

**Principles of Mathematics Grade 10: Patterns and Relations
An Item-Level Analysis (Provincial Level)**

British Columbia

All schools

June/2007

Provincial Principles of Mathematics 10 Item-Level Response Reports include data for all BC students who wrote the exam in June 2007 (about 26,530 students). Both public and independent schools are included. The Principles of Mathematics 10 June 2007 provincial Item-Level Response Report displays the proportion of students who made errors on each exam item of this specific curriculum organizer: Patterns and Relations.

Click [here](#) to view the Prescribed Learning Outcomes

Form	Item #	Question type	Prescribed Learning Outcomes	Number of Students who Responded to the Item	Percentage of Students who Answered Incorrectly	Specific Curricular Aspect that Needs Attention [$>20\%$ selected incorrect response]
A	16	MC	C1	4844	22	*
A	17	MC	C2	4843	13	N/A
A	18	MC	C2	4808	26	*
A	19	MC	C2	4814	33	<ul style="list-style-type: none"> Students likely calculated the 15th term of an arithmetic sequence instead of the sum of 15 terms.
A	21	MC	C13	4844	41	*
A	22	MC	C15	4843	51	<ul style="list-style-type: none"> When associating a linear function described by an equation to a graph, students switched the x-axis with y-axis.
A	23	MC	C16	4835	53	<ul style="list-style-type: none"> Students did not understand function notation and incorrectly identified the values of y on a graph. Students did not understand function notation

						and switched the values of x and y
A	24	MC	C16	4799	50	<ul style="list-style-type: none"> Students incorrectly obtained the expression of a composite function.
A	25	MC	C17	4841	55	<ul style="list-style-type: none"> Students likely confused range and domain in identifying functions with same domain. Students likely thought that only graphs with similar forms have same domain.
A	26	MC	C17	4836	54	<ul style="list-style-type: none"> Students did not understand a situation where a function was described by a set of discrete values.
A	27	MC	C18	4842	37	*
A	28	MC	C18	4829	54	<ul style="list-style-type: none"> Students incorrectly matched the y-intercept of 2 linear equations written in standard form.
A	29	MC	C18	4825	57	<ul style="list-style-type: none"> Students did not recognize a linear graph with negative slope.
A	31	MC	C5	4842	35	*
A	32	MC	C5	4826	36	*
A	34	MC	C6	4836	43	*
A	35	MC	C7	4822	42	<ul style="list-style-type: none"> Students made numerical mistakes in obtaining the remainder when dividing a polynomial by a binomial.
A	36	MC	C7	4806	62	<ul style="list-style-type: none"> Students made numerical mistakes in obtaining the quotient when dividing two polynomials.

A	37	MC	C9	4838	35	*
A	38	MC	C9	4841	34	*
A	39	MC	C8	4841	36	<ul style="list-style-type: none"> Students incorrectly factored 2 trinomials and simplified factors in a rational expression.
A	40	MC	C8	4831	42	*
A	42	MC	C10	4842	35	*
A	43	MC	C10	4804	64	<ul style="list-style-type: none"> Students correctly found a common denominator and multiplied each rational expression with the appropriate factor but obtained wrong signs. Students correctly found a common denominator but added numerators without multiplying a constant term with the appropriate factor.
A	44	MC	C10	4823	37	*
A	45	MC	C10	4831	50	<ul style="list-style-type: none"> When multiplying 2 rational expressions, students replaced a binomial with the difference of squares.
B	16	MC	C4	4274	42	<ul style="list-style-type: none"> Students likely confused the properties of geometric and arithmetic sequences and added the common ratio to the first term.
B	17	MC	C1	4257	22	*
B	18	MC	C1	4254	27	*
B	19	MC	C2	4255	23	*
B	21	MC	C13	4277	35	<ul style="list-style-type: none"> Students incorrectly associated a continuous graph with a total cost involving a fixed rate and a rate per person.
B	22	MC	C19	4253	47	<ul style="list-style-type: none"> Students did not recognize that a difference in

						rental prices is not the fixed daily rate.
B	23	MC	C15	4275	45	*
B	24	MC	C16	4274	35	<ul style="list-style-type: none"> Students incorrectly thought that the perfect square of a negative monomial was negative.
B	25	MC	C16	4259	51	<ul style="list-style-type: none"> Students correctly used function notation but only squared the terms and did not properly expand.
B	26	MC	C16	4263	43	<ul style="list-style-type: none"> Students incorrectly identified on a graph the value of a function.
B	27	MC	C17	4270	56	<ul style="list-style-type: none"> When comparing two graphs, students did not recognize that the domains were the same.
B	28	MC	C18	4273	24	*
B	29	MC	C18	4271	42	*
B	31	MC	C6	4274	17	N/A
B	32	MC	C6	4269	55	<ul style="list-style-type: none"> Students only distributed the negative to the first term of a binomial.
B	34	MC	C5	4268	54	<ul style="list-style-type: none"> Students only factored the difference of squares once ignoring the exponents.
B	35	MC	C5	4262	35	*
B	36	MC	C7	4259	37	*
B	37	MC	C7	4228	49	*
B	38	MC	C8	4262	27	*
B	39	MC	C8	4267	42	*
B	40	MC	C8	4257	28	*

B	42	MC	C10	4264	48	<ul style="list-style-type: none"> When adding two rational expressions, students added the numerators and added the denominators.
B	43	MC	C10	4243	51	<ul style="list-style-type: none"> Students likely simplified a wrong factor when factoring and dividing two rational expressions.
B	44	MC	C11	4268	50	<ul style="list-style-type: none"> Students did not recognize that the multiplication by a constant was correctly performed in a rational equation.
B	45	MC	C11	4204	62	<ul style="list-style-type: none"> In a word problem involving distance and time, students correctly found the rational equation but made mistakes in solving it. In a word problem involving distance and time, students incorrectly found the rational equation describing the situation.
C	16	MC	C2	4367	22	*
C	17	MC	C1	4364	24	*
C	18	MC	C2	4354	21	*
C	19	MC	C2	4312	47	<ul style="list-style-type: none"> Students obtained the common difference rather than second term in an arithmetic sequence.
C	21	MC	C19	4364	60	<ul style="list-style-type: none"> Students did not understand that a direct variation does not include a constant term.
C	22	MC	C17	4367	35	*
C	23	MC	C15	4361	43	*
C	24	MC	C13	4370	35	<ul style="list-style-type: none"> When associating a real situation to a linear increasing graph, students did not recognize that

						it described a non-linear variation.
C	25	MC	C16	4342	44	*
C	26	MC	C16	4366	48	<ul style="list-style-type: none"> Students did not know how to interpret a graph and incorrectly switched the x and y-axis.
C	27	MC	C16	4360	43	*
C	28	MC	C18	4363	46	<ul style="list-style-type: none"> When changing the equation of a line from standard to the slope y-intercept form, students obtained the wrong sign for both the slope and y-intercept.
C	29	MC	C18	4328	54	<ul style="list-style-type: none"> In a word problem involving coordinates of points on a certain line, students made mistakes in obtaining and solving 2 linear equations.
C	31	MC	C6	4367	17	N/A
C	32	MC	C6	4367	11	N/A
C	34	MC	C5	4364	27	*
C	35	MC	C5	4332	82	<ul style="list-style-type: none"> Students incorrectly factored a fourth-degree trinomial that involved a difference of squares.
C	36	MC	C9	4357	39	<ul style="list-style-type: none"> Students incorrectly identified more non-permissible values of a rational expression and did not notice that 2 binomials in the denominator were identical.
C	37	MC	C9	4355	48	<ul style="list-style-type: none"> Students incorrectly identified non-permissible values of a rational expression after simplifying by a binomial.
C	38	MC	C8	4359	37	*

C	39	MC	C8	4356	37	*
C	40	MC	C7	4350	46	<ul style="list-style-type: none"> When dividing a polynomial by a binomial, students made a sign error.
C	42	MC	C10	4366	46	<ul style="list-style-type: none"> Students correctly found a common denominator but subtracted numerators without multiplying each rational expression with the appropriate factor.
C	43	MC	C10	4365	37	<ul style="list-style-type: none"> When dividing 2 rational expressions, students made a sign error in factoring a trinomial and simplified the wrong factors.
C	44	MC	C10	4341	56	<ul style="list-style-type: none"> When adding three rational expressions, students correctly found a common denominator but added numerators without multiplying each rational expression with the appropriate binomial. When adding three rational expressions, students made sign errors when obtaining the numerator.
C	45	MC	C11	4331	67	<ul style="list-style-type: none"> When solving an equation involving rational expressions, students correctly eliminated the denominators but made a sign error in solving the final linear equation. When solving an equation involving rational expressions, students correctly eliminated the denominators but made sign errors and did not obtain the correct linear equation.
D	16	MC	C1	4827	12	N/A
D	17	MC	C2	4825	21	*
D	18	MC	C2	4802	41	<ul style="list-style-type: none"> In a word problem involving an arithmetic series,

						students obtained a term of the series rather than the sum.
D	19	MC	C2	4769	40	*
D	21	MC	C13	4834	31	*
D	22	MC	C17	4832	37	*
D	23	MC	C17	4832	62	<ul style="list-style-type: none"> Students did not recognize that both graphs have the same domain. Students did not recognize that both graphs have the same range.
D	24	MC	C15	4827	73	<ul style="list-style-type: none"> Students did not recognize that a quadratic relation can be a function. Students did not recognize that a set of points with different x coordinates represent a function and/or that a graph describing a vertical line does not represent a function.
D	25	MC	C18	4821	39	*
D	26	MC	C18	4820	66	<ul style="list-style-type: none"> Students incorrectly identified the same y-intercept rather than x-intercept when comparing the equations of two lines.
D	27	MC	C18	4820	51	*
D	28	MC	C19	4825	35	*
D	29	MC	C16	4809	45	<ul style="list-style-type: none"> Students correctly used the function notation and expanded a binomial squared, but incorrectly multiplied it by a coefficient.
D	31	MC	C8	4829	8	N/A

D	32	MC	C8	4800	18	N/A
D	34	MC	C6	4827	10	N/A
D	35	MC	C6	4824	9	N/A
D	36	MC	C5	4819	31	*
D	37	MC	C5	4827	11	N/A
D	38	MC	C5	4815	54	<ul style="list-style-type: none"> Students were likely able to expand an algebraic expression involving a binomial squared but made a sign error when factoring the trinomial, or they made a sign error when factoring the original trinomial.
D	39	MC	C9	4820	29	*
D	40	MC	C9	4818	50	<ul style="list-style-type: none"> Students made a numerical mistake in solving a linear equation to determine one of two non-permissible values of a rational expression.
D	42	MC	C10	4821	25	*
D	43	MC	C10	4800	34	*
D	44	MC	C10	4803	33	*
D	45	MC	C11	4799	58	<ul style="list-style-type: none"> Students made an error in simplifying an equation involving rational expressions or did not understand the concept of restricted values of the solution in a rational equation.
E	16	MC	C13	3999	10	N/A
E	17	MC	C15	3997	42	<ul style="list-style-type: none"> In a word problem involving the cost of bulk candy, students did not recognize that a function describing the cost was not expressed in appropriate units.
E	18	MC	C16	3972	46	<ul style="list-style-type: none"> Students correctly used the function notation to compute the difference of two functions but made

						a sign error in obtaining the result.
E	19	MC	C16	3970	61	<ul style="list-style-type: none"> Students incorrectly evaluated a function written in function notation.
E	21	MC	C17	3999	47	<ul style="list-style-type: none"> When asked to identify the domain of a function described by a graph, students indicated the range of the function.
E	22	MC	C18	3984	50	<ul style="list-style-type: none"> Students made a sign error in identifying the equation of the line that has the same x-intercept as the given equation.
E	23	MC	C18	3992	51	<ul style="list-style-type: none"> Students correctly identified that an equation in standard form had a positive slope but incorrectly stated that it had a negative y-intercept.
E	24	MC	C18	3967	44	<ul style="list-style-type: none"> Students did not recognize that a difference in rental prices is not the fixed daily rate.
E	25	MC	C4	3964	30	*
E	26	MC	C1	3995	5	N/A
E	27	MC	C1	3996	10	N/A
E	28	MC	C1	3971	39	*
E	29	MC	C2	3952	69	<ul style="list-style-type: none"> Students misinterpreted the information regarding the partial sum of an arithmetic series and thought it was the value of the last term.
E	31	MC	C6	3996	24	*
E	32	MC	C6	3987	59	<ul style="list-style-type: none"> Students correctly expanded a binomial squared but did not distribute a negative sign to the

						second and third terms of the trinomial.
E	34	MC	C6	3974	47	<ul style="list-style-type: none"> Students incorrectly simplified an algebraic expression involving the difference of two binomial squares.
E	35	MC	C5	3995	56	<ul style="list-style-type: none"> Students incorrectly factored a difference of squares with a common factor.
E	36	MC	C5	3990	24	*
E	37	MC	C5	3989	64	<ul style="list-style-type: none"> Students incorrectly factored a polynomial that contained a difference of squares.
E	38	MC	C7	3977	46	<ul style="list-style-type: none"> When dividing a trinomial with one unknown coefficient by a binomial, students performed an addition instead of a subtraction.
E	39	MC	C8	3995	26	*
E	40	MC	C8	3991	32	*
E	42	MC	C10	3995	33	*
E	43	MC	C10	3992	44	*
E	44	MC	C10	3978	38	*
E	45	MC	C11	3972	42	*
F	16	MC	C4	4198	37	<ul style="list-style-type: none"> Students likely confused the properties of geometric and arithmetic sequences and added the common ratio to the first term.
F	17	MC	C1	4191	20	*
F	18	MC	C1	4189	24	*
F	19	MC	C2	4165	21	*

F	21	MC	C13	4199	37	<ul style="list-style-type: none"> Students incorrectly associated a continuous graph with a total cost involving a fixed rate and a rate per person.
F	22	MC	C19	4164	44	<ul style="list-style-type: none"> Students did not recognize that a difference in rental prices is not the fixed daily rate.
F	23	MC	C15	4188	43	*
F	24	MC	C16	4195	31	<ul style="list-style-type: none"> Students incorrectly thought that the perfect square of a negative monomial was negative.
F	25	MC	C16	4185	47	<ul style="list-style-type: none"> Students correctly used function notation but only squared the terms and did not properly expand.
F	26	MC	C16	4190	41	<ul style="list-style-type: none"> Students incorrectly identified on a graph the value of a function.
F	27	MC	C17	4192	55	<ul style="list-style-type: none"> When comparing two graphs, students did not recognize that the domains were the same.
F	28	MC	C18	4197	22	*
F	29	MC	C18	4194	39	*
F	31	MC	C6	4197	15	N/A
F	32	MC	C6	4191	10	N/A
F	34	MC	C5	4194	24	*
F	35	MC	C5	4165	80	<ul style="list-style-type: none"> Students incorrectly factored a fourth-degree trinomial that involved a difference of squares.
F	36	MC	C9	4193	38	<ul style="list-style-type: none"> Students incorrectly identified more non-permissible values of a rational expression and did not notice that 2 binomials in the denominator

						were identical.
F	37	MC	C9	4192	46	<ul style="list-style-type: none"> Students incorrectly identified non-permissible values of a rational expression after simplifying by a binomial.
F	38	MC	C8	4197	34	*
F	39	MC	C8	4187	35	*
F	40	MC	C7	4184	41	<ul style="list-style-type: none"> When dividing a polynomial by a binomial, students made a sign error.
F	42	MC	C10	4196	42	<ul style="list-style-type: none"> Students correctly found a common denominator but subtracted numerators without multiplying each rational expression with the appropriate factor.
F	43	MC	C10	4188	33	*
F	44	MC	C10	4173	53	<ul style="list-style-type: none"> When adding three rational expressions, students made sign errors when obtaining the numerator.
F	45	MC	C11	4135	61	<ul style="list-style-type: none"> When solving an equation involving rational expressions, students correctly eliminated the denominators but made a sign error in solving the final linear equation. When solving an equation involving rational expressions, students correctly eliminated the denominators but made sign errors and did not obtain the correct linear equation.

Notes:

- (1) A description of the misconception is given when more than 20% of students answered the item incorrectly (i.e. selected a distractor).
- (2) '**N/A**' indicates that fewer than 20% of students answered the item incorrectly. Therefore, no description is provided.

(3) '*' indicates that more than 20% of students answered the item incorrectly, but no single distractor was selected by more than 20% of the students. Therefore, no description is provided.