



Our Students. Their Moment.

**Regents Exam in
Algebra I
(Common Core)**

**Sample Items
May 2013**



THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY,
NY 12234

New York State Common Core Sample Questions: Regents Examination in Algebra I (Common Core)

With the adoption of the New York P-12 Common Core Learning Standards (CCLS) in ELA/Literacy and Mathematics, the Board of Regents signaled a shift in both instruction and assessment. Educators around the state have already begun instituting Common Core instruction in their classrooms. To aid in this transition, we are providing sample Regents Examination in Algebra I (Common Core) questions to help students, parents, and educators better understand the instructional shifts demanded by the Common Core and the rigor required to ensure that all students are on track to college and career readiness.

These Questions Are Teaching Tools

The sample questions emphasize the instructional shifts demanded by the Common Core. For Algebra I (Common Core) we have provided five questions. These questions include multiple-choice and constructed response. The sample questions are teaching tools for educators and can be shared freely with students and parents. They are designed to help clarify the way the Common Core should drive instruction and how students will be assessed starting with the June 2014 administration of Regents Exams measuring CCLS. NYSED is eager for feedback on these sample questions. Your input will guide us as we develop future exams.

These Questions Are NOT Test Samplers

While educators from around the state have helped craft these sample questions, they have not undergone the same extensive review, vetting, and field testing that occurs with actual questions used on the State exams. The sample questions were designed to help educators think about content, NOT to show how operational exams look exactly or to provide information about how teachers should administer the test.

How to Use the Sample Questions

- Interpret how the standards are conceptualized in each question.
- Note the multiple ways the standard is assessed throughout the sample questions.
- Look for opportunities for mathematical modeling, i.e., connecting mathematics with the real world by conceptualizing, analyzing, interpreting, and validating conclusions in order to make decisions about situations in everyday life, society, or the workplace.
- Consider the instructional changes that will need to occur in your classroom.

- Notice the application of mathematical ways of thinking to real-world issues and challenges.
- Pay attention to the strong distractors in each multiple-choice question.
- **Don't** consider these questions to be the only way the standard will be assessed.
- **Don't** assume that the sample questions represent a mini-version of future State exams.

Understanding Math Sample Questions

Multiple-Choice Questions

Sample multiple-choice math questions are designed to assess CCLS math standards and incorporate both standards and math practices in real-world applications. Math multiple-choice questions assess procedural and conceptual standards. Unlike questions on past math exams, many require the use of multiple skills and concepts. Answer choices are also different from those on past exams. Within the sample questions, all distractors will be based on plausible missteps.

Constructed Response Questions

Math constructed response questions are similar to past questions, asking students to show their work in completing one or more tasks or more extensive problems. Constructed response questions allow students to show their understanding of math procedures, conceptual understanding, and application.

Format of the Math Sample Questions Document

The Math Sample Questions document is formatted so that headings appear below each item to provide information for teacher use to help interpret the item, understand alignment with the CCLS, and inform instruction. A list of the headings with a brief description of the associated information is shown below.

Key: This is the correct response or, in the case of multiple-choice items, the correct option.

Aligned to CCLS: This is the NYS P-12 Common Core Learning Standard to which the item is aligned.

Mathematical Practices: If applicable, this is a list of mathematical practices associated with the item.

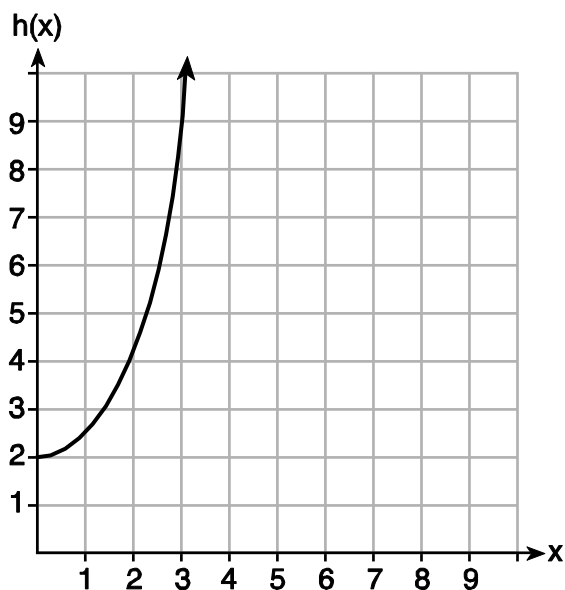
Commentary: This is an explanation of how the item aligns with the listed standard.

Rationale: For multiple-choice items, this section provides the correct option and demonstrates one method for arriving at that response. For constructed response items, one possible approach to solving the item is shown followed by the scoring rubric that is specific to the item. Note that there are often multiple approaches to solving each problem. The rationale section provides only one example. The scoring rubrics should be used to evaluate the efficacy of different methods of arriving at a solution.

1. Given the functions $g(x)$, $f(x)$, and $h(x)$ shown below:

$$g(x) = x^2 - 2x$$

x	$f(x)$
0	1
1	2
2	5
3	7



The correct list of functions ordered from greatest to least by average rate of change over the interval $0 \leq x \leq 3$ is

- (1) $f(x)$, $g(x)$, $h(x)$
- (2) $h(x)$, $g(x)$, $f(x)$
- (3) $g(x)$, $f(x)$, $h(x)$
- (4) $h(x)$, $f(x)$, $g(x)$

Key: 4

Aligned to CCLS: F.IF.6

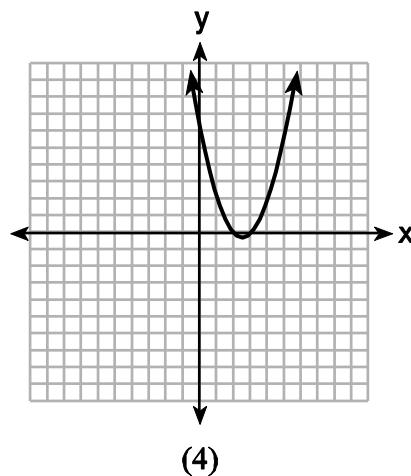
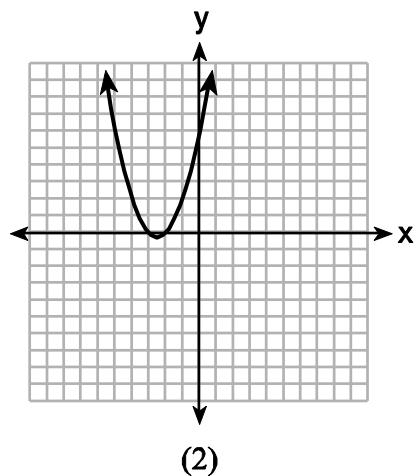
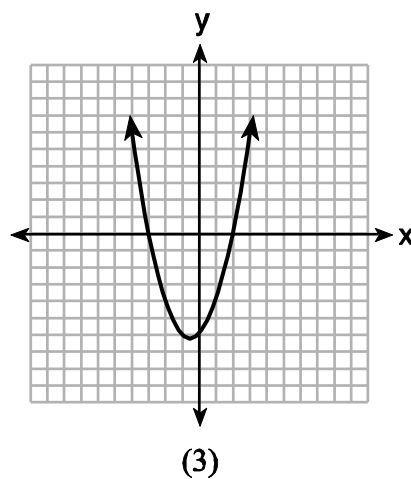
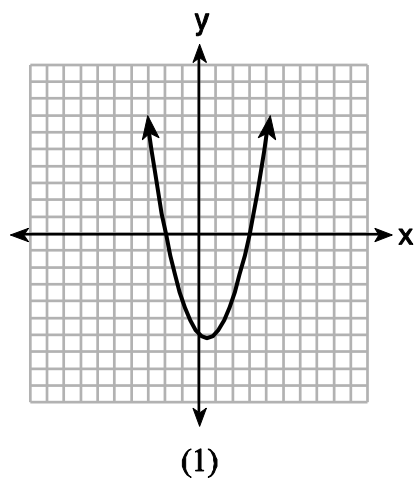
Mathematical Practices: 2

Commentary: This question aligns to F.IF.6 because it assesses a student's ability to calculate the average rate of change of a function presented symbolically, as a table, and graphically.

Rationale:

Option 4 is correct. Over the interval $0 \leq x \leq 3$, the average rate of change for $g(x) = \frac{3}{3} = 1$, $f(x) = \frac{6}{3} = 2$, and $h(x) = \frac{7}{3} = 2\frac{1}{3}$. Ordering these values from greatest to least results in the list of functions: $h(x)$, $f(x)$, $g(x)$.

2. The graphs below represent functions defined by polynomials. For which function are the zeros of the polynomials 2 and -3 ?



Key: 3

Aligned to CCLS: A.APR.3

Commentary: This question aligns to A.APR.3 because it requires a student to identify the graph of a polynomial with two given zeros.

Rationale: Option 3 is correct. The graph of the polynomial intersects the x -axis at points $(-3, 0)$ and $(2, 0)$. These are the only points on the graph where $y = 0$.

3. For which function defined by a polynomial are the zeros of the polynomial -4 and -6 ?

(1) $y = x^2 - 10x - 24$

(2) $y = x^2 + 10x + 24$

(3) $y = x^2 + 10x - 24$

(4) $y = x^2 - 10x + 24$

Key: 2

Aligned to CCLS: A.APR.3

Mathematical Practices: 2

Commentary: This question aligns to A.APR.3 because it requires a student to identify the equation of a polynomial with two given zeros.

Rationale: Option 2 is correct.

$$x = -4 \text{ and } x = -6$$

$$x + 4 = 0 \text{ and } x + 6 = 0$$

$$0 = (x + 4)(x + 6)$$

$$0 = x^2 + 4x + 6x + 24$$

$$0 = x^2 + 10x + 24$$

4. The length of the shortest side of a right triangle is 8 inches. The lengths of the other two sides are represented by consecutive odd integers. Which equation could be used to find the lengths of the other sides of the triangle?

- (1) $8^2 + (x + 1) = x^2$
- (2) $x^2 + 8^2 = (x + 1)^2$
- (3) $8^2 + (x + 2)^2 = x^2$
- (4) $x^2 + 8^2 = (x + 2)^2$

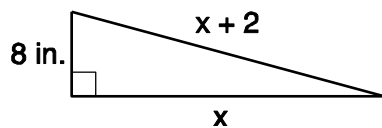
Key: 4

Aligned to CCLS: A.CED.1

Mathematical Practices: 1 and 2

Commentary: This item aligns to A.CED.1 because the student creates an equation in one variable that can be used to solve a problem.

Rationale: Option 4 is correct.



$$a^2 + b^2 = c^2$$
$$x^2 + 8^2 = (x + 2)^2$$

5. Donna wants to make trail mix made up of almonds, walnuts and raisins. She wants to mix one part almonds, two parts walnuts, and three parts raisins. Almonds cost \$12 per pound, walnuts cost \$9 per pound, and raisins cost \$5 per pound.

Donna has \$15 to spend on the trail mix. Determine how many pounds of trail mix she can make. [Only an algebraic solution can receive full credit.]

Key: 2 pounds of trail mix

Aligned to CCLS: A.CED.1

Mathematical Practices: 1 and 2

Commentary: This question aligns to A.CED.1 because the student creates equations in one variable and uses them to solve a problem.

Rationale: Let x = pounds of an ingredient. Then the number of pounds of trail mix is represented by the expression $x + 2x + 3x$. Therefore, the number of pounds of trail mix is $6x$. Then,

$$12x + 9(2x) + 5(3x) = 15$$

$$45x = 15$$

$$x = \frac{1}{3}$$

$$\text{So, } 6\left(\frac{1}{3}\right) = 2 \text{ pounds.}$$

Rubric:

[2] 2 and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made, but an appropriate number of pounds is stated.

or

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate number of pounds is stated.

or

[1] 2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

6. A high school drama club is putting on their annual theater production. There is a maximum of 800 tickets for the show. The costs of the tickets are \$6 before the day of the show and \$9 on the day of the show. To meet the expenses of the show, the club must sell at least \$5,000 worth of tickets.

a) Write a system of inequalities that represent this situation.

b) The club sells 440 tickets before the day of the show. Is it possible to sell enough additional tickets on the day of the show to at least meet the expenses of the show? Justify your answer.

Key: a) $x + y \leq 800$
 $6x + 9y \geq 5000$

b) Yes with appropriate work shown to justify the answer.

Aligned to CCLS: A.CED.3

Commentary: This question aligns to A.CED.3 because a student writes a system of inequalities to determine a viable solution.

Mathematical Practices: 4 and 6

Rationale:

a) Let x = number of presale tickets
 y = number of day of show tickets

$$x + y \leq 800$$
$$6x + 9y \geq 5000$$

b) $6(440) + 9y \geq 5000$
 $2640 + 9y \geq 5000$
 $9y \geq 2360$
 $y \geq 262.\bar{2}$

263 tickets

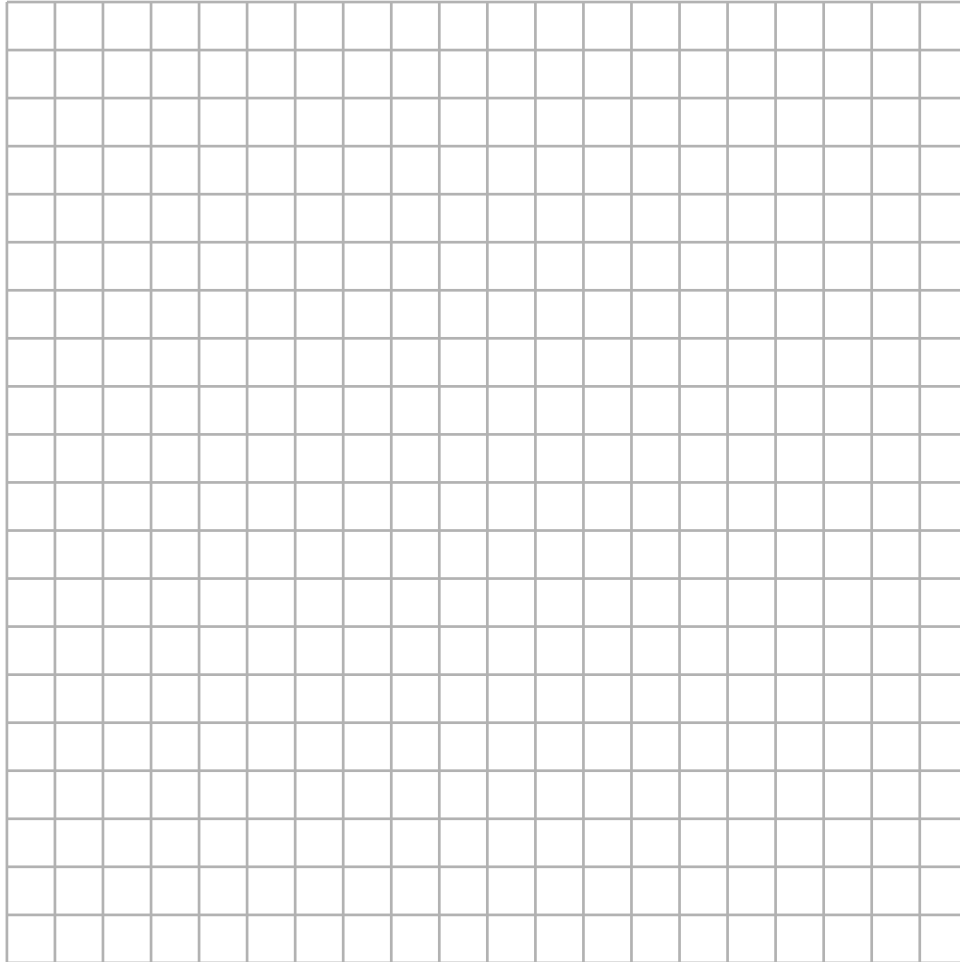
440 advance purchase tickets added to 263 day of show tickets is 703 tickets, which is below the 800 ticket maximum. So yes, it is possible.

Rubrics:

- (a) [2] $x + y \leq 800$ and $6x + 9y \geq 5000$.
- [1] $x + y \leq 800$ or $6x + 9y \geq 5000$.
- [1] $x + y = 800$ and $6x + 9y = 500$. *or*
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- (b) [2] Yes, and appropriate work is shown.
- [1] Appropriate work is shown, but “yes” is not stated.
- [1] Appropriate work is shown, but one computational error is made, but an appropriate determination is made.
- [1] Appropriate work is shown, but one conceptual error is made, but an appropriate determination is made. *or*
- [0] Yes, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

7. During a snowstorm, a meteorologist tracks the amount of accumulating snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours.

a) On the grid below, draw and label a graph that models the accumulation of snow over time using the data the meteorologist collected.



b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

Key: a) See graph in rationale below.

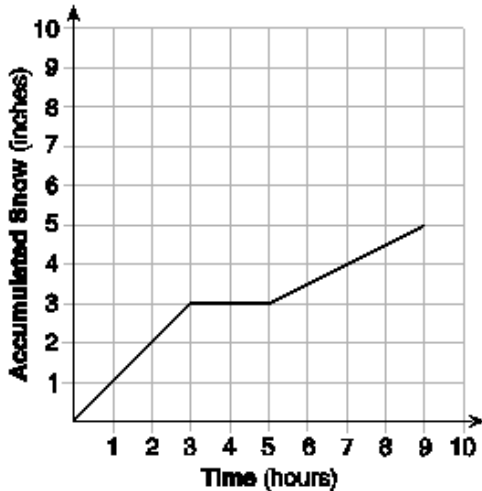
b) $3\frac{1}{2}$

Aligned to CCLS: F.IF.4

Commentary: This question aligns to F.IF.4 because the students sketch a graph based on a verbal description of the snowstorm.

Mathematical practices: 4

Rationale:



Rubric:

- [4] A correct graph is drawn, the axes are labeled correctly, and $3\frac{1}{2}$ is stated.
- [3] Appropriate work is shown, but one graphing or labeling error is made, but an appropriate amount of snow is stated.
- or*
- [3] A correct graph is drawn, the axes are labeled correctly, but the amount of snow is missing or is incorrect.
- [2] Appropriate work is shown, but two or more graphing or labeling errors are made, but an appropriate amount of snow is stated.
- or*
- [2] Appropriate work is shown, but one conceptual error is made, but an appropriate amount of snow is stated.
- or*
- [2] Appropriate work is shown, but one graphing or labeling error is made, and the amount of snow is missing or is incorrect.
- [1] Appropriate work is shown, but two or more graphing or labeling errors are made, and the amount of snow is missing or incorrect.

or

[1] Appropriate work is shown, but one conceptual error and one graphing or labeling error are made, but an appropriate amount of snow is stated.

or

[1] Appropriate work is shown, but one conceptual error is made, and the amount of snow is missing or is incorrect.

or

[1] $3\frac{1}{2}$, but no work is shown.

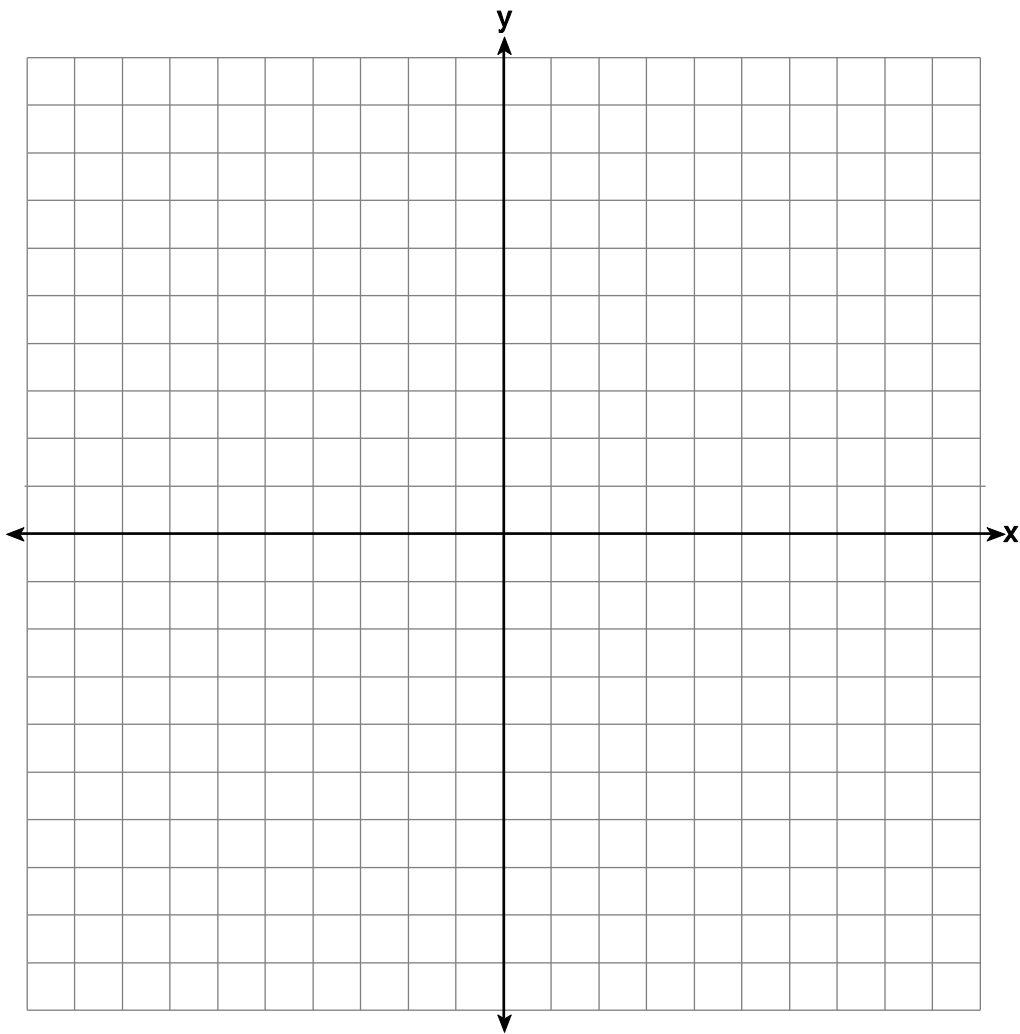
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

8. Next weekend Marnie wants to attend either carnival *A* or carnival *B*. Carnival *A* charges \$6 for admission and an additional \$1.50 per ride. Carnival *B* charges \$2.50 for admission and an additional \$2 per ride.

a) In function notation, write $A(x)$ to represent the total cost of attending carnival *A* and going on x rides. In function notation, write $B(x)$ to represent the total cost of attending carnival *B* and going on x rides.

b) Determine the number of rides Marnie can go on such that the total cost of attending each carnival is the same. [Use of the set of axes below is optional.]

c) Marnie wants to go on five rides. Determine which carnival would have the lower total cost. Justify your answer.



Key: a) $A(x) = 1.50x + 6$
 $B(x) = 2x + 2.50$

b) 7 rides

c) Carnival B with appropriate justification.

Aligned to CCLS: A.REI.11

Mathematical Practices: 2, 3, and 4

Commentary: This question aligns to A.REI.11 because the answer to the problem requires the student to solve $A(x) = B(x)$, either algebraically or graphically.

Rationale:

a) $A(x) = 1.50x + 6$
 $B(x) = 2x + 2.50$

b) $A(x) = B(x)$
 $1.50x + 6 = 2x + 2.5$
 $x = 7$

c) Carnival A cost = $1.50x + 6$
 $= 1.50(5) + 6$
 $= \$13.50$

Carnival B cost = $2x + 2.50$
 $= 2(5) + 2.50$
 $= \$12.50$

Carnival B because it costs \$12.50 and carnival A costs \$13.50.

Rubrics:

(a) [2] $A(x) = 1.50x + 6$ and $B(x) = 2x + 2.50$

[1] Either $A(x) = 1.50x + 6$ or $B(x) = 2x + 2.50$ is written.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(b) [2] 7 and appropriate work is shown.

[1] Appropriate work is shown, but one computational or graphing error is made, but an appropriate number of rides is stated.

or

[1] Appropriate work is shown, but one conceptual error is made, but an appropriate number of rides is stated.

or

[1] 7, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(c) [2] Carnival *B* and an appropriate justification is given, such as showing that carnival *B* costs \$12.50 and carnival *A* costs \$13.50.

[1] Carnival *B*, but the justification is incomplete or incorrect.

[0] Carnival *B*, but no explanation is given.