

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

British Columbia

All schools

June/2006

Provincial Principles of Mathematics 10 Item-Level Response Reports include data for all BC students who wrote the exam in June 2006 (about 26,450 students). Both public and independent schools are included. The Principles of Mathematics 10 June 2006 provincial Item-Level Response Report displays the proportion of students who made errors on each exam item (MC, MT or TF) of this specific curriculum organizer –Patterns and Relations. A description of the misconception is given when more than 20% of students selected the incorrect response.

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	TF	C4	4587	6	N/A
A	17	MC	C1	4584	14	N/A
A	18	MC	C1	4540	31	*
A	19	MC	C2	4550	84	<ul style="list-style-type: none"> Students correctly found the number of items in the nth row but did not find the sum of the items. Students could not correctly find an expression for the number of items in the nth row.
A	21	MC	C13	4585	35	<ul style="list-style-type: none"> When interpreting a graph, students incorrectly believed that children born with zero height.
A	22	MC	C19	4584	74	<ul style="list-style-type: none"> Students correctly correlated the data to a graph. Students did not understand the concept of a direct variation.

A	23	MC	C17	4587	72	<ul style="list-style-type: none"> • Student incorrectly found the range of the graphs. • Students correctly found the domain of the data but incorrectly noticed that the second graph has an arrowhead pointing down which would make its range all real values.
A	24	MC	C15	4545	66	<ul style="list-style-type: none"> • Students could not relate the slope of a graph to its equation. • Students did not understand the difference between a linear relationship and a quadratic relationship.
A	25	MC	C16	4572	27	*
A	26	MC	C16	4542	59	<ul style="list-style-type: none"> • Students did not understand function notation and incorrectly added the two x values together.
A	27	MT	C18	4561	54	*
A	28	MT	C18	4543	50	*
A	29	MT	C18	4554	56	<ul style="list-style-type: none"> • Students properly graphed the line $x = 4$ but gave the range instead of the domain.
A	31	MC	C6	4584	24	*
A	32	MC	C5	4568	29	*
A	34	MT	C8	4571	36	*
A	35	MT	C8	4560	27	*
A	36	MT	C8	4550	52	<ul style="list-style-type: none"> • Student incorrectly chose the sign of the factors.
A	37	TF	C6	4586	21	<ul style="list-style-type: none"> • Students incorrectly multiplied a binomial by a

						trinomial.
A	38	MC	C6	4570	38	*
A	39	MC	C10	4556	41	*
A	40	MC	C10	4531	73	<ul style="list-style-type: none"> Students incorrectly added the numerators without finding a common denominator. Students used a common denominator on the first two rational expressions, but not on the constant term.
A	42	MC	C9	4575	60	<ul style="list-style-type: none"> Students did not correctly factor the trinomial or found that all three non permissible values are equal but counted them more than once.
A	43	MC	C9	4560	54	<ul style="list-style-type: none"> Students properly extracted a common factor of x and concluded that one non-permissible value is 0. Students incorrectly found the exponent on x in the second factor as x^{-4} instead of $x^2 - 4$.
A	44	MC	C7	4570	43	<ul style="list-style-type: none"> Students incorrectly combined the quotient with the remainder.
A	45	MC	C7	4533	67	<ul style="list-style-type: none"> Students added when doing polynomial division instead of subtracting. Students made a subtraction mistake when doing polynomial division.
B	16	TF	C1	3821	25	<ul style="list-style-type: none"> Students were not able to find the common ration of $2x + 6$.

B	17	MC	C2	3807	65	<ul style="list-style-type: none"> Students gave the value of the last term of an arithmetic series, rather than the t_n term.
B	18	MC	C4	3818	47	<ul style="list-style-type: none"> When asked to find the common ratio of a geometric series, students divided each term by the common ratio instead of multiplying.
B	19	MC	C2	3765	40	*
B	21	MC	C13	3822	23	*
B	22	MC	C15	3817	21	*
B	23	MC	C16	3794	52	*
B	24	MC	C17	3819	35	<ul style="list-style-type: none"> Students did not understand the difference between discrete and continuous domains.
B	25	MC	C19	3724	54	<ul style="list-style-type: none"> Students were not able to use data points to obtain the equation of a line.
B	26	MC	C16	3804	33	<ul style="list-style-type: none"> Students did not know how to find the value of a function for a given x value.
B	27	MT	C18	3801	48	*
B	28	MT	C18	3781	58	*
B	29	MT	C18	3789	36	<ul style="list-style-type: none"> Students were not able to find the range of a vertical line given its x-intercept and incorrectly gave the domain of the data.
B	31	MC	C6	3819	38	<ul style="list-style-type: none"> Students did not distribute the negative sign when expanding and simplifying an algebraic expression.
B	32	MC	C6	3774	52	*

B	34	MT	C5	3806	21	*
B	35	MT	C5	3789	46	<ul style="list-style-type: none"> Students were not able to factor a trinomial that contained a common factor.
B	36	MT	C5	3778	64	<ul style="list-style-type: none"> Students were not able to factor a difference of perfect squares.
B	37	TF	C7	3815	50	<ul style="list-style-type: none"> Students were not able to identify the remainder from the division statement.
B	38	MC	C8	3817	48	<ul style="list-style-type: none"> Students were not able to properly expand and simplify an expression involving the squares of binomials.
B	39	MC	C8	3803	45	<ul style="list-style-type: none"> Students incorrectly factor a trinomial with and without a leading coefficient.
B	40	MC	C10	3808	25	*
B	42	MC	C10	3794	51	<ul style="list-style-type: none"> Students incorrectly factored trinomials.
B	43	MC	C10	3803	65	<ul style="list-style-type: none"> When simplifying a rational expression, students combined numerators without a common denominator. When simplifying a rational expression, students found a common denominator but did not distribute the negative sign.
B	44	MC	C11	3792	51	<ul style="list-style-type: none"> Students were not able to multiply to eliminate fractions when solving an equation.
B	45	MC	C11	3777	44	*

C	16	TF	C1	4556	31	<ul style="list-style-type: none"> In a given sequence, students did not recognize that there was a common ratio instead of a common difference.
C	17	MC	C2	4550	20	*
C	18	MC	C2	4496	41	*
C	19	MC	C2	4499	42	<ul style="list-style-type: none"> Students correctly calculated the common difference of an arithmetic sequence but made an error in obtaining the first term.
C	21	MC	C13	4553	38	<ul style="list-style-type: none"> Students chose an incorrect graph because they believed that the number of hours of daylight increases at first, reaches a maximum and then decreases.
C	22	MC	C16	4516	53	<ul style="list-style-type: none"> Students correctly squared the binomial when evaluating a function but only distributed the coefficient to the first term. Students were not able to correctly evaluate a function which involved squaring a binomial.
C	23	MC	C16	4523	70	<ul style="list-style-type: none"> Students substituted the given value of the function in for x instead of y and then multiplied instead of adding. Students substituted the given value of the function in for x instead of y.
C	24	MC	C15	4552	33	*
C	25	MC	C17	4548	47	*
C	26	MC	C18	4537	32	*
C	27	MT	C18	4523	55	*

C	28	MT	C18	4514	48	*
C	29	MT	C18	4516	81	<ul style="list-style-type: none"> • Student found the y-intercept instead of the slope. • Students found the slope of a vertical line instead of a horizontal line.
C	31	MC	C8	4550	11	N/A
C	32	MC	C8	4506	19	N/A
C	34	MT	C6	4550	14	N/A
C	35	MT	C6	4535	12	N/A
C	36	MT	C6	4526	34	*
C	37	TF	C5	4553	30	<ul style="list-style-type: none"> • Students incorrectly factored a difference of perfect squares by dividing the second term by two instead of square rooting it.
C	38	MC	C5	4534	74	<ul style="list-style-type: none"> • Students were unable to identify a binomial factor because they made an error in expanding, simplifying and factoring a polynomial expression.
C	39	MC	C9	4544	35	<ul style="list-style-type: none"> • Students incorrectly believed that a non-permissible value was one that caused the numerator to simplify to zero.
C	40	MC	C9	4499	58	<ul style="list-style-type: none"> • Students were unable to find non-permissible values for a polynomial expression.
C	42	MC	C10	4548	32	*
C	43	MC	C10	4536	42	*
C	44	MC	C10	4508	41	*
C	45	MC	C11	4504	68	<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.
D	16	TF	C1	4727	19	N/A
D	17	MC	C2	4714	24	*
D	18	MC	C2	4607	40	*
D	19	MC	C4	4702	30	*
D	21	MC	C13	4727	19	N/A
D	22	MC	C15	4724	65	<ul style="list-style-type: none"> Students correctly deduced a graph as not being a function but could not determine whether a set of points describes a function. Students correctly deduced a graph as not being a function but could not graph a quadratic relationship to determine if it is a function.
D	23	MC	C18	4690	45	<ul style="list-style-type: none"> Students found the y intercept instead of the x intercept.
D	24	MC	C18	4724	32	*
D	25	MC	C18	4712	66	<ul style="list-style-type: none"> Students gave the y intercept instead of the slope of a horizontal line. Students mixed up the slope of a horizontal line with a vertical line.
D	26	MC	C17	4721	23	*
D	27	MT	C16	4714	24	*
D	28	MT	C16	4706	28	*
D	29	MT	C16	4698	47	<ul style="list-style-type: none"> Students were unable to properly square a

						binomial, expand and then simplify.
D	31	MC	C5	4711	40	*
D	32	MC	C5	4676	25	*
D	34	MT	C6	4727	5	N/A
D	35	MT	C6	4697	17	N/A
D	36	MT	C6	4714	25	*
D	37	TF	C9	4728	27	<ul style="list-style-type: none"> Students made an error when evaluating an expression for a given value or did not understand the condition which for which an expression is undefined.
D	38	MC	C7	4714	15	N/A
D	39	MC	C7	4652	48	<ul style="list-style-type: none"> Students made errors in simplifying an equation which involved subtracting rational expressions.
D	40	MC	C10	4706	23	*
D	42	MC	C10	4706	45	*
D	43	MC	C10	4682	62	<ul style="list-style-type: none"> Students made an error while factoring a trinomial and did not understand how to find a common denominator in a rational expression. Students subtracted the rational expression instead of adding.
D	44	MC	C11	4686	35	*
D	45	MC	C11	4705	24	*
E	16	TF	C4	4211	12	N/A
E	17	MC	C2	4203	32	*
E	18	MC	C1	4158	44	*

E	19	MC	C2	4192	62	<ul style="list-style-type: none"> Students were unable to determine that not enough information was given to find the sums of two arithmetic series.
E	21	MC	C19	4205	73	<ul style="list-style-type: none"> Students did not understand the concept of partial and direct relationships.
E	22	MC	C17	4206	45	*
E	23	MC	C15	4195	63	<ul style="list-style-type: none"> Students did not recognize the equation of a parabola and realize that it was not a function. Students were not able to determine that a vertical line does not represent a function.
E	24	MC	C16	4205	51	<ul style="list-style-type: none"> Students did not understand function notation. When interpreting the function notation, students mixed up the x and y axes.
E	25	MC	C16	4205	21	*
E	26	MC	C16	4165	50	<ul style="list-style-type: none"> Students did not understand function notation and multiplied instead of substituting for the variable.
E	27	MT	C18	4187	55	<ul style="list-style-type: none"> Students found the correct y intercept, but interchanged the rise and the run of the slope.
E	28	MT	C18	4190	51	<ul style="list-style-type: none"> Students mixed up the equation of a vertical line with a horizontal line.
E	29	MT	C18	4188	55	*
E	31	MC	C6	4210	6	N/A

E	32	MC	C6	4200	12	N/A
E	34	MT	C5	4203	16	N/A
E	35	MT	C5	4168	63	<ul style="list-style-type: none"> Students made a sign error while factoring a trinomial with two variables and leading coefficient.
E	36	MT	C5	4144	60	<ul style="list-style-type: none"> Students made a sign error while factoring a difference of squares with multiple steps. Students were unable to factor a difference of squares with multiple steps and did not correctly distribute a negative when simplifying.
E	37	TF	C9	4211	18	N/A
E	38	MC	C8	4205	35	*
E	39	MC	C8	4201	48	<ul style="list-style-type: none"> When simplifying a rational expression, students made a sign error when factoring a trinomial with a leading coefficient.
E	40	MC	C10	4163	36	*
E	42	MC	C10	4209	45	<ul style="list-style-type: none"> Students used a common numerator instead of denominator when adding fractions with variables in the numerators.
E	43	MC	C10	4196	42	*
E	44	MC	C10	4170	69	<ul style="list-style-type: none"> When finding the area of the shaded portion of a circle, students found the radius of the whole circle and incorrectly expressed its area by not squaring the radius. When finding the area of the shaded portion of a circle, students were unable to find the area of the un-shaded circle and subtract it from the

						larger circle.
E	45	MC	C11	4194	29	*
F	16	TF	C1	4541	25	<ul style="list-style-type: none"> Students were not able to determine that there is a common difference between the terms of a given sequence.
F	17	MC	C2	4536	62	<ul style="list-style-type: none"> Students gave the value of the last term of an arithmetic series, rather than the t_n term.
F	18	MC	C4	4542	43	*
F	19	MC	C2	4505	40	*
F	21	MC	C13	4542	23	*
F	22	MC	C15	4536	19	N/A
F	23	MC	C16	4518	46	*
F	24	MC	C17	4543	32	<ul style="list-style-type: none"> Students did not understand the difference between discrete and continuous domains.
F	25	MC	C19	4433	49	<ul style="list-style-type: none"> Students were not able to use data points to obtain the equation of a line.
F	26	MC	C16	4534	27	<ul style="list-style-type: none"> Students did not know how to find the value of a function for a given x value.
F	27	MT	C18	4528	44	*
F	28	MT	C18	4520	51	*
F	29	MT	C18	4520	31	<ul style="list-style-type: none"> Students were not able to find the range of a vertical line given its x-intercept and incorrectly gave the domain of the data.
F	31	MC	C8	4542	7	N/A

F	32	MC	C8	4502	16	N/A
F	34	MT	C6	4540	10	N/A
F	35	MT	C6	4532	7	N/A
F	36	MT	C6	4519	26	*
F	37	TF	C5	4544	22	<ul style="list-style-type: none"> Students incorrectly factored a difference of perfect squares by dividing the second term by two instead of square rooting it.
F	38	MC	C5	4509	68	<ul style="list-style-type: none"> Students were unable to identify a binomial factor because they made an error in expanding, simplifying and factoring a polynomial expression.
F	39	MC	C9	4538	28	*
F	40	MC	C9	4492	48	<ul style="list-style-type: none"> Students were unable to find non-permissible values for a polynomial expression.
F	42	MC	C10	4536	23	*
F	43	MC	C10	4521	32	*
F	44	MC	C10	4503	33	*
F	45	MC	C11	4482	62	<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.

Note: '*' indicates that there was no specific curricular aspect that needed attention; 'N/A' indicates that there were fewer than 20% of the students who incorrectly answered the item, hence, no curricular note is reported.