

Cluster Common C1

Strand: Number (Number Concepts)

Students will:

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

[C] Communication

[CN] Connections

[E] Estimation and

Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples																																																																																		
<p>Analyze the numerical data in a table for trends, patterns and interrelationships.</p> <p><i>(continued)</i></p>	<p>C1-1. (N1) Use words and algebraic expressions to describe the data and the interrelationships in a table with rows that are not related recursively (not calculated from previous data). [C, CN]</p>	<p>1.1</p> <table border="1"> <thead> <tr> <th>Price</th> <th>GST</th> <th>PST</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>\$120.00</td> <td>\$ 8.40</td> <td>\$12.84</td> <td>\$141.24</td> </tr> <tr> <td>\$275.00</td> <td>\$19.25</td> <td>\$29.43</td> <td>\$323.68</td> </tr> </tbody> </table> <p>a) What is the rate of GST?                      b) What could be the rate of PST?                      c) What could be the rule for calculating PST?                      d) What is the total GST paid on the two items in the table?                      e) What is the total PST paid on the two items in the table?</p> <p>1.2 National Hockey League (NHL)                      Western Conference: February 1, 1996</p> <table border="1"> <thead> <tr> <th></th> <th>W</th> <th>L</th> <th>T</th> <th>Points</th> </tr> </thead> <tbody> <tr><td>Detroit</td><td>35</td><td>9</td><td>4</td><td>74</td></tr> <tr><td>Colorado</td><td>26</td><td>14</td><td>9</td><td>61</td></tr> <tr><td>Chicago</td><td>25</td><td>15</td><td>11</td><td>61</td></tr> <tr><td>Toronto</td><td>22</td><td>19</td><td>9</td><td>53</td></tr> <tr><td>St. Louis</td><td>21</td><td>20</td><td>8</td><td>50</td></tr> <tr><td>Winnipeg</td><td>21</td><td>24</td><td>4</td><td>46</td></tr> <tr><td>Vancouver</td><td>17</td><td>20</td><td>12</td><td>46</td></tr> <tr><td>Los Angeles</td><td>17</td><td>22</td><td>11</td><td>45</td></tr> <tr><td>Calgary</td><td>18</td><td>23</td><td>9</td><td>45</td></tr> <tr><td>Edmonton</td><td>18</td><td>25</td><td>6</td><td>42</td></tr> <tr><td>Anaheim</td><td>17</td><td>27</td><td>5</td><td>39</td></tr> <tr><td>Dallas</td><td>14</td><td>24</td><td>10</td><td>38</td></tr> <tr><td>San Jose</td><td>11</td><td>35</td><td>4</td><td>26</td></tr> </tbody> </table> <p>What happens to the NHL standings if wins are worth three points and ties are worth one point?</p>	Price	GST	PST	Total	\$120.00	\$ 8.40	\$12.84	\$141.24	\$275.00	\$19.25	\$29.43	\$323.68		W	L	T	Points	Detroit	35	9	4	74	Colorado	26	14	9	61	Chicago	25	15	11	61	Toronto	22	19	9	53	St. Louis	21	20	8	50	Winnipeg	21	24	4	46	Vancouver	17	20	12	46	Los Angeles	17	22	11	45	Calgary	18	23	9	45	Edmonton	18	25	6	42	Anaheim	17	27	5	39	Dallas	14	24	10	38	San Jose	11	35	4	26
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Cluster Common C1

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| [C]  | Communication                        | [PS] | Problem Solving |
| [CN] | Connections                          | [R]  | Reasoning       |
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<p><i>(continued)</i></p>	<p>C1–2. Use words and algebraic expressions to describe the data and the interrelationships in a table with rows that are related recursively (calculated from previous data).                      [C, CN]</p>	<p>2.1 The following table provides data on the repayment of a \$100 000 farm loan. The farmer has negotiated for one annual payment to be made each year after harvest and for the right to make an extra payment, if the harvest is good. Use the table to answer the questions.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Opening Balance</th> <th>Interest Rate (%)</th> <th>Interest Charged</th> <th>Regular Payment</th> <th>Extra Payment</th> <th>Closing Balance</th> </tr> </thead> <tbody> <tr><td>1</td><td>\$100 000.00</td><td>8</td><td>\$8000.00</td><td>\$14 902.95</td><td></td><td>\$93 097.05</td></tr> <tr><td>2</td><td>\$ 93 097.05</td><td>8</td><td>\$7447.76</td><td>\$14 902.95</td><td></td><td>\$85 641.87</td></tr> <tr><td>3</td><td>\$ 85 641.87</td><td>8</td><td>\$6851.35</td><td>\$14 902.95</td><td></td><td>\$77 590.27</td></tr> <tr><td>4</td><td>\$ 77 590.27</td><td>8</td><td>\$6207.22</td><td>\$14 902.95</td><td></td><td>\$68 894.54</td></tr> <tr><td>5</td><td>\$ 68 894.54</td><td>8</td><td>\$5511.56</td><td>\$14 902.95</td><td></td><td>\$59 503.15</td></tr> <tr><td>6</td><td>\$ 59 503.15</td><td>8</td><td>\$4760.25</td><td>\$14 902.95</td><td></td><td>\$49 360.46</td></tr> <tr><td>7</td><td>\$ 49 360.46</td><td>8</td><td>\$3948.84</td><td>\$14 902.95</td><td></td><td>\$38 406.34</td></tr> <tr><td>8</td><td>\$ 38 406.34</td><td>8</td><td>\$3072.51</td><td>\$14 902.95</td><td></td><td>\$26 575.90</td></tr> <tr><td>9</td><td>\$ 26 575.90</td><td>8</td><td>\$2126.07</td><td>\$14 902.95</td><td></td><td>\$13 799.03</td></tr> <tr><td>10</td><td>\$ 13 799.03</td><td>8</td><td>\$1103.92</td><td>\$14 902.95</td><td></td><td>\$ 0.00</td></tr> </tbody> </table> <p>a) What is the period of the loan?                      b) What is the amount of the annual payment?                      c) How much of the annual payment at the end of Year 5 went toward the opening balance? Show how to determine the answer in two different ways.                      d) Create an algebraic expression to find the answer in c).                      e) If the interest rate went up to 11% in Year 10, how much would be owing at the end of Year 10?                      f) What extra payment at the end of Year 4 would pay the loan off at the end of Year 8?</p>	Year	Opening Balance	Interest Rate (%)	Interest Charged	Regular Payment	Extra Payment	Closing Balance	1	\$100 000.00	8	\$8000.00	\$14 902.95		\$93 097.05	2	\$ 93 097.05	8	\$7447.76	\$14 902.95		\$85 641.87	3	\$ 85 641.87	8	\$6851.35	\$14 902.95		\$77 590.27	4	\$ 77 590.27	8	\$6207.22	\$14 902.95		\$68 894.54	5	\$ 68 894.54	8	\$5511.56	\$14 902.95		\$59 503.15	6	\$ 59 503.15	8	\$4760.25	\$14 902.95		\$49 360.46	7	\$ 49 360.46	8	\$3948.84	\$14 902.95		\$38 406.34	8	\$ 38 406.34	8	\$3072.51	\$14 902.95		\$26 575.90	9	\$ 26 575.90	8	\$2126.07	\$14 902.95		\$13 799.03	10	\$ 13 799.03	8	\$1103.92	\$14 902.95		\$ 0.00
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General Outcomes	Specific Outcomes	Illustrative Examples
<p>Explain and illustrate the structure and the interrelationship of the sets of numbers within the real number system.</p>	<p>C1–3. (N3) Classify numbers as natural, whole, integer, rational or irrational, and show that these number sets are nested within the real number system. [C, R, V]</p> <p>C1–4. (N4) Use approximate representations of irrational numbers. [R, T]</p>	<p>3.1 Explain why the number 1.112111211112 . . . is irrational.</p> <p>3.2 Given a set of numbers, place them in their appropriate box in a nested Venn diagram.</p> <p>3.3 Describe, orally and in writing, whether or not a number is irrational.</p> <p>3.4 Demonstrate that a particular real number, such as <math>\sqrt{3}</math>, is rational or irrational.</p> <p>4.1 Compare the results of using different approximations for <math>\sqrt{2}</math> in calculations.</p> <p>a) Calculate <math>\sqrt{2} \times \sqrt{2}</math> as <math>1.4 \times 1.4</math>.</p> <p>b) Calculate <math>\sqrt{2} \times \sqrt{2}</math> as <math>1.41 \times 1.41</math>.</p> <p>4.2 Use a calculator to get the approximate value, to four decimal places, of <math>\sqrt{8}</math> and of <math>2\sqrt{2}</math>.</p>

Cluster Common C1

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.

[C] Communication

[CN] Connections

[E] Estimation and

Mental Mathematics

[PS] Problem Solving

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General Outcomes	Specific Outcomes	Illustrative Examples
<p>Use basic arithmetic operations on real numbers to solve problems.</p>	<p>C1–5. Communicate a set of instructions used to solve an arithmetic problem. [C]</p> <p>C1–6. Perform arithmetic operations on irrational numbers, using appropriate decimal approximations. [E, T]</p>	<p>5.1 Write a set of instructions that will allow another student to find:</p> <p>a) <math>1 + 2 \div 3</math></p> <p>b) <math>9 \times 4 \div 3 \times 5</math></p> <p>c) the reciprocal of a square root of a number, using a scientific calculator</p> <p>d) a 5% commission on a sale of \$40 200.</p> <p>6.1 Mahal indicates that <math>\sqrt{2} + \sqrt{8}</math> has an approximate value of 3.16. Use estimates to show whether Mahal’s answer is reasonable, and use a calculator to verify the accuracy of Mahal’s answer.</p> <p>6.2 Find a decimal approximation of <math>\left(\frac{3}{\sqrt{5}-\sqrt{2}}\right)</math> to three decimal places.</p> <p>6.3 Arrange the following in order of value from least to greatest: <math>7, 2\sqrt{13}, 3\sqrt{6}, 4\sqrt{5}, 5\sqrt{2}</math>. Use decimal approximations.</p> <p>6.4 Evaluate <math>\sqrt[3]{128} + 4(\sqrt[3]{16})</math> to three decimal places.</p> <p>6.5 Find the length of the base and the height of an equilateral triangle of area <math>24 \text{ cm}^2</math>.</p>

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<p>Describe and apply arithmetic operations on tables to solve problems, using technology as required.</p> <p><i>(continued)</i></p>	<p>C1-7. (N7) Create and modify tables from both recursive and nonrecursive situations. [PS, T, V]</p>	<p>7.1</p> <table border="1"> <thead> <tr> <th>Price</th> <th>GST</th> <th>PST</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>\$120.00</td> <td>\$ 8.40</td> <td>\$12.84</td> <td>\$141.24</td> </tr> <tr> <td>\$275.00</td> <td>\$19.25</td> <td>\$29.43</td> <td>\$323.68</td> </tr> </tbody> </table> <p>a) Modify the table to allow for a PST of 6.5% of the price before taxes.                      b) If the price after both taxes is \$138.00 and PST is charged on the \$120.00 price before taxes, what is the rate of PST?</p> <p>7.2 In 1993, sales of a particular video game doubled every month. The game was released in May 1993 with sales of 32 000 for May. Prepare a table to illustrate the 1993 monthly sales figures. How many video games were sold in December 1993? Identify the assumptions you made when determining the solution. In 1994, the demand for the video game peaked. Starting in January 1994, and every month thereafter, sales were cut to one quarter of what they were in the previous month. How many video games were sold in April 1994? If April 1994 was the last month of sales, how many video games were sold over the entire twelve months?</p>	Price	GST	PST	Total	\$120.00	\$ 8.40	\$12.84	\$141.24	\$275.00	\$19.25	\$29.43	\$323.68
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<p><i>(continued)</i></p>	<p>C1–8. Use and modify a spreadsheet template to model recursive situations. (N8) [PS, T, V]</p>	<p>8.1 Modify the given template for a 10-year, \$85 000 farm mortgage with fixed annual payments, to allow for a change in interest rate.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Opening Balance</th> <th>Interest Rate (%)</th> <th>Interest Charged</th> <th>Regular Payment</th> <th>Closing Balance</th> </tr> </thead> <tbody> <tr><td>1</td><td>\$85 000.00</td><td>8</td><td>\$6800.00</td><td>\$12 667.51</td><td>\$79 132.49</td></tr> <tr><td>2</td><td>\$79 132.49</td><td>8</td><td>\$6330.60</td><td>\$12 667.51</td><td>\$72 795.59</td></tr> <tr><td>3</td><td>\$72 795.59</td><td>8</td><td>\$5823.65</td><td>\$12 667.51</td><td>\$65 951.73</td></tr> <tr><td>4</td><td>\$65 951.73</td><td>8</td><td>\$5276.14</td><td>\$12 667.51</td><td>\$58 560.36</td></tr> <tr><td>5</td><td>\$58 560.36</td><td>8</td><td>\$4684.83</td><td>\$12 667.51</td><td>\$50 577.68</td></tr> <tr><td>6</td><td>\$50 577.68</td><td>8</td><td>\$4046.21</td><td>\$12 667.51</td><td>\$41 956.39</td></tr> <tr><td>7</td><td>\$41 956.39</td><td>8</td><td>\$3356.51</td><td>\$12 667.51</td><td>\$32 645.39</td></tr> <tr><td>8</td><td>\$32 645.39</td><td>8</td><td>\$2611.63</td><td>\$12 667.51</td><td>\$22 589.52</td></tr> <tr><td>9</td><td>\$22 589.52</td><td>8</td><td>\$1807.16</td><td>\$12 667.51</td><td>\$11 729.17</td></tr> <tr><td>10</td><td>\$11 729.17</td><td>8</td><td>\$ 938.33</td><td>\$12 667.51</td><td>\$ 0.00</td></tr> </tbody> </table> <p>a) What alternatives are open to the farmer, if the interest rate increases?                      b) What alternatives are open to the farmer, if the interest rate decreases?</p> <p>8.2 Modify the template in illustrative example 8.1 to reflect a 25-year home mortgage with monthly payments that gives the customer the option of making an annual extra payment of \$1500 at the end of any year. Interest is charged monthly.</p>	Year	Opening Balance	Interest Rate (%)	Interest Charged	Regular Payment	Closing Balance	1	\$85 000.00	8	\$6800.00	\$12 667.51	\$79 132.49	2	\$79 132.49	8	\$6330.60	\$12 667.51	\$72 795.59	3	\$72 795.59	8	\$5823.65	\$12 667.51	\$65 951.73	4	\$65 951.73	8	\$5276.14	\$12 667.51	\$58 560.36	5	\$58 560.36	8	\$4684.83	\$12 667.51	\$50 577.68	6	\$50 577.68	8	\$4046.21	\$12 667.51	\$41 956.39	7	\$41 956.39	8	\$3356.51	\$12 667.51	\$32 645.39	8	\$32 645.39	8	\$2611.63	\$12 667.51	\$22 589.52	9	\$22 589.52	8	\$1807.16	\$12 667.51	\$11 729.17	10	\$11 729.17	8	\$ 938.33	\$12 667.51	\$ 0.00
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Cluster Common C1

Strand: Patterns and Relations (Relations and Functions)

Students will:

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

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
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General Outcomes	Specific Outcomes	Illustrative Examples																								
<p>Examine the nature of relations with an emphasis on functions.</p>	<p>C1–9. (PR47) Plot linear and nonlinear data, using appropriate scales. [C, V]</p>	<p>9.1 The mass of a beaker is recorded when the beaker contains varying volumes of ethanol. The results of the experiment are recorded in the table below.</p> <table border="1"> <thead> <tr> <th>Volume of Ethanol (mL)</th> <th>Mass of Beaker and Liquid (g)</th> </tr> </thead> <tbody> <tr><td>0</td><td>90</td></tr> <tr><td>50</td><td>129</td></tr> <tr><td>100</td><td>168</td></tr> <tr><td>150</td><td>207</td></tr> <tr><td>200</td><td>246</td></tr> </tbody> </table> <p>Measurements may be assumed correct to the nearest mL and to the nearest g.</p> <p>Plot this data on a scatterplot, using appropriate scales, and answer the following questions.</p> <ol style="list-style-type: none"> <li>Assuming that this pattern continues, determine the mass of the beaker and liquid when 250 mL of ethanol is present.</li> <li>When a volume of 200 mL of ethanol is in the beaker, determine the mass of the ethanol alone.</li> <li>The density of a liquid is defined as the mass of 1 mL of the liquid. Determine the density of the ethanol.</li> </ol> <p>9.2 Nannook’s Pizza uses the following price structure.</p> <table border="1"> <thead> <tr> <th>Diameter (inches)</th> <th>Cost (\$)</th> </tr> </thead> <tbody> <tr><td>8</td><td>6.50</td></tr> <tr><td>10</td><td>10.20</td></tr> <tr><td>12</td><td>14.65</td></tr> <tr><td>14</td><td>19.90</td></tr> <tr><td>16</td><td>26.00</td></tr> </tbody> </table> <p>Plot this data on a scatterplot, using appropriate scales, and describe the pattern.</p>	Volume of Ethanol (mL)	Mass of Beaker and Liquid (g)	0	90	50	129	100	168	150	207	200	246	Diameter (inches)	Cost (\$)	8	6.50	10	10.20	12	14.65	14	19.90	16	26.00
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Cluster Common C1

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.

- |  |                      |
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|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Solve coordinate geometry problems involving lines and line segments.</p> <p>(continued)</p>	<p>C1–10. Solve problems involving distances between points in the coordinate plane. [PS, V]</p> <p>C1–11. Solve problems involving midpoints of line segments. [PS]</p> <p>C1–12. Solve problems involving rise, run and slope of line segments. [PS, V]</p>	<p>10.1 Bob and Christine want to meet; see map below. Each block has dimensions of 120 m by 120 m. Assuming the roads are of negligible width, how far does Bob <math>B</math> have to travel to get to Christine <math>C</math>? Find two separate answers, one for a path along the roads and one for a direct path.</p> <div style="text-align: center;"> </div> <p>10.2 Plot the points <math>(-4, -2)</math> and <math>(1, 5)</math> on the coordinate plane. Describe two different ways to calculate the distance between the two points.</p> <p>10.3 Generate a method of determining the distance between any two points in the coordinate plane without having to plot the points. Justify your method.</p> <p>10.4 Program a calculator or computer to accept, as input, the coordinates of two points and to give, as output, the distance between the two points. Document the program so that someone else can use it without assistance.</p> <p>11.1 Explain to a partner the meaning of the midpoint of the line segment joining two points without using the word midpoint.</p> <p>11.2 On a map with numerical coordinates in kilometres, the village of Sundown is at <math>(6.3, 2.9)</math>, while the town of Sunup is at <math>(4.7, 13.2)</math>. It was decided to construct a water main on the direct line joining Sunup with Sundown. Each community was responsible for the cost of construction from the community to the midpoint. Find the coordinates of the midpoint and Sundown's costs, if Sundown spent \$63 475 per kilometre for construction. Determine alternative methods that could be used to solve the problem.</p> <p>12.1 If the slope of a line is 6 (<math>m = 6</math>) and the line passes through the points <math>(2, 5)</math> and <math>(1, k)</math>, what is the value of <math>k</math>?</p> <p>12.2 If two points on a line are <math>(4, 3)</math> and <math>(6, 4)</math>, find one other point on the line. Use a graphing utility to demonstrate the reasonableness of your answer.</p>

Cluster Common C1

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.

[C] Communication

[CN] Connections

[E] Estimation and  
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

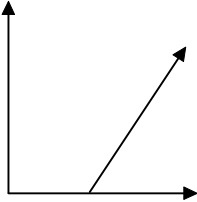
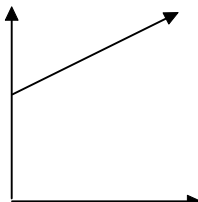
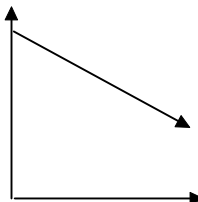
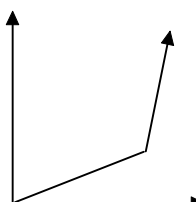
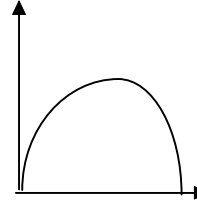
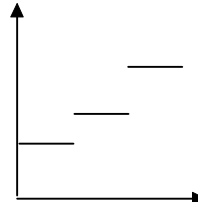
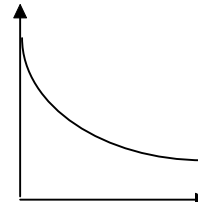
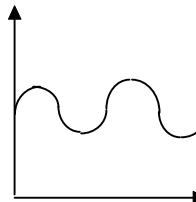
General Outcomes	Specific Outcomes	Illustrative Examples
<p><i>(continued)</i></p>	<p>C1–13. Determine the equation of a line, given information that uniquely determines the line. [PS, V]</p> <p>C1–14. Solve problems using slopes of: (SS23)</p> <ul style="list-style-type: none"> <li>parallel lines</li> <li>perpendicular lines.</li> </ul> <p>[CN, PS, V]</p>	<p>13.1 Use a graphing device to examine changes in the graph of <math>y = mx + b</math> as the values of <math>m</math> and <math>b</math> are changed. Use the results to explain why the equation <math>y = mx + b</math> is called the slope and <math>y</math>-intercept form of a linear equation.</p> <p>13.2 Write a clear explanation of the nature of the following lines: <math>x = a</math>, <math>y = b</math>, <math>x = y</math>.</p> <p>13.3 Manipulate the standard form of a straight line (<math>Ax + By + C = 0</math>) into the slope and <math>y</math>-intercept form of the same line. Determine rules that connect <math>A</math>, <math>B</math> and <math>C</math> to the slope (<math>m</math>) and to the intercepts.</p> <p>13.4 Find the equation of a line passing through the points <math>(-1, 3)</math> and <math>(4, 2)</math>.</p> <p>13.5 Given the graph of an oblique line, determine an equation for the line.</p> <p>13.6 A spring with no masses attached is 25.2 cm long. For each 1-g mass attached to the spring, the spring's length increases by 4 mm. Graph this scenario, label the axes, and find an equation for the graph.</p> <p>14.1 Graphically examine the slopes of various lines, all of which are perpendicular to the line <math>y = \frac{2}{3}x + 2</math>. Describe the slopes, and make a rule for finding the slope of a perpendicular to a given line.</p> <p>14.2 Two perpendicular lines intersect on the <math>x</math>-axis. The equation of one of the lines is <math>y = 2x - 6</math>. Find the equation of the second line.</p>

Cluster Common C2

**Strand: Patterns and Relations (Relations and Functions)**  
*Students will:*

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Examine the nature of relations with an emphasis on functions.</p> <p><i>(continued)</i></p>	<p>C2-1. (PR48) Represent data, using function models. [CN, PS, V]</p>	<p>1.1 Sketch graphs to illustrate the following situations. If sufficient information is given, represent the situation by a suitable equation. Sketch and, if possible, represent by an equation:</p> <ol style="list-style-type: none"> <li>the area of a circle as a function of its radius</li> <li>the cost of mailing a letter as a function of the mass of the letter</li> <li>the cost of renting a car for one day as a function of the kilometres driven</li> <li>the population of Canada as a function of the year</li> <li>the length of daylight as a function of the date.</li> </ol> <p>1.2 For each of the following graphs, describe a practical situation that could be represented by the graph. In describing the situation, state the meanings of any intercepts, slopes, maxima and/or minima.</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> <div style="text-align: center;"></div> </div>

Cluster Common C2

Strand: Patterns and Relations (Relations and Functions)

Students will:

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

[C] Communication

[CN] Connections

[E] Estimation and

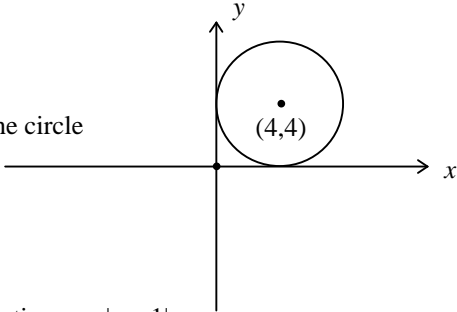
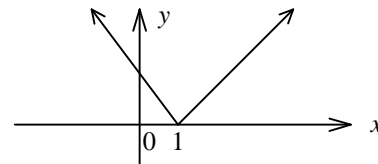
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
<p><i>(continued)</i></p>	<p>C2-2. Use a graphing tool to draw the graph of a function from its equation. [C, T, V]</p> <p>C2-3. Describe a function in terms of:  <ul style="list-style-type: none"> <li>• ordered pairs</li> <li>• a rule, in word or equation form</li> <li>• a graph.</li> </ul>                     [C, CN, V]</p> <p>C2-4. Use function notation to evaluate and represent functions. [C, PS]</p> <p>C2-5. Determine the domain and range of a relation from its graph. [PS, V]</p>	<p>2.1 Graph the function <math>y = x + 1</math>, using a graphing tool.</p> <p>2.2 Graph the function <math>y = x^2 + 100</math>, using a graphing tool. Explain the process used, so that the graph appears on the screen.</p> <p>3.1 Describe the parking charges at a parkade in terms of ordered pairs, a rule and a graph.</p> <p>4.1 If <math>f(x) = x^2 - 5x + 3</math>, find <math>f(2)</math>. What is an ordered pair describing the point on the graph having a y-coordinate of <math>f(2)</math>?</p> <p>4.2 If <math>f(x) = 3x^2 - 6x + 5</math>, find <math>f(\sqrt{3})</math>, <math>f(2x)</math> and <math>f(3t + 2)</math>.</p> <p>5.1 If the coordinate axes touch the circle, what is the domain and range of the circle shown in the graph to the right?</p> <p>5.2 Determine, from its graph shown below, the domain and range of the function <math>y =  x - 1 </math>.</p> <div style="text-align: right; margin-top: 20px;">  </div> <div style="text-align: center; margin-top: 20px;">  </div>

Cluster Common C2

Strand: Patterns and Relations (Relations and Functions)

Students will:

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

[C] Communication

[CN] Connections

[E] Estimation and

Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
<p><i>(continued)</i></p>	<p>C2-6. (PR53) Determine the following characteristics of the graph of a linear function, given its equation:</p> <ul style="list-style-type: none"> <li>• intercepts</li> <li>• slope</li> <li>• domain</li> <li>• range.</li> </ul> <p>[PS, V]</p>	<p>6.1 A tanker truck drives on a weigh scale and then is filled with crude oil. The mass <math>M</math>, measured in kilograms, of the truck and the volume <math>V</math>, measured in barrels, of crude oil are related by the formula:</p> $M = 14\,000 + 180V; V \leq 500.$ <ol style="list-style-type: none"> <li>Draw the graph with <math>V</math> on the horizontal axis and <math>M</math> on the vertical axis.</li> <li>The tank has a maximum capacity of 500 barrels. What is the mass of the truck when it contains 500 barrels of oil?</li> <li>What is the mass of the empty truck? Where is this value found on the graph?</li> <li>Find the slope, and give an interpretation for it.</li> <li>Give the domain for this problem.</li> <li>Express the range in words.</li> </ol> <p>6.2 Graph each of the following equations; and indicate intercepts, slope, domain and range.</p> <ol style="list-style-type: none"> <li><math>y = 2x; x = (0, 1, 2, 3, 4, 5, 6)</math></li> <li><math>y = -\frac{1}{3}x; x = \text{a real number}</math></li> <li><math>y = 3</math></li> <li><math>x = 3</math></li> <li><math>y = \frac{1}{3}x + 5; x = \text{a real number}</math></li> <li><math>y = mx + b; x = \text{a real number}</math></li> </ol>

Cluster Common C2

Strand: Patterns and Relations (Relations and Functions)

Students will:

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

[C] Communication

[CN] Connections

[E] Estimation and

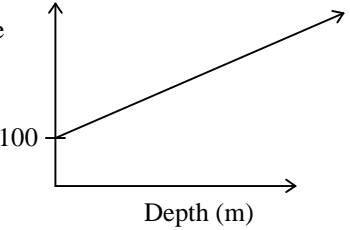
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples										
<p>Represent data, using linear function models.</p> <p><i>(continued)</i></p>	<p>C2-7. (PR56) Use direct variation and arithmetic sequences as applications of linear functions. [CN, PS, V]</p> <p><i>(continued)</i></p>	<p>7.1 A hydrologist studied the relationship between the pressure on an object and its depth of submersion in a liquid. The following graph was sketched. Draw conclusions based upon the sketch.</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>Pressure (kPa)</p> <p>100</p> </div>  </div> <p>7.2 Simple interest varies directly with the amount borrowed.</p> <p>a) If the interest is \$5 for \$100 borrowed, what would the interest be for \$325 borrowed?</p> <p>b) Graph the relation, and write the equation of the graph.</p> <p>7.3 A jet ski rental operation at Lake Okanagan charges a fixed insurance premium, plus an hourly rate. The total cost for two hours is \$50 and for five hours is \$110.</p> <p>a) Graph the relation.</p> <p>b) Determine the fixed insurance premium and the hourly rate to rent the jet ski.</p> <p>7.4 With new equipment coming on line, a soft drink manufacturer has been increasing its production each day according to the following table. Assume a maximum daily output of 25 000 cans.</p> <table border="1" style="margin-left: 20px;"> <tr> <td>Day</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Units</td> <td>4000</td> <td>4200</td> <td>4400</td> <td>4600</td> </tr> </table> <p>a) Graph the relation. Hint: this is a discrete case.</p> <p>b) On what day will they be able to produce 20 000 cans, if this trend continues?</p>	Day	1	2	3	4	Units	4000	4200	4400	4600
Day	1	2	3	4								
Units	4000	4200	4400	4600								

Cluster Common C2

Strand: Patterns and Relations (Relations and Functions)

Students will:

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

[C] Communication

[CN] Connections

[E] Estimation and

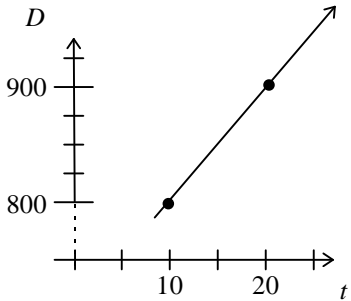
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples										
(continued)	(continued)	<p>7.5 Given the distance–time graph shown, answer the following questions.</p>  <p>a) If <math>D = 850</math>, what is <math>t</math>?</p> <p>b) If <math>t = 25</math>, what is <math>D</math>?</p> <p>c) If <math>D = 1500</math>, what is <math>t</math>?</p> <p>d) Write the equation of the function.</p> <p>e) Verify the accuracy of your estimates in a), b) and c), using the equation of the function.</p> <p>7.6 Given the data in the table, predict the fuel consumption for the following engines:</p> <p>a) 2.5 L</p> <p>b) 5.0 L.</p> <table border="1"> <thead> <tr> <th>Engine Size (L)</th> <th>Consumption ( L/100 km)</th> </tr> </thead> <tbody> <tr> <td>2.2</td> <td>6.4</td> </tr> <tr> <td>3.0</td> <td>7.5</td> </tr> <tr> <td>3.8</td> <td>8.1</td> </tr> <tr> <td>4.1</td> <td>8.6</td> </tr> </tbody> </table> <p>7.7 A video game operator gives all her change in quarters. From a \$20 bill, she gives 56 quarters change for a \$6 purchase. She gives 8 quarters change from a \$20 bill for an \$18 purchase.</p> <p>a) Graph the number of quarters given as change <math>N</math> on the vertical axis and the amount of the purchase <math>P</math> on the horizontal axis. Assume that a \$20 bill was given.</p> <p>b) What is the domain and range of the function?</p> <p>c) How does the graph change, if a \$10 bill is used?</p>	Engine Size (L)	Consumption ( L/100 km)	2.2	6.4	3.0	7.5	3.8	8.1	4.1	8.6
Engine Size (L)	Consumption ( L/100 km)											
2.2	6.4											
3.0	7.5											
3.8	8.1											
4.1	8.6											

Cluster Common C3

**Strand: Shape and Space (Measurement)**  
*Students will:*

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

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

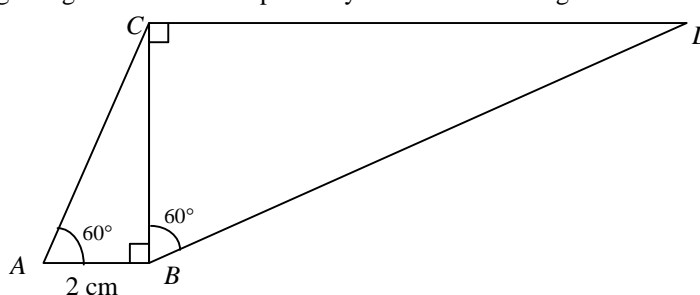
General Outcomes	Specific Outcomes	Illustrative Examples
<p>Demonstrate an understanding of scale factors, and their interrelationship with the dimensions of similar shapes and objects.</p>	<p>C3-1. (SS1) Calculate the volume and surface area of a sphere, using formulas that are provided. [CN, PS, V]</p> <p>C3-2. (SS2) Determine the relationships among linear scale factors, areas, the surface areas and the volumes of similar figures and objects. [CN, PS, R, V]</p>	<p>1.1 Calculate the volume and surface area of a beach ball of radius 15 cm.</p> <p>1.2 A hot air balloon has a spherical shape and a diameter of 4 m. If 30 additional cubic metres of air are pumped into the balloon, what will be the new values for the diameter, volume and surface area?</p> <p>2.1 The area of a region in a plane is <math>10 \text{ cm}^2</math>. By what factor must each of the dimensions of this region be multiplied to increase the area by <math>20 \text{ cm}^2</math>?</p> <p>2.2 A model train is built to a scale of 1:50. If the length of the model engine is 20 cm and the area of sheet metal used to cover the outside surface of the model is <math>180 \text{ cm}^2</math>, what is the actual length of the engine and the actual area of the sheeting used to cover the engine? If the volume displaced by the model engine is <math>126 \text{ cm}^3</math>, what is the volume displaced by the real engine, in <math>\text{m}^3</math>?</p> <p>2.3 It is improbable that a giant human, 6 m in height (three or four times normal human height), could exist. Which biological systems are most likely to break down? Explain your answer.</p>

Cluster Common C3

**Strand: Shape and Space (Measurement)**  
*Students will:*

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

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Solve problems involving triangles, including those found in 3-D and 2-D applications.</p> <p><i>(continued)</i></p>	<p>C3–3. Solve problems involving two right triangles. [CN, PS, V]</p> <p>C3–4. Extend the concepts of sine and cosine for angles from <math>0^\circ</math> to <math>180^\circ</math>. [R, T, V]</p> <p><i>(continued)</i></p>	<p>3.1 From the top of a 100 m fire tower, a fire ranger observes two fires, one at an angle of depression of <math>5^\circ</math> and the other at an angle of depression of <math>2^\circ</math>. Assuming that the fires and the tower are in a straight line, determine the distance between the fires for the following:</p> <ol style="list-style-type: none"> <li>when the fires are on the same side of the tower</li> <li>when the fires are on opposite sides of the tower.</li> </ol> <p>3.2 The triangles <math>ABC</math> and <math>BCD</math> have right angles at <math>B</math> and <math>C</math> respectively. Calculate the length of side <math>CD</math>, and state the ratio of length <math>BD</math> to length <math>AC</math>.</p>  <p>3.3 Canada's highest waterfall is Della Falls on Vancouver Island. An observer standing at the same level as the base of the falls views the top of the falls at an angle of elevation of <math>58^\circ</math>. When the observer moves 31 m closer to the base of the falls, the angle of elevation increases to <math>61^\circ</math>. Find the height of Della Falls.</p> <p>4.1 Find <math>\sin 130^\circ</math>.</p> <p>4.2 Use a calculator to find multiple solutions for angle <math>A</math>, if <math>\sin A = \sin 130^\circ</math>. Use trial and error to find as many solutions as possible. Summarize the pattern found in the solutions.</p>

Cluster Common C3

Strand: Shape and Space (Measurement)

Students will:

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

[C] Communication

[CN] Connections

[E] Estimation and

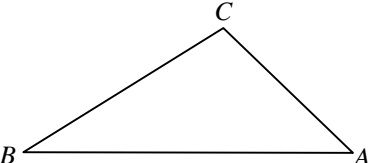
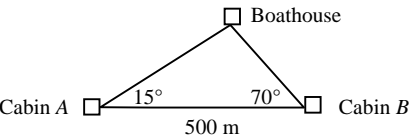
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
(continued)	<p style="text-align: center;">(continued)</p> <p>C3-5. Apply the sine and cosine laws, excluding the ambiguous case, to solve problems. [CN, PS, V]</p>	<p>4.3 Find the value(s) for <math>A</math> (<math>0^\circ \leq A \leq 180^\circ</math>) when <math>\sin A = \frac{1}{2}</math>. Find the value(s) for <math>A</math> (<math>0^\circ \leq A \leq 180^\circ</math>) when <math>\cos A = \frac{1}{2}</math>. Find the value(s) for <math>A</math> (<math>0^\circ \leq A \leq 180^\circ</math>) when <math>\cos A = -\frac{1}{2}</math>.</p> <p>5.1 An electric transmission line is planned to go directly over a pond. The power line will be supported by posts at points <math>A</math> and <math>B</math>. A surveyor measures the distance from <math>B</math> to <math>C</math> as 580 m, the distance from <math>A</math> to <math>C</math> as 337 m and <math>\angle BCA</math> as <math>105.34^\circ</math>. What is the distance from post <math>A</math> to post <math>B</math>?</p>  <p>5.2 Two cabins are located 500 m apart on the same side of a river. Across the river from the two cabins is a boathouse. This situation is illustrated in the diagram below. Use the measurements to find the width of the river.</p>  <p>5.3 A farmer has a field in the shape of a triangle. From one corner, it is 530 m to the second corner and 750 m to the third corner. The angle between the lines of sight to the second and to the third corners is <math>53^\circ</math>. Find the perimeter and area of the field.</p> <p>5.4 A sailboat leaves the dock at Gibson's Landing on a bearing of <math>S57^\circ W</math>. After sailing for 8 km, the ship tacks and travels <math>S31^\circ E</math> for 5 km. a) How far is the sailboat from Gibson's Landing? b) What direction would it have to sail to return to the dock at Gibson's Landing?</p> <p>Bye et al., <i>Holtmath 11</i>, p. 313. Reprinted with permission.</p>

Cluster Common C3

**Strand: Statistics and Probability (Data Analysis)**

*Students will:*

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

- |      |                                      |      |                 |
|------|--------------------------------------|------|-----------------|
| [C]  | Communication                        | [PS] | Problem Solving |
| [CN] | Connections                          | [R]  | Reasoning       |
| [E]  | Estimation and<br>Mental Mathematics | [T]  | Technology      |
|      |                                      | [V]  | Visualization   |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Implement and analyze sampling procedures, and draw appropriate inferences from the data collected.</p>	<p>C3–6. (SP1) Choose, justify and apply sampling techniques that will result in an appropriate, unbiased sample from a given population. [C, PS, R]</p> <p>C3–7. (SP2) Defend or oppose inferences and generalizations about populations, based on data from samples. [C, PS, R]</p>	<p>6.1 A toothpaste company advertises that three out of four dentists prefer their product. Analyze this statement for its completeness and its accuracy in terms of population, sample, possible sampling technique, validity and bias.</p> <p>6.2 A school cafeteria wants to introduce a new dessert. Describe how a survey could be conducted to decide which of three choices should be the new dessert.</p> <p>6.3 To predict a winner in a federal election, a magazine compiled a list of about 200 000 names from sources, such as telephone books, lists of automobile owners, club membership lists and its own subscription lists. The magazine mailed a questionnaire to everybody on the list, and 4000 returned it. The 4000 responses became the sample. Discuss the potential sources of bias.</p> <p>7.1 To determine a preference for spending \$50 in either a clothing store, an electronics shop or a restaurant, customers were surveyed one Saturday morning at the mall. Fifty-nine per cent preferred spending in a clothing store, 32% in an electronics shop and 9% in a restaurant. What generalizations can be made from these results? Does the sample adequately represent the population to be surveyed? Design a more reliable sampling method to obtain this information, and include details of the questionnaires used and the method of selecting the sample.</p> <p>7.2 Search through various forms of media to find examples of generalizations that have been made about populations, based on data from samples. Do you agree or disagree with the generalizations? Explain why.</p>

Cluster Common C4

**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.

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Solve consumer problems, using arithmetic operations.</p> <p><i>(continued)</i></p>	<p>C4–1. Solve consumer problems, including: (N12)</p> <ul style="list-style-type: none"> <li>• wages earned in various situations</li> <li>• property taxation</li> <li>• exchange rates</li> <li>• unit prices.</li> </ul> <p>[CN, E, PS, R, T]</p>	<p>1.1 Calculate and compare wage situations involving minimum wage rates, regular pay, overtime pay, gratuities, piecework, straight commission, salary and commission, salary plus quota and graduated commission.</p> <p>1.2 Jane has a choice of two restaurants at which to work. Mario’s pays \$8/h, and tips average \$24 daily. Teppan’s pays \$5.50/h, and tips average \$35 daily. If Jane works 30 hours weekly, spread over four days, how much would she earn at each restaurant?</p> <p>1.3 Identify and calculate various payroll deductions, including income tax, CPP, UI, medical benefits, union and professional dues and life insurance premiums.</p> <p>1.4 Estimate, calculate and compare gross and net pay for various wage or salary earners in your community.</p> <p>1.5 The Ningart property has a market value of \$105 000. The assessed values in the area are 60% of market values. The tax rate is 32.3 mills of assessed value. What is the Ningarts’ monthly tax payment?</p> <p>1.6 The exchange rate on a given day in the United States is 28% and in Canada 38.8%. Explain why this is possible.</p> <p>1.7 A Canadian traveller goes from Switzerland to Germany. She knows that one Swiss franc is equivalent to \$1.26 Canadian (including exchange cost) and that one German mark is \$0.97 Canadian (including exchange cost). How many German marks does she get for 100 Swiss francs?</p> <p>1.8 Which provides better value for tomato soup, \$0.69 for 284 mL or \$1.79 for 907 mL?</p>

Cluster Common C4

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.

[C] Communication

[CN] Connections

[E] Estimation and

Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples																																																								
<i>(continued)</i>	<p>C4–2. Reconcile financial statements including: (N13)</p> <ul style="list-style-type: none"> <li>• cheque books with bank statements</li> <li>• cash register tallies with daily receipts.</li> </ul> <p>[CN, PS, T]</p>	<p>2.1 The following petty cash transactions occurred during the first week of March.</p> <p>March 4 \$100 cheque was received to establish the fund.            March 5 Bought \$12.50 worth of postage stamps.            March 5 Spent \$10 to have something delivered by taxi.            March 6 Spent \$6.50 for lunch.            March 7 Paid a courier service \$25 for deliveries.            March 7 Bought flowers for opening day, \$28.            March 8 Replenished the fund by \$25.            March 9 Postage stamps purchased for \$21.50.</p> <p>Determine if a final balance of \$20 is correct. If not, provide an explanation for the difference, and indicate possible ways to correct the problem.</p> <p>2.2 Complete the table below to determine the cost of credit for using a department store charge account for the period shown. Monthly credit charges are 1.4% of the balance due.</p> <table border="1"> <thead> <tr> <th>Month</th> <th>Previous Balance</th> <th>– Payment Made</th> <th>+ Purchases Charged</th> <th>⇒ Balance Due</th> <th>+ Credit Charges</th> <th>⇒ New Balance</th> </tr> </thead> <tbody> <tr> <td>February</td> <td>\$314.65</td> <td>\$100.00</td> <td>\$193.75</td> <td></td> <td>\$5.72</td> <td>\$414.12</td> </tr> <tr> <td>March</td> <td></td> <td>\$150.00</td> <td>\$ 59.60</td> <td></td> <td></td> <td></td> </tr> <tr> <td>April</td> <td></td> <td>\$140.00</td> <td>\$421.83</td> <td></td> <td></td> <td>\$618.62</td> </tr> <tr> <td>May</td> <td>\$618.62</td> <td>\$200.00</td> <td>\$ 39.65</td> <td></td> <td></td> <td></td> </tr> <tr> <td>June</td> <td></td> <td>\$250.00</td> <td>\$ 58.11</td> <td></td> <td></td> <td></td> </tr> <tr> <td>July</td> <td></td> <td>\$150.00</td> <td>\$ 77.21</td> <td></td> <td></td> <td></td> </tr> <tr> <td>August</td> <td>\$206.68</td> <td>\$120.00</td> <td>\$163.09</td> <td></td> <td>\$3.50</td> <td>\$253.27</td> </tr> </tbody> </table>	Month	Previous Balance	– Payment Made	+ Purchases Charged	⇒ Balance Due	+ Credit Charges	⇒ New Balance	February	\$314.65	\$100.00	\$193.75		\$5.72	\$414.12	March		\$150.00	\$ 59.60				April		\$140.00	\$421.83			\$618.62	May	\$618.62	\$200.00	\$ 39.65				June		\$250.00	\$ 58.11				July		\$150.00	\$ 77.21				August	\$206.68	\$120.00	\$163.09		\$3.50	\$253.27
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Cluster Common C4

**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.

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples														
<i>(continued)</i>	<i>(continued)</i>	<p>4.2 Plot the world population on the vertical axis and the date on the horizontal axis. Use the graph to predict the date when the population reached 4 billion and to predict the present population of the world.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Date</th> <th>Population</th> </tr> </thead> <tbody> <tr> <td>1650</td> <td>500 000 000</td> </tr> <tr> <td>1850</td> <td>1 100 000 000</td> </tr> <tr> <td>1930</td> <td>2 000 000 000</td> </tr> <tr> <td>1950</td> <td>2 500 000 000</td> </tr> <tr> <td>1970</td> <td>3 600 000 000</td> </tr> <tr> <td>1988</td> <td>5 100 000 000</td> </tr> </tbody> </table> <p>C4–5. Solve investment and credit problems involving simple and compound interest. [CN, PS, T]</p> <p>5.1 Determine the effective annual interest rate on a loan of \$1000 at 10% per year, compounded quarterly.</p> <p>5.2 Calculate the compound amount, after one year, of a deposit of \$1000. Assume the current nominal annual interest when the interest is compounded:</p> <ol style="list-style-type: none"> <li>annually</li> <li>monthly</li> <li>daily.</li> </ol> <p>5.3 A bank offers an interest rate of 8% per year, compounded annually. A second bank offers an interest rate of 8% per year, compounded quarterly. If \$2000 were deposited, for ten years, in each bank, how much more income would be gained in the second bank than in the first?</p> <p>5.4 Calculate the interest paid on various forms of credit, including:</p> <ol style="list-style-type: none"> <li>credit cards</li> <li>loans</li> <li>mortgages.</li> </ol> <p>5.5 A loan of \$5000 carries an interest rate of 9% per year, compounded monthly. Adele makes a payment of \$350 every month. Use a spreadsheet to determine how much she still owes after making 12 payments.</p> <p>5.6 Compare two investments in an RRSP for one year with contributions starting January 1.</p> <ol style="list-style-type: none"> <li>\$100 is invested monthly at 10% per annum, compounded monthly.</li> <li>\$600 is invested semi-annually at 10% per annum, compounded semi-annually.</li> </ol>	Date	Population	1650	500 000 000	1850	1 100 000 000	1930	2 000 000 000	1950	2 500 000 000	1970	3 600 000 000	1988	5 100 000 000
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Cluster Common C5

**Strand: Patterns and Relations (Variables and Equations)**  
*Students will:*

- represent algebraic expressions in multiple ways.

- |      |                                      |      |                 |
|------|--------------------------------------|------|-----------------|
| [C]  | Communication                        | [PS] | Problem Solving |
| [CN] | Connections                          | [R]  | Reasoning       |
| [E]  | Estimation and<br>Mental Mathematics | [T]  | Technology      |
|      |                                      | [V]  | Visualization   |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Represent and analyze situations that involve expressions, equations and inequalities.</p>	<p>C5-1. Graph linear inequalities, in two variables. (PR29) [PS, V]</p>	<p>1.1 Solve, algebraically and graphically, for <math>x</math>: <math>2x + 5 &gt; 3x - 1</math>.</p> <p>1.2 A target is described in terms of coordinates <math>(x, y)</math>, where <math>x</math> and <math>y</math> are measured in metres. All of the following are true:</p> <ul style="list-style-type: none"> <li><math>x \leq 6</math></li> <li><math>y \geq 7</math></li> <li><math>(x, y)</math> is in the first quadrant</li> <li><math>x + y \leq 10</math>.</li> </ul> <p>What is the shape and the area of the target?</p>
	<p>C5-2. Solve systems of linear equations, in two variables: (PR30)</p> <ul style="list-style-type: none"> <li>algebraically (elimination and substitution)</li> <li>graphically.</li> </ul> <p>[CN, PS, T, V]</p>	<p>2.1 Solve this system of equations, using the elimination method: <math>x + 2y = 10</math> <math>2x + 3y = 14</math>.</p> <p>2.2 Solve this system of equations, using the substitution method: <math>3x + 4y = 15</math> <math>x - y = 5</math>.</p> <p>2.3 A principal of \$42 000 is invested partly at 7% and partly at 9.5%. If the interest is \$3700, how much is invested at each interest rate?</p> <p>2.4 Plot the graphs of <math>2x + 3y = 11</math> and <math>2x - 3y = 17</math>. What is their point of intersection?</p>
	<p>C5-3. Solve nonlinear equations, using a graphing tool. (PR31) [CN, T, V]</p>	<p>3.1 Using a graphing tool, solve <math>x^2 + 6x - 11 = 0</math>.</p> <p>3.2 Solve <math>x^3 + x = 30</math> graphically, using two different methods. Which method gives solutions that are freer from rounding errors and other inaccuracies?</p> <p>3.3 Where does the line <math>y = 4x + 5</math> cut the curve <math>y = 2^x</math>? Use a graphing tool to find the points of intersection.</p>

Cluster Common C5

**Strand: Patterns and Relations (Relations and Functions)**  
*Students will:*

- use algebraic and graphical models to generalize patterns, make predictions and solve problems.

- |      |                                      |      |                 |
|------|--------------------------------------|------|-----------------|
| [C]  | Communication                        | [PS] | Problem Solving |
| [CN] | Connections                          | [R]  | Reasoning       |
| [E]  | Estimation and<br>Mental Mathematics | [T]  | Technology      |
|      |                                      | [V]  | Visualization   |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Represent and analyze quadratic, polynomial and rational functions, using technology as appropriate.</p>	<p>C5-4. (PR57) Determine the following characteristics of the graph of a quadratic function:</p> <ul style="list-style-type: none"> <li>vertex</li> <li>domain and range</li> <li>axis of symmetry</li> <li>intercepts.</li> </ul> <p>[C, PS, T, V]</p>	<p>4.1 Given the graph of any quadratic function, determine the following:</p> <ol style="list-style-type: none"> <li>vertex</li> <li>domain</li> <li>range</li> <li>axis of symmetry</li> <li>intercepts.</li> </ol> <p>4.2 Use technology to graph <math>f(x) = x^2 - 6x + 4</math> and to determine the vertex, domain, range, axis of symmetry and intercepts.</p> <p>4.3 One model concerning the rate of population growth of Earth has the annual rate of increase varying jointly as the population and the unused carrying capacity of Earth. The equation of the model is: <math>y = 0.001x(21 - x)</math>, where <math>y</math> = the rate of increase in population (in billions per year), and <math>x</math> = the present population (in billions).</p> <ol style="list-style-type: none"> <li>Plot this model of growth.</li> <li>The present population of Earth is 5.8 billion. What is the annual increase in population at present?</li> <li>What is the population when the rate of increase in population is at its greatest?</li> <li>What is the population when the rate of increase is zero?</li> <li>What is the projected maximum population that Earth can accommodate, according to this model?</li> </ol>

Cluster Common C5

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.

[C] Communication

[CN] Connections

[E] Estimation and

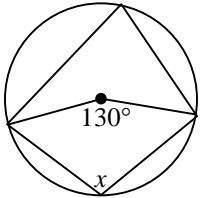
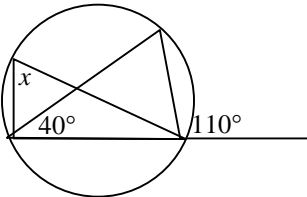
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Develop and apply the geometric properties of circles and polygons to solve problems.</p> <p style="text-align: right;"><i>(continued)</i></p>	<p>C5-5. (SS26) Use technology and measurement to confirm and apply the following properties to particular cases:</p> <ul style="list-style-type: none"> <li>the perpendicular from the centre of a circle to a chord bisects the chord</li> <li>the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc</li> <li>the inscribed angles subtended by the same arc are congruent</li> <li>the angle inscribed in a semicircle is a right angle</li> <li>the opposite angles of a cyclic quadrilateral are supplementary</li> <li>a tangent to a circle is perpendicular to the radius at the point of tangency</li> <li>the tangent segments to a circle, from any external point, are congruent</li> <li>the angle between a tangent and a chord is equal to the inscribed angle on the opposite side of the chord</li> <li>the sum of the interior angles of an <math>n</math>-sided polygon is <math>(2n - 4)</math> right angles.</li> </ul> <p>[PS, R, T, V]</p> <p style="text-align: right;"><i>(continued)</i></p>	<p>5.1 A plate, with a diameter of 20 cm, is placed on a square place mat, with no overhang. Calculate the length of the diagonal of the square.</p> <p>5.2 Determine the measure of angle <math>x</math>.</p>  <p>5.3 Determine the measure of angle <math>x</math>.</p>  <p>5.4 Draw a semicircle with diameter <math>AB</math>. Draw an angle, <math>ACB</math>, with <math>C</math> being any point on the semicircle. What is the measure of angle <math>ACB</math>? Repeat for two other points, <math>C'</math> and <math>C''</math>, on the semicircle. What pattern emerges?</p>

Cluster Common C5

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.

[C] Communication

[CN] Connections

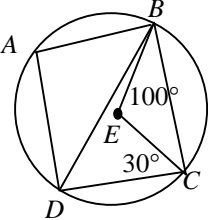
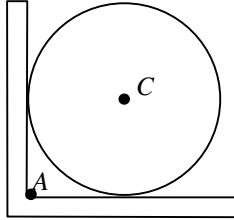
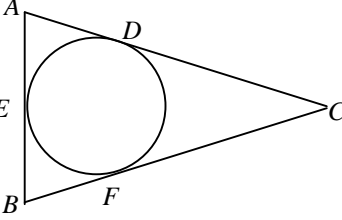
[E] Estimation and  
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
(continued)	(continued)	<p>5.5 Determine the measure of <math>\angle ECB</math>, <math>\angle BDC</math>, <math>\angle BAD</math> and <math>\angle DBE</math>, where <math>E</math> is the centre of the circle.</p>  <p>5.6 How far from the inside corner of the shelf, <math>A</math>, is the centre <math>C</math> of the plate, if the plate has a diameter of 20 cm?</p>  <p>5.7 The perimeter of the isosceles triangle <math>ABC</math>, with <math>AC = BC</math>, is 54 cm. If <math>AD = 5</math> cm, and <math>D, E</math> and <math>F</math> are points of tangency, find the length of <math>BC</math>.</p> 

Cluster Common C5

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.

[C] Communication

[CN] Connections

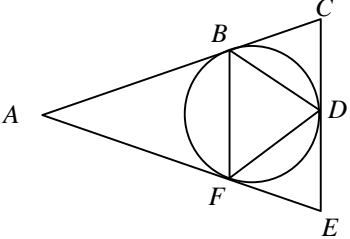
[E] Estimation and  
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
<p><i>(continued)</i></p>	<p><i>(continued)</i></p>	<p>5.8 Determine the measure of <math>\angle CAE</math>, if <math>\angle BDF = 60^\circ</math> and <math>\angle FDE = 70^\circ</math>.</p> 

Cluster Common C6

**Strand: Statistics and Probability (Chance and Uncertainty)**

*Students will:*

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

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples																														
<p>Use normal and binomial probability distributions to solve problems involving uncertainty.</p> <p style="text-align: right;"><i>(continued)</i></p>	<p>C6–1. (SP11) Find the population standard deviation of a data set or a probability distribution, using technology. [CN, E, T, V]</p> <p>C6–2. (SP12) Use <math>z</math>-scores and <math>z</math>-score tables to solve problems. [PS, R, T, V]</p> <p style="text-align: right;"><i>(continued)</i></p>	<p>1.1 Measure the height of each student in a class, and calculate the mean and standard deviation.</p> <p>1.2 A company uses an automated packaging device to produce 50-g bags of Karmel Korn. The machine needs frequent checking to see if it is actually putting 50 g in each bag. The following are the masses, in grams, of thirty bags of Karmel Korn.</p> <table border="1"> <tr><td>54</td><td>50</td><td>47</td><td>50</td><td>51</td><td>50</td></tr> <tr><td>53</td><td>50</td><td>47</td><td>51</td><td>50</td><td>51</td></tr> <tr><td>52</td><td>49</td><td>46</td><td>52</td><td>50</td><td>49</td></tr> <tr><td>52</td><td>48</td><td>48</td><td>53</td><td>49</td><td>49</td></tr> <tr><td>51</td><td>48</td><td>49</td><td>52</td><td>49</td><td>50</td></tr> </table> <p>a) Calculate the mean and standard deviation of this data. b) What problems will be encountered, if the standard deviation gets too high?</p> <p><i>Dottori et al., Foundations of Mathematics 11, p. 392. Adapted with permission.</i></p> <p>2.1 The volume of the contents of a soft drink can is normally distributed about a mean of 350 mL, with a standard deviation of 1.5 mL. a) Calculate the <math>z</math>-score for a can with a volume of 355 mL. b) What percentage of production will consist of cans having content volumes between 350 mL and 355 mL? c) What percentage of production will consist of cans having content volumes less than 355 mL? d) If cans containing less than 346 mL must be rejected, how many cans will be expected to be rejected in a run of 50 000?</p>	54	50	47	50	51	50	53	50	47	51	50	51	52	49	46	52	50	49	52	48	48	53	49	49	51	48	49	52	49	50
54	50	47	50	51	50																											
53	50	47	51	50	51																											
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51	48	49	52	49	50																											

Cluster Common C6

Strand: Statistics and Probability (Chance and Uncertainty)

Students will:

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

[C] Communication

[CN] Connections

[E] Estimation and

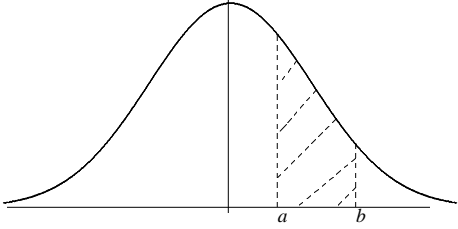
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
(continued)	(continued)	<p>2.2</p>  <p>a) What is the area under this curve?            b) If <math>P(a &lt; z &lt; b) = 0.4</math>, what is the area under the curve for the interval <math>a &lt; z &lt; b</math>?            c) If <math>P(z &lt; b) = 0.9</math>, calculate <math>P(z &gt; b)</math>, and calculate the value of <math>b</math>.</p> <p>2.3 For entry into the Canadian Armed Forces, the standards for height used to be set at 158 cm to 194 cm for males, and 152 cm to 184 cm for females. Use the concept of <math>z</math>-score to test if these two height standards are equivalent. Assume means of 176 cm and 163 cm and standard deviations of 8 cm and 7 cm respectively.</p> <p>2.4 A sample of 122 people gives a mean body temperature of <math>36.8^{\circ}\text{C}</math>, with a standard deviation of <math>0.35^{\circ}\text{C}</math>. Assuming a normal distribution, find:            a) the expected number of people with temperatures above <math>37.0^{\circ}\text{C}</math>            b) the expected number of people with temperatures below <math>36.0^{\circ}\text{C}</math>.</p> <p>Also, estimate the range of temperatures contained within the sample.</p> <p>2.5 In the general population, the IQ scores of individuals is normally distributed with a mean of 110 and a standard deviation of 10. If a large group of people is tested:            a) What proportion of this group is expected to have IQs between 100 and 120?            b) What is the probability that an individual in the group has an IQ greater than 120?</p>

Cluster Common C6

Strand: Statistics and Probability (Chance and Uncertainty)

Students will:

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

- |  |                      |
|--|----------------------|
| [C] Communication                        | [PS] Problem Solving |
| [CN] Connections                         | [R] Reasoning        |
| [E] Estimation and<br>Mental Mathematics | [T] Technology       |
|  | [V] Visualization    |

General Outcomes	Specific Outcomes	Illustrative Examples
<p><i>(continued)</i></p>	<p>C6-3. (SP13) Use the normal distribution and the normal approximation to the binomial distribution to solve problems involving confidence intervals for large samples. [CN, E, PS]</p>	<p>3.1 The heights of males employed by a manufacturer follow a normal distribution with a mean of 169 cm and a standard deviation of 8 cm.</p> <p>a) Establish a symmetric 95% confidence interval for the average height in a random sample of 36 male employees.</p> <p>b) What happens to the width of the symmetric 95% confidence interval, if the sample size is increased from 36 to 225?</p> <p>3.2 Pollsters estimate that the number of decided voters in favour of a particular bylaw is 64%, and the number opposed is 36%.</p> <p>a) If the sample size is 250, find the expected mean and standard deviation of <i>yes</i> voters.</p> <p>b) Estimate, for this sample, the expected percentage of <i>yes</i> voters, with a symmetric 95% confidence interval used to establish the margin of error.</p> <p>c) If the margin of error for the percentage of <i>yes</i> voters must be less than <math>\pm 1.0\%</math>, what would be the minimum sample size required?</p> <p>3.3 The probability that a car salesperson will complete a sale is 0.10. If the salesperson has 200 customers in the next month, establish a symmetric 95% confidence interval for the number of completed sales for the month.</p>

Cluster Common C6

Strand: Statistics and Probability (Chance and Uncertainty)

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[C] Communication

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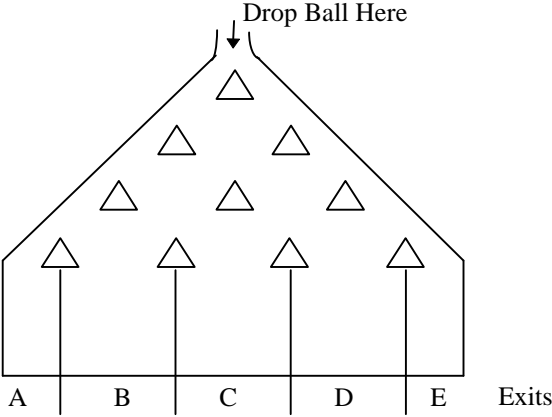
[E] Estimation and  
Mental Mathematics

[PS] Problem Solving

[R] Reasoning

[T] Technology

[V] Visualization

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Solve problems based on the counting of sets, using techniques such as the fundamental counting principle, permutations and combinations.</p>	<p>C6-4. Solve pathway problems, interpreting and applying any constraints. [PS, R]</p> <p>C6-5. Use the fundamental counting principle to determine the number of different ways to perform multistep operations. [PS, R]</p>	<p>4.1 Given the following “pinball” situation, what is the probability of the ball reaching each of the exits?</p>  <p>What assumptions are made in the solution?</p> <p>5.1 Joe has three different shirts, two different pairs of pants and five different pairs of shoes. List all possible outfits in such a way as to ensure that all have been counted and none have been counted twice. How many possible outfits are there? Use the fundamental counting principle to determine the number of outfits there should be. Do your answers match?</p> <p>5.2 An airline pilot reported that in seven days she spent one day in Winnipeg, one day in Regina, two days in Edmonton and three days in Yellowknife. How many different itineraries are possible? What difference would it make if the first day and the last day had to be spent in Yellowknife?</p>

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- |      |                                      |      |                 |
|------|--------------------------------------|------|-----------------|
| [C]  | Communication                        | [PS] | Problem Solving |
| [CN] | Connections                          | [R]  | Reasoning       |
| [E]  | Estimation and<br>Mental Mathematics | [T]  | Technology      |
|      |                                      | [V]  | Visualization   |

General Outcomes	Specific Outcomes	Illustrative Examples
<p>Model the probability of a compound event, and solve problems based on the combining of simpler probabilities.</p>	<p>C6–6. (SP20) Construct a sample space for two or three events. [PS, R, V]</p> <p>C6–7. (SP21) Classify events as independent or dependent. [C]</p> <p>C6–8. (SP22) Solve problems, using the probabilities of mutually exclusive and complementary events. [CN, PS, R]</p>	<p>6.1 List the sample space for rolling a 6-sided die and flipping a coin.</p> <p>6.2 Draw or list the sample space for the following situation. A bus is scheduled to arrive at a train station at any time between 07:05 and 07:15 inclusive. A train is scheduled to arrive between 07:11 and 07:17 inclusive. The arrival of a bus at 07:06 and a train at 07:14 can be represented by the point (6, 14). Times are expressed in whole minutes.</p> <p>a) How many points are there in this sample space?            b) How many points have the bus and the train arriving at the same time?            c) How many points have the bus arriving after the train?            d) What is the probability of the bus arriving after the train?</p> <p>7.1 Classify the following events as independent or dependent:</p> <p>a) tossing a head in a coin toss and rolling a 6 on a die            b) drawing an ace for the first card and another ace for the second, if the experiment is carried out without replacement            c) drawing a king for the first card and a queen for the second, if the experiment is carried out with replacement.</p> <p>7.2 Sixty per cent of young drivers take driver training, and 25% of young drivers have an accident in their first year of driving. Statistics show that 10% of those who do take driver training have an accident in their first year. Are taking driver training and having an accident in the first year independent events?</p> <p>8.1 If the probability of winning a game is <math>\frac{1}{31}</math>, what is the probability of losing the game?</p> <p>8.2 A shootout consists of teams A and B taking alternate shots on goal. The first team to score wins. Team A has a probability of 0.3 of scoring with any one shot. Team B has a probability of 0.4 of scoring with any one shot.</p> <p>a) If Team A shoots first, what is the probability of Team B winning on its first shot?            b) If Team A shoots first, what is the probability of Team A winning on its third shot?</p>