

The Common Curriculum Framework

for

K-12 MATHEMATICS

(10-12 is under development)

Western Canadian Protocol for Collaboration in Basic Education

GRADE 6

JUNE 1995

VI. GENERAL OUTCOMES, AND SPECIFIC OUTCOMES WITH ILLUSTRATIVE EXAMPLES (K–9)

This section elaborates on the general outcomes and specific outcomes by providing illustrative examples, by grade, for the K–9 program. Note that the specific outcomes and illustrative examples for the Grade 10 to Grade 12 program will be developed at a later date.

CODING FOR ILLUSTRATIVE EXAMPLES (IEs)

The illustrative examples (IEs) listed on the following pages are organized by grade and have been correlated to specific outcomes (SOs). The coding used recognizes that IEs relating to more than one SO are listed before those relating to only one SO. Examples of the coding system are listed below.

1–4	Means that the IE relates to specific outcomes one through four in the subsection being addressed.
1, 3	Means that the IE relates to specific outcomes one and three in the subsection being addressed.
1, 3.1 1, 3.2	Means that the IEs relate to specific outcomes one and three in the subsection being addressed and that there are two of them.
6.1	Means that the IE relates to specific outcome six in the subsection being addressed.
4.1 4.2 4.3	Means that the IEs relate to specific outcome four in the subsection being addressed and that there are three of them.

Grade 6
Strand: Number (Number Concepts)

Students will:

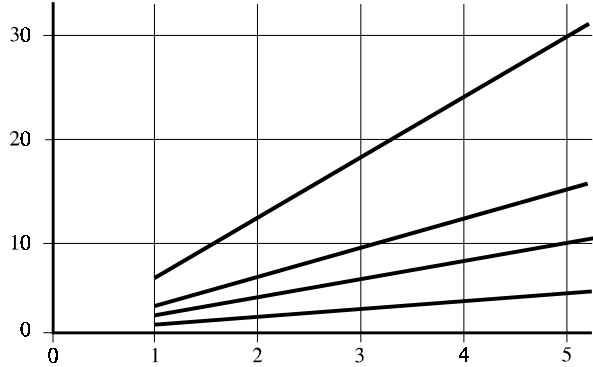
- use numbers to describe quantities
- represent numbers in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>	<p>1. Read and write numerals greater than a million. [C, CN]</p> <p>2. Estimate quantities up to a million. [E]</p>	<p>1, 12 Read the paragraph below. Rewrite number words, using numerals, and rewrite numerals, using number words: In her book called <i>What Do You Prefer: Chunky or Smooth?</i>, Heather Brazier tells us the following: “On an average day in Canada . . . We consume eighty thousand, eight hundred forty-nine kilograms of peanut butter. Of the total, 20 212 kg are chunky.” (p. 46) According to the information provided, how many kilograms of smooth peanut butter must be eaten by Canadians on the average day? Ms Brazier writes that Canadians choose smooth over chunky 3 to 1. Explain what she means. Write, in words, the number of kilograms of peanut butter Canadians will consume in one hundred days.</p> <p>1.1 The day after a telethon, the radio reported that about \$2.1 million was raised. Explain why the value would be expressed in this way. What may have been the amount raised?</p> <p>2.1 On a field trip, have students estimate the number of seats in a hockey rink, theatre or stadium. Compare your result to the box office count.</p> <p>2.2 What could you buy for a million dollars? Describe your answer in terms of cars, houses or groceries.</p> <p>2.3 About how many pages in your local telephone book do you think are needed to list ten thousand names? Explain your estimation strategy. How can you check your prediction, without counting ten thousand names? Carry out your plan, and compare your prediction with your results.</p> <p>Use your work to predict the number of pages needed to list: – one hundred thousand names – one million names.</p> <p>Did you use estimation, mental mathematics or a calculator to find these solutions? Why?</p>

Grade 6
Strand: Number (Number Concepts)

Students will:

- use numbers to describe quantities
- represent numbers in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>	<p>3. Distinguish among, and find, multiples, factors, composites and primes, using numbers 1 to 100. [R]</p>	<p>3–4 Study this representation of the multiplication facts.</p>  <p>What multiples of 6 are plotted?</p> <p>What factors of 12 are plotted?</p> <p>If the graph was extended in length and width to 100, what composite number would have the greatest number of factors plotted. What would the points be?</p> <p>If the lines for each multiple were extended backward, what point would all lines travel through? Why?</p> <p>3.1 Draw a Venn diagram. Sort the numbers from 1 to 25, by these rules:</p> <ul style="list-style-type: none"> – prime – greater than 10.

Grade 6
Strand: Number (Number Concepts)

Students will:

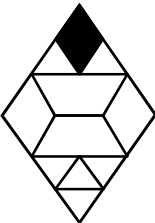
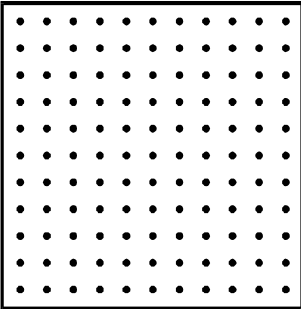
- use numbers to describe quantities
- represent numbers in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>	<p>4. Recognize, model, identify, find and describe common multiples, common factors, least common multiple, greatest common factor and prime factorization, using numbers 1 to 100. [C, PS, R, V]</p> <p>5. Explain the meaning of integers by extending counting numbers to less than zero. [R]</p> <p>6. Identify practical applications of integers. [CN, PS]</p> <p>7. Read and write numbers to thousandths. [C, CN, V]</p>	<p>4.1 Josie and Pierre work part time at the local store. Josie works every four days and Pierre works every six days. If they both start today and the store is open every day of the week, when will they work together again?</p> <p>5.1 A certain negative integer is:</p> <ul style="list-style-type: none"> – less than -3 – greater than -8 – farther from -8 than -3. <p>What is the integer?</p> <p>Draw and label a number line to justify your answer. Make up another set of clues about a negative integer.</p> <p>6.1 Explain how negative numbers are used to help describe the following:</p> <ul style="list-style-type: none"> – golf scores – temperature – an example of your choice. <p>7, 9 Trevor's homework revealed this statement:</p> $0.790 \quad \boxed{>} \quad 0.79$ <p>Is he correct? What model(s) or diagram(s) would you use to justify your answer?</p> <p>Order these numbers from least to greatest:</p> $0.499 \quad 2.66$ $\frac{4}{3} \quad 1\frac{7}{8} \quad 0.1$ <p>Construct a number line to help Trevor visualize your thinking. Label each number.</p>

Grade 6
Strand: Number (Number Concepts)

Students will:

- use numbers to describe quantities
- represent numbers in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>	<p>8. Round numbers to the nearest unit, tenth and hundredth.</p> <p>9. Demonstrate and explain the meaning of improper fractions and mixed numbers (positive) concretely, pictorially and symbolically. [C, R, V]</p> <p>10. Demonstrate and explain the meaning of ratio concretely, pictorially and symbolically. [C, CN, R, V]</p> <p>11. Demonstrate and explain the meaning of percentage concretely, pictorially and symbolically. [C, CN, R, V]</p>	<p>7.1 It takes the Earth 365.256 days to revolve around the Sun. Read the number aloud, and write the number in words.</p> <p>8.1 What number could be in the thousandths place, if a number rounds to 6.53?</p> <p>9.1 With the help of pattern blocks, and using the value of the yellow hexagon as one whole, make a pattern with a value of $2\frac{1}{2}$.</p> <p>9.2. The following diagram is made from pattern block pieces. If the shaded area has a value of $\frac{1}{3}$, what is the value of the whole design? Make a design with a value of eleven thirds. Rearrange the blocks to show eleven thirds as a mixed number.</p> <div style="text-align: center;">  </div> <p>10–11.1 Let the largest possible square on an 11 by 11 pin geoboard have a value of 1. Construct a different (noncongruent) shape for each part named below:</p> <ul style="list-style-type: none"> – 0.25 of the square – $\frac{1}{4}$ of the square – 25% of the square. <div style="text-align: right;">  </div> <p>Record, colour and label each shape on geodot paper. How is each coloured part the same? Shannon outlined a new shape. She says the ratio of the coloured part to the whole square is 3:5. Record and colour one possible shape. Record other ways to name the shape as part of 1.</p>

Grade 6
Strand: Number (Number Concepts)

Students will:

- use numbers to describe quantities
- represent numbers in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples										
<p>Develop a number sense for decimals and common fractions, explore integers, and show number sense for whole numbers.</p>		<p>10–11.2 Dennis linked 10 cubes together in this order: <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td>G</td><td>G</td><td>G</td><td>G</td><td>Y</td><td>G</td><td>G</td><td>G</td><td>G</td><td>Y</td></tr></table></p> <p>What colours are described by these ratios: 2:8 4:1 8:10</p> <p>Suppose Dennis continued the pattern to cover a 10 by 10 grid. How would the ratios change? How would you use per cent to describe:</p> <ul style="list-style-type: none"> – the green area? – the area not green? – the red area? <p>Would it be true to write the following about the yellow area?</p> $0.20 = \frac{2}{10} = \frac{1}{5}$ <p>Explain. Draw and colour a 5-cube train. Describe the colours in different mathematical ways.</p> <p>10.1 A punch is made by mixing 3 L of pop with 1 L of orange juice. Model the situation with two different coloured tiles. Find the amount of pop required for 2 L of orange juice, 3 L, 4 L. Write each case as a ratio.</p>	G	G	G	G	Y	G	G	G	G	Y
G	G	G	G	Y	G	G	G	G	Y			

Grade 6

Strand: Number (Number Operations)

Students will:

- demonstrate an understanding of and proficiency with calculations
- decide which arithmetic operation or operations can be used to solve a problem and then solve the problem.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Apply arithmetic operations on whole numbers and decimals in solving problems.</p>	<p>12. Solve problems that involve arithmetic operations on decimals to thousandths, using appropriate technology (2-digit whole number multipliers and dividers). [PS, R, T]</p> <p>13. Estimate the solution to calculations involving whole numbers and decimals (2-digit whole number multipliers and divisors). [E, PS, R]</p>	<p>12–13.1 Bohdan needs to cut 7.92 m of trophy ribbon into six equal lengths. Why should he estimate before he actually calculates the solution? What might he estimate each length to be? Explain your method. If Bohdan has no calculator or pencil, how might he find the actual solution? Explain your method.</p> <p>12–13.2 Which of these expressions has the same product as 12.8×48?</p> <ul style="list-style-type: none"> – 8×4.8 – 64×9.6 – $2 \times 6.4 \times 4 \times 12$ – 25.6×24 – 128×4.8 <p>Write several expressions that would have the same product as 60×24.4.</p> <p>12.1 Nigel and Maria are combining their money to buy a gift. Together they have \$52.08. Maria has \$12.08 more than Nigel. How much did each have before they combined their money? Make up a new problem like this one.</p> <p>13.1 Use all the cards. Create a decimal number and a 1-digit number. Arrange the numbers to get the greatest quotient. Do you have a strategy that will work successfully on any set of digits? Explain, using a calculator to check several examples.</p> <div style="display: flex; justify-content: center; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 10px;">8</div> <div style="border: 1px solid black; padding: 2px 10px;">3</div> <div style="border: 1px solid black; padding: 2px 10px;">9</div> <div style="border: 1px solid black; padding: 2px 10px;">2</div> <div style="border: 1px solid black; padding: 2px 10px;">0</div> </div> <p>13.2 On an average day in Canada, about seventy-two thousand six hundred eighty-five Canadians celebrate their birthdays. About how many people must there be in Canada? Estimate your answer. Check your estimate with a calculator.</p>

Grade 6

Strand: Number (Number Operations)

Students will:

- demonstrate an understanding of and proficiency with calculations
- decide which arithmetic operation or operations can be used to solve a problem and then solve the problem.

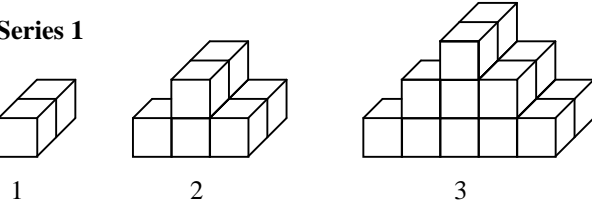
General Outcome	Specific Outcomes	Illustrative Examples
<p>Apply arithmetic operations on whole numbers and decimals in solving problems.</p>	<p>14. Use a variety of methods to solve problems with multiple solutions. [PS, R, T, V]</p>	<p>13.3 When would you use mental mathematics, paper and pencil calculation, or a calculator to answer each of the following questions?</p> <ul style="list-style-type: none"> – What fraction of a day is an hour, a minute, a second? – How many items in a gross (twelve dozen), a dozen gross, a hundred gross? <p>Justify each decision. Answer each question.</p> <p>13.4 In the book, <i>Counting on Frank</i> by Rod Clement, Frank’s master learns that the average ballpoint pen can produce a line twenty-one hundred metres long. The ratio of a line draw by a ballpoint pen compared to a pencil is about 1:18. About how many kilometres long would the pencil line be? Frank’s master imagines drawing lines on the walls. What process would you use to find about how many times you can draw a line around the perimeter of your classroom using:</p> <ul style="list-style-type: none"> – a ballpoint pen – a pencil. <p>Explain.</p> <p>13.5 How would you use a calculator to find an estimate for this question? About 280 million cans of one brand of pop are sold each day. About how many days does it take to sell enough cans to make a stack that would reach the Moon—385 000 kilometres away? Keep a record of your work, and plan to report your results to the class.</p> <p>14.1 A friend says she is thinking of a number. When 100 is divided by the number, the answer is between 2 and 5. Give at least three possibilities of what this number could be. Explain your reasoning. (You may use examples.)</p>

Grade 6

Strand: Patterns and Relations (Patterns)

Students will:

- use patterns to describe the world and to solve problems.

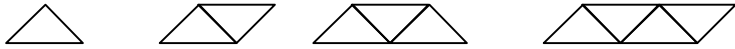
General Outcome	Specific Outcomes	Illustrative Examples												
<p>Use relationships to summarize, generalize and extend patterns, including those found in music and art.</p>	<ol style="list-style-type: none"> 1. Represent, visually, a pattern to clarify relationships and to verify predictions. [C, R, V] 2. Summarize a relationship, using everyday language in spoken or written form. [C, R] 3. Create expressions and rules to describe, complete and extend patterns and relationships. [C, CN, PS, R] 	<p>1–4</p> <p>Series 1</p>  <p>1 2 3</p> <p>Provide a written description of how to build the fourth model in the series. Include a drawing. Then describe any patterns that can be seen in the models.</p> <p>Chart the number of cubes needed to build the first five models.</p> <p>Graph the relationship between the number of the model and the number of cubes needed to construct each. Use your graph to predict the number of cubes needed to build the 6th model.</p> <p>1–2.1</p> <p>Greg used counters to build rectangles that expand in two directions. Then he produced this chart.</p> <table border="1" data-bbox="1231 1089 1822 1187"> <tr> <td>Term</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td></td> </tr> <tr> <td>Number of Counters</td> <td>2</td> <td>6</td> <td>12</td> <td>20</td> <td></td> </tr> </table> <p>Draw or use counters to construct the first four rectangles in Greg’s pattern. Record your work on paper.</p> <p>How are the numbers in each column on the chart related. Explain.</p> <p>Will 60 be a number that appears, if the chart is extended? Explain why or why not.</p>	Term	1	2	3	4		Number of Counters	2	6	12	20	
Term	1	2	3	4										
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Grade 6

Strand: Patterns and Relations (Patterns)

Students will:

- use patterns to describe the world and to solve problems.

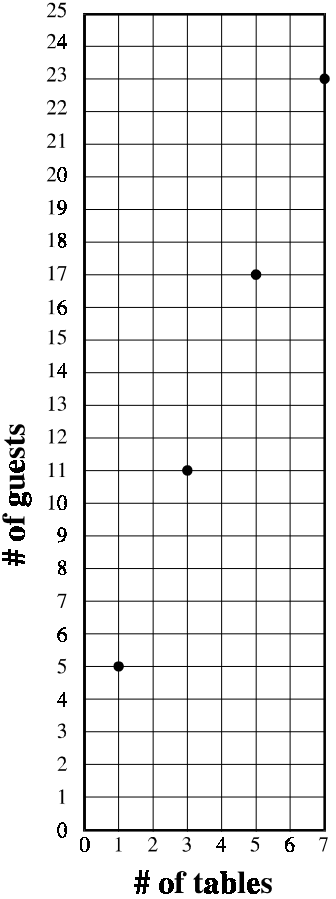
General Outcome	Specific Outcomes	Illustrative Examples										
<p>Use relationships to summarize, generalize and extend patterns, including those found in music and art.</p>		<p>1-2.2</p>  <p>Gretta sees that the number of lines increases by two for each triangle that is added. She predicts that the number of lines used is two times the number of triangles used.</p> <p>Do you agree with Gretta? Why? Use a grid to plot the number pairs in the pattern, and use your graph to justify your answer.</p> <table border="1" data-bbox="1228 686 1688 992"> <thead> <tr> <th>No. of Triangles</th> <th>No. of Lines</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td>5</td> </tr> <tr> <td>3</td> <td>7</td> </tr> <tr> <td>4</td> <td>9</td> </tr> </tbody> </table>	No. of Triangles	No. of Lines	1	3	2	5	3	7	4	9
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Grade 6

Strand: Patterns and Relations (Patterns)

Students will:

- use patterns to describe the world and to solve problems.

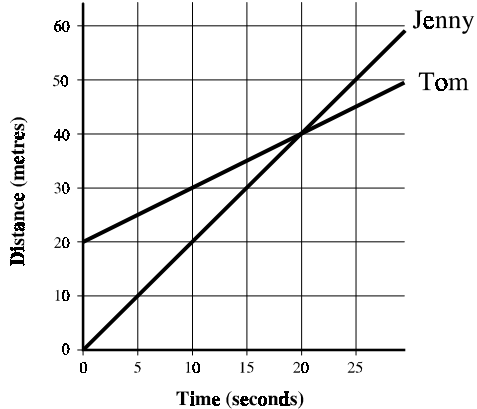
General Outcome	Specific Outcomes	Illustrative Examples										
Use relationships to summarize, generalize and extend patterns, including those found in music and art.	4. Find approximate number values from a given graph. [PS, R]	<p>4.1 Joanne's graph plots the number of guests that can be seated at 1, 3, 5 and 7 tables.</p> <p>Explain how to use her graph to determine the number of people that can be seated, if the number of tables is even, but less than 8.</p> <p>How might you determine the number of guests who can be seated at 10 tables.</p>  <table border="1"><caption>Data points from Joanne's graph</caption><thead><tr><th># of tables</th><th># of guests</th></tr></thead><tbody><tr><td>1</td><td>5</td></tr><tr><td>3</td><td>11</td></tr><tr><td>5</td><td>17</td></tr><tr><td>7</td><td>23</td></tr></tbody></table>	# of tables	# of guests	1	5	3	11	5	17	7	23
# of tables	# of guests											
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Grade 6

Strand: Patterns and Relations (Patterns)

Students will:

- use patterns to describe the world and to solve problems.

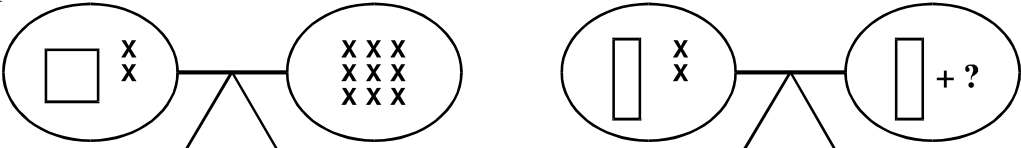
General Outcome	Specific Outcomes	Illustrative Examples
Use relationships to summarize, generalize and extend patterns, including those found in music and art.		<p>4.2 Tom and Jenny had a 60 m race.</p>  <p>Read the graph to find the answers to these questions:</p> <ul style="list-style-type: none">Who wins the race? By how much?Where did Jenny let her little brother begin the race?Who was leading after 15 seconds? By how much?How many seconds from the start did Jenny overtake Tom?How far from the start of the race did Jenny overtake Tom?If they run the race again, where should Tom start, if he is to reach the 60 metre line at the same time as Jenny? <p>Explain your reasoning.</p>

Grade 6

Strand: Patterns and Relations (Variables and Equations)

Students will:

- represent algebraic expressions in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Use informal and concrete representations of equality and operations on equality to solve problems.</p>	<p>5. Demonstrate and explain the meaning and preservation of equality by balancing objects, or by using models and diagrams. [C, CN, PS, R, V]</p> <p>6. Use pre-algebra strategies to solve equations with one unknown and with whole number coefficients and solutions. [PS, R]</p>	<p>5.1 How does the shape of a rectangle affect the perimeter, if the area remains constant? Generalize the effect on the perimeter when the sides are changed.</p> <p>5.2 Lydia has 144 squares of fudge arranged in a single layer. Suggest how she might design a box to hold the fudge and to have the smallest possible perimeter of its base.</p> <p>6.1 Use the balance scale at the mathematics centre to demonstrate how to find the masses of the various problem shapes.</p> <p>Possible scale set-ups:</p>  <p>6.2 Fill in the missing number(s) in each equation. Choose two and explain how you know your answer is correct.</p> <p>$7 + \square = 9 + 4$ $16 - 7 = 3 + \Delta$ $\Delta \times 6 = 60 \div 2$ $2 \times (3 + 5) = \square - 4$ $\Delta + (3 \times 6) = \Delta + \Delta + 15$</p> <p>6.3 Find the value of the variable in each equation. Choose one question you found easy, and one you found not easy to answer. Explain the strategy you used to solve each.</p> <p>a. $16 = n + 3$ b. $t + t + 7 = 15$ c. $d + 4 = (3 \times 2) + 4$ d. $33 - 12 = 37 - h$ e. $12 \div z = 24 \div 4$</p>

Grade 6

Strand: Shape and Space (Measurement)

Students will:

- describe and compare everyday phenomena, using either direct or indirect measurement.


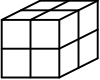

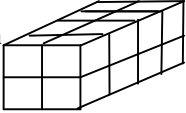

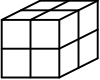

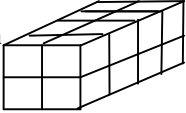

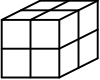

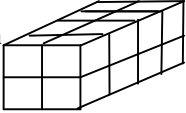
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<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>	<p>1. Use conversions among commonly used SI units of length, mass (weight) and capacity (volume) to solve problems. [E, PS]</p>	<p>1.1 Match the Canadian coin or bill with the correct width.</p> <table data-bbox="1223 472 1612 662"> <tr> <td>penny</td> <td>2.5 cm</td> </tr> <tr> <td>two dollar bill</td> <td>19 mm</td> </tr> <tr> <td>nickel</td> <td>0.07 m</td> </tr> <tr> <td>dollar coin (loonie)</td> <td>2.2 cm</td> </tr> <tr> <td>quarter</td> <td>0.02 m</td> </tr> <tr> <td>dime</td> <td>28 mm</td> </tr> </table> <p>Use a ruler and real money to check your decisions.</p> <p>1.2 What is the difference between the highest and lowest price. Explain how you know.</p> <table data-bbox="1223 854 1666 979"> <tr> <td>Alaskan pollock fillets</td> <td>69¢/100 g</td> </tr> <tr> <td>Pacific sole</td> <td>\$3.90/kg</td> </tr> <tr> <td>Manitoba whitefish</td> <td>\$0.32/100 g</td> </tr> <tr> <td>Fresh oysters</td> <td>\$3.99/500 g</td> </tr> </table>	penny	2.5 cm	two dollar bill	19 mm	nickel	0.07 m	dollar coin (loonie)	2.2 cm	quarter	0.02 m	dime	28 mm	Alaskan pollock fillets	69¢/100 g	Pacific sole	\$3.90/kg	Manitoba whitefish	\$0.32/100 g	Fresh oysters	\$3.99/500 g
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Grade 6

Strand: Shape and Space (Measurement)

Students will:

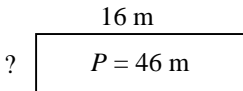
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples																																			
<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>	<p>2. Develop, verify and use rules or expressions for the perimeter of polygons. [CN, PS, R]</p>	<p>2-5 Use unit cubes to build the objects shown in the following chart. Complete the chart.</p> <table border="1" data-bbox="1231 456 2368 1328"> <thead> <tr> <th data-bbox="1231 456 1540 505">Figure</th> <th data-bbox="1545 456 1790 505">Perimeter of Top</th> <th data-bbox="1795 456 1983 505">Area of Top</th> <th data-bbox="1989 456 2177 505">Surface Area</th> <th data-bbox="2182 456 2368 505">Volume</th> </tr> </thead> <tbody> <tr> <td data-bbox="1231 508 1540 662">  </td> <td data-bbox="1545 508 1790 662"></td> <td data-bbox="1795 508 1983 662"></td> <td data-bbox="1989 508 2177 662"></td> <td data-bbox="2182 508 2368 662"></td> </tr> <tr> <td data-bbox="1231 665 1540 789"> <p>each dimension doubled</p>  </td> <td data-bbox="1545 665 1790 789"></td> <td data-bbox="1795 665 1983 789"></td> <td data-bbox="1989 665 2177 789"></td> <td data-bbox="2182 665 2368 789"></td> </tr> <tr> <td data-bbox="1231 792 1540 915"> <p>each dimension tripled</p> </td> <td data-bbox="1545 792 1790 915"></td> <td data-bbox="1795 792 1983 915"></td> <td data-bbox="1989 792 2177 915"></td> <td data-bbox="2182 792 2368 915"></td> </tr> <tr> <td data-bbox="1231 919 1540 1042">  </td> <td data-bbox="1545 919 1790 1042"></td> <td data-bbox="1795 919 1983 1042"></td> <td data-bbox="1989 919 2177 1042"></td> <td data-bbox="2182 919 2368 1042"></td> </tr> <tr> <td data-bbox="1231 1045 1540 1169"> <p>each dimension doubled</p>  </td> <td data-bbox="1545 1045 1790 1169"></td> <td data-bbox="1795 1045 1983 1169"></td> <td data-bbox="1989 1045 2177 1169"></td> <td data-bbox="2182 1045 2368 1169"></td> </tr> <tr> <td data-bbox="1231 1172 1540 1328"> <p>each dimension tripled</p> </td> <td data-bbox="1545 1172 1790 1328"></td> <td data-bbox="1795 1172 1983 1328"></td> <td data-bbox="1989 1172 2177 1328"></td> <td data-bbox="2182 1172 2368 1328"></td> </tr> </tbody> </table>	Figure	Perimeter of Top	Area of Top	Surface Area	Volume						<p>each dimension doubled</p> 					<p>each dimension tripled</p>										<p>each dimension doubled</p> 					<p>each dimension tripled</p>				
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Grade 6
 Strand: Shape and Space (Measurement)

Students will:

- describe and compare everyday phenomena, using either direct or indirect measurement.

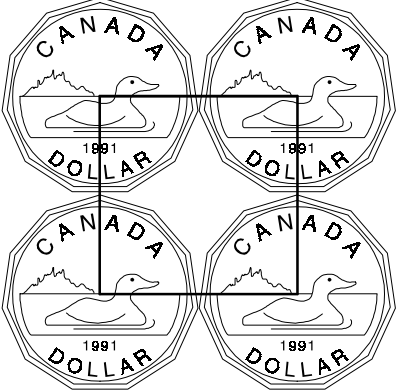
General Outcome	Specific Outcomes	Illustrative Examples
<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>		<p>2.1 Domenico has forgotten one dimension of a room. What is the missing dimension.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Three students each began to solve the problem.</p> <p>Domenico wrote: $P = L + W + L + W$ $46 = 16 + W + 16 + W$</p> <p>Jake wrote: $P = (2 \times L) + (2 \times W)$ $46 = (2 \times 16) + (2 \times W)$</p> <p>Owen wrote: $P = 2(L + W)$ $46 = 2(16 + W)$</p> <p>Choose one boy's work and finish solving the problem. What is the missing dimension? Explain why you chose the work you did.</p> <p>2.2 A triangular garden is a different length on each side. Side two is 3 metres shorter than side one, and side three is 8 metres longer than side one. If the perimeter of the garden is 65 metres, what is the length of each side?</p>

Grade 6

Strand: Shape and Space (Measurement)

Students will:

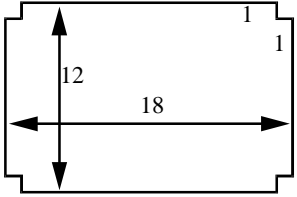
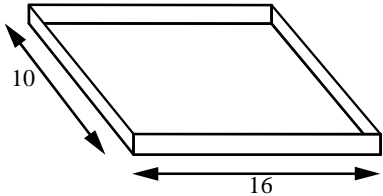
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>	<p>3. Develop, verify and apply rules or expressions for the area of rectangles (mm^2, cm^2, m^2, ha and km^2). [CN, PS, R]</p> <p>4. Estimate and determine the surface area of a right rectangular prism, without using a formula. [E, PS]</p>	<p>3.1 Four loonies are arranged as shown:</p>  <p>The centres of the loonies are the vertices of a square. If the radius of a loonie is 13 mm, what is the area of the square?</p> <p>3.2 Measure a football field, and use the measurements to calculate its area in hectares.</p> <p>4–5 Carefully observe a drink box. Then estimate:</p> <ul style="list-style-type: none"> – the surface area of the box in square centimetres – the volume of the box in cubic centimetres. <p>Measure the three dimensions. Explain how to use the dimensions to mentally estimate</p> <ul style="list-style-type: none"> – the area of a grid paper jacket for the drink box – the volume of the drink box. <p>Use centimetre cubes to explain how to calculate the volume of the drink box.</p> <p>Design a centimetre grid paper jacket to cover the box, and use the jacket to explain finding the surface area of a rectangular prism.</p> <p>4.1 Explain how to find the surface area of a rectangular prism.</p>

Grade 6
Strand: Shape and Space (Measurement)

Students will:

- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples								
<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>	<p>5. Discover, generalize and use rules for the volume of right rectangular prisms. [PS, R]</p> <p>6. Design and construct rectangles, given one or both of perimeter and area, using whole numbers. [PS, R]</p> <p>7. Demonstrate concretely, pictorially and symbolically that many rectangles are possible for a given perimeter or a given area. [CN, R]</p>	<p>5.1 A manufacturer of open boxes has a large supply of cardboard sheets, 12 units by 18 units in length. The box-making machine can be set to cut square corners from each sheet before folding it to make an open box.</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p>What is the volume of the box, if a 1 by 1 unit square is cut from each corner? Use centimetre paper to build a box with a 2-unit square cut from each corner. What is the volume of this box? Build and/or calculate the volume of all possible open boxes. What size of square should be cut from the cardboard sheets, if the open box is to have the greatest possible volume? Complete the chart to justify your answer.</p> <table border="1" data-bbox="1228 857 2228 993"> <thead> <tr> <th>Size of Square Cut Outs</th> <th>Length of Box</th> <th>Width of Box</th> <th>Volume of Box</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>5.2 Use a large, graduated cylinder to determine the volume of a bunch of grapes. A grape is about 8 times the size it will be if it is dried to form a raisin. What might be the dimensions of a snack box designed to hold your bunch of grapes, after it becomes raisins? Explain your reasoning.</p> <p>6–7.1 Loretta wants to put 12 small square tables together to make one larger rectangular table to use for a class party. She is using square tiles to experiment before she moves the tables. Use 12 tiles to find all possible arrangements. Use grid paper to record your solutions. Make a chart to show each solution. What is the area of each large table? What is the perimeter of each large table? Which one has the least perimeter? Try the same experiment with 15 tiles, 24 tiles, 30 tiles. Compare your results. Is there a relationship between the shape of a table and its perimeter?</p>	Size of Square Cut Outs	Length of Box	Width of Box	Volume of Box				
Size of Square Cut Outs	Length of Box	Width of Box	Volume of Box							

Grade 6

Strand: Shape and Space (Measurement)

Students will:

- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Solve problems involving perimeter, area, surface area, volume and angle measurement.</p>	<p>8. Determine the volume of an object by measuring the displacement of a liquid by that object (cm³ or mL). [PS, R]</p> <p>9. Recognize angles as being more than 90 degrees, equal to 90 degrees, less than 90 degrees, equal to 180 degrees, greater than 180 degrees. [V]</p> <p>10. Estimate and measure angles, using a circular protractor. [E]</p> <p>11. Sketch and draw an angle when the degree measure is specified. [E, V]</p> <p>12. Classify given angles as acute, right, obtuse, straight and reflex. [E]</p>	<p>6-7.2 You are building a run in the backyard for your dog. You have 24 m of fence wire and you want the run to be the shape of a rectangle. – Make at least two drawings of rectangles that you could use that would require all the fencing. – Explain which one you would choose to build, and why.</p> <p>8.1 Bring a stone to class and determine its volume.</p> <p>10, 12 Use pattern block pieces and name the type of interior angle present in all blocks in the sets: Set 1—hexagon, trapezoid, blue and tan rhombuses Set 2—triangle, trapezoid, blue and tan rhombuses.</p> <p>Combine pattern block pieces to form new angles. Trace and label an example for each: – combine 2 blocks to form an acute angle – combine 2 blocks to form an obtuse angle – combine 3 blocks to form a right angle – combine 5 blocks to form a straight angle.</p> <p>Demonstrate how to use a circular protractor to measure and name the angle in each answer traced above.</p>

Grade 6
Strand: Shape and Space (Measurement)

Students will:

- describe and compare everyday phenomena, using either direct or indirect measurement.

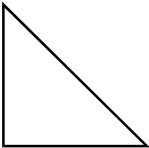
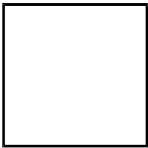
General Outcome	Specific Outcomes	Illustrative Examples
Solve problems involving perimeter, area, surface area, volume and angle measurement.	13. Identify and compare examples of angles in the environment. [CN, V]	<p>10, 13 Visualize angle ABC when you are B, the teacher's desk is A, and the classroom door is C. About what size is the angle? How can you check your estimate?</p> <p>10.1 Sketch and label a pizza that has been sliced to reveal these angles: $1-30^\circ$; $1-60^\circ$; $1-90^\circ$; $1-180^\circ$. Which piece would you be least likely to choose? Explain why.</p> <p>10.2 Determine the approximate and exact measures of the angle between the hour hand and the minute hand when the clock reads 1:15.</p> <p>13-14 Look at, or research business signs, logos, flags, etc. How common is it to see triangles in these creations? Name any triangles, according to their angles. Continue the search by observing art works and crafts. How are triangles used in quilting? Wallpaper designs? Stained glass windows? Use triangles in a creative work of your own. Present your work, describing what triangles you used.</p>

Grade 6

Strand: Shape and Space (3-D Objects and 2-D Shapes)


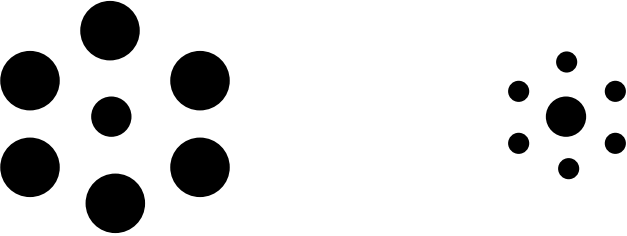
Students will:

- describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Use visualization and symmetry to solve problems involving classification and sketching.</p>	<p>14. Classify triangles according to the measures of their angles. [C, E]</p> <p>15. Sort quadrilaterals and regular polygons according to the number of lines of symmetry. [V]</p> <p>16. Reproduce a given geometric drawing on grid paper. [V]</p> <p>17. Sketch 3-D solids and skeletons with and without grids. [PS, T, V]</p>	<p>14–15</p> <ul style="list-style-type: none"> – Give as many similarities and differences about these figures as you can. – Draw a figure that you think is like Figure 1. Explain why you think it is like Figure 1. <div style="text-align: center;">   </div> <p>Figure 1 Figure 2</p> <p>14.1 On a geoboard, create as many different triangles as possible. Record the different (not congruent) triangles on grid paper, making sure not to repeat. Keep one triangle on the geoboard. With the rest of your class, sort these triangles by angle measure.</p> <p>15.1 You have been given four, 10-cm straws; four, 20-cm straws; and four pieces of pipe cleaner to act as corners. Construct, and draw quadrilaterals with: 0 lines of symmetry, 1 line, 2 lines, 3 lines, 4 lines. Look at your drawings. Can you predict the number of lines of symmetry a shape will have? Take four more 10-cm straws. Will your prediction work for regular polygons with 5 to 8 sides?</p> <p>16.1 Sketch a 1-cm grid onto a picture having a geometric design. Reproduce the picture on a larger scale grid paper.</p> <p>17.1 A single serving cereal box is 9 cm wide, 3 cm deep and 12 cm high. Use grid paper to draw a picture of the box. A larger box of the same cereal is three times as wide, deep and tall. Draw the box to actual scale on a large, plain sheet of paper.</p> <p>17.2 Sketch a 3-D statue, monument, or sculpture found in your community. What polygons or polyhedra help to guide your lines? Explain.</p> <p>17.3 Use isometric dot paper to draw the skeleton of a triangular prism. Use plain paper and a ruler to draw the skeleton of a triangular pyramid.</p>

Grade 6
 Strand: Shape and Space (3-D Objects and 2-D Shapes)
 Students will:

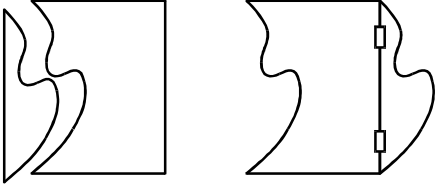
- describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

General Outcome	Specific Outcomes	Illustrative Examples
Use visualization and symmetry to solve problems involving classification and sketching.	18. Recognize and appreciate optical illusions. [V]	<p>18.1 Which is shorter?</p>  <p>18.2 Which centre circle is larger?</p> 

Grade 6
Strand: Shape and Space (Transformations)

Students will:

- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Create patterns and designs that incorporate symmetry, tessellations, translations and reflections.</p>	<p>19. Create, analyze and describe designs, using translations (slides) and reflections (flips). [C, T, V]</p> <p>20. Draw designs, using ordered pairs, in the first quadrant of the coordinate grid. [PS, V]</p>	<p>19.1 Raj cut away one side of a regular polygon to make a new shape. Then he slid the shape to the opposite side and fastened it securely with tape. He says the new shape will tessellate and his method of decorating the shape will result in a “cool” tiling pattern. Investigate Raj’s shape. Try your own tessellation, complete with unique decorating and colouring. Could the shape actually tile a surface? Report your work in an oral presentation to the class.</p> <div style="text-align: center;">  </div> <p>20.1 Plot these points on a coordinate grid.</p> <p>$A(1, 5)$ $D(6, 3)$ $B(1, 3)$ $E(6, 1)$ $C(2, 3)$ $F(5, 1)$</p> <p>Describe what combination of translations, rotation and/or reflections would move triangle ABC to the position of triangle DEF.</p> <p>Make up a problem with quadrilaterals in place of triangles.</p> <p>20.2 Plot these points on a coordinate grid.</p> <p>$A(2, 2)$ $C(2, 5)$ $B(3, 3)$ $D(0, 3)$</p> <p>Join the points A to B, B to C, C to D, D to A.</p> <p>Reflect the shape over a line drawn by joining $(4, 0)$ to $(4, 6)$. Name the location of points A', B', C' and D'.</p>

Grade 6

Strand: Statistics and Probability (Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.</p>	<ol style="list-style-type: none"> 1. Formulate questions for investigation, given a context. [C, CN, R] 2. Identify appropriate data sources: first-hand, second-hand and combination. [R] 3. Select and use appropriate methods of collecting data: <ul style="list-style-type: none"> • designing and using structured questionnaires • experiments • observations • electronic networks. [C, PS, T] 4. Select and defend the choice of an appropriate sample or population to be used to answer a question. [C, R] 	<p>1–4 You will often find a relationship between two different body measurements, such as the circumference of a person’s head to his or her height.</p> <p>What are some key questions you might form to guide your investigation of body relationships? Can you predict what conclusion might be expected for each? Write and carry out a plan for investigating one of your questions above. Include information on the following:</p> <ul style="list-style-type: none"> – sources of your data – sample size and makeup – method of data collection <p>Find two different but satisfactory ways to display your data so any relationships between body measurements are revealed. Draw conclusions about your investigation, and compare them to your predictions.</p> <p>1–2 It is Andrea’s thirteenth birthday today. How many other students in Canada have their thirteenth birthday today?</p> <p>4–5 Ray says the taller the basketball player, the more points she or he scores.</p> <p>Tell why each would or would not be an appropriate sample to use to verify his prediction.</p> <ul style="list-style-type: none"> – NBA scoring leaders in the last 10 years – all basketball players on a local high school team – the centres on last year’s provincial teams – the information he can find in a 1990 copy of <i>World Book Encyclopedia</i>.

Grade 6
Strand: Statistics and Probability (Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population.

General Outcome	Specific Outcomes	Illustrative Examples															
<p>Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.</p>	<p>5. Discuss how collected data are affected by the nature of the sample, the method of collection, the sample size and biases. [C, CN]</p>	<p>5.1 Carmen designed and handed out 100 questionnaires to middle year students in her school. One question she asked was this:</p> <p>What do you want to be? Choose one.</p> <p><input type="checkbox"/> Doctor/Dentist <input type="checkbox"/> Teacher <input type="checkbox"/> Lawyer <input type="checkbox"/> Sports Manager, Coach or Trainer</p> <p>50 questionnaires were returned. Here are the results.</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th style="text-align: center;">Boys</th> <th style="text-align: center;">Girls</th> </tr> </thead> <tbody> <tr> <td>Doctor/Dentist</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Teacher</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Lawyer</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td>Sports/Manager, etc.</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </tbody> </table> <p>Carmen reached the conclusion that most students will become doctors or dentists.</p> <p>Tell if you agree with each, and describe what else she might have done:</p> <ul style="list-style-type: none"> - the wording of Carmen's question - the method of gathering data - the sample she chose to survey - the conclusion she reached. 		Boys	Girls	Doctor/Dentist			Teacher			Lawyer			Sports/Manager, etc.		
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Grade 6

Strand: Statistics and Probability (Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population.

General Outcome	Specific Outcomes	Illustrative Examples																									
<p>Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.</p>	<p>6. Display data by hand or by computer in a variety of ways, including:</p> <ul style="list-style-type: none"> • histograms • double bar graphs • stem and leaf plots. <p>[C, T, V]</p>	<p>6.1 The following are the marks that a class got on the last mathematics test: 75, 65, 88, 92, 45, 47, 59, 74, 48, 96, 75, 56, 67, 69, 76, 59, 76, 58, 94, 55, 79, 89, 96, 86. Use a stem and leaf plot to display the data.</p> <p>6.2 Annual precipitation in the various regions of Canada is shown below:</p> <table data-bbox="1266 630 1720 755"> <tr> <td>Coastal regions</td> <td>100</td> <td>–</td> <td>400 cm</td> </tr> <tr> <td>Ontario and Quebec</td> <td>65</td> <td>–</td> <td>90 cm</td> </tr> <tr> <td>Prairie region</td> <td>40</td> <td>–</td> <td>55 cm</td> </tr> <tr> <td>Northlands</td> <td>15</td> <td>–</td> <td>40 cm</td> </tr> </table> <p>Display the above data, using a suitable graph. Briefly describe why you chose the graph that you did.</p> <p>6.3 The magazine <i>Sports Illustrated for Kids</i> asked many young people this question:</p> <p>“Have you ever played on a sports team where your mom or dad was coach?”</p> <p>These were the results:</p> <table data-bbox="1225 1141 1518 1234"> <tr> <td>Yes</td> <td>42.9%</td> <td>(dad)</td> </tr> <tr> <td></td> <td>5.2%</td> <td>(mom)</td> </tr> <tr> <td></td> <td>1.9%</td> <td>(both)</td> </tr> </table> <p>No 50%</p> <p>Display the survey results on two different graphs. Give reasons for your choice of graphs.</p>	Coastal regions	100	–	400 cm	Ontario and Quebec	65	–	90 cm	Prairie region	40	–	55 cm	Northlands	15	–	40 cm	Yes	42.9%	(dad)		5.2%	(mom)		1.9%	(both)
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Grade 6

Strand: Statistics and Probability (Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.</p>	<p>7. Read and interpret graphs that are provided. [C, E, PS, R]</p> <p>8. Describe the general distribution of data, using:</p> <ul style="list-style-type: none"> • smallest and largest value • frequency • value in the middle • patterns. <p>[C, CN]</p> <p>9. Analyze sets of data to make comparisons. [E, PS, R]</p>	<p>7, 9 Two candidates (A and B) ran for election for school president in 1993. The graph at the left shows the results. One candidate used those results during the 1994 election campaign and prepared the graph at the right. Which candidate prepared the 1994 graph? How did the candidate misuse the information?</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="1185 511 1669 852"> <p>1993 Actual Results</p> </div> <div data-bbox="1741 511 2333 852"> <p>1993 Results Used in 1994 Campaign</p> </div> </div> <p>7.1 Our Favourite Sport to Play</p> <div style="text-align: center;"> <p>Legend: Boys Girls</p> </div> <p>What are some conclusions you can make from this graph? Explain your reasoning for each. What important information is not provided by this graph? Could this graph be true for the students in your class? Your school? Why?</p>

Grade 6
 Strand: Statistics and Probability (Data Analysis)

Students will:

- collect, display and analyze data to make predictions about a population.

General Outcome	Specific Outcomes	Illustrative Examples																												
Develop and implement a plan for the collection, display and analysis of data gathered from appropriate samples.		<p>8.1 A Grade 6 class measured their heights to the nearest centimetre.</p> <table data-bbox="1223 472 1876 597"> <tbody> <tr> <td>137</td> <td>115</td> <td>153</td> <td>179</td> <td>164</td> <td>143</td> <td>170</td> </tr> <tr> <td>142</td> <td>129</td> <td>157</td> <td>153</td> <td>128</td> <td>161</td> <td>149</td> </tr> <tr> <td>139</td> <td>164</td> <td>121</td> <td>138</td> <td>161</td> <td>119</td> <td>140</td> </tr> <tr> <td>137</td> <td>157</td> <td>136</td> <td>126</td> <td>149</td> <td>143</td> <td>149</td> </tr> </tbody> </table> <p>What are the least and greatest heights? What chart or graph would best reveal the two numbers? What height occurred more often than any other height? What chart or graph would best reveal this number? What height represents the middle of all the heights? How do you know? What chart or graph best reveals this?</p>	137	115	153	179	164	143	170	142	129	157	153	128	161	149	139	164	121	138	161	119	140	137	157	136	126	149	143	149
137	115	153	179	164	143	170																								
142	129	157	153	128	161	149																								
139	164	121	138	161	119	140																								
137	157	136	126	149	143	149																								

Grade 6

Strand: Statistics and Probability (Chance and Uncertainty)

Students will:

- use experimental or theoretical probability to represent and solve problems involving uncertainty.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Use numbers to communicate the probability of single events from experiments and models.</p>	<p>10. Distinguish between experimental and theoretical probability for single events. [PS, R]</p> <p>11. Make the connection between the number of faces, for various dice, and the probability of a single event. [CN, R]</p> <p>12. Calculate theoretical probability, using numbers between 0 and 1. [E, PS]</p> <p>13. Demonstrate that different outcomes may occur when repeating the same experiment. [PS, T]</p> <p>14. Compare experimental results with theoretical results. [C, E, R]</p>	<p>10, 14 You have a cube with faces numbered 1 to 6. – What is the theoretical probability of rolling: a 6? A 4? A 1? – Perform an experiment with a die and compare the results.</p> <p>11, 12 Draw and label the net of a die to match each statement. – The probability of rolling an odd number is $\frac{5}{6}$. – The chance of rolling a prime number is $\frac{0}{4}$. – The likelihood of rolling a multiple of two is $\frac{5}{8}$.</p> <p>13.1 Toss a styrofoam cup, repeatedly, on a flat surface. Note how many times it lands in each position. Keep a record for 40 tosses. – How many times did the cup land on its side? Top? Bottom? – How would you express each as a probability? Side? Top? Bottom? – Based on the results of the above experiment, predict how many times the cup would land on its top, if you tossed it 1000 times.</p>