Mathematics 3201
June 2018 Public Exam Outcome Report

This examination follows the specifications, conventions and standards set out in the:
Mathematics Public Examination Standards

Chapters:
1 Set Theory
2 Counting Method
3 Probability
4 Rational Expressions and Equations
5 Polynomial Functions
6 Exponential Functions
7 Logarithmic Functions
8 Sinusoidal Functions
9 Financial Mathematics: Borrowing Money

PART I: Selected Response—Total Value: 50%

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description
1	26	LR2	L2M	Given a Venn diagram with three non-disjoint (intersecting) sets, determine the number of elements in the intersection of two of the sets.
2	26	LR2	L2M	Given a Venn diagram with two non-disjoint (intersecting) sets, determine the number of elements in the complement of set A.
3	22	LR2	L2A	Given one finite set, and one infinite set, each described using set notation, determine a correct statement about the two sets.
4	30	LR2	L2A	Given $n(A)$, $n(B)$, $n(A \cup B)'$, and $n(A \cap B)$, determine $n(U)$, where U represents the universal set.
5	52	P4	L2M	Given multiple distinct elements in each of three categories, determine the total number of choices possible if one element is selected from each category.
6	58	P5	L2M	Determine the number of ways in which n distinct objects can be arranged in a line where order matters.
7	68	P5	L2M	Determine the number of different arrangements of a word with n letters, not all of which are distinct.
8	60	P5	L2A	Simplify an algebraic fraction containing factorials in the numerator and in the denominator.
9	62	P5	L2A	Determine the number of ways that n distinct objects can be arranged in a line if r objects must remain together.

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description
10	74	P6	L2A	Given the number of defensemen and the number of forwards on a hockey team, identify the notation that indicates the number of ways in which a starting lineup of 5 players (no goalie) can be selected if the lineup must include exactly 2 defensemen.
11	88	P3	L2M	Given four Venn Diagrams, determine which diagram represents mutually exclusive events.
12	80	P1	L2M	Given the probability of an event as a percentage, determine the odds against the event.
13	88	P2	L2A	Given a Venn diagram containing $n(A \setminus B)$, $n(B \setminus A)$, $n(A \cap B)$, and $n(A \cup B)'$ determine the probability (as a percentage) that a randomly selected element is in $(A \setminus B) \cup (B \setminus A)$.
14	94	P3	L2A	Given a bag containing *n* marbles divided into 3 different-colored sets, determine the probability that the first marble is a given colour and the second marble is a different given colour, provided the marbles are drawn without replacement.
15	92	P3	L3	Given two dependent events *X* and *Y*, $n(X), n(Y)$, $n(X \cap Y)$, and $n(X \cup Y)'$, determine $P(X \cap Y)$. (number of elements given in factorial notation)
16	102	RF1	L2M	Identify the non-permissible values for a given rational expression in factored form.
17	108	RF2	L2M	Determine the LCD for a rational equation with denominators in factored form.
18	108	RF1	L2A	Determine the simplified form of a rational expression.
19	108	RF2	L2A	Simplify the quotient of two rational expressions with different monomial denominators.
20	110	RF2	L2A	Simplify the difference of two rational expressions, one with a binomial linear denominator, the other with a constant denominator.
21	112	RF3	L2A	Solve a rational equation of the form $\frac{a}{b} = \frac{cx - d}{x}$ where *a*, *b*, *c* and *d* are constants.
22	128	RF7	L2M	Identify the polynomial equation with the given end behavior.
23	122	RF7	L2M	Given four graphs, identify the graph of a polynomial function.

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description
24	128	RF7	L2A	Determine the correct maximum number of *x*-intercepts given the degree of the function.
25	128	RF7	L2A	Given the graph of a cubic polynomial ($y = ax^3 + cx + d$), determine the values of *a* and *d.*
26	132	RF7	L2A	Given the polynomial equation of the curve of best fit in standard form, determine the *y*-value for a given *x*-value.
27	134	RF7	L2A	Given the graph of a polynomial function, identify the *y*-value for a given *x*-value.
28	142	RF6	L2M	Given an equation of the form $y = a(b)^x$, determine the coordinates of the y-intercept.
29	144	RF6	L2M	Given the graph of an exponential function, identify the corresponding equation.
30	144	RF5	L2A	Solve an exponential equation in which the bases can be made equal. The base of one expression is a natural number with a linear binomial exponent. The other expression is a numeric fraction with a linear binomial exponent.
31	152	RF5	L2A	Given an exponential equation of the form $A(t) = A_o\left(\frac{1}{2}\right)^{\frac{t}{h}}$, which models the half-life of a radioactive isotope, determine amount of isotope remaining after a given time.
32	158	RF5, RF6	L2A	Given the principal invested, the annual interest rate, and the compounding period, identify the function that models the situation.
33	144	RF6	L2A	Given a table of values which models exponential growth, determine the function that models the data.
34	172	RF4	L2M	Identify the logarithmic equation that is equivalent to the given exponential equation.
35	168	RF6	L2M	Given an exponential graph, identify the graph that switches the *x*- and *y*-values of the original graph.
36	172	RF4	L2A	Evaluate a numeric logarithmic expression of the form $\log_b\left(\frac{1}{N}\right)$, where *N* is a power of *b*.
37	176	RF4	L2A	Rewrite $\log_b a - c\log_b d$ as a single logarithm (*a* and *d* are constants, *c* is a fraction).

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38	180	RF5	L2A	Determine the exact solution to an exponential equation, equating a power (with a constant base and a linear binomial in the exponent) and a constant, in which the bases cannot be made equal.
39	184	RF5	L3	Given an exponential function of the form $A(t) = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$, determine how long it would take for a given percentage of a radioactive substance to remain
40	196	RF8	L2M	Determine the period of a given sinusoidal graph.
41	198	RF8	L2M	Determine the amplitude of the graph of a sinusoidal function given the equation of the function.
42	192	RF8	L2A	Convert an angle measure from radians to degrees.
43	196	RF8	L2A	Determine the amplitude of a given sinusoidal graph with its maximum and minimum values also provided.
44	202	RF8	L2A	Given the equation $h(t) = a\sin b\left(t - c\right) + d$, representing the motion of point on a Ferris Wheel, determine the height of the point after a certain time.
45	198	RF8	L2A	Given an equation of the form $y = a\cos b\left(x - c\right) + d$, determine the range of the function.
46	214	F1	L2M	Given the number of bi-weekly payments, determine the term of a lease.
47	218	F1	L2M	Given a partial amortization table showing the payment period, the loan payment amount for each payment period, the amount of the principal repaid for each payment period, and the loan balance after each payment period, determine the amount of a given payment that goes toward the principal.
48	228	F2	L2M	Identify the factor that might lead a person to purchase a home rather than rent.
49	214	F1	L2A	Given the investment principal, the annual interest rate as a percent, the compounding period, and the loan term in years, determine total interest earned on the investment over the term.
50	212	F1	L2A	Given an exponential equation in the form $A = P\left(1 + i\right)^n$ that models a bank loan with a non-annual compounding period, determine the annual interest rate.

PART II: Constructed Response—Total Value: 50%

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description	Item
51	30	LR2	2A	3	Given $n(U)$, $n(A)$, $n(B)$, $n(C)$, $n(A \cap C \setminus B)$, $n(A \cap B \setminus C)$, $n(B \cap C \setminus A)$, $n(A \cap B \cap C)$, and $n(A \cup B \cup C)'$, use the provided Venn diagram to algebraically determine the number of the elements in $(A \cap B \cap C)$.
52a	74	P5, P6	2A	3	Given an equation in the form ${}_nC_r = k$, where *r,* and *k* are constants, algebraically solve the equation for *n*.
52b	70,74	P6	3	3	Determine the number of ways in which *r* elements can be chosen from *n* elements in two different scenarios, one in which order is important and one in which order is not important, and explain why the answer in each scenario is different.
53a	84	P6	2A	3	Given the number of teachers from three different subject areas, determine the probability of selecting a committee of size *n* consisting of exactly two teachers from each subject area.
53b	84	P5, P6	3	3	Given the total number of students and the number of students who own each of items A, B, and C, determine the probability of selecting *r* students with at least 2 owning item A.
54a(i)	114	RF3	2A	3	Solve a rational equation in a single variable, based on a real-life situation, in which one side of the equation consists of the difference of two rational expressions, one with a monomial denominator and one with a binomial denominator; the other side of the equation is a constant.
54a(ii)	114	RF3	3	1	Re-write the equation from part (i), given different parameters for the real-life scenario.
54b(i)	110	RF3	3	1	Identify the error in the simplification of the difference of two rational expressions.
54b(ii)	110	RF3	2A	1	Provide the correct simplification for the rational expression in 54b(i).

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description	Item
55a(i)	128	RF7	2A	1	Sketch a possible polynomial graph that has the given end behaviour and *y*-intercept.
55a(ii)	128	RF7	2A	1	Write a polynomial equation that could represent the graph described in 55a(i).
55b	122	RF7	2A	2	Given a polynomial graph, determine the end behaviour, the number of turning points, the constant term, and the degree of the corresponding polynomial function.
55c	132	RF7	3	2	Given a quadratic regression equation and the parameters *a*, *b* and *c,* as well as the graph of the curve of best fit, explain how to use the graph to solve the regression equation when it equals a particular value *r* and state solutions.
56a	144	RF5	2A	4	Algebraically solve an exponential equation in which the bases can be made equal. The left side of the equation consists of a numerical radical raised to a linear binomial exponent and the right side of the equation consists of a fractional base raised to a linear monomial exponent.
56b	152	RF5	3	2	Given two exponential functions, one of the form $P(t) = a(b)^t$ (*a* and *b* are constants) and the other $P(t) = a(b)^{\frac{t}{c}}$ (*a*, *b*, and *c* are constants) that models the value of two vehicles, algebraically determine which vehicle depreciates faster.
57a	184	RF5	2A	3	Given the exponential function $A(t) = A_0\left(\frac{1}{2}\right)^{\frac{t}{d}}$, which models a real-life phenomenon, and the numerical values of A_0, *A* and *d*, algebraically determine the value of *t*.
57b(i)	178	RF5	2A	2	Given the formula for pH and a table with the pH of several solutions, determine which solution has a hydrogen ion concentration of *r*.
57b(ii)	178	RF5	2A	2	Given the formula for pH and the pH of a solution, determine the concentration of hydrogen ions in the solution.

Item	Curriculum Guide Page(s)	Outcome(s)	Cognitive Level	Outcome Description	Item
58(i)	196	RF8	2A	4	Given the graph of a sinusoidal function, determine the amplitude, the period, the equation of the midline, and the range.
58(ii)	202	RF8	3	2	Use the information in 58(i) to determine the equation of the graph in the form $y = a\cos b(x - c) + d$.
59	212	F1	3	4	Given two loan repayment options with different annual interest rates and the same compounding frequency, but different repayment terms, determine the cheaper lump sum payment at the end of the terms.