Item #	Strand	Specific Outcome	Item Complexity	Item Description
20	PR	4	Moderate	Translate a given problem into a single variable inequality with rational coefficients (Gr.8, PR.2; Gr.7, PR.6; Gr.6, PR.4)

	% of Student Responses (*Correct)			
	A*	B	C	D
Students Achieving the *Standard of Excellence*	77.5	4.2	17.2	1.1
Students Achieving the *Acceptable Standard*	47.1	13.6	31.7	7.4

Commentary:

The most frequent error for both groups of students, represented by option **C**, suggests that these students did not understand how to represent the given context with an algebraic relation when the variable appears on the right side of the inequality. Conversely, the error represented by option **B** suggests that while these students did understand the order relationship of the information of the context, they failed to understand that the term "maximum" (in the stem of the question) implies "greater than or equal to," and not just "greater than."

Use the following information to answer question 20.

Chantal receives a $50 gift card to join the online music store shown below.

20. Which of the following inequalities can be used to determine the maximum number of songs that Chantal can purchase with her gift card?

A. $50 \geq 5 + 0.99x$

B. $50 > 5 + 0.99x$

C. $50 \leq 5 + 0.99x$

D. $50 < 5 + 0.99x$

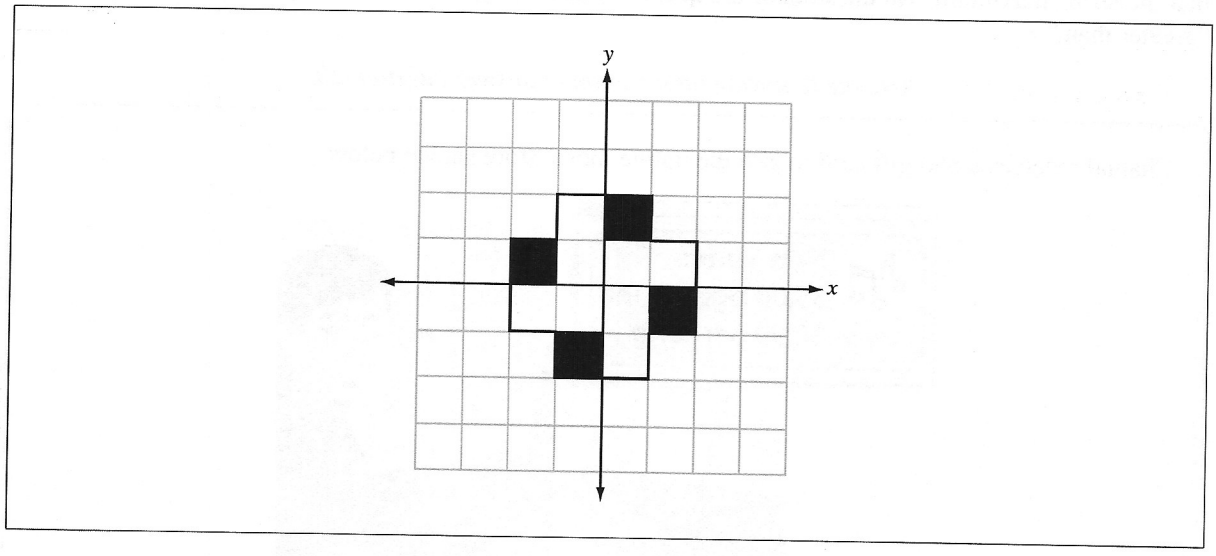
Item #	Strand	Specific Outcome	Item Complexity	Item Description
24	SS	5	Low	Determine the order of rotational symmetry of a given 2-D shape and the number of lines of symmetry it has (Gr.4, SS.6)

	% of Student Responses (*Correct)			
	A	**B**	**C***	**D**
Students Achieving the *Standard of Excellence*	3.0	1.7	81.7	13.5
Students Achieving the *Acceptable Standard*	9.2	11.2	49.8	29.7

Commentary:

The most frequent error for both groups of students, represented by option **D**, suggests that while these students did understand the concept of rotational symmetry, they lacked knowledge in the area of line symmetry.

Use the following information to answer question 24.



24. *The shape shown above has rotational symmetry of order* ___*i*___, *and* ___*ii*___ *lines of symmetry.*

The statement above is completed by the information in row

Row	*i*	*ii*
A.	2	0
B.	2	2
C.	4	0
D.	4	2

Item #	Strand	Specific Outcome	Item Complexity	Item Description
40	SP	3	Moderate	Identify how results from a given survey could be misinterpreted because of the way the results are graphed

	% of Student Responses (*Correct)			
	A	B*	C	D
Students Achieving the *Standard of Excellence*	2.7	78.2	14.2	4.6
Students Achieving the *Acceptable Standard*	9.0	46.9	32.9	10.1

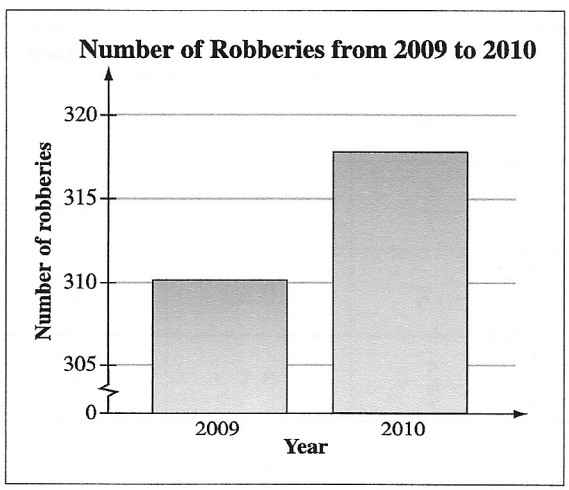
Commentary:

The most frequent errors for both groups of students, represented by option **C** and option **D**, suggest that these students simply did not read the question carefully; otherwise they would have known that the graph represents actual population data that was not generated from experimental or theoretical probability experiments.

Use the following information to answer question 40.

The local newspaper of a large city printed the following graph with the following headline:

"Robberies are Predicted to Double in 2011"



40. The newspaper headline is **not** a reasonable interpretation of the graph shown above because the

A. width of the bars is exaggerated

B. scale of the *y*-axis is misleading

C. probability is based on theoretical data

D. probability is based on experimental data

The following 4 items, from all 4 strands, illustrate significant performance differences between students who achieved the *acceptable standard* and those who were below the *acceptable standard.*

Item #	Strand	Specific Outcome	Item Complexity	Item Description
23	N	3	Moderate	Order a set of rational numbers given in fraction and decimal form (Gr.7, N.4; Gr.7, N.7; Gr.6, N.7)

	% of Student Responses (*Correct)			
	A*	B	C	D
Students Achieving the *Acceptable Standard*	63.5	22.5	10.0	3.9
Students Below the *Acceptable Standard*	28.4	30.3	22.9	18.0

Commentary:

The most frequent error for both groups of students, represented by option **B**, suggests that these students did understand how to order values involving positive fractions and decimals (as evident from the correct ordering of $\frac{2}{5}$ and 0.5); however, the error likely stems from a lack of understanding of how to order negative rational numbers.

23. Which of the following rows has the rational numbers ordered from **least** to **greatest**?

Row	Least			Greatest
A.	$-\frac{5}{7}$	$-0.\overline{6}$	$\frac{2}{5}$	0.5
B.	$-0.\overline{6}$	$-\frac{5}{7}$	$\frac{2}{5}$	0.5
C.	$-\frac{5}{7}$	$-0.\overline{6}$	0.5	$\frac{2}{5}$
D.	$-0.\overline{6}$	$-\frac{5}{7}$	0.5	$\frac{2}{5}$

Item #	Strand	Specific Outcome	Item Complexity	Item Description
11	PR	1	High	Identify the linear equation that could represent a given pattern that is presented in a table (Gr.8, PR.1)

	% of Student Responses (*Correct)			
	A	**B**	**C**	**D***
Students Achieving the *Acceptable Standard*	5.9	1.5	15.3	77.2
Students Below the *Acceptable Standard*	24.6	12.1	31.3	31.4

Commentary:

The most frequent errors for both groups of students, represented by options **A** and **C**, suggest that these students did understand how to solve the given equation to satisfy the relationship of the first row of the given table (i.e., between the weekly earnings of $10 and the corresponding weekly savings of $7); however, they did not verify whether the equation could represent all relationships in the table.

Use the following information to answer question 11.

Raj saves a part of his earnings each week. He uses the pattern below to decide how much of his weekly earnings he will save.

Weekly Earnings (e)	Weekly Savings (s)
$10	$7
$12	$8
$14	$9
$16	$10

11. Which of the following equations could represent the relationship between Raj's weekly savings, s, and his weekly earnings, e?

A. $s = e - 3$

B. $s = e - 6$

C. $s = 2.0(e - 5) - 3$

D. $s = 0.5(e + 10) - 3$

Item #	Strand	Specific Outcome	Item Complexity	Item Description
NR 2	SS	2	Moderate	Determine the difference in surface area of two 3-D objects that are similar (Gr.8, SS.3)

Performance of Students Achieving the *Acceptable Standard*				
Responses	1.25	15	1125*	1237
% of Student Responses (*Correct)	1.9	5.0	38.8	2.5

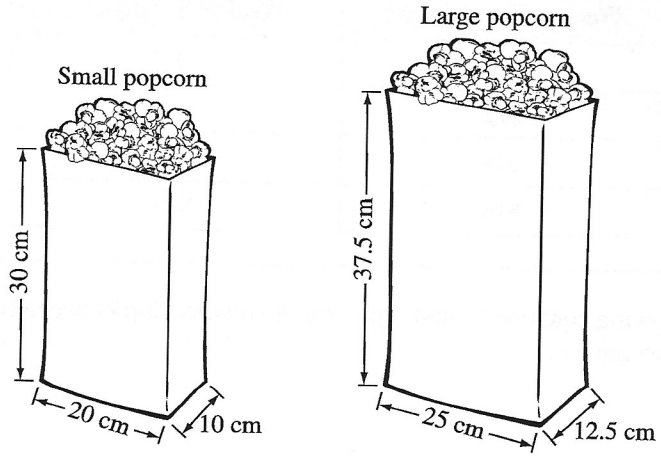
Performance of Students Below the *Acceptable Standard*				
Responses	1.25	7.5	15	1125*
% of Student Responses (*Correct)	6.3	6.0	15.9	4.0

Commentary:

The most frequent error for both groups of students, represented by the response of 15, indicates that these students do not fully understand the concept of surface area and simply found the difference of the sums of the three given edge lengths of each bag.

Use the following information to answer numerical-response question 2.

The local movie theatre sells two sizes of popcorn. The large bag of popcorn is a scale enlargement of the small bag.



Numerical Response

2. The difference between the exterior surface area of the large popcorn bag and the small popcorn bag is _____ cm^2.

(Record your answer in the numerical-response section on the answer sheet.)

Item #	Strand	Specific Outcome	Item Complexity	Item Description
14	SP	2	Moderate	Identify valid reasons for using a sample of a population instead of a population to answer a survey question (Gr.6, SP.2)

	% of Student Responses (*Correct)			
	A	B*	C	D
Students Achieving the *Acceptable Standard*	21.4	48.8	18.6	11.1
Students Below the *Acceptable Standard*	27.6	27.1	22.3	22.6

Commentary:

The most frequent error for both groups of students, represented by option **A**, suggests that these students did not consider or understand the negation in the question, i.e., "Which of the following statements is **not** a valid reason..."Additionally, in the below the *acceptable standard* group, the number of students that selected each option is almost equal, which suggests that these students do not fully understand the reasons for selecting a sample over a population.

14. Which of the following statements is **not** a valid reason for using a representative sample to conduct a survey?

A. It is cheaper to use a sample.

B. There is too much error in a sample.

C. There is too much data in the complete population.

D. It is too time-consuming to use the complete population.

Sample Questions from the 2012 Grade 9 Mathematics Achievement Test

The following 4 items, from all 4 strands, illustrate significant performance differences between students who achieved the *standard of excellence* and those who achieved the *acceptable standard*.

Item #	Strand	Specific Outcome	Item Complexity	Item Description
39	N	3	Low	Solve a given problem involving operations on rational numbers and powers with integral bases and whole number exponents (Gr.8, N.6)

	% of Student Responses (*Correct)			
	A	B	C	D*
Students Achieving the *Standard of Excellence*	1.9	9.8	9.9	78.2
Students Achieving the *Acceptable Standard*	10.0	23.5	23.8	41.6

Commentary:

Although the errors represented by option **B** and **C** were the most frequently chosen responses for both groups of students, the errors themselves suggest different misconceptions. The error represented by option **B** suggests that these students may have correctly applied the zero-exponent rule, but simply neglected to find the correct product. An alternative hypothesis is that students did correctly apply the zero exponent rule but did not understand that $-\frac{3}{2}$ was the product being asked for, e.g. $-\frac{2}{3}x-\frac{3}{2}=1$ which is equivalent to $\left(\frac{3}{2}\right)^0$. However, the error represented by option C suggests that these students did not correctly apply the order of operations with exponents.

39. Monica multiplies $-\frac{2}{3}$ by a number. If her answer is $-\frac{3}{2}$, then Monica multiplied $-\frac{2}{3}$ by

A. $-\left(\frac{3}{2}\right)^0$

B. $\left(\frac{3}{2}\right)^0$

C. $-\left(\frac{3}{2}\right)^2$

D. $\left(\frac{3}{2}\right)^2$