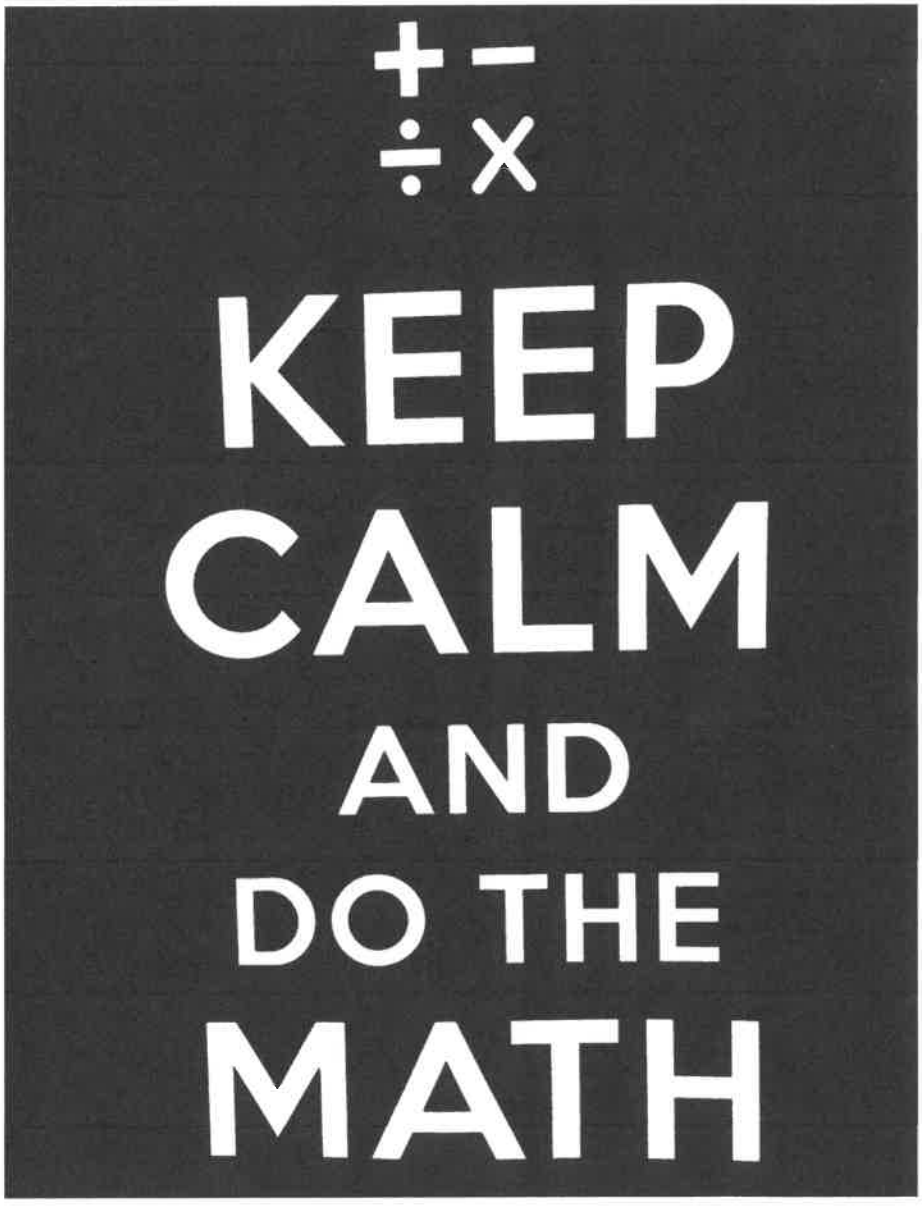
NOMBRE: _____

P.A.T Prep

2019 General P.A.T.Information



St. Brendan School

Mr. Martínez

2019 Mathematics P.A.T.
General Information

General Description

1 point each → Total: 20 Non-calculator

2 points each → Total: 40 Calculator

The Grade 9 Mathematics Provincial Achievement Test consists of two parts:

- Part A contains 20 numerical-response questions and assesses students' foundational skills and fluency in mental math, estimation, algebra, square roots, exponent laws, and arithmetic operations on rational numbers without the use of calculators.
- Part B contains 32 multiple-choice questions and 8 numerical-response questions and assesses students' ability to recall concepts and principles and to apply reasoning skills to solve problems.

This means: PART A is 20% of the final mark. PART B is 80%

Questions are categorized according to three levels of complexity: low, moderate, and high. (See Appendix 1 for a more detailed explanation of each complexity level.)

Question Format

The following bullets briefly describe the two question formats:

- Multiple-choice questions provide students with four response options, of which only one is correct.
- Numerical-response questions require students to generate a response (in symbolic form) to a particular problem, rather than selecting a response from a list of four options.

Use of Calculators and Manipulatives

Part A: Manipulatives may be used, but use of a calculator is not permitted.

Part B: Students may use calculators and manipulatives; however, use of graphing calculators is not permitted.

An acceptable manipulative is any mathematical tool that can be used by a student to help convert abstract ideas into concrete representations for the purpose of solving a problem (e.g., a ruler, tracing paper, pattern blocks, tiles and cubes, geoboards, tangrams, counters, spinners, number lines). The manipulative cannot perform the mental conversion or provide the solution to a problem. A multiplication table is not an acceptable manipulative for use in completing Part A (except as an accommodation) or Part B.

VERY IMPORTANT

You will NOT BE ALLOWED to use your phones, which means, you MUST have a calculator. (MAKE SURE IT IS NOT A GRAPHING CALCULATOR)

Here is the expected breakdown:

Test Component	Number of Questions	Question Format	Weighting on Total Test Score
Part A	20	Numerical Response	20%
Part B	32 8	Multiple Choice Numerical Response	80%

Content Domain of Test (Strand)	Part A: Percentage of Questions	Part B: Percentage of Questions
Number	70–80% 14–16	25–35% 10–14
Patterns and Relations	20–30% 4–6	35–45% 14–18
Shape and Space		20–30% 8–12
Statistics and Probability		5–10% 2–4

Possible amount of questions

Cognitive Domain of Test (Complexity Level)	Part A: Percentage of Questions	Part B: Percentage of Questions
Low	80–90% 16–18	30–40% 12–16
Moderate	10–20% 2–4	45–55% 18–22
High		10–20% 4–8

NUMBER STRAND

- **Unit 2:**
  - Powers: *repeated multiplication, powers with exponent 0, base vs. exponents*
  - Operations with powers: *Multiplication and division of power with same base; power of a power, etc.*
- **Unit 3:**
  - Rational numbers: *comparing and ordering rational numbers; solving problems that involve operations with decimals, fractions, and mixed numbers.*
  - ORDER OF OPERATIONS: BEDMAS
- **Unit 1:**
  - Square roots: *how to approximate square roots*
  - Perfect squares: *including the perfect square of decimals and fractions*

PATTERNS & RELATIONS

- **Unit 4:**
  - *Finding patterns*
  - *Linear equations and their verifying by substitution*
- **Unit 6:**
  - *Be able to write equations from word problems*
  - *Solve equations: inverse operations, distributive property*
- **Unit 5:**
  - *Polynomials: Identify its parts; classification according to number of terms; degree of a polynomial.*
  - *Operations with polynomials: Addition and subtraction of polynomials; multiplication and division of polynomials by a monomial.*

SHAPE AND SPACE

- **Unit 8:**
  - *Perpendicular from the centre of a circle to a chord bisects the chord*
  - *Central and inscribed angles*
  - *The inscribed angles subtended by the same arc are congruent (equal)*
  - *Tangent and point of tangency*

Outcomes from previous PAT's

June 2017
https://goo.gl/MU8SSS

June 2016
https://goo.gl/k3XKiE

June 2015
https://goo.gl/zWk6EF

Released Materials (which I have included in these review packages)

2010 Released Exam
https://goo.gl/AKTCMD

2013 Released Exam
https://goo.gl/vuaDHG

2014 Assessment Highlights
https://goo.gl/QOV6tb

2015 Assessment Highlights
https://goo.gl/GJwymW

2015 Released Exam
https://goo.gl/dHcmDM

2016 Assessment Highlights
https://goo.gl/rgJzOy

- **Unit 1:**
  - *Surface area of composite figures*
- **Unit 7:**
  - *Similarity of polygons*
  - *Scale diagrams – scale factor*
  - *Line and rotational symmetry*

STATISTICS AND PROBABILITY

- **Unit 9:**
  - *The effects of: bias, use of language, ethics, cost, time and timing, privacy, cultural sensitivity*
  - *Using either a population or a sample to answer a question*
  - *Role of probability in society*

Here are the actual specific OUTCOMES published by Alberta Education. Make sure you feel comfortable with each one, that you know the outcome. This list is probably the best study guide to use:

June 2017 – PAT Outcomes

Complexity	Item Description
Low	Find the sum of two positive rational numbers that are perfect squares (Gr.7, N.5)
Low	Evaluate a power with an integral base and whole number exponent to find a certain perfect square number (Gr.8, N.1)
Low	Evaluate powers with integral bases and whole number exponents to determine which powers are equivalent
Low	Evaluate a set of powers and order them from lowest value to highest value
Low	Apply knowledge of operations on powers with integral bases and whole number exponents to determine the value of an unknown power
Low	Determine the perimeter of a design composed of square shapes by calculating the square root of each given square's area, which is a perfect square number (Gr.8, N.1)
Low	Order a given set of inequalities according magnitude
Low	Determine the sum of two given powers with integral bases and whole number exponents
Low	Order a given set of rational numbers in fraction and decimal form by placing them on a number line

Complexity	Item Description
Moderate	Apply the exponent laws to simplify a given expression involving powers
Moderate	Determine an approximate square root of a given rational number that is not a perfect square
Moderate	Evaluate given expressions by applying the exponent laws and the order of operations
Moderate	Apply the order of operations, including exponents, to verify and extend a numeric pattern
Moderate	Determine whether a given approximate square root of a positive rational number is reasonable and identify the correct statement that supports the position
Moderate	Identify the error in a given simplification of an expression involving powers
High	Solve a problem involving arithmetic operations on rational numbers (Gr.8, N.4)
High	Solve a multi-step problem by determining the square root of a given value, calculating a fraction of the square root, and then using this value in an operation
High	Solve a problem involving arithmetic operations on rational numbers

Complexity	Item Description
Low	Solve a single variable linear inequality with rational coefficients (Gr.8, PR.2)
Low	Match equivalent polynomial expressions
Low	Manipulate a given pictorial model of a polynomial expression to make it equivalent to a given symbolic polynomial expression
Low	Identify the simplified form of a given polynomial expression
Low	Identify the single variable expression that represents a given context
Low	Match a linear equation to a pictorial pattern
Low	Extend a given graph (extrapolate) to determine the value of an unknown element
Low	Solve a given linear equation symbolically
Moderate	Determine which linear equation represents a pattern in a given table of values

Complexity	Item Description
Moderate	Given a pictorial model of a linear equation, solve for the single unknown variable and represent the solution in symbolic form
Moderate	Solve a given linear inequality algebraically, and graph the solution on a number line
Moderate	Translate a given problem into a single variable linear inequality
Moderate	Solve a given problem by representing the problem as a linear equation and solving for the unknown variable (Gr.8, PR.2)
Moderate	Represent and solve a given problem using a linear equation
Moderate	Determine which polynomial expressions are equivalent to one another
Moderate	Solve a given problem by representing the problem as a linear equation and solving for the unknown variable (Gr.8, PR.2)
Moderate	Match a graph to a corresponding equation of a linear relation
Moderate	Create and solve a linear inequality that represents a given context

Complexity	Item Description
Low	Determine the rotational symmetry of a regular 2-D shape that has shaded and unshaded congruent sections
Low	Determine the relationship between angles inscribed in a circle using circle properties
Low	Solve a given problem involving the application of one of the circle properties
Low	Solve a given problem using the properties of similar polygons
Moderate	Determine the location of a vertex of a 2-D shape so that the resulting 2-D shape is similar to a given 2-D shape
Moderate	Solve a given problem involving surface area of a composite 3-D object (Gr.8, SS.5)
Moderate	Solve a problem by applying a circle property involving the perpendicular from the centre of a circle to a chord
Moderate	Determine the surface area of a composite 3-D object
Moderate	Identify the image of a given 2-D shape following a single transformation

Complexity	Item Description
Moderate	Identify the type of symmetry that arises from a given transformation on the Cartesian plane
Moderate	Determine the actual height of a 2-D shape given a scaled drawing of the shape and the scale factor used to create the drawing
Low	Determine a reasonable prediction that can be made given the probability of an event occurring
Moderate	Identify the issue that would have the greatest effect on the analysis of the data of a given survey
Moderate	Interpret the results of a survey to identify a valid generalization about the population of the survey

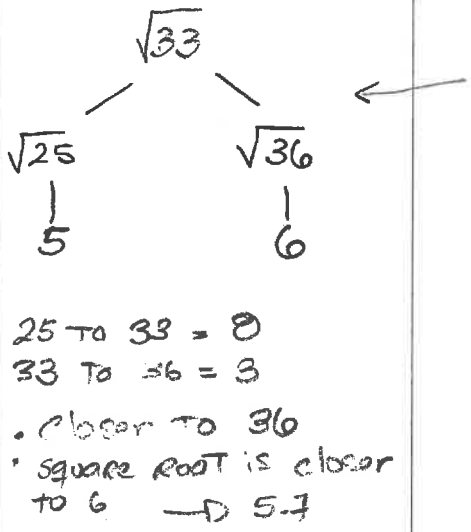
The following pages contain links to some excellent resources (web addresses) that you can use to review at any time. Even though Alberta Education suggests these resources, they have my personal stamp of approval.

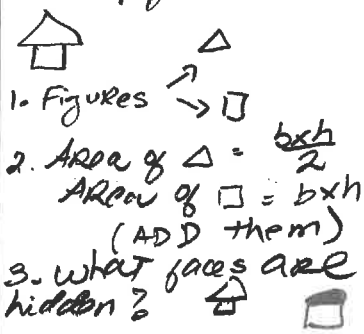
Grade 9	Date Added to List
IXL • Add and subtract polynomials [1] • Add and subtract polynomials using algebra tiles [1] • Model polynomials with algebra tiles [1] • Multiply a polynomial by a monomial [1] • Multiply monomials to find area [1] • Multiply polynomials to find area [1]	August 2015
Khan Academy • How to solve an equation with variables on both sides [1] • Intro to exponents [1] • Exponent rules part 1 [1] • Exponent rules part 2 [1] • The parts of polynomial expressions [1] • Intro to combining like terms [1] • Combining like terms example [1] • Combining like terms challenge problem [1] • Combining like terms with negative coefficients [1] • Equivalent forms of expressions [1] • Equivalent expressions [1] • More examples of adding and subtracting polynomials [1] • Adding and subtracting polynomials [1] • Simplifying expressions [1] • Combining like terms with negative coefficients and distribution [1] • Combining like terms [1]	August 2015
Quia • Solving Equations Jeopardy Style [1]	August 2015
Tic Tac Math Algebra [1]	August 2015
Nelson Education • Good Questions: Great Ways to Differentiate Mathematics Instruction [2] • More Good Questions: Great Ways to Differentiate Secondary Mathematics Instruction [2]	August 2016
Netmath [1]	August 2016

Grade 9 Continued	Date Added to List
Saxon Publishers Inc. • Saxon Math Grade 9 Kit ❷	August 2016
3P Learning • Mathletics ❶❷	June 2017
Nelson • From Patterns to Algebra	June 2017

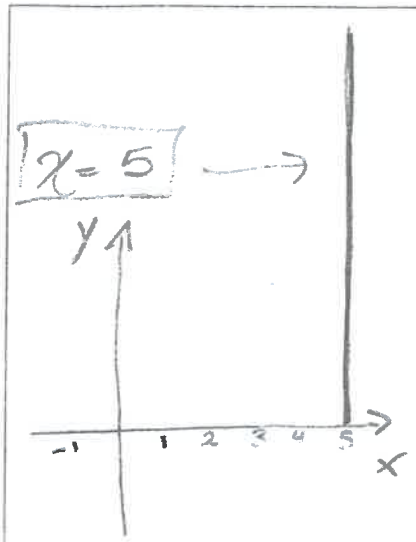
Grade 9 – Cumulative Exam Self-Check

Review Guide

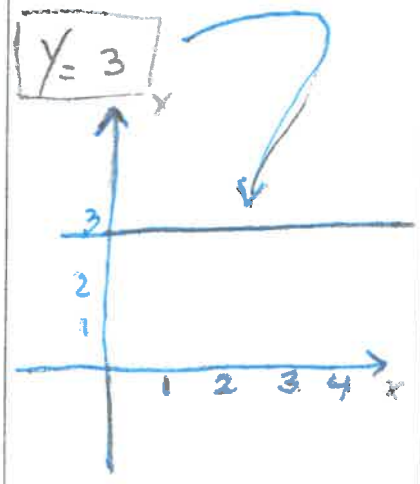
Question	Do I Know? Do I Understand?	Need to Review and Focus on
1. Square Roots and Surface Area • Perfect Squares • Square roots • Approximating Square Roots • Fractions and decimals as perfect squares  25 TO 33 = 8 33 TO 36 = 3 • CLOSER TO 36 • SQUARE ROOT IS CLOSER TO 6 → 5.7	• A **perfect square** is a number that is the square of a number, or the PRODUCT of am number multiplied by itself: 1 (1 x 1), 4 (2 x 2), 9 (3 X 3)... 16, 25, 36, 49, 64, 81, 100, 121, 144 ,169 • **To convert a decimal into a fraction:** Move the decimal place to the right until it is gone. The denominator will be a base of ten with AS MANY ZEROES AS THE SPACES YOU MOVED THE DECIMAL. 0.64 = 64/100 (moved the decimal 2 spaces) 0.989 = 989/1000 (moved the decimal 3 spaces) • **To approximate a square root:** 1. Determine the perfect squares that come before and after your number. 2. The square root of the number will be between the square roots of the perfect squares chosen above. 3. Estimate by determining the closer of the two perfect squares, and placing your number within a reasonable range from that closest perfect square's square root. • **A fraction is a perfect square if BOTH THE NUMERATOR AND THE DENOMINATOR are perfect squares.** • **To determine whether a decimal is a perfect square, rewrite it as a fraction and apply the rule above**	
2. Area of composite objects • Areas • Perimeters • Overlap • Area of composite objects	• The **area of a parallelogram** (square, rectangle) is: Base x Height • The **area of a triangle** is: (Base x Height)/ 2 • The **perimeter** is defined as the sum of all lengths that form the OUTSIDE of a shape. • To get the area of a 3-D object, calculate the area of all the faces, and add them together.	

S.A: Areas of all figures  1. Figures → □ △ 2. Area of △ = $\frac{b \times h}{2}$ Area of □ = b×h (ADD them) 3. what faces are hidden?	• A composite object is made of two or more shapes together. The faces that "touch" each other are said to be "overlapping." • **REMEMBER**: All overlaps MUST be multiplied by 2, since they involve 2 faces. Overlaps = areas hidden • To get the area of a composite object, first get the area of each individual object by adding the areas of their individual faces. Then, add all areas together. Lastly, subtract the overlaps.	
3. Powers and Exponent Laws • For addition and Subtraction of Exponents, LAWS DO NOT Apply $3^7 - 3^2$ is NOT $3^{7-2} = 3^5$ Convert to number $2187 - 9 = 2178$ See: $3^5 = 243$ NOT the same!	• I can recognize the base and the exponent of a power • Another name for a power with an exponent of 2 is "square" • Another name for a power with an exponent of 3 is "cubed" • **If the base is negative (that is, the negative sign is INSIDE the bracket), and the exponent is even, the result is ALWAYS POSITIVE** • **If the base is negative (that is, the negative sign is INSIDE the bracket), and the exponent is odd, the result is ALWAYS NEGATIVE** • **A power with an exponent of 0 is always 1** • **A power with an exponent of 1 is itself** • **The order of operation to follow is always BEDMAS** • **Powers with a base of ten have an amount of zeroes EQUAL TO THE EXPONENT:** $10^2 = 100$ $10^5 = 100000$	
4. Powers and Exponent Laws Conditions: Same base This is the only time the exp. multiply!	• To **multiply powers** with the same base, you keep the base and **ADD the exponents** • **To divide powers** with the same base: you keep the base and **SUBTRACT the exponents** • **For the power of a power, or a power inside a bracket with an exponent outside the bracket, you MULTIPLY the exponents**	e^e $(3^2)^6 \rightarrow 3^{2\times6} = 3^{12}$

	• **For a power of a division of fraction, you multiply the exponents for both the numerator and the denominator by the power outside the bracket** • **For the power of a multiplication (which is inside a bracket), each of the individual numbers inside that bracket is multiplied by the power outside the bracket**	
5, 6. Rational Numbers • Rational numbers • Positive and negative signs combined in addition, subtraction, multiplication and division • Number lines • Ordering numbers in increasing or decreasing value • Adding and subtracting fractions • Multiplying and dividing fractions ADD/SUBTRACT FRACTIONS Goal: Make them have same denominator. DIVISION: Big C, little C $\left(\frac{\frac{3}{4}}{\frac{2}{8}}\right) = \frac{3\times8}{4\times2}$	• A **rational number** is any number that can be made into a fraction. • For negative numbers, the bigger numbers are the closest to 0. • For positive numbers, the bigger numbers are the ones away from 0 • **When combining numbers with the same sign, add them and keep the common sign** • **When combining numbers with different numbers, they subtract, and the number with the biggest value determines the sign of the answer** • **The order of operations for rational numbers is BEDMAS** • (+) x (+) = + (+) / (+) = + • (+) x (-) = - (+) / (-) = - • (-) x (-) = + (-) / (-) = - • (-) x (+) = - • **To multiply fractions, multiply the numerators with each other, and the denominators with each other** • **To divide fractions, cross multiply.**	
7, 8. Linear Relations • Extrapolation • Interpolation • Ordered pair • Linear relation • Be able to come up with the equation that represents the relation	• For a relation to be linear, both **the x and the y values have to increase or decreased in a constant pattern** (although they don't have to be the same pattern for both) • **A relation is linear if its graph is a straight line. Equations that have both the *–x and the –y* variables in it will produce OBLIQUE (INCLINED) LINES** • Always make a table of values • The points on the graph **ARE NOT JOINED** because there isn't enough data, or the data is finite • You can extrapolate (make longer) the graphed lined, or "interpolate to find any point along the graph	



- To find points along the graph, start at either the *x* or the *y* coordinate, draw a line towards the graphed line, and then draw a line towards the other axis. You are looking for the point in which the line intercepts the axis
- An ordered pair describes a point on the Cartesian plain. It is read *(X, Y)*
- When the equation HAS JUST ONE VARIABLE:
  x = a number, it means x is constant, and therefore its graph is a VERTICAL line
  y = a number, it means that y is constant, and therefore its graph is a HORIZONTAL line
- To come up with the equation that represents a relation, follow the following steps:



Figure, f	Number of Squares, S
1	5
2	7
3	9
4	11
5	13

+1 ( ) +2

- f goes up by 1
- S goes up by 2 (2 is in equation)
- But when f=1, S = 5
- From 2 to 5 there is 3

$S = 2f + 3$

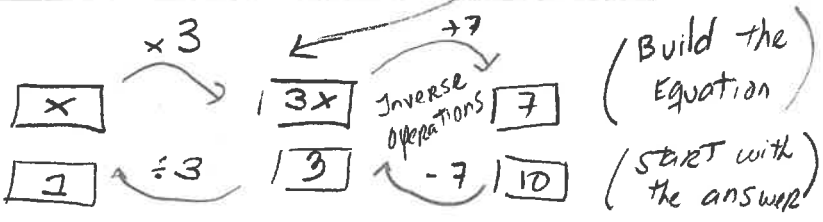
If 2 variables:

/ or \

9, 10. Polynomials • Term • Like and unlike terms • Degree of the polynomial • Variable • Exponent • Numerical coefficient • Constant	• A **polynomial** is defined as one term or the sum of terms whose variables have whole-number exponents. • A **term** is a number, a variable, or the product of numbers and variables. • A **binomial** is a polynomial that has 2 terms

• Monomial • Binomial • Trinomial • Simplification = Combination of like terms • Subtract = ADD THE OPPOSITE	• A **trinomial** is a polynomial that has 3 terms • **Using tiles, the big squares represent the x^2 terms, the rectangles represent the x terms, and the small squares represent the constant terms** • **"Like terms"** are terms that have THE SAME VARIABLE AND THE SAME EXPONENT • **To simplify polynomials, you combine the LIKE TERMS** (that is letters with letters with the same exponents, and numbers with numbers). BE CAREFUL: THE BASES HAVE TO MATCH UP!!!!! • **To ADD polynomials, you combine all "like terms".** Again, you can only combine terms that have the same base and exponent • **To SUBTRACT polynomials, you "ADD THE OPPOSITE":** That is, you change the subtraction sign to an add sign, and then YOU CHANGE THE SIGNS OF ALL THE TERMS • **To multiply a binomial or a trinomial by a constant, the constant (outside the bracket) MULTIPLIES EACH TERM INSIDE THE BRACKET** • **To divide a binomial or a trinomial by a constant, divide each term on the numerator (individually) by the numerator. If needed, combine like terms.** • **To divide a binomial or a trinomial by a monomial, divide the numbers with each other, and for the constant (letter), remember that to divide exponent you subtract them (bases have to match!)**	
11. Linear Equalities and Inequalities **EQUATION:** One quantity is EQUAL to another **INEQUALITY:** 1. One quantity is less than another 2. One quantity is greater than another 3. One quantity is greater or equal to another 4. One quantity is less or equal to another	• **To solve an equation:** 1. **Isolate the variable** 2. **Use INVERSE OPERATIONS** • If you want, you can use rectangles • **The first rectangle ALWAYS starts with the variable** • The arrows indicate the operations • On the lower row, you start backwards. THE LAST RECTANGLE starts with THE ANSWER. • Now follow back, and use inverse operations. **Inequalities:** • Remember that inequalities have MANY solutions, and you can use a number line to see the solutions	

$3x + 7 = 10$



	• **IMPORTANT: You REVERSE the sign of the inequality when you MULTIPLY OR DIVIDE each side BY THE SAME NEGATIVE NUMBER**	
13, 14, 15, 16, 17. Similarities and Transformations Scale factor Enlargements Reductions Similar Polygons Similar Triangles Corresponding side Ratio Rotational Symmetry Order of rotation Angle of rotational symmetry Translations Rotations Reflection Ordered pair	• **SCALE FACTOR = New/old** • **For enlargements = SCALE FACTOR > 1** • **For reductions = SCALE FACTOR < 1** • **To get the NEW DIMENSIONS, multiply each length by the scale factor** • **Similar Polygons:** Have to have SAME ANGLES and SAME SCALE FACTOR (you have to get the scale factor **of each individual side**) • **Corresponding sides must be proportional. They are written in fractions form: AC/DB** • Make sure you ROTATE the polygons if you have to so that they "look the same" • **Similar Triangles: Similar triangles have EITHER the same angles OR the same scale factor** • **Remember to rotate (if you have to) the triangles so that they look the same.** • **TO SOLVE RATIOS: Cross-multiply!** • When given two triangles, and asked to find the length of one side, you MUST IDENTIFY THE EQUIVALENT SIDES, CALCULATE THE SCALE FACTOR WITH TWO EQUIVALENT, KNOWN DIMENSIONS, and use that scale factor to calculate the unknown length. • **LINE OF SYMMETRY = LINE OF REFLECTION:** Where you would "put" the mirror to reflect • **Lines of symmetry can be horizontal, vertical, and oblique (inclined)** • A shape has **ROTATIONAL SYMMETRY** when it is rotated, and it coincides with itself (before a full 360 degrees rotation) • If a figure is rotated and it does not coincide with itself, IT HAS NO ROTATIONAL SYMMETRY • The **order of rotation** is how many time a figure coincides with itself before a full rotation	

	• **The angle of rotation symmetry is 360 divided by the order of rotation** • **There are 3 types of transformations: Translations, Rotations and Reflections**	
18, 19, 20, 21, 22, 23. Circle Geometry Tangent Point of tangency Pythagorean Theorem Radius Diameter Chord Perpendicular bisector Minor arc Mayor arc Inscribed angle Central angle Semi-circle Subtended	• **A tangent to a circle is perpendicular to the radius. It is a line that touches the circle in one point (outside).** • This point where the tangent touches the circle is called the **POINT OF TANGENCY.** • **The angle at the point of tangency is always 90 degrees.** • A **radius** is any line that originates at the center of the circle and it ends in the circle itself • A **chord** is a line that goes from side to side in a circle but DOES NOT PASS THROUGH THE CENTER • A **diameter** is a line that goes through the middle of the circle, and it goes from one side to the other • **The longest chord in a circle is the diameter** • A **chord** is cut in two **IDENTICAL** parts by a line that comes from the centre of the circle and it goes to the center of the chord. This line is called the PERPENDICULAR BISECTOR • Remember: Perpendicular bisectors **COME FROM THE CENTRE OF THE CIRCLE**, and cut the chord in two IDENTICAL parts. • The angles created by the perpendicular bisectors are always 90 degrees. • Always try to complete triangles. That way you can use the Pythagorean Theorem. • **The total amount of degrees in ALL triangles is 180.** • **The total amount of degrees in all QUADRILATERALS is 360.** • **The total amount of degrees in all CIRCLEs is 360.** • The shortest distance between two points in the circumference of a circle is called the **MINOR ARC.**	

	• The longest distance between two points in the circumference of a circle is called the **MAJOR ARC** • **The angle that forms in the CENTRE of the circle, and it comes from the endpoints of an arc is called the CENTRAL ANGLE.** • **The angle formed ON THE CIRCLE, and it comes from the endpoints of an arc is called the INSCRIBED ANGLE.** • **CENTAL ANGLE = 2 x CENTRAL ANGLE** • **INSCRIBED ANGLE = (CENTRAL ANGLE)/2** • **Remember:** In order for you to utilize the above mathematical relation, **both the central and the inscribed angle HAVE to originate from the same two points.** • **All inscribed angles SUBTENDED (originating from) the same 2 points ARE EQUAL or EQUIVALENT (CONGRUENT)** • **In a circle, if a triangle has the diameter as its base, the vertex (where the other two sides meet) is always along the circle, and it will always be A RIGHT ANGLE.** • **OR: All inscribed angles subtended (originating from) a semi-circle are right angles.**	
24-29. Probability in Society Probability Theoretical probability Experimental probability Subjective judgement POTENTIAL PROBLEMS WITH DATA COLLECTION: • Bias • Use of language • Timing • Privacy • Ethics • Cultural Sensitivity • Cost • Time Population Census Sample Validity of conclusions	• **Probability:** Defined as the possibility of an outcome happening. It can be expressed as a ratio (4:10), "4 out of 10," as a fraction (4/10), a decimal, or a percentage. • **Theoretical Probability:** The number of favourable outcomes written as a fraction of the total number of possible outcomes (based on a "theory") • **Experimental probability:** The probability of an event calculated from experimental results. • **Subjective judgement:** A decision made based on instinct, "gut feeling", superstition, etc. • A question is **BIASED** when the question influences responses in favour of, or against the topic of the data collection. • The **USE OF LANGUAGE** in a question could lead people to give a particular answer.	

Simple random sampling Systematic or Interval sampling Cluster sampling Self-selected sampling Convenience sampling Stratified random sampling	• **Timing:** Refers to **WHEN** the data is collected, and it could potentially lead to particular results. • **Privacy:** If the topic of the data collection is personal, a person may not want to participate or may give an untrue answer on purpose. • **Cultural Sensitivity** means being aware of other cultures. The surveyor must avoid being offensive when asking questions that do not apply to that culture. • **Ethics:** The collected data must not be used for purposes other than those told to the participants. • **The COST** of collecting data must be taken into account. • The **TIME** needed for collecting the data must be considered. • **POPULATION:** The group about which information is being obtained. • **CENSUS:** Conducted when data are collected from EACH MEMBER of the population. Census can be time consuming, difficult or impossible to complete, and could be very expensive. • **SAMPLE:** A small part of the population used when a census is not feasible. • **REMEMBER: The sample has to be big enough to be a truer representation of the population. Also, if the sample is representative of the population, the data collection provides valid conclusions** • **Simple random sampling:** Each member of the population has an equal chance of being selected • **Systematic or Interval Sampling:** Every *nth* member of the population is selected. • **Cluster Sampling:** Every member of each randomly chosen group of the population is selected. • **Self-selected Sampling:** Only members of the population who are interested and volunteer will participate. • **Convenience Sampling:** Only members of the population who are convenient to include are selected • **Stratified Random Sampling:** Some members from each group of the population are randomly selected	

Mathematics Grade 9

I Can Statements

	Math Makes Sense Correlation	Meets Standard of Excellence	Exceeds Acceptable Standard	Meets Acceptable Standard	Does Not Meet Acceptable Standard
		I know this so well I could teach someone	I know this fairly well	I can figure this out with help	This is too hard
GENERAL OUTCOME: Numbers					
Develop Number Sense					
I can demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by: • **representing repeated multiplication, using powers** • **using patterns to show that a power with an exponent of zero is equal to one** • **solving problems involving powers**	**Unit 2**				
I can demonstrate an understanding of operations on powers with integral bases (excluding base 0) and whole number exponents: • $(a^m)(a^n) = a^{m+n}$ • $a^m \div a^n = a^{m-n}$, m > n • $(a^m)^n = a^{mn}$ • $(ab)^m = a^m b^m$ • $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$, $b \neq 0$.	**Unit 2**				
I can demonstrate an understanding of rational numbers by: • **comparing and ordering rational numbers** • **solving problems that involve arithmetic operations on rational numbers** (maintenance and refine note: see grades 4-SO3. 5-SO5 & SO6, 7-SO5 and 8-SO6 number outcomes)	**Units 3**				
I can explain and apply the order of operations, including exponents, with and without technology (maintenance and refine note: see related grades 4-SO3, 5-SO-5 & SO6, 7-SO5 & SO6 and 8-SO6 & SO7 number outcomes)	**Unit 3**				
I can determine the square root of positive rational numbers that are perfect squares.	**Unit 1**				

GENERAL OUTCOME: Patterns & Relations Use patterns to describe the world and to solve problems					
	Math Makes Sense Correlation	**Meets Standard of Excellence**	**Exceeds Acceptable Standard**	**Meets Acceptable Standard**	**Does Not Meet Acceptable Standard**
		I know this so well I could teach someone else	I know this fairly well	I can figure this out with help	This is too hard
I can generalize a pattern arising from a problem-solving context, using a linear equation, and verify by substitution	**Unit 4**				
I can graph a linear relation, analyze the graph, and interpolate or extrapolate to solve problems	**Unit 4**				
GENERAL OUTCOME: Patterns & Relations **Represent algebraic expressions in multiple ways**					
I can model and solve problems, using linear equations of the form: • $ax = b$ • $\frac{x}{a} = b, a \neq 0$ • $ax + b = c$ • $\frac{x}{a} + b = c, a \neq 0$ • $ax = b + cx$ • $a(x + b) = c$ • $ax + b = cx + d$ • $a(bx + c) = d(ex + f)$ • $\frac{a}{x} = b, x \neq 0$ **where a, b, c, d, e and f are rational numbers**	**Unit 6**				
I can explain and illustrate strategies to solve single variable linear inequalities with rational coefficients within a problem-solving context	**Unit 6**				
I can demonstrate an understanding of polynomials (limited to polynomials of degree less than or equal to 2).	**Unit 5**				
I can model, record and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially and symbolically (limited to polynomials of degree less than or equal to 2). (maintenance and refine note: see grades 4-SO3 & 7-SO6 number outcomes)	**Unit 5**				

I can model, record and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials, concretely, pictorially and symbolically. (maintenance and refine note: see grades 5-SO5 & SO6, and 8-SO7 number outcomes)	**Unit 5**				
GENERAL OUTCOME: Shape and Space					
Use direct and indirect measurement to solve problems					
	Math Makes Sense Correlation	**Meets Standard of Excellence**	**Exceeds Acceptable Standard**	**Meets Acceptable Standard**	**Does Not Meet Acceptable Standard**
		I know this so well I could teach someone else	I know this fairly well	I can figure this out with help	This is too hard
I can solve problems and justify the solution strategy, using the following circle properties: • **the perpendicular from the centre of a circle to a chord bisects the chord** • **the measure of the central angle is equal to twice the measure of the inscribed angle subtended by the same arc** • **the inscribed angles subtended by the same arc are congruent** • **a tangent to a circle is perpendicular to the radius at the point of tangency**	Unit 8				
GENERAL OUTCOME: Shape and Space					
Describe the characteristics of 3-D objects and 2-D shapes, and analyze the relationships among them					
I can determine the surface area of composite 3-D objects to solve problems	Unit 1				
I can demonstrate an understanding of similarity of polygons	Unit 7				
GENERAL OUTCOME: Shape and Space					
Describe and analyze position and motion of objects and shapes					
I can draw and interpret scale diagrams of 2-D shapes	Unit 7				
I can demonstrate an understanding of line and rotation symmetry	Unit 7				

GENERAL OUTCOME: Statistics and Probability Collect, display and analyze data to solve problems					
	Math Makes Sense Correlation	Meets Standard of Excellence	Exceeds Acceptable Standard	Meets Acceptable Standard	Does Not Meet Acceptable Standard
		I know this so well I could teach someone else	I know this fairly well	I can figure this out with help	This is too hard
I can describe the effect of: • bias • use of language • ethics • cost • time and timing • privacy • cultural sensitivity On the collection of data	Unit 9				
I can select and defend the choice of using either a population or a sample of a population to answer a question	Unit 9				
GENERAL OUTCOME: Statistics and Probability **Use experimental or theoretical probabilities to represent and solve problems involving uncertainty**					
I can demonstrate an understanding of the role of probability in society	Unit 9				