

The Common Curriculum Framework

for

# K-12 MATHEMATICS

( 10-12 is under development )

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Western Canadian Protocol for Collaboration in Basic Education

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**GRADE 8**

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)

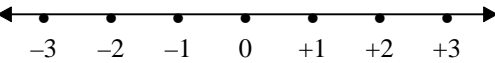
The illustrative examples (IEs) listed on the following pages are organized by grade and have been correlated to specific outcomes (SOs). The coding used recognizes that IEs relating to more than one SO are listed before those relating to only one SO. Examples of the coding system are listed below.

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 8  
Strand: Number (Number Concepts)

Students will:

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

General Outcome	Specific Outcomes	Illustrative Examples
<p>Demonstrate a number sense for rational numbers, including common fractions, integers and whole numbers.</p>	<p>1. Demonstrate and explain the meaning of a negative exponent, using patterns (limit to base 10). [C, CN, R, V]</p> <p>2. Represent any number in scientific notation. [R]</p> <p>3. Define, compare and order any rational numbers. [R, T, V]</p>	<p>1.1 Look for a pattern in both the top and bottom numbers. Continue the patterns.</p> <p>100 000, 10 000, 1000, 100, 10, ____, ____, ____, ____  <math>10^5, 10^4, 10^3, 10^2, 10^1, \_, \_, \_, \_</math></p> <p>What is the connection between the two patterns?          Make a rule to explain.</p> <p>2.1 The number of visitors to Banff National Park in 1989 was <math>4.032\ 396 \times 10^6</math>, and the number of visitors to Kootenay National Park was 1 555 607. Which park had more visitors? How many more?          Give your answer in standard notation.</p> <p>2.2 If <math>5.03 \times 10^{-5}</math> was incorrectly written as <math>5.03 \times 10^5</math>, how many times larger is this?</p> <p>2.3 The diameter of a human hair is 0.000 07 m. Write this number in scientific notation, using metres as the unit of measure. What is the diameter in centimetres?</p> <p>3.1 Show how you could represent and compare the numbers 0.34 and 0.43, using base-10 blocks when:          – the cube represents one          – the flat represents one.</p> <p>Explain why <math>-0.43</math> is less than <math>-0.34</math>.</p> <p>3.2 Explain where you would place each of the following numbers on the number line.</p> <p><math>+1.75, -1.2, -\frac{6}{5}, +\frac{2}{3}</math></p> 

Grade 8  
Strand: Number (Number Concepts)

Students will:

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

General Outcome	Specific Outcomes	Illustrative Examples
<p>Demonstrate a number sense for rational numbers, including common fractions, integers and whole numbers.</p>	<p>4. Demonstrate concretely, pictorially and symbolically that the product of reciprocals is equal to 1. [R, V]</p> <p>5. Express 3-term ratios in equivalent forms. [CN]</p> <p>6. Represent and apply fractional per cents, and per cents greater than 100, in fraction or decimal form, and vice versa. [CN, R]</p>	<p>4.1 Doris has <math>1\frac{1}{3}</math> large pizzas left over from a party. At lunch the next day, her family ate <math>\frac{3}{4}</math> of the leftovers. Doris said they ate one whole pizza in total. Use fraction circles to represent the pizzas to decide if Doris is correct. Explain why or why not.</p> <p>4.2 Select appropriate Cuisenaire rods to explain why <math>\frac{4}{1} \times \frac{1}{4} = 1</math>. Draw a diagram to show what you did.</p> <p>5.1 Three classes have the same ratio of girls to boys. In Elisapee's class there are 6 girls and 5 boys. Bert's class has 15 boys and Karen's class has 12 girls. Show the equivalent ratios of girls to boys in Elisapee's, Bert's and Karen's classes.</p> <p>5.2 A recipe calls for 250 mL of sugar, 500 mL of oatmeal and 750 mL of flour. Write the amounts of ingredients as a ratio. Write another equivalent ratio.</p> <p>6.1 John made a chart to illustrate per cents. He started with a large <math>10 \times 10</math> grid. He folded it in half and shaded half the squares. He counted the shaded squares and wrote <math>\frac{50}{100} = 50\%</math>. He then folded the unshaded part in half and shaded the new half a different colour. He counted shaded parts and wrote <math>\frac{25}{100} = 25\%</math>. He did this three more times.  Use a large grid to copy and complete John's work. Use the results from your work to show 150%, 212%, and <math>103\frac{1}{8}\%</math>.</p> <p>6.2 How could you use <math>10 \times 10</math> grid sheets to represent:  <math>33\frac{1}{3}\%</math>, <math>166\frac{2}{3}\%</math>, 210%.</p>



Grade 8

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 rational numbers to solve problems.</p>	<p>9. Add, subtract, multiply and divide fractions concretely, pictorially and symbolically. [E, PS, V]</p> <p>10. Estimate, compute and verify the sum, difference, product and quotient of rational numbers, using only decimal representations of negative rationals. [E, PS, T]</p>	<p>9.1 Eric ordered several large pizzas for a party. <math>1\frac{1}{2}</math> pepperoni pizzas and <math>\frac{2}{3}</math> of a pineapple pizza were not eaten. Was there more than one large pizza left over? Explain how you can estimate the answer. Add <math>1\frac{1}{2} + \frac{2}{3}</math>, using a pencil and paper method, and use paper circles to explain your method and your answer.</p> <p>9.2 Mr. Blair’s gas tank was <math>\frac{7}{8}</math> full when he left home. He used <math>\frac{3}{4}</math> of a tank of gas on his errands. What fraction of a tank of gas was left? Explain how you know the answer is less than <math>\frac{1}{4}</math> by subtracting <math>\frac{7}{8} - \frac{3}{4}</math>, using a pencil and paper method, and use fraction strips to explain your method and your answer.</p> <p>9.3 Lisa had <math>\frac{3}{4}</math> of a large candy bar. She gave <math>\frac{1}{3}</math> of what she had to Shannon. Explain how you know that Shannon got less than <math>\frac{1}{3}</math> of a whole bar by: – multiplying <math>\frac{1}{3} \times \frac{3}{4}</math>, using a pencil and paper method – explaining your method and your answer by folding a piece of paper that represents a whole candy bar.</p> <p>9.4 Miko has <math>2\frac{1}{2}</math> m of blue cloth. How many pieces <math>\frac{1}{4}</math> m long can she cut from her piece? Estimate the answer and explain the solution by: – dividing <math>2\frac{1}{2} \div \frac{1}{4}</math>, using a pencil and paper method – using Cuisenaire rods to explain your method and your answer.</p> <p>9.5 In the community hall, <math>\frac{1}{4}</math> of the people present are men, <math>\frac{1}{3}</math> are women and the rest are children. There are 840 people in the hall. How many children are there?</p> <p>10.1 Pam recorded the daily high temperatures for one week and found the average high temperature for the week to be <math>-4.1^{\circ}\text{C}</math>. If the temperatures from Sunday to Friday were <math>+11.7^{\circ}\text{C}</math>, <math>-17.4^{\circ}\text{C}</math>, <math>0^{\circ}\text{C}</math>, <math>-23.6^{\circ}\text{C}</math>, <math>-13.9^{\circ}\text{C}</math>, and <math>+9.1^{\circ}\text{C}</math>, what was the temperature on Saturday? Explain how you would estimate the answer. Calculate the answer and compare it with your estimate.</p> <p>10.2 René spends half his money buying a ticket at the school dance. From one third of the money he has left, he buys himself a bag of chips and a soft drink. When he gets home, he has \$4.50. How much money did he have when he went to the dance?</p>

Grade 8

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 rational numbers to solve problems.</p> <p>Apply the concepts of rate, ratio, percentage and proportion to solve problems in meaningful contexts.</p>	<p>11. Estimate, compute (using a calculator) and verify approximate square roots of whole numbers and of decimals. [E, PS, T]</p> <p>12. Use concepts of rate, ratio, proportion and per cent to solve problems in meaningful contexts. [E, PS, T]</p>	<p>11.1 Steve knew the square root of 30 must be between 5 and 6 since 30 is between 25 and 36. He estimated it to be 5.6. He then used his calculator to find <math>(5.6)^2 = 31.36</math>. He then tried <math>(5.5)^2 = 30.25</math> and <math>(5.4)^2 = 29.16</math>. He said 5.5 was the closest. Explain. Use Steve’s method to find the square root of 40 to the nearest tenth and the square root of 20.5 to the nearest hundredth.</p> <p>11.2 A domino is 2 squares side by side. If the area of the top is <math>882 \text{ mm}^2</math>, what are the dimensions of the domino?</p> <p>12.1 Have you read, or heard of, the book by Jonathan Swift called <i>Gulliver’s Travels</i>? Gulliver, a ship captain, suffers a shipwreck, and finds himself in the land of Lilliput. Here he finds that the heights of the people, plants and animals are in a 1:12 ratio to the heights of the people, plants and animals in his world. Use the measuring tape to measure yourself. Then complete this chart.</p> <table border="1" data-bbox="1231 769 1997 984"> <thead> <tr> <th>Body Part</th> <th>Actual Length</th> <th>Length in Lilliput</th> </tr> </thead> <tbody> <tr> <td>Length of middle finger</td> <td></td> <td></td> </tr> <tr> <td>Length of your foot</td> <td></td> <td></td> </tr> <tr> <td>Your choice</td> <td></td> <td></td> </tr> </tbody> </table> <p>Each day the Emperor of Lilliput gave Gulliver the food and drink necessary to feed about 1 728 Lilliputians. How did the Emperor’s mathematicians arrive at this number? Explain why this should be about the right amount.</p> <p>12.2 Which is the better buy: 1.2 L orange juice for \$2.50 or 0.75 L orange juice for \$1.40?</p> <p>12.3 Walter and Pat have the same ratio of cats to dogs in their kennels. Walter has 3 cats for every 5 dogs. Pat has 48 cats and dogs altogether. How many of Pat’s animals are dogs?</p> <p>12.4 [Relates to Data Analysis, Specific Outcome 4] A class of 25 students has an average mark of 65% on a written test; a second class of 21 students has an average of 60%, and a third class of 23, an average of 67%. Find the average mark for all of the students.</p>	Body Part	Actual Length	Length in Lilliput	Length of middle finger			Length of your foot			Your choice		
Body Part	Actual Length	Length in Lilliput												
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Length of your foot														
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Grade 8  
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.

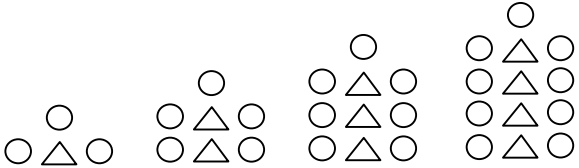
General Outcome	Specific Outcomes	Illustrative Examples
<p>Apply the concepts of rate, ratio, percentage and proportion to solve problems in meaningful contexts.</p>	<p>13. Calculate combined percentages in a variety of meaningful contexts. [CN, E, PS, T]</p> <p>14. Derive and apply unit rates. [PS, R]</p> <p>15. Express rates and ratios in equivalent forms. [PS, R]</p>	<p>13.1 Suits selling regularly for \$185.00 were marked down by 25%. To further improve sales, the discount price was reduced by another 15%. What was the final selling price? What was the total per cent of discount on the original price?</p> <p>13.2 A store had a NO GST sale. Darcy purchased a skirt priced at \$39.99. When she paid for it, the clerk first subtracted 7% to get a new price and then added 7% GST to this new price. Is this a fair way to calculate the price? Why would a store use this practice?</p> <p>14.1 Jerry bought 3.5 kg of apples for \$5.25. What was the cost of 1 kg?</p> <p>14.2 Toothpaste is advertised as 75¢ for a 50 mL tube. A 75 mL tube is priced at \$1.09. Which is the better buy? Why?</p> <p>15.1 Gas usage is expressed as the rate of number of litres of gas used per 100 km. On a 225 km trip, Nadia used 20.5 L of gas. Express her usage in terms of the above rate. Why do you think this type of rate is used?</p> <p>15.2 Jelly powder was on sale for three packages for \$1.68. Make a chart to show the cost of 6 packages, 9 packages, 12 packages.</p> <p>15.3 In Canada, there are 1 million curlers registered in 1200 clubs. In Scotland, there are 50 000 curlers in 52 clubs, and in Sweden there are 9000 curlers in 36 clubs. Write a ratio for each to compare the number of curlers to the number of clubs, and arrange these in order of size from least to greatest.</p>

Grade 8

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 patterns, variables and expressions, together with their graphs, to solve problems.</p>	<p>1. Generalize a pattern arising from a problem-solving context, using mathematical expressions and equations, and verify by substitution. [C, CN, PS, R]</p>	<p>1.1 Long-Foi made the following pictures with circles and triangles.</p>  <p>He started making a chart to show the number of circles and triangles in each picture.</p> <table border="1" data-bbox="1231 721 2037 967"> <thead> <tr> <th>Picture</th> <th>Number of Circles</th> <th>Number of Triangles</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3</td> <td>1</td> </tr> <tr> <td>2</td> <td>5</td> <td>2</td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> </tbody> </table> <p>Complete Long-Foi's chart and look for a pattern.</p> <p>Write a mathematics sentence to show the relationship between the number of circles and the number of triangles. Make concrete models or pictures to verify your answers. How many circles would you need in a picture with 12 triangles? How can you find and verify the answer? Substitute numbers in your sentence for each picture.</p>	Picture	Number of Circles	Number of Triangles	1	3	1	2	5	2	3			4		
Picture	Number of Circles	Number of Triangles															
1	3	1															
2	5	2															
3																	
4																	

Grade 8

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 patterns, variables and expressions, together with their graphs, to solve problems.</p>	<p>2. Substitute numbers for variables in expressions, and graph and analyze the relation. [C, PS, R, V]</p> <p>3. Translate between an oral or written expression and an equivalent algebraic expression. [C, CN]</p>	<p>2.1 Brock started making a chart to show the value of <math>y</math> when <math>x</math> changes for the expression <math>y = x + 2</math></p> <table border="1" data-bbox="1292 456 1489 545"> <tr> <td><math>x</math></td> <td>0</td> <td>1</td> <td>2...</td> </tr> <tr> <td><math>y</math></td> <td>2</td> <td>3</td> <td>4...</td> </tr> </table> <p>Complete Brock's chart and make a graph to show the relationship. Analyze the graph.</p> <p>3.1 Write an algebraic expression for the following: When a number is doubled and increased by seven, the result is twenty.</p> <p>3.2 Describe the following algebraic equation in words.</p> $\frac{x}{2} + 5 = x + 2$ <p>3.3 Carl has 30 coins, all dimes and quarters. Write an expression to represent</p> <ul style="list-style-type: none"> <li>– the number of dimes, if he has <math>x</math> quarters</li> <li>– the total value of the coins.</li> </ul>	$x$	0	1	2...	$y$	2	3	4...
$x$	0	1	2...							
$y$	2	3	4...							

Grade 8

Strand: Patterns and Relations (Variables and Equations)

Students will:

- represent algebraic expressions in multiple ways.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Solve and verify one-step and two-step linear equations with rational number solutions.</p>	<p>4. Illustrate the solution process for a two-step, single-variable, first-degree equation, using concrete materials or diagrams. [CN, PS, V]</p> <p>5. Solve and verify one- and two-step, first-degree equations of the form:</p> <ul style="list-style-type: none"> <li>• <math>x + a = b</math></li> <li>• <math>ax = b</math></li> <li>• <math>\frac{x}{a} = b</math></li> <li>• <math>ax + b = c</math></li> <li>• <math>\frac{x}{a} + b = c</math></li> </ul> <p>where <math>a, b</math> and <math>c</math> are integers. [PS, V]</p> <p>6. Create and solve problems, using first-degree equations. [PS]</p>	<p>4-6.1 Joe had 5 sports cards. He bought 3 packs with the same number of cards in each pack. If he now has 35 cards in all, how many were in each pack? Write an equation, and show how to solve it algebraically. Verify your answer by substituting it in your equation or by using algebra tiles.</p> <p>4-6.2 Hans gave Vera half his marbles. She lost seven of the marbles Hans gave her and had 23 left. How many marbles did Hans have to start with? Write an equation, and show how to solve it algebraically. Verify your answer by substituting it in your equation or by using counters.</p> <p>5-6.1 Kiotaka made 76 sandwiches for a party. If 29 were left over, how many were eaten? Write an equation and show how to solve it algebraically. Verify your answer by substituting it in your equation or by using base-10 blocks.</p> <p>5-6.2 Kassidy bought five CDs at the same price each and paid a total of \$84.45. How much did each CD cost? Write an equation, and show how to solve it algebraically. Verify your answer by substituting it in your equation.</p> <p>5-6.3 Maria had a length of fabric to make banners. She divided the fabric into six equal pieces, and each piece was 2.75 m long. What was the length of the fabric? Write an equation, and show how to solve it algebraically. Verify your answer by substituting it in your equation or by using strips of grid paper.</p> <p>6.1 The following is some information that will be the basis of your constructing a word problem.</p> <p style="padding-left: 40px;">It is 300 km from Regina to Gull Lake. About halfway between the two locations is Chaplin. Deleho drives her car the speed limit on No. 1 highway. Alain drives his convertible 10 km slower than Deleho.</p> <p>Write two problems or questions based on this information.</p>

Grade 8

Strand: Shape and Space (Measurement)

Students will:

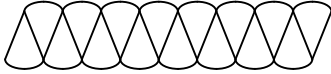
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Apply indirect measurement procedures to solve problems.</p> <p>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>	<ol style="list-style-type: none"> <li>1. Use concrete materials and diagrams to develop the Pythagorean relationship. [CN, R]</li> <li>2. Use the Pythagorean relationship to calculate the measure of the third side, of a right triangle, given the other two sides in 2-D applications. [PS]</li> <li>3. Describe patterns, and generalize the relationships by determining the areas and perimeters of quadrilaterals and the areas and circumferences of circles. [C, CN, PS, T]</li> </ol>	<ol style="list-style-type: none"> <li>1.1 Tara is investigating the relationship among the three sides of a right triangle. She drew a right triangle in the middle of a sheet of paper and then constructed a square on each side of the triangle. Then she tried to cut the two smaller squares and fit them on the largest square. Try Tara’s investigation, using right triangles with different shapes. Explain what you find.</li> <li>2.1 Jamie wants to walk from one corner of the rectangular playground to the opposite corner. The playground is 30 m by 50 m. What is the shortest route he can take? Explain.</li> <li>3.1 The dimensions of five decorative gardens are given below. Which garden has the greatest area? <ul style="list-style-type: none"> <li>– square with sides 10.2 m</li> <li>– rectangle with length 15 m and width 6.9 m</li> <li>– parallelogram with base 14.6 m and height 7.2 m</li> <li>– triangle with base 16.5 m and height 12.4 m</li> <li>– trapezoid with bases of 18.1 m and 10.4 m, and height 7.1 m.</li> </ul> </li> <li>3.2 Create a lake and island board by using the following directions: <ul style="list-style-type: none"> <li>– a rectangular island A with an area of about 100 cm<sup>2</sup></li> <li>– a triangular island B with an area of about 18 cm<sup>2</sup></li> <li>– an irregular shaped island C with an area of about 50 cm<sup>2</sup></li> <li>– a circular shaped island D with an area of about 25 cm<sup>2</sup>.</li> </ul> </li> <li>3.3 You want to paint one wall of your room. The wall is 7.0 m long and 2.4 m high. It takes one small can of paint to cover 9 m<sup>2</sup> and the paint sells for \$3.99 a can. <ul style="list-style-type: none"> <li>– What would it cost you, if you purchase only paint?</li> <li>– What else do you need to think of?</li> <li>– Make a plan for your trip to the store for supplies for this painting job.</li> </ul> </li> </ol>

Grade 8  
Strand: Shape and Space (Measurement)

Students will:

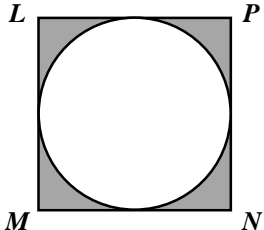
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples																																				
<p>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>		<p>3.4 Melodie said that to find the perimeter of a triangle, you only have to measure one side and multiply by 3. Do you agree? Cut straws in several different lengths and make as many different triangles as you can. Use these straw triangles to explain your answer. Make a rule to find the perimeter of a triangle.</p> <p>3.5 Trace a circle. Fold it in half four times to make 16 sectors. Cut out the sectors. Place the sectors in a line, alternating the bases to form a parallelogram. e.g.,</p>  <p>Show that the height is the radius of the circle and the base is half the circumference. Use this to find a rule for the area of a circle.</p> <p>3.6 Aaron sketched some parallelograms on grid paper and cut them out. Then he cut a piece off one end of each parallelogram and fit it on the other side to form a rectangle. He made this chart:</p> <table border="1" data-bbox="1231 852 2268 1198"> <thead> <tr> <th>Base of Parallelogram</th> <th>Height of Parallelogram</th> <th>Area of Parallelogram</th> <th>Base of Rectangle</th> <th>Height of Rectangle</th> <th>Area of Rectangle</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>4</td> <td>12</td> <td>3</td> <td>4</td> <td>12</td> </tr> <tr> <td>2.5</td> <td>3.5</td> <td>8.75</td> <td>2.5</td> <td>3.5</td> <td>8.75</td> </tr> <tr> <td>1.5</td> <td>4.2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>6.5</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Finish Aaron's chart, and look for a pattern. Test your pattern. Make a rule to find the area of a parallelogram. What other information should Aaron include on his chart to identify a pattern for finding the perimeter of a parallelogram?</p>	Base of Parallelogram	Height of Parallelogram	Area of Parallelogram	Base of Rectangle	Height of Rectangle	Area of Rectangle	3	4	12	3	4	12	2.5	3.5	8.75	2.5	3.5	8.75	1.5	4.2					3	6.5										
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Grade 8  
Strand: Shape and Space (Measurement)

Students will:

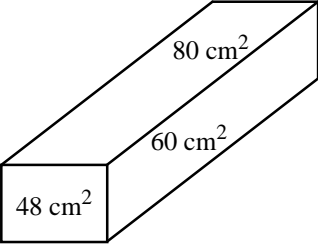
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>	<p>4. Estimate, measure and calculate the surface area and volume of any right prism or cylinder. [E, PS, T]</p>	<p>3.7 Yolande drew some triangles in different sizes and shapes. She then cut out two of each triangle. She fit each pair of triangles together to make a parallelogram. Try Yolande's investigation. Justify that each shape you make is a parallelogram. How can you use this investigation to make a rule for finding the area of a triangle? Do the same thing with trapezoids.</p> <p>3.8 How many sides of a trapezoid must you measure to find the perimeter? Explain your answer.</p> <p>3.9 The perimeter of the square <math>LMNP</math> is 60 cm. Find the:</p> <ul style="list-style-type: none"> <li>- diameter of the circle</li> <li>- circumference of the circle</li> <li>- area of the circle</li> <li>- area of the shaded region.</li> </ul> <div style="text-align: center;">  </div> <p>4.1 How much cardboard does it take to make a cereal box? Cut some cereal boxes to form nets. How many faces does each have? What shape are the faces? Are any of the faces the same size? How could you find the area of each face?</p> <p>Use the data you collected to make a rule for finding the surface area of a right prism. Use your rule to find which of your cereal boxes has the greatest surface area.</p>

Grade 8  
Strand: Shape and Space (Measurement)

Students will:

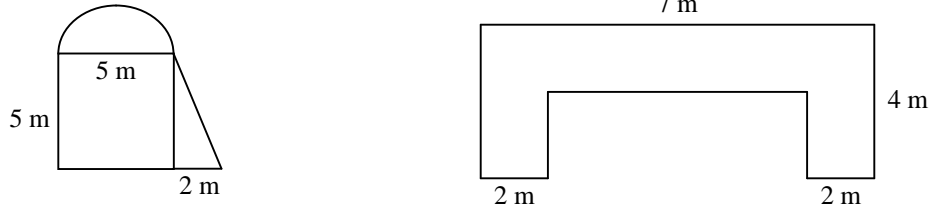
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>		<p>4.2 Collect some cardboard cylinders that have lids. Cut the cylinders to form nets. How many faces does each have? What shape are the faces? Are any of the faces identical? Could you find the area of each face?</p> <p>Use the data you collected to make a rule for finding the surface area of a cylinder. Use your rule to find the surface areas of your cylinders.</p> <p>4.3 Wole had a jelly powder box and some centicubes. He first estimated how many cubes would fit in the box. Next, he filled the box, dumped out the cubes and counted them. How should Wole place the cubes in the box to get the most accurate measure? Explain. If Wole finds out how many cubes cover the bottom of the box, how can he use this information to find the volume of the box in cubic centimetres? Make a rule for finding the volume of a right prism. Test your rule with another prism.</p> <p>4.4 Hugh had a small juice can and some centicubes. He first estimated how many cubes would fit in the can. Next, he filled the can with cubes, dumped them out and counted them. Is the volume (in cubic centimetres) he gets from this experiment larger or smaller than the actual volume? Explain. Hugh decided to find a way to get a more accurate answer. He traced the base of the juice can on some <math>\text{cm}^2</math> grid paper and counted the number of squares inside the circle. What will this tell him? What else does Hugh need to do to find the volume of the cylinder? Make a rule for finding the volume of any cylinder. Test your rule with another cylinder.</p> <p>4.5 The areas of the faces of a rectangular box are given in <math>\text{cm}^2</math>. What is the volume of the box?</p> 

Grade 8  
Strand: Shape and Space (Measurement)

Students will:

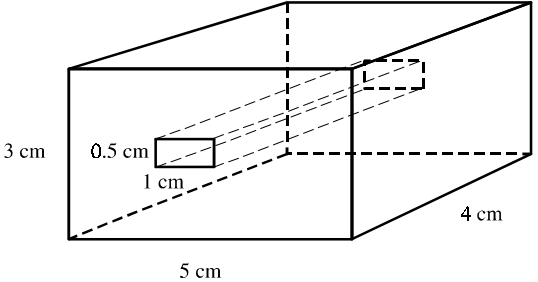
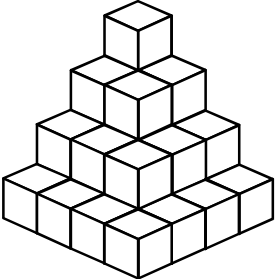
- describe and compare everyday phenomena, using either direct or indirect measurement.

General Outcome	Specific Outcomes	Illustrative Examples
Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.	5. Estimate and calculate the area of composite figures. [E, PS, R]	5.1 First estimate, and then find, the area of the figures below.  <p>The first figure is a composite shape consisting of a rectangle with a width of 5 m and a height of 5 m. A semicircle is attached to the top edge of the rectangle. To the right of the rectangle, a triangle is attached with a base of 2 m and a height of 5 m.</p> <p>The second figure is a U-shaped polygon. The top horizontal edge is 7 m long. The two vertical edges on the right side are 4 m high. The bottom edge consists of a central horizontal segment that is 2 m wide, and two vertical segments on either side, each 2 m wide, forming a notch.</p>

Grade 8  
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>Generalize measurement patterns and procedures, and solve problems involving area, perimeter, surface area and volume.</p>	<p>6. Estimate, measure and calculate the surface area of composite 3-D objects. [E, PS, R]</p> <p>7. Estimate, measure and calculate the volume of composite 3-D objects. [E, PS, R]</p>	<p>6-7 First estimate, and then find, the volume and the surface area of the figure below. The figure is a <math>3\text{ cm} \times 4\text{ cm} \times 5\text{ cm}</math> solid block of wood with a <math>1\text{ cm} \times 0.5\text{ cm} \times 4\text{ cm}</math> hole cut in it.</p>  <p>6.1 Thirty unit cubes are stacked in square layers to form a tower, as shown below.</p>  <p>Determine the total surface area of the tower of cubes.</p> <p>Suppose that the number of cubes and height of the tower are increased according to this pattern. Complete the table below for several specific towers.</p> <table border="1" data-bbox="1223 1263 2507 1409"> <thead> <tr> <th>Bottom Layer of Tower</th> <th>Total Number of Cubes</th> <th>Surface Area of Tower</th> </tr> </thead> <tbody> <tr> <td>5 cubes by 5 cubes</td> <td></td> <td></td> </tr> <tr> <td>8 cubes by 8 cubes</td> <td></td> <td></td> </tr> <tr> <td>10 cubes by 10 cubes</td> <td></td> <td></td> </tr> </tbody> </table>	Bottom Layer of Tower	Total Number of Cubes	Surface Area of Tower	5 cubes by 5 cubes			8 cubes by 8 cubes			10 cubes by 10 cubes		
Bottom Layer of Tower	Total Number of Cubes	Surface Area of Tower												
5 cubes by 5 cubes														
8 cubes by 8 cubes														
10 cubes by 10 cubes														

Grade 8

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

Students will:

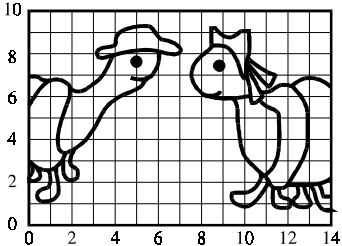
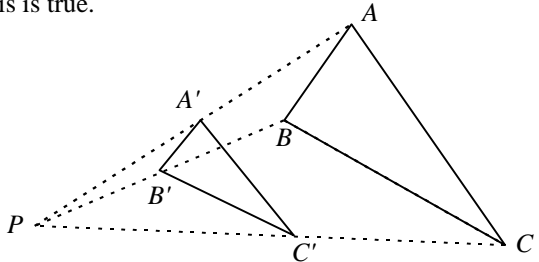
- describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Link angle measures and the properties of parallel lines to the classification and properties of quadrilaterals.</p>	<p>8. Identify, investigate and classify quadrilaterals, regular polygons and circles, according to their properties. [PS, R, T]</p> <p>9. Build 3-D objects from a variety of representations (nets, skeletons). [PS, V]</p>	<p>8.1 Investigate and describe the properties of intersections of diagonals of any quadrilaterals. Where possible, use computer software.</p> <p>8.2 Identify, compare and debate the merits of shape in present and past architectural construction methods and decoration features; e.g., golden rectangle.</p> <p>8.3 Given a variety of cutout polygons (regular and irregular with different numbers of sides); and circles (quadrilaterals should include irregular shapes, trapezoids, parallelograms, rectangles, rhombuses, squares and kites); find several ways to sort the figures and identify the characteristics of the subsets for each different way.</p> <p>8.4 Take all the quadrilaterals from the set in 8.3. Sort them in different ways; e.g., number of parallel sides, number of right angles, number of congruent sides, number of congruent angles. Use sets of nesting boxes to show how the different kinds of quadrilaterals are related.</p> <p>8.5 Draw five different rectangles. Devise a numerical measure of squareness that would allow you to rank your rectangles from the one most like a square to the one least like a square. Justify your choice.</p> <p>9.1 Raymond cut this net for a cube from grid paper. How many different nets can you cut that make cubes?</p> <div data-bbox="1311 1076 1400 1195" style="text-align: center;"> </div> <p>9.2 Find two different nets for a cylinder.</p> <p>9.3 Use toothpicks and molding clay to build prisms and pyramids with various polygons for bases.</p>

Grade 8  
Strand: Shape and Space (Transformations)

Students will:

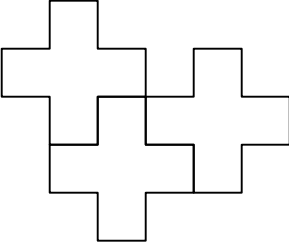
- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.</p>	<p>10. Represent, analyze and describe enlargements and reductions. [CN, R]</p>	<p>10.1 If the following figure is drawn on 1 cm grid paper, draw its enlargement on 2 cm grid paper.</p>  <p>10.2 The figure <math>ABC</math> is said to be reduced by <math>\frac{1}{2}</math> to form the image <math>A'B'C'</math>. Use a series of measurements to show whether or not this is true.</p>  <p>10.3 Describe some everyday situations in which 2-D and 3-D enlargements and reductions are necessary or useful; e.g., photocopies, photographs, scale models, statues. Explain how the enlargement or reduction is the same and how it is different from the original figure or object; e.g., size, shape, proportion.</p> <p>10.4 Darren had some small unit cubes. He used them to build larger cubes. What are the three smallest cubes Darren could build? How much larger is each one than the original unit cube? Explain, using cubes or a diagram.</p> <p>10.5 Sandra was making squares with toothpicks for sides. What are the 3 smallest squares she can make? How much larger is each one than the square with one toothpick on each side? Explain your answer, using toothpicks.</p>

Grade 8  
 Strand: Shape and Space (Transformations)

*Students will:*

- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.</p>	<p>11. Draw and interpret scale diagrams. [PS, T]</p> <p>12. Represent, analyze and describe regions and colouring problems. [C, PS, V]</p>	<p>11.1 Make a scale diagram of your bedroom or your classroom. In what units will you measure the room? What ratio will you use for your scale diagram?</p> <p>11.2 Working in pairs, make a scale drawing of a sheet of ice at a curling rink, if the ice is a rectangle 44.5 m by 4.3 m and the scale is 1 cm : 3 m.</p> <p>12.1 The four-colour map theorem says that any flat map, no matter how many separate regions it has, can be coloured using only four colours, so that no bordering regions are the same colour. Cover a page with a design like the one below, and test the theorem. Also test the theorem with a real map, such as that of Canada, the United States or Europe.</p> <div style="text-align: center;">  </div>

Grade 8  
Strand: Shape and Space (Transformations)

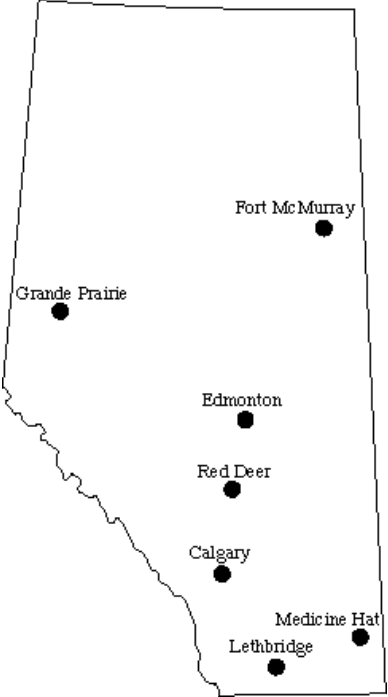
Students will:

- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples																																																																
<p>Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.</p>	<p>13. Describe, analyze and solve network problems; e.g., bus routes, a telephone exchange. [C, E, PS]</p>	<p>13.1 On a map of Canada, mark the cities Whitehorse, Victoria, Edmonton, Yellowknife, Regina and Winnipeg. Devise an airplane network so that you can get from any one of these cities to any other one of them by changing planes, at most, once. Each route can have no more than two stops. You want the least number of routes.</p> <p>13.2 Truck routes must connect Grande Prairie, Fort McMurray, Edmonton, Red Deer, Calgary, Lethbridge and Medicine Hat. The design must use the fewest number of trucks possible, and no truck must be driven more than 1100 km in any 24-hour period. In addition, the total number of kilometres driven nightly must be kept to a minimum. Use coloured pins and threads, on a map, to help you keep track of the routes.</p> <p>The following table shows the kilometres between major cities in Alberta.</p> <table border="1" data-bbox="1233 805 2435 1239"> <thead> <tr> <th>From/To</th> <th>Grande Prairie</th> <th>Fort McMurray</th> <th>Edmonton</th> <th>Red Deer</th> <th>Calgary</th> <th>Lethbridge</th> <th>Medicine Hat</th> </tr> </thead> <tbody> <tr> <td>Grande Prairie</td> <td>0</td> <td>720</td> <td>460</td> <td>620</td> <td>760</td> <td>985</td> <td>1010</td> </tr> <tr> <td>Fort McMurray</td> <td>720</td> <td>0</td> <td>445</td> <td>605</td> <td>745</td> <td>970</td> <td>990</td> </tr> <tr> <td>Edmonton</td> <td>460</td> <td>445</td> <td>0</td> <td>160</td> <td>300</td> <td>525</td> <td>550</td> </tr> <tr> <td>Red Deer</td> <td>620</td> <td>605</td> <td>160</td> <td>0</td> <td>140</td> <td>375</td> <td>420</td> </tr> <tr> <td>Calgary</td> <td>760</td> <td>745</td> <td>300</td> <td>140</td> <td>0</td> <td>225</td> <td>280</td> </tr> <tr> <td>Lethbridge</td> <td>985</td> <td>970</td> <td>525</td> <td>375</td> <td>225</td> <td>0</td> <td>170</td> </tr> <tr> <td>Medicine Hat</td> <td>1010</td> <td>990</td> <td>550</td> <td>420</td> <td>280</td> <td>170</td> <td>0</td> </tr> </tbody> </table> <p>Your task is to design a route network, draw the routes on the Alberta map shown on the next page, state the number of trucks used, and calculate the number of kilometres driven each night.</p>	From/To	Grande Prairie	Fort McMurray	Edmonton	Red Deer	Calgary	Lethbridge	Medicine Hat	Grande Prairie	0	720	460	620	760	985	1010	Fort McMurray	720	0	445	605	745	970	990	Edmonton	460	445	0	160	300	525	550	Red Deer	620	605	160	0	140	375	420	Calgary	760	745	300	140	0	225	280	Lethbridge	985	970	525	375	225	0	170	Medicine Hat	1010	990	550	420	280	170	0
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Grade 8  
 Strand: Shape and Space (Transformations)  
*Students will:*

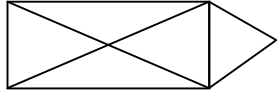
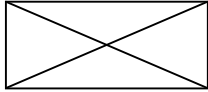
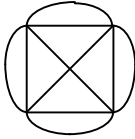
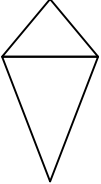
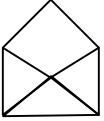
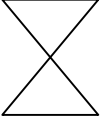

- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples
<p>Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.</p>		<p>Finished work:</p> <p>Map of Alberta with truck routes marked:</p>  <p>Number of trucks used: _____</p> <p>Kilometres driven each night: _____</p>

Grade 8  
 Strand: Shape and Space (Transformations)

Students will:

- perform, analyze and create transformations.

General Outcome	Specific Outcomes	Illustrative Examples															
<p>Create and analyze design problems and architectural patterns, using the properties of scaling, proportion and networks.</p>		<p>13.3 A network consists of vertices (points) and arcs that join them. A vertex is called even or odd, depending on whether or not an even or odd number of arcs are connected to it. Kwigah tried to trace each of the networks below without lifting his pencil or retracing any arcs. He made a chart of his findings. Trace the network and fill in Kwigah's chart. Can you find a pattern?</p> <div style="display: flex; justify-content: space-around; align-items: center;">     </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;">    </div> <table border="1" style="margin: 20px auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Number of Even Vertices</th> <th style="padding: 5px;">Number of Odd Vertices</th> <th style="padding: 5px;">Can the figure be traced?</th> </tr> </thead> <tbody> <tr><td style="height: 20px;"> </td><td> </td><td> </td></tr> <tr><td style="height: 20px;"> </td><td> </td><td> </td></tr> <tr><td style="height: 20px;"> </td><td> </td><td> </td></tr> <tr><td style="height: 20px;"> </td><td> </td><td> </td></tr> </tbody> </table> <p style="text-align: center; margin-top: 20px;">Based on the pattern you find, draw a network that can be traced and one that cannot be traced.</p> <p>13.4 Research the famous problem of the Bridges of Koenigsberg, and make a report.</p>	Number of Even Vertices	Number of Odd Vertices	Can the figure be traced?												
Number of Even Vertices	Number of Odd Vertices	Can the figure be traced?															

Grade 8

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, using technology, as required.</p> <p>Evaluate and use measures of central tendency and variability.</p>	<ol style="list-style-type: none"> <li>1. Formulate questions for investigation, using existing data. [C, CN, R]</li> <li>2. Select, defend and use appropriate methods of collecting data:               <ul style="list-style-type: none"> <li>• designing and using surveys</li> <li>• research, using electronic media. [C, PS, T]</li> </ul> </li> <li>3. Display data by hand or by computer in a variety of ways, including box and whisker plots. [C, T, V]</li> <li>4. Determine and use the most appropriate measure of central tendency in a given context. [CN, PS, T]</li> <li>5. Describe the variability of data sets, using such techniques as range, and box and whisker plots. [C, PS, T]</li> </ol>	<p>1–3 How much household garbage is produced in our homes? In the average home in Canada? Design a questionnaire to investigate this problem. Justify your questions. Explain how you will carry out this survey. Could you collect data via computer networking? How can you use a computer to record, organize and display your data?</p> <p>1.1 Find some data collected and presented in a local newspaper that are related to a current civic, regional or health issue. Do the data seem to support the conclusions the newspaper makes? Are the data presented in a fair, clear and appropriate manner? What questions about the issue are not addressed?</p> <p>3, 5.1 Play a memory game with your class. Write 16 words on the board or overhead projector. Let everyone look at them for 2 minutes. When the time is up, each person writes as many words as he or she remembers. Collect the data (number of words remembered). Find the median and quartile scores, and make a box and whisker plot. Why is this method of displaying variability useful?</p> <p>3, 5.2 Using published data, find the life expectancy for females of 20 different countries. Graph the results, using a box and whisker plot.</p> <p>4.1 Explain why each of the following people might select the mean, median or mode in a set of data.         <ul style="list-style-type: none"> <li>– A store owner deciding what sizes of shoes to order.</li> <li>– Someone moving to a new city and looking at housing costs.</li> <li>– Reporting the average score on a test.</li> </ul> </p>

Grade 8

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>Evaluate and use measures of central tendency and variability.</p>	<p>6. Construct sets of data given measures of central tendency and variability. [PS, R]</p> <p>7. Determine the effect on the mean, median and/or mode when:</p> <ul style="list-style-type: none"> <li>• a constant is added or subtracted from each value</li> <li>• each value is multiplied or divided by the same constant</li> <li>• a significantly different value is included.</li> </ul> <p>[E, PS, R]</p>	<p>6-7 The mean score on a test was 5. The median was also 5, but the mode was 6. The 13 scores ranged from 2 to 10. Construct a set of scores that have the above measures. Represent each score with centicubes or unifix to show the measures concretely. Another score of 15 is added to the data. How will this affect each of the above measures?</p> <p>6.1 Janice is sales manager in a department store. She must maintain average (mean) daily sales of at least \$8500. Sales for the first four days of the week are \$7530, \$8475, \$6550 and \$7155. The store is not open on Sunday. What sales will Janice need to make on Friday and Saturday to come in over the target? Discuss whether or not it is likely that Janice will achieve her target.</p> <p>6.2 The mean mark on four tests is 78%. What mark is needed on the next test to increase the mean to 80%?</p> <p>6.3 State seven prices, where the median is \$3.00, the highest price is \$20.00, and the lowest price is \$1.00.</p> <p>7.1 The number of passengers in different buses was recorded. The mean was 46 and the median was 47.</p> <p>If 20 extra passengers rode on each bus, what would the new mean and median be? If each passenger paid \$1.25 to ride the bus, what would be the mean and median amount of money collected?</p>

Grade 8

Strand: Statistics and Probability (Chance and Uncertainty)

Students will:

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

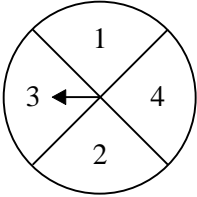
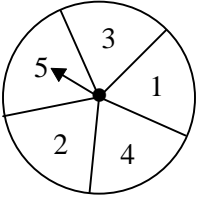
General Outcome	Specific Outcomes	Illustrative Examples
<p>Compare theoretical and experimental probability of independent events.</p>	<p>8. Use computer or other simulations to solve probability and data collection problems. [E, PS, T]</p> <p>9. Recognize that if <math>n</math> events are equally likely the probability of any one of them occurring is <math>\frac{1}{n}</math>. [R]</p>	<p>8.1 Draw vertical lines on large chart paper exactly two toothpick lengths apart. Toss 100 toothpicks randomly. Record any toothpick that touches a line as a “hit”. Calculate the ratio between the number of tosses and the number of hits. Compare results. As more trials are attempted, the outcome will converge on <math>\pi</math>.</p> <p>Experiment with differing spaces between the lines as well as with different sticks.</p> <p>8.2 A soft drink company placed a lucky liner in the caps of half their 1-L bottles. Derek said he bought five bottles and they all had lucky liners. How could you use computer-generated random numbers to simulate the situation and find the probability of getting the five lucky liners?</p> <p>8.3 What is the probability of having exactly two boys in a family of five children? Design a simulation, using coins to answer the question.</p> <p>9.1 If you toss one standard die, what are the possible events? Are they equally likely? Explain. Write the probability of tossing a 4. If you did the same experiment with a 12-sided die, what would be the probability of tossing a 4?</p> <p>9.2 If you draw a card from a deck, what suit could it be? Are all suits equally likely? What is the probability of drawing a heart?</p>

Grade 8

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>Compare theoretical and experimental probability of independent events.</p>	<p>10. Determine the probability of two independent events where the combined sample space has 52 or fewer elements. [PS, R, V]</p> <p>11. Predict population characteristics from sample data. [C, CN]</p>	<p>10.1</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">Spinner A                      Spinner B</p> <p>A number spun on Spinner A is multiplied by a number spun on Spinner B. Calculate the expected probability of the product being:</p> <ul style="list-style-type: none"> <li>- 5 or less</li> <li>- even</li> <li>- a multiple of 5</li> <li>- 1.</li> </ul> <p>Draw a diagram or table to help explain your reasoning.</p> <p>10.2 Players in a dice game threw two dice each. A player wins, if the total is exactly 11. What is the probability of winning?</p> <p>10.3 If you toss two dice, and find the sum, what are the possible sums? Are they equally likely? Explain. Give an example of two sums that are equally likely. What sum has the same probability as 10?</p> <p>11.1 A jar contains red and white jellybeans. There are 1000 jellybeans in all. Explain how you could draw samples from the jar, and use them to predict the number of red jellybeans in the jar.</p>