

Mathematics 3201

June 2017 Public Exam Outcome Report

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

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

PART I: Selected Response—Total Value: 50%

Item	Curriculum Guide Pages	Outcome	Cognitive Level	Outcome Description
1	26	LR2	L2M	Given a Venn diagram containing three non-disjoint (intersecting) sets, identify the statement and notation that corresponds to a given subset of elements.
2	26	LR2	L2M	Given a Venn diagram with two non-disjoint (intersecting) sets, determine the number of elements in the complement of the intersection of the sets.
3	23, 26	LR2	L2A	Given two finite sets, each described using set notation, determine the number of elements in the intersection of the sets.
4	24, 30	LR2	L2A	Given $n(A), n(B), n(A \cup B)'$ and $n(U)$, where U denotes the universal set, determine $n(B \setminus A)$.
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	62	P5	L2M	Identify the notation which indicates the number of ways in which r distinct elements can be selected from n distinct elements, where $r < n$ and where order is important.
7	56, 64	P4, P5	L2M	Determine the number of passwords that can be created using the numbers 0 to 9 given the number of digits in the password, that repetition of numbers is permitted, and that there is a restriction on the numbers used for the first digit of the password.

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8	60	P5	L2A	Simplify an algebraic fraction containing factorials in the numerator and in the denominator.
9	68	P5	L2A	Determine the number of distinct paths between two points on a grid, given that movement in only two perpendicular directions is possible.
10	70, 72	P6	L2A	Given the number of females and the total number people trying out for a swim team, determine the number of swim teams that can be chosen with n males and $n+2$ females.
11	82	P1	L2M	Identify the numeric expression which indicates the theoretical probability of a given outcome when a fair coin is tossed more than once.
12	80, 82	P1	L2M	Given the probability of an event as a percent, determine the odds in favour of 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 deck containing n cards divided into 4 equal different-colored sets, determine the probability that the first card is a given color and the second card is the same color as the first or any two other colors, if the cards are drawn without replacement.
15	94, 96	P3	L3	Given the probability that a person attends a music festival if a certain band is playing at the festival, the probability that the person attends if the band is not playing, and the probability that the band plays at the festival, determine the probability that the person will attend the festival.
16	102	RF1	L2M	Identify the non-permissible values for a rational expression given in factored form.
17	106	RF1	L2M	Determine the simplified form of a rational expression that is given in factored form.
18	108	RF2	L2A	Simplify the product of two rational expressions.
19	108	RF2	L2A	Simplify the quotient of two rational expressions with like numeric denominators and monomials with the same variable but different degrees in each numerator.
20	110	RF2	L2A	Simplify the difference of two rational expressions with like binomial linear denominators.
21	112	RF3	L2A	Solve a rational equation of the form $\frac{a}{x^2 - bx} = \frac{c}{x}$ where a , b , & c are constants.
22	122	RF7	L2M	Given the graph of a polynomial function, identify the range of the function.

Item	Curriculum Guide Pages	Outcome	Cognitive Level	Outcome Description
23	128, 130	RF7	L2M	Identify the graph that matches a given polynomial function, given the function type (linear, quadratic, or cubic).
24	122	RF7	L2A	Determine which characteristic of a parabola would change if the sign of the leading coefficient of the quadratic equation is changed.
25	122	RF7	L2A	Determine the maximum number of turning points and the maximum number of x-intercepts of the graph of a polynomial function, given the function type (linear, quadratic, or cubic).
26	130, 132	RF7	L2A	Given the polynomial equation of the curve of best fit in standard form and the scatter plot containing the curve of best fit, determine the y-value for a given x-value.
27	130	RF7	L2A	Given the graph of a cubic polynomial, determine the corresponding polynomial equation in standard form.
28	142	RF6	L2M	Given the y-intercept and a description of the end behaviour of the graph of an exponential function, identify the equation of the function.
29	142	RF6	L2M	Determine the range of a given exponential function.
30	144	RF5	L2A	Solve an exponential equation equating expressions in which the bases can be made equal. The base of one expression is a natural number with a linear monomial exponent. The other expression is a numeric fraction.
31	152	RF5	L2A	Given an exponential equation of the form $G(t) = a(b)^{ct+d}$ which models the growth of a population over time, where $a, b, c & d$ are constants, determine the amount of time taken for the population to reach a given value.
32	150, 152	RF5	L2A	Given a table of values which models exponential growth, determine the initial amount and the rate of growth.
33	152	RF6	L2A	Given the principal invested, the annual interest rate, the compounding period, and the term of the investment, identify the exponential equation that represents the value of the investment at the end of the term.
34	172	RF4	L2M	Identify the logarithmic equation that is equivalent to the given exponential equation.
35	166, 170	RF6	L2M	Given a logarithmic graph, identify the corresponding equation.
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 .

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37	180	RF5	L2A	Give the exact solution to an exponential equation in which the bases cannot be made equal. One side of the equation consists of a power with an integral base and a linear binomial exponent and the other side of the equation is a constant.
38	176	RF4	L2A	Rewrite $\ln a - b \ln c$, where a, b , & c are constants, as a single logarithm.
39	176	RF4	L3	Identify the step in which the error occurs in the simplification of a logarithmic expression containing the sum and difference of logarithms with equal bases.
40	202	RF8	L2M	Identify the equation that corresponds to a given sinusoidal graph.
41	198	RF8	L2M	Determine the equation of the midline of the graph of a sinusoidal function with equation $f(x) = a \cos b(x - c^\circ) + d$, where a, b, c , & d are constants.
42	192	RF8	L2A	Convert an angle measure from degrees to radians.
43	198	RF8	L2A	Given a sinusoidal function in the form $f(x) = a \sin b(x - c) + d$, where a, b, c , and d are constants, determine the maximum value of the function.
44	198	RF8	L2A	Given the equation $y = a \sin b(x - c) + d$, determine the value of b that will result in a graph with a given period.
45	198	RF8	L2A	Determine the range of a sinusoidal function that has the form $y = a \cos(x - c) + d$.
46	212	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 interest for a given payment.
47	212, 214	F1, RF6	L2M	Given the payment frequency and the number of payments required to repay a loan, determine the term of the loan.
48	212	F1	L2M	Given the principal borrowed (P), the annual interest rate (r) as a percent, the term of the loan, and the corresponding equation in the form $A = P \left(1 + \frac{r}{k}\right)^n$, where P, r, k , and n are constants, identify the interest compounding period.
49	212	F1	L2A	Given the future value of an investment, the annual interest rate as a percent, the compounding period, and the investment time, determine the present value of the investment.
50	214	F1	L2A	Given the loan principal, the annual interest rate as a percent, the compounding period, and the loan term in years, determine the total amount to be repaid at the end of the term if the loan is to be repaid in one lump sum.

PART II: Constructed Response—Total Value: 50%

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
51	30	LR2	L3	3	Given $n(U), n(A), n(B), n(C), n(A \cap C \setminus B), n(A \cap B \setminus C), n(A \cap B \cap C)$, and $n(A \cup B \cup C)'$, use the provided Venn diagram to algebraically find the percentage of the elements in $(A \cap B) \cup (A \cap C) \cup (B \cap C)$.
52a	66, 68	P5	L2A	3	Given an equation in the form $\frac{n}{n+c} P_r = k$, where c, r , and k are constants, algebraically solve the equation for n .
52b	64	P5	L3	3	Given k different cars and c different trucks, determine the number of ways that the vehicles can be parked so that all c trucks are not parked next to each other.
53a	82	P1	L2A	2	Given the odds in favour of a human trait and the odds against another human trait, determine the probability of having a child with both traits.
53b	84	P5	L2A	2	Given a word consisting of n letters, not all of which are distinct, determine the probability that an arrangement of the n letters starts with a given letter and ends with a different letter.
53c	84	P6	L2A	2	Given the number of teachers and the number of students on a school council, determine the probability that sub-committee of size n has x teachers and $n - x$ students.
54a	108	RF2	L2A	4	Given the quotient of two algebraic rational expressions, both with binomials in the numerator and in the denominator, simplify the expression and state the non-permissible values.
54b	112, 114	RF3	L3	2	Solve a rational equation in a single variable, based on a real-life situation, in which one side of the equation consists of the sum of 2 rational expressions with different monomial denominators and the other side of the equation is a constant.
55a	129	RF7	L2A	2	On the axes provided, sketch a possible polynomial graph given the number of turning points of the graph as well as the range and the constant term of the polynomial function; also state the number of x -intercepts of the graph.
55b	128	RF7	L3	2	Given a polynomial function and a description of four characteristics of the function/graph, two of which are incorrect, identify the two errors and explain the corrections.

Item	Curriculum Guide Page	Outcome	Cognitive Level	Value	Outcome Description
55c	128	RF7	L2A	2	Given a cubic polynomial function, determine the end behaviour, the maximum number of turning points, the y -intercept, and the maximum number of x -intercepts of the graph.
56a	144	RF5	L2A	3	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 monomial exponent and the right side of the equation consists of an integral base raised to a linear binomial exponent.
56b	152	RF5	L3	3	Given the exponential function $A(t) = A_0 \left(\frac{1}{2}\right)^{\frac{t}{h}}$, which models a real-life phenomenon, and the numerical values of A_0 , A and t , algebraically determine the value of h .
57a	180	RF5	L2A	4	Solve an exponential equation in which the bases cannot be made equal. Both sides of the equation consist of a base that is a natural number and an exponent that is the form $x + b$, where b is a constant.
57b	178	RF5	L3	3	Given the formula $\beta = 10(\log I + 12)$, the sound intensity of one sound in W/m^2 , and the sound level of a second sound in decibels, determine the factor by which the first sound is more intense than the second sound.
58(i)	196	RF8	L2A	4	Given the graph of a sinusoidal function, determine the amplitude, the period, the equation of the midline and the range.
58(ii)	205	RF8	L3	2	Use the information in 58(i) to determine the equation of the function in the form $y = a \sin b(x - c) + d$.
59	214	F1	L2A	4	Given two loan repayment options, with different annual interest rates and compounding frequencies, but equal repayment terms, determine the total interest paid if each loan is repaid with a lump sum payment at the end of the term.