Numeracy
GRADE 6

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Sample 1: Lifestyle Data (Data Analysis) . . . 158
Sample 2: Designing a Box to Hold CDs (Measurement) . . . 177
By Grade 6, students are expected to complete a variety of numeracy tasks based on their own research, as well as simulated tasks provided by their teachers. The following briefly describes typical Grade 6 numeracy tasks. For quick reference, these examples have been grouped according to purpose. In practice, a single numeracy task or problem may often address more than one purpose.

**MONEY TASKS**
- Find the most economical prices for school supplies.
- Choose something they would like to purchase and compare prices from three different sources.
- Compare prices of products expressed in different units (e.g., .69/g, $3.90/kg, 0.32/100g, $3.99/500g).

**CHANCE TASKS**
- Determine whether or not a coin-toss game is fair.
- Design games involving chance.

**DATA ANALYSIS**
- Record, display, and analyze data to draw conclusions about own lifestyle.
- Design and conduct surveys, display and analyze resulting data, and draw conclusions.
- Analyze television commercials for number, type, and target audience.
- Analyze graphs from magazines, newspapers, or web sites, and evaluate the appropriateness of the population sample used.

**MEASUREMENT AND OTHER APPLICATIONS OF SHAPE AND SPACE**
- Design a container for compact disks.
- Create a “personal” box: calculate the surface area, choose material, and determine the most economical way to use material to cover the box.
- Given a set of parameters, design the shortest fence to enclose a skateboard park.
- Estimate and measure volume and mass of various types of rocks as part of a science study; draw conclusions.
Wherever possible, students should demonstrate numeracy through real situations and problems that can be solved in a variety of ways. Students should be expected to explain their procedures and results, and to suggest other situations where similar methods might be useful. In most cases, these tasks will require an extended amount of time. Relatively short questions with one correct procedure and answer are not appropriate for performance assessment.
# Quick Scale: Grade 6 Numeracy

This Quick Scale is a summary of the criteria described in detail in the Rating Scale that follows. These criteria may apply at any time of the year, depending when specific skills or concepts are introduced.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Not Yet Within Expectations</th>
<th>Meets Expectations (Minimal Level)</th>
<th>Fully Meets Expectations</th>
<th>Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNAPSHOT</td>
<td>The student is unable to meet basic requirements of the task without close, ongoing assistance. Unable to provide a relevant extension.</td>
<td>The work satisfies most basic requirements of the task, but it is flawed or incomplete in some way. May produce a simple extension with help.</td>
<td>The work satisfies basic requirements. If asked, the student can produce a relevant extension or further illustration.</td>
<td>The work is complete, accurate, and efficient. The student may volunteer an extension, an application, or a further illustration.</td>
</tr>
<tr>
<td>CONCEPTS AND APPLICATIONS*</td>
<td>• unable to identify mathematical concepts or procedures needed</td>
<td>• identifies most mathematical concepts and procedures needed</td>
<td>• identifies mathematical concepts and procedures needed</td>
<td>• identifies mathematical concepts and procedures needed; may offer alternatives</td>
</tr>
<tr>
<td></td>
<td>• does not apply relevant mathematical concepts and skills appropriately; major errors or omissions</td>
<td>• applies most relevant mathematical concepts and skills appropriately; some errors or omissions may need help to describe and use patterns and relationships</td>
<td>• applies mathematical concepts and skills appropriately; may be inefficient, make minor errors or omissions</td>
<td>• applies mathematical concepts and skills accurately and efficiently; thorough</td>
</tr>
<tr>
<td></td>
<td>• often unable to describe patterns or relationships</td>
<td></td>
<td>• describes and uses basic patterns and relationships</td>
<td>• independently describes and uses patterns and relationships</td>
</tr>
<tr>
<td>STRATEGIES AND APPROACHES</td>
<td>• appears unsystematic and inefficient</td>
<td>• generally follows instructions without adjusting or checking</td>
<td>• follows logical steps; may be inefficient</td>
<td>• structures the task efficiently; may find a shortcut</td>
</tr>
<tr>
<td></td>
<td>• results or solutions are often improbable</td>
<td>• may need reminding to verify results or solutions; estimates are generally logical</td>
<td>• makes logical, relatively accurate estimates to verify results or solutions</td>
<td>• makes logical estimates to verify results or solutions</td>
</tr>
<tr>
<td>ACCURACY</td>
<td>• often includes major errors in recording or calculations</td>
<td>• may include some errors in recording or calculations; generally “close”</td>
<td>• recording and calculations are generally accurate; may include minor errors</td>
<td>• recording and calculations are accurate; may use mental math</td>
</tr>
<tr>
<td>REPRESENTATION AND COMMUNICATION</td>
<td>• work is often confusing, with key information omitted</td>
<td>• most work is clear; may omit some needed information</td>
<td>• work is generally clear and easy to follow</td>
<td>• work is clear, detailed, and logically organized</td>
</tr>
<tr>
<td></td>
<td>• often omits required charts, diagrams, or graphs, or makes major errors</td>
<td>• creates required charts, diagrams, or graphs; some features may be inaccurate or incomplete</td>
<td>• uses required charts, diagrams, or graphs appropriately; may have minor errors or flaws</td>
<td>• uses required charts, diagrams, or graphs effectively and accurately</td>
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<tr>
<td></td>
<td>• explanations are incomplete or illogical</td>
<td>• explanations may be incomplete or imprecise</td>
<td>• explains procedures and results logically in own words</td>
<td>• explains procedures and results clearly and logically; may include visuals</td>
</tr>
</tbody>
</table>

* You may want to list key curriculum concepts or skills for a particular task.
### Rating Scale: Grade 6 Numeracy

These criteria may apply at any time of the year, depending when specific skills or concepts are introduced. *

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<tbody>
<tr>
<td><strong>SNAPSHOT</strong></td>
<td>The student is unable to meet basic requirements of the task without close, ongoing assistance. The student is unable to provide a relevant extension.</td>
<td>The work satisfies most basic requirements, but it is flawed or incomplete. The student may produce an extension by making a minor variation in the original task. Often needs some help.</td>
</tr>
</tbody>
</table>
| **CONCEPTS AND APPLICATIONS**               | * unable to identify mathematical concepts or procedures needed to solve a problem or complete a task  
* does not apply relevant mathematical concepts and skills appropriately; major errors or omissions  
* often unable to describe patterns or relationships | * identifies most mathematical concepts and procedures needed to solve a problem; may oversimplify or miss some aspects of the task  
* applies most relevant mathematical concepts and skills appropriately; some errors or omissions  
* describes and uses some patterns and relationships; may need some help |
| **STRATEGIES AND APPROACHES**              | * appears unsystematic and inefficient  
* results or solutions are often improbable, suggesting that the student is unable to make logical estimates | * generally follows instructions without adjusting or checking procedures  
* may need reminding to use estimation to verify results or solutions; estimates are generally logical |
| **ACCURACY**                                | * often includes major errors in recording or calculations                                  | * may include some errors in recording or calculations; generally answer or solution is “close”       |
| **REPRESENTATION AND COMMUNICATION**        | * work is often confusing, with key information omitted  
* often omits required charts, diagrams, or graphs, or makes major errors  
* explanation of procedures or results is incomplete or illogical; uses little or no mathematical language | * most work is clear, although some necessary information may be omitted  
* creates required charts, diagrams, or graphs, but some features may be inaccurate or incomplete (e.g., diagrams not to approximate scale; inappropriate intervals)  
* explanations of procedures and results may be incomplete or imprecise; uses little mathematical language |

* Student performance that falls within the wide range of expectations for Grade 6 generally matches the Level 3 descriptions in Evaluating Mathematical Development Across Curriculum.

**Some of the curriculum concepts and skills students are expected to apply in completing numeracy tasks are specific to the type of task. The shaded charts below the Rating Scale show some of the concepts and skills most likely to apply in Grade 6.

#### MONEY TASKS
- percentage  
- equality

#### CHANCE TASKS
- experimental and theoretical probability of single events  
- identify relationships between number of faces and probability of a single event, using various polyhedrons and dice
<table>
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<th>Exceeds Expectations</th>
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<td><strong>The work satisfies basic requirements of the task. If asked, the student can produce a relevant extension or further illustration.</strong></td>
<td><strong>The work is complete, accurate, and efficient. The student may volunteer an extension, application, or further illustration of the same mathematical idea.</strong></td>
</tr>
<tr>
<td>• identifies the mathematical concepts and procedures needed to solve a problem or complete a task</td>
<td>• identifies the mathematical concepts and procedures needed to solve a problem or complete a task; may offer alternative methods</td>
</tr>
<tr>
<td>• applies relevant mathematical concepts and skills appropriately; may be somewhat inefficient or make minor errors or omissions</td>
<td>• applies relevant mathematical concepts and skills accurately and efficiently; thorough</td>
</tr>
<tr>
<td>• describes and uses basic patterns and relationships (e.g., how surface area affects volume; comparison of two results); may need prompting</td>
<td>• independently describes and uses patterns and relationships (e.g., how surface area affects volume; comparison of two results)</td>
</tr>
<tr>
<td>• structures the task into logical steps or stages; may be inefficient</td>
<td>• structures the task efficiently; may find a shortcut for the procedure modelled or offer alternative ways to address the task</td>
</tr>
<tr>
<td>• makes logical and relatively accurate estimates to verify results or solutions</td>
<td>• makes logical estimates to verify results or solutions</td>
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<td>• recording and calculations are generally accurate; may be minor errors</td>
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<tr>
<td>• uses required charts, diagrams, or graphs appropriately; these may have minor errors or flaws (e.g., missing units, title, or axis labels)</td>
<td>• uses required charts, diagrams, or graphs effectively and accurately</td>
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<td>• explains procedures and results logically in own words; uses some mathematical language</td>
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</table>

**DATA ANALYSIS**

- formulate questions
- identify appropriate data sources
- select data collection method
- choose population sample
- display data (including histograms, double-bar graphs, stem-and-leaf plots)
- interpret graphs; describe distributions
- analyze data to make comparisons and test predictions

**MEASUREMENT**

- perimeter
- area
- surface area
- volume
- measurement of angles

**OTHER APPLICATIONS OF SHAPE AND SPACE**

- create, analyze, and describe designs
- draw designs
- recognize and describe optical illusions
- sketch 3-D solids and skeletons
Sample 1: Lifestyle Data (Data Analysis)

CONTEXT
This task was a mathematics component within an integrated unit on "Healthy Lifestyles" for Personal Planning.

MATHEMATICAL CONCEPTS
- compare and order improper fractions and decimal fractions
- calculate with whole numbers, decimal fractions, and percentage
- display data by hand or by computer in a variety of ways
- read and interpret graphs
- describe the general distribution of data

PROCESS
Students were given written instructions to follow a five-step process, as summarized here.

Step 1
Use a chart provided to record the time spent (rounded to the nearest 15-minute interval) in a 24-hour period on each of the following activities:
- exercising
- sleeping
- watching TV
- other activities

Step 2
Use recorded data to:
- calculate the total amount of time in each category
- check that the total added up to 24 hours (If the total was not 24 hours, students discussed what they might have done wrong and solicited advice from other students.)

Step 3
Represent data by:
- constructing a 24-hour strip graph using the template provided and a different colour for each category of activity
- construct a circle graph with the same data
NOTE:
In order to help students construct a circle graph without using protractors, the teacher ironed basket coffee filters flat and had students figure out different ways of finding the centre (folding, using a compass). She then had the students tape the ends of their strip graphs together into circular bracelets. Students placed their bracelets on the circles so that each section was an equal distance from the centre of the circle and marked the boundaries of each category from the strip graphs onto the circle graphs.

**Step 4**
Suggest alternative methods of representing the information, choose the one most appropriate, explain the choice, and represent the information in this form as well.

**Step 5**
Respond to a series of questions designed to help interpret the data. (See student samples for the questions.)

NOTE:
In the following examples, students used colour coding in their charts and graphs. This is not always easy to see in the reproduction.
NOT YET WITHIN EXPECTATIONS

Teacher's Observations

This student required ongoing assistance to record data, graph it, interpret it, and answer questions. She was unable to do the calculations involving fractions and percentage, or to represent the data in a way that had not been modelled in class.

- unable to identify mathematical concepts or procedures needed
- appears unsystematic and inefficient
- key information omitted
- explanation of procedures and results is incomplete; uses little mathematical language
24 Hour Activity Chart

Alternate Ways to Represent Information
1. Suggest some alternate ways to represent this information:
   - Number charts
   - Writing charts
   - Block charts
   - Strip charts
2. Choose what you feel is the most appropriate method for this data and represent the information in this area. Explain why you chose this method.
   The best number charts because you just have to write numbers in order of how many.

Interpreting the Data and Looking at Your Lifestyle
1. What surprised you the most about the data represented in your charts? Explain.
   The sleep thought that I sleep a lot but I don't feel that surprised me at all.

2. Express each category as a fraction and as a percent. Which category took up the greatest amount of time?
   Other was the greatest amount of time.

3. In an article in the Vancouver Sun, experts stated that children at your age should be sleeping a minimum of 10 hours in a 24 hour period. How close does this amount of time that you slept compare to the recommended amount? Is this a fairly typical amount of sleep or do you get less in a day?
   Yasmin said: 

4. If you were to look on this day on its own, what changes if any would you make in your daily activities to achieve a more balanced or healthy lifestyle? Would it make more sense to look at your activities in one day, or to look at activities over one week? Explain your answer.
   I would watch TV, do my work, then go to sleep.

5. What questions do you have about the project?
   Could we have more options?
   Can we look at sleep over two days?

6. Do you have any suggestions for extensions for this project?
   No, I don't.

7. What are the two most important things that you learned from this activity?
   I watch TV a lot, I sleep little.
MEETS EXPECTATIONS (MINIMAL LEVEL)

Teacher’s Observations

This student was able to interpret his results with some prompting. Some of the calculations of percentage are inaccurate. The circle graph is constructed carelessly, and he did not represent his data in an additional way.

- identifies most mathematical concepts and procedures needed
- describes and uses some patterns and relationships; needs some help
- some errors in calculations; the answer is “close”
- creates required graphs, but some features are inaccurate or incomplete
- explanations of procedures and results are incomplete; uses little mathematical language
Step 2

1. exercise = 4 hours  
   sleep = 11 hours

2. exercise = 4 hours  
   TV = 3 hours  
   sleep = 11 hours  
   other = 6 hours

3. The strategies I used were to use a watch and time everything I did.

4. I would tell them to reduce their paper

Step 3

Legend

- exercise = red
- TV = blue
- sleep = green
- other = yellow

- TV 3 hours
- sleep 11 hours
- exercise 4 hours
- other 6 hours

Total = 24 hours
Step 4

○ For a different way, I would make a bar graph to show the information on a tally graph.
○ I would choose the tally graph.
○ I like this method because it's a better way of showing the time.

Step 5

○ I was surprised that my 7.24 period was short, because it seemed I watched a lot of

○ The red is 24.25%. The green took up 34.60% most of the time.
  The yellow is 24.16.5%
  Red Blue 12.5%

○ My sleep time compares pretty well, 10.5 hours.
  Yes, this is pretty typical.
  My sleep changes from homework or the weekends.

○ I spent 4 hours exercising.
○ I spent 3 hours watching TV.
○ I would make sure that I get a lot more exercise
  because it's healthy for your body.
FULLY MEETS EXPECTATIONS

Teacher's Observations

This student approached the task confidently and completed all aspects of the task correctly, although she was unable to suggest an extension.

- identifies the mathematical concepts and procedures needed
- applies relevant mathematical concepts and skills appropriately
- describes and uses basic patterns and relationships (e.g., comparison of results)
- recording and calculations are generally accurate
- uses required graphs appropriately
- explains procedures and results logically in own words; uses some mathematical language
A TYPICAL THURSDAY

6:30 wake up
6:30 - 6:40 eat breakfast (10 min)
6:40 - 6:45 brush teeth (5 min)
6:45 - 7:30 get ready for school (45 min)
7:30 - 7:35 walking to Terri’s (5 min)
7:35 - 8:30 time @ Terri’s (1 hour)
8:30 - 8:35 walking from Terri’s to school (5 min)
8:35 - 8:40 waiting for the bell to ring (5 min)
8:40 - 2:30 school (6 hours)
2:30 - 2:35 walking from school to Terri’s (5 min)
2:35 - 2:40 walking from Terri’s (5 min)
2:40 - 3:30 time @ Terri’s (45 min)
3:30 - 3:55 Terri’s house to my house (5 min)
3:35 - 4:00 getting ready for football (30 min)
4:00 - 6:00 basketball camp (2 hours)
6:00 - 6:30 eat and change clothes (30 min)
6:30 - 8:00 C.C.D (1 hour 30 min)
8:00 - 8:15 driving home (15 min)
8:15 - 8:30 brushing my teeth and washing up (15 min)
8:30 - 8:45 changing into PJs (15 min)
8:45 - 9:00 getting into bed and saying good night (15 min)
9:00 - 6:30 sleep

Exercise - 1 hour 45 min.
Washroom - 20 min.
Sleep - 9 hours 30 min.
Other - 1 hour 40 min.
Time @ Terri’s - 1 hour 45 min.
Eating - 40 min.
School - 6 hour

P.S. - Terri is my baby-sitter
CIRCLE GRAPH

LEGEND

- Exercise
- Washroom
- Sleep
- Other
- Time at Terris
- Eating
- School

ALTERNATE WAYS TO REPRESENT THIS INFORMATION:

- This information could be shown in a bar graph
- This information could be shown in a line graph
- This information could be shown on a chart
- This information could be shown in a pie graph
- This information could be shown in a write-up

CONCLUSION

I thought that this information was shown the best in a bar graph. I thought this because a bar graph is simple and easy to read.
BAR GRAPH

NOTE:
EACH BOX STANDS
FOR HALF AN HOUR OR
30 MINUTES.

INTERPRETING THE DATA AND LOOKING AT YOUR LIFESTYLE

It surprised me that school and sleep took up so much
time in my life. After that, exercise was what I did
much more than anything else. The other category
is made up of all other activities that I do, and
I even exercise more than all of those things
put together.
2) Sleep took up the most of my time. I slept from 9:00 pm - 6:30 am.

3) I sleep very close to ten hours a night. I sleep nine hours and thirty minutes every night. This is a fairly typical amount of sleep per day. This amount of sleep may change if I am ill and go to bed earlier, or if I have a late night. It may also change if I have a nap during the day.

4) I spend 1 and a half to 2 and a half hours exercising every day.

5) I don't spend any time watching T.V. during the day.

6) If I could change my day I would become more active, join a club or do more after school activities. I think that I should do more activities, and that I should exercise more.

7) If a person was wondering if they needed to make changes to their lifestyle it would only be fair to look at their activities in a week. After all, what if you caught them on a bad day when all they did was watch T.V.? You would think they were lazy. But if you got them on a day when they exercised a lot you would think they were a jock. That is why it is fair to look at a week not a day.

8) I don't have any.

9) No.

10)
EXCEEDS EXPECTATIONS

Teacher's Observations

This student collected exceptionally detailed data and offered logical conclusions. All work is correct, accurate, detailed, and thorough.

- applies relevant mathematical concepts and skills accurately and efficiently; thorough
- independently describes and uses patterns and relationships involved (e.g., comparisons of results)
- structures the task efficiently
- recording and calculations are accurate
- uses required charts and graphs effectively and accurately
- explains procedures and results clearly and logically, in own words; uses mathematical language; includes visuals

![24 hour chart]

<table>
<thead>
<tr>
<th>Step</th>
<th>24 hour chart</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise</strong></td>
<td><strong>Typical Monday</strong></td>
</tr>
<tr>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td>7:30 am</td>
<td>8:45 am</td>
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<td>8:45 am</td>
<td>9:30 am</td>
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<td>9:30 am</td>
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<td>11:00 am</td>
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<td>2:45 pm</td>
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<td><strong>T.V.</strong></td>
<td><strong>Explanation of Activity</strong></td>
</tr>
<tr>
<td>From</td>
<td>To</td>
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<tr>
<td>(I do not watch T.V. on Mondays)</td>
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<tr>
<td><strong>Sleeping</strong></td>
<td><strong>Explanation of Activity</strong></td>
</tr>
<tr>
<td>From</td>
<td>To</td>
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<tr>
<td>9:00 pm</td>
<td>6:00 am</td>
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<tr>
<td>From</td>
<td>To</td>
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<td>6:45 pm</td>
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</tbody>
</table>
Step 2

3) Strategies - The strategies I used were simple. I added each category by counting the number of numbers. I know it sounds confusing. For example in Exercise I have:

- 45
- 15
- 30
- 30

Then I calculated each of these and divided them by 60.

- 45 x 1 = 45 + 60 = 45 minutes
- 15 x 3 = 45 + 60 = 45 minutes
- 30 x 2 = 60 + 60 = 1 hour

Then I did a grand total and calculated each of the remaining minutes/hours.

45 min
1 hour
45 min
+ 1 hour
3 hours 30 minutes

I followed this process throughout the other categories.

4 a) The advice I would give someone would be that at whatever time you go to bed (the day before) you must go until then the next day. Example: I go to bed at 9:00 p.m. and finished my day at 9:00 p.m.
Typical Thursday

Legend
- sleep 9 hours
- eat 1 hour
- school 6 hours
- homework 1 hour 30 min
- washroom 1 hour
- read 2 hours
- ballet 1 hour 30 min
- violin 1 hour
- computer 30 min
- walk dog 30 min
- Total 24 hours
Step 4

1. You could use a line graph, pictograph, bar graph.
2. Stapled on the back.
3. I chose to do this bar graph because I like the look of the organized and neat way that the data is displayed. It is easy to read and is to use.

Number of Hours

<table>
<thead>
<tr>
<th>Things I Do</th>
<th>10 h</th>
<th>9 h</th>
<th>8 h</th>
<th>7 h</th>
<th>6 h</th>
<th>5 h</th>
<th>4 h</th>
<th>3 h</th>
<th>2 h</th>
<th>1 h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
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Step 4: 24 Bar Graph
Step 5

1) What I was surprised with the fact that after completing it I was pretty happy with myself. I realize that even if my questions were incorrect, being myself, I know I am not a mathnasium (or a speller)

<table>
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<th>Fraction</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Exercise</td>
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<tr>
<td>TV</td>
<td>0</td>
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<tr>
<td>Sleeping</td>
<td>3/4</td>
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<tr>
<td>Other</td>
<td>3/75</td>
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</tbody>
</table>

My OTHER category took up the majority of my time.

2) I sleep 7 hours a day. (Yes I know my bedtime’s early for a grade six, but I LOVE my bed. On school days I get to bed at 9:00 and wake up at 7:000 except on Mondays when I have to get up at 6:30 for badminton at 7:30)

3) I spent 3 hours 30 min exercising during the day.

4) I do not watch TV on Monday.

5) I don’t think that there is a need to change anything. I spend a healthy time exercising, a healthy time sleeping (well, maybe a little too healthy, but when it comes down to it I don’t want to change anything.

6) I think it would be better to look at someone’s activities in a week because someone could have more or less of something in a week.
8. I don't have any questions, except for the fact of why our class had to do this.

9. No, I do however think you should explain what you want us to do a little more clearly.

10. Two important things I learnt from doing this was: a) how to work together with someone b) how to use logic in solving these problems.
Sample 2: Designing a Box to Hold CDs
(Measurement)

CONTEXT
Students had previous instruction and practice in calculating surface area and volume using exploration, guess, and test techniques. The teacher reviewed these concepts, along with SI (metric) units and how to use measurement tools with precision.

MATHEMATICAL CONCEPTS
- calculations involving whole numbers and decimal fractions
- using SI units for length and capacity
- calculation of volume
- calculation of surface area
- describing patterns and relationships (i.e., how different dimensions affect volume)

PROCESS
Students were asked to:
- design one or more boxes to hold 12 CDs
- draw and label the dimensions of the box(es)
- calculate the volume of each box
- calculate the surface area for one box
- provide a written explanation of their thinking processes and how they went about designing their boxes
- explain how different dimensions affect the volume
**NOT YET WITHIN EXPECTATIONS**

**Teacher's Observations**

This student was able to measure a CD accurately, but unable to consistently use the correct SI units of measurement (i.e., sometimes recording length in cm, sometimes in cm³). He was unable to complete the remaining parts of the task.

- does not apply relevant mathematical concepts and skills appropriately
- unable to describe patterns or relationships
- appears unsystematic and inefficient
- includes major errors in calculations
- omits required diagrams and makes major errors

![Mathematical calculations image]
MEETS EXPECTATIONS (MINIMAL LEVEL)

Teacher's Observations
This student was able to complete the basic steps of the task. However, some calculations are missing (i.e., surface area) and diagrams are not to approximate scale. She was unable to give a clear explanation of how different dimensions affect volume.

◆ applies most relevant mathematical concepts and procedures needed; misses some aspects of the task
◆ follows instructions without adjusting or checking procedures
◆ includes some errors in recording and calculations; the answer or solution is “close”
◆ most work is clear, although some necessary information is omitted
◆ creates required diagrams (but not to approximate scale)
Different dimensions do effect the volume because I did so many different designs. And how you space them out and how you put them in also changes the volume.

Volume: 4,725 cm³

- Shelving for 12 CDs
- 47.25 cm x 15 cm

Volume: 2,535 cm³

- Shelving for 10 CDs
- 13 cm x 15 cm

CD case: 14 cm x 12 cm

Give 5 mm keeway on CD boxes
**FULLY MEETS EXPECTATIONS**

**Teacher's Observations**

This student designed three CD boxes, accurately calculating volume in each case. Diagrams are to approximate scale and clearly labelled using appropriate units. Her explanation of the effect of different dimensions on volume demonstrates a good spatial understanding.

- applies relevant mathematical concepts and skills appropriately
- describes and uses basic patterns and relationships
- recording and calculations are generally accurate
- uses required diagrams appropriately
- explains procedures and results logically in own words; uses some mathematical language
EXCEEDS EXPECTATIONS

Teacher's Observations

This student designed four CD boxes, accurately calculating volume in each case. The diagrams are to approximate scale and clearly labelled, using appropriate units. His explanation of his approach and the effect of the dividers and external dimensions on volume demonstrates an excellent spatial understanding.

◆ applies relevant mathematical concepts and skills accurately and efficiently; thorough
◆ independently describes and uses patterns and relationships (e.g., how surface area affects volume; comparison of results)
◆ structures the task efficiently; offers alternative ways to address the task
◆ work is clear, detailed, and logically organized
◆ uses required diagrams effectively and accurately
◆ explains procedures and results clearly and logically in own words; uses mathematical language
3. Height = 18 cm
   Width = 12.2 cm
   Depth = 14.3 cm
   Volume = 3140.28

4. Height = 24.9 cm
   Width = 6 cm
   Depth = 14.3 cm
   Volume = 2136.42 cm³
Since I knew the dimensions of a CD case (1cm height x 12.2 cm width x 14.3 cm depth), I was able to design four CD boxes.

The depth of one case is 14.3 cm, so I automatically knew the depth of the box will be 14.3 cm. The height of one case is 1 cm, so I stacked 4 cases on top of each other with 5 mm dividers in between the cases. Then I put three piles of four together to get 12 CD’s. To get the width, I multiplied 12.2 x 3 to get 36.6 cm which is the width. There are no dividers in between the piles. That is how I designed box #1.

Once again, the depth is 14.3 cm, which is the depth of one case. Instead of 3 stacks of 4 cases, I made 2 stacks of 6 cases. Once again, with 5 mm dividers in between the cases. For the width, I multiplied 12.2 x 2 and added 1 cm for the divider between the two piles, which gave me 23.4 cm. This is how I designed box #2.

All the boxes, including this one, have a depth of 14.3 cm. The height is 8 cm because I stacked them all in one pile with 5 mm dividers in between. The width is 12.2 cm because I only had one pile and that is the width of one case. This is how I designed box #3.

This box also has a width of 14.3 cm. The height is 24.9 cm because I stood the cases on end, 6 cases on the top and 6 on the bottom. I had a 5 mm divider between the 6 cases on the top and 6 on the bottom. Since I stacked them on end, the width is 6 cm with no dividers.

The dividers are what affect the volume. It also depends on your pile. How many there are and how high they are also affect the volume of the box.