

## Rationale for Yearly Plan

Starting with chapter 5 allows the student to explore numbers and number patterns, while connecting them to visual representations. This is an excellent opportunity to explore patterns with squares, represent numbers in multiple ways, order and operate on numbers and solve interesting problems, both routine and non-routine. In chapter 5, students will understand the importance of recognizing patterns, creating visual representations, reading word problems carefully and repeatedly, using variables to represent unknown quantities, using appropriate notation, solving simple equations, using the calculator correctly and efficiently, using units appropriately, and making concluding statements. Students have a “way in” as there is very little prior knowledge required for success. The symbolism is used only after students have come to the understanding of the patterns and their importance. Work in this chapter and the relevant 10 Plus outcomes should span the first week in September to the end of the first or second week in October.

Chapter 1 represents a change of pace for the students. The approach is very visual and numerical as it develops the concepts associated with observing patterns, extracting meaning from data and making predictions with some degree of confidence. This is an opportunity to work with whole numbers as well as decimals resulting from measurement and discuss reasonableness of the statistics that arise from the calculations, continuing to develop students’ number sense. The normal distribution provides a context for further work on percent. The more students can see themselves in the data, the more they are likely to relate to the concepts that are being developed. The data displays developed here should be continued throughout the year. For example, when tests are returned to students, the teacher could illustrate results with a stem-and-leaf plot, box-and-whisker plot, frequency polygon and/or giving either the five-point summary or information about measures of central tendency and standard deviation with discussion to reinforce understanding. The chapter concludes with scatter plots and a brief exploration of lines of best fit which serve as an introduction to two-variable statistics and the concepts, language and visual representations associated with dependence. The time line for this chapter runs from the second week in October to the third week in November.

Chapters 3 and 4 are heavily symbolic. It is important to connect the symbolism, language and algebraic skills with visual and contextual understanding. It is good practice to make use of opportunities for students to work in groups and explain their thinking and reasoning. Work in chapter 3 spans the time from the last week in November to the third week of January. This allows one week of review if students are to prepare for an exam. Some exploration of the subsets of the real numbers is needed so that students can distinguish as needed in discussions of domain and range, as well as in describing solutions of equations. It is important to take the time to develop the processes associated with solving equations using algebra tiles and then, through discussion and student observation, synthesize the understanding so that students see that they are “undoing”

equations by performing inverse operations and further, when an operation is performed, both sides of the equation must be treated the same to preserve the balance. Any “shortcuts” must be careful to preserve these two critical concepts. (If students can identify what needs to be undone, and if they “do it” to both sides, they will be able to use the same basic understanding when solving equations requiring more sophisticated methods.) Suggested resources: Pilmer, Algebra with Pizzazz, Shell material.

In section 3.5, return to using algebra tiles. Discuss area – Demonstrate the use of the area model for  $23 \times 67$ . Investigation 9 is important for connecting the graph, the intercepts and the factors. More practice must be provided, however. In assessing this unit, opportunities must be provided for students to demonstrate their understanding with regard to all of the outcomes listed and not simply the factoring skill.

February begins chapter 4 which builds on the skills and concepts of chapter 3. Students sketch graphs from stories and data and practice the skill of interpreting a graphical representation. They will also have the experience of creating a story which corresponds to a given graph and recognizing what information can be determined as well as which information is not determined by the graph. The use of a CBR or CBL provides students with validation of their observations and provides a useful demonstration activity. Students can begin to study the dynamics of change as indicated by graphs. The concept of function is introduced in unit 4.2. A comprehensive definition of function can be developed as students work through the exercises in the text. Supplemental activities can be found in Pilmer and the appendix; students should be comfortable with function notation applied to graphs as well as to equations and tables. It may be necessary to spend some time reviewing the visual cues and geometric properties associated with transformations. To begin section 4.3, it is useful to discuss the graph of  $y = x^2$  at length and in detail. It may be useful to introduce it by playing “What’s My Rule”. Then, all possible representations of the relation are given. More ordered pairs may have to be computed to answer the following questions. Is the relation a function? How do you know? How can you tell from the graph? from the table? Is it linear? How do you know from the table? From the graph? From the rule (equation)? What is the domain? The range? (Use interval notation and set notation). Will the graph continue? Is it discrete or continuous? Construct a story to fit the graph. Does it fit the whole graph or only a part of it? Where does the shape of the graph come from? The equation is called a quadratic equation and the shape of the curve is called a parabola. Students may need support recognizing what the various transformations look like before they can look at a graph and decide what type has taken place. Section 4.4 and 4.5 continue the study of scatter plots, begun in grade 6, and continued each year through to this course where they will learn to find the equation for the line of best fit first using the median-median approach, both by hand and by using the graphing calculators regression processes, then by the least squares method (calculator only). Near the end of this section students will be given opportunities to explore tables, and situations that require a curve of best fit. Both QuadReg and ExpReg will be used. Students should be able to determine the best fit model by inspecting the curve drawn on the scatter plot and the correlation coefficient

value, or by understanding the situation described by the scatter plot and what shape might best describe it, or by examining the patterns or lack of in the residuals.

Chapter 2 presents a change of pace. It is important to verbalize and discuss the definitions associated with the various networks. As this is an area where the homework assignments are not onerous, it presents a possible opportunity to work a parallel unit on understanding and operating on fractions.

How to build skills with numbers:

Although students are encouraged to have and use a calculator, suggest that for basic one digit multiplications and two digit additions and subtractions, they try to answer the question first in their head and use the calculator only as a check. To help with multiplication and developing number sense, create a “times table” sheet.

Examine a Story – work with a set of numbers – what operations keep you in the set (closure property)? Story – what operation can’t you do and stay in the set? Write a story to show understanding.

Supplemental work on matrices – equality; addition; subtraction; multiplication by a scalar; multiplying matrices; applications.

Chapter 7:

Use either Modeling mathematics or Baker’s Choice

Explain the process: Post a sheet of chart paper with the headings – refer to the sheet to show students where they are in the process:

- Understand the problem – discussion of constraints (in words only) and profit and the relationship between these
- students experiment to determine possible and impossible solutions by relating them to the constraints – use the table, plot the points in different colours – observe pattern
- need to take a closer look – investigate one constraint at a time (make a simpler problem) – groups on chart paper – seems to be a boundary – what does boundary look like – what happens on the boundary – write equation – what happens on the good side of the boundary – inequality – overlap graphs – need to refine procedures
- investigate inequalities – one variable to understand notation – two variable gives region on graph – indicate region with shading – practice
- return to Heather’s problem – graph all constraints to determine the feasible region
- complete the sentence “If you choose any point in the feasible region . . . .”
- investigation of profit line or optimal solution line– Pick a point; determine the profit (or optimal solution). Find another point that gives exactly the same profit (use what we know about solving equations to do this). Find a third point with the same profit. What do you notice. Why? Shortcut – use Autograph once you have generated the equation. Why should the lines be

parallel? Work through a couple of different profit lines – show how the equation in the  $y=mx+b$  form evolves from the  $Ax+By=C$  form and how the slope will be the same in every case. How could we make the profit greater? Where will the line  $Ax+By=50$  be in relation to the others? What about  $Ax+By=300$ ? How will we know where the greatest profit is?

- How can we determine the coordinates of the point that passes through the optimal solution line? It is the point last touched by the optimal solution lines as it passes through the feasible region.
  - Summarize the steps for solving a linear programming problem
    - Read the problem
    - Identify the variables. Represent them using letters.
    - Identify the constraints. Represent them as inequalities.
    - Graph the inequalities to determine the feasible region.
    - Write the optimal solution line equation. Graph a possible line to represent a particular optimal solution.
    - Use the optimal solution line to determine the point(s) that cause the optimal solution. Determine the coordinates for that point or points.
- OR
- Determine the coordinates of the vertices of the feasible region.
  - Substitute the coordinates of the vertices in the optimal solution equation to determine the values of the variables that give an optimal solution.
  - Write a concluding statement.

## Chapter 6

Use Polydron or GO Frame pieces to help students get a feel for surface area and volume. Allow students to create shapes and apply the definition of pyramids and prisms. Review formulas for area of rectangle, triangle, circle. Use these and trigonometry to determine a simple formula to find the area of any regular  $n$ -gon (see question 17, page 369 in the text). Use area formulae and the concept of volume = area of base times height to determine the volume of prisms (rectangular, triangular, pentagonal, hexagonal). Use this to get area of pyramids (one third area of prism with same base and height – done in grade 9). Explore the Economy of Design to determine relationships between minimum surface areas and maximum volumes. Examine similarity of 3-d objects.

A suggested laboratory activity: bring in shapes used for packaging; students identify shape; take the required measurements; determine surface area; determine volume. Write a report. It is at this point when a discussion about accuracy and precision is meaningful. All students should not use the same shapes – provide a dozen different ones and each student must do 2 or 3 and write a report describing their process and indicating why that particular package is suitable for the contents. Examples: Toblerone bar, cereal boxes, Quality Street, chips, tuna can, etc.

Get into the chapter activities – explore – conjecture – determine relationships – have fun.

## Yearly Plan

### Chapter 5: How Far? How Tall? How Steep? 5 weeks

Math 10 Outcomes	Math 10 Plus Outcomes
<p><b>5.1 Ratios Based on Right Triangles</b></p> <ul style="list-style-type: none"> <li>• apply the properties of similar triangles D2</li> <li>• solve problems involving similar triangles and right triangles</li> <li>• D8determine the accuracy and precision of a measurement D7</li> <li>• solve problems involving measurement using bearings and vectors D6</li> </ul>	<ul style="list-style-type: none"> <li>• choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil), and for problem solving 10+B3</li> <li>• develop and use ratio, rate and proportions as tools for solving problems 10+D3</li> <li>• demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10+C7</li> <li>• represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10+A3</li> </ul>
<p><b>5.2 The Pythagorean Theorem</b></p> <ul style="list-style-type: none"> <li>• apply the Pythagorean theorem D14</li> <li>• demonstrate an understanding of and write a proof for the Pythagorean theorem E7</li> <li>• solve problems involving similar triangles and right triangles D8</li> <li>• use inductive and deductive reasoning when observing patterns, developing properties, and making conjectures E8</li> <li>• use deductive reasoning, construct logical arguments, and be able to determine, when given a logical argument, if it is valid E9</li> </ul>	<ul style="list-style-type: none"> <li>• choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil) , and for problem solving 10+B3</li> <li>• demonstrate an understanding of rational and irrational numbers, compare and order them, and apply them in meaningful situations 10+A1</li> <li>• represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10+A3</li> </ul>

<p><b>5.3 Square Roots and Their Properties</b></p> <ul style="list-style-type: none"> <li>• approximate square roots A4</li> <li>• demonstrate an understanding of and apply properties to operations involving square roots A8</li> <li>• develop algorithms and perform operations on irrational numbers B2</li> <li>• apply the Pythagorean theorem D14</li> <li>• use inductive and deductive reasoning when observing patterns, developing properties, and making conjectures E8</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate an understanding of rational and irrational numbers, compare and order them, and apply them in meaningful situations 10<sup>+</sup>A1</li> <li>• represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10<sup>+</sup>A3</li> <li>• choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil) , and for problem solving 10<sup>+</sup>B3</li> <li>• represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10<sup>+</sup>C1</li> </ul>
<p><b>5.4 Defining Trigonometric Ratios</b></p> <ul style="list-style-type: none"> <li>• explore and apply functional relationships and notation, both formally and informally C21</li> <li>• relate the trigonometric functions to the ratios in similar right triangles D3</li> <li>• apply trigonometric functions to solve problems involving right triangles including the use of angle of elevation D5</li> <li>• use calculators to find trigonometric values of angles and angles when trigonometric values are known D4</li> <li>• solve problems using trigonometric ratios D12</li> </ul>	<ul style="list-style-type: none"> <li>• develop and use ratio, rate and proportions as tools for solving problems 10<sup>+</sup>D3</li> <li>• represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10<sup>+</sup>A3</li> </ul>
<p><b>5.5 Applications of Trigonometry</b></p> <ul style="list-style-type: none"> <li>• solve problems involving similar triangles and right triangles D8</li> <li>• solve problems using trigonometric ratios D12</li> <li>• solve problems involving measurement using bearings and vectors D6</li> <li>• apply trigonometric functions to solve problems involving right triangles including the use of angle of elevation D5</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10<sup>+</sup>C7</li> <li>• represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10<sup>+</sup>A3</li> </ul>

## Chapter 1: Data Management 6 weeks

<b>Math 10 Outcomes</b>	<b>Math 10 Plus Outcomes</b>
<p><b>1.1 Variables and Relationships</b></p> <ul style="list-style-type: none"> <li>• analyze graphs or charts of given situations to identify specific information A2</li> <li>• gather data, plot the data using appropriate scales, and demonstrate an understanding of independent and dependent variables, domain, and range C3</li> <li>• design and conduct experiments using statistical methods and scientific inquiry F1</li> <li>• (optional) demonstrate an understanding of concerns and issues that pertain to the collection of data F2</li> <li>• solve problems by modeling real-world phenomena F6</li> </ul>	<ul style="list-style-type: none"> <li>• collect data, display it accordingly as a histogram, a stem-and-leaf plot, a box plot, a scatter plot and interpret the displays, both with technology and by hand when appropriate 10°F1</li> </ul>
<p><b>1.2 Measuring</b></p> <ul style="list-style-type: none"> <li>• (optional) determine accuracy and precision of a measurement D7</li> <li>• demonstrate an understanding of the concerns and issues that pertain to the collection of data F2</li> </ul>	<ul style="list-style-type: none"> <li>• model, solve and create problems that utilize addition, subtraction, multiplication and divisions of fractions and decimals 10*B2</li> </ul>
<p><b>1.3 Describing Data</b></p> <ul style="list-style-type: none"> <li>• analyze graphs or charts of given situations to identify specific information A2</li> <li>• design and conduct experiments using statistical methods and scientific inquiry F1</li> <li>• demonstrate an understanding of the concerns and issues that pertain to the collection of data F2</li> <li>• construct various displays of data F3</li> <li>• calculate various statistics using appropriate technology, analyse and interpret the displays, and describe the relationships F4</li> <li>• analyze statistical summaries, draw conclusions, and communicate results about distributions of data F5</li> <li>• create and analyse plots using appropriate technology C4</li> <li>• solve problems using graphing technology C17</li> </ul>	<ul style="list-style-type: none"> <li>• choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil) , and for problem solving 10*B3</li> <li>• collect data, display it accordingly as a histogram, a stem-and-leaf plot, a box plot, a scatter plot and interpret the displays, both with technology and by hand when appropriate 10°F1</li> </ul>

<p><b>1.4 Defining Data Spread and 1.5 Large Distributions and the Normal Curve</b></p> <ul style="list-style-type: none"> <li>analyse statistical summaries, draw conclusions, and communicate results about distributions of data F5</li> <li>calculate various statistics using appropriate technology, analyse and interpret the displays, and describe the relationships F4</li> <li>calculate and apply the mean and standard deviation using technology to determine whether a variation makes a difference F13</li> <li>make and interpret frequency bar graphs while conducting experiments and exploring measurement issues F14</li> <li>solve problems using graphing technology C17</li> <li>explore measurement issues using the normal curve F12</li> <li>calculate and apply mean and standard deviation using technology, to determine if a variation makes a difference F13</li> <li>determine whether differences in repeated measurements are significant or accidental D9</li> </ul>	<ul style="list-style-type: none"> <li>demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10+C7</li> <li>represent numbers in multiple ways (including exponents, ratios, percents, proportions, and scientific notation) and apply appropriate representations to solve problems 10+A3</li> <li>collect data, display it accordingly as a histogram, a stem-and-leaf plot, a box plot, a scatter plot and interpret the displays, both with technology and by hand when appropriate 10+F1</li> </ul>
<p><b>1.6 Using Data to Predict</b></p> <ul style="list-style-type: none"> <li>create and analyse plots using appropriate technology C4</li> <li>gather data, plot the data using appropriate scales, and demonstrate an understanding of independent and dependent variables, and domain and range C3</li> <li>solve problems using graphing technology C17</li> <li>explore non-linear data, using power and exponential regression, to find a curve of best fit F7</li> <li>determine and apply a line of best fit, using the least squares method F8</li> <li>demonstrate an intuitive understanding of correlation F9</li> <li>use interpolation and extrapolation and the equation to predict and solve problems F10</li> <li>sketch lines and curves of best fit, and determine the equation for the line of best fit by hand and with technology F2</li> </ul>	



## Chapter 3: Patterns, Relations, Equations, and Predictions 7 weeks

<b>Math 10 Outcomes</b>	<b>Math 10 Plus Outcomes</b>
<p><b>3.1 Describing Patterns</b></p> <ul style="list-style-type: none"> <li>• express problems in terms of equations and vice versa C1</li> <li>• model real-world phenomena with linear, quadratic exponential, and power equations C2</li> <li>• gather data, plot the data using appropriate scales, and demonstrate an understanding of independent and dependent variables and domain and range C3</li> <li>• construct and analyse tables relating two variables C9</li> <li>• develop and apply strategies for solving problems C15</li> <li>• describe real-world relationships depicted by graphs and tables of values F11</li> <li>• identify, generalize, and apply patterns C8</li> <li>• solve problems using graphing technology C17</li> <li>• determine if a graph is linear by plotting points in a given situation C32</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate an understanding of the interrelationships of subsets of real numbers 10+A2</li> <li>• represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>• construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> <li>• solve and create problems involving linear equations and inequalities 10+C3</li> <li>• graph, and write in symbols and in words, the solution set for equations and inequalities involving all real numbers 10+A4</li> <li>• apply algebraic operations on polynomial expressions and equations to simplify, expand, factor, and to solve relevant problems 10+B5</li> <li>• choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil) , and for problem solving 10+B3</li> </ul>
<p><b>3.2 Solving Problems by Solving Equations</b></p> <ul style="list-style-type: none"> <li>• apply properties of numbers when operating upon expressions and equations A6</li> <li>• model (with concrete materials and pictorial representations) and express the relationships between arithmetic operations and operations on algebraic expressions and equations B1</li> <li>• interpret solutions to equations based on context C16</li> </ul>	<ul style="list-style-type: none"> <li>• solve and create problems involving linear equations and inequalities 10+C3</li> <li>• apply algebraic methods to solve linear equations and inequalities 10+C6</li> <li>• explore and explain, using physical models, the connections between arithmetic and algebraic operations 10+B4</li> </ul>

<p><b>3.3 Decision Making and Patterns</b></p> <ul style="list-style-type: none"><li>• apply properties of numbers when operating upon expressions and equations A6</li><li>• model (with concrete materials and pictorial representations) and express the relationships between arithmetic operations and operations on algebraic expressions and equations B1</li><li>• sketch graphs from words, tables, and collected data C5</li><li>• identify, generalize and apply patterns C8</li><li>• describe real-world relationships depicted by graphs, tables of values, and written descriptions C10</li><li>• interpret solutions to equations based on context C16</li><li>• investigate and find the solution to a problem by graphing two linear equations with and without technology C18</li><li>• solve equations using graphs C25</li><li>• solve linear and simple radical, exponential, and absolute value equations and linear inequalities C27</li><li>• explore and describe the dynamics of change depicted in tables and graphs C28</li></ul>	<ul style="list-style-type: none"><li>• graph, and write in symbols and in words, the solution set for equations and inequalities involving all real numbers 10+A4</li><li>• model, solve and create problems that utilize addition, subtraction, multiplication, and division of fractions and decimals 10+B3</li><li>• explore and explain, using physical models, the connections between arithmetic and algebraic operations 10+B4</li><li>• apply algebraic operations on polynomial expressions and equations to simplify, expand, factor, and to solve relevant problems 10+B5</li><li>• represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li><li>• construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li><li>• solve and create problems involving linear equations and inequalities 10+C3</li><li>• apply algebraic methods to solve linear equations and inequalities 10+C6</li><li>• demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10+C7</li></ul>
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<p><b>3.4 Predictions and Lines: <math>y = mx + b</math></b></p> <ul style="list-style-type: none"> <li>• determine the slope and y-intercept of a line from a table of variables C13</li> <li>• determine the equation of a line using the slope and y-intercept C14</li> <li>• rearrange equations C24</li> <li>• investigate and make and test conjectures concerning the steepness and direction of a line C29</li> <li>• graph by constructing a table of values, by using graphing technology, and when appropriate by intercept-slope method C33</li> </ul>	<ul style="list-style-type: none"> <li>• model, solve and create problems that utilize addition, subtraction, multiplication, and division of fractions and decimals 10<sup>+</sup>B3</li> <li>• explore and explain, using physical models, the connections between arithmetic and algebraic operations 10<sup>+</sup>B4</li> <li>• apply algebraic operations on polynomial expressions and equations to simplify, expand, factor, and to solve relevant problems 10<sup>+</sup>B5</li> <li>• represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10<sup>+</sup>C1</li> <li>• construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10<sup>+</sup>C2</li> <li>• solve and create problems involving linear equations and inequalities 10<sup>+</sup>C3</li> <li>• determine the equations of lines by obtaining their slopes and yintercepts from graphs 10<sup>+</sup>C4</li> <li>• determine the equations of lines, and solve equations and inequalities by using technology 10<sup>+</sup>C5</li> <li>• apply algebraic methods to solve linear equations and inequalities 10<sup>+</sup>C6</li> <li>• demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10<sup>+</sup>C7</li> </ul>
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<p><b>3.5 More Patterns</b></p> <ul style="list-style-type: none"> <li>demonstrate an understanding of the zero product property and its relationship to solving equations by factoring A5</li> <li>use concrete materials, pictorial representations, and algebraic symbolism to perform operations on polynomials B3</li> <li>solve quadratic equations by factoring C26</li> <li>expand and factor polynomial expressions using perimeter and area models C35</li> </ul>	<ul style="list-style-type: none"> <li>choose appropriate strategies for calculating (mental math, estimation, appropriate technology, paper and pencil) , and for problem solving 10<sup>+</sup>B3</li> <li>explore and explain, using physical models, the connections between arithmetic and algebraic operations 10<sup>+</sup>B4</li> <li>apply algebraic operations on polynomial expressions and equations to simplify, expand, factor, and to solve relevant problems 10<sup>+</sup>B5</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10<sup>+</sup>C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10<sup>+</sup>C2</li> <li>solve and create problems involving linear equations and inequalities 10<sup>+</sup>C3</li> <li>demonstrate an understanding that using strategies is useful in solving routine and non-routine problems 10<sup>+</sup>C7</li> </ul>
<p><b>3.6 Other Patterns</b></p> <ul style="list-style-type: none"> <li>express problems in terms of equations and vice versa C1</li> <li>solve linear and simple radical, exponential, and absolute value equations and linear inequalities C27</li> </ul>	<ul style="list-style-type: none"> <li>explore and explain, using physical models, the connections between arithmetic and algebraic operations 10<sup>+</sup>B4</li> <li>apply algebraic operations on polynomial expressions and equations to simplify, expand, factor, and to solve relevant problems 10<sup>+</sup>B5</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10<sup>+</sup>C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10<sup>+</sup>C2</li> </ul>

## Chapter 4: Modeling Functional Relationships 5 weeks

Math 10 Outcomes	Math 10 Plus Outcomes
<p><b>4.1 Tables, Graphs, and Connections</b></p> <ul style="list-style-type: none"> <li>analyse graphs or charts of situations to derive specific information A2</li> <li>sketch graphs from words, tables, and collect data C5</li> <li>identify, generalize, and apply patterns C8</li> <li>describe real-world relationships depicted by graphs and tables of values F11</li> </ul>	<ul style="list-style-type: none"> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> </ul>
<p><b>4.2 Relations and Functions</b></p> <ul style="list-style-type: none"> <li>explore and apply functional relationships and notation, both formally and informally C21</li> <li>graph by constructing a table of values, by using graphing technology, and when appropriate, by intercept-slope method C33</li> </ul>	<ul style="list-style-type: none"> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> </ul>
<p><b>4.3 Equipping Your Function Toolkit</b></p> <ul style="list-style-type: none"> <li>model real-world phenomena with linear, quadratic, exponential and power equations, and linear inequalities C2</li> <li>analyse and describe transformations of quadratic functions and apply them to absolute value functions C22</li> <li>express transformations algebraically and with mapping rules C23</li> <li>graph equations and inequalities and analyse graphs both with and without graphing technology C31</li> <li>apply transformations when solving problems E4</li> <li>use transformations to draw graphs E5</li> </ul>	<ul style="list-style-type: none"> <li>demonstrate an understanding of the properties of transformations and their mapping notation E1</li> <li>demonstrate an understanding that using strategies is useful in solving routine and non-routine problems C7</li> </ul>

<p><b>4.4 Algebraic Models: Part 1</b></p> <ul style="list-style-type: none"> <li>• model real-world phenomena with linear, quadratic, exponential and power equations, and linear inequalities C2</li> <li>• create and analyse scatter plots using appropriate technology C4</li> <li>• determine and apply the line of best fit using the least squares method and the median-median method with and without technology, and describe the differences between the two methods F8</li> <li>• use interpolation, extrapolation and equations to predict and solve problems F10</li> <li>• calculate various statistics using appropriate technology, analyse and interpret displays and describe the relationships F4</li> <li>• demonstrate an intuitive understanding of correlation F9</li> </ul>	<ul style="list-style-type: none"> <li>• represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>• construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> <li>• solve and create problems involving linear equations and inequalities 10+C3</li> <li>• determine the equations of lines, and solve equations and inequalities by using technology 10+C5</li> <li>• collect data, display it accordingly as a scatter plot and interpret the display both with and without technology and by hand when appropriate 10+F1</li> <li>• sketch lines and curves of best fit, and determine the equation for the line of best fit by hand and with technology 10+F2</li> <li>• use technology to determine the curve of best fit 10+F3</li> </ul>
<p><b>4.5 Algebraic Models: Part 2</b></p> <ul style="list-style-type: none"> <li>• create and analyse scatter plots using appropriate technology C4</li> <li>• solve problems using graphing technology C17</li> <li>• evaluate and interpret non-linear equations using graphing technology C20</li> <li>• construct various displays of data F3</li> <li>• explore non-linear data using power and exponential regressions to find a curve of best fit F7</li> <li>• use interpolation, extrapolation and equations to predict and solve problems F10</li> <li>• compare regression models of linear and non-linear functions C30</li> </ul>	<ul style="list-style-type: none"> <li>• collect data, display it accordingly as a scatter plot and interpret the display both with and without technology and by hand when appropriate 10+F1</li> <li>• sketch lines and curves of best fit, and determine the equation for the line of best fit by hand and with technology 10+F2</li> <li>• use technology to determine the curve of best fit 10+F3</li> </ul>

## Chapter 2: Networks and Matrices 3 weeks

<b>Math 10 Outcomes</b>	<b>Math 10 Plus Outcomes</b>
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<p><b>2.1 Creating and Travelling Network Graphs</b></p> <ul style="list-style-type: none"> <li>model real-world situations with networks and matrices C7 represent network problems using matrices and vice versa C37</li> </ul>	<ul style="list-style-type: none"> <li>represent problem situations involving matrices 10+A5</li> <li>model, solve, and create problems involving the matrix operations of addition, subtractions and scalar multiplication 10+B6</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> </ul>
<p><b>2.2 Digraphs and Adjacency Matrices</b></p> <ul style="list-style-type: none"> <li>represent network problems as digraphs C37</li> <li>model real-world situations with networks C7</li> <li>solve network problems using matrices B6</li> <li>represent network problems as digraphs E6</li> </ul>	<ul style="list-style-type: none"> <li>represent problem situations involving matrices 10+A5</li> <li>model, solve, and create problems involving the matrix operations of addition, subtractions and scalar multiplication 10+B6</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> </ul>
<p><b>2.3 Matrix Multiplication</b></p> <ul style="list-style-type: none"> <li>develop, analyse and apply procedures for matrix multiplication B5</li> <li>solve network problems involving matrices B6</li> <li>develop and apply strategies for solving problems C15</li> </ul>	<ul style="list-style-type: none"> <li>represent problem situations involving matrices 10+A5</li> <li>model, solve, and create problems involving the matrix operations of addition, subtractions and scalar multiplication 10+B6</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> </ul>

## Chapter 7 Linear Programming 4 weeks

<b>Math 10 Outcomes</b>	<b>Math 10 Plus Outcomes</b>
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<p><b>7.1 Exploring an Optimization Problem</b></p> <ul style="list-style-type: none"> <li>analyse graphs or charts of situations to derive specific information A2</li> <li>identify and calculate the maximum and/or minimum values in a linear programming model B4</li> <li>apply linear programming to find optimal solutions to real world problems C6</li> <li>construct and analyse tables relating two variables C9</li> </ul>	<ul style="list-style-type: none"> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> </ul>
<p><b>7.2 Exploring Possible Solutions</b></p> <ul style="list-style-type: none"> <li>relate sets of numbers to solutions of inequalities A1</li> <li>analyse graphs or charts of situations to derive specific information A2</li> <li>demonstrate and apply an understanding of discrete and continuous number systems A7</li> <li>identify and calculate the maximum and/or minimum values in a linear programming model B4</li> <li>model real-world phenomena with linear, quadratic, exponential and power equations, and linear inequalities C2</li> <li>apply linear programming to find optimal solutions to real world problems C6</li> <li>construct and analyse table relating two variables C9</li> <li>write an inequality to describe its graph C11</li> <li>express and interpret constraints using inequalities C12</li> <li>interpret solutions to equations based on context C16</li> <li>rearrange equations C24</li> <li>solve linear and simple radical, exponential, and absolute value equations and linear inequalities C27</li> <li>graph equations and inequalities and analyse graphs both with and without graphing technology C31</li> <li>graph by constructing a table of values, by using graphing technology, and when appropriate, by intercept-slope method C33</li> <li>investigate and make and test conjectures about the solution to equations and inequalities using graphing technology C34</li> </ul>	<ul style="list-style-type: none"> <li>graph, and write in symbols and in words, the solution set for equations and inequalities involving all real numbers 10+A4</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> <li>determine the equations of lines, and solve equations and inequalities by using technology 10+C5</li> <li>apply algebraic methods to solve linear equations and inequalities 10+C6</li> <li>solve and create problems involving linear equations and inequalities 10+C3</li> </ul>



<p><b>7.3 Connecting the Region and the Solution</b></p> <ul style="list-style-type: none"> <li>relate sets of numbers to solutions of inequalities A1</li> <li>analyse graphs or charts of situations to derive specific information A2</li> <li>demonstrate and apply an understanding of discrete and continuous number systems A7</li> <li>identify and calculate the maximum and/or minimum values in a linear programming model B4</li> <li>apply linear programming to find optimal solutions to real world problems C6</li> <li>express and interpret constraints using inequalities C12</li> <li>solve problems using graphing technology C17</li> <li>solve systems of linear equations using substitution and graphing methods C19</li> <li>rearrange equations C24</li> <li>graph equations and inequalities and analyse graphs both with and without graphing technology C31</li> <li>investigate and make and test conjectures about the solution to equations and inequalities using graphing technology C34</li> </ul>	<ul style="list-style-type: none"> <li>graph, and write in symbols and in words, the solution set for equations and inequalities involving all real numbers 10+A4</li> <li>represent patterns and relationships in multiple ways (context, concrete, pictorial, verbal, and symbol) and use these representations to predict and solve problems 10+C1</li> <li>construct and analyse tables and graphs to describe how changes in one quantity affect a related quantity 10+C2</li> <li>determine the equations of lines, and solve equations and inequalities by using technology 10+C5</li> <li>apply algebraic methods to solve linear equations and inequalities 10+C6</li> <li>solve and create problems involving linear equations and inequalities 10+C3</li> <li>demonstrate an understanding that using strategies is useful in solving routine and non-routine problems C7</li> </ul>
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Chapter 6: The Geometry of Packaging      6 weeks

<b>Math 10 Outcomes</b>	<b>Math 10 Plus Outcomes</b>
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<p><b>6.1 Examining Factors in Container Design</b></p> <ul style="list-style-type: none"> <li>• explore, determine and apply formulas for perimeter, area, surface area and volume D1</li> <li>• determine the precision and accuracy of a measurement D7</li> <li>• demonstrate an understanding of the concepts of surface area and volume D13</li> </ul>	<ul style="list-style-type: none"> <li>• relate the volumes of pyramids, cones and spheres to the volumes of corresponding prisms and cylinders 10<sup>+</sup>D1</li> <li>• describe patterns and generalize the relationships between areas and perimeters of quadrilaterals, and areas and circumferences of circles 10<sup>+</sup>D2</li> <li>• examine and draw representations of 3-dimensional shapes, and from drawings, construct 3-dimensional shapes 10<sup>+</sup>E2</li> <li>• develop and apply properties of 2-dimensional figures, and apply them 10<sup>+</sup>E3</li> <li>• develop and apply relationships between parallel lines and congruent angles 10<sup>+</sup>E4</li> <li>• investigate, and demonstrate an understanding of the minimum sufficient conditions to guarantee congruent triangles 10<sup>+</sup>E5</li> <li>• make informal deductions using congruent triangle, polygon and angle properties 10<sup>+</sup>E6</li> </ul>
<p><b>6.2 Regular Polygons</b></p> <ul style="list-style-type: none"> <li>• determine and apply formulas for perimeter, area, surface area and volume D1</li> <li>• explore, discover, and apply properties of maximum area and volume D11</li> <li>• explore, determine, and apply relationships between perimeter and area, surface area, and volume C36</li> <li>• solve problems involving polygons and polyhedra E2</li> </ul>	<ul style="list-style-type: none"> <li>• relate the volumes of pyramids, cones and spheres to the volumes of corresponding prisms and cylinders 10<sup>+</sup>D1</li> <li>• describe patterns and generalize the relationships between areas and perimeters of quadrilaterals, and areas and circumferences of circles 10<sup>+</sup>D2</li> </ul>
<p><b>6.3 Surface Area</b></p> <ul style="list-style-type: none"> <li>• demonstrate an understanding of the concepts of surface area and volume D13</li> <li>• determine and apply formulas for perimeter, area, surface area, and volume D1</li> </ul>	<ul style="list-style-type: none"> <li>• relate the volumes of pyramids, cones and spheres to the volumes of corresponding prisms and cylinders 10<sup>+</sup>D1</li> <li>• describe patterns and generalize the relationships between areas and perimeters of quadrilaterals, and areas and circumferences of circles 10<sup>+</sup>D2</li> </ul>
<p><b>6.4 Economy of Design</b></p> <ul style="list-style-type: none"> <li>• demonstrate an understanding of the role of irrational numbers in applications A3</li> <li>• approximate square roots A4</li> <li>• solve problems involving polygons and polyhedra E2</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate an understanding of rational and irrational numbers, compare and order them, and apply them in meaningful situations 10<sup>+</sup>A1</li> <li>• Develop and use ratio, rate and proportions as tools for solving problems 10<sup>+</sup>D3</li> </ul>

<p><b>6.5 Similarity and Size</b></p> <ul style="list-style-type: none"> <li>determine and apply relationships between the perimeters and areas of similar figures and between the surface and volumes of similar solids D10</li> </ul>	<ul style="list-style-type: none"> <li>relate the volumes of pyramids, cones and spheres to the volumes of corresponding prisms and cylinders 10<sup>+</sup>D1</li> <li>describe patterns and generalize the relationships between areas and perimeters of quadrilaterals, and areas and circumferences of circles 10<sup>+</sup>D2</li> <li>develop and use ratio, rate and proportions as tools for solving problems 10<sup>+</sup>D3</li> </ul>
<p><b>6.6 Variations in Packaging</b></p> <ul style="list-style-type: none"> <li>explore properties of, and make and test conjectures about 2D and 3D figures E1</li> <li>use deductive reasoning and construct logical arguments and be able to determine, when given a logical argument, its validity E9</li> <li>use inductive reasoning when observing patterns developing properties, and making conjectures E8</li> <li>construct and apply altitudes, medians, angle bisectors and perpendicular bisectors to examine their intersection points E3</li> </ul>	<ul style="list-style-type: none"> <li>develop and apply properties of 2-dimensional figures, and apply them 10<sup>+</sup>E3</li> <li>develop and apply relationships between parallel lines and congruent angles 10<sup>+</sup>E4</li> <li>investigate, and demonstrate an understanding of the minimum sufficient conditions to guarantee congruent triangles 10<sup>+</sup>E5</li> <li>make informal deductions using congruent triangle, polygon and angle properties 10<sup>+</sup>E6</li> <li>Develop and use ratio, rate and proportions as tools for solving problems 10<sup>+</sup>D3</li> </ul>