SPRING 2020 PRE-CALCULUS 11

COURSE OUTLINE

MR. E. WONG

Class Days : Monday to Friday **Time** : 10:35 to 12:10 pm **Room** : 100

Mathematics is a very important part of our technological society. Students require the ability to reason and communicate mathematically, to solve problems, and to understand and use mathematics. Skill in these areas create a mathematically literate citizen.

Pre-calculus 11 uses a wide variety of methods to solve real life, practical, technical and theoretical problems. It is expected that students will be able to solve problems involving content areas such as algebra, trigonometry, and geometry. Students will be expected to solve problems involving more than one content area, problems involving mathematics in other disciplines, analyze problems and identify significant elements, and to acquire skills which enable them to develop and select appropriate methods for problem solving.

BIG IDEAS :

1. Algebra allows us to **generalize** relationships through abstract thinking.
2. The meaning of, and **connections** between, operations extend to powers, radicals, and polynomials.
3. Quadratic **relationships** are prevalent in the world around us.
4. Trigonometry involves using **proportional reasoning** to solve **indirect measurement** problems.

Big Ideas – Elaborations

Generalize

- After solving a problem, can we extend it? Can we generalize it ?
- How can we tell if a mathematical solution is reasonable ?
- What are the similarities and differences between quadratic functions and linear functions? How are they connected ?
- What do we notice about the rate of change in a quadratic function ?
-How do the strategies for solving linear equations extend to solving quadratic, radical, or rational equations ?

Connections

- How are the different operations (+ , - , x , / , exponents, roots) connected ?
- What are the similarities and differences between multiplication of numbers, powers, radicals, polynomials, and rational expressions ?
- How can patterns in numbers lead to algebraic generalizations ?
- When would we choose to represent a number with a radical rather than a rational exponent ?
- How do operations on rational numbers extend to operations with rational expressions ?

Relationships
- What are some examples of quadratic relationships in the world around us, and what are the similarities and differences between these ?
- Why are quadratic relationships so prevalent in the world around us ?
- Why is the shape of a quadratic function called a parabola ?
- How can we decide which form of a quadratic function to use for a given problem ?

Proportional Reasoning
- Comparisons of relative size or scale instead of numerical difference

Indirect Measurement
- Using measurable values to calculate immeasurable values (eg. Calculating the width of a river using the distance between two points on one shore and angle to a point on the other shore)
- How is the cosine law related to the Pythagorean theorem ?
- How do we decide when to use the sine law or cosine law ?
- What would it mean for an angle to have a negative measure ?

CURRICULAR COMPETENCIES

Students are expected to do the following :

Reasoning and modeling
- Develop thinking strategies to solve puzzles and play games
- Explore, analyze, and apply mathematical ideas using reason, technology, and other tools.
- Estimate reasonably and demonstrate fluent, flexible, and strategic thinking about numbers
- Model with mathematics in situational contexts
- Think creatively and with curiosity and wonder when exploring problems.

Understanding and solving
- Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, inquiry, and problem solving.
- Visualize to explore and illustrate mathematical concepts and relationships
- Apply flexible and strategic approaches to solve problems
- Solve problems with persistence and a positive disposition
- Engage in problem solving experiences connected with place, story, cultural practices, and perspectives relevant to local *First Peoples* communities, the local community, and other cultures.

Communicating and representing
- Explain and justify mathematical ideas and decisions in many ways
- Represent mathematical ideas in concrete, pictorial, and symbolic forms
- Use mathematical vocabulary and language to contribute to discussions in the classroom
- Take risks when offering ideas in classroom discourse

Connecting and reflecting

- Reflect on mathematical thinking
- Connect mathematical concepts with each other, with other areas, and with personal interests
- Use mistakes as opportunities to advance learning
- Incorporate *First Peoples* world views, perspectives, knowledge, and practices to make connections with mathematical ideas.

Curricular Competencies – Elaborations

- thinking strategies
- analyze mathematical ideas
- reason (inductive and deductive)
- technology (graphing , mathematical modeling)
- estimate reasonably
- fluent, flexible, and strategic thinking
- model (use mathematical concepts and tools to solve problems and make decisions)
- situational contexts
- think creatively (trying different strategies)
- curiosity and wonder (asking questions to further understanding)
- inquiry (noticing and wondering)
- visualize (use dynamic materials such as graphical relationships and simulations, drawings)
- solve problems (identify a problem and apply mathematics to solve)
- persistence and a positive disposition
- connected to local practices, popular media and news events
- explain and justify (use mathematical arguments to convince)
- decisions (given two scenarios, choose one and defend your choice)
- communicate in many ways (oral, written, visual, technology)
- represent (using models, tables, graphs, numbers, symbols)
- discussions (partner talks, small-group discussions, teacher-student conferences)
- reflect (share mathematical thinking, even if unsure or have misconceptions)
- mistakes (range from calculation errors to misconceptions)
- knowledge (local knowledge and cultural practices that are appropriate to share and that are non-appropriated

Incorporation of First Nations

- collaborating with Elders and knowledge keepers among local First Peoples
- First People's Principles of Learning e.g. Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)
- learning involves patience and time
- making explicit connections with learning mathematics
- exploring cultural practices and knowledge of local First Peoples and identifying mathematical connections

CORE COMPETENCIES

1. Communication

- Students will connect and engage with others when group work involving problem solving are assigned.
- In doing project work, students will acquire, interpret, and present information orally.

2. Creative Thinking

- Students will generative ideas and develop them when solving mathematical problems using several ways.

3. Critical Thinking

- Upon accumulating basic knowledge, students will reflect on that knowledge and use it to analyze, investigate and critique an application problem and then be able to solve it successfully.

4. Positive Personal & Cultural Identity

- Students will develop personal strengths and abilities for certain genres in the curriculum. By recognizing their strengths, it will satisfy their personal values and choices which may be culturally influenced. At the same time, weaker curricular skills will necessitate further study and investigation.

5. Personal Awareness & Responsibility

- Students will demonstrate self-determination and self-regulation when they work consistently throughout the semester (like ensuring that assignments and homework are done in a timely fashion.).

6. Social responsibility

- Solving problems in ways that are for peaceful and environmentally friendly endeavours.

EVALUATION

Summative assessment :

Tests and Quizzes (of **Curricular Competencies**)	20 %
Midterm Exam	20 %
Homework, in-class assignments	5 %
Project/Presentation	10 %
Final Exam	25 %
Attendance, class participation	5 %
	80%

Formative assessment :

Self-assessment	5 %
Core competencies	15 %
	20 %

Final Grade = Summative + Formative = 80% + 20% = 100 %

PRE-CALCULUS 11

UNIT INSTRUCTIONAL PLANS
September 2019

UNITS :

1. Graphing Inequalities and Systems of Equations
2. Trigonometry
3. Arithmetic and Geometric Sequences and Series
4. Rational Expressions
5. Absolute Value and Radicals
6. Quadratic Functions

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : **Graphing Inequalities and Systems of Equations** Time Length : 1 ½ weeks

BIG IDEAS :

Algebra allows us to generalize relationships through abstract thinking.
The meanings of, and connections between operations extend to powers , radicals, and polynomials.

Curricular Competencies

Students are expected to **DO** the following :

Reasoning and modeling

1. Develop thinking strategies to solve problems.
2. Explore, analyze, and apply mathematical ideas using reason, technology, and other tools
3. Model with mathematics in situational contexts.
4. Think creatively and with curiosity and wonder when exploring problems.
5. Visualize to explore and illustrate mathematical concepts and relationships.

Understanding and solving

6. Apply flexible and strategic approaches to solve problems.
7. Engage in problem-solving experiences connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures.

Communicating and representing

8. Explain and justify mathematical ideas and decisions in many ways.
9. Represent mathematical ideas in concrete, pictorial, and symbolic forms
10. Use mathematical vocabulary and language to contribute to discussions in the classroom.

Connecting and Reflecting

11. Reflect on mathematical thinking.
12. Connect mathematical concepts with each other, with other areas, and with personal interests
13. Use mistakes as opportunities to advance learning.
14. Incorporate First Peoples world views, perspectives, knowledge, and practices to make connections with mathematical concepts.

Concepts and Content :

What students will **KNOW** :

1. Solve, algebraically and graphically, problems that involve systems of linear-quadratic and quadratic-quadratic equations in two variables.
2. Solve problems that involve linear and quadratic inequalities in two variables.
3. Solve problems that involve quadratic inequalities in one variable.

Learning Targets	**Formative Assessment**
1. Model a situation, using a system of linear-quadratic or quadratic-quadratic equations.	1. Commercial and consumer applications can be found for systems of equations.
2. Determine and verify the solution of a system of linear-quadratic or quadratic-quadratic equations graphically, with technology	2. The solution of a system of equations satisfies both equations in the system.
3. Determine and verify the solution of a system of linear-quadratic or quadratic-quadratic equations algebraically.	3. A system may have one solution, more than one solution, or no solution.
4. Explain the meaning of the points of intersection of a system of linear-quadratic or quadratic-quadratic equations. .	4. Relate the number of intersections to the number of solutions found via algebraic calculation.
5. Explain, using examples why a system of linear-quadratic or quadratic-quadratic. equations may have zero, one, two or an infinite number of solutions.	5. As in 4 above.
6. Solve a problem by modeling a situation with a radical equation.	6. As in 1 above.
7. Solve problems that involve linear and quadratic inequalities.	7. - Explain how test points can be used to determine the solution region that satisfies an inequality. - Explain when a solid or a dashed line should be used in the solution of an inequality.
8. Solve problems that involve quadratic inequalities in one variable.	8. -Use strategies such as graphing, roots and test points, sign analysis, and explain the strategy used. -Interpret the solution to a problem.

9. Solve a problem that involves a linear or quadratic inequality	9. -Solutions to systems of equations are seen to be the optimum solution. -If the solutions of the equation are also the solutions of the inequality, the boundary is a solid line or curve, otherwise it is a dashed line or curve.

Curricular Competencies in Action

1. Sketch graphs of systems of equations which could be linear-quadratic or quadratic-quadratic equations.

2. Solve problems that involve systems of equations.

3. Understand the relationship between points of intersections found on graphs of linear-quadratic or quadratic-quadratic and the solutions from the algebraic solving of the system of equations.

4. Recognize that systems of different mathematical functions such as linear, exponential, quadratic, absolute value, and reciprocal can be solved graphically.

5. An inequality in two variables has a related inequation.

6. The solutions of an inequality in two variables can be represented by a region in the coordinate plane.

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking and feelings in interactions with class mates to see where and when topics involving systems of equations are used in physical science and in mathematical games and puzzles. Doing an internet search and researching applications of systems of equations can generate applications in science and business.

TRANSFER/EXTENSION : Doing an internet search and researching applications of systems of equations can generate applications in science and business.

EVALUATION

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

SUMMATIVE ASSESSMENT: Students will demonstrate their understanding with little projects that systems of equations in physics applications such as in cost functions. . Tests, quizzes, midterm and final exams that cover the curricular competencies will form the bulk of the summative assessment.

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : **Trigonometry** Time Length : 2 weeks

BIG IDEAS :

Trigonometry involves using proportional reasoning and to solve indirect measurement problems.

Using trigonometric functions successfully means a thorough and complete understanding of angles since these ratios depend on the size of the angle.

Curricular Competencies

Students are expected to **DO** the following :

1. Demonstrate an understanding of angles in standard position [0 ° to 360 °]
2. Solve problems using the three primary trigonometric ratios for angles from 0 ° to 360 ° in standard position.
3. Solve problems, using the cosine law and sine law, including the ambiguous case.

Concepts and Content :

What students will **KNOW** :

1. Sketch an angle in standard position, given the measure of the angle ..
2. Determine the reference angle for an angle in standard position.
3. Explain, using examples, how to determine the angles from 0 ° to 360 ° that have the same reference angle as a given angle.
4. Determine the quadrant in which a given angle in standard position terminates. distance between two points on a number line can be expressed in terms of absolute value.
5. Draw an angle in standard position given any point P (x,y) on the terminal arm.
6. Illustrate, using examples, that the points P(x,y), P (-x,y), P(-x,-y) and P (x, -y) are points on the terminal sides of angles in standard position that the same reference angle.
7. Determine, using the Pythagorean theorem or the distance formula, the distance from the origin to a point (x,y) on the terminal arm of an angle.
8. Determine the value of sin θ , cos θ, or tan θ , given any point p(x,y) on the terminal arm of angle θ .
9. Determine the value of sin θ , cos θ, or tan θ , given any point P (x,y) on the terminal arm of angle θ , where $\theta = 0°$, $90°$, $180°$, $270°$ or $360°$.
10. Determine the sign of a given trigonometric ratio for a given angle, and explain.
11. Solve, for all values of θ , an equation of form $\sin\theta = a$ or $\cos\theta, = a$, where $-1 \leq a \leq 1$, and $\tan\theta = a$, where a is a real number.
12. Determine the exact value of the sine, cosine, or tangent of a given angle with a reference

angle of 30 °, 45 °, or 60 °.

13. Sketch a diagram to represent a problem.
14. Solve a contextual problem, using trigonometric ratios.
15. Sketch a diagram to represent a problem that involves a triangle without a right angle.
16. Solve, using primary trigonometric ratios, a triangle that is not a right triangle.
17. Sketch a diagram and solve a problem , using the cosine law.
18. Sketch a diagram and solve a problem , using the sine law.

Learning Targets

1. Demonstrate an understanding of angles in in standard position [0 ° to 360 °]
2. Determine the quadrant in which a given angle in standard position terminates.
3. Solve a contextual problem , using trigonometric ratios.
4. Determine the reference angle for an angle in standard position.
5. Solve problems that involve $\sin \theta = a$ or $\cos \theta, = a$ or $\tan \theta = a$.
6. Solve problems , using the cosine law and sine law, including the ambiguous case.

Formative Assessment

1. Demonstrate an understanding of angles in standard position, expressed in degrees.
2. Solve problems, using the six trigonometr ic ratios for angles, expressed in degrees.
3. Analyze the trig functions sine, cosine, and tangent to solve problems.
4. Understand the use of the reference angle to determine trig function values of standard position angles greater than 90° .
5. Emphasize the coordinates of a point on the terminal arm of an angle in standard position can be used to determine the primary trigonometric ratios of an angle from 90 ° to 360 °
6. In a triangle, the ratios of the sine of an angle to the length of is opposite side are equal. This is known as the Sine Law.
7. The Pythagorean Theorem can be generalized to triangles that are not right triangles. This is called the Cosine Law.
8. It is expected that students can use the the Cosine and Sine Laws together.

Curricular Competencies in Action

1. Demonstrate an understanding of angles in standard position.

2. Solve problems that involve trigonometric equations.

3. Be able to determine for the angles from 0 ° to 360 ° that have the same reference angle as a given angle.
4. Determine the sign of a given trigonometric ratio for a given angle and explain.

5. Sketch a diagram to represent a problem.

6. Sketch a diagram to represent a problem that involves a triangle without a right triangle.

7. Sketch a diagram and solve a problem, using the cosine law.

8. Sketch a diagram and solve a problem, using the sine law.

7. Sketch a diagram and solve a problem, using the both the cosine and sine laws together.

TRANSFER/EXTENSION : The students will see applications of trigonometric equations in many applications that can lead to a deep appreciation of trigonometry and algebra.

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

EVALUATION

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

SUMMATIVE ASSESSMENT: Students will demonstrate their understanding with little projects that incorporate the use of trigonometric functions, such as measuring the height of tree in a park, using the tangent function. Or, by taking a few angle measurements, the Sine law can be used to indirectly calculate horizontal distances. Tests, quizzes, midterm and final exams that cover the curricular competencies will form the majority of the summative assessment.

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking about trigonometry and see its effectiveness and power, when they see actual applications such as measuring heights and distances using trigonometric ratios and the Sine and Cosine Laws. In the process, future careers in surveying and even civil and geological engineering can be contemplated by the student, much to the satisfaction of themselves and to their parents.

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : **Arithmetic and Geometric Sequences and Series** Time Length : 1½ weeks

BIG IDEAS :

Algebra allows us to generalize relationships through abstract thinking.
The meanings of, and connections between operations extend to powers , radicals, and polynomials.
Explore, analyze , and apply mathematical ideas using reason and technology to see numerical patterns in sequences and series.

Curricular Competencies

Students are expected to **DO** the following :

Reasoning and modeling

1. Develop thinking strategies to solve problems.
2. Explore, analyze, and apply mathematical ideas using reason, technology, and other tools
3. Model with mathematics in situational contexts.
4. Think creatively and with curiosity and wonder when exploring problems.
5. Visualize to explore and illustrate mathematical concepts and relationships.

Understanding and solving

6. Apply flexible and strategic approaches to solve problems.
7. Engage in problem-solving experiences connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures.

Communicating and representing

8. Explain and justify mathematical ideas and decisions in many ways.
9. Represent mathematical ideas in concrete, pictorial, and symbolic forms
10. Use mathematical vocabulary and language to contribute to discussions in the classroom.

Connecting and Reflecting

11. Reflect on mathematical thinking.
12. Connect mathematical concepts with each other, with other areas, and with personal interests
13. Use mistakes as opportunities to advance learning.
14. Incorporate First Peoples world views, perspectives, knowledge, and practices to make connections with mathematical concepts.

Concepts and Content :

What students will **KNOW** :

1. Analyze arithmetic sequences and series to solve problems.
2. Analyze geometric sequences and series to solve problems.

Learning Targets	**Formative Assessment**
1. Provide and justify an example of an arithmetic sequence.	1. An arithmetic sequence is related to a linear function.
2. Derive a rule for determining the general term of an arithmetic sequence.	2. As in 1 above.
3. Describe the relationship between arithmetic sequences and linear functions.	3. As in 1 above. than one solution, or no solution.
4. Determine t_1, d, n or t_n in a problem that involves an arithmetic sequence.	4. As in 1 above.
5. Derive a rule for determining the sum of n terms of an arithmetic series.	5. An arithmetic series is the sum of the terms of an arithmetic sequence.
6. Determine t_1, d, n or t_n in a problem that involves an arithmetic series .	6. As in 5 above.
7. Solve a problem that involves an arithmetic sequence or series.	7. Word problems and applications will be included in formal examinations.
8. Provide and justify an example of a geometric sequence.	8. A geometric sequence is created by repeatedly multiplying an initial number by a constant.
9. Derive a rule for determining the general term of a geometric sequence.	9. As in 8 above.
10. Determine t_1, d, n or t_n in a problem that involves a geometric sequence.	10. As in 8 above.
11. Derive a rule for determining the sum of n terms of a geometric series.	11. A geometric series is the sum of the terms of a geometric sequence.

12. Determine t_1, d, n or t_n in a problem that involves a geometric series .	12. As in 11 above.
13. Solve a problem that involves an arithmetic sequence or series.	13. Word problems and applications will be included in formal examinations.
14. Generalize, using inductive reasoning, a rule for determining the sum of an infinite geometric series.	14. Any finite series has a sum but an infinite geometric series may or may or may not have a sum.
15. Explain why a geometric series is convergent or divergent.	15. Understand the importance of the common ratio.

Curricular Competencies in Action

1. Sketch graphs of systems of equations which could be linear-quadratic or quadratic-quadratic equations.

2. Solve problems that involve systems of equations.

3. Understand the relationship between points of intersections found on graphs of linear-quadratic or quadratic-quadratic and the solutions from the algebraic solving of the system of equations.

4. Recognize that systems of different mathematical functions such as linear, exponential, quadratic, absolute value, and reciprocal can be solved graphically.

5. An inequality in two variables has a related inequation.

6. The solutions of an inequality in two variables can be represented by a region in the coordinate plane.

TRANSFER/EXTENSION : Doing research papers on the applications of arithmetic and geometric sequences and presenting them orally, the student can see and appreciate the importance and prominence of them in our society.

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

EVALUATION

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

.

SUMMATIVE ASSESSMENT: Students will demonstrate their understanding with little projects that demonstrate how arithmetic sequences are used in predicting the next appearance of a comet eg. Kojima or the years of an animal such as Dog in the Chinese zodiac . Tests, quizzes, midterm and final exams that cover the curricular competencies will form the majority of the summative assessment.

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking and feelings in interactions with class mates to see where and when topics involving arithmetic and geometric sequences and series are used in our world. An arithmetic series can be used to determine the total cost of a loan where monthly payments are incrementally stepped by a fixed amount each month. Geometric sequences and series to make prediction on population increases and sizes based on an annual rate. Infinite geometric series can be used to convert repeating decimal values into exact fractional equivalents.

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : **Rational Expressions**/ Algebra and Number Time Length : 1 week

BIG IDEAS :

Algebra allows us to generalize relationships through abstract thinking.
The meanings of, and connections between operations extend to powers , radicals, and polynomials.

Curricular Competencies

Students are expected to **DO** the following :

1. Determine equivalent forms of rational expressions (limited to numerators and denominators that are monomials, binomials, and trinomials) .
2. Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials, or trinomials).
3. Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials, or trinomials).

Concepts and Content :

What students will **KNOW** :

1. Compare the strategies for writing equivalent forms of rational expressions to the strategies for writing equivalent forms of rational numbers..
2. Explain why a given value is non-permissible for a given rational expression.
3. Determine the non-permissible values for a rational expression.
4. Explain, using examples, how distance between two points on a number line can be expressed in terms of absolute value.
5. Simplify a rational expression.
6. Express a mixed radical with a numerical radicand as an entire radical .
7. Explain why the non-permissible values of a given rational expression and its simplified form are the same.
8. Identify and correct errors in a simplification of a rational expression, and explain the reasoning.
9. Determine the non-permissible values when performing operations on rational expressions.
10. Determine, in simplified form, the sum or difference of rational expressions in which the denominators are not the same, and which may or may not contain common factors.
11. Determine, in simplified form, the product or quotient of rational expressions.
12. Simplify an expression that involves two or more operations on rational expressions.

13. Determine the solution to a rational equation algebraically, and explain the process used to solve the equation.
14. Explain why a value obtained in solving a rational equation may not be a solution of the equation.
15. Solve problems by modelling a situation using a rational equation..

Learning Targets	**Formative Assessment**
1. Determine equivalent forms of rational expressions.	1. Demonstrate that rational expressions can be added, subtracted, multiplied , and divided using strategies similar to those for rational numbers.
2. Simplify a rational expression.	2. As in 1.
3. Explain why the non-permissible values of a given rational expression and its simplified. form are the same.	3. See that a rational expression is defined for all real values of the variable except for those values that make the denominator zero.
4. Identify and correct errors in the simplification of a rational expression and explain the reasoning.	4. As in 1.
5. Perform operations on rational expression.	5. As in 1.
6. Determine, in simplified form, the sum or difference of rational expression in which the denominators are not the same and which may or may not contain common factors.	6. As in 1.
7. Determine, in simplified form, the product quotient of rational expressions.	7. As in 1.
8. Solve problems that involve rational equations (limited to numerators and denominators that are monomials, binomials, or trinomials.	8. Use rational equations in problem solving where the denominator can be a monomial, binomial, or a trinomial.
9. Determine the solution to a rational to a rational equation algebraically, and explain the process used to solve the equation.	9. Rational equations can be solved using strategies similar to those for solving linear and quadratic equations. The solution may produce extraneous roots.

10. Solve problems by modelling a situation using a rational equation.	10. As in 9.

Curricular Competencies in Action

1. Explain why a given value is non-permissible for a given rational expression.

2. Determine non-permissible values for a given rational expression.

3. Simplify a rational expression.

4. Identify and correct errors in a simplification of a rational, and explain the reasoning.

5. Determine, in simplified form, the sum or difference of rational expressions that have the same denominator, or when the denominators are not the same.

6. Determine, in simplified form, the product or quotient of rational expressions.

7. Determine the solution to a rational equation algebraically, and explain the process used to solve the equation.

8. Solve problems by modeling a rational equation.

TRANSFER/EXTENSION : The students will see applications of rational equations such as in work or rate problems and even in dilution problems found in chemistry.

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

EVALUATION

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

SUMMATIVE ASSESSMENT: Students will demonstrate their understanding of some important properties of rational expressions such as the domain by understanding the significance of non-permissible values. Using examples of rational expressions particularly in the field of Physics (the lens equation) , it may direct the student to consider careers in physics or engineering. Tests, quizzes, midterm and final exams that cover the curricular competencies will form the majority of the summative assessment.

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking and feelings in interactions with class mates to see where and when topics rational equations may have practical and career implications. And, by doing questions involving the identification and correction of errors in the simplification process, the student can apply their knowledge and practice critical thinking, as professional educators have to do all the time.

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : Absolute Value and Radicals/ Algebra and Number Time Length : 1 ½ weeks

BIG IDEAS :

Algebra allows us to generalize relationships through abstract thinking.
The meanings of, and connections between operations extend to powers , radicals, and polynomials.

Curricular Competencies

Students are expected to **DO** the following :

1. Demonstrate an understanding of the absolute value of real numbers.
2. Solve problems that involve operations on radicals and radical expressions with numerical and variable radicands.
3. Solve problems that involve radical equations (limited to square roots).

Concepts and Content :

What students will **KNOW** :

1. Determine the distance of two real numbers of the form +/- a , x ε R , from 0 on a number line, and relate this to the absolute value of a (|a|) .
2. Determine the absolute value of a positive or negative real number.
3. Determine the absolute value of a numerical expression.
4. Explain, using examples, how distance between two points on a number line can be expressed in terms of absolute value.
5. Express an entire radical with a numerical radicand or a mixed radical.
6. Express a mixed radical with a numerical radicand as an entire radical .
7. Perform one or more operations to simplify radical expressions with numerical or variable radicands.
8. Rationalize the denominator of a rational expression with monomial or binomial denominators.
9. Identify the values of the variable for which a given radical expression is defined.
10. Determine the roots of a radical equation algebraically, and explain the process used to solve the equation.
11. Explain why some roots determined in a solving a radical equation algebraically are extraneous.
12. Solve problems by modelling a situation using a radical equation.

Learning Targets	Formative Assessment
1. Explain how distance between two points on a number line can be expressed in terms of absolute value.	1. Recognize that the absolute value of a number is the distance of the number from 0 on a number line
2. Determine the absolute value of a positive or negative real number.	2. As in 1.
3. Compare and order the absolute values of real numbers in a given set.	3. As in 1.
4. Solve problems that involve operations on radicals and radical expressions with numerical and variable radicands.	4. Variables can be used to generalize numbers , so the strategies for working with radicals with variable radicands are the same as those for radicals with numerical radicands.
5. Solve problems that involve radical equations (limited to square roots).	5. Radical expressions may be solved algebraically, but sometimes in in extraneous radicands.
6. Solve a problem by modelling a situation with a radical equation.	6. As in 5.

Curricular Competencies in Action

1. Compare and order the absolute values of real numbers in a given set.

2. Solve problems that involve radical equations.

3. Simplify entire radicals so that they become mixed radicals. Express a mixed radical with a numerical radicand as an entire radical.

4. Rationalize the denominator of rational expression with monomial or binomial denominators.

5. Identify the values fo the variable for which a given radical expression is defined.

6. Perform one or more mathematical operations to simplify radical expressions with numerical or variable radicands.

TRANSFER/EXTENSION : The students will see applications of radical equations such as in physics (period of a pendulum, displacement and velocity functions) . In researching the golden ratio, radicals involving irrational numbers are absolutely necessary.

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

EVALUATION

SUMMATIVE ASSESSMENT: Students will demonstrate their understanding with little projects and exercises that incorporate radicals in physics applications such as the period of a pendulum. Tests, quizzes, midterm and final exams that cover the curricular competencies will form the bulk of the summative assessment.

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking and feelings in interactions with class mates to see where and when topics on absolute and radical equations may have practical and career implications. Doing an internet search and researching applications of absolute value and radicals can generate a lot of uses.

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %

COURSE : **PRE-CALCULUS 11**

UNIT INSTRUCTIONAL PLAN

UNIT TITLE : **Quadratic Functions** / Relations and Functions Time Length : 5 weeks

BIG IDEAS :

Quadratic relationships are prevalent in the world around us.
Algebra allows us to generalize relationships through abstract thinking.

Curricular Competencies

Students are expected to **DO** the following :

1. Analyze quadratic functions of the form $y = ax^2 + bx + c$ to identify characteristics of the corresponding graph, including:
   - vertex
   - domain and range
   - direction of opening
   - axis of symmetry
   - x- and y- intercepts

   and to solve problems

2. Solve problems that involve quadratic equations.

Concepts and Content :

What students will **KNOW** :

1. Explain the reasoning for the process of completing the square .
2. Write a quadratic function given in the form $y = ax^2 + bx + c$ as a quadratic function in the form : $y = a (x - p)^2$ by completing the square.
3. Identify, explain and correct errors in an example of completing the square.
4. Sketch the grah of a quadratic function given in the form $y = ax^2 + bx + c$.
5. Verify that a quadratic function I the form $y = ax^2 + bx + c$ represents the same function as a given quadratic function in the form $y = a (x - p)^2$.
6. Write a quadratic function that models a given situation, and explain any assumptions made.
7. Solve a problem by analyzing a quadratic function .
8. Explain, using examples, the relationship among the roots of a quadratic equation, the zeros of the corresponding quadratic function and the x-intercepts of the graph of the quadratic function.
9. Derive the quadratic formula, using deductive reasoning.
10. Solve a quadratic equation of the form $ax^2 + bx + c = 0$ by using strategies such as
    - determining the square roots

- factoring
- completing the square
- applying the quadratic formula
- graphing its corresponding function

11. Select a method for solving a quadratic equation, justify the choice, and verify the solution.
12. Explain, using examples, how the discriminant may be used to determine whether a quadratic equation has two, one or no real roots; and relate the number of zeros to the graph of the corresponding quadratic function.
13. Identify and correct errors in a solution to a quadratic equation.
14. Solve a problem by :
    - analyzing a quadratic equation
    - determining and analyzing a quadratic equation

12. Solve problems by modelling a situation using a radical equation.

Learning Targets	**Formative Assessment**
1. Sketch the graph of a quadratic function given in the form $y = ax^2 + bx + c$	1. The graph of a every quadratic function is a parabola.
2. Recognize the characteristics of the graph of a quadratic function.	2. Identify the characteristics of the graph of a quadratic function including vertex, domain and range, direction of opening axis of symmetry and x- and y-intercepts.
3. Write a quadratic function given in the form $y = ax^2 + bx + c$ as a quadratic function in the form $y = a (x - p)^2$.	3. Solve quadratic equations by factoring, using square roots, completing the square, and the quadratic formula.
4. Solve problems that involve quadratic equations .	4. Quadratic equations can be used to model many real-life situations.
5. Solve a quadratic equation of the form $y = ax^2 + bx + c$ by using strategies such as determining the square roots, factoring, completing the square, applying the quadratic formula, and by graphing	5. As in 3.
6. Explain how the discriminant may be used to determine whether a quadratic equation Has two, one or no real roots; and relate the number of zeros to the graph of the quadratic function	6. Relate the nature of the roots to the shape of the graph of the quadratic function.

Curricular Competencies in Action

1. Write a quadratic function given in the form $y = ax^2 + bx + c$ as a quadratic function in the form : $y = a (x - p)^2$ by completing the square.

2. Solve problems that involve quadratic equations.

3. Sketch the grah of a quadratic function given in the form $y = ax^2 + bx + c$.

4. Identify and correct errors in a solution to a quadratic equation.

5. Solve a quadratic equation of the form $ax^2 + bx + c = 0$ by using strategies such as
   - determining the square roots
   - factoring
   - completing the square
   - applying the quadratic formula
   - graphing its corresponding function

6. Explain, using examples, how the discriminant may be used to determine whether a quadratic equation has two, one or no real roots; and relate the number of zeros to the graph of the corresponding quadratic function.

TRANSFER/EXTENSION : The students will see applications of quadratic equations such as in physics, sports (basketball, golf, soccer) and architecture (design of doorways, windows, etc).

CORE COMPETENCIES IN ACTION

Students will focus on the following core competencies in this unit :

- **Communication** : Acquire and **communicate** mathematical ideas using appropriate language, equations, graphs and graphing technology, oral presentations.
- **Creative thinking** :Collaboratively develop, **analyze**, and carry out problem solving and research based mathematical activities.
- Reflect on experiences and accomplishments to demonstrate one's own progress in learning
- **Positive Personal Awareness and Responsibility** : demonstrate self-determination and self-regulation.
- **Critical thinking**: visualize to explore, investigate and illustrate mathematical concepts and relationships.
- **First Peoples Principles of Learning** (FPPL) :- Connect mathematical concepts to each other and to other areas and personal interests.

FIRST PEOPLES PRINCIPLES OF LEARNING (FPPL)

Over the course of the semester, students will incorporate from FPPL :

- Learning is holistic, reflexive, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions eg. doing your homework regularly and diligently.
- Learning is embedded in memory, history and story eg. mathematical principles build on each other and what you learn in the past will facilitate learning in the future
- Learning involves patience and time.
- Learning involves exploration of one's identity eg. how has mathematics influenced you in the past present, and how will it impact you in the future.
- Engage in problem-solving experiences that are connected to local **First Peoples** communities, the local community, and other cultures.
- Incorporate **First Peoples** world views and perspectives to make connections to mathematical concepts.

TRANSFER/EXTENSION : Doing research projects that include researching applications of quadratic functions can enhance the student's interest and motivation in seeking new and innovative applications in science and business.

EVALUATION

FORMATIVE ASSESSMENT : Students will regularly check each other's work. The student will self assess themselves regularly in each of the units of study. Teacher and student will have two or three meetings to discuss grades, work habits, core competencies, e.g. assignment accountability (positive, personal, & cultural identity) and acknowledgment of FPPL

SUMMATIVE ASSESSMENT: Students will be expected to incorporate the study of quadratic functions in scientific situations found in physics called kinematics with essentially is the mathematics of motion. Projectile motion can be modeled extensively using parabolas. Tests, quizzes, midterm and final exams that cover the curricular competencies will form the bulk of the summative assessment.

REFLECTION/SELF ASSESSMENT : Students can reflect on their thinking and feelings of quadratic functions when they see the numerous examples of quadratic functions that we see in real life such as projectiles (paths of golf balls, footballs) and in parabolic objects such as door arches and suspension bridges. These actual examples can lead to an deeper appreciation of mathematics and later on extend to studies in physics and engineering

FINAL ASSESSMENT :

Summative Assessment	= 80 %
Formative Assessment	= 15 %
Grade Reporting (Teacher-student meeting)	= **5 %**
	100 %