

Numeracy Performance Standards Revision

Instructions for Field-Testing

Context

Over the past year, the Ministry has been working with math educators to update the BC Numeracy Performance Standards to ensure that they are aligned with the current curriculum, while continuing to build on the extensive work that many BC districts, schools, teachers, and inquiry groups have already done.

The revised standards will feature:

- One scale for each of grades 1-3; 4-6; 7-9; 10-12, with space to indicate the specific **strands** and **key concepts** that are being assessed in specific cases.
- Tasks/sample sets at each grade (we anticipate having a minimum of two tasks/student sample sets – and at least one of these will feature **number**)

Field-testing Procedures

Some tasks and samples have been developed as prototypes for field-testing. The prototypes start to show what the final product will look like. These tasks and student samples may or may not be selected for the final version of the standards. It is critical that these prototypes be field-tested by students and teachers.

We currently have prototypes available for Grades 1 to 9. Prototypes for Grades 10 to 12 will be forthcoming.

Each prototype includes:

- (1) Quick Scale
 - (2) Designation of the key concepts involved
 - (3) Task description
 - (4) One sample at each of the four levels of performance
 - (5) The teacher's observations for each sample
 - (6) The small 'logo' form of the scale showing which level(s) each aspect was rated as.
- We need teachers and students to try the prototype tasks. For example, using one of the tasks with a class; then using the scale and samples to try to assess the results gives the best possible insight into how they are working. Another example is that a group of teachers get together to work through the prototype at their grade level as a form of Pro-D.
 - Provide specific, concrete feedback. For example, if you don't agree with the placement of a sample, please be as specific as possible about why and where you think it should be rated. Use the attached *Prototype Feedback Questions* to provide focused feedback.

Numeracy Performance Standards, Grade 8 Prototype

- Send your comments and any additional student exemplars from your field testing to the Ministry. We'd like to hear from you by **September 30, 2011**.
- These prototypes are being circulated as widely as possible, so please feel free to share them with others.

What's Next?

- We will be working on similar prototypes for grades 10, 11 and 12 and would welcome any contributions.
- We need to keep adding to the task/sample sets for Grades 1 to 9. We aim to have two sets per grade for the published materials eventually. We would welcome task/sample sets, especially in patterns and relations, shape and space, statistics and uncertainty.
- If you have something suitable, please either post it on the Moodle site at <http://www.learnnowbc.ca/educators/default.aspx>, or contact Jiemei Li at Jiemei.Li@gov.bc.ca or Nancy Walt at Nancy.Walt@gov.bc.ca

Numeracy Performance Standards, Grade 8 Prototype

Numeracy Performance Standards Revision

Prototype Feedback Questions

1. What suggestions do you have about the use of the numeracy performance standards? Are these materials easy for teachers to use?
2. Are the rating scales easy to apply to samples of student work? What improvements are needed?
3. Is the task grade/age-appropriate? Provide your opinion and comments.
4. What suggestions do you have for improving the student samples in the prototype? Do you agree with the rating? If not, what is the rating and rationale for the rating?
5. Would you suggest other samples that better exemplify the performance levels?
6. Are these materials helpful to discuss with students and parents? In what ways?
7. Would you like to contribute new tasks/samples?

Please send your comments and materials by **September 30, 2011** to Jiemei Li

- by email at Jiemei.Li@gov.bc.ca
- by mail at: Student Assessment Branch, PO Box 9143 Stn Prov Govt
Victoria, BC V8W 9H1

or post them on the Moodle at <http://www.learnnowbc.ca/educators/default.aspx>

Thank you!

Numeracy Performance Standards, Grade 7 Prototype

Quick Scale: Numeracy Performance Standards (Grades 7-9)

Task: _____

Grade _____

Strand	Key concepts required by this task (see IRP p. 16)

	Not Yet Within Expectations	Meets Minimal Expectations	Fully Meets Expectations	Exceeds Expectations
Snapshot	<i>Does not meet basic requirements of the task without close, ongoing assistance. No adequate explanation.</i>	<i>Satisfies basic requirements for most parts of the task; some important aspect is flawed or incomplete. Partial explanation.</i>	<i>Satisfies basic requirements for all parts of the task; reaches a reasonable solution. (may be minor flaws.)</i>	<i>Thoroughly satisfies requirements of the task; solution is well-developed and justified; shows insight; often innovative.</i>
Concepts and Connections - recognizes the math; applies appropriate concepts [R] [V] [CN] - explains/demonstrates relevant concepts; makes connections [R]	<ul style="list-style-type: none"> Does not identify or apply concepts and procedures needed Does not show understanding of relevant concepts; explanations are incomplete or illogical 	<ul style="list-style-type: none"> Identifies/applies concepts/procedures needed for most parts of task (may not be best choice) Shows partial understanding of relevant concepts; explanations may be incomplete 	<ul style="list-style-type: none"> Identifies/applies concepts and procedures needed for all parts of task Shows understanding of relevant concepts; explanations are logical and complete 	<ul style="list-style-type: none"> Identifies/ applies a wide range of concepts and procedures including those that have not been recently taught Shows thorough understanding; explanations are insightful
Problem-solving and reasoning -selects and uses appropriate strategies to analyze, solve and create problems [PS] [V] [T] - uses estimation strategies [ME] - verifies and justifies that results are reasonable [R]	<ul style="list-style-type: none"> Does not use appropriate strategies to analyze and solve problems No evidence of estimation strategies (answers are often highly improbable) Does not verify results or solutions 	<ul style="list-style-type: none"> Uses some appropriate strategies to analyze and solve problems Some evidence of estimation; may be somewhat ineffective (some answers reasonable) May verify parts of results/solution; often needs direction 	<ul style="list-style-type: none"> Uses appropriate strategies to analyze and solve problems Uses estimation strategies appropriately; most answers are reasonable Verifies and justifies results or solutions (may be inefficient; imprecise) 	<ul style="list-style-type: none"> Uses highly effective, often innovative, strategies to analyze and solve problems Uses estimation strategies effectively; answers are reasonable (high precision) Verifies and justifies results or solutions efficiently; precise
Procedures - accurate and precise in recording, substitutions, calculations, units, and symbols [C] - fluent; efficient in applying procedures including mental math [ME]	<ul style="list-style-type: none"> Limited accuracy in applying procedures. Inefficient; struggles (e.g., false starts; repeats; little evidence of mental math strategies) 	<ul style="list-style-type: none"> Partially accurate; some errors Inconsistent; fluent with some procedures but inefficient or not demonstrated in others 	<ul style="list-style-type: none"> Generally accurate with some minor errors or omissions Follows most procedures appropriately; uses mental math strategies 	<ul style="list-style-type: none"> Accurate and precise; very few if any minor errors/ omissions Uses range of procedures and mental math strategies fluently and efficiently; may find own 'shortcuts'
Representation and Communication -communicates mathematically including mathematical language [C] -includes appropriate graphics; representations (e.g., charts, tables, graphs, diagrams; sketches) [V]	<ul style="list-style-type: none"> Does not explain procedures and results clearly; key information missing Omits required graphics or representations and/or does not construct them appropriately; many omissions; serious flaws 	<ul style="list-style-type: none"> Partially explains procedures; results; parts are confusing, vague, incomplete Constructs most required graphics; representations; some features are seriously flawed/ incomplete (e.g., not to approximate scale) 	<ul style="list-style-type: none"> Explains results and procedures clearly using some math language Constructs required graphics and/or representations appropriately; may have minor errors or flaws (e.g., missing labels or dimensions) 	<ul style="list-style-type: none"> Explains procedures and results precisely; uses mathematical language Constructs required graphics and/or representations effectively and accurately

Used for major tasks, projects, or ongoing observations.

Develop a better Olympic ranking system (number)

CONTEXT

This activity was part of a district assessment of numeracy conducted part way through the year in grade 8. Teachers had recently emphasized the importance of mathematical communication.

KEY CONCEPTS

- rate, ratio and proportional reasoning

PROCESS

The teacher directed students to read the task, and then spend 5 minutes discussing the problem in groups. The group discussion was intended to ensure that all students understood the question, and began to formulate some strategies. Students were not permitted to write anything down during the discussion.

When they returned to their desks, they were asked to:

- describe their plan for answering the question
- complete and record all processes and calculations needed to answer the question
- represent and explain their final ranking
- describe how their proposed system is fair

Students had approximately 60 minutes to complete the task.

2006 WINTER OLYMPIC RESULTS

Traditionally the final standings to determine the winning country at the Olympics are determined by the total number of medals won by each country. Many of the smaller countries believe that this is not a FAIR system, and believe that a better way should be developed. Please decide on a NEW strategy for ranking the following countries from 1 – 12 (with 1 being the best). Your system needs to be more appealing to countries and/or teams of all sizes.

The following list represents the order of results from the 2006 Winter Olympics, held in Turin, Italy. The information in columns 6 and 7 may help develop a better ranking system. Keep in mind that ties are not allowed so you will have to have tie-breakers built into your system.

1	2	3	4	5	6	7
	GOLD	SILVER	BRONZE	Total Medals	# of athletes at the games	Population of the country
Germany	11	12	6	29	164	82.4 million
United States	9	9	7	25	211	298.4 million
Canada	7	10	7	24	196	32.7 million
Russia	8	6	8	22	178	142.9 million
Norway	2	8	9	19	81	4.6 million
Sweden	7	2	6	15	112	9.0 million
Switzerland	6	4	5	15	143	7.5 million
China	2	4	5	11	78	1,314.0 million
Italy	5	0	6	11	184	58.1 million
Korea	6	3	2	11	40	70.3 million
France	3	3	4	10	89	60.9 million
Australia	1	0	1	2	40	20.3 million

Your presentation to the International Olympic Committee must:

- Represent your rankings.
- Explain why you ranked the countries the way you did and what information you considered.
- Explain how you account for ties.
- Explain how your system is more FAIR for countries of all sizes, than the system currently in place.

Numeracy Performance Standards, Grade 8 Prototype

NOT YET WITHIN EXPECTATIONS

Teacher's Observations

The student demonstrates some basic understanding of the concepts involved, but the work is incomplete, and does not meet basic requirements of the task.

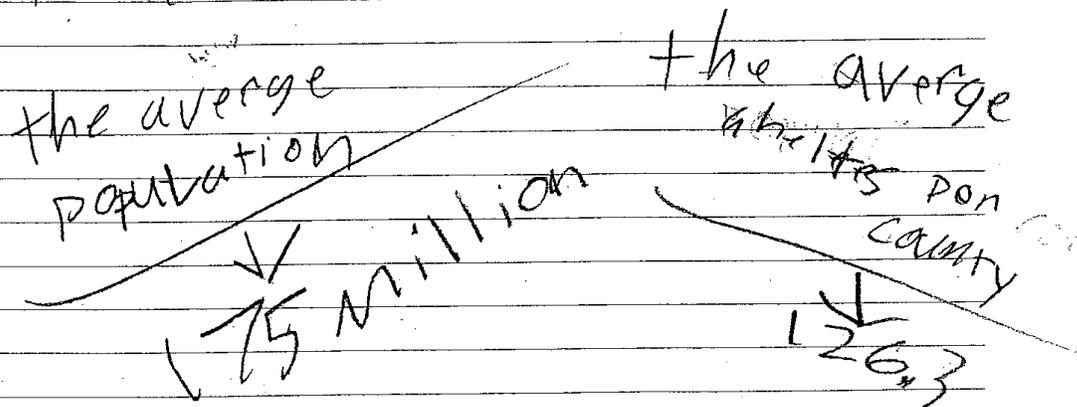
- Recognizes concepts needed for most parts of the task
- Uses some appropriate strategies
- Does not persevere to a solution
- Does not verify or justify
- Major omissions
- Does not explain procedures and results clearly

	NYM	MM	FM	Ex
OVERALL				
Snapshot				
Concepts Connections				
Prob-Solving Reasoning				
Procedures				
Represent'n Commun				

DESCRIBE YOUR PLAN!

my plan is to figure out a better system
 by... Even^{ing} out the chances for each country
 by putting a limit on athletes

by putting limits on athletes it would even out the odds. each country should be assessed ~~on~~ the population of the country and the positioning the Olympics before and how many athletes they put in before.



they should be only allowed up to 126 athletes and if a country does not put in that many athletes then it's their fault because there are even chances, how it would depend on skill level so countries like Canada and Norway would win.

the more athletes you have when you were high up but if you had less and were high up when the change would come the team that had the least but was still high up would win like Canada.

Numeracy Performance Standards, Grade 8 Prototype

	10	S	b	medals	athlets	Population
1st Germany	11	11	7	29	126	82 mil
- Canada	10	12	6	28	126	312 mil
- Russia	9	13	5	27	126	mil
- U.S.A	10	10	1	21	126	298.4 mil
- Norway	9	9	0	18	126	mil
- Switz					126	mil
- China					126	mil
- Sweden					126	mil
- Italy					126	mil
2nd - Canada					126	mil
3rd - France					126	mil
4th - Australia					126	mil

Numeracy Performance Standards, Grade 8 Prototype

MEETS EXPECTATIONS (MINIMAL LEVEL)

Teacher's Observations

The student satisfies basic requirements for most parts of the task, but the explanation is vague and does not clearly explain mathematical concepts involved.

- Shows partial understanding of relevant concepts; explanation is vague and incomplete
- Uses some appropriate strategies
- Does not verify or justify
- Follows chosen procedure appropriately
- Does not explain procedures and results clearly; key information is missing

	NYM	MM	FM	Ex
OVERALL				
Snapshot				
Concepts				
Connections				
Prob-Solving				
Reasoning				
Procedures				
Represent'n				
Commun				

DESCRIBE YOUR PLAN!

my plan is to make a chart similar to what the chart is already like, but make it more simple.
 Heres an example:
 x all golds by 5
 x all silver by 3
 x all bronze by 2
 im going to make each category by 5, 3, and 2 to get my answer.

country	Gold	silver	bronze	totals	
Germany	55	36	12	103	1
U.S	45	27	14	86	2
Canada	35	30	14	79	4
Russia	40	24	16	80	3
Norway	10	24	18	52	7
Sweden	35	6	12	53	5
Switzerland	30	12	10	52	6
China	10	12	10	32	11
Italy	25	0	12	37	9
Korea	30	9	4	43	8
France	15	9	8	32	10
Australia	5	0	2	7	12

Numeracy Performance Standards, Grade 8 Prototype

Represent your final rankings	
1.	Germany
2.	U.S
3.	Russia
4.	Canada
5.	Sweden
6.	Switzerland
7.	Norway
8.	Korea
9.	Italy
10.	France
11.	China
12.	Australia

1. Explain why you ranked the countries the way you did and what information you considered.
2. Explain how you account for ties.
3. Explain how your system is FAIR for countries of all sizes, than the system currently in place.

① I ranked the countries the way I did because I felt it was the easiest and most understanding way to rank the countries.

2. I used which country had more golds than the other to take away my tie breakers.

3. I feel that my system is fair for everybody because I did the most I could and I felt that my answer is fair and square, the other system wasn't fair for many reasons, but I believe you won't get any other system as fair in the world like this one!

To get my answer I times all the gold medals by 5 all the silver medals by 3 and times all the bronze by 3! I hope you feel it is fair just how I do!

times
times

Numeracy Performance Standards, Grade 8 Prototype

FULLY MEETS EXPECTATIONS

Teacher's Observations

The student satisfies basic requirements for all parts of the task, reaching and explaining a reasonable solution.

- Shows understanding of relevant concepts; explanation is logical and complete.
- Uses appropriate strategies
- Accurate and precise
- Explains procedures and results clearly; uses some mathematical language.

	NYM	MM	FM	Ex
OVERALL				
Snapshot				
Concepts				
Connections				
Prob-Solving				
Reasoning				
Procedures				
Represent'n				
Commun				

DESCRIBE YOUR PLAN! My plan is to find out what the scores were when you divide [the number of a country's athletes that competed in the games] by the [total number of medals that country received.] I will then rank the teams, with the group country with the least ^{lowest} score coming first and the ^{highest} coming last because the more medals the more medals per person the better the country did.

to 3 decimals
↓

Country	# of athletes	Total Medals	Medals / Athlete	Ranking
Germany	164	29	0.177	3
US	211	25	0.118	8
Canada	196	24	0.123	7
Russia	178	22	0.124	6
Norway	81	19	0.235	2
Sweden	112	15	0.134	5
Switzerland	143	15	0.105	10
China	78	11	0.141	4
Italy	184	11	0.06	11
Korea	40	11	0.275	1 ← Greatest # of medals/athlete
France	89	10	0.112	9
Australia	40	2	0.05	12 ← Least # of medals/athlete

Represent your final rankings
1. KOREA
2. NORWAY
3. GERMANY
4. CHINA
5. SWEDEN
6. RUSSIA
7. CANADA
8. USA
9. FRANCE
10. SWITZERLAND
11. ITALY
12. AUSTRALIA

Explain why you ranked the countries the way you did and what information you considered.
Explain how you account for ties.
Explain how your system is FAIR for countries of all sizes, than the system currently in place.

I ranked the countries in this order because it is from greatest number of medals per athlete to least number of medals per athlete. I considered the number of medals a country won and the number of athletes at the Games. If there were to be a tie (rather unlikely), I would revert to the greatest total number

of medals between the members of the tie. My system is fair for countries of all sizes. Of course a country with a smaller population will have a smaller number of athletes at the Games. It is also likely that they will have fewer medals, but they could still have the highest number of medals for athlete. For example, if a country only had 10 athletes at the games, but received 15 medals, their average would be 0.5, and a country with 10 medals but 70 athletes would have an average of about 0.143, 0.5 is higher than 0.143, so the smaller country could still win. It still partially depends on the number of medals which is important, but it also relies on other information, making it more fair.

REPRESENTATION AND COMMUNICATION	Not Yet Meeting	Minimally Meeting	Fully Meeting	Exceeding
<ul style="list-style-type: none"> presenting work constructing charts, diagrams, and displays explaining procedures, results 	<ul style="list-style-type: none"> work is often confusing often omits required charts, diagrams, or graphs or makes major errors explanations are incomplete or illogical 	<ul style="list-style-type: none"> most work is clear; may be confusing in places constructs required charts, diagrams, or graphs; some omissions or errors explanations of procedures and results may be incomplete 	<ul style="list-style-type: none"> work is generally clear constructs required charts, diagrams, or graphs appropriately; may include minor errors explains procedures and results logically 	<ul style="list-style-type: none"> work is detailed, clearly labeled, and logically organized constructs required charts, diagrams, or graphs effectively explains procedures and results logically and thoroughly

Numeracy Performance Standards, Grade 8 Prototype

EXCEEDS EXPECTATIONS

Teacher's Observations

The student thoroughly satisfies requirements of the task; the solution is well-developed and justified; the student uses mathematical concepts and language effectively to reach a solution. The student offers a rationale for using medals to athletes rather than medals to population.

- Shows thorough understanding; explanation is insightful.
- Uses highly effective strategies
- Accurate and precise
- Uses procedures fluently and efficiently
- Explains results and procedures precisely, uses mathematical language
- Constructs effective and accurate table

	NYM	MM	FM	Ex
OVERALL				
Snapshot				
Concepts				
Connections				
Prob-Solving				
Reasoning				
Procedures				
Represent'n				
Commun				

DESCRIBE YOUR PLAN!

My plan is to make a ratio to see how many people are accounted to 1 medal for every team. This way the smaller teams will get credit for the amount of medals they recieved. I believe that the numbers should be looked at medals to number of athletes instead of medals to the population, because ultimately, the numbers go down to the number of athletes at the Olympics. For example, China has the largest population, yet does not have as many medals as Germany, a smaller country.

Numeracy Performance Standards, Grade 8 Prototype

THE RANKING WAS DETERMINED BY LOOKING AT THE DECIMAL IN RATIO!!

Country	# of Medals	# of Athletes	Calculated Ratio - 1 Athlete = $\frac{m}{n}$	Old Rank	New Rank
Germany	29	164	1:6	1	3
United States	25	211	1:8	2	8
Canada	24	196	1:8	3	7
Russia	22	178	1:8	4	6
Norway	19	81	1:4	5	2
Sweden	15	112	1:7	6	5
Switzerland	15	143	1:10	7	10
China	11	78	1:7	8	4
Italy	11	134	1:17	9	11
Korea	11	40	1:4	10	1
France	10	89	1:9	11	9
Australia	2	40	1:20	12	12

- Represent your final rankings**
1. Korea
 2. Norway
 3. Germany
 4. China
 5. Sweden
 6. Russia
 7. Canada
 8. United States
 9. France
 10. Switzerland
 11. Italy
 12. Australia

Explain why you ranked the countries the way you did and what information you considered.
Explain how you account for ties.
Explain how your system is FAIR for countries of all sizes, than the system currently in place.

I ranked the countries the way I did because I put the scores into a ratio so that the number of athletes was put into consideration. When it came down to ties, I looked at the decimal in the ratio. This is because, for example, Korea's ratio was 1:3.63, while Norway's was 1:4.26. However, when I rounded the decimals, both teams ended up being tied. I think that my system is fair because countries get acknowledged for the amount of medals they won, considering that they have less athletes.