

*Consultation Draft for the Common Curriculum  
Framework Kindergarten to Grade 9 Mathematics*

**Final Analysis Report**

Prepared for the  
Western and Northern Canadian Protocol

by



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# Consultation Draft of the Common Curriculum Framework for Kindergarten to Grade 9 Mathematics

## *Final Analysis Report*

### **Executive Summary**

In January 2005 the Western and Northern Canadian Protocol (WNCP) completed development of, and posted on the Internet, the *Consultation Draft for the Common Curriculum Framework for Kindergarten to Grade 9 Mathematics*. At the same time Hold Fast Consultants Inc. completed development of two data collection instruments for the purpose of collecting feedback on the consultation draft. The two instruments include:

- A web-based stakeholder survey that asked the general public to submit responses to a series of broad questions on the content, structure and flow of the draft Kindergarten to Grade 9 CCF; and,
- A set of detailed curriculum-specific questions used by WNCP Mathematics Consultants when meeting with focus groups consisting primarily of classroom teachers.

From January to March 2005 stakeholder groups were invited to review the draft K – 9 CCF documents and to respond to the web-based survey. In total, 563 submissions representing approximately 3378 individual responses were submitted. The majority of these responses were from teachers (74%) but consultants, postsecondary educators, administrators, parents and one student, also submitted responses. Responses to the web-based survey were received from six of the seven WNCP member jurisdictions. No responses were received from Nunavut.

During the same time period a total of 247 focus groups representing 2030 respondents met to review the draft K – 9 CCF documents. As with the web-based survey the majority of focus group participants were teachers (88%) with school administrators, consultants, post-secondary institution representatives and other ministry departments also submitting responses. No responses were received from parents, students, or industry/business. Responses were received from five of the seven WNCP member jurisdictions. No responses were received from Nunavut or the Northwest Territories.

The quantitative and qualitative data from the surveys were analyzed during the period March 26 – April 17 2005. Overall, respondents reported high levels of satisfaction with respect to the draft curriculum. Additionally, the achievement indicators developed for the Number strand also received very favourable responses. Summaries of comments related to each learning outcome have been developed and included in this report. Additionally eleven spreadsheets providing detailed responses by each individual and group have been shared with all WNCJ jurisdictions. In total 12 recommendations have been made concerning the next phase of curriculum revision for the K – 9 CCF as well as for future surveys of a similar nature (e.g., the upcoming Mathematics 10 – 12 CCF revision).

The 12 recommendations are as follows:

**Recommendation 1:** Ensure that the final curriculum document includes clear statements concerning the change in curriculum design and its intended corresponding impact on teaching and assessment in the mathematics classroom.

**Recommendation 2:** When revising the draft curriculum look for opportunities to explicitly highlight problem solving and other mathematical processes in the learning outcomes. This is in addition to the process coding that is presently included with each learning outcome.

**Recommendation 3:** Keep the focus on Number in the K – 3 curriculum, but include suggestions of how Statistics and Probability topics could be included to support the development of the other topics. Clarify that teachers may include these topics, but should not include them in their assessments of student mastery of the curriculum.

**Recommendation 4:** Do not finalize development of the K – 9 curriculum until at least a draft of the Grades 10 – 12 document has been created. The intent is to ensure there is continuity in the development of topics and that students will be adequately prepared for all subsequent courses. Consider addressing the teacher concerns by redistributing some of the content in the courses (e.g. in the Number and Patterns strands, focus on operations with fractions, decimal numbers, percents, integers in grades 7 and 8 and on exponents, equations and polynomials in grade 9.) Alternatively, provide a rationale for the changes in the scope and sequence and show the development of topics across grades to address teacher concerns.

**Recommendation 5:** Include a glossary of terms used throughout the curricula along with one or more illustrated examples to support the definition.

**Recommendation 6:** Include Achievement Indicators for all strands in all grades.

**Recommendation 7:** When working on the final revision of the K - 9 CCF authors should have ongoing access to this report as well as the database of survey responses - to further inform the revision process.

**Recommendation 8:** Ensure that future reviews of French translated curricula focus on the content of the learning outcomes, achievement indicators, and other curriculum document components and that a review of the translation take place using the final English version of the curriculum.

**Recommendation 9:** Include Illustrative Examples for the Learning Outcomes and/or student exemplars, examples of assessment items, rubrics, and student work at various mastery levels. Documents should also clarify that the reduced content is to allow for greater depth of development and mastery level.

**Recommendation 10:** Provide a scope and sequence chart for each grade level detailing the placement of topics in the curriculum.

**Recommendation 11:** Jurisdictions provide appropriate in-service to help teachers develop a greater understanding of the topics and learn strategies so that they can adequately provide the desired depth in development of the topics.

**Recommendation 12:** Once learning resources have been reviewed and recommended, jurisdictions should take steps to ensure that K – 3 classroom teachers have access to the appropriate manipulatives for teaching mathematics.

## Introduction

In 1993 the ministers of education of the western provinces and territories signed the *Western Canadian Protocol for Collaboration in Basic Education* with the stated intent to provide quality education for all students from Kindergarten to Grade 12. The western jurisdictions agreed to, among other things, identify means by which the parties could significantly enhance current efforts to work together in the area of mathematics curriculum.

The Western and Northern Canadian Protocol (WNCP) member jurisdictions now include the following provinces and territories:

- Alberta
- British Columbia
- Manitoba
- Northwest Territories
- Nunavut
- Saskatchewan
- Yukon

The WNCP developed and published *The Common Curriculum Framework (CCF) for K – 12 Mathematics* in two parts: *Kindergarten to Grade 9* in 1995 and *Grade 10 to Grade 12* in 1996. Since the initial release of the CCF the various member jurisdictions have used this two-part framework, to varying degrees, as the basis for their respective mathematics curricula.

In September 2003 the WNCP jurisdiction began the process of reviewing the CCF with a research project (completed April 2004) that included:

- A review of the current academic literature on numeracy and mathematical literacy, brain research as it related to mathematics teaching and pedagogy and new developments in terms of Kindergarten to Grade 12 Mathematics;
- A survey of all WNCP partners to determine the degree of implementation of the CCF; and,
- The identification of essential learning outcomes required for success in the world of work and for continuing education.

The *Consultation Draft for the Common Curriculum Framework for Kindergarten to Grade 9 Mathematics* was completed in January 2005 and posted on the WNCP website. Hold Fast Consultants Inc. was contracted to:

- Develop an on-line consultation survey for distribution and posting on the Internet;

- Develop a common instrument to be used in focus groups facilitated by WNCP mathematics consultants; and,
- Write a *Final Analysis Report* that summarizes and presents the results of the on-line consultation survey and focus group sessions.

## Survey Methodology

From December 2004 to January 2005 Hold Fast staff worked with various Mathematics Consultants from each of the WNCP member jurisdictions to develop two data collection instruments. These included:

- A web-based stakeholder survey (Appendix A) that was used by the general public to submit responses to a series of broad questions on the content, structure and flow of the draft Kindergarten to Grade 9 CCF; and,
- A set of detailed curriculum-specific questions to be used by WNCP Mathematics Consultants when meeting with focus groups consisting primarily of classroom teachers.

### Web-based Stakeholder Survey

The English version of the stakeholder survey was posted on the University of Victoria's website on January 25, 2005 (French version was posted January 26, 2005). Both surveys were removed from the website on March 28, 2005. It was left to the various jurisdictions to inform their stakeholder groups that the survey was posted and to encourage them to respond.

Responses to the stakeholder survey were received via email. At the conclusion of the response period these responses were imported into an Excel spreadsheet that was used to sort the data by a variety of criteria including:

- |   |                                    |
|---|------------------------------------|
| ➤ Jurisdiction                                    | ➤ Grade                            |
| ➤ Occupation                                      | ➤ Curriculum strand and sub-strand |
| ➤ Group size (if not responding as an individual) | ➤ Language (English/French).       |

The total number of responses, weighted mean scores, and standard deviations for each question were calculated and sorted using the criteria noted previously. Specific written comments accompanying the quantitative data were reviewed and summarized in order to assist in interpreting the results.

## Focus Group Questionnaires

The English version of the focus group questionnaires (one set per grade level) were provided to the project manager in MS Word and PDF formats on January 22, 2005 (French versions were provided on March 2, 2005). It was left to the various jurisdictions to determine how these questionnaires would be used. Responses were received primarily via email (i.e., MS Word files) while two jurisdictions (Yukon and Northwest Territory) sent their responses in via courier.

The quantitative and qualitative data were entered into an Excel spreadsheet (one per grade level) for analysis. For each grade level (K to 9) the total number of responses, weighted mean scores and standard deviations for each learning outcome were calculated and sorted using the criteria noted previously. Specific written comments accompanying the quantitative data were reviewed and summarized in order to assist in interpreting the results.

## Respondent Demographics

The following section summarizes the demographic information of the respondents to the stakeholder survey and focus group questionnaire. Respondent data are broken down by grade level, jurisdiction, and occupation.

### Summary of Web-based Stakeholder Respondents

From January to March 2005 stakeholder groups were invited to review the draft K – 9 CCF documents and to respond to a web-based survey about the draft curriculum. In total, 563 individuals or groups submitted responses. The majority of these responses were from teachers (74%) but consultants, postsecondary educators, administrators, parents and one student, also submitted responses. In addition, 81 submissions were received from groups identifying themselves as "Other". Eighty of these responses were from groups composed primarily of teachers participating in focus group sessions, learning support teachers, and district mathematics or assessment coordinators. This effectively increases the proportion of responses from teachers to closer to 88%. The other individual identified as "Other" was a chemical engineer. No responses were received from industry or business representatives.

Responses were received from six of the seven WNCP member jurisdictions. No responses were received from Nunavut. Table 1 (next page) shows the distribution of responses by jurisdiction and stakeholder group.

Table 1: Number of Responses by Jurisdiction and Stakeholder group

Occupation	Jurisdiction						Total by Occupation	Percent of Total by Occupation
	AB	BC	MB	NT	SK	YK		
Administrator	6	3	2	1	3		<b>15</b>	<b>2.7</b>
Consultant	16		3	2	7	1	<b>29</b>	<b>5.2</b>
Other *	12	66	3				<b>81</b>	<b>14.4</b>
Parent	1		2				<b>3</b>	<b>0.5</b>
Post Secondary	12	4	2		1		<b>19</b>	<b>3.4</b>
Student					1		<b>1</b>	<b>0.2</b>
Teacher	188	57	118	19	20	13	<b>415</b>	<b>73.7</b>
<b>Total by Jurisdiction</b>	<b>235</b>	<b>130</b>	<b>130</b>	<b>22</b>	<b>32</b>	<b>14</b>	<b>563</b>	
<b>Percent of Total by Jurisdiction</b>	<b>41.7</b>	<b>23.1</b>	<b>23.1</b>	<b>3.9</b>	<b>5.7</b>	<b>2.5</b>		

\* 80 of these responses represent teachers/district coordinators

Responses were weighted by the average of the group size submitting the response. Table 2 shows the weightings used to represent the group sizes and distribution by jurisdiction.

Based on these weightings, the 563 submissions received represent the equivalent of approximately 3378 individual responses.

Table 2: Average Group Size by Jurisdiction

Group Size	AB	BC	MB	NT	SK	YK	Total by Group Size	Percent of Total by Group Size
1	142	62	58	16	27		<b>305</b>	<b>54.2</b>
3.5	31	40	16	1	1	14	<b>103</b>	<b>18.3</b>
8	7	7	7				<b>21</b>	<b>3.7</b>
13	6	1	2	1			<b>10</b>	<b>1.8</b>
18	17	8	7	1			<b>33</b>	<b>5.9</b>
20	32	12	40	3	4		<b>91</b>	<b>16.2</b>
<b>Total</b>	<b>235</b>	<b>130</b>	<b>130</b>	<b>22</b>	<b>32</b>	<b>14</b>	<b>563</b>	

Respondents were asked to identify the grade level their comments addressed. Submissions were well distributed across all grades for the stakeholders in the jurisdictions who responded to the survey. Table 3 shows the breakdown of responses by both jurisdiction and grade level.

Table 3: Number of Responses by Jurisdiction and Grade Level

Grade Represented	AB	BC	MB	NT	SK	YK	Total
1	24	9	17	1	4	2	<b>57</b>
2	26	12	22	2	4	2	<b>68</b>
3	28	9	13	2	5	1	<b>58</b>
4	25	17	15	1	3	1	<b>62</b>
5	19	10	9	5	2	2	<b>47</b>
6	21	8	8	4	3	1	<b>45</b>
7	20	14	11	4	2	2	<b>53</b>
8	19	18	6	0	4	1	<b>48</b>
9	40	21	18	2	1	1	<b>83</b>
K	13	12	11	1	4	1	<b>42</b>
<b>Total</b>	<b>235</b>	<b>130</b>	<b>130</b>	<b>22</b>	<b>32</b>	<b>14</b>	<b>563</b>

### Summary of Focus Group Respondents

Tables 4 and 5 identify the number of respondents involved in the focus group sessions organized by jurisdiction, grade level, and occupation. A more detailed breakdown of respondent distribution has been included in Appendix B.

Table 4: Focus Group Respondents by Grade and Jurisdiction

Grade	Number of Focus Group Respondents by Jurisdiction							Total by Grade	Average % by Grade
	AB	BC	MB	NT	NU	SK	YK		
<b>K</b>	43	104	47	0	0	5	0	<b>199</b>	<b>9.8</b>
<b>1</b>	43	104	47	0	0	5	0	<b>199</b>	<b>9.8</b>
<b>2</b>	43	106	46	0	0	2	0	<b>197</b>	<b>9.7</b>
<b>3</b>	43	103	93	0	0	5	0	<b>244</b>	<b>12.0</b>
<b>4</b>	37	104	64	0	0	3	3	<b>211</b>	<b>10.4</b>
<b>5</b>	28	102	40	0	0	2	7	<b>179</b>	<b>8.8</b>
<b>6</b>	28	104	41	0	0	2	8	<b>183</b>	<b>9.0</b>
<b>7</b>	54	103	43	0	0	3	6	<b>209</b>	<b>10.3</b>
<b>8</b>	54	105	37	0	0	3	4	<b>203</b>	<b>10.0</b>
<b>9</b>	54	106	40	0	0	2	4	<b>206</b>	<b>10.1</b>
<b>Total by Jurisdiction</b>	<b>427</b>	<b>1041</b>	<b>498</b>	<b>0</b>	<b>0</b>	<b>32</b>	<b>32</b>	<b>2030</b>	
<b>Average % by Jurisdiction</b>	<b>21.0</b>	<b>51.3</b>	<b>24.5</b>	<b>0</b>	<b>0</b>	<b>1.6</b>	<b>1.6</b>		

It should be noted that the total number respondents includes those individuals who participated in reviewing multiple grade groupings. This value does not represent 2030 distinct respondents, but rather the sum of respondents in the various focus groups (regardless of how many grade groupings a particular respondent participated in). These values were used to determine weighting factors for calculating mean scores of learning

outcomes ratings. The distribution of respondents by grade is relatively even, although Grade 3 did have the greatest number of respondents accounting for 12.0% of the total.

Table 5: Focus Group Respondents by Occupation

Grade	Number of Focus Group Respondents by Occupation				
	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>Post-Secondary</i>	<i>Other</i>
<b>K</b>	178	7	5	2	7
<b>1</b>	178	7	5	2	7
<b>2</b>	176	7	5	2	7
<b>3</b>	220	8	7	2	7
<b>4</b>	189	7	6	2	7
<b>5</b>	154	8	8	2	7
<b>6</b>	161	6	7	2	7
<b>7</b>	179	10	5	2	13
<b>8</b>	174	8	6	2	13
<b>9</b>	175	9	6	3	13
<b>Total by Occupation</b>	<b>1784</b>	<b>77</b>	<b>60</b>	<b>21</b>	<b>88</b>
<b>Average % by Occupation</b>	<b>87.9</b>	<b>3.8</b>	<b>3.0</b>	<b>1.0</b>	<b>4.3</b>

Not surprisingly, the majority of focus group participants were *Teachers* (~88%) with *School Administrators* and school board *Consultants* comprising collectively ~7% of the respondents. Representatives from *Post-secondary Institutions* and *Other* (ministry departments) made up the final ~5% of respondents. Although there was a requirement to include Parents, Students, Industry/Business categories on the response forms, no respondents from these groups were included in the focus groups.

### Summary of Stakeholder & Focus Group Responses

The following sections summarize the stakeholder survey and focus group responses for the questions and learning outcomes at each grade level. Note, the term "Pure pathway" includes both Principles of Math and Pre-calculus Math and the term "Applied pathway" includes Applications of Math.

### Web-based Stakeholder Survey Results

The stakeholder survey asked respondents to rate several factors related to the proposed Learning Outcomes and Achievement Indicators and include any comments they wished to make about them. Data on all rating items was coded using 1 to indicate the highest level of satisfaction and 4 as the lowest level of satisfaction with the Learning Outcomes or

Achievement Indicators. Although means have been used in this report to summarize the data, it should be noted that descriptors on rating scales provide ordered data rather than interval data. Therefore, the means reported here are only convenient but limited indexes of the response distribution.

The questions, along with means and most frequently received comments related to that question, are provided below. Many responses were received expressing a wide range of views about the curriculum. In some cases respondents had conflicting views on which topics to include at a particular grade level or how to change a particular Learning Outcome. Also, only one respondent group made extensive suggestions or comments. For this reason, only the responses representing a common view of at least two respondent groups are included in the summary below.

### Learning Outcomes

Questions 5 – 7 asked respondents to rate items and provide comments related to the development of concepts across and within grades. Overall, respondents were moderately satisfied with the development of concepts in the draft K – 9 CCF curriculum. The highest level of dissatisfaction was at the grade 9 level. Respondents felt that too much content had been removed and that the remaining topics were often disjointed, lacking continuity, and would not adequately prepare students for the Pure pathway in high school. Elementary teachers were also dissatisfied with the Statistics and Probability strand. They felt like this was an area of success and interest for many students and did not want this strand omitted or reduced in focus. Specific ratings and comments by grade are listed below.

Table 6: Respondent Average Ratings of the Development of Concepts Across Grades

<b>Question 5: The <i>development of concepts across grades</i> in each curriculum strand is:</b>				
<b>Grade</b>	<b>Number</b>	<b>Patterns</b>	<b>Shape &amp; Space</b>	<b>Statistics &amp; Probability</b>
<b>K</b>	1.8	1.8	2.3	NA
<b>1</b>	1.9	1.9	2.2	NA
<b>2</b>	1.9	1.8	2.1	1.9
<b>3</b>	1.8	1.8	2.0	2.1
<b>4</b>	2.3	2.2	2.3	2.6
<b>5</b>	1.9	2.2	2.2	2.3
<b>6</b>	1.8	1.8	1.9	2.0
<b>7</b>	2.0	2.2	1.9	2.0
<b>8</b>	2.4	2.4	2.3	2.3
<b>9</b>	2.5	2.6	2.5	2.3
<b>Overall</b>	<b>2.1</b>	<b>2.1</b>	<b>2.2</b>	<b>2.3</b>
Note: 1 = Excellent, 2 = Satisfactory, 3 = Limited, 4 = Unsatisfactory				

Table 7: Respondent Average Ratings & Comments on the Appropriateness of Learning Outcomes Within Each Curriculum Strand

<b>Questions 6 &amp; 7: Are the Learning Outcomes for the grade you reviewed <i>developmentally appropriate within</i> each curriculum strand? Please identify any Learning Outcomes that you consider are <i>not</i> developmentally appropriate and provide suggestions for improvement.</b>				
<b>Grade</b>	<b>Number</b>	<b>Patterns</b>	<b>Shape &amp; Space</b>	<b>Statistics &amp; Probability</b>
<b>K</b>	1.8	1.6	2.1	NA
<b>1</b>	1.6	1.5	1.9	NA
<b>2</b>	1.8	1.8	2.0	1.9
<b>3</b>	2.0	1.9	2.2	2.0
<b>4</b>	1.8	1.9	2.2	2.1
<b>5</b>	2.0	2.1	2.2	2.1
<b>6</b>	2.0	1.9	2.0	2.0
<b>7</b>	2.0	2.0	2.0	1.9
<b>8</b>	2.1	2.2	2.3	2.1
<b>9</b>	2.8	2.5	2.3	2.5
<b>Overall</b>	<b>2.0</b>	<b>1.9</b>	<b>2.1</b>	<b>2.2</b>
Note: 1 = Very Appropriate, 2 = Appropriate, 3 = Somewhat Appropriate, 4 = Not Appropriate				
<b>Grade</b>	<b>Most Frequent Comments</b>			
<b>K</b>	<ul style="list-style-type: none"> <li>➤ Replicating a 3-D structure is too advanced – limit to 2-D shapes.</li> <li>➤ Include data analysis – students love it and it teaches important skills.</li> <li>➤ Sorting should not be limited to presorted groups.</li> </ul>			
<b>1</b>	<ul style="list-style-type: none"> <li>➤ Counting backwards by 2, 5, &amp; 10 is too hard for students this age.</li> <li>➤ 3-D shapes are very difficult for grade one, particularly the expectation to take them apart and put them back together.</li> <li>➤ Growing patterns are not appropriate for this age.</li> <li>➤ Writing number words to 20 is too hard. Suggest just write words to 12.</li> </ul>			
<b>2</b>	<ul style="list-style-type: none"> <li>➤ Numbers should go beyond 100 – to at least 1000.</li> <li>➤ The concept of fractions should be introduced.</li> <li>➤ Standard measurement with cm and m and telling time should be included.</li> </ul>			
<b>3</b>	<ul style="list-style-type: none"> <li>➤ Multiplication facts should extend beyond 5 x 5.</li> <li>➤ Representing multiplication and division numerically is too challenging – focus more on concrete representation.</li> <li>➤ Area/perimeter of odd shapes is developmentally inappropriate.</li> <li>➤ Some outcomes in shape and space are not appropriate (time on a clock, mass, km, converting g to kg).</li> </ul>			
<b>4</b>	<ul style="list-style-type: none"> <li>➤ Surface area of 3-D shapes is too advanced – just do 2-D shapes (overwhelming consensus on this comment.)</li> <li>➤ Too much emphasis on non-standard units of measure.</li> <li>➤ Would like money, probability included.</li> <li>➤ Benchmarks for fractions are inappropriate.</li> </ul>			
<b>5</b>	<ul style="list-style-type: none"> <li>➤ Numbers to a million too much – too large a quantity to grasp.</li> <li>➤ Numbers to a thousandth too much.</li> <li>➤ Moves too quickly from concrete to abstract.</li> </ul>			
<b>6</b>	<ul style="list-style-type: none"> <li>➤ Integers should move to grade 7.</li> <li>➤ Stats and probability should move to grade 7.</li> <li>➤ Measuring angles with protractors is too advanced for grade 6.</li> </ul>			

Grade	Most Frequent Comments (cont'd)
7	<ul style="list-style-type: none"> <li>➤ Similarity/congruence of triangles should be left to grade 8 or 9.</li> <li>➤ Ratio/proportion should be included – particularly to study similarity.</li> <li>➤ Order of operations should be included.</li> <li>➤ Don't split integer operations – include all operations.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Exponent laws too high level.</li> <li>➤ Similarity/congruence of figures should be grade 9.</li> <li>➤ Multi-step linear equations too advanced.</li> <li>➤ Tessellations could move down to grade 6 or 7.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ Keep Number Operations in the curriculum.</li> <li>➤ Keep factoring/polynomials in the curriculum.</li> <li>➤ Too much has been moved to grade 8.</li> </ul>

Questions 8 and 9 asked respondents to rate and comment on the clarity of wording of the Learning Outcomes. Again, respondents believed the outcomes were moderately clear. The recurring comment that appeared in most grades was the need for a glossary of definitions. Teachers relied heavily on the Achievement Indicators to help clarify the meaning of the Learning Outcomes. They commented that in their focus groups they often had several different interpretations of an outcome and that too much would be left to individual interpretation without a well-defined list of terms and clear Achievement Indicators. Respondents also requested inclusion of more examples and rubrics or indications of mastery level to help clarify the outcomes. They like the Illustrative Examples provided for the current curriculum and would like to also have these for the new curriculum. Ratings and specific comments and suggestions by grade for Questions 8 and 9 are listed below.

Table 8: Respondent Average Ratings & Comments on the Clarity of Learning Outcomes at Each Grade Level

Questions 8 & 9: Are the Learning Outcomes for the grade you reviewed <i>clearly worded</i> ? Please identify any outcomes that you consider are <i>not</i> clearly worded and provide suggestions for improvement.				
Grade	Number	Patterns	Shape & Space	Statistics & Probability
K	2.0	2.0	2.1	NA
1	2.0	1.8	2.1	NA
2	2.2	1.9	2.0	2.1
3	1.9	2.1	2.0	1.8
4	2.0	2.0	2.4	2.2
5	2.1	2.4	2.2	2.1
6	2.1	2.1	2.3	2.2
7	2.0	2.1	2.0	1.9
8	2.1	2.1	2.2	1.9
9	2.3	2.2	2.0	2.1
<b>Overall</b>	<b>2.1</b>	<b>2.1</b>	<b>2.1</b>	<b>2.1</b>

Note: 1 = Very Clear, 2 = Clear, 3 = Somewhat Clear, 4 = Not Clear

Grade	Most Frequent Comments
K	<ul style="list-style-type: none"> <li>➤ Examples are needed to clarify what is meant by the outcome.</li> <li>➤ Number #4: Represent a number in two parts and name the parts (cited as unclear by several respondents.)</li> <li>➤ Number 3: relate ...” to quantity...” was vague.</li> <li>➤ Shape &amp; Space 3: “Identify the single attribute used to sort pre-sorted sets” - wording was considered awkward.</li> </ul>
1	<ul style="list-style-type: none"> <li>➤ Vocabulary and language used was unclear and subject to different interpretations – examples or definitions are needed.</li> <li>➤ Skip counting by 2s, 5s, and 10s starting at 0 or 100 (cited by many as unclear and inappropriate).</li> </ul>
2	<ul style="list-style-type: none"> <li>➤ Wording was unclear – definitions or a glossary is needed.</li> <li>➤ Benchmark, Carroll diagram, non-standard units, growing patterns all need clarification.</li> </ul>
3	<ul style="list-style-type: none"> <li>➤ Many outcomes unclear – need a glossary of terms (benchmark, transitivity, line plot, personal procedure).</li> <li>➤ Extent of outcome not clear (e.g. range of numbers, complexity of pattern, which strategies for mental math).</li> </ul>
4	<ul style="list-style-type: none"> <li>➤ Clarify terms e.g. number/numeral, personal strategies, open number sentence, benchmark, many to one correspondence, SI time – need a glossary.</li> <li>➤ Need illustrative examples to clarify the outcomes.</li> <li>➤ Need to know level of mastery.</li> <li>➤ “Variety of ways”, “referent” are not explicit enough – list them.</li> </ul>
5	<ul style="list-style-type: none"> <li>➤ Need definitions for terms e.g. convex, open number sentence, annexing zero, referent.</li> <li>➤ Unclear on how far to go in number i.e. millions, thousandths.</li> <li>➤ Please keep the illustrative examples.</li> </ul>
6	<ul style="list-style-type: none"> <li>➤ Clarify terms and definitions - e.g. rational numbers, referents, and preservation.</li> <li>➤ Connect concrete, pictorial, and symbolic in the learning outcomes.</li> <li>➤ More emphasis on mental math and estimation.</li> <li>➤ Integrate a consistent problem solving approach.</li> <li>➤ Be specific in integrating technology.</li> <li>➤ Some wording is too vague, e.g. “variety of ways”.</li> </ul>
7	<ul style="list-style-type: none"> <li>➤ Need definitions/clarification of terms: Cartesian plane, concrete, symbolic, vice versa, appropriate form, express - need to be explicit (more precise language).</li> <li>➤ Numbers and Patterns organizers not well organized.</li> <li>➤ Need examples to clarify outcomes.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Very specific/technical language used – need a glossary for teachers with no math background.</li> <li>➤ Language not always consistent – appeared different people wrote different LOs.</li> <li>➤ Shape and Space – clearly identify the 2-D/3-D shapes to include.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ Outcomes all too vague – too much left to personal interpretation.</li> <li>➤ Need illustrative examples to clarify intent of the outcomes.</li> </ul>

Questions 10, 11 and 12 had respondents rate appropriateness of the amount of content and give additional comments on the Learning Outcomes. Respondents felt the amount of content was moderately appropriate. The greatest satisfaction was at the primary level. Respondents were generally happy with the focus on number and operations, although several respondents also commented that the Statistics and Probability components should have been retained.

Respondents to the draft grade 8 and 9 curriculum were much less satisfied with the proposed changes. Many felt that the grade 8 curriculum was now too heavy and the grade 9 curriculum was now too light. They were greatly concerned about the continuity between the grade 9 curriculum and the 10 – 12 courses and worried that students would not be adequately prepared for the Pure pathway. However, it should be noted that several other respondents expressed satisfaction with the changes and felt like their students would now have time to adequately address topics in the curriculum.

Respondents at all grade levels were happy with the move to reduce content. Many respondents (with the notable exception of those at the grade 9 level) even felt the curriculum did not go far enough in that direction. Many requests were received for more guidance in knowing the depth of coverage of the topics that are included in the curriculum. Suggested solutions included using illustrative examples or samples of student work with rubrics to show depth of coverage. Specific ratings and comments by grade are listed below.

Table 9: Respondent Average Ratings & Comments on the Amount of Content at Each Grade Level

<b>Questions 10 &amp; 11: Is the <i>amount</i> of content appropriate for the grade being considered? If the amount is not appropriate please indicate what should be added or deleted.</b>					
<b>Grade</b>	<b>Number</b>	<b>Patterns</b>	<b>Shape &amp; Space</b>	<b>Statistics &amp; Probability</b>	<b>Whole Course</b>
<b>K</b>	2.1	1.7	2.1	NA	2.0
<b>1</b>	1.6	1.6	2.0	NA	1.9
<b>2</b>	2.1	1.8	2.1	1.8	2.1
<b>3</b>	2.1	2.0	2.3	2.0	2.1
<b>4</b>	2.1	2.0	2.3	2.3	2.2
<b>5</b>	2.1	2.3	2.2	2.2	2.3
<b>6</b>	2.0	2.0	2.0	2.1	2.1
<b>7</b>	2.0	2.0	2.3	2.2	2.3
<b>8</b>	2.4	2.2	2.3	2.1	2.5
<b>9</b>	2.6	2.5	2.5	2.6	2.9
<b>Overall</b>	<b>2.1</b>	<b>2.0</b>	<b>2.2</b>	<b>2.3</b>	<b>2.3</b>

Note: 1 = Very Appropriate, 2 = Appropriate, 3 = Somewhat Appropriate, 4 = Not Appropriate

Grade	Most Frequent Comments
K	<ul style="list-style-type: none"> <li>➤ Include the concept of 0.</li> <li>➤ Include sorting beyond geometry concepts.</li> <li>➤ Include statistics and probability.</li> </ul>
1	<ul style="list-style-type: none"> <li>➤ We're happy with the focus on number.</li> <li>➤ Keep the statistics (graphing).</li> <li>➤ Representing/comparing numbers should go to 50 rather than 20.</li> <li>➤ Time/calendar should be included.</li> </ul>
2	<ul style="list-style-type: none"> <li>➤ Need standard as well as non-standard units in time and measurement.</li> <li>➤ Some basic fractions needed.</li> <li>➤ Amount is appropriate but need a better idea of the depth of coverage.</li> </ul>
3	<ul style="list-style-type: none"> <li>➤ Include time and money concepts.</li> <li>➤ Delete statistics and probability.</li> <li>➤ Too much in grade 3 compared to grade 2.</li> </ul>
4	<ul style="list-style-type: none"> <li>➤ Still too much to cover in the curriculum.</li> <li>➤ Identify which outcomes must be taught to mastery level.</li> <li>➤ Shape and Space is too heavy – cut down – suggest cutting surface area of 3-D shapes.</li> <li>➤ Give some direction defining problem solving.</li> <li>➤ Include more graphing and probability.</li> </ul>
5	<ul style="list-style-type: none"> <li>➤ Moving in the right direction, but still too much to cover – identify essential vs. developing concepts.</li> <li>➤ More emphasis on basic operations.</li> </ul>
6	<ul style="list-style-type: none"> <li>➤ Get rid of polyhedron in grade 6.</li> <li>➤ Good move to reduce content.</li> <li>➤ Move statistics and probability to grade 8.</li> <li>➤ Include more fraction work (e.g. ratio/proportion, simplifying).</li> </ul>
7	<ul style="list-style-type: none"> <li>➤ Shape and Space strand appears heavy delete similar/congruent triangles.</li> <li>➤ More algebra – more than one-step equations.</li> <li>➤ Include BEDMAS, all integer operations.</li> <li>➤ Worry about the fraction work.</li> <li>➤ Too much content.</li> <li>➤ Decrease Statistics and Probability content.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Too much content downloaded to grade 8.</li> <li>➤ Move similarity/congruence to grade 9, move tessellations down.</li> <li>➤ Leave exponent laws in grade 9.</li> <li>➤ Do more fraction work earlier to prepare students for grade 8.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ Too much has been taken out of grade 9 – include more emphasis on equation solving and polynomials.</li> <li>➤ Reduce the amount of statistics and probability/shape and space outcomes.</li> <li>➤ Too many isolated outcomes not linked to other content.</li> </ul>

Table 10: Summary of Respondents' Additional Comments on Learning Outcomes

Question 12: Additional Comments regarding the Learning Outcomes	
Grade	Most Frequent Comments
K	<ul style="list-style-type: none"> <li>➤ We like having a separate curriculum for K.</li> <li>➤ More examples are needed to clarify the outcomes.</li> </ul>
1	<ul style="list-style-type: none"> <li>➤ Many outcomes are too vague and need the Achievement Indicators to clarify exactly what is expected. Terms need to be simpler.</li> <li>➤ The term "explore" needs to be there or it will not occur in the class.</li> </ul>
2	<ul style="list-style-type: none"> <li>➤ Like the emphasis on mental math and strategies.</li> <li>➤ Need more clarity in wording.</li> <li>➤ Depth versus breadth is a positive move.</li> </ul>
3	<ul style="list-style-type: none"> <li>➤ Include a glossary. Groups had difficulty agreeing on meaning and interpretation of terms.</li> <li>➤ Include examples to show level of mastery.</li> </ul>
4	<ul style="list-style-type: none"> <li>➤ Need achievement indicators/illustrative examples for all strands to clarify the learning outcomes.</li> <li>➤ Need a glossary of terms.</li> <li>➤ Like the emphasis on number and more student exploration.</li> </ul>
5	<ul style="list-style-type: none"> <li>➤ Need achievement indicators to clarify all learning outcomes.</li> <li>➤ Encourages more emphasis on communication and problem solving.</li> <li>➤ Need a glossary to clarify terms.</li> </ul>
6	<ul style="list-style-type: none"> <li>➤ Needs to show more connections between the subtopics.</li> <li>➤ Would like references to where outcomes are found in recommended resources.</li> <li>➤ Need illustrative examples.</li> </ul>
7	<ul style="list-style-type: none"> <li>➤ Need specific/explicit examples.</li> <li>➤ Include order of operations.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Need more repetition of previous topics.</li> <li>➤ Need order of operations.</li> <li>➤ Delete transformations, tessellations, exponents, and type V &amp; VI equations.</li> <li>➤ Grade 8 is a heavy curriculum – no longer a catch up year.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ The curriculum is too general, too vague, too watered down and will not prepare students for the Pure pathway.</li> <li>➤ Factoring should remain in grade 9.</li> <li>➤ Integers and fractions could be taught at lower grades but need to be reviewed here.</li> <li>➤ More equations before inequalities topics.</li> </ul>

### Achievement Indicators

Respondents generally felt the Achievement Indicators were appropriate and helped clarify the Learning Outcomes. In fact, the most frequent theme in the comments was that the Achievement Indicators were essential to understand the Learning Outcomes since wording of the Learning Outcomes was often vague and subject to individual interpretation. They also felt like the Achievement Indicators would be helpful in preparing to teach and to assess student learning at that grade. Respondents requested both Achievement Indicators and

Illustrative Examples for all strands. Specific ratings and comments by grade are listed below.

Table 11: Respondent Average Ratings & Comments on the Clarity of Achievement Indicators within **Number**

<b>Question 13: Do the Achievement Indicators for the grade you reviewed help clarify the Learning Outcomes within the <i>Number</i> curriculum strand?</b>										
<b>Grade</b>	K	1	2	3	4	5	6	7	8	9
<b>Mean</b>	1.0	1.0	1.2	1.1	1.1	1.2	1.2	1.0	1.2	1.3
Note: 1 = Yes, 2 = No										
<b>Grade</b>	<b>Most Frequent Comments</b>									
<b>K</b>	<ul style="list-style-type: none"> <li>➤ Include indicators for all the strands.</li> <li>➤ Make them mandatory – not an optional part of the curriculum.</li> </ul>									
<b>1</b>	<ul style="list-style-type: none"> <li>➤ They are very valuable. Many outcomes would not have been clear without them.</li> <li>➤ Include illustrative examples as well as the achievement indicators.</li> </ul>									
<b>2</b>	<ul style="list-style-type: none"> <li>➤ More achievement indicators for each strand and outcome would be helpful.</li> <li>➤ Include examples or rubrics in the Achievement Indicators.</li> <li>➤ Clarify benchmarks and Carroll diagrams.</li> </ul>									
<b>3</b>	<ul style="list-style-type: none"> <li>➤ Helpful, but need more examples to show other possibilities.</li> <li>➤ Some vagueness in expectations (e.g. what does “use a variety of strategies mean – which strategies?) – clarify level of expectation.</li> <li>➤ Include both Achievement Indicators and illustrative examples.</li> </ul>									
<b>4</b>	<ul style="list-style-type: none"> <li>➤ Very helpful, but need more examples and clarification of some wording.</li> <li>➤ Keep the illustrative examples as well.</li> <li>➤ Need reminders that these are not an exhaustive list.</li> <li>➤ Need rubrics to help with assessment.</li> </ul>									
<b>5</b>	<ul style="list-style-type: none"> <li>➤ Definitely helpful – many Learning Outcomes would not have been clear without them.</li> <li>➤ Include more Achievement Indicators as well as Illustrative Examples.</li> </ul>									
<b>6</b>	<ul style="list-style-type: none"> <li>➤ Very helpful, but also need Illustrative Examples.</li> </ul>									
<b>7</b>	<ul style="list-style-type: none"> <li>➤ They are good but we still want Illustrative Examples.</li> <li>➤ Help clarify Learning Outcomes.</li> </ul>									
<b>8</b>	<ul style="list-style-type: none"> <li>➤ Need both Achievement Indicators and Illustrative Examples.</li> <li>➤ Some indicators were wordy/unclear – need illustrations/examples to clarify.</li> <li>➤ Need to know boundaries – rubric or expected level of achievement.</li> </ul>									
<b>9</b>	<ul style="list-style-type: none"> <li>➤ Indicators seemed to be just a restatement of the Learning Outcomes.</li> <li>➤ Illustrative examples/limiting examples would provide more clarification.</li> <li>➤ Some performance terms used were subjective.</li> </ul>									

Table 12: Respondent Average Ratings & Comments on the Appropriateness of Achievement Indicators within **Number**

<b>Question 14:</b> Are the Achievement Indicators for the <i>Number</i> curriculum strand appropriate for students in the grade you reviewed?										
<b>Grade</b>	K	1	2	3	4	5	6	7	8	9
<b>Mean</b>	1.1	1.0	1.1	1.1	1.2	1.2	1.1	1.0	1.2	1.2
Note: 1 = Yes, 2 = No										
<b>Grade</b>	<b>Most Frequent Comments</b>									
<b>K</b>	➤ No commonly included comments.									
<b>1</b>	➤ Need clarification on the skip counting outcomes. ➤ Wording/terms not always clear – need a glossary.									
<b>2</b>	➤ No commonly included comments.									
<b>3</b>	➤ Include more examples. ➤ Some seem rather difficult/abstract for this age.									
<b>4</b>	➤ Definitely include them for all strands– they will help with assessment.									
<b>5</b>	➤ Yes, but many students are not functioning at this level and need review of basic operations. These concepts are too difficult.									
<b>6</b>	➤ No commonly included comments.									
<b>7</b>	➤ They are appropriate and clearer than the Learning Outcomes.									
<b>8</b>	➤ Too general – need more clarity.									
<b>9</b>	➤ The Achievement Indicators do not take into account students at different levels.									

Table 13: Respondent Average Ratings on the Helpfulness of Achievement Indicators within **Number** in Preparing to Teach Students

<b>Question 15:</b> How helpful will the Achievement Indicators for the <i>Number</i> curriculum strand be in preparing to <i>teach</i> a topic or lesson at the grade you reviewed?										
<b>Grade</b>	K	1	2	3	4	5	6	7	8	9
<b>Mean</b>	2.0	1.6	1.8	1.8	1.9	2.0	1.8	1.8	2.0	2.4
Note: 1 = Very Helpful, 2 = Helpful, 3 = Somewhat Helpful, 4 = Not Helpful										

Table 14: Respondent Average Ratings on the Helpfulness of Achievement Indicators within **Number** in Preparing to Assess Students

<b>Question 16:</b> How helpful will the Achievement Indicators for the <i>Number</i> curriculum strand be in preparing to <i>assess</i> student learning at the grade you reviewed?										
<b>Grade</b>	K	1	2	3	4	5	6	7	8	9
<b>Mean</b>	1.9	1.5	1.8	1.7	1.8	2.0	1.7	1.9	2.3	2.6
Note: 1 = Very Helpful, 2 = Helpful, 3 = Somewhat Helpful, 4 = Not Helpful										

Table 15: Summary of Respondents' Additional Comments Regarding the Achievement Indicators by Grade Level

Question 17: Additional Comments Regarding the Achievement Indicators	
Grade	Most Frequent Comments
K	<ul style="list-style-type: none"> <li>➤ They are great, but would like more examples.</li> <li>➤ Provide rubrics or specific examples of “fully meets expectations”.</li> </ul>
1	<ul style="list-style-type: none"> <li>➤ Have Achievement indicators for all strands – not just Number.</li> <li>➤ Include more examples.</li> <li>➤ Make sure benchmarks are very clear.</li> </ul>
2	<ul style="list-style-type: none"> <li>➤ Need more indicators and illustrative examples as well.</li> <li>➤ Need rubrics or information on depth of coverage.</li> </ul>
3	<ul style="list-style-type: none"> <li>➤ Vague wording needs to be clarified.</li> <li>➤ Correlation to the Performance Standards would be useful.</li> <li>➤ Include more concrete examples and illustrations.</li> </ul>
4	<ul style="list-style-type: none"> <li>➤ Need a rubric to help assess student progress.</li> <li>➤ Worry that list is too prescriptive and may be viewed as exhaustive.</li> <li>➤ Need specific examples.</li> </ul>
5	<ul style="list-style-type: none"> <li>➤ Need rubrics to assess level of mastery.</li> <li>➤ Need Achievement Indicators for all strands.</li> <li>➤ Help clarify the Learning Outcomes.</li> </ul>
6	<ul style="list-style-type: none"> <li>➤ Would like both Achievement Indicators and Illustrative Examples.</li> <li>➤ Worry that the list is too prescriptive and may be viewed as exhaustive.</li> <li>➤ Specific examples and rubrics would be appreciated.</li> </ul>
7	<ul style="list-style-type: none"> <li>➤ They are good, but need to be supported with examples.</li> <li>➤ Need them for the whole curriculum.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Not specific enough - need more concrete examples.</li> <li>➤ Provide Illustrative Examples as well.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ Include exemplars to show levels of student achievement or alternate strategies.</li> <li>➤ Provide Illustrative Examples as well.</li> </ul>

#### Additional Comments

Respondents also provided additional comments regarding their overall impression of the curriculum and any further suggestions they wished to make. Comments and suggestions primarily reiterated the comments already made about the Learning Outcomes and the Achievement Indicators. Respondents to the K – 3 curriculum appreciated having separate curricula for each grade, reduced content, and more focus on number concepts. However, many respondents felt that it was important to also include some statistics and probability content at that level.

Respondents to the grade 4 – 6 curriculum were also happy with the reduced content. Their primary concern was a need for a scope and sequence to see how topics were developed across the grades, clarification of terms in the learning outcomes, and inclusion of illustrative examples, rubrics, and examples of student work.

Respondents to the grade 7 – 9 curriculum had mixed feelings about the changes. Many teachers appreciated a reduced content coverage in the curricula. Others welcomed the reduction in content in grade 7, but felt the proposed grade 8 curriculum is now too heavy and the grade 9 curriculum is too light. Respondents at the grade 9 level in particular felt they were at a disadvantage to adequately critique the changes. As the grade 10 – 12 curricula are not yet available it was difficult to evaluate the adequacy of the grade 9 curriculum to prepare students for the grade 10 – 12 courses. The most frequent suggestions were to focus on integers and fractions in grades 7 and 8 and do polynomials and more extensive equations at the grade 9 level. Respondents preferred not to split integer and fraction operations between two grades. They wished all operations to be introduced in grade 7 and reinforced again in grade 8. It should also be noted that many respondents who felt the curriculum was too light at the grade 9 level recommended that the grade 9 curricula not be changed at all. They claimed the current curricula met student needs and content coverage did not need to be reduced. This was in marked contrast to views by other teachers that the current grade 9 course is too heavy for many students.

Respondents at all grade levels commented on the need for resources and in-service. Even those who wished they could start the new curricula immediately recognized the importance of adequate support, particularly for those teachers who were non-mathematics specialists who were less comfortable with the content. Final comments from many respondents also expressed appreciation for the opportunity to participate in the focus groups and/or stakeholder survey. They are happy that their voices are being heard and their professional expertise and practical experience are being recognized and valued in the curriculum revision process.

Additional comments included many suggestions specific to an individual grade. Most of these were suggestions for topics to add or delete from a particular grade. The comments most frequently received are summarized below.

Table 16: Summary of Respondents' Overall Impressions of the Curriculum by Grade Level

<b>Question 18: What are your overall impressions of the curriculum for the grade for which you are responding?</b>	
<b>Grade</b>	<b>Most Frequent Comments</b>
<b>K</b>	<ul style="list-style-type: none"> <li>➤ Outcomes are realistic and achievable.</li> <li>➤ A separate curriculum for Kindergarten is nice.</li> <li>➤ Too much taken out – keep statistics (graphing), sorting, and numbers beyond 10.</li> </ul>
<b>1</b>	<ul style="list-style-type: none"> <li>➤ Like the focus on the Number strand. The curriculum is more manageable and realistic.</li> <li>➤ Would like statistics included.</li> <li>➤ Clearer wording desired for outcomes and achievement indicators.</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>➤ Overall happy with the direction – less content.</li> <li>➤ Too much focus on Number.</li> <li>➤ Clearer wording desired.</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>➤ Many happy with the changes, but others feel still too heavy.</li> <li>➤ Pleased that statistics and probability is gone.</li> <li>➤ Need more emphasis on reflection and explanation.</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>➤ Like the overall trend to less content and more time to explore concepts.</li> <li>➤ Need a scope and sequence to see the development of a concept across grades.</li> <li>➤ Prefer to see more spiraling to tie content across grades.</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>➤ Very happy to see the emphasis on depth rather than breadth.</li> <li>➤ Seems developmentally appropriate for this grade.</li> <li>➤ Like the changes at this level.</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>➤ Reduced content is welcome, although some great topics are gone (probability, tessellations, symmetry).</li> <li>➤ Good layout, but would like a scope and sequence to see development of topics across grades.</li> <li>➤ Overall content is good, not much different than the present curriculum.</li> </ul>
<b>7</b>	<ul style="list-style-type: none"> <li>➤ Like the reduced amount of content.</li> <li>➤ Need a scope and sequence to see how the grades fit together.</li> <li>➤ Need order of operations.</li> <li>➤ Why are integer operations split over two years?</li> <li>➤ Need suggestions for working with students below grade level.</li> </ul>
<b>8</b>	<ul style="list-style-type: none"> <li>➤ Grade 8 curriculum is too heavy.</li> <li>➤ Too much reliance on calculators.</li> <li>➤ Need to provide for structured review of concepts.</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>➤ Not enough content – too weak, disjointed, will not prepare students for grades 10-12, more able students will bore quickly.</li> <li>➤ Good move to reduce content – more manageable.</li> <li>➤ Achievement Indicators/Illustrative Examples need to show depth of coverage of the outcomes – too many teachers may teach these superficially.</li> </ul>

Table 17: Summary of Respondents' Suggestions for Changes to the Curriculum

<b>Question 19: What are your suggestions, if any, for changes to the curriculum for the grade for which you are responding?</b>	
<b>Grade</b>	<b>Most Frequent Comments</b>
<b>K</b>	<ul style="list-style-type: none"> <li>➤ Put back graphing and sorting.</li> <li>➤ Make sure teachers know they can explore beyond these expectations, but not assess beyond them.</li> </ul>
<b>1</b>	<ul style="list-style-type: none"> <li>➤ Include graphing.</li> <li>➤ Reading/writing /number operations to 12 rather than 20.</li> <li>➤ Omit skip counting starting at 100.</li> </ul>
<b>2</b>	<ul style="list-style-type: none"> <li>➤ Include standard measurement units (cm, m).</li> <li>➤ Telling time (face clock).</li> <li>➤ Place value emphasized.</li> </ul>
<b>3</b>	<ul style="list-style-type: none"> <li>➤ Include money.</li> <li>➤ Provide more examples of levels of expectations.</li> </ul>
<b>4</b>	<ul style="list-style-type: none"> <li>➤ Clarify vague/misleading language.</li> <li>➤ Provide more examples and level of mastery expected.</li> <li>➤ Provide better explanation of the rationale for changes.</li> </ul>
<b>5</b>	<ul style="list-style-type: none"> <li>➤ Need more suggestions for assessment – rubrics, checklists.</li> <li>➤ Need more explanations with money.</li> <li>➤ Don't go to thousandths with decimals.</li> <li>➤ Need suggested time allotments for various topics.</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>➤ Extensive in-service and teacher support required.</li> <li>➤ Include the Illustrative Examples.</li> <li>➤ Move Statistics and Probability to grade 8.</li> <li>➤ Include suggestions for teaching a split grade.</li> <li>➤ More fraction work.</li> </ul>
<b>7</b>	<ul style="list-style-type: none"> <li>➤ Put in order of operations, more complex equations (algebra), LCM, GCF, ratio/proportion/decimals/percents.</li> <li>➤ Remove similarity and congruence.</li> <li>➤ Make it manageable – fewer outcomes so teachers don't have to select what to leave out.</li> <li>➤ Provide suggestions for adaptations.</li> </ul>
<b>8</b>	<ul style="list-style-type: none"> <li>➤ Move all integer operations to grade 7.</li> <li>➤ Do fractions in all three junior high grades.</li> <li>➤ Move exponent rules and similarity/congruence to grade 9.</li> <li>➤ Include order of operations.</li> <li>➤ Move tessellations out of grade 8.</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>➤ Leave grade 9 alone and concentrate on more fractions, integers, rates, percents in grades 7 &amp; 8.</li> <li>➤ Increase emphasis on algebra concepts (polynomials, factoring, equations).</li> <li>➤ May need another course for students who will take the Pure pathway.</li> </ul>

Table 18: Summary of Respondents' Additional Comments

Question 20: Other Comments	
Grade	Most Frequent Comments
K	<ul style="list-style-type: none"> <li>➤ Thank you for the opportunity to participate and give input.</li> <li>➤ What kind of in-service will be offered?</li> </ul>
1	<ul style="list-style-type: none"> <li>➤ Like the layout, but need clearer wording of the learning outcomes.</li> </ul>
2	<ul style="list-style-type: none"> <li>➤ Thanks for the opportunity to participate.</li> <li>➤ Glossary and user friendly size/binding needed.</li> </ul>
3	<ul style="list-style-type: none"> <li>➤ We need in-service and resources.</li> </ul>
4	<ul style="list-style-type: none"> <li>➤ Thanks for the opportunity to give input to the revision.</li> <li>➤ We need resources and in-service.</li> </ul>
5	<ul style="list-style-type: none"> <li>➤ Need teacher in-service/teacher support.</li> <li>➤ Include more on assessment and integration.</li> </ul>
6	<ul style="list-style-type: none"> <li>➤ Time frame required for teaching the curriculum.</li> <li>➤ Need in-service and teacher support.</li> <li>➤ Some concern about how to manage this curriculum with students if they arrive in grade 6 not having mastered preceding curricula.</li> </ul>
7	<ul style="list-style-type: none"> <li>➤ Need in-service and appropriate resources.</li> <li>➤ A 6/7 split will be difficult to teach.</li> </ul>
8	<ul style="list-style-type: none"> <li>➤ Some topics too advanced for developmental level of the students.</li> <li>➤ Need in-service and support to change how teachers teach.</li> </ul>
9	<ul style="list-style-type: none"> <li>➤ Need to see the changes in 10 – 12 to get whole picture. This curriculum will not work without significant changes to the 10 – 12 curriculum.</li> <li>➤ Great concern that this curriculum will not adequately prepare students for the high school Pure pathway.</li> </ul>

### Focus Group Responses

The tables starting on the next page summarize the focus group responses for the learning outcomes at each grade level (K to 9). Respondents scored two or three statements (depending upon the curriculum strand) using a 4-point Likert scale shown below. Column 1 includes the learning outcomes and, if available, Achievement Indicators. The calculated mean scores and standard deviations (weighted by respondent group size) for each learning outcome are reported in columns two through four. The last column contains a summary of common comments made by respondents related to each learning outcome. A series of spreadsheets containing the detailed breakdown of responses by grade level, jurisdiction of respondent, respondent occupation, group size, etc. has been made available to all WNCP jurisdictions.

Statements that respondents were asked to rate the learning outcomes and achievement indicators on were:

**CL = The learning outcome is clear.**

**DA = The learning outcome is developmentally appropriate.**

**AI = The achievement indicator(s) will help in determining students' understanding of the outcome.**

The 4-point Likert Scale respondents were required to use is:

**1 = Strongly Agree    2 = Agree    3 = Disagree    4 = Strongly Disagree**

Table 19: Focus Group Responses for Kindergarten Learning Outcomes

KINDERGARTEN	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i><b>NUMBER</b></i>				
1. Say the number sequence by 1s starting anywhere 1 to 10 and from 10 to 1. [C, CN] <ul style="list-style-type: none"> <li>➤ State the number name after a given number name (one to nine).</li> <li>➤ State the number name before a given number name (two to ten).</li> <li>➤ Recite number names from a given number name to a stated number name (one to ten; ten to one).</li> </ul>	1.4 (0.8)	1.4 (1.1)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Include "0" in the sequence.</li> <li>➤ Increase counting to at least 20 (consider increasing to 30).</li> <li>➤ Reword to state: "name the number".</li> </ul>
2. Recognize at a glance and name familiar arrangements of numbers 1 to 5. [CN, V] <ul style="list-style-type: none"> <li>➤ Look briefly at a familiar arrangement of dots (1 to 5) and answer the question, 'How many do you see?' without counting.</li> </ul>	1.3 (0.5)	1.0 (0.2)	1.1 (0.3)	<ul style="list-style-type: none"> <li>➤ Arrange 1 – 6 (e.g. dice, dominoes).</li> <li>➤ Explain "familiar arrangements".</li> </ul>

KINDERGARTEN	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>3. Relate numerals 1 to 10, to quantity in a variety of ways. [CN, V]</p> <ul style="list-style-type: none"> <li>➤ Construct a set of objects for a given quantity.</li> <li>➤ Name the number shown for a given a set of objects.</li> <li>➤ Hold up the appropriate number of fingers for a given numeral.</li> <li>➤ Match numerals with the appropriate number of dots.</li> </ul>	1.5 (0.9)	1.0 (0)	1.0 (0.3)	<ul style="list-style-type: none"> <li>➤ Wording is awkward.</li> <li>➤ Reword: "Relate numerals 1 to 10 to their respective quantities in a variety of ways."</li> <li>➤ Define "numeral".</li> <li>➤ Introduce estimating.</li> </ul>
<p>4. Represent a number (2 to 5) in two parts and name the parts. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Represent a given number (2 to 5) in two parts concretely and state the number of objects in each part.</li> </ul>	1.9 (1.3)	1.2 (0.5)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Error in the statement of the outcome.</li> <li>➤ Numbers 2 to 10 (not just 2 to 5).</li> <li>➤ Give examples of the language for teachers to use.</li> <li>➤ Indicator does not give an example.</li> </ul>
<p>5. Compare quantities 1 to 10 using one-to-one correspondence. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Construct a set to show more than, fewer than, or as many as another set.</li> <li>➤ Compare two sets through direct comparison and describe using words such as: 'there are more', 'there are fewer', and 'there are as many' or 'there is the same number.'</li> </ul>	1.3 (0.7)	1.1 (0.4)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Change vocabulary to include: greater (than), less (than), equal (to).</li> </ul>

Kindergarten	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe the pattern involved in simple repeating sound, colour, size, shape and positional patterns. [C, PS, V]	1.4 (0.7)	1.0 (0)	<ul style="list-style-type: none"> <li>➤ Clarify the meaning of "simple" and "positional".</li> <li>➤ Include the concept of "sorting" to make patterns easier to teach and understand.</li> <li>➤ Insert the word "orally" after the word "Describe".</li> </ul>
2. Reproduce and extend simple repeating sound, colour, size, shape and positional patterns. [CN, PS, V]	1.2 (0.6)	1.0 (0)	<ul style="list-style-type: none"> <li>➤ Clarify the meaning of "simple" and "positional".</li> </ul>
3. Create a simple repeating sound, colour, size, shape and positional pattern. [CN, PS, V]	1.2 (0.4)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Clarify the meaning of "simple" and "positional".</li> <li>➤ Clarify if this can be used to show transformation.</li> </ul>
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Make direct comparisons based on a single attribute. [CN, R, V]	1.8 (1.3)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarify the meaning of "attribute" and give guidelines.</li> <li>➤ Clarify what comparisons are expected.</li> </ul>
2. Describe attributes of objects using terms such as long, short, light and heavy. [C]	1.3 (0.6)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Include more terms as examples.</li> <li>➤ Include positional words such as: over, under, in, out, and between.</li> </ul>
<b><i>SHAPE &amp; SPACE (3-D OBJECTS AND 2-D SHAPES)</i></b>			
3. Identify the single attribute used to sort pre-sorted sets. [R, V]	1.5 (0.9)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Students should do the sorting (why presorted sets?) - Needs clarification.</li> <li>➤ Include expected attributes.</li> </ul>
4. Copy and create designs using manipulatives. [CN, PS, V]	1.6 (1.0)	1.1 (0.3)	<ul style="list-style-type: none"> <li>➤ Clarify the difference between "design" and "pattern".</li> <li>➤ Specify that it is 2-D designs.</li> <li>➤ "Create" is too hard to assess.</li> <li>➤ Might not be developmentally appropriate.</li> </ul>
5. Replicate a given 3-D structure. [CN, PS, V]	1.7 (1.1)	1.7 (1.4)	<ul style="list-style-type: none"> <li>➤ Clarify how many 3-D objects are expected in a 3-D structure.</li> <li>➤ Too difficult for this grade level (perhaps even too difficult for grade 1).</li> </ul>

### *Summary of Kindergarten General Comments*

The following is a summary of the most common general comments made by respondents about the kindergarten curriculum:

- 2-D shapes should be formally introduced at this grade level;
- Comparing sets should be included (e.g., birthdays, weather); and,
- Learning outcomes should introduce the concept of zero.

Table 20: Focus Group Responses for Grade 1 Learning Outcomes

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Demonstrate an understanding of counting by:</p> <ul style="list-style-type: none"> <li>• indicating that the last number said identifies "how many";</li> <li>• show that any collection has only one "count";</li> <li>• using the counting on strategy;</li> <li>• using parts or equal groups to count collections. [C, CN, R, V]</li> </ul> <p>➤ Identify that the last number counted when using one-to-one correspondence represents the number of objects in a set.</p> <p>➤ Correct errors (two number names assigned to one object; a number name assigned to a gap between two counters; another number name is recited after the last counter) in determining the number of objects in a set.</p> <p>➤ Conclude that it does not matter in which order you count the number of objects in a set does not change.</p> <p>➤ State that if several objects are counted and then rearranged then the count of the set does not change.</p> <p>➤ Use recognition of a known quantity and counting on to determine the total number of objects in a set.</p> <p>➤ Use grouping in order to count larger quantities.</p>	<p>1.8 (0.7)</p>	<p>1.3 (0.6)</p>	<p>1.8 (0.7)</p>	<ul style="list-style-type: none"> <li>➤ In the 2nd bullet in the learning outcome - "count" is a confusing word - replacement terms suggested included "quantity" or "value".</li> <li>➤ The 2nd achievement indicator is considered to be unclear.</li> </ul>

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>2. Recognize at a glance familiar arrangements of numbers up to and including 10. [CN, V]</p> <ul style="list-style-type: none"> <li>➤ Look briefly at a familiar arrangement of dots (including 5 and 10 frame) and answer the question, 'How many?' without counting.</li> <li>➤ Look briefly at a group of objects in a familiar arrangement and identify 'How many?' without counting.</li> </ul>	1.3 (0.5)	1.0 (0.1)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ The concept of estimating should be introduced to make learning easier.</li> </ul>
<p>3. Represent and describe numbers to 20 in a variety of ways. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Represent numbers up to 20 using base ten materials.</li> <li>➤ Read and write number words to 20.</li> <li>➤ Partition any quantity to demonstrate that the original number does not change.</li> <li>➤ Illustrate how a number can be modeled by different objects (e.g. ten elephants represents the same number as ten mice).</li> </ul>	1.4 (0.5)	1.4 (0.5)	1.4 (0.6)	<ul style="list-style-type: none"> <li>➤ Learning should be extended to the number 30 so that such things as a calendar can be used.</li> <li>➤ Writing number words is considered too difficult for many students at this age.</li> </ul>
<p>4. Identify where numerals are used in everyday situations, including coins. [C, CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Identify examples where numerals are used in the home, school, store, and everyday situations.</li> </ul>	1.3 (0.6)	1.2 (0.8)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Another AI is needed to clarify number vs. numeral.</li> <li>➤ More detail is needed in the example, e.g., street number, phone number.</li> </ul>

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>5. Say the number sequence by:</p> <ul style="list-style-type: none"> <li>• 1s forwards and backwards between any two given numbers;</li> <li>• 2s, 5s and 10s starting at 0 or 100. [C]</li> </ul> <p>➤ Recite by 1s the number sequence between two given numbers (forwards; backwards).</p> <p>➤ Skip count by 2s starting at 0 or 100.</p> <p>➤ Skip count by 5s starting at 0 or 100.</p> <p>➤ Skip count by 10s starting at 0 or 100.</p> <p>➤ Identify and correct errors and omissions in a number sequence.</p>	2.4 (1.1)	2.0 (1.0)	2.2 (1.2)	<p>➤ More clarity is needed in both the outcome and the examples.</p> <p>➤ Some respondents indicated that this outcome might not be developmentally appropriate.</p>
<p>6. Compare sets to 20 using</p> <ul style="list-style-type: none"> <li>• benchmarks;</li> <li>• direct comparison. [C, CN, R, V]</li> </ul> <p>➤ Build and compare sets that contain up to 20 elements using direct comparison.</p> <p>➤ Build several sets of different objects to represent the same number.</p> <p>➤ Place numerals on a number line in relation to the benchmarks of 5 and 10.</p> <p>➤ Use comparative language to relate numbers to the benchmarks of 5 and 10.</p>	1.9 (1.2)	1.1 (0.4)	2.0 (1.1)	<p>➤ Clarification is needed for the terms: "direct comparison", "comparative language" and "benchmark".</p>

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>7. Identify the numeral that is one more, two more, one less and two less than a given numeral. [C, CN, PS, V]</p> <ul style="list-style-type: none"> <li>➤ Select from given choices the numeral that is one more/two more, one less/two less than a given numeral.</li> <li>➤ Name the numeral that is one more, two more, one less and two less than a given numeral.</li> </ul>	<p>1.4 (0.7)</p>	<p>1.2 (0.5)</p>	<p>1.1 (0.4)</p>	<ul style="list-style-type: none"> <li>➤ The outcome should also be applicable to numbers (not just numerals).</li> <li>➤ Clarification should be done with respect to the range of numerals (numbers).</li> </ul>

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>8. Demonstrate an understanding of addition and subtraction by:</p> <ul style="list-style-type: none"> <li>• using familiar and mathematical language to describe additive and subtractive actions from their experience;</li> <li>• solving and creating problems in context that involve addition and subtraction from 0 to 18;</li> <li>• modeling addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically (0 to 18). [C, CN, R, V]</li> </ul> <p>➤ Listen to a word problem and act it out.</p> <p>➤ Listen to a word problem and represent the numbers and action using manipulatives and record it using sketches and/or number sentences.</p> <p>➤ Create a word problem for addition that connects to experience and simulate the action with counters.</p> <p>➤ Create a word problem for subtraction that connects to experience and simulate the action with counters.</p> <p>➤ Create a word problem for a given equation.</p> <p>➤ Draw a matching sketch for an equation that shows the additive (subtractive) action and explain how to use the sketch to find the answer.</p>	1.6 (0.9)	1.4 (0.7)	1.8 (1.1)	<p>➤ Clarification is needed for the terms: "familiar language" and "in context".</p> <p>➤ Emphasis should be placed on the use of 'mathematical' language.</p>

Grade 1	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>9. Communicate and use mental mathematics strategies (memorization not intended) for adding and subtracting such as:</p> <ul style="list-style-type: none"> <li>• bridging to 5 or 10;</li> <li>• counting on and counting back;</li> <li>• building up and building down to 10;</li> <li>• building on a known double;</li> <li>• connecting addition to subtraction. [C, CN, E, PS, R, V]</li> </ul> <p>➤ It is not intended that students will recall the basic facts but will become familiar with strategies to mentally determine sums and differences.</p> <p>➤ Describe a personal strategy for finding a sum or difference.</p> <p>➤ Explain a strategy used by another student for finding a sum or difference.</p>	1.6 (0.7)	1.1 (0.4)	1.5 (0.7)	<p>➤ Some respondents considered "building on a known double" to be too difficult for many students to understand.</p> <p>➤ Clarification is needed for the term: "bridging to".</p>

Grade 1	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
<p>1. Describe and extend patterns using manipulatives, diagrams and spoken terms, including:</p> <ul style="list-style-type: none"> <li>• repeating patterns;</li> <li>• growing patterns. [C, PS, R, V]</li> </ul>	1.7 (1.0)	1.3 (0.9)	<p>➤ Clarification is needed for the terms: "repeating" and "growing" patterns.</p> <p>➤ Sorting should be included to make teaching and learning easier.</p>
<p>2. Create and describe patterns using manipulatives, diagrams and spoken terms, including:</p> <ul style="list-style-type: none"> <li>• repeating patterns;</li> <li>• growing patterns. [C, PS, R, V]</li> </ul>	1.6 (1.0)	1.3 (0.9)	<p>➤ Clarification is needed for terms such as: "repeating" and "growing" patterns.</p>

Grade 1	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
3. Translate repeating patterns from one mode to another. [C, R, V]	1.6 (1.0)	1.1 (0.4)	➤ Clarification is needed for terms such as: "mode".
4. Describe repeating patterns in personal environments. [C, CN, V]	1.2 (0.5)	1.2 (0.6)	➤ Sorting should be included to make teaching and learning easier.
<b><i>PATTERNS &amp; RELATIONS (VARIABLES AND EQUATIONS)</i></b>			
5. Describe equality as a balance and inequality as an imbalance and provide concrete examples. [C, CN, R, V]	1.7 (0.9)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Clarification is needed for terms such as: "concrete examples".</li> <li>➤ Pictorial examples should be considered and included in the Achievement Indicators.</li> </ul>
6. Record equalities in number sentences using the equal symbol. [C, CN, PS]	1.0 (0.2)	1.2 (0.6)	➤ The symbols for "less than" and "greater than" should be introduced here.
7. Illustrate that different representations of the same quantity (0-18): <ul style="list-style-type: none"> <li>• are equal;</li> <li>• represent a single quantity;</li> <li>• can be written as an equality. [C, CN, V]</li> </ul>	1.2 (0.5)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ Some respondents felt the outcome needed clarification.</li> <li>➤ Quantities to 20 or 30 were considered more in keeping with the other outcomes.</li> </ul>
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Compare and order events according to their duration. [CN, R]	1.3 (0.7)	1.2 (0.5)	➤ Clarification of the kind of events and the duration expected are needed.
2. Demonstrate an understanding of measurement as a process of comparing by: <ul style="list-style-type: none"> <li>• identifying attributes that can be compared;</li> <li>• ordering objects using direct measurement;</li> <li>• making statements of comparison;</li> <li>• filling, covering or matching. [C, CN, R, V]</li> </ul>	2.2 (1.0)	1.2 (0.4)	<ul style="list-style-type: none"> <li>➤ Clarification is needed for terms such as: "direct measurement".</li> <li>➤ Clear Achievement Indicators are needed to avoid misinterpretation.</li> </ul>

Grade 1	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>SHAPE &amp; SPACE (3-D OBJECTS AND 2-D SHAPES)</i></b>			
3. Classify and describe 3-D objects according to two attributes. [C, PS, R, V]	1.6 (0.7)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Some respondents considered the use of two attributes to be too difficult for students at this level (next outcome only uses one attribute).</li> <li>➤ Examples of attributes should be stated.</li> <li>➤ Examples of 2-D shapes should be included.</li> </ul>
4. Identify and sort objects and shapes, using one attribute determined by the student, and explain the sorting rule. [C, CN, R, V]	1.3 (0.5)	1.0 (0.1)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
5. Compare and match 3-D objects with objects in the environment. [CN, R]	1.1 (0.3)	1.0 (0.1)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
6. Replicate structures in the environment using 3-D objects. [CN, R, V]	1.3 (0.5)	1.2 (0.4)	<ul style="list-style-type: none"> <li>➤ Clarification needed with respect to the complexity of the objects.</li> </ul>
7. Compare and match 2-D shapes to parts of 3-D objects in the environment. [CN, C, R]	1.1 (0.3)	1.0 (0.1)	<ul style="list-style-type: none"> <li>➤ Identification should be made of examples of 2-D shapes and 3-D objects that students should know.</li> </ul>
8. Investigate and predict the results of putting together and taking apart 2-D shapes and 3-D objects. [PS, V]	2.3 (1.2)	1.7 (0.9)	<ul style="list-style-type: none"> <li>➤ Clarification is needed for terms such as: "putting together" and "taking apart".</li> <li>➤ Some appropriate manipulatives should be identified.</li> </ul>

### *Summary of Grade 1 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 1 curriculum:

- Number sense should extend beyond 10 or 20;
- Learning outcomes should include the concept of zero.
- Learning outcomes should include time and the calendar; and,
- Clear indication should be given that manipulatives should be used and examples given of what those manipulatives could be.

Table 21: Focus Group Responses for Grade 2 Learning Outcomes

Grade 2	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<b>NUMBER</b>				
<p>1. Represent and describe numbers to 100 in a variety of ways, including coins. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Represent a given number using concrete materials such as coins, ten frames and base ten materials.</li> <li>➤ Represent a given number using tallies, illustrations, and number sentences.</li> <li>➤ Read and write number words to 100.</li> <li>➤ Describe how a given number relates to other numbers.</li> <li>➤ Decompose numbers in more than one way.</li> </ul>	1.3 (0.6)	1.3 (0.5)	1.5 (1.0)	<ul style="list-style-type: none"> <li>➤ The connection between the last two AIs and the learning outcome was not clear to some respondents.</li> <li>➤ Some felt the last two AIs could be separate learning outcomes.</li> <li>➤ Clarification of the term "decompose" was requested.</li> </ul>
<p>2. Demonstrate if a number from 1 to 100 is even or odd. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Use models to determine if a number is even or odd.</li> <li>➤ Identify even and odd numerals in a given sequence.</li> <li>➤ Sort a given set of numerals into even and odd.</li> </ul>	1.3 (0.7)	1.0 (0.1)	1.4 (0.6)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "models" was requested.</li> <li>➤ Problem solving could be added as a process to do this.</li> <li>➤ The wording of the outcome could be changed to include: "Demonstrate an understanding of whether..."</li> </ul>

Grade 2	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>3. Illustrate the meaning of numerals to 100 using models of place value. [C, CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Illustrate, by using models such as base ten materials, 10 frames and diagrams that a numeral consists of a certain number of groups of ten and a certain number of ones.</li> <li>➤ Illustrate how numbers can be represented using different combinations of ones and tens (pennies and dimes).</li> </ul>	1.1 (0.3)	1.0 (0.2)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "models" was requested.</li> <li>➤ AIs require some clarification and perhaps some examples.</li> </ul>
<p>4. Compare and order numerals to 100. [C, CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Given three numerals, place them in ascending or descending order and verify the result using models such as place value, number line position, benchmarks and hundred chart position.</li> </ul>	1.2 (0.5)	1.0 (0.2)	1.4 (0.8)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "benchmarks" was requested.</li> <li>➤ It was felt that the AI should read " ... in ascending and descending order.</li> </ul>
<p>5. Say the number sequence by:</p> <ul style="list-style-type: none"> <li>• 2s, 5s and 10s, forwards and backwards, using starting points that are multiples of 2, 5 and 10 respectively;</li> <li>• 10s using starting points from 1 to 9;</li> <li>• 2s starting from 1. [C]</li> <li>➤ Extend a skip counting sequence (2s, 5s, 10s).</li> <li>➤ Identify and correct errors and omissions in a given skip counting sequence.</li> </ul>	1.6 (1.1)	1.2 (0.5)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ It was indicated that the sequence should be stated as to 100.</li> <li>➤ Counting should also be done by 25's.</li> </ul>

Grade 2	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Describe order or position using ordinal numbers (up to tenth). [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Indicate a position in a sequence by using ordinal numbers up to tenth.</li> <li>➤ Describe the ordinal description of an object in more than one way depending upon the starting point.</li> </ul>	1.2 (0.6)	1.2 (0.7)	1.8 (1.2)	<ul style="list-style-type: none"> <li>➤ Respondents suggested that ordinals up to 31st rather than tenth be included so as to address the issue of the calendar.</li> </ul>
<p>7. Apply mental mathematics strategies to develop the recall of basic addition facts to 18 and related subtraction facts. [CN, E, R, V]</p> <ul style="list-style-type: none"> <li>➤ Use a mental mathematics strategy to explain how to determine the correct basic fact when an error is made.</li> <li>➤ Explain the mental mathematics strategy that could be used to determine a basic fact that could not be recalled.</li> <li>➤ Provide examples for applying: <ul style="list-style-type: none"> <li>• doubles to find the answer for near doubles (e.g. <math>5+6=5+5+1</math>; <math>5+7=6+6</math>);</li> <li>• one more, one less;</li> <li>• two more, two less;</li> <li>• bridging to 10;</li> <li>• addition to subtraction.</li> </ul> </li> </ul>	1.4 (0.8)	1.0 (0.2)	1.2 (0.6)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "bridging" was requested.</li> <li>➤ Some respondents felt that facts to 18 was too limited and should be extended to 20 or higher.</li> <li>➤ Consider rewording the outcome to eliminate the word "recall".</li> </ul>

Grade 2	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>8. Demonstrate an understanding of addition and subtraction by:</p> <ul style="list-style-type: none"> <li>• using personal procedures for adding and subtracting with and without the support of concrete materials;</li> <li>• solving and creating problems in context that involve addition and subtractions with answers to 100;</li> <li>• explaining that the order in which numbers are added does not matter. [C, CN, PS, R, V]</li> </ul> <ul style="list-style-type: none"> <li>➤ Model addition and subtraction using a variety of concrete and visual representations, and record the process symbolically (answers to 100).</li> <li>➤ Describe strategies for solving problems involving missing addends.</li> <li>➤ Match a number sentence to a missing addend problem.</li> <li>➤ Compare strategies used for addition and subtraction.</li> <li>➤ Compare strategies for adding a column of single digit numbers.</li> </ul>	<p>1.6 (0.9)</p>	<p>1.1 (0.4)</p>	<p>1.7 (1.3)</p>	<ul style="list-style-type: none"> <li>➤ Clarification of the term "personal procedures" was requested. Strategies were suggested instead of procedures.</li> <li>➤ Specific examples were requested, especially involving coins.</li> </ul>

Grade 2	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>9. Communicate and use mental mathematics strategies for adding and subtracting such as:</p> <ul style="list-style-type: none"> <li>• building on doubles;</li> <li>• counting on or back using steps larger than a unit;</li> <li>• bridging to 10 or multiples of ten</li> <li>• changing the order of addends;</li> <li>• using a known sum or difference. [C, CN, E, PS, R, V]</li> </ul> <p>➤ Describe a mental mathematics strategy for finding a sum or difference.</p> <p>➤ Compare mental mathematics strategies used by other students for finding a sum or difference.</p>	1.4 (0.8)	1.0 (0.2)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "a unit" was requested. Suggested using one instead.</li> <li>➤ Clarification of the term "bridging" was requested.</li> <li>➤ Concern was expressed about the lack of limits indicated by the outcome.</li> </ul>
<p>10. Explain what happens when zero is added to or subtracted from any number. [C, R]</p> <p>➤ Create and test a rule for finding the answer when adding zero to or subtracting zero from any number.</p>	1.7 (1.2)	1.3 (0.8)	1.8 (1.3)	<ul style="list-style-type: none"> <li>➤ Concern was expressed that "Explain" does not fit the language of a learning outcome.</li> <li>➤ Examples of rules were requested.</li> </ul>
<p>11. Estimate quantities less than 100 by using benchmarks. [E, PS]</p> <p>➤ Estimate a quantity by comparing it to a known quantity (benchmark).</p> <p>➤ Use 10 as a benchmark to estimate the number of groups of ten in a given quantity.</p> <p>➤ Select an estimate for a quantity by choosing between two possible choices.</p>	1.2 (0.5)	1.1 (0.3)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Students are asked to estimate to 100 in grade 2, whereas they have never been asked to estimate in grade 1. Respondents suggested that estimation to 20 be included in the Grade 1 Number strand.</li> <li>➤ Additional clarification of the term "benchmarks" was requested.</li> </ul>

Grade 2	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe numeric patterns including those found in a hundred chart. [C, CN, PS, R, V]	1.1 (0.4)	1.1 (0.3)	➤ Respondents suggested changing the word numeric to numerical.
2. Describe the strategy used to determine missing elements in simple patterns, including those found in hundred charts. [C, CN, R, PS, V]	1.2 (0.5)	1.1 (0.4)	➤ Clarification of the term "missing elements" was requested.
3. Create and describe repeating and growing patterns, including concrete representations of numerical and concrete and visual patterns. [C, CN, PS, V]	1.3 (0.8)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Change wording to only use "concrete" once.</li> <li>➤ Respondents suggested replacing the last two and's with or's.</li> </ul>
<b><i>PATTERNS &amp; RELATIONS (VARIABLES AND EQUATIONS)</i></b>			
4. Illustrate that different representations of the same quantity (0-100): <ul style="list-style-type: none"> <li>• are equal;</li> <li>• represent a single quantity;</li> <li>• can be written as an equality. [C, CN, V]</li> </ul>	1.6 (1.1)	1.1 (0.4)	➤ Some confusion exists with respect to the meaning of this outcome.
5. Demonstrate and explain the meaning of inequality by using objects, models and diagrams. [C, PS, R, V]	1.6 (1.1)	1.0 (0.2)	➤ Clarification of the outcome was requested.
6. Record equalities and inequalities in number sentences using the equal and not equal symbols. [C, CN, PS]	1.2 (0.5)	1.5 (1.0)	➤ Clarification of the outcome was requested.
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Measure the duration of common activities using non-standard units. [CN, R]	2.0 (1.4)	2.2 (1.7)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "non-standard units" was requested along with examples.</li> <li>➤ It was felt that at grade 2 students should be learning standard units.</li> <li>➤ Clarification of the outcome was requested.</li> </ul>
2. Read the date on a calendar. [C, R]	1.0 (0.1)	1.2 (0.7)	➤ Respondents indicated the connection with an earlier outcome related to ordinals and the need to go higher than tenths.

Grade 2	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
3. Relate the number of days to a week and months to a year. [CN]	1.00 (0)	1.00 (0)	➤ Concern was expressed that this was left to Grade 2 rather than being done earlier.
4. Recognize that two objects may be different in a number of attributes, but be equivalent in another attribute. [C, R, V]	1.6 (1.1)	1.0 (0.2)	➤ No consistent comments/suggestions.
5. Demonstrate an understanding of the term "unit" by selecting and using reasonable non-standard units of measure that have the same attribute as the object being measured. [PS, R, V]	2.1 (1.7)	1.2 (0.6)	<ul style="list-style-type: none"> <li>➤ Clarification was requested with respect to the meaning of "using reasonable non-standard units of measure."</li> <li>➤ Some respondents considered the wording to be confusing.</li> </ul>
6. Relate the size of a unit of measure to the number of units used to measure length and mass. [CN, PS, V]	2.3 (2.0)	1.2 (0.7)	➤ Clarification of the outcome was requested.
7. Compare and order objects by length, height, distance around or mass using non-standard units, and make statements of comparison. [E, PS, V]	1.3 (0.7)	1.0 (0.2)	➤ Clarification of the outcome was requested.
8. Estimate the length or mass of an object using non-standard units as the referent. [E, PS, V]	1.3 (0.8)	1.0 (0.1)	➤ Should use "standard units".
9. Measure length to the nearest unit by using multiple copies of a unit and by using a single copy of a unit (iteration process). [PS, V]	2.0 (1.6)	1.1 (0.4)	➤ Clarification of the term "iteration process" was requested.
<b>SHAPE &amp; SPACE (3-D OBJECTS AND 2-D SHAPES)</b>			
10. Sort regular and irregular shapes and objects using two attributes, and explain the sorting rule. [PS, R, V]	1.2 (0.6)	1.1 (0.3)	➤ Clarification of the differences between "regular" and "irregular" shapes was requested along with examples of each.
11. Record the results of sorting in a variety of ways, including Venn and Carroll diagrams. [C, PS, R, V]	1.9 (1.3)	1.1 (0.3)	➤ Clarification of the term "Carroll diagrams" was requested along with examples.

Grade 2	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
12. Describe, compare, name and construct 3-D objects including: <ul style="list-style-type: none"> <li>• cubes;</li> <li>• spheres;</li> <li>• cones;</li> <li>• cylinders;</li> <li>• pyramids. [C, R, V]</li> </ul>	1.1 (0.3)	1.3 (0.7)	➤ Constructing objects like these may be a developmental problem.
13. Describe, compare, name and draw 2-D shapes in different orientations including: <ul style="list-style-type: none"> <li>• squares;</li> <li>• rectangles;</li> <li>• circles;</li> <li>• triangles. [C, R, V]</li> </ul>	1.3 (0.5)	1.2 (0.5)	➤ Outcome may be too broad and cumbersome. Clarify how a student is to compare the orientation of circles drawn on paper.
14. Demonstrate an understanding of the relationships between 2-D shapes and 3-D objects by relating 3-D objects to their 2-D representations. [CN, C, R, V]	1.4 (0.8)	1.2 (0.7)	➤ Clarification of the outcome is needed since this outcome could be too difficult for students at this age.
<b>STATISTICS AND PROBABILITY (DATA ANALYSIS)</b>			
1. Gather and record data about self to answer questions relevant to their world. [C, CN, PS]	1.4 (0.9)	1.2 (0.5)	➤ Outcome could be expanded to include others (Gather and record data about self and others ... )
2. Construct, discuss, and interpret concrete/object graphs and pictographs to answer questions. [C, E, PS, R, V]	1.2 (0.4)	1.1 (0.5)	➤ Defining limits were requested.

### *Summary of Grade 2 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 2 curriculum:

- Examples of the limits expected in some outcomes should be given to promote consistency; and,
- Assessment should include indications of the expected standards and mastery levels.

Table 22: Focus Group Responses for Grade 3 Learning Outcomes

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Represent and describe numbers to 1000 in a variety of ways. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Read and write (words and symbols) any given three-digit number without using the word 'and'.</li> <li>➤ Represent a given number using concrete materials such as money, base ten materials and diagrams and vice-versa.</li> <li>➤ Describe how a given number relates to other numbers.</li> <li>➤ Use base ten materials to show a variety of ways of representing a given number and explain how they are equivalent.</li> <li>➤ Describe the number 1000 in relation to events they can experience.</li> </ul>	1.2 (0.5)	1.2 (0.5)	1.6 (0.9)	<ul style="list-style-type: none"> <li>➤ Some respondents indicated that the third AI needed to be improved, as it was unclear.</li> <li>➤ Clarify the distinction between symbols and diagrams.</li> <li>➤ A concern was expressed with using money as an example because of the potential for decimal numbers.</li> <li>➤ A question was raised with respect to having students spell the number words correctly.</li> </ul>
<p>2. Illustrate the meaning of numerals to 1000 using models of place value. [C, CN]</p> <ul style="list-style-type: none"> <li>➤ Use base ten representations of numbers to model and explain the meaning and value of digits in different place value positions.</li> <li>➤ Express numbers as the sum of place values.</li> </ul>	1.2 (0.5)	1.2 (0.5)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarify the distinction between numbers and numerals.</li> </ul>

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>3. Compare and order numerals to 1000. [PS, R, V]</p> <ul style="list-style-type: none"> <li>➤ Given a set of numerals, place them in ascending or descending order and verify the result using models such as place value, number line position and benchmarks.</li> <li>➤ Given three different digits create as many different 3-digit numbers as possible and place them in order.</li> </ul>	1.2 (0.5)	1.2 (0.4)	1.5 (0.9)	<ul style="list-style-type: none"> <li>➤ Some respondents found the use of the term "benchmarks" confusing and unclear.</li> </ul>
<p>4. Say the number sequence by 25s or 100s to 1000 using starting points that are multiples of 25 or 100 respectively. [C, CN]</p> <ul style="list-style-type: none"> <li>➤ Extend a skip counting sequence (25s, 100s).</li> <li>➤ Identify and correct errors and omissions in a given skip counting sequence.</li> <li>➤ Determine the value of a set of quarters.</li> <li>➤ Explain the pattern rule for skip counting.</li> </ul>	1.2 (0.5)	1.4 (0.7)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ The Achievement Indicator regarding the set of quarters was found to be confusing since "quarters" was unclear.</li> </ul>

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>5. Demonstrate an understanding of addition and subtraction by:</p> <ul style="list-style-type: none"> <li>• using personal procedures for adding and subtracting with and without the support of base ten materials;</li> <li>• solving and creating problems in context that involve addition and subtraction of numbers with answers up to 1000;</li> <li>• applying the commutative and associative property for addition. [CN, PS, R]</li> </ul> <p>➤ Model addition and subtraction using a variety of concrete and visual representations, and recording the process symbolically.</p> <p>➤ Compare strategies used for addition and subtraction.</p> <p>➤ Compare strategies for adding a column of numbers (limit to a maximum of four 2 digit numbers).</p> <p>➤ Illustrate the associative and commutative property for a given number sentence.</p> <p>➤ Explain strategies for checking a calculation.</p>	<p>1.8 (1.3)</p>	<p>1.3 (0.6)</p>	<p>1.5 (0.9)</p>	<p>➤ Comparing strategies was considered too hard to assess.</p> <p>➤ Based on the range of comments and questions raised by respondents, there is considerable concern and confusion related to this outcome.</p>

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Apply estimation and mental mathematics strategies for adding and subtracting. [E, PS, R, V]</p> <ul style="list-style-type: none"> <li>➤ Determine mentally the sum or difference of 2 two-digit numbers and explain the strategy used.</li> <li>➤ Use a variety of estimation strategies.</li> <li>➤ Use estimation to determine the reasonableness of the solution to a problem.</li> </ul>	1.2 (0.5)	1.3 (0.70)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Examples of estimation strategies were requested.</li> <li>➤ Some respondents indicated that this outcome could be too difficult for students at this level.</li> </ul>
<p>7. Estimate quantities less than 1000 by using benchmarks. [E, PS, R]</p> <ul style="list-style-type: none"> <li>➤ Use 10 or 100 as a benchmark to estimate the number of groups of ten or hundred in a given quantity.</li> <li>➤ Estimate a quantity by comparing it to a known quantity (benchmark).</li> <li>➤ Select an estimate for a quantity by choosing between three possible choices.</li> <li>➤ Select and justify a benchmark for determining an estimate for an unknown quantity.</li> </ul>	1.6 (1.2)	1.3 (0.6)	1.6 (1.2)	<ul style="list-style-type: none"> <li>➤ Concern was indicated about the meaning of the term benchmarks with examples of benchmarks being requested.</li> </ul>
<p>8. Apply the basic addition facts to 18 and related subtraction facts to solve problems. [PS, R]</p> <ul style="list-style-type: none"> <li>➤ State the answer for a basic fact question and explain at least one strategy for checking the answer.</li> </ul>	1.5 (0.8)	1.3 (0.6)	1.6 (1.1)	<ul style="list-style-type: none"> <li>➤ Examples of strategies were requested.</li> </ul>

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>9. Demonstrate an understanding of multiplication and division by:</p> <ul style="list-style-type: none"> <li>• using familiar and mathematical language to describe multiplicative and divisive actions from their experience;</li> <li>• solving and creating problems in context that involve multiplication and division;</li> <li>• representing and explaining multiplication using array models and equal grouping;</li> <li>• relate division to multiplication using array models and equal grouping. [C, CN, PS, R]</li> </ul> <p>➤ Listen to a word problem and act it out.</p> <p>➤ Listen to a word problem and represent the numbers and action using manipulatives and record it using sketches and/or number sentences.</p> <p>➤ Model multiplication and division using a variety of concrete and visual representations and recording the process symbolically (to <math>5 \times 5</math>).</p> <p>➤ Create an array to illustrate and solve a multiplication or division problem.</p> <p>➤ Create equal groupings to illustrate and solve a multiplication or division problem.</p> <p>➤ Create a word problem for a given equation.</p>	1.7 (1.1)	1.4 (0.8)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarification was requested about the term "in context".</li> <li>➤ Several respondents indicated the need to split this outcome into two separate outcomes, one for multiplication and one for division.</li> <li>➤ Responses seem to indicate some confusion between learning outcomes and instructional strategies.</li> <li>➤ Specific examples were requested in order to understand the limits or extent of the learning expected.</li> </ul>

Grade 3	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>10. Demonstrate an understanding of fractions by:</p> <ul style="list-style-type: none"> <li>• distinguishing fractions and non-fractions</li> <li>• explaining the meaning of the numerator and the denominator;</li> <li>• naming and recording fractions for the parts of a region;</li> <li>• comparing and ordering fractions with like denominators;</li> <li>• describing where fractions are used.[C, CN, PS, R, V]</li> </ul> <p>➤ Sort diagrams of regions into those that represent equal parts and those that do not.</p> <p>➤ Partition a concrete or pictorial model of a region into equal sized parts.</p> <p>➤ Name and record the shaded and un-shaded parts of a region.</p> <p>➤ Represent a given fraction with concrete materials.</p> <p>➤ Use models to compare and order fractions with the same denominators.</p> <p>➤ Describe everyday situations where fractions are used.</p>	<p>1.2 (0.5)</p>	<p>1.2 (0.5)</p>	<p>1.6 (0.9)</p>	<p>➤ Specific examples were requested so the limits of the learning could be established.</p> <p>➤ Clarification was requested for the second indicator.</p>

Grade 3	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe increasing and decreasing numeric patterns. [C]	1.5 (0.8)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Clarification of the pattern limits was requested.</li> <li>➤ Respondents noted that students should understand non-numeric patterns as well.</li> <li>➤ Identification of the terms to be used by students was requested.</li> </ul>
2. Extend increasing and decreasing numeric patterns. [CN, PS, V]	1.2 (0.5)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Identification of the limits of the patterns was requested.</li> </ul>
3. Compare numeric patterns including those found in hundred charts. [CN, PS, R]	1.4 (0.8)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Some confusion regarding the outcome was evident but it was indicated that AIs could help relieve this confusion depending on their clarity.</li> </ul>
4. Describe the strategy used to determine missing elements in patterns. [C, R, PS]	1.3 (0.60)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Examples were requested to clarify the outcome and ensure that it is not just a repeat of what is found in grade 2.</li> </ul>
5. Create a concrete, visual or numerical pattern when provided with the rule (limit to addition and subtraction). [PS, V]	1.5 (1.0)	1.5 (0.9)	<ul style="list-style-type: none"> <li>➤ Clarification was requested.</li> <li>➤ It was suggested that multiplication be added to this.</li> </ul>
6. Determine a rule for a concrete, visual or numerical pattern. [R]	1.4 (0.7)	1.3 (0.8)	<ul style="list-style-type: none"> <li>➤ It was suggested that this outcome be combined with the next one.</li> </ul>
7. Extend patterns in a variety of ways and explain the rule. [C, PS, R]	1.6 (1.0)	1.6 (1.0)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
8. Build and extend concrete patterns using manipulatives and record the pattern in a table. [C, PS, V]	2.1 (1.5)	1.7 (1.0)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
<b><i>PATTERNS &amp; RELATIONS (VARIABLES AND EQUATIONS)</i></b>			
9. Recognize that different symbols can be used to represent an unknown in a number sentence. [R, PS]	1.4 (0.7)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
10. Recognize that a particular symbol can represent different numbers in different number sentences. [CN, R]	1.9 (1.6)	1.6 (0.9)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>

Grade 3	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
11. Solve open number sentences with one unknown (symbol) using manipulatives. [CN, PS, R, V]	1.6 (0.9)	1.4 (0.7)	➤ An explanation of the term "open number sentences" was requested.
<b>SHAPE &amp; SPACE (MEASUREMENT)</b>			
1. Relate the passage of time to common activities, using standard units (minutes, hours, days, weeks, months and years). [CN, R]	1.3 (0.5)	1.2 (0.5)	➤ No consistent comments/suggestions.
2. Relate the number of minutes to hours and days to a month. [CN]	1.3 (0.7)	1.2 (0.5)	➤ It was suggested that the concept of seconds should be introduced here.
3. Write calendar dates using words and numbers. [C, PS, V]	1.2 (0.4)	1.2 (0.4)	➤ The format of the written date should be identified.
4. Demonstrate that changing the orientation of an object does not alter the measurements of its attributes. [C, R, V]	1.8 (1.4)	1.6 (1.2)	➤ Clarification of the term "orientation" was requested.
5. Use concrete materials to demonstrate the principles of transitivity when ordering objects according to length and mass. [C, CN, R]	2.8 (2.8)	2.1 (1.8)	➤ Clarification of the term "transitivity" was requested.
6. Select and justify referents for the units cm, m and km. [C, CN, PS, R]	1.3 (0.7)	1.3 (0.6)	➤ Clarification of the term "referents" was requested.
7. Describe the relationships between the units cm and m and between m and km [C, R]	1.2 (0.5)	1.2 (0.5)	➤ No consistent comments/suggestions.
8. Select and justify referents for the units g and kg. [C, R]	1.3 (0.6)	1.4 (0.7)	➤ Clarification of the term "referents" was requested. ➤ It was suggested that this should be done in Science.
9. Describe the relationship between the units g and kg. [C]	1.3 (0.6)	1.5 (1.0)	➤ It was suggested that this should be done in Science. ➤ Clarification of the term "relationship" was requested.

Grade 3	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
10. Describe and apply strategies to estimate the perimeter of regular and irregular shapes using referents for cm or m. [E, PS]	1.5 (0.8)	1.5 (1.0)	➤ The relevance of this process was questioned.
11. Measure the perimeter of regular and irregular shapes (cm, m). [PS, V]	1.2 (0.5)	1.2 (0.5)	➤ The relevance of this process was questioned.
12. Measure and order objects according to a linear attribute (cm, m). [E, PS, V]	1.4 (0.7)	1.2 (0.5)	➤ Concern about the developmental appropriateness was expressed.
13. Measure and order objects according to their mass (g, kg). [E, PS, V]	1.3 (0.6)	1.3 (0.7)	➤ It was suggested that this should be done in Science.
14. Draw and construct shapes of specific linear measurements (cm, m). [PS, V]	1.3 (0.7)	1.3 (0.6)	➤ No consistent comments/suggestions.
15. Construct different shapes, for a given perimeter (cm, m), to demonstrate that many shapes are possible. [CN, PS]	1.3 (0.6)	1.4 (0.8)	➤ No consistent comments/suggestions.
<b>SHAPE &amp; SPACE (3-D OBJECTS AND 2-D SHAPES)</b>			
16. Sort regular and irregular shapes and objects using two or more attributes, and explain and record the sorting rule. [C, CN, R, V]	1.4 (0.8)	1.3 (0.6)	➤ No consistent comments/suggestions.
17. Identify and name the faces of 3-D objects with appropriate 2-D names. [C, R, V]	1.2 (0.4)	1.2 (0.4)	➤ No consistent comments/suggestions.
18. Describe the characteristics of 3-D objects, including faces, edges, and vertices. [C, R, V]	1.2 (0.5)	1.2 (0.5)	➤ No consistent comments/suggestions.
19. Identify possible 3-D objects based upon the known shape of a face. [C, PS, V]	1.8 (1.3)	1.5 (0.9)	➤ Some confusion about the meaning of the outcome was evident indicating a need to include examples and Achievement Indicators.

Grade 3	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
20. Describe, compare, name and model regular and irregular polygons according to the number of sides, including: <ul style="list-style-type: none"> <li>• quadrilaterals;</li> <li>• pentagons;</li> <li>• hexagons;</li> <li>• octagons. [CN, C, R, V]</li> </ul>	1.4 (0.8)	1.6 (1.2)	➤ Clarification of the terms "regular", "irregular" and "model" was requested.
<b>STATISTICS AND PROBABILITY (DATA ANALYSIS)</b>			
1. Organize data using tally marks, line plots, diagrams, charts and lists to solve problems. [CN, E, PS, V]	1.3 (0.7)	1.3 (0.7)	➤ Examples were requested to clarify the meaning and limits of the outcome. ➤ It was suggested that line plots are too difficult for students at this age.
2. Construct and label bar graphs using one-to-one correspondence to answer questions. [PS, V]	1.6 (1.0)	1.3 (0.7)	➤ Questions were raised with respect to creating the graphs on a computer.
3. Interpret concrete/object graphs, pictographs and bar graphs by drawing conclusions and making predictions. [C, E, PS, R, V]	1.2 (0.5)	1.2 (0.5)	➤ Concern was expressed with respect to students at this age doing predictions. ➤ Clarification of the outcome may address concerns about having students predict.

### *Summary of Grade 3 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 3 curriculum:

- Respondents felt the load was too heavy for this grade level; and,
- Many requests were made for specific examples and strategies.

Table 23: Focus Group Responses for Grade 4 Learning Outcomes

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<b>NUMBER</b>				
<p>1. Describe numbers to 10,000 in a variety of ways. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Read and write (words and symbols) any given four-digit numeral without using the word 'and'.</li> <li>➤ Represent a given numeral using a place value chart or diagrams.</li> <li>➤ Describe the meaning of each digit in a numeral.</li> <li>➤ Relate a given numeral to specific benchmarks, such as multiples of 100, 500 and 1000, and justify their choice of benchmarks.</li> <li>➤ Express numerals in expanded notation and vice-versa.</li> <li>➤ Describe the number 10,000 in relation to events they can experience.</li> </ul>	1.5 (1.1)	1.3 (0.6)	1.8 (1.2)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "benchmark" was requested.</li> <li>➤ Clarification of the function "visa versa" as suggested in the fifth Achievement Indicator was requested.</li> </ul>
<p>2. Compare and order numerals to 10 000 by making reference to place value; [C, CN, PS]</p> <ul style="list-style-type: none"> <li>➤ Given a set of numerals, place them in ascending or descending order and verify the result.</li> <li>➤ Compare a given numeral to benchmarks.</li> </ul>	1.3 (0.7)	1.4 (0.6)	2.0 (1.5)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "benchmark" was requested.</li> </ul>
<p>3. Solve problems that involve addition and subtraction. [C, PS, R]</p> <ul style="list-style-type: none"> <li>➤ Apply a variety of strategies to solve problems.</li> </ul>	1.8 (1.2)	1.4 (0.7)	2.1 (1.5)	<ul style="list-style-type: none"> <li>➤ Strategy suggestions were requested.</li> </ul>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>4. Estimate sums and differences to solve problems. [C, E, PS, R]</p> <ul style="list-style-type: none"> <li>➤ Describe a situation in which an estimate rather than an exact answer is sufficient.</li> <li>➤ Use a variety of strategies to estimate sums and differences.</li> </ul>	1.3 (0.8)	1.4 (0.8)	1.6 (1.0)	<ul style="list-style-type: none"> <li>➤ Strategy suggestions were requested.</li> <li>➤ Limits were requested.</li> </ul>
<p>5. Explain the properties of 0 and 1 for multiplication and of 1 for division. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Create and test a rule for multiplying by one.</li> <li>➤ Create and test a rule for multiplying by zero.</li> <li>➤ Create and test a rule for dividing by one.</li> </ul>	1.1 (0.3)	1.3 (0.6)	1.7 (1.2)	<ul style="list-style-type: none"> <li>➤ Explanations regarding how students could test their rules were requested.</li> </ul>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Communicate and use mental mathematics strategies to develop the recall of multiplication facts to <math>9 \times 9</math> such as:</p> <ul style="list-style-type: none"> <li>• skip counting;</li> <li>• skip counting from a known fact;</li> <li>• using doubling or halving;</li> <li>• using doubling or halving and adding or subtracting one more set;</li> <li>• using patterns in the 9s facts;</li> <li>• using repeated doubling [C, E, PS, R]</li> </ul> <p>➤ Explain the mental mathematics strategy that could be used to determine a basic fact that could not be recalled.</p> <p>➤ Compare mental mathematics strategies used by other students for finding a product.</p> <p>➤ Provide examples for applying the commutative property (e.g., If they know that <math>5 \times 7 = 35</math>, they should recognize that <math>7 \times 5 = 35</math>.);</p> <p>➤ doubling (e.g., If they know that <math>4 \times 3 = 12</math>, they should recognize that <math>8 \times 3 = 12 + 12</math>.);</p> <p>➤ doubling and adding one more (e.g., <math>3 \times 7 = 2 \times 7 + 7 = 14 + 7 = 21</math>.);</p> <p>➤ patterns when multiplying by 9 (e.g., To recall <math>9 \times 6</math>, think <math>10 \times 6 - 6 = 60 - 6 = 54</math>) (e.g., To recall <math>9 \times 7</math>, think <math>7 - 1 = 6</math> (tens value) and <math>10 - 7 = 3</math> (ones value) = 63.);</p>	1.1 (0.4)	1.1 (0.4)	1.3 (0.7)	<p>➤ This was generally considered a very good outcome and well worded.</p>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>7. Demonstrate an understanding of multiplication (1-digit by 2 or 3 digits) to solve problems by:</p> <ul style="list-style-type: none"> <li>• inventing personal procedures with and without the support of concrete materials;</li> <li>• using area models to represent multiplication. [C, CN, PS, R, V]</li> </ul> <p>➤ Model using concrete and visual representations, and recording the process symbolically.</p> <p>➤ Create a problem for a given equation.</p> <p>➤ Solve problems involving multiplication.</p>	1.4 (0.8)	1.3 (0.8)	1.6 (1.0)	<p>➤ Problem suggestions were requested.</p> <p>➤ Clarification of the term "inventing" was requested.</p> <p>➤ It was requested that the term "manipulatives" be used in place of "concrete materials".</p>
<p>8. Demonstrate an understanding of division (1-digit divisor up to 2-digit dividend) to solve problems by:</p> <ul style="list-style-type: none"> <li>• using personal procedures for dividing with and without the support of concrete materials;</li> <li>• relating division to multiplication using the area model. [C, CN, PS, R, V]</li> </ul> <p>➤ Solve and create problems in context that involve division.</p> <p>➤ Model equal sharing and grouping division using concrete materials and record the process symbolically.</p>	1.4 (0.7)	1.3 (0.6)	1.5 (0.9)	<p>➤ No consistent comments/suggestions.</p>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>9. Demonstrate an understanding of fractions less than or equal to one by using concrete and visual models to:</p> <ul style="list-style-type: none"> <li>• name and record fractions for the parts of a region or a set;</li> <li>• compare and order unit fractions;</li> <li>• illustrate and explain that two identical fractions may not represent the same quantity. [C, CN, PS, R, V]</li> </ul> <p>➤ Name and record the shaded and un-shaded parts of a set.</p> <p>➤ Shade parts of a set to represent a given fraction.</p> <p>➤ Explain why the denominators can be used to compare unit fractions.</p> <p>➤ Order a set of fractions that have the same numerator.</p> <p>➤ Provide examples of when two identical fractions may not represent the same quantity. (e.g. Half of a large pizza is not equivalent to half of a small pizza.) (e.g. A third of a dozen cookies is not equivalent to a third of half a dozen cookies.)</p>	<p>1.4 (0.8)</p>	<p>1.2 (0.5)</p>	<p>1.4 (0.8)</p>	<p>➤ Achievement Indicators were considered to be good.</p>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>10. Order and compare fractions using concrete models, a number line and benchmarks of 0, <math>\frac{1}{2}</math> and 1. [CN, PS, R, V]</p> <ul style="list-style-type: none"> <li>➤ Explain which of the benchmarks 0, <math>\frac{1}{2}</math> or 1 a given fraction is closer to.</li> <li>➤ Name fractions that are between two given benchmarks on the number line.</li> <li>➤ Order fractions by placing them on a number line that contains benchmarks.</li> <li>➤ Order and compare fractions by building concrete models.</li> </ul>	<p>1.7 (1.1)</p>	<p>1.8 (1.3)</p>	<p>1.7 (1.1)</p>	<ul style="list-style-type: none"> <li>➤ Clarification of "concrete models" and "benchmarks" was requested by way of examples.</li> </ul>
<p>11. Illustrate and explain decimals (tenths and hundredths) as part of a length, region, or set. [C, R, V]</p> <ul style="list-style-type: none"> <li>➤ Write the decimal numeral for a given concrete representation.</li> <li>➤ Use a model to represent a given decimal numeral.</li> <li>➤ Explain the relationship between decimals and money (dollars, dimes and pennies).</li> <li>➤ Describe contexts for tenths and hundredths.</li> <li>➤ Use a model to illustrate that a tenth can be expressed as an equivalent hundredth.</li> </ul>	<p>1.6 (1.0)</p>	<p>1.4 (0.8)</p>	<p>1.4 (0.7)</p>	<ul style="list-style-type: none"> <li>➤ Clarification was requested by way of examples.</li> <li>➤ Clarification of the term "region" was requested.</li> </ul>

Grade 4	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>12. Illustrate and explain how proper fractions and decimals are related (to hundredths). [C, CN, PS, V]</p> <ul style="list-style-type: none"> <li>➤ Name a part of a region divided into tenths or hundredths using both a fraction and a decimal.</li> <li>➤ Represent a fraction or decimal by shading part of a region.</li> <li>➤ Provide the decimal for a fraction and vice versa.</li> </ul>	1.5 (0.9)	1.4 (0.8)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarification of the limits was requested by way of examples.</li> <li>➤ Clarification of the term "region" was requested.</li> </ul>
<p>13. Order and compare decimal numerals to hundredths by using:</p> <ul style="list-style-type: none"> <li>• benchmarks;</li> <li>• visual and concrete models;</li> <li>• position on a number line;</li> <li>• place value;</li> <li>• equivalent decimals. [CN, R, V]</li> </ul> <ul style="list-style-type: none"> <li>➤ Place decimals on a place value chart to compare or order.</li> <li>➤ Name decimals that are between two given benchmarks on the number line.</li> <li>➤ Order decimals by placing them on a number line that contains benchmarks (0.0, 0.5, 1.0 or 0.00, 0.50, 1.00).</li> <li>➤ Express tenths as equivalent hundredths to compare decimals.</li> </ul>	1.5 (0.8)	1.6 (1.0)	1.5 (0.9)	<ul style="list-style-type: none"> <li>➤ The fourth AI was considered unclear and confusing.</li> </ul>

Grade 4	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe relationships for a pattern found in tables and charts, including the multiplication chart. [C, CN, PS, V]	1.3 (0.7)	1.2 (0.5)	➤ Suggested wording change to indicate patterns as opposed to a single pattern.
2. Extend increasing and decreasing numeric patterns in both directions (limited to whole numbers) and justify reasoning. [CN, PS, R, T]	1.2 (0.6)	1.4 (0.7)	➤ Specific information is needed to clarify the limits intended.
3. Create increasing or decreasing numeric and concrete and visual patterns and describe the rule. [C, PS, V]	1.3 (0.8)	1.3 (0.7)	➤ Specific information is needed to clarify the limits intended. ➤ Clarification of the term "visual patterns" was requested.
4. Create a pattern when provided with the rule and vice versa. [C, CN, PS, V]	1.4 (0.9)	1.3 (0.7)	➤ Specific information is needed to clarify the limits intended. ➤ Clarification of what is meant by "visa versa" in this case may be needed to help a number of teachers.
<b><i>PATTERNS &amp; RELATIONS (VARIABLES AND EQUATIONS)</i></b>			
5. Translate a given problem into an open number sentence involving one or two unknowns and find a solution. [CN, PS, R]	2.6 (2.2)	2.4 (2.5)	➤ Clarification of the term "number sentence" was requested.
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Relate the passage of time to common activities using seconds. [CN]	1.2 (0.5)	1.3 (0.6)	➤ Clarification is needed since this appears to be the same as outcomes at previous grades. ➤ It was suggested that this could be done at an earlier grade.
2. Read and write time from digital and analog clocks. [C, CN, V]	1.4 (0.7)	1.3 (0.7)	➤ It was suggested that this could be done at an earlier grade.
3. Relate 60 seconds to a minute and 24 hours to a day. [CN]	1.1 (0.3)	1.2 (0.5)	➤ It was suggested that this could be done at an earlier grade.

Grade 4	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
4. Read and write calendar dates in the SI format dd/mm/yyyy. [C, V]	1.3 (0.9)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ It was suggested that this could be done at an earlier grade.</li> <li>➤ The SI form given here is incorrect. Format is from large unit to small unit.</li> </ul>
5. Demonstrate an understanding of the term "unit" by selecting and using reasonable non-standard and standard units ( $\text{cm}^2$ , $\text{m}^2$ ) of measure of area. [C, CN, E, R, V]	1.5 (1.0)	1.7 (1.2)	<ul style="list-style-type: none"> <li>➤ Clarification with examples was requested for the distinction between standard and non-standard units.</li> </ul>
6. Relate the size of a unit of measure to the number of units used to measure area. [E, CN, V]	2.7 (2.6)	1.7 (0.9)	<ul style="list-style-type: none"> <li>➤ Respondents were unsure of the meaning of this outcome.</li> </ul>
7. Describe and apply strategies to estimate the area of regular and irregular shapes, using referents for non-standard and standard units ( $\text{cm}^2$ , $\text{m}^2$ ). [E, PS]	2.3 (2.2)	1.7 (1.1)	<ul style="list-style-type: none"> <li>➤ Respondents were unsure of the meaning of this outcome.</li> <li>➤ Clarification of the terms "referent" and "non-standard unit" was requested.</li> </ul>
8. Describe and apply strategies to estimate the surface area of right rectangular prisms, using $\text{cm}^2$ as a referent. [E, PS]	1.7 (1.2)	2.2 (2.0)	<ul style="list-style-type: none"> <li>➤ Wording was considered confusing (e.g., right rectangular prisms).</li> <li>➤ Clarification of the term "referent" was requested.</li> <li>➤ Clarification was requested with respect to what strategies could be used.</li> </ul>
9. Order shapes according to their area, using non-standard units. [E, PS, V]	1.6 (0.9)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarification of the term "non-standard units" was requested.</li> </ul>
10. Measure, by covering, and order shapes according to their area ( $\text{cm}^2$ , $\text{m}^2$ ). [C, PS, V]	2.4 (2.3)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Wording was considered to be confusing.</li> <li>➤ Clarification and examples were requested.</li> </ul>
11. Determine the surface area of a right rectangular prism and describe their process. [PS, V]	1.8 (1.3)	2.2 (1.9)	<ul style="list-style-type: none"> <li>➤ Wording was considered confusing (e.g., right rectangular prisms).</li> </ul>
12. Construct different shapes, given a specific area in non-standard units and draw conclusions. [C, E, PS]	2.0 (1.6)	1.7 (1.1)	<ul style="list-style-type: none"> <li>➤ Wording was considered awkward.</li> <li>➤ Clarification of the term "non-standard units" was requested.</li> <li>➤ Clarification of the outcome was requested by way of examples.</li> </ul>

Grade 4	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
13. Construct different shapes, for a given area (cm <sup>2</sup> ), to demonstrate that many shapes are possible. [PS]	1.4 (0.8)	1.2 (0.5)	➤ There appeared to be some confusion as to the meaning and the limits of this outcome.
<b>SHAPE &amp; SPACE (3-D OBJECTS AND 2-D SHAPES)</b>			
14. Design and construct nets for 3-D objects. [C, CN, PS, V]	1.3 (0.6)	1.3 (0.7)	➤ Clarification of the term "nets" was requested.
15. Predict and verify 3-D objects from a given net. [C, PS, V]	1.3 (0.6)	1.4 (0.7)	➤ Clarification was requested with respect to examples of 3-D objects and the net from which they could be taken.
16. Describe and give examples from everyday experience of: <ul style="list-style-type: none"> <li>• parallel;</li> <li>• intersecting;</li> <li>• perpendicular;</li> <li>• vertical;</li> <li>• horizontal. [C, CN, V]</li> </ul>	1.3 (0.6)	1.3 (0.6)	➤ The addition of the word "lines" could help clarify this outcome.
17. Describe and name pyramids and prisms by the shape of the base. [C, CN, V]	1.2 (0.5)	1.2 (0.4)	➤ No consistent comments/suggestions.
18. Compare and contrast: <ul style="list-style-type: none"> <li>• two or more pyramids;</li> <li>• two or more prisms;</li> <li>• pyramids and prisms. [C, CN, V]</li> </ul>	1.5 (1.0)	1.6 (1.10)	<ul style="list-style-type: none"> <li>➤ Respondents felt that this was implied in the previous outcome.</li> <li>➤ Learning outcomes #17 &amp; 18 could be combined</li> </ul>
<b>SHAPE &amp; SPACE (TRANSFORMATIONS)</b>			
19. Create and describe symmetrical 2-D shapes. [C, PS, V]	1.2 (0.4)	1.3 (0.7)	➤ A suggestion was made to introduce symmetry earlier than this.
20. Verify that a 2-D shape is symmetrical by drawing one or more lines of symmetry. [PS, V]	1.3 (0.6)	1.2 (0.6)	➤ A suggestion was made that the drawing of a line of symmetry won't automatically provide verification that the shape is symmetrical at this age.
<b>STATISTICS AND PROBABILITY (DATA ANALYSIS)</b>			
1. Answer questions by collecting first-hand data and displaying it in a variety of ways, using many to one correspondence. [C, PS, T, V]	1.9 (1.2)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarification was requested with respect to the meaning of: "a variety of ways" in this context.</li> <li>➤ Some respondents indicated this outcome was not specific enough.</li> </ul>

Grade 4	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
2. Justify the choice of intervals and correspondence used. [C, R, T, V]	2.2 (1.9)	1.3 (0.6)	➤ Respondents indicated the wording made this outcome unclear and that examples were needed to clarify the intent of the outcome.
3. Interpret pictographs and bar graphs involving many to one correspondence to draw conclusions and make predictions. [C, E, PS, R]	2.0 (1.7)	1.4 (0.7)	➤ Clarification was requested with respect to the meaning of "many to one correspondence" and it was suggested the outcome be rewritten.

### *Summary of Grade 4 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 4 curriculum:

- Use and type of technology expected should be indicated where appropriate.

Table 24: Focus Group Responses for Grade 5 Learning Outcomes

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Describe numbers to 1,000,000 in a variety of ways. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Read and write (words and symbols) any given four-digit numeral without using the word 'and'.</li> <li>➤ Explain the pattern in saying and writing numerals.</li> <li>➤ Describe the patterns of adjacent place positions moving from right to left.</li> <li>➤ Describe the meaning of each digit in a numeral.</li> <li>➤ Express numerals in expanded notation and vice-versa.</li> <li>➤ Describe the numbers 100,000 and 1,000,000 in relation to events they can experience.</li> </ul>	1.3 (0.8)	1.2 (0.5)	1.8 (1.4)	<ul style="list-style-type: none"> <li>➤ "Represent and describe" or "Communicate" were suggested for revising learning outcome.</li> <li>➤ Four-digit reference in AI 1 is inconsistent with learning outcome (six-digit numbers).</li> <li>➤ "variety of ways" requires elaboration in AIs.</li> <li>➤ In general, respondents were unclear what the AIs were describing.</li> </ul>
<p>2. Develop and justify a rule for comparing and ordering numerals to 1,000,000. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Identify an error in an ordered sequence of numerals and explain why it is incorrect.</li> <li>➤ Explain the strategy for ordering numerals.</li> </ul>	1.5 (0.8)	1.3 (0.7)	1.4 (0.8)	<ul style="list-style-type: none"> <li>➤ Respondents see these learning outcomes as inconsistent with prior grade outcomes where place value has already been established.</li> </ul>
<p>3. Apply the basic multiplication and related division facts to solve problems. [PS, R]</p> <ul style="list-style-type: none"> <li>➤ State the answer for a basic fact question and explain at least one strategy for checking the answer.</li> </ul>	1.5 (0.8)	1.9 (1.6)	1.5 (0.9)	<ul style="list-style-type: none"> <li>➤ Define "basic" multiplication and division facts.</li> <li>➤ More clarity in AI needed.</li> </ul>

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>4. Demonstrate an understanding of multiplication by:</p> <ul style="list-style-type: none"> <li>• determining multiples and factors of numbers less than 100 using a variety of strategies;</li> <li>• identifying prime and composite numerals;</li> <li>• determining the product of 2 two-digit numerals. [PS, R, V]</li> </ul> <p>➤ Explain how skip counting is related to multiples and factors.</p> <p>➤ Use arrays to determine all the whole number factors of a given numeral.</p> <p>➤ Identify factors for a given numeral and explain the strategy (e.g. models, repeated division by prime numbers, or factor trees).</p> <p>➤ Identify multiples for a given numeral and explain the strategy.</p> <p>➤ Sort a given set of numerals into prime and composite and explain the reasoning.</p> <p>➤ Solve problems involving multiplication.</p> <p>➤ Model multiplication (2-digit by 2-digit) in a variety of ways, using concrete and visual representations, and recording the process symbolically.</p>	1.2 (0.6)	1.0 (0.2)	1.5 (0.9)	<p>➤ Use of "number" vs. "numeral" requires clarification.</p> <p>➤ Like having a range of AIs.</p>

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>5. Communicate and use mental mathematics strategies for multiplication including:</p> <ul style="list-style-type: none"> <li>• annexing zero;</li> <li>• using the distributive property. [C, PS, R]</li> </ul> <p>➤ Explain the strategy for determining the solutions of multiplication problems involving multiples of 10 or 100.</p> <p>➤ Apply the distributive property to questions that involve numbers that are close to multiples of 10. (e.g., <math>98 \times 7 = (100 \times 7) - (2 \times 7)</math>).</p>	1.7 (1.2)	1.4 (0.9)	1.6 (1.1)	<ul style="list-style-type: none"> <li>➤ Respondents not sure what "annexing 0" is.</li> <li>➤ Use of distributive property as an example of "mental mathematics" is questioned.</li> <li>➤ AIs illustrate only one approach - need to provide greater range of AIs.</li> </ul>
<p>6. Demonstrate an understanding of division (3-digit by 1-digit) to solve problems by using personal procedures for dividing with and without the support of concrete materials. [C, CN, PS]</p> <p>➤ Model equal sharing and grouping division using concrete materials and record the process symbolically.</p> <p>➤ Identify and interpret remainders.</p> <p>➤ Solve and create problems in context that involve division.</p>	1.2 (0.7)	1.1 (0.6)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Some respondents unclear as to the reference to "personal strategies" instead of "strategies".</li> <li>➤ Is an algorithm to be developed or is this exploratory in nature?</li> <li>➤ Like inclusion of problem solving in AIs.</li> </ul>

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>7. Use estimation strategies (in problem solving settings) including:</p> <ul style="list-style-type: none"> <li>• front end calculation;</li> <li>• compensation;</li> <li>• compatible numbers;</li> <li>• rounding. [C, CN, E, PS]</li> </ul> <p>➤ Determine approximate solutions to problems when an exact answer is not required.</p> <p>➤ Determine the reasonableness of calculations.</p> <p>➤ Select and defend the use of an estimation strategy for a given problem.</p> <p>➤ Explain the importance of using compensation when estimating solutions to problems.</p>	<p>1.8 (1.5)</p>	<p>1.3 (0.7)</p>	<p>1.9 (1.5)</p>	<p>➤ Learning outcome wording is not clear - e.g., "front end calculation", "compensation".</p>
<p>8. Demonstrate an understanding of fractions by using concrete and visual models to:</p> <ul style="list-style-type: none"> <li>• create sets of equivalent fractions;</li> <li>• compare fractions with like and unlike denominators. [C, CN, PS, R, V]</li> </ul> <p>➤ Illustrate and explain that equivalent fractions represent the same quantity.</p> <p>➤ Generate and verify a rule for creating equivalent fractions.</p> <p>➤ Explain why there are many equivalent fractions for any given fraction.</p> <p>➤ Compare fractions by creating equivalent fractions.</p> <p>➤ Position a given set of fractions on a number line and explain strategies used to determine order.</p>	<p>1.7 (1.4)</p>	<p>1.1 (0.4)</p>	<p>2.1 (2.0)</p>	<p>➤ Some respondents question students' ability to order fractions with unlike denominators - possibly limit to unit fractions if denominators are "unlike".</p>

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>9. Describe and represent decimals to thousandths in a variety of ways. [C, CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Write the decimal numeral for a given concrete or visual representation.</li> <li>➤ Use a model or diagram to represent a given decimal.</li> <li>➤ Use a model to illustrate that tenths and hundredths can be expressed as equivalent thousandths.</li> <li>➤ Describe contexts for decimals to thousandths.</li> </ul>	1.3 (0.7)	1.7 (1.2)	1.4 (0.8)	<ul style="list-style-type: none"> <li>➤ AIs could show a progression from 10ths to 100ths to 1000ths.</li> <li>➤ Context for 1000ths may be difficult for students to comprehend.</li> </ul>
<p>10. Illustrate and explain how proper fractions and decimals are related (to thousandths). [C, R, V]</p> <ul style="list-style-type: none"> <li>➤ Name a part of a region divided into tenths, hundredths, or thousandths using both a fraction and a decimal.</li> <li>➤ Represent a fraction or decimal by shading part of a region.</li> <li>➤ Explain how to change a decimal to a fraction and vice versa.</li> </ul>	1.7 (1.3)	1.6 (1.1)	1.6 (1.0)	<ul style="list-style-type: none"> <li>➤ Respondents consistently suggest that this outcome only go to 100ths.</li> <li>➤ Clarification of what fractions are expected (denominators of only 10, 100, 1000?)</li> <li>➤ A few respondents suggested similar learning outcome to thousandths.</li> </ul>

GRADE 5	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
11. Order and compare decimals to thousandths by using: <ul style="list-style-type: none"> <li>• benchmarks;</li> <li>• visual and concrete models;</li> <li>• position on a number line;</li> <li>• place value;</li> <li>• equivalent decimals. [CN, R, V]</li> </ul> <ul style="list-style-type: none"> <li>➤ Place decimals on a place value chart to compare or order.</li> <li>➤ Describe the patterns of adjacent place positions moving from left to right.</li> <li>➤ Name decimals that are between two given benchmarks on the number line.</li> <li>➤ Name a decimal that is between two given hundredths.</li> <li>➤ Order a given set of decimals including tenths, hundredths, and thousandths and justify the order.</li> </ul>	1.2 (0.5)	1.6 (1.1)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Unclear as to "benchmark" reference. Requires clear definition.</li> <li>➤ A few respondents questioned when students would add/subtract decimal numbers greater than 1.</li> </ul>

GRADE 5	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe the relationship between two columns of numbers to formulate a rule. [C, CN, PS, R]	1.2 (0.5)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Majority of respondents wanted to know the type of "relationship" expected/required.</li> <li>➤ Some respondents requested clarification as to whether the rule is one- or two-step (stated preference was one-step).</li> </ul>
2. Represent a pattern visually to clarify relationships and to verify predictions. [C, R, T, V]	1.7 (1.4)	1.2 (0.4)	<ul style="list-style-type: none"> <li>➤ Learning outcome is generally unclear.</li> <li>➤ Use of "clarify" and "verify" require elaboration.</li> </ul>

GRADE 5	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
3. Create numeric and concrete and visual patterns, record them in a table and describe the relationships. [C, PS, V]	1.4 (0.8)	1.2 (0.4)	➤ Only comment - is graphing the pattern an expectation?
<b><i>PATTERNS &amp; RELATIONS (VARIABLES &amp; EQUATIONS)</i></b>			
4. Translate a given problem into an open number sentence using variables (symbols including letters), and find a solution. [C, CN, PS, R]	1.7 (1.4)	1.4 (0.8)	<ul style="list-style-type: none"> <li>➤ Clarification required as to whether one or two variables were expected (a few respondents questioned the introduction of variables at Grade 5 instead of Grade 6).</li> <li>➤ Term "open number sentence" requires clarification.</li> </ul>
5. Use symbols to describe the relationship for a pattern found in a table. [C, CN, PS, V]	1.7 (1.1)	1.5 (1.0)	<ul style="list-style-type: none"> <li>➤ Learning outcome generally not clear to respondents.</li> <li>➤ Is the use of symbols the expected rule for LO 1? What types of relationships are expected? To what depth? Addition &amp; multiplication? One-step?</li> </ul>
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Read and write time from a 24-hour clock. [C, CN]	1.1 (0.4)	1.2 (0.4)	➤ Some respondents requested the inclusion of 12-hour clocks (one respondent noted this was already in Grade 4).
2. Relate the size of a unit of measure to the number of units used to measure volume and capacity. [E, CN, V]	2.3 (1.8)	1.5 (1.0)	➤ Majority of respondents suggest re-wording this learning outcome as it is very unclear what is meant.
3. Demonstrate an understanding of the term "unit" by selecting and using reasonable non-standard and standard units (cm <sup>3</sup> , mL, L) of measure of volume and capacity. [E, C, R, V]	1.4 (0.7)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ Mixed responses on whether to use standard or non-standard units.</li> <li>➤ Consider re-ordering LO2 &amp; 3 - students should understand "unit" before "relating the size of a unit".</li> </ul>
4. Select and justify referents for the units cm <sup>3</sup> , L and mL. [C, PS, R]	1.4 (0.7)	1.2 (0.5)	➤ Term "referent" requires clarification.
5. Describe the relationship between the units mL and L. [C, CN, R]	1.2 (0.8)	1.2 (0.8)	<ul style="list-style-type: none"> <li>➤ General comments were positive.</li> <li>➤ Some thought the learning outcome could be addressed at an earlier grade or embedded in another learning outcome.</li> </ul>

GRADE 5	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
6. Describe and apply strategies to estimate the volume of objects or capacity of containers, using referents for non-standard and standard units (cm <sup>3</sup> , mL, L). [CN, E, PS]	1.0 (0.3)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Term "referent" requires clarification.</li> <li>➤ Respondents unclear about what a non-standard unit would be - suggest standard units only.</li> </ul>
7. Order containers according to their capacity and verify by measuring, using non-standard and standard units (mL, L). [PS, V]	1.2 (0.5)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Relationship between capacity and volume needs to be addressed/clarified.</li> <li>➤ Use of non-standard units questioned.</li> </ul>
8. Order objects according to their volume and verify by measuring, using non-standard units and standard units (cm <sup>3</sup> ). [E, PS]	1.2 (0.4)	1.1 (0.3)	<ul style="list-style-type: none"> <li>➤ Use of non-standard units questioned.</li> </ul>
9. Construct different objects for a given volume, using non-standard units and standard units (cm <sup>3</sup> ), and draw conclusions. [PS, R, V]	1.2 (0.5)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Use of non-standard units questioned.</li> </ul>
10. Design and construct different rectangles, given one or both of perimeter and area, using whole numbers, and draw conclusions. [PS, R]	1.3 (0.6)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Many respondents suggested that learning outcomes 10 and 11 could be moved to Grade 4.</li> </ul>
11. Predict and verify the effect of changing one or more dimensions of a rectangle on its perimeter and area. [E, PS, R]	1.1 (0.3)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Many respondents suggested that learning outcomes 10 and 11 could be moved to Grade 4.</li> </ul>
<b>SHAPE &amp; SPACE (3-D OBJECT &amp; 2-D SHAPES)</b>			
12. Build, represent and compare and classify regular and irregular polygons, including convex and non-convex polygons. [C, CN, R, V]	1.9 (1.6)	1.7 (1.2)	<ul style="list-style-type: none"> <li>➤ Terms "convex" and non-convex" require clarification.</li> <li>➤ Learning outcomes is generally not understood.</li> </ul>
13. Identify and draw polygons with different orientations. [C, R, V]	1.4 (0.8)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Use of term "orientation" not understood - requires clarification.</li> </ul>

GRADE 5	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>SHAPE &amp; SPACE (TRANSFORMATIONS)</b>			
14. Perform and describe a single transformation as a translation, rotation or a reflection. [C, T, V]	1.6 (1.1)	1.3 (0.9)	➤ Previous terms of "slide", "turn", and "rotation" preferred.
15. Recognize and describe a single transformation as a translation, rotation or a reflection. [C, T, V]	1.4 (1.0)	1.3 (0.9)	➤ Learning outcomes 14 - 16 could be combined into one.
16. Recognize and demonstrate that a rotation can occur around a variety of points. [C, N, PS, T]	1.2 (0.4)	1.3 (0.6)	➤ Some respondents questioned whether understanding of angles is required.
17. Recognize and demonstrate that the reflection in a line depends upon the position of the line of reflection. [C, N, PS, T, V]	1.1 (0.4)	1.1 (0.4)	➤ No consistent comments/suggestions.
18. Predict and verify the results of a translation, rotation or reflection. [C, E, V]	1.3 (0.6)	1.2 (0.6)	➤ No consistent comments/suggestions.
19. Draw and describe the image of a 2-D shape after a single transformation. [C, V]	1.4 (1.0)	1.4 (0.9)	➤ No consistent comments/suggestions.
<b>STATISTICS &amp; PROBABILITY (DATA ANALYSIS)</b>			
1. Answer questions by collecting second-hand data and displaying it in a variety of ways including: <ul style="list-style-type: none"> <li>• double bar graphs;</li> <li>• frequency diagrams. [C, PS, T, V]</li> </ul>	1.6 (1.0)	1.2 (0.6)	➤ Terminology (e.g., frequency diagrams, second hand data) requires clarification.
2. Interpret frequency diagrams and double bar graphs to draw conclusions and make predictions. [C, E, PS, R, V]	1.4 (0.9)	1.2 (0.4)	➤ No consistent comments/suggestions.
3. Justify the appropriateness of using first-hand and/or second-hand data to answer a question. [C, PS]	1.3 (0.6)	1.3 (0.6)	➤ Clarify terms "first-hand data" and "second-hand data".
4. Evaluate the graphic presentation of the data to ensure clear representation of the results. [C, R, V]	1.4 (0.9)	1.3 (0.6)	➤ No consistent comments/suggestions.

GRADE 5	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
5. Discuss the reasonableness of data and results. [C, R]	1.3 (0.6)	1.2 (0.6)	➤ Comments indicate that many respondents were unclear as to what this outcome means.
<b>STATISTICS &amp; PROBABILITY (CHANCE &amp; UNCERTAINTY)</b>			
6. Explain the meaning of event and outcomes in the context of probability. [C, R]	1.9 (1.6)	1.8 (1.4)	➤ Respondents questioned why this concept was not addressed earlier. ➤ Some respondents suggest the wording could be made clear (no specifics provided).
7. Describe outcomes as likely or unlikely and describe the degree of likelihood using words such as: <ul style="list-style-type: none"> <li>• certain;</li> <li>• impossible;</li> <li>• equally likely/probable;</li> <li>• more likely/probable;</li> <li>• less likely/probable. [C, CN, PS, R]</li> </ul>	1.3 (0.6)	1.5 (1.1)	➤ No consistent comments/suggestions.
8. Recognize that different outcomes may occur when repeating the same probability experiment. [PS, T]	1.1 (0.3)	1.3 (0.7)	➤ No consistent comments/suggestions.
9. Make predictions for a single event probability experiment using the language of probability, conduct the experiment and compare the predictions to the results. [C, E, PS]	1.2 (0.4)	1.1 (0.5)	➤ No consistent comments/suggestions.

### *Summary of Grade 5 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 5 curriculum:

- Overall the volume of content in the grade appears to be too heavy;
- Some of the content in Probability could be introduced earlier (possibly Grade 4);
- It is unclear as to whether students are adding/subtracting decimal numbers; and,
- The use of standard vs. non-standard units needs to be clarified.

Table 25: Focus Group Responses for Grade 6 Learning Outcomes

GRADE 6	Statements			Summary of Comments or Suggestions for Change
	CL	DA	AI	
Learning Outcome Achievement Indicator(s)	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Demonstrate an awareness of the magnitude of numbers larger than one million and smaller than one thousandth. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Provides examples of where large numerals and small decimal numerals are used in the media, by groups, or by individuals.</li> <li>➤ Describe the patterns of adjacent place value positions including the repetition of ones, tens, and hundreds.</li> <li>➤ Explain how the pattern of the place value system makes it possible to read and write numerals of any magnitude.</li> </ul>	2.0 (1.6)	1.7 (1.2)	1.5 (0.7)	<ul style="list-style-type: none"> <li>➤ Respondents suggest breaking outcome into two parts.</li> <li>➤ Respondents would like more direct language - e.g., decimal numbers, delete or replace "magnitude".</li> <li>➤ Concern that decimal numbers beyond thousandths may be too challenging.</li> </ul>
<p>2. Represent and describe percent in a variety of ways. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Use concrete materials and diagrams to model a given percentage.</li> <li>➤ Write the symbolic representation of a percentage from concrete or pictorial models.</li> <li>➤ Identify contexts where percents are used and explain their meaning.</li> </ul>	1.2 (0.5)	1.1 (0.2)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ "variety of ways" requires clarification.</li> <li>➤ Unclear if percent relate to 10ths, 100ths, 1000ths.</li> </ul>

GRADE 6	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>3. Represent and describe the relationship between decimals (to hundredths), fractions, and percents. [C, CN, V]</p> <ul style="list-style-type: none"> <li>➤ Represent a given fraction, decimal number or percent as an equivalent fraction, decimal or percent and verify the equivalence.</li> <li>➤ Use the relationship between decimal, fractions and percents to solve problems.</li> <li>➤ Express values as decimal, fractions or percents for a given context and explain why this form was chosen.</li> </ul>	1.2 (0.4)	1.3 (0.6)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Unclear as to what "represent" and "verify" would look like.</li> <li>➤ Respondents not sure if this includes fractions that are not out of 100 - e.g., 1/8, 1/3. If so, then outcome should be specific to include decimal numbers to thousandths (not just hundredths).</li> </ul>
<p>4. Solve, using technology, multiplication and division problems involving large numbers. [PS, T,]</p> <ul style="list-style-type: none"> <li>➤ Explain how to determine the reasonableness of an answer.</li> </ul>	1.7 (1.1)	1.3 (0.6)	2.3 (1.9)	<ul style="list-style-type: none"> <li>➤ AI should include specific reference to type of technology.</li> <li>➤ AI could be an outcome by itself.</li> <li>➤ Estimation should be part of the learning outcome.</li> <li>➤ More detail required.</li> </ul>
<p>5. Relate improper fractions to mixed numbers. [CN, PS, R, V]</p> <ul style="list-style-type: none"> <li>➤ Express improper fractions as mixed numbers and vice versa using concrete representations.</li> <li>➤ Use models to show that improper fractions represent more than 1.</li> <li>➤ Explain how to write improper fractions as mixed numerals and vice versa.</li> <li>➤ Position a given set of fractions (including mixed numerals and improper fractions) on a number line and explain strategies used to determine position.</li> </ul>	1.0 (0.2)	1.0 (0.2)	1.1 (0.3)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>

GRADE 6	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Demonstrate an understanding of integers by:</p> <ul style="list-style-type: none"> <li>• providing examples of contexts that involve integers and explaining what information the integers convey;</li> <li>• comparing and ordering integers in a variety of ways, including a number line. [C, CN, PS, R, V]</li> </ul> <ul style="list-style-type: none"> <li>➤ Provide examples to illustrate where integers are used in a context and explain their meaning.</li> <li>➤ Use concrete materials and diagrams to represent positive and negative integers.</li> <li>➤ Place a given set of integers on a number line and justify their placement</li> <li>➤ Compare two integers and represent their relationship using the symbols '&lt;', '&gt;', and '='.</li> <li>➤ Arrange given integers in ascending or descending order.</li> <li>➤ Compare integers used in everyday contexts.</li> </ul>	1.2 (0.4)	1.1 (0.4)	1.2 (0.4)	<ul style="list-style-type: none"> <li>➤ AIs should reference concrete materials - e.g., money, temperature.</li> </ul>
<p>7. Demonstrate an understanding of the addition and subtraction of decimals in problem solving contexts. [C, CN, PS, R, V]</p> <ul style="list-style-type: none"> <li>➤ Model addition and subtraction using place value materials and record the process symbolically.</li> <li>➤ Use estimation to determine the reasonableness of calculations.</li> </ul>	1.2 (0.5)	1.6 (1.2)	1.4 (0.7)	<ul style="list-style-type: none"> <li>➤ Unsure as to how far this would extend - 10ths, 100th, 1000ths?</li> <li>➤ Possibly move outcomes to Grade 5.</li> <li>➤ Context for AIs should include money.</li> </ul>

GRADE 6	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
8. Demonstrate an understanding of the multiplication and division of decimals to hundredths (1-digit whole number multipliers and divisors) in problem solving contexts. [CN, E, PS, T] ➤ Model multiplication and division in a variety of ways and record the process symbolically. ➤ Use estimation to determine the reasonableness of calculations.	1.4 (0.9)	1.5 (0.7)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ Unsure why just 1-digit - could be 2-digit.</li> <li>➤ AIs need to provide more specifics.</li> </ul>
9. Use estimation to predict products and quotients of decimals to hundredths (1-digit whole number multipliers and divisors). [E, PS] ➤ Round the decimal to the nearest whole number to estimate a product or quotient.	1.4 (0.9)	1.1 (0.3)	1.2 (0.6)	<ul style="list-style-type: none"> <li>➤ Unclear as to whether refers to significant figures - what if rounding is to 0.</li> <li>➤ This learning outcome should come earlier in the sequence (possible in place of #4), but before #8.</li> </ul>

GRADE 6	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Describe the relationship in tables, charts and patterns using number sentences to formulate a rule. [C, CN, PS, R]	1.5 (1.0)	1.4 (0.8)	<ul style="list-style-type: none"> <li>➤ Range of questions indicates that the intent of this learning outcome is not understood.</li> <li>➤ Clarify - "number sentence", difference between table and chart.</li> </ul>
2. Analyze numeric, concrete and visual patterns to predict subsequent elements and build the pattern to verify the prediction. [CN, E, PS, R]	1.3 (0.6)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Poorly worded outcome - remove "subsequent elements".</li> </ul>

GRADE 6	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
3. Construct graphs of given patterns to verify the prediction of subsequent elements. [CN, E, PS, R, V]	1.4 (0.7)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Define the types of graphs expected.</li> <li>➤ Concern that graphing has not been previously taught.</li> <li>➤ Needs clearer language - extrapolate instead of "subsequent elements".</li> </ul>
<b><i>PATTERNS &amp; RELATIONS (VARIABLES &amp; EQUATIONS)</i></b>			
4. Explain and illustrate strategies for solving equations in one variable (with whole number coefficients and solutions). [C, CN, PS, R]	1.5 (1.0)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Clarify which operations would be expected.</li> <li>➤ Clarify one-step, two step...</li> <li>➤ Wording generally not clear.</li> </ul>
5. Demonstrate and explain the meaning of preservation of equality by balancing objects using models and diagrams. [C, CN, PS, R, V]	1.5 (1.0)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Respondents approved of the intent of the learning outcome, but felt the wording was unclear.</li> </ul>
<b><i>SHAPE &amp; SPACE (MEASUREMENT)</i></b>			
1. Demonstrate an understanding of the term "angle" by providing a variety of examples of angles including: <ul style="list-style-type: none"> <li>• measure of rotation;</li> <li>• measure of a wedge of a circle</li> <li>• measure of an inside corner of a polygon. [CN, PS, R]</li> </ul>	1.4 (1.1)	1.3 (0.9)	<ul style="list-style-type: none"> <li>➤ Learning outcomes could come earlier (Grade 4?)</li> <li>➤ Use correct terminology - e.g., sector instead of "wedge".</li> </ul>
2. Name and classify angles as: <ul style="list-style-type: none"> <li>• acute;</li> <li>• right;</li> <li>• obtuse;</li> <li>• straight;</li> <li>• reflex;</li> </ul> and provide examples within a context. [C, CN, V]	1.0 (0)	1.0 (0)	<ul style="list-style-type: none"> <li>➤ No comments.</li> </ul>
3. Demonstrate and explain why the sum of the interior angles of a triangle is $180^\circ$ and the sum of the interior angles of a quadrilateral is $360^\circ$ [C, R]	1.2 (0.6)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Students should "explain that..." not "explain why..." not developmentally appropriate.</li> </ul>
4. Estimate the measure of an angle using $45^\circ$ , $90^\circ$ or $180^\circ$ as reference angles. [E]	1.2 (0.7)	1.3 (0.8)	<ul style="list-style-type: none"> <li>➤ Move to an earlier grade (5).</li> <li>➤ Unclear if students know what the unit "degree" is.</li> </ul>

GRADE 6	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
5. Draw an angle when the measure of the angle in degrees is specified. [E, PS, V]	1.2 (0.5)	1.0 (0.3)	➤ Replace "draw" with "sketch".
6. Measure angles using a circular protractor. [PS, V]	1.0 (0.3)	1.3 (0.8)	➤ Use of circular protractor felt to be unnecessary (just use regular protractor).
7. Develop, apply and verify rules and formulas for determining the perimeter of polygons. [CN, PS, R]	1.5 (1.0)	1.1 (0.4)	➤ Some respondents suggest moving these outcomes to Grade 4/5. ➤ Clarify the type of polygons expected.
8. Develop, apply and verify rules and formulas for determining the area of rectangles. [CN, PS, R]	1.2 (0.5)	1.3 (0.8)	➤ Some respondents suggest moving these outcomes to Grade 4/5.
9. Connect the formula for determining the area of rectangles to determining the surface area of a right rectangular prism. [CN, E, PS]	1.6 (1.1)	1.4 (0.7)	➤ Respondents indicated general dissatisfaction with the wording of this outcome - e.g., what is the difference between a right rectangular prism and rectangular prism (Note: A diagram would clear up this confusion). ➤ Some respondents suggest moving this outcome to Grade 7.
10. Develop, apply and verify rules and formulas for determining the volume of right rectangular prisms. [PS, R]	1.6 (1.3)	1.6 (1.2)	➤ No consistent comments/suggestions.
<b>SHAPE &amp; SPACE (3-D OBJECT &amp; 2-D SHAPES)</b>			
11. Construct, analyze and classify triangles in different orientations according to the length of their sides. [PS, R, V]	1.5 (1.2)	1.1 (0.3)	➤ No consistent comments/suggestions.
12. Classify triangles according to the measure of their interior angles. [PS, R, V]	1.1 (0.3)	1.1 (0.3)	➤ Specify types of triangles.
13. Identify and sort quadrilaterals according to their attributes including: <ul style="list-style-type: none"> <li>• rectangles;</li> <li>• squares;</li> <li>• trapezoids;</li> <li>• parallelograms;</li> <li>• rhombuses. [C, R, V]</li> </ul>	1.1 (0.4)	1.1 (0.4)	➤ Clarify what attributes are expected. ➤ Could be moved to an earlier grade.

GRADE 6	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>SHAPE &amp; SPACE (TRANSFORMATIONS)</i></b>			
14. Draw and describe the image of a 2-D shape as a result of a combination of translation(s) rotation(s) and/or reflection(s). [C, T, V]	1.2 (0.5)	1.2 (0.5)	➤ This could be part of an Art program rather than mathematics.
15. Create, describe and analyze designs using translations, rotation and reflections. [C, CN, T, V]	1.2 (0.5)	1.2 (0.5)	➤ This could be part of an Art program rather than mathematics. ➤ Clarify what is expected by "analyze designs".
16. Specify locations and describe paths using ordered pairs in the first quadrant. [C, CN]	1.5 (0.8)	1.5 (0.9)	➤ No consistent comments/suggestions.
17. Describe positional change, using horizontal (left-right) and vertical (up-down) descriptors in relation to a reference point. [C, PS, V]	1.2 (0.6)	1.6 (1.1)	➤ No consistent comments/suggestions.
<b><i>STATISTICS &amp; PROBABILITY (DATA ANALYSIS)</i></b>			
1. Organize collected data and display it in an appropriate manner and analyze it in order to answer a question. [C, CN, PS]	1.1 (0.4)	1.1 (0.3)	➤ Clarify what "an appropriate manner" for displaying data is.
2. Construct and label broken-line and straight-line graphs to answer questions. [C, CN, PS, V]	1.2 (0.5)	1.1 (0.3)	➤ Clarify the context for using broken-line and straight-line graphs.
3. Select, justify and use appropriate methods of collecting data including: <ul style="list-style-type: none"> <li>• designing and using questionnaires;</li> <li>• designing and performing experiments;</li> <li>• making observations;</li> </ul> using electronic media. [C, PS, T]	1.2 (0.6)	1.2 (0.6)	➤ Clarify limits of scope - e.g., what electronic media.
4. Interpret a variety of graphs including: <ul style="list-style-type: none"> <li>• broken-line graphs;</li> <li>• straight-line graphs;</li> </ul> to draw conclusions and make predictions. [C, E, PS, R]	1.2 (0.5)	1.1 (0.2)	➤ Respondents suggest that outcomes #2 and #4 could be combined. ➤ Clarify if these are the only two types of graphs at the grade 6 level.

GRADE 6	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
5. Formulate questions for investigation, given a context. [C, CN, PS, R]	1.3 (0.8)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Clarify types of investigations - or this becomes a science class.</li> <li>➤ This learning outcome could be the first in this strand.</li> </ul>
<b><i>STATISTICS &amp; PROBABILITY (CHANCE &amp; UNCERTAINTY)</i></b>			
6. Describe experimental probability as the number of favourable outcomes over the number of possible outcomes. [C, E, PS]	1.6 (1.2)	1.6 (1.3)	<ul style="list-style-type: none"> <li>➤ Clarify terms "experimental" and "theoretical".</li> </ul>
7. Describe theoretical probability as the number of favourable outcomes over the number of possible outcomes. [C, E, PS]	1.2 (0.5)	1.4 (1.0)	<ul style="list-style-type: none"> <li>➤ Clarify terms "experimental" and "theoretical".</li> </ul>
8. Compare experimental results with theoretical data for single event probability experiments. [C, CN, PS, R]	1.4 (0.9)	1.1 (0.5)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
9. Consider a single event experiment and identify and describe outcomes that are equally likely/probable, more likely/probable and less likely/probable. [C, E, PS]	1.4 (0.7)	1.2 (0.44)	<ul style="list-style-type: none"> <li>➤ Concern about consistent use of language - i.e., likely/probable, etc.</li> </ul>

### *Summary of Grade 6 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 6 curriculum:

- Overall the volume of content in the grade appears to be too heavy;
- Curriculum is disjoint - does not flow well to Grade 7 - too large of a jump;
- Some of the content in Transformations could be addressed earlier (possibly Grade 4);
- Order of operations should be addressed at this grade; and,
- Problem solving is not addressed properly.

Table 26: Focus Group Responses for Grade 7 by Learning Outcome

GRADE 7	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Write a whole number in a variety of forms including:</p> <ul style="list-style-type: none"> <li>• an expanded numeral using powers of 10;</li> <li>• scientific notation and vice versa;</li> <li>• combined decimals and place value words;</li> <li>• select an appropriate form for a whole number for a given purpose.</li> </ul> <p>and vice-versa. [C, CN, PS, V]</p> <ul style="list-style-type: none"> <li>➤ Explain why it may be preferred to represent very large numbers using scientific or combined decimal and place value notation.</li> <li>➤ Express a whole number as an expanded number using powers of ten and vice-versa.</li> <li>➤ Express a combined decimal and place value word as a whole number and vice versa.</li> <li>➤ Express whole numbers in scientific notation using proper conventions and vice-versa.</li> <li>➤ Given different contexts, express numerals in a suitable form and explain why this form was chosen.</li> <li>➤ Provide examples where scientific notation, and combined decimal number and place value words are used.</li> <li>➤ Illustrate place value using expanded form notation.</li> </ul>	<p>2.1 (1.7)</p>	<p>1.3 (0.6)</p>	<p>1.6 (1.0)</p>	<ul style="list-style-type: none"> <li>➤ Clarify meaning of "combined decimal" and "place value word".</li> <li>➤ "vice versa" not considered appropriate mathematical language.</li> <li>➤ Learning outcome bullets not clear to many respondents.</li> </ul>

GRADE 7	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>2. Express fractions as decimals (repeating or terminating) and terminating decimals as fractions. [C, CN, T]</p> <ul style="list-style-type: none"> <li>➤ Match fractions to their decimal representations.</li> <li>➤ Divide the numerator of a fraction by the denominator to determine if the fraction has a terminating or repeating decimal.</li> </ul>	1.2 (0.5)	1.2 (0.4)	1.5 (0.7)	<ul style="list-style-type: none"> <li>➤ Include changing decimal number to fractions.</li> <li>➤ Include expressing simple repeating decimal numbers to fractions.</li> </ul>
<p>3. Classify fractions and their decimal representations according to the type of decimal (including repeating and terminating decimals), and explain whether the decimal form is approximate or exact. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Sort common fractions into repeating or terminating decimals.</li> <li>➤ Use the appropriate representation when solving a problem that requires an exact answer.</li> <li>➤ Explain how place value can be used to write terminating decimals as fractions.</li> </ul>	1.3 (0.6)	1.3 (0.7)	1.5 (0.7)	<ul style="list-style-type: none"> <li>➤ Clarify what "appropriate representations" means.</li> <li>➤ Clarify what place value is expected - 10ths? 100ths? 1000ths?</li> <li>➤ Could break into two learning outcomes.</li> </ul>

GRADE 7	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>4. Determine and explain why a number is divisible by 2, 3, 4, 5, 6, 9 or 10 and cannot be divided by 0. [C, R]</p> <ul style="list-style-type: none"> <li>➤ Provide a number within a given range that meets criteria based upon divisibility and explain why.</li> <li>➤ Demonstrate the divisibility of a given number using a variety of methods.</li> <li>➤ Sort a given set of numbers based upon their divisibility, using organizers such as Venn and Carroll diagrams.</li> <li>➤ Explain, using examples, why a non-zero number cannot be divided by 0.</li> </ul>	1.2 (0.6)	1.1 (0.2)	1.3 (0.6)	<ul style="list-style-type: none"> <li>➤ Include 7 &amp; 8 in the rules.</li> <li>➤ First AI not clear to some respondents - re-word.</li> <li>➤ Some respondents question why the concept of division by zero is included in this outcome - recommend keeping them separate.</li> <li>➤ Clarify what a Carroll diagram is.</li> </ul>
<p>5. Demonstrate an understanding of adding and subtracting positive fractions with like and unlike denominators concretely, pictorially and symbolically. [C, CN, PS]</p> <ul style="list-style-type: none"> <li>➤ Model addition and subtraction of fractions using a variety of concrete and visual representations, and record the process symbolically.</li> <li>➤ Identify common multiples to determine common denominators.</li> <li>➤ Compare strategies used for addition and subtraction of fractions without the use of technology.</li> <li>➤ Estimate the sum or difference of two positive fractions using benchmarks.</li> <li>➤ Determine common factors to simplify fractions.</li> </ul>	1.5 (1.0)	2.0 (1.6)	1.6 (1.2)	<ul style="list-style-type: none"> <li>➤ Where in the curriculum are LCM and GCF?</li> <li>➤ Some respondents suggest simplifying this outcome - e.g., limit to positive fractions, eliminate symbolically.</li> <li>➤ Other respondents suggest adding multiplication &amp; division of fractions.</li> </ul>

GRADE 7	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Define and apply power, base and exponent to represent repeated multiplication [C, T, V]</p> <ul style="list-style-type: none"> <li>➤ Explain the difference between a power and an exponent.</li> <li>➤ Explain the meaning of the base and the exponent for a given power.</li> <li>➤ Express a power as a repeated multiplication and vice-versa.</li> <li>➤ Evaluate a given power with and without technology as appropriate.</li> </ul>	1.1 (0.2)	1.0 (0.1)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Clarify that base and exponents are whole numbers only.</li> <li>➤ Other comments not consistent.</li> </ul>
<p>7. Solve problems involving the addition, subtraction, multiplication and division of decimals (for more than 1-digit divisors or multipliers, the use of technology is expected). [E, PS, T]</p> <ul style="list-style-type: none"> <li>➤ Compare strategies for solving problems involving operations on decimals including technology as appropriate.</li> <li>➤ Check the reasonableness of calculations used to solve problems involving decimals using estimation.</li> </ul>	1.5 (1.1)	1.5 (1.1)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Majority of respondents concerned that the learning outcome limits students to 1-digit divisors or multipliers. Respondents strongly suggest that 2-digit divisors or multipliers be expected of students before using technology.</li> <li>➤ 1-digit divisor implies students would be expected to divide by tenths - requires clarification.</li> </ul>
<p>8. Explain and demonstrate that the sum of opposite integers is zero. [C, CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Use concrete materials and diagrams to represent and explain how the sum of opposite integers is zero.</li> <li>➤ Use a number line to explain that a move in one direction followed by an equivalent move in the opposite direction results in no change in position.</li> </ul>	1.0 (0.1)	1.2 (0.7)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>

GRADE 7	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
9. Explain a strategy when adding and subtracting integers concretely, pictorially and symbolically. [C, CN, PS, R, V] <ul style="list-style-type: none"> <li>➤ Model addition and subtraction of integers using a variety of concrete and visual representations, and record the process symbolically.</li> <li>➤ Compare strategies used for addition and subtraction of integers.</li> </ul>	1.2 (0.6)	1.0 (0.2)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ Many respondents suggest the learning outcome be modified to indicate that students should actually perform the operations on integers (not just explain a strategy).</li> </ul>

GRADE 7	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>PATTERNS &amp; RELATIONS (PATTERNS)</b>			
1. Determine a mathematical expression to represent a given situation. [C, CN, PS, R, V]	1.8 (1.3)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ Respondents indicated this learning outcome is vague - not sure what it is asking.</li> </ul>
2. Translate between an oral or written expression and an equivalent algebraic expression. [C, CN]	1.4 (0.9)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Some respondents felt this outcome was vague - need to differentiate between this and #1.</li> </ul>
<b>PATTERNS &amp; RELATIONS (VARIABLES &amp; EQUATIONS)</b>			
3. Model and solve problems that can be represented by one-step linear equations of the form <ul style="list-style-type: none"> <li>• <math>x + a = b</math></li> <li>• <math>ax = b</math></li> <li>• <math>\frac{x}{a} = b</math></li> </ul> using a variety of strategies including concrete materials and diagrams where $a$ and $b$ are integers. [C, CN, PS, R]	1.5 (0.9)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Could also include <math>ax + b = c</math> from Grade 8 (but keep in Grade 8 as well).</li> <li>➤ <math>\frac{x}{a} = b</math> and <math>ax = b</math> may not be appropriate if multiplication or division of integers is not addressed (presently only +/-).</li> <li>➤ Some confusion concerning subtraction - i.e., <math>x - a = b</math> (need to clarify that when <math>a</math> is a negative integer then <math>x + a</math> becomes <math>x - a</math>).</li> <li>➤ Many respondents suggest that examples of "strategies" be clearly spelled out in AIs.</li> </ul>

GRADE 7	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>SHAPE &amp; SPACE (MEASUREMENT)</b>			
1. Establish and describe the relationships among radius, diameter and circumference of circles. [C, CN, R] <ul style="list-style-type: none"> <li>• measure of rotation;</li> <li>• measure of a wedge of a circle</li> <li>• measure of an inside corner of a polygon. [CN, PS, R]</li> </ul>	1.0 (0.1)	1.0 (0.1)	<ul style="list-style-type: none"> <li>➤ Clarify if this requires developing <math>n</math>. If so, state this with examples.</li> </ul>
2. Solve problems involving the radii, diameters and circumferences of circles. [CN, PS, T]	1.0 (0.2)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Clear and precise iff (if and only if) <math>n</math> is introduced.</li> </ul>
3. Demonstrate that a circle can be divided into a number of congruent wedges and that the measure of each wedge can be determined by dividing $360^\circ$ by the number of wedges. [CN, PR, V]	1.2 (0.6)	1.1 (0.3)	<ul style="list-style-type: none"> <li>➤ Use correct terminology - wedge is sector.</li> </ul>
4. Perform geometric constructions including: <ul style="list-style-type: none"> <li>• circles of a given radius, diameter or circumference;</li> <li>• perpendicular bisectors;</li> <li>• angle bisectors;</li> <li>• parallel lines;</li> </ul> and connect them with real-world applications. [PS, V]	1.4 (0.9)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Specific real-world applications should be provided.</li> </ul>
5. Develop, verify and apply the formula for determining the area of a triangle. [CN, PS, R]	1.0 (0.2)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Consider reversing the order of learning outcomes #5 &amp; 6.</li> </ul>
6. Develop, verify and apply the formula for determining the area of a parallelogram. [CN, PS, R]	1.0 (0.2)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Consider reversing the order of learning outcomes #5 &amp; 6.</li> </ul>
7. Explain how the formula for determining the area of a circle is derived and apply the formula to solve problems. [C, CN, PS]	1.3 (0.6)	1.6 (1.3)	<ul style="list-style-type: none"> <li>➤ Respondents indicate it is unnecessary (or developmentally inappropriate) for students to explain the derivation - sufficient to recognize and apply the formula.</li> </ul>

GRADE 7	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>SHAPE &amp; SPACE (3-D OBJECT &amp; 2-D SHAPES)</b>			
8. Identify and describe the properties that define similar triangles. [C, CN, R, V]	1.7 (1.3)	1.6 (1.2)	➤ Learning outcome assumes that students understand ratio, but not apparent that they will until Grade 8.
9. Solve problems using the properties of similar triangles. [CN, PS]	1.3 (0.9)	1.7 (1.3)	➤ Most respondents suggest moving this learning outcome to Grade 8 or 9.
10. Identify and describe the properties that define congruent triangles. [C, R, V]	1.3 (0.7)	1.5 (1.0)	➤ Most respondents suggest moving this learning outcome to Grade 8 or 9.
11. Solve problems using the properties of congruent triangles. [CN, PS]	1.3 (0.7)	1.5 (1.0)	➤ Most respondents suggest moving this learning outcome to Grade 8 or 9.
12. Demonstrate that similar triangles may be congruent and that congruent triangles are similar. [C, PS, R, T, V]	1.3 (0.7)	1.8 (1.4)	➤ Most respondents suggest moving this learning outcome to Grade 8 or 9.
<b>SHAPE &amp; SPACE (TRANSFORMATIONS)</b>			
13. Plot and read ordered pairs on a Cartesian plane to: <ul style="list-style-type: none"> <li>illustrate translation, rotation and reflection in ages;</li> <li>describe the coordinates and movement of in ages during translation, rotation and reflection. [C, PS, V]</li> </ul>	1.3 (0.7)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Should introduce 4 quadrants first.</li> <li>➤ Need to define Cartesian plane first.</li> </ul>
14. Create, analyze and describe designs using translations, rotations and reflections on a Cartesian plane. [C, T, V]	1.2 (0.6)	1.1 (0.4)	➤ Most respondents suggest moving this learning outcome to Grade 8.
15. Recognize and demonstrate the congruence of a triangle with its: <ul style="list-style-type: none"> <li>translation in age;</li> <li>rotation in age;</li> <li>reflection in age. [R]</li> </ul>	1.3 (0.7)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Some respondents question whether this learning outcome is necessary.</li> <li>➤ Some respondents suggest moving this learning outcome to Grade 8.</li> </ul>

GRADE 7	Statements		Summary of Comments or Suggestions for Change
	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>STATISTICS &amp; PROBABILITY (DATA ANALYSIS)</b>			
1. Demonstrate an understanding of central tendency and range by: <ul style="list-style-type: none"> <li>calculating and analyzing the measures of central tendency (mean, median, mode) and range;</li> <li>determining the most appropriate measures of central tendency to report findings and to defend choices;</li> <li>formulating questions for further investigation. [C, PS, T]</li> </ul>	1.2 (0.5)	1.1 (0.5)	➤ No consistent comments/suggestions.
2. Identify outliers and justify whether or not they are to be included in the analysis of a set of data. [C, R, V]	1.1 (0.3)	1.1 (0.5)	➤ Clarify what "outliers" mean.
3. Determine the effect on the mean, median and/or mode when an outlier is included in the data set. [C, CN, R]	1.1 (0.3)	1.1 (0.5)	➤ No consistent comments/suggestions.
4. Construct, label and interpret circle graphs to answer questions. [C, E, PS, R]	1.2 (0.5)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Concern from respondents that this requires understanding of proportion.</li> <li>➤ Some respondents suggest moving this learning outcome to Grade 8.</li> </ul>
<b>STATISTICS &amp; PROBABILITY (CHANCE &amp; UNCERTAINTY)</b>			
5. Distinguish between independent and dependent events. [C, R]	1.3 (0.7)	1.4 (0.9)	➤ Some respondents question whether students can accomplish this (particularly dependent events).
6. List all possible outcomes for a probability experiment involving two independent events. [C, E, PS]	1.3 (0.7)	1.4 (0.9)	➤ Some respondents suggested that, if this were to be done, then sample space should also be introduced.
7. Make predictions for a probability experiment involving two independent events, conduct the experiment and compare the predictions to the results. [C, E, PS]	1.3 (0.7)	1.5 (1.1)	<ul style="list-style-type: none"> <li>➤ Difficult learning outcomes without using sample space.</li> <li>➤ Consider moving to a later grade (9?)</li> </ul>

### *Summary of Grade 7 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 7 curriculum:

- Overall the volume of content in the grade appears to be appropriate;
- Concern that rate, ratio, proportion, percentage are absent;
- Triangle congruency should be moved to Grade 9 and keep similar triangles in Grade 7 only if ration and proportion are added;
- Concern that order of operations is not included at this grade - not until Grade 9;
- Need clarification as to what technology should be used and how; and,
- Problem solving is not addressed properly.

Table 27: Focus Group Responses for Grade 8 by Learning Outcome

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
<p>1. Represent square numbers and their square roots concretely, pictorially and symbolically. [C, CN, R]</p> <ul style="list-style-type: none"> <li>➤ Use manipulatives or diagrams to represent a perfect square and determine its square root.</li> <li>➤ Demonstrate that any perfect square can be represented concretely or pictorially as a square region (i.e. all sides are exactly equal without rounding).</li> </ul>	1.0 (0.2)	1.0 (0.2)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ Clarify that these are "perfect squares", not "square numbers".</li> <li>➤ Clarify in AI what is meant by concretely, pictorially and symbolically.</li> </ul>
<p>2. Recognize and explain that the square root of a non-perfect square is a decimal approximation. [C, E, R, T]</p> <ul style="list-style-type: none"> <li>➤ Determine whether or not a given number is a square number, and justify their reasoning.</li> <li>➤ Use technology to show that not all numbers are perfect squares.</li> <li>➤ Determine a decimal approximation for the square root of a non-perfect square.</li> </ul>	1.1 (0.5)	1.0 (0.1)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Clarify that these "non-perfect squares" are irrational numbers (unless only whole number are expected?)</li> <li>➤ If technology means calculator, then this term should be used.</li> </ul>
<p>3. Approximate the square root of numbers using square numbers as benchmarks. [C, R]</p> <ul style="list-style-type: none"> <li>➤ Identify the two closest whole number perfect squares to a given number.</li> <li>➤ Explain how to use benchmarks to determine a decimal approximation for a square root of a number that is not a perfect square.</li> </ul>	1.0 (0.2)	1.0 (0.2)	1.0 (0.2)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>4. Explain and illustrate that a numeral in the form <math>\frac{a}{b}</math> can be interpreted as:</p> <ul style="list-style-type: none"> <li>• a fraction;</li> <li>• a rate ratio;</li> <li>• a comparison ratio;</li> <li>• division;</li> <li>• indicating probability. [C, CN, R]</li> </ul> <p>➤ Explain how a numeral in the form of a/b can be interpreted in a variety of ways and provide examples.</p> <p>➤ Given the same numeral in the form a/b, but in different contexts, explain how that numeral can be interpreted.</p> <p>➤ Compare and contrast fractions and ratios.</p>	1.5 (0.9)	1.2 (0.5)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ Respondents indicate that the wording of this outcome is unclear - e.g., a=?, b=?, difference between fraction and rate ratio or probability and comparison ratio is unclear.</li> <li>➤ AIs do not elaborate on outcome sufficiently.</li> <li>➤ Many new concepts in this learning outcome - first time students have been exposed to rates/ratios.</li> </ul>
<p>5. Solve problems involving rates, ratios, and proportions. [PS, R]</p> <p>➤ Determine whether rate, ratio, proportion or percent could be used in solving a given problem.</p> <p>➤ Calculate the rate, ratio, and solve proportions for given numbers.</p> <p>➤ Solve problems involving rates, ratios and proportions.</p>	1.2 (0.7)	1.0 (0.1)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ First AI is not clear - does not indicate how far this should go.</li> <li>➤ First AI includes %, but this is not part of the learning outcome.</li> <li>➤ Learning outcomes could possibly precede #4.</li> </ul>

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Derive, explain and apply the exponent laws with whole number exponents and bases, including:</p> <ul style="list-style-type: none"> <li>• <math>(a^m)(a^n) = a^{m+n}</math></li> <li>• <math>a^m \div a^n = a^{m-n}</math></li> <li>• <math>(a^m)^n = a^{mn}</math></li> <li>• <math>(ab)^m = a^m b^m</math></li> <li>• <math>\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0</math></li> <li>• <math>a^0 = 1, a \neq 0</math> [C, CN, PS, R]</li> </ul> <p>➤ Explain how an exponent law, excluding the 0 exponent, can be generalized from a set of examples.</p> <p>➤ Simplify expressions by applying the exponent laws.</p> <p>➤ Substitute whole number values for the base and exponent and solve to verify a law.</p> <p>➤ Show that any base (except 0) with an exponent of 0 is equal to 1, using a pattern or the quotient law for exponents.</p> <p>➤ Write alternate forms for a given power using the exponent laws.</p>	1.0 (0.2)	2.1 (1.7)	1.7 (1.1)	<ul style="list-style-type: none"> <li>➤ Mixed comments from respondents on the placement of this learning outcome in Grade 8 (50/50 for/against).</li> <li>➤ Some respondents feel this would be better separated so that bullets 1,2, 6 could be covered in Grade 8 with the rest being addressed in Grade 9.</li> <li>➤ Case where illustrative examples in the AIs would clarify the learning outcomes.</li> </ul>

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>7. Compare and order rational numbers in a variety of ways, including number lines and benchmarks. [CN, R, V]</p> <ul style="list-style-type: none"> <li>➤ Compare and contrast rational numbers with fractions, integers, and decimal numbers.</li> <li>➤ Name rational numbers that are between two given rational numbers on a number line.</li> <li>➤ Order a set of rational numbers, given in fraction or decimal form, by placing them on a number line.</li> <li>➤ Determine whether one rational number is greater than, less than or equal to another, and provide a justification.</li> <li>➤ Select a benchmark for comparing two rational numbers and explain its choice.</li> </ul>	1.1 (0.4)	1.0 (0.1)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Respondents unclear what a "benchmark" is.</li> <li>➤ First AI is not clear - implies that rational numbers are different from fractions, integers &amp; decimal numbers.</li> </ul>
<p>8. Estimate to predict whether a product or quotient will be greater than 1, less than 1 or about 1. [CN, E, PS, R]</p> <ul style="list-style-type: none"> <li>➤ Compare strategies used to predict if a product or quotient of two fractions will be less than one greater than one or less than one.</li> </ul>	1.3 (0.8)	1.2 (0.7)	2.2 (1.7)	<ul style="list-style-type: none"> <li>➤ Several respondents question the purpose or grade placement of this outcome - indicates the learning outcome is unclear.</li> <li>➤ "less than one" repeated in AI.</li> </ul>
<p>9. Explain a strategy when multiplying and dividing positive fractions. [C, CN, PS]</p> <ul style="list-style-type: none"> <li>➤ Compare strategies for multiplying and dividing positive fractions.</li> <li>➤ Predict with justification if the product or quotient of two fractions will be greater than 1, less than 1 or about 1.</li> </ul>	1.0 (1.0)	1.0 (0.3)	1.6 (1.1)	<ul style="list-style-type: none"> <li>➤ Second AI the same as in learning outcome #8.</li> <li>➤ Clarify what is expected in terms of strategies (should outcome require several strategies - concrete, pictorial, symbolic?)</li> </ul>

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>10. Demonstrate an understanding of percents by:</p> <ul style="list-style-type: none"> <li>• modeling fractional percents and percents greater than 100;</li> <li>• representing percents greater than 100 and smaller than 1 in decimal, fractional, and percentage form;</li> <li>• applying percents in a variety of contexts. [CN, PS, R, V]</li> </ul> <p>➤ Identify contexts where a percentage may be more than 100% or less than 1%.</p> <p>➤ Model concretely and/or pictorially percents (given as a fraction, decimal, or percentage) greater than 100 or less than 1.</p> <p>➤ Calculate and determine percents in a variety of contexts.</p> <p>➤ Demonstrate the effect of combining percents within an everyday context.</p> <p>➤ Solve problems involving combined percent.</p>	1.3 (0.9)	1.5 (1.0)	1.4 (1.0)	<p>➤ Lack of continuity (re: %) between Grades 6 - 8. Large jump from Grade 6 to Grade 8.</p> <p>➤ AI language is inconsistent with previous terminology - e.g., "fractional percents" should be replaced with "percents less than one".</p>

GRADE 8	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
11. Explain a strategy when multiplying and dividing integers concretely, pictorially and symbolically. [C, CN, PS, R, V] <ul style="list-style-type: none"> <li>➤ Demonstrate the multiplication and division of integers using concrete materials and diagrams and record the process symbolically.</li> <li>➤ Compare strategies for multiplying and dividing integers.</li> <li>➤ Solve problems involving multiplication and division of integers with and without technology.</li> </ul>	1.2 (0.8)	1.2 (0.7)	1.4 (0.9)	<ul style="list-style-type: none"> <li>➤ Respondents indicated a preference to combining operations into one grade.</li> <li>➤ Clarification required as to the expected strategies - e.g., pictorially.</li> </ul>

GRADE 8	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Predict possible nth values of a number pattern, and verify by substitution. [C, CN, E, R]	1.4 (0.9)	1.3 (0.7)	<ul style="list-style-type: none"> <li>➤ Outcomes needs to be clarified in several ways:               <ul style="list-style-type: none"> <li>○ Limited to 1st degree polynomials;</li> <li>○ Are variables involved;</li> <li>○ Should patterns be depicted visually; and,</li> <li>○ AIs will need clear examples.</li> </ul> </li> </ul>
2. Construct the graph of relations, analyze the graph and draw a conclusion. [C, R, V]	1.6 (1.1)	1.2 (0.5)	<ul style="list-style-type: none"> <li>➤ Clarify what types of graphs are expected.</li> <li>➤ Are interpolation or extrapolation expected?</li> </ul>
<b><i>PATTERNS &amp; RELATIONS (VARIABLES &amp; EQUATIONS)</i></b>			
3. Identify and provide examples of constant terms, coefficients and variables. [CN, PS, V]	1.1 (0.5)	1.0 (0.1)	<ul style="list-style-type: none"> <li>➤ Clarify what "constant", "coefficient", and "variable" are.</li> </ul>

GRADE 8	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
4. Model (concretely, pictorially and symbolically), record and explain monomial addition and subtraction. [C, CN, PS, V]	1.2 (0.6)	1.0 (0.2)	➤ Some respondents suggested this is "combining like terms". If so, suggest using this terminology.
5. Model (concretely, pictorially and symbolically) and explain the distributive property when multiplying a binomial by a constant. [CN, PS, V]	1.0 (0.2)	1.1 (0.3)	➤ Respondents suggest moving this to Grade 9, as it is very difficult.
6. Model, record and explain the solution process for linear equations of the form: <ul style="list-style-type: none"> <li>• <math>ax + b = c</math></li> <li>• <math>\frac{x}{a} + b = c</math></li> <li>• <math>ax = b + cx</math></li> <li>• <math>a(x + b) = c</math></li> <li>• <math>ax + b = cx + d</math></li> <li>• <math>a(bx + c) = d(ex + f)</math></li> <li>• <math>\frac{a}{x} = b</math></li> </ul> where $a, b, c, d, e$ and $f$ are integers, using concrete materials or diagrams. [C, CN, PS, V]	1.0 (0.2)	1.8 (1.5)	<ul style="list-style-type: none"> <li>➤ Many respondents suggested that this learning outcome be split so that the first four bullets are in Grade 8 with the rest in Grade 9.</li> <li>➤ Many respondents noted that order of operations is a prerequisite to this learning outcome.</li> </ul>
7. Solve and verify equations of the form: <ul style="list-style-type: none"> <li>• <math>ax + b = c</math></li> <li>• <math>\frac{x}{a} + b = c</math></li> <li>• <math>ax = b + cx</math></li> <li>• <math>a(x + b) = c</math></li> <li>• <math>ax + b = cx + d</math></li> <li>• <math>a(bx + c) = d(ex + f)</math></li> <li>• <math>\frac{a}{x} = b</math></li> </ul> where $a, b, c, d, e$ and $f$ are integers using a variety of strategies. [PS, V]	1.1 (0.4)	1.5 (1.1)	<ul style="list-style-type: none"> <li>➤ Many respondents suggested that this learning outcome be split so that the first four bullets are in Grade 8 with the rest in Grade 9.</li> <li>➤ Many respondents noted that order of operations is a prerequisite to this learning outcome.</li> </ul>
<b>SHAPE &amp; SPACE (MEASUREMENT)</b>			
1. Develop the Pythagorean relationship using concrete materials and diagrams. [CN, R, T]	1.0 (0.2)	1.0 (0.2)	➤ No consistent comments/suggestions.

GRADE 8	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
2. Apply the Pythagorean relationship to determine the measure of the third side of a right triangle, given the measures of the other two sides in a problem-solving context. [CN, PS, R, T]	1.0 (0.2)	1.0 (0.2)	➤ No consistent comments/suggestions.
3. Apply the Pythagorean relationship to determine whether or not a triangle is a right triangle. [PS, R, T]	1.0 (0.1)	1.0 (0.2)	➤ No consistent comments/suggestions.
4. Determine the effect of changing one or more dimensions of a given 3-D object on its surface area and volume and draw conclusions. [C, E, PS, R]	1.6 (1.0)	1.9 (1.6)	<ul style="list-style-type: none"> <li>➤ Many respondents suggested moving this learning outcome to Grade 9.</li> <li>➤ A few respondents suggested this learning outcome be switched with LO#7.</li> <li>➤ Need to be specific what shapes are expected.</li> </ul>
5. Develop, apply and verify the formula for determining the surface area of cylinders. [PS, R]	1.0 (0.2)	1.0 (0.2)	➤ Many respondents suggested moving this learning outcome to Grade 9.
6. Connect the formula for determining the area of rectangles to determining the surface area of composite 2-D shapes. [CN, E, PS]	2.0 (1.7)	1.1 (0.4)	<ul style="list-style-type: none"> <li>➤ "Surface" not required as these are only 2-D shapes and area is sufficient.</li> <li>➤ Does this include only composite shapes that are comprised of rectangles?</li> </ul>
7. Connect the formula for determining the area of rectangles to determining the surface area of composite 3-D objects. [CN, PS]	1.8 (1.5)	1.3 (0.8)	<ul style="list-style-type: none"> <li>➤ Consider combining with "volume" in Grade 9.</li> <li>➤ Clarify why this appears to exclude all composite objects that are comprised of rectangles when they know others.</li> </ul>
<b>SHAPE &amp; SPACE (3-D OBJECT &amp; 2-D SHAPES)</b>			
8. Identify and describe the properties that define similar 2-D shapes. [C, CN, R, V]	1.2 (0.6)	1.2 (0.7)	<ul style="list-style-type: none"> <li>➤ Most respondents suggested these outcomes be moved to Grade 9.</li> <li>➤ Some respondents noticed that there was no mention of technology.</li> </ul>
9. Solve problems using the properties of similar 2-D shapes. [CN, PS]	1.7 (1.3)	1.4 (0.9)	
10. Identify and describe the properties that define congruent 2-D shapes. [C, R, V]	1.5 (1.1)	1.5 (1.0)	

GRADE 8	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
11. Solve problems using the properties of congruent 2-D shapes. [CN, PS]	1.6 (1.3)	1.5 (1.1)	
12. Demonstrate that similar 2-D shapes may be congruent and that congruent 2-D shapes are similar. [C, PS, R, V]	1.4 (1.1)	1.5 (1.1)	
<b>SHAPE &amp; SPACE (TRANSFORMATIONS)</b>			
13. Explain the properties of shapes that make tessellation possible. [C, V]	1.2 (0.7)	1.2 (1.4)	<ul style="list-style-type: none"> <li>➤ Most respondents suggested these outcomes be moved to Grade 9.</li> <li>➤ Some respondents suggested that learning outcomes #13 - 16 could be combined.</li> </ul>
14. Recognize tessellations created with regular and irregular shapes in a variety of contexts. [CN, V]	1.0 (0.2)	1.1 (0.5)	
15. Create tessellations using transformations (translation, reflection, and rotation). [C, PS, T, V]	1.2 (0.7)	1.1 (0.5)	
16. Describe a series of transformations that can result in a given tessellation. [C, CN, V]	1.1 (0.3)	1.1 (0.4)	
<b>STATISTICS &amp; PROBABILITY (DATA ANALYSIS)</b>			
1. Analyze and critique ways in which displayed data and/or conclusions are presented by the media and other sources. [C, R]	1.0 (0.3)	1.4 (1.1)	➤ Good cross-curricular tie-ins.
2. Analyze data sets to make comparisons. [E, PS, R]	1.6 (1.2)	1.0 (0.1)	➤ Clarification of what is being compared is needed - e.g., means? medians?
3. Identify and describe issues to be considered when collecting data including: <ul style="list-style-type: none"> <li>• appropriate language;</li> <li>• ethics;</li> <li>• cost;</li> <li>• privacy;</li> <li>• cultural sensitivity. [C, CN, R]</li> </ul>	1.4 (1.0)	1.5 (1.2)	<ul style="list-style-type: none"> <li>➤ A few respondents concerned that this is also covered in Social Studies.</li> <li>➤ A few respondents felt this belonged in Grade 9.</li> </ul>

GRADE 8	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
4. Distinguish between a population and a sample of that population to determine whether or not the sample is representative of the population, and identify factors that might affect representativeness. [CN, R]	1.4 (0.8)	1.1 (0.4)	➤ Wordy learning outcome - "representativeness" is an unfamiliar word.
5. Select and defend the choice of an appropriate sample or population to be used to answer a question. [C, CN, PS, R]	1.0 (0.3)	1.0 (0.3)	➤ No consistent comments/suggestions.
6. Assess and report the strengths, weaknesses and biases of samples and data collection methods. [C, R, T]	1.4 (1.0)	1.6 (1.3)	➤ Many respondents suggest moving this to Grade 9. ➤ Learning outcome is wordy and unclear.
<b>STATISTICS &amp; PROBABILITY (CHANCE &amp; UNCERTAINTY)</b>			
7. Determine and compare the theoretical and experimental probability of two independent events. [C, E, PS, R]	1.1 (0.5)	1.2 (0.7)	➤ Most respondents suggested either removing this learning outcome completely or move it to Grade 7 or 9.

### *Summary of Grade 8 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 8 curriculum:

- Overall the volume of content in the grade appears to be too much;
- Suggest moving Shape and Space (3-D Objects & 2-D Shapes and Transformations) to Grade 9 and Statistics & Probability (Chance & Uncertainty) to Grade 7 or 9;
- Concern that rate, ratio, proportion are covered very lightly - little to no connection to percentage. Learning outcomes for these concepts not well developed;
- Curriculum requires greater emphasis on order of operations and fraction operations; and,
- Serious concern that this curriculum will not adequately prepare students for Grade 9.

Table 28: Focus Group Responses for Grade 9 by Learning Outcome

GRADE 9	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<i>NUMBER</i>				
1. Solve problems with square root solutions and justify the inclusion of either the positive or negative solutions, or both. [C, CN, PS, R, V] <ul style="list-style-type: none"> <li>➤ Provide the positive (principal) and negative square root for a given numeral and explain why both are possible.</li> <li>➤ Justify which square root (principal and/or negative) is appropriate as the solution to a given problem.</li> <li>➤ Solve problems involving perfect squares less than 100 without technology.</li> </ul>	1.3 (0.7)	1.2 (0.4)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Third AI should reference perfect squares less than... at least 225; possibly to 400.</li> <li>➤ Technology should be included in first two AIs.</li> </ul>

GRADE 9	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>2. Explain and apply the exponent laws with integral exponents and bases, including:</p> <ul style="list-style-type: none"> <li>• <math>(a^m)(a^n) = a^{m+n}</math></li> <li>• <math>a^m \div a^n = a^{m-n}</math></li> <li>• <math>(a^m)^n = a^{mn}</math></li> <li>• <math>(ab)^m = a^m b^m</math></li> <li>• <math>\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0</math></li> <li>• <math>a^0 = 1, a \neq 0</math></li> <li>• <math>a^{-n} = \frac{1}{a^n}, a \neq 0</math> [C, CN, PS, R]</li> </ul> <p>➤ Verify that the exponent laws are true for negative integers.</p> <p>➤ Simplify expressions with integer exponents by applying the exponent laws.</p> <p>➤ Substitute integer values for the base and exponent and solve to verify a law.</p> <p>➤ Evaluate exponential expressions with numeric bases with and without a calculator.</p> <p>➤ Show that any base (except 0) with an exponent of 0 is equal to 1, using a pattern or the quotient law for exponents.</p> <p>➤ Write alternate forms for a given power using the exponent laws.</p>	1.3 (0.6)	1.2 (0.3)	1.4 (0.5)	<p>➤ Clarify whether variable bases are included or state that integer bases only are expected.</p> <p>➤ AIs with clear examples are required to elaborate on learning outcome - present AIs have resulted in a wide range of questions from respondents.</p>

GRADE 9	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>3. Evaluate exponential expressions with numeric bases with and without a calculator. [E, T]</p> <ul style="list-style-type: none"> <li>➤ Evaluate simple exponential expressions without using a calculator.</li> <li>➤ Explain how to solve an exponential expression using a calculator.</li> <li>➤ Use estimation strategies to determine the reasonableness of a solution calculated with a calculator.</li> </ul>	1.4 (0.5)	1.3 (0.2)	1.3 (0.3)	<ul style="list-style-type: none"> <li>➤ Inconsistent language in AIs - "evaluate" in place of "solve".</li> <li>➤ Clarify if this limited to integer bases or rational bases with integer exponents.</li> <li>➤ Examples of types of "simple exponential expressions) are needed.</li> </ul>
<p>4. Explain a strategy when adding and subtracting negative fractions and negative decimals. [C, CN, PS, R, T]</p> <ul style="list-style-type: none"> <li>➤ Compare strategies for adding and subtracting negative fractions and negative decimal numbers.</li> <li>➤ Compare and contrast the adding and subtracting of negative fractions, negative decimal numbers, and integers.</li> </ul>	1.7 (0.6)	1.4 (0.6)	2.1 (1.2)	<ul style="list-style-type: none"> <li>➤ Clarification of the types of strategies is suggested.</li> <li>➤ Some respondents concerned that students do not have to actually perform the operations.</li> <li>➤ Some respondents would like this to occur earlier.</li> <li>➤ Some respondents suggested using the term rational number rather than just fractions or decimal numbers.</li> </ul>
<p>5. Explain a strategy when multiplying and dividing negative fractions and negative decimals. [C, CN, PS, R, T]</p> <ul style="list-style-type: none"> <li>➤ Compare strategies for multiplying and dividing negative fractions, negative decimal numbers, and integers.</li> <li>➤ Compare and contrast the multiplying and dividing of negative fractions, negative decimal numbers, and integers.</li> </ul>	1.5 (0.9)	1.5 (0.9)	1.8 (1.1)	<ul style="list-style-type: none"> <li>➤ Clarification of the types of strategies is suggested.</li> <li>➤ Some respondents concerned that students do not have to actually perform the operations.</li> <li>➤ Some respondents would like this to occur earlier.</li> <li>➤ Some respondents suggested using the term rational number rather than just fractions or decimal numbers.</li> </ul>

GRADE 9	Statements			Summary of Comments or Suggestions for Change
Learning Outcome Achievement Indicator(s)	CL	DA	AI	
	Weighted Mean Score (Standard Deviation)			
<p>6. Illustrate and explain the order of operation, with and without technology. [PS, T]</p> <ul style="list-style-type: none"> <li>➤ Demonstrate why there is a need to have a universally accepted order of operations.</li> <li>➤ Apply the order of operations to solve problems, with and without technology.</li> <li>➤ Use estimation strategies to determine the reasonableness of a solution.</li> </ul>	1.2 (0.3)	1.7 (1.0)	1.4 (0.6)	<ul style="list-style-type: none"> <li>➤ Most respondents indicated this should be done at an earlier grade (majority indicated Grade 7).</li> <li>➤ Many respondents indicated this should reference rational numbers.</li> <li>➤ Clear AIs with examples involving calculators should be included.</li> </ul>

GRADE 9	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b><i>PATTERNS &amp; RELATIONS (PATTERNS)</i></b>			
1. Generalize a pattern arising from a problem-solving context, using mathematical expressions and equations, and verify by substitution. [C, CN, PS, R]	1.7 (1.3)	1.6 (0.7)	<ul style="list-style-type: none"> <li>➤ "Describe" or "Determine" are suggested in place of "Generalize".</li> <li>➤ Several respondents indicated the learning outcome is unclear - e.g., to what level should it go? Include graphing?</li> </ul>
2. Substitute numbers for variables in expressions, construct a graph and analyze the relation. [C, PS, R, V]	2.0 (1.2)	1.7 (0.9)	<ul style="list-style-type: none"> <li>➤ Clarify the type of analysis expected.</li> <li>➤ Respondents generally felt this learning outcome was unclear.</li> </ul>
<b><i>PATTERNS &amp; RELATIONS (VARIABLES &amp; EQUATIONS)</i></b>			
3. Explain and illustrate strategies to solve open number sentences involving single variable inequalities within a context. [C, CN, PS, R]	2.2 (1.0)	2.2 (1.3)	<ul style="list-style-type: none"> <li>➤ Clarify what is meant by "open number sentence".</li> <li>➤ Many respondents expressed concern that solving equations was not included.</li> <li>➤ Respondents generally felt this learning outcome was unclear.</li> </ul>

GRADE 9	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
4. Translate a problem into a single variable inequality and determine a solution. [CN, PS, R]	1.2 (0.4)	1.8 (1.1)	<ul style="list-style-type: none"> <li>➤ Many respondents expressed concern that solving equations was not included.</li> <li>➤ A few respondents questioned why this learning outcome was not in Grade 10.</li> </ul>
5. Demonstrate that a variable may represent more than one number in an inequality. [C, CN, R, PS]	1.2 (0.7)	1.7 (1.1)	<ul style="list-style-type: none"> <li>➤ Respondents generally felt this learning outcome was unclear.</li> </ul>
6. Model, record and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially and symbolically. [C, CN, PS, R, V]	1.3 (0.7)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Clarify what is meant by concrete representation - e.g. quartic function.</li> <li>➤ Some respondents questioned the inclusion of the process "modeling" - possibly too advanced for Grade 9.</li> </ul>
7. Model, record and explain the operations of multiplication and division by monomials, concretely, pictorially and symbolically. [C, CN, R, V]	1.6 (0.8)	1.3 (0.5)	<ul style="list-style-type: none"> <li>➤ Respondents generally felt this learning outcome was unclear: <ul style="list-style-type: none"> <li>○ Need restrictions clarified;</li> <li>○ Consider including binomials; and,</li> <li>○ Dividing monomials or polynomials?</li> </ul> </li> </ul>
<b>SHAPE &amp; SPACE (MEASUREMENT)</b>			
1. Determine the measure of an unknown side or an unknown angle in a right triangle using primary trigonometric ratios. [PS, R, T, V]	1.1 (0.2)	1.1 (0.2)	<ul style="list-style-type: none"> <li>➤ Many respondents suggest explicitly stating the functions as "sine", "cosine", "tangent" rather than "primary trigonometric ratios".</li> <li>➤ Some respondents suggested including similar and congruent triangles in Grade 9 to go with this.</li> </ul>
2. Apply sine, cosine and tangent to solve problems involving right triangles. [PS, R, T, V]	1.1 (0.2)	1.1 (0.2)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
3. Develop, verify and apply the formula for determining the volume of cylinders. [C, CN, V, R]	1.1 (0.2)	1.5 (0.7)	<ul style="list-style-type: none"> <li>➤ Some respondents suggested merging learning outcomes #3 &amp; 4.</li> </ul>
4. Connect the formula for the area of a circle to determining the volume of a cylinder. [CN, E, PS]	1.2 (0.3)	1.2 (0.3)	<ul style="list-style-type: none"> <li>➤ Some respondents suggested merging learning outcomes #3 &amp; 4.</li> </ul>

GRADE 9	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
5. Develop and apply strategies for determining the volume of composite 3-D objects (limit to rectangular prisms and cylinders). [PS, V]	1.3 (0.5)	1.3 (0.5)	➤ Some respondents suggested including triangular prisms (and possibly composite 3-D objects).
<b>SHAPE &amp; SPACE (3-D OBJECT &amp; 2-D SHAPES)</b>			
6. Sketch and draw a 3-D object, given its plan and elevation views. [C, CN, PS, T, V]	1.3 (0.4)	1.3 (0.4)	➤ Several respondents question the inclusion of learning outcomes 6 to 9 - suggest deleting them completely.
7. Draw the plan and elevations of a 3-D object from sketches and models. [C, CN, R, T, V]	1.3 (0.4)	1.3 (0.4)	
8. Build a 3-D object, given its plan and elevation views. [CN, PS, T, V]	1.2 (0.5)	1.2 (0.5)	
9. Sketch, draw a scale diagram, and build a 3-D object. [CN, V]	1.1 (0.0)	1.1 (0.0)	
10. Draw and interpret scale diagrams. [CN, PS, T]	1.2 (0.1)	1.3 (0.4)	➤ No consistent comments/suggestions.
11. Construct, analyze and describe enlargements and reductions. [C, CN, R, V]	1.3 (0.4)	1.2 (0.3)	➤ Respondents were generally uncertain as to what was expected (and why this learning outcome was included).
<b>SHAPE &amp; SPACE (TRANSFORMATIONS)</b>			
12. Draw the image of a 2-D shape as a result of a dilatation. [PS, T, V]	1.2 (0.3)	1.2 (0.3)	➤ No consistent comments/suggestions.
13. Create, analyze and describe designs using translations, rotations and reflections on a Cartesian plane. [C, T, V]	1.7 (1.1)	1.2 (0.3)	➤ Clarify what is expected here. ➤ Similar to Grade 7 with different vocabulary.
14. Demonstrate that a triangle and its dilatation image are similar. [R]	2.0 (1.2)	1.3 (0.4)	➤ Respondents generally felt this learning outcome was unclear.
15. Represent, analyze and describe dilatations in an everyday context. [C, CN, T, V]	1.2 (0.4)	1.0 (0)	➤ No consistent comments/suggestions.

GRADE 9	Statements		Summary of Comments or Suggestions for Change
Learning Outcome	CL	DA	
	Weighted Mean Score (Standard Deviation)		
<b>STATISTICS &amp; PROBABILITY (DATA ANALYSIS)</b>			
1. Develop and implement a plan for the collection, display and analysis of data by: <ul style="list-style-type: none"> <li>• formulating a question for investigation</li> <li>• choosing an appropriate data collection method that includes social considerations;</li> <li>• selecting a population or an appropriate sample and justify it;</li> <li>• collecting the data;</li> <li>• displaying the collected data in an appropriate manner;</li> <li>• draw conclusions to answer the question;</li> <li>• extrapolating. [C, E, PS, R, T]</li> </ul>	1.2 (0.3)	1.6 (1.0)	<ul style="list-style-type: none"> <li>➤ Some respondents questioned where interpolation would be addressed in the curriculum.</li> <li>➤ Some respondents wanted to make it clear this learning outcome takes time.</li> </ul>
<b>STATISTICS &amp; PROBABILITY (CHANCE &amp; UNCERTAINTY)</b>			
2. Provide and explain examples that show the role of probability and statistics in society. [C, CN, R]	1.2 (0.3)	1.1 (0.2)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
3. Design and conduct simulations, and use the results to draw conclusions. [C, CN, PS, T]	2.0 (1.3)	1.2 (0.3)	<ul style="list-style-type: none"> <li>➤ Clarify the type(s) of simulations expected.</li> </ul>
4. Make predictions about populations based on experimental probabilities. [C, CN, E, PS, R]	1.3 (0.6)	1.5 (0.8)	<ul style="list-style-type: none"> <li>➤ No consistent comments/suggestions.</li> </ul>
5. Explain how decisions based on probability may involve the consideration of theoretical calculations, experimental results and subjective judgements. [C, R]	1.7 (1.3)	1.7 (1.1)	<ul style="list-style-type: none"> <li>➤ Many respondents questioned having this outcome at this level.</li> </ul>

### *Summary of Grade 9 General Comments*

The following is a summary of the most common general comments made by respondents about the grade 9 curriculum:

- Overall the volume of content in the grade appears to be light - concern that this curriculum does not contain enough algebra to prepare students for Grade 10 (i.e., Pure pathway);
- Concern that polynomials are absent from this curriculum;
- Mixed responses to the removal of factoring, but overall, respondents were concerned about this change;
- Concern that classification of numbers was absent;
- Concern that not enough emphasis has been placed on equation solving;
- Inclusion of a Finance section was suggested (this same suggestion came from a different group responding to the Grade 8 draft); and,
- Problem solving is not addressed properly - needs more explicit inclusion in learning outcomes.

## Analysis of Responses

The following section includes an analysis of comments, suggestions and ratings made by respondents to the Stakeholder Survey and the Focus Group Questions. This analysis has been broken down into three main categories: Common Curricular Themes; Common Implementation Themes; and General Observations.

### Common Curriculum Themes

The following is a synthesis of respondent comments or suggestions that were recurring in both the web-based stakeholder survey responses and the focus group responses. In some cases the theme is one that the researchers have inferred from responses, rather than being explicitly stated by one or more respondents.

- The final K - 9 CCF document requires a straightforward introduction that clearly states, among other things that:
  - The philosophy of the curriculum (i.e., that it is based on a constructivist, student-oriented approach to the teaching and learning of mathematics);
  - The curriculum (particularly in the early grades) is designed to foster the development of students' numeracy knowledge, skills and attitudes;
  - The number of curriculum topics and learning outcomes has been reduced (less breadth) to support the development of greater understanding of those concepts (more depth). This is supported, in part, by providing teachers with more time to teach each topic.
- At times the curriculum does not flow well from grade to grade. Topic treatment is occasionally disjoint with significant jumps in understanding expected from one grade to the next.
- At times the curriculum focuses too heavily on content and not enough on process.
- Wording of learning outcomes is inconsistent. Many outcomes are quite specific while others are too general to be of use to a classroom teacher (particularly generalist teachers not experienced in teaching mathematics.)
- The use of jargon causes considerable confusion for many respondents. Plain language is preferred and respondents at all grade levels repeatedly asked for a clear illustrated glossary. This is especially important for teachers who are new to their teaching

assignment. Although the researchers are aware that many of the terms that respondents indicated were problematic are presently in the K - 9 CCF, it is still apparent that a glossary accompanying the draft curriculum would be beneficial.

- The Achievement Indicators were well received by the overwhelming majority of respondents. Requests for Achievement Indicators for all learning outcomes were made at all grade levels.
- Respondents at all grade levels requested Illustrative Examples that would accompany the Achievement Indicators. Respondents clearly felt that Illustrative Examples would help to clarify the learning outcomes and the depth of learning that was expected of students.

### **Common Implementation Themes**

The following is a synthesis of comments or suggestions related to curriculum implementation. These themes were recurring at all grade levels in both the web-based stakeholder survey responses and the focus group responses. In some cases the theme is one that the researchers have inferred from responses, rather than being explicitly stated by one or more respondents.

- Teacher in-service was the most common comment made by respondents. This is needed to help teachers understand the addition or deletion of mathematical content at each grade level. It is particularly important that teacher in-service address the philosophical shift in the curriculum. NB: Teachers need to understand that the removal of topics or learning outcomes does not mean a reduction in the amount of time they are expected to teach mathematics (specifically at the elementary grades). To help ensure this understanding teachers need in-service on how to teach for greater depth of understanding.
- Many respondents noted that learning resources that support teaching the revised curriculum must be in place before implementation commences. These resources must be consistent with the change in philosophy as noted in the preceding paragraph.
- Many respondents questioned whether the revised curriculum would prepare students for their respective provincial mathematics assessments. It is disconcerting that these respondents appear to have the mistaken belief that the curriculum should be designed to prepare students for these assessments rather than understanding that these large-scale assessments are designed to assess students' understanding of the curriculum.

- Respondents commonly requested that the final curriculum document include a scope & sequence that would support teachers in planning for instruction. This would consist of more than the Strand layout that is used in the present CCF. It would provide a sequence for integrating the learning outcomes from the various strands into a suggested integrated implementation model.
- Respondents (particularly at the Grade 8 & 9 levels) requested that specific learning outcomes be included for "review". As this is an instructional design decision, it may be inappropriate to include these learning outcomes directly in the curriculum, but it is possible that this "review" could either be imbedded in a scope & sequence or stressed in the Introduction. If included in the Introduction it should be made clear to teachers that the required time for review and remediation (if needed) has been factored into the overall curriculum design.

### **General Observations**

The following is a synthesis of our observations related to the approximate 2500 responses reviewed over the course of this project.

- The web-based survey responses were very consistent with the focus group responses. The similarity in ratings/comments suggests that the results of this analysis can be reliably used to help guide the next phase of curriculum revision.
- When reviewing the analysis of respondents' comments/suggestions it is prudent to keep in mind that those responses reflect the views of respondents who typically indicated that they were less satisfied with the curriculum than the majority of respondents who did not provide a comment. Although respondents submitted positive comments, it is the negative comments that are the focus of this analysis. By addressing the "negative" comments in the next phase of curriculum revision, the result should be a shift of mean scores from "good" to "very good".
- A significant number of respondents indicated they felt the wording of some learning outcomes in the original version of the CCF was clearer. Although this may simply be the result of teachers' familiarity with the previous curriculum wording, it may be prudent to revisit the 1996 version of the CCF with a view to incorporating more of the previous language into the present revision.
- When synthesizing respondents' comments only those that were common to two or more groups were included in this report. The database of scores and comments (in the form of an Excel spreadsheet) should be used by the curriculum authors during the final revision

process, as there may be pertinent suggestions for change that, although only stated by a single respondent, are still useful.

- The researchers infer that comments about the inability of non-specialist teachers to understand the curriculum were made by specialist teachers. It would be useful to verify these comments by asking "non-specialist" teachers to confirm or refute the comments. The results may not support the assumptions made by specialist teachers.
- It is interesting to note that many "specialist" teachers were asked to review and comment on the curriculum for a grade level that they had never taught. This has positive and negative implications for the validity of the responses. It may be useful in the future to identify whether respondents had actually taught at the grade level they are commenting on. It would also be useful to determine the teaching experience and academic qualifications of specialist teachers commenting on grade levels they had not taught.
- Both Focus and Stakeholder groups' responses submitted in French include a significant number of comments related to the translation of the draft curriculum and not on the curriculum itself. Assuming that the final curriculum will include substantial wording changes, it appears it will have to be re-translated making the comments on the original translation into French obsolete.

## Recommendations for Completing the CCF for K – 9 Mathematics

The following recommendations are made based upon the mean scores and respondent comments derived for the web-based stakeholder survey and focus group responses:

1. Respondents' questions and comments underscored that many were unaware of the intended shift in curriculum design and corresponding instructional approach (i.e., less breadth in terms of number of concepts/topics at each grade level with a corresponding increase in expected depth of understanding). Those that indicated awareness of this change were generally happier with the draft curriculum than those who were not.

**Recommendation 1:** Ensure that the final curriculum document includes clear statements concerning the change in curriculum design and its intended corresponding impact on teaching and assessment in the mathematics classroom.

2. Respondents at all grade levels indicated concern that problem solving was not apparent in many of the outcomes. This concern was also evident in many respondents comments that the curriculum was, in places, too content oriented and was not addressing mathematical processes sufficiently (e.g., problem solving)

**Recommendation 2:** When revising the present draft curriculum look for opportunities to explicitly highlight problem solving and other mathematical processes in the learning outcomes. This is in addition to the present process coding that is presently included with each learning outcome.

3. Respondents at the K-3 level are generally happy with the reduction in content and focus on Number. However, many primary teachers would like to see Statistics and Probability topics (primarily surveys and graphing) in the curriculum.

**Recommendation 3:** Keep the focus on Number in the K – 3 curriculum, but include suggestions of how Statistics and Probability topics could be included to support the development of the other topics. Clarify that teachers may include these topics, but should not include them in their assessments of student mastery of the curriculum.

4. Respondents to the grade 8 and 9 documents had the highest levels of dissatisfaction with the proposed changes to the curriculum. Although many respondents viewed the changes favourably, many others expressed strong concerns about both the amount of content and topics included in those grades. They felt that the grade 8 curriculum was too heavy and the grade 9 curriculum was too light. The absence of the grade 10 – 12 curricula made it difficult to adequately judge the impact of the changes on student preparation for subsequent courses.

**Recommendation 4:** Do not finalize development of the K – 9 curriculum until at least a draft of the Grades 10 – 12 document has been created. The intent is to ensure there is continuity in the development of topics and that students will be adequately prepared for all subsequent courses. Consider addressing the teacher concerns by redistributing some of the content in the courses (e.g. in the Number and Patterns strands, focus on operations with fractions, decimal numbers, percents, integers in grades 7 and 8 and on exponents, equations and polynomials in grade 9.) Alternatively, provide a rationale for the changes in the scope and sequence and show the development of topics across grades to address teacher concerns.

5. Respondents at all levels were concerned about the clarity of wording of the Learning Outcomes and the definition of terms used.

**Recommendation 5:** Include a glossary of terms used throughout the curricula along with one or more illustrated examples to support the definition.

6. Respondents at all levels liked the Achievement Indicators and felt they were essential to help clarify the Learning Outcomes.

**Recommendation 6:** Include Achievement Indicators for all strands in all grades.

7. A database of responses to both the web-based survey and focus group sessions includes verbatim versions of the respondents' comments. This includes a number of individual comments made by individuals or single groups that were not included in the summary of comments, but still include pertinent observations and suggestions.

**Recommendation 7:** When working on the final revision of the K - 9 CCF authors should have ongoing access to this report as well as the database of survey responses - to further inform the revision process.

## Other Recommendations

Based on the Focus and Stakeholder groups' responses, the following additional recommendations are put forward for consideration:

8. The majority of comments submitted by Focus and Stakeholder groups that reviewed the French translation of the draft curriculum were related to the translation itself (rather than the curriculum). These comments may not be applicable if the curriculum is subsequently revised in any significant manner.

**Recommendation 8:** Ensure that future reviews of French translated curricula focus on the content of the learning outcomes, achievement indicators, and other curriculum document components and that a review of the translation take place using the final English version of the curriculum.

9. Respondents at most levels wanted guidance to know the depth of coverage and expected mastery level for the included Learning Outcomes.

**Recommendation 9:** Include Illustrative Examples for the Learning Outcomes and/or student exemplars, examples of assessment items, rubrics, and student work at various mastery levels. Documents should also clarify that the reduced content is to allow for greater depth of development and mastery level.

10. Respondents to the grades 4 – 9 documents wanted information outlining the development of concepts across grades to guide them in their teaching of the topics.

**Recommendation 10:** Provide a scope and sequence chart for each grade level detailing the placement of topics in the curriculum.

11. Overall, most respondents are happy with the direction of the revised curriculum, but many have concerns that teachers will not take the opportunity to develop the depth in the topics. The benefit of fewer topics can only be achieved if teachers provide their students with the opportunities to truly gain depth and mastery of those topics.

**Recommendation 11:** Jurisdictions provide appropriate in-service to help teachers develop a greater understanding of the topics and learn strategies so that they can adequately provide the desired depth in development of the topics.

12. Respondents teaching K – 3 indicated that they required access to the manipulatives required to support the teaching of the revised curriculum as intended.

***Recommendation 12:*** Once learning resources have been reviewed and recommended, jurisdictions should take steps to ensure that K – 3 classroom teachers have access to the appropriate manipulatives for teaching mathematics.

**Appendices**

**Appendix A: Stakeholder Survey Questions**

The following is a MS Word version of the questions that formed the basis of the web-based Stakeholder Survey:

**WNCP Educational Stakeholders Survey**

**Part A - Demographics**

*Part A **must** be completely filled out before you submit your response.  
Please submit a separate set of responses for each grade you wish to respond to.*

1. Respondent category:

- |   |                                  |  |
|---|----------------------------------|--|
| <input type="radio"/> Teacher                               | <input type="radio"/> Consultant | <input type="radio"/> Administrator        |
| <input type="radio"/> Parent                                | <input type="radio"/> Student    | <input type="radio"/> Industry or Business |
| <input type="radio"/> Post-secondary (please specify) _____ |                                  |  |
| <input type="radio"/> Other (please specify) _____          |                                  |  |

2. Jurisdiction you represent:

- |                       |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| AB                    | BC                    | MB                    | NU                    | NT                    | SK                    | YK                    |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

3. Group Size:

- |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Individual            | 2 - 5                 | 6 - 10                | 11 - 15               | 16 - 20               | > 20                  |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

4. Identify the grade for which you are responding (Select one only):

- |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| K                     | 1                     | 2                     | 3                     | 4                     | 5                     | 6                     | 7                     | 8                     | 9                     |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**Part B - Learning Outcomes**

5. The ***development of concepts across grades*** in each curriculum strand is:

	Excellent	Satisfactory	Limited	Unsatisfactory
Number	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patterns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shape and Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statistics and Probability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. Are the Learning Outcomes for the grade you reviewed ***developmentally appropriate within*** each curriculum strand?

	Very Appropriate	Appropriate	Somewhat Appropriate	Not Appropriate
Number	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patterns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shape and Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statistics and Probability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Please identify any Learning Outcomes that you consider are ***not*** developmentally appropriate and provide suggestions for improvement.

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8. Are the Learning Outcomes for the grade you reviewed ***clearly worded?***

	Very Clear	Clear	Somewhat Clear	Not Clear
Number	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patterns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shape and Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statistics and Probability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Please identify any outcomes that you consider are ***not*** clearly worded and provide suggestions for improvement.

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10. Is the ***amount*** of content appropriate for the grade being considered?

	Very Appropriate	Appropriate	Somewhat Appropriate	Not Appropriate
Number	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patterns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shape and Space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statistics and Probability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Whole Course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. If the amount of course content is not appropriate please indicate what should be added or deleted.

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12. Indicate any additional comments regarding the Learning Outcomes. Please be specific.

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**Part C - Achievement Indicators**

13. Do the Achievement Indicators for the grade you reviewed help clarify the Learning Outcomes within the ***Number*** curriculum strand?

YES       NO

Comments: \_\_\_\_\_

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14. Are the Achievement Indicators for the ***Number*** curriculum strand appropriate for students in the grade you reviewed?

- YES       NO

If no, please provide specific examples and suggestions for change: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

15. How helpful will the Achievement Indicators for the ***Number*** curriculum strand be in preparing to ***teach*** a topic or lesson at the grade you reviewed??

- |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|
| Very Helpful          | Helpful               | Somewhat Helpful      | Not Helpful           |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

16. How helpful will the Achievement Indicators for the ***Number*** curriculum strand be in preparing to ***assess*** student learning at the grade you reviewed?

- |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|
| Very Helpful          | Helpful               | Somewhat Helpful      | Not Helpful           |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

17. Indicate any additional comments regarding the Achievement Indicators. Please be specific.

\_\_\_\_\_  
\_\_\_\_\_

**Part D - Additional Comments**

18. What are your overall impressions of the curriculum for the grade for which you are responding? Please be specific.

\_\_\_\_\_  
\_\_\_\_\_

19. What are your suggestions, if any, for changes to the curriculum for the grade for which you are responding? Please be specific.

\_\_\_\_\_  
\_\_\_\_\_

20. Other comments.

\_\_\_\_\_  
\_\_\_\_\_

### Appendix B: Detailed Breakdown of Number of Focus Group Respondents by Grade, Jurisdiction and Occupation

<b>K</b>		<i>Number of Respondents by Occupation and Jurisdiction</i>					<i>Total</i>
<i>Province or Territory</i>	<i>Number of Groups</i>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	8	35	1	1	0	6	<b>43</b>
<i>BC</i>	7	96	2	4	2	0	<b>104</b>
<i>MB</i>	6	42	4	0	0	1	<b>47</b>
<i>SK</i>	3	5	0	0	0	0	<b>5</b>
<b>Total</b>	<b>24</b>	<b>178</b>	<b>3</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>199</b>
<b>Grade 1</b>		<i>Number of Respondents by Occupation and Jurisdiction</i>					<i>Total</i>
<i>Province or Territory</i>	<i>Number of Groups</i>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	8	35	1	1	0	6	<b>43</b>
<i>BC</i>	7	96	2	4	2	0	<b>104</b>
<i>MB</i>	6	42	4	0		1	<b>47</b>
<i>SK</i>	3	5	0	0	2	0	<b>5</b>
<b>Total</b>	<b>23</b>	<b>178</b>	<b>7</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>199</b>
<b>Grade 2</b>		<i>Number of Respondents by Occupation and Jurisdiction</i>					<i>Total</i>
<i>Province or Territory</i>	<i>Number of Groups</i>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	8	35	1	1	0	6	<b>43</b>
<i>BC</i>	7	98	2	4	2	0	<b>106</b>
<i>MB</i>	6	41	4	0	0	1	<b>46</b>
<i>SK</i>	2	2	0	0	2	0	<b>2</b>
<b>Total</b>	<b>23</b>	<b>176</b>	<b>7</b>	<b>5</b>	<b>4</b>	<b>7</b>	<b>197</b>
<b>Grade 3</b>		<i>Number of Respondents by Occupation and Jurisdiction</i>					<i>Total</i>
<i>Province or Territory</i>	<i>Number of Groups</i>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	8	35	1	1	0	6	<b>43</b>
<i>BC</i>	7	95	2	4	2	0	<b>103</b>
<i>MB</i>	16	85	4	2	0	1	<b>93</b>
<i>SK</i>	4	5	0	0		0	<b>5</b>
<b>Total</b>	<b>35</b>	<b>220</b>	<b>7</b>	<b>7</b>	<b>2</b>	<b>7</b>	<b>244</b>
<b>Grade 4</b>		<i>Number of Respondents by Occupation and Jurisdiction</i>					<i>Total</i>
<i>Province or Territory</i>	<i>Number of Groups</i>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	7	29		2	0	6	<b>37</b>
<i>BC</i>	7	96	2	4	2	0	<b>104</b>
<i>MB</i>	11	59	4	0	0	1	<b>64</b>
<i>SK</i>	3	2	1	0	0	0	<b>3</b>
<i>YK</i>	1	3	0	0	0	0	<b>3</b>
<b>Total</b>	<b>29</b>	<b>189</b>	<b>7</b>	<b>6</b>	<b>2</b>	<b>7</b>	<b>211</b>

<b>Grade 5</b>		<b>Number of Respondents by Occupation and Jurisdiction</b>					<b>Total</b>
<b>Province or Territory</b>	<b>Number of Groups</b>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	4	19	0	3	0	6	<b>28</b>
<i>BC</i>	6	94	2	4	2	0	<b>102</b>
<i>MB</i>	4	35	4	0	0	1	<b>40</b>
<i>SK</i>	2	2	0	0	0	0	<b>2</b>
<i>YK</i>	2	4	2	1	0	0	<b>7</b>
<b>Total</b>	<b>18</b>	<b>154</b>	<b>8</b>	<b>58</b>	<b>2</b>	<b>7</b>	<b>179</b>
<b>Grade 6</b>		<b>Number of Respondents by Occupation and Jurisdiction</b>					<b>Total</b>
<b>Province or Territory</b>	<b>Number of Groups</b>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	4	19	0	3	0	6	<b>28</b>
<i>BC</i>	7	96	2	4	2	0	<b>104</b>
<i>MB</i>	4	36	4	0	0	1	<b>41</b>
<i>SK</i>	2	2	0	0	0	0	<b>2</b>
<i>YK</i>	2	8	0	0	0	0	<b>8</b>
<b>Total</b>	<b>19</b>	<b>161</b>	<b>6</b>	<b>7</b>	<b>2</b>	<b>7</b>	<b>183</b>
<b>Grade 7</b>		<b>Number of Respondents by Occupation and Jurisdiction</b>					<b>Total</b>
<b>Province or Territory</b>	<b>Number of Groups</b>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	9	39	2	1	0	12	<b>54</b>
<i>BC</i>	7	95	2	4	2	0	<b>103</b>
<i>MB</i>	5	37	5	0	0	1	<b>43</b>
<i>SK</i>	3	3	0	0	0	0	<b>3</b>
<i>YK</i>	2	5	1	0	0	0	<b>6</b>
<b>Total</b>	<b>26</b>	<b>179</b>	<b>10</b>	<b>5</b>	<b>2</b>	<b>13</b>	<b>209</b>
<b>Grade 8</b>		<b>Number of Respondents by Occupation and Jurisdiction</b>					<b>Total</b>
<b>Province or Territory</b>	<b>Number of Groups</b>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	9	39	2	1	0	12	<b>54</b>
<i>BC</i>	7	97	2	4	2	0	<b>105</b>
<i>MB</i>	4	32	4	0	0	1	<b>37</b>
<i>SK</i>	3	3	0	0	0	0	<b>3</b>
<i>YK</i>	1	3	0	1	0	0	<b>4</b>
<b>Total</b>	<b>24</b>	<b>174</b>	<b>8</b>	<b>6</b>	<b>2</b>	<b>13</b>	<b>203</b>
<b>Grade 9</b>		<b>Number of Respondents by Occupation and Jurisdiction</b>					<b>Total</b>
<b>Province or Territory</b>	<b>Number of Groups</b>	<i>Teachers</i>	<i>Consultants</i>	<i>Admin</i>	<i>PSI</i>	<i>Other</i>	
<i>AB</i>	9	39	2	1	0	12	<b>54</b>
<i>BC</i>	7	98	2	4	2	0	<b>106</b>
<i>MB</i>	4	34	4	0	1	1	<b>40</b>
<i>SK</i>	1	1	1	0	0	0	<b>2</b>
<i>YK</i>	1	3	0	1	0	0	<b>4</b>
<b>Total</b>	<b>22</b>	<b>175</b>	<b>9</b>	<b>6</b>	<b>3</b>	<b>13</b>	<b>206</b>