

**Principles of Mathematics Grade 10: Shape and Space
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 – Shape and Space. 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	46	MC	D1	4558	44	<ul style="list-style-type: none"> Students incorrectly used the volume formula to calculate the area of a sphere.
A	47	MC	D1	4572	47	<ul style="list-style-type: none"> Student only calculated the volume of the inside sphere.
A	48	MC	D2	4536	75	<ul style="list-style-type: none"> Students correctly obtained the squared value of the factor defining the increase of a side length of a cube, but did not apply the square root.
A	50	MC	D3	4538	36	*
A	51	MC	D5	4567	52	<ul style="list-style-type: none"> Students incorrectly used Pythagorean theorem even though it is not a right angle triangle.
A	52	MC	D5	4460	66	<ul style="list-style-type: none"> Students incorrectly used the sin ratio in a

						<p>triangle than was not a right angle triangle instead of the cosine law.</p> <ul style="list-style-type: none"> Students incorrectly used the vertically opposite angle as 40 degrees.
A	53	TF	D6	4582	57	<ul style="list-style-type: none"> Students failed to recognize how Pythagoras theorem relates to a right triangle in a coordinate grid.
A	54	MC	D7	4579	23	*
A	56	MC	D9	4570	74	<ul style="list-style-type: none"> Students correctly realized that the slopes of the two lines were the same and thus parallel, and correctly calculated that a point was on the line, but were not able to relate the y-intercept of the line to its equation. Students were able to correctly derive the equation of the line and calculate a point that passes through it, but did not understand that the slopes of both lines were the same and thus parallel. Students were able to correctly derive the equation of the line and realize that the slopes of the two lines were the same and thus parallel, but incorrectly calculated that a point was not on the line when it was.
A	57	MT	D9	4556	65	<ul style="list-style-type: none"> Students could not relate the x intercept of an equation as a point on the line and use it to find the slope of the line.
A	58	MT	D9	4544	65	<ul style="list-style-type: none"> Students could not use the slope of a line and a point on the line to calculate the equation of the

						line in standard form.
A	59	MT	D10	4540	73	<ul style="list-style-type: none"> Students could not understand that the slopes of perpendicular lines are negative reciprocals. Consequently students were unable to get the correct slope.
A	60	MC	D10	4565	79	<ul style="list-style-type: none"> Students correctly chose the y coordinate of the midpoint but wrote the equation of a line parallel to the y-axis instead of the x-axis. Students incorrectly chose the x coordinate of the midpoint instead of the y coordinate. Students incorrectly found the equation of a line that is parallel to the y axis.
B	46	MC	D2	3809	62	<ul style="list-style-type: none"> Students were not able to determine what effect increasing the radius and height of a cylinder had on the volume.
B	47	MC	D1	3789	57	<ul style="list-style-type: none"> Students found the volume of the sphere instead of surface area.
B	48	MC	D3	3786	22	*
B	50	MC	D5	3808	21	*
B	51	MC	D5	3794	65	<ul style="list-style-type: none"> Students incorrectly used the Pythagorean theorem in an attempt to find the length of one side of a non-right angled triangle. Students used the correct procedure to determine the length of one side of a triangle, but rounded one of the angle measures incorrectly.

B	52	MC	D5	3746	47	<ul style="list-style-type: none"> Students did not correctly apply the cosine law in computing an angle when all sides were given, and obtained the supplementary angle instead of the required one.
B	53	TF	D7	3815	19	N/A
B	54	MC	D7	3801	27	*
B	56	MC	D8	3806	38	*
B	57	MT	D9	3794	28	*
B	58	MT	D10	3787	49	*
B	59	MT	D10	3780	73	*
B	60	MC	D9	3795	78	<ul style="list-style-type: none"> Students correctly identified that the y intercepts must be equal but incorrectly found the y intercept of a line in standard form. Students incorrectly believed that the y intercept is equal to the constant term in standard form. Students incorrectly found an expression for the slope and believed that the two lines must have equal slopes.
C	46	MC	D2	4537	63	<ul style="list-style-type: none"> Students either did not correctly use the formula for a volume of a sphere or could not solve an equation involving radicals for the ratio of radii of two spheres. When attempting to find the radius of a sphere, students used the formula for finding surface area instead of the formula for finding the volume of a sphere.
C	47	MC	D1	4528	66	<ul style="list-style-type: none"> Students did not include the base of the

						<p>hemisphere in the calculation of the surface area.</p> <ul style="list-style-type: none"> When calculating the surface area of a hemisphere, students did not divide the surface area of the sphere in half and did not include the base of the hemisphere.
C	48	MC	D4	4525	70	<ul style="list-style-type: none"> Students did not understand how the sine and cosine of an angle are related.
C	50	MC	D5	4540	33	*
C	51	MC	D5	4545	41	*
C	52	MC	D5	4501	47	<ul style="list-style-type: none"> Students incorrectly used the tangent ratio when it was not a right triangle.
C	53	TF	D8	4553	32	<ul style="list-style-type: none"> Students were not able to properly calculate the slope of a line on a graph.
C	54	MC	D7	4525	59	<ul style="list-style-type: none"> Students correctly found a point on a graph but it was not the point requested.
C	56	MC	D10	4526	56	<ul style="list-style-type: none"> Students correctly found the slope of the lines but did not use it to find the missing value.
C	57	MT	D9	4527	48	*
C	58	MT	D10	4513	55	<ul style="list-style-type: none"> Students were unable to find the equation of a line perpendicular to a given line and having the same y-intercept as a second line.
C	59	MT	D9	4501	66	<ul style="list-style-type: none"> Students were unable to find the equation of a line with the same x-intercept as a given line and

						passing through a given point.
C	60	MC	D9	4538	63	<ul style="list-style-type: none"> Students incorrectly approximated the x-intercept of a line from its graph.
D	46	MC	D2	4680	65	<ul style="list-style-type: none"> Students did not realize that there is a squared relation between the areas and perimeters of two similar triangles.
D	47	MC	D1	4692	72	<ul style="list-style-type: none"> Students used the diameter instead of the radius when finding the volume of a sphere.
D	48	MC	D6	4674	48	<ul style="list-style-type: none"> When given the coordinates of the vertices of a triangle, students incorrectly used the hypotenuse and the base to find the area of the triangle.
D	50	MC	D8	4727	15	N/A
D	51	MC	D9	4710	47	<ul style="list-style-type: none"> Given an equation in standard form, students made a sign error while finding both the slope and the y intercept.
D	52	MC	D9	4676	39	*
D	53	TF	D10	4728	19	N/A
D	54	MC	D10	4700	55	<ul style="list-style-type: none"> When asked to find the equation of a line passing through a point with specified coordinates and perpendicular to a given line, students took the reciprocal but not the negative reciprocal for perpendicular slopes and made a sign error.
D	56	MC	D3	4709	27	*
D	57	MT	D5	4705	32	*
D	58	MT	D5	4703	40	*

D	59	MT	D5	4665	64	<ul style="list-style-type: none"> Students did not correctly apply cosine and sine laws in solving a triangle which is not right-angled.
D	60	MC	D4	4713	65	<ul style="list-style-type: none"> Students did not understand how the cosine of an angle relates to the supplementary angle.
E	46	MC	D2	4192	66	<ul style="list-style-type: none"> Students did not realize that there is a squared relation between the areas and perimeters of two similar triangles.
E	47	MC	D1	4175	77	<ul style="list-style-type: none"> Students used the diameter instead of the radius when finding the volume of a sphere.
E	48	MC	D6	4171	56	<ul style="list-style-type: none"> When given the coordinates of the vertices of a triangle, students incorrectly used the hypotenuse and the base to find the area of the triangle.
E	50	MC	D8	4207	21	*
E	51	MC	D9	4198	62	<ul style="list-style-type: none"> Given an equation in standard form, students made a sign error while finding both the slope and the y intercept.
E	52	MC	D9	4161	51	<ul style="list-style-type: none"> When asked to find the equation of a line with attributes similar to those given on a graph provided, students correctly found the y intercept of a line but mixed up the rise and run while calculating slope.
E	53	TF	D10	4208	27	<ul style="list-style-type: none"> Students knew that perpendicular lines have reciprocal slopes but did not know that they have to be the negative reciprocal.

E	54	MC	D10	4167	67	<ul style="list-style-type: none"> When asked to find the equation of a line passing through a point with specified coordinates and perpendicular to a given line, students took the reciprocal but not the negative reciprocal for perpendicular slopes and made a sign error. When asked to find the equation of a line passing through a point with specified coordinates and perpendicular to a given line, students took the reciprocal but not the negative reciprocal for perpendicular slopes.
E	56	MC	D3	4185	37	<ul style="list-style-type: none"> Students were not able to set up the cosine ratio to find an unknown side angle of a triangle.
E	57	MT	D5	4182	51	*
E	58	MT	D5	4180	54	*
E	59	MT	D5	4161	75	*
E	60	MC	D4	4193	73	<ul style="list-style-type: none"> Students did not understand how the cosine of an angle relates to the supplementary angle.
F	46	MC	D2	4533	51	<ul style="list-style-type: none"> Students incorrectly believed that when you double each side of a rectangular prism, you double the volume.
F	47	MC	D1	4537	16	N/A
F	48	MC	D1	4510	60	<ul style="list-style-type: none"> Students incorrectly took the square root of one quarter as two when rearranging the formula for the surface area of a sphere.
F	50	MC	D3	4494	50	<ul style="list-style-type: none"> When determining the increase in height of a hot air balloon, students gave the total height of the balloon by incorrectly using the sin ratio instead

						of tangent.
F	51	MC	D5	4536	33	<ul style="list-style-type: none"> Students incorrectly used the Pythagorean Theorem for a non right-angled triangle.
F	52	MC	D5	4472	43	<ul style="list-style-type: none"> Students incorrectly used the sin ratio for a non-right angled triangle.
F	53	TF	D4	4536	54	<ul style="list-style-type: none"> Students did not understand that the sin ratio has two angles with the same sine ratio.
F	54	MC	D6	4491	69	<ul style="list-style-type: none"> Students found the radius of the circle instead of the x value of the coordinate requested. Students incorrectly used the slope between a point on the circumference of a circle and its center to find another point.
F	56	MC	D8	4529	16	N/A
F	57	MT	D8	4494	45	*
F	58	MT	D9	4509	69	<ul style="list-style-type: none"> Students correctly found the y intercept from a given equation but mixed up the rise and the run while finding the slope of the line from a graph.
F	59	MT	D10	4503	64	*
F	60	MC	D7	4523	39	<ul style="list-style-type: none"> Students found the x coordinate of the wrong point.

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.