1. SO 1, AI 1.5: Does this include both set notation and interval notation?
WNCP Response: “In a variety of ways” includes both set notation and interval notation as well as other ways, such as written and verbal descriptions, etc., to describe domain and range.
2. SO 3: Is it expected that different approaches for determining slope are to be developed? e.g., rise/run, vertical & horizontal distance, formula.
WNCP Response: Yes.
3. SO 4: Does this include step functions?
WNCP Response: No, since step functions are not linear relations.
4. SO 4, AI 4.1: Please provide rationale for the use of this methodology.
WNCP Response: It is important for students to realize that the context or situation defines which variable is dependent and which is independent.
5. SO 5, AI 5.4: Please clarify meaning of this AI.
**WNCP Response: One intersection point: a relation that defines either a vertical or horizontal line that is not an axis. Either an x or a y intercept.
Two intersection points: a relation that defines any line that is neither vertical nor horizontal (may have positive or negative slope, but not 0 or infinite). One intercept will be an x-intercept, one a y-intercept.
Infinite number of intercepts: a relation that defines either a vertical or horizontal line that is an axis. Either all x-intercepts (if horizontal) or all y-intercepts (if vertical).**
6. SO 6, AI 6.4: Are students required to have a graphing calculator?
WNCP Response: Students require access to graphing technology—either a calculator or a computer program.

Foundations of Mathematics – Grade 11

Measurement

1. SO 1, AI 1.5: Would you please clarify how this differs from 1.6?
WNCP Response: Although a graph can be a pictorial representation, it is a very abstract representation. In 1.5, students might show pictures in relation to time. For example, if sand is leaking out at $1 \text{ m}^3/\text{hr}$, the student might show pictures of the container with changing heights of sand and label them with different times.
2. SO 3, AI 3.7: Does this imply three variables? Where do the variables come from? (formulas for area, surface, and volume)
WNCP Response: Yes. The variables will come from the formulas for area or volume.

Geometry

1. SO 1: What does the word “proof” mean in this context? Are Euclid’s axioms and postulates expected?
WNCP Response: Proof means that they justify the conclusion using deductive reasoning. We are not looking for formal Euclidean statements of axioms and postulates, but rather known statements. An example of the type of reasoning statement is “the sum of the measures of the angles in a triangle is 180° .” This outcome is about students working with deductive rather than inductive reasoning.
2. SO 1, AI 1.1: Technology is not an identified process. Why is this here? Please define what you mean with the term “inductive reasoning” and how technology can be used.
WNCP Response: Technology is not identified as a process because it is not a major focus for students’ learning of the outcome. However, dynamic software programs can be used by students to help them develop conjectures about relationships within the given conditions.
3. SO 3, AI 3.2: Is a derivation a proof?
WNCP Response: Yes. Students are not expected to derive the formula but need to explain each step in the proof.
4. SO 3, AI 3.3: Please provide rationale for the use of this methodology.
WNCP Response: Students should be able to solve for any variable in a problem if they have one formula. This was an essential skill identified by the post-secondary institutions. Please see the final CCF where the AIs have been changed to:
 - 3.1 Draw a diagram to represent a problem that involves the cosine law or sine law.
 - 3.2 Explain the steps in a given proof of the sine law or cosine law.
 - 3.3 Solve a problem involving the cosine law that requires the manipulation of a formula.
 - 3.4 Explain concretely, pictorially or symbolically whether zero, one or two triangles exist, given two sides and a non-included angle.
 - 3.5 Solve a problem involving the sine law that requires the manipulation of a formula.
 - 3.6 Solve a contextual problem that involves the cosine law or the sine law.

5. SO 3, AI 3.4: Does this mean that all three methods must be used? (inclusive “or”)
WNCP Response: Yes. Students should be exposed to concrete, pictorial and symbolic methods in order to fully develop their understanding.

Logical Reasoning

1. SO 1, AI 1.2: How does this relate to the requirement to use inductive reasoning in the previous section (geometry)?
WNCP Response: The conjectures could come from geometry, number theory or other areas in mathematics. This is a good place to develop connections between topics.

2. SO 1, AI 1.5: How do you prove a “mental math strategy”?
WNCP Response: One way is to write a general formula for the strategy and prove that it is true; e.g.,

“When you square a two-digit number ending in five, the answer is the tens digit times one more than the tens digit and then 25 “tacked” onto the end.”

e.g., $25^2 \dots$ the tens digit is 2, one more than that is 3, 2×3 is 6, tack 25 on the end, so $25^2 = 625$.

A proof:

We are looking at $(a5)^2$ where a is 1, 2, 3, 4, 5, 6, 7, 8 or 9

The expanded value of $a5$ is $10a + 5$

So, we can write $(10a+5)^2$

Expanding this, we get $100a^2 + 100a + 25$

Notice that the first two terms have a common factor of $100a \dots$

$100a(a + 1) + 25$

Note that we already have our “tack on 25” very nicely (actually had it the step before). So, what is the first part saying? What does multiplying by 100 do? It moves the decimal place two to the right, puts two zeros on the end of the number, and when you “tack on 25” you will end up with a number that ends in 25. So, what is being multiplied by 100? $a(a+1) - a$ is the tens digit, $a+1$ is one more than the tens digit. So, overall, we are multiplying the tens digit times one more than the tens digit and tacking 25 on.

Note:

This is probably the most advanced of the strategies that students would be asked to prove. Doing this type of proof requires that students have number sense, and often it requires that students do examples with numbers before developing the proof.

3. SO 2: Please clarify what this means with respect to the development of a textbook. Does this mean one game per chapter, several times in the book, or should it appear multiple times within each chapter?
WNCP Response: It could be any of these. The mathematics related to the game or puzzle should be made explicit. Other examples of games and puzzles could be in the teacher or Web-based resource.

Statistics

1. SO 1, AI 1.2: Is it expected that sample SD be calculated as well?
WNCP Response: No.
2. SO 1, AI 1.3: Does this imply that the term (or measure) skew is to be used?
WNCP Response: No.

Relations and Functions

1. SO 2: Is any algebraic manipulation expected here?
WNCP Response: Yes.
2. SO 2, AI 2.7: Can students be asked to sketch by hand as well?
WNCP Response: Please see the final CCF where the AIs have been changed to:
(It is intended that completion of the square not be required.)
 - 2.1 **Determine, with or without technology, the intercepts of the graph of a quadratic function.**
 - 2.2 **Determine, by factoring, the roots of a quadratic equation, and verify by substitution.**
 - 2.3 **Determine, using the quadratic formula, the roots of a quadratic equation.**
 - 2.4 **Explain the relationships among the roots of an equation, the zeros of the corresponding function, and the x -intercepts of the graph of the function.**
 - 2.5 **Explain, using examples, why the graph of a quadratic function may have zero, one or two x -intercepts.**
 - 2.6 **Express a quadratic equation in factored form, using the zeros of a corresponding function or the x -intercepts of its graph.**
 - 2.7 **Determine, with or without technology, the coordinates of the vertex of the graph of a quadratic function.**
 - 2.8 **Determine the equation of the axis of symmetry of the graph of a quadratic function, given its x -intercepts (roots).**
 - 2.9 **Determine the coordinates of the vertex of the graph of a quadratic function, given the equation of the function and the axis of symmetry, and determine if the y -coordinate of the vertex is a maximum or a minimum.**
 - 2.10 **Determine the domain and range of a quadratic function.**
 - 2.11 **Sketch the graph of a quadratic function.**
 - 2.12 **Solve a contextual problem involving the characteristics of a quadratic function.**

Foundations of Mathematics—Grade 12

Financial Mathematics

1. SO 2: Should assets be included?
WNCP Response: Please clarify this question.
2. SO 2, AI 2.4: Does this AI belong here? How do you see this being covered?
WNCP Response: Students can isolate a variable in a formula, such as the simple interest formula, before solving the problem. This is an essential skill as identified by the post-secondary institutions.
3. SO 3: Should this be also included in the Apprenticeship & Workplace Mathematics program of studies?
WNCP Response: No.
4. SO 3: Note that the accommodation outcomes should be included here.
WNCP Response: Please clarify this question.

Probability

1. SO 3: Is there a maximum sample space? Why is technology not included here?
WNCP Response: The resource should include relevant and realistic contexts. As a result, the sample space will be reasonable. Technology is not included because the use of technology in the student's learning of this outcome is not related to understanding of conditional probability, but to carrying out previous knowledge about computations once the conditional probability has been algebraically represented.
Please see the final CCF where this SO has been changed to:
Solve problems that involve the probability of two events.
In the final CCF, the AIs have been changed to:
 - 3.1 Compare, using examples, dependent and independent events.
 - 3.2 Determine the probability of an event, given the occurrence of a previous event.
 - 3.3 Determine the probability of two dependent or two independent events.
 - 3.4 Create and solve a contextual problem that involves determining the probability of dependent or independent events.
2. SO 4: Are students expected to solve problems involving cases?
WNCP Response: Please clarify this question.
3. SO 5: Are we expected to deal with circular perms? Repetitive (identical) terms? What is the limit?
WNCP Response: No, circular permutations are not included. Permutations with identical objects are expected. Contexts should be realistic and relevant to students.
Please see the final CCF where the AIs have been changed to:
(It is intended that circular permutations not be included.)
 - 5.1 Represent the number of arrangements of n elements taken n at a time, using factorial notation.

- 5.2 Determine, with or without technology, the value of a factorial.
- 5.3 Simplify a numeric or algebraic fraction containing factorials in both the numerator and denominator.
- 5.4 Solve an equation that involves factorials.
- 5.5 Determine the number of permutations of n elements taken r at a time.
- 5.6 Determine the number of permutations of n elements taken n at a time where some elements are not distinct.
- 5.7 Explain, using examples, the effect on the total number of permutations of n elements when two or more elements are identical.
- 5.8 Generalize strategies for determining the number of permutations of n elements taken r at a time.
- 5.9 Solve a contextual problem that involves probability and permutations.

Relations and Functions

1. Is it expected that all students have access to graphing calculators and/or computers? Must the resource deal with both?
WNCP Response: Students require access to graphing technology—either a calculator or a computer program.
2. SO 1, AI 1.4: Are students expected to determine curves of best fit?
WNCP Response: Yes. Since T is a specified process, the expectation is that students use technology to determine the curve of best fit.
3. SO 2: Is there any restriction on the bases for either exponential or logarithmic functions?
WNCP Response: Since T is a specified process, the expectation is that the exponential or logarithmic functions could have any defined base.

Mathematics Research Project

1. SO 1: Can you explain how this differs from FM 11?
WNCP Response: The intent is to focus on historical events in Grade 11 and on current events in Grade 12. The inclusion of this outcome at both grade levels is intended to allow students to explore two unique mathematical topics.
Please see the final CCF where this SO and the AIs have been changed to:
 - Research and give a presentation on a current event or an area of interest that involves mathematics.**
 - 1.1 Collect primary or secondary data (statistical or informational) related to the topic.
 - 1.2 Assess the accuracy, reliability and relevance of the primary or secondary data collected by:
 - identifying examples of bias and points of view
 - identifying and describing the data collection methods
 - determining if the data is relevant
 - determining if the data is consistent with information obtained from other sources on the same topic.
 - 1.3 Interpret data, using statistical methods if applicable.
 - 1.4 Identify controversial issues, if any, and present multiple sides of the issues with supporting data.

1.5 Organize and present the research project, with or without technology.

The SO and AIs in the Mathematics Research Project in Foundations of Mathematics 11 have been changed to:

Research and give a presentation on a historical event or an area of interest that involves mathematics.

1.1 Collect primary or secondary data (statistical or informational) related to the topic.

1.2 Assess the accuracy, reliability and relevance of the primary or secondary data collected by:

- identifying examples of bias and points of view**
- identifying and describing the data collection methods**
- determining if the data is relevant**
- determining if the data is consistent with information obtained from other sources on the same topic.**

1.3 Interpret data, using statistical methods if applicable.

1.4 Identify controversial issues, if any, and present multiple sides of the issues with supporting data.

1.5 Organize and present the research project, with or without technology.

Pre-calculus – Grade 11

Trigonometry

1. SO 2, AI 2.2: Is this derivation to be in terms of trig functions or x-y coordinates?
WNCP Response: Please see the final CCF where this AI has been deleted and AI 2.1 has been changed to:
Determine, using the Pythagorean Theorem or the distance formula, the distance from the origin to a point P(x, y) on the terminal arm of an angle.
2. SO 2, AI 2.6: As these are circular functions, will students be required to state the general solution for an infinite number of rotations?
WNCP Response: The SO restricts the domain to $[0^\circ, 360^\circ]$; therefore, an infinite number of rotations is beyond the scope of this outcome at this grade level. Circular functions will be developed in Grade 12.

Relations and Functions

1. SO 1: Are there limitations on a and b? E.g., can they be irrational numbers?
WNCP Response: Please see the final CCF where the SO has been changed to:
Factor polynomial expressions of the form:
 - $ax^2+bx+c, a \neq 0$
 - $a^2x^2-b^2y^2, a \neq 0, b \neq 0$
 - $a(f(x))^2+b(f(x))+c, a \neq 0$
 - $a^2(f(x))^2-b^2(g(y))^2, a \neq 0, b \neq 0$**where a, b and c are rational numbers.**
2. SO 5, AI 5.3: Are students expected to be able to use all of these methods? Can they use the solver function of a graphing calculator?
WNCP Response: For depth of understanding, students should be exposed to a variety of methods for solving quadratic equations. Using the solver function of a graphing calculator is acceptable as long as it is not the only method used.
3. SO 6, AI 6.7: Is the PS process in the SO 6 missing?
WNCP Response: Please see the final CCF where the PS process has been added to the SO.

Pre-calculus – Grade 12

Trigonometry

1. SO 3: How is ME expected to be used here?
WNCP Response: Students will be using mental mathematics and estimation as they are working with degree and radian measures. AI 3.2 is asking for exact values and implies that students need to know the special triangles.

Permutations, Combinations and Binomial Theorem

1. SO 2: Are students expected to deal with questions involving cases?
WNCP Response: Please clarify this question.