RELEASED TEST ITEMS

Sample Student Work
Illustrating GEE Achievement Levels

August 2007

Mathematics

GEE
Graduation Exit Examination

Grade
10

Louisiana Department of
EDUCATION
Reaching For Results

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Louisiana's Graduation Exit Examination (GEE)
Grade 10 Sample Items and Student Work
2006–2007

GEE is an integral part of the Louisiana school and district accountability system passed by the state legislature and signed into law in 1997. The primary purposes of the accountability system are to raise expectations for achievement for all Louisiana public school students and to improve public education in the state.

In March 2007, retesters and grade 10 initial testers took GEE English Language Arts and Mathematics tests. The test scores are combined with other relevant data to create school and district accountability scores, which serve as a means of measuring educational quality and improvement in educational programs over time.

This document is part of a series of materials meant to promote understanding of knowledge and skills students must have and the kinds of work they must produce to be successful on the GEE. Other documents providing background and further information on the GEE tests can be found on the Louisiana Department of Education Web site at www.louisianaschools.net.

GEE Reports

Louisiana's grade 10 students are tested each year in March. Individual student, school, district, and state test results are released in phases in May and July. School and district accountability results are reported in the fall.

For GEE, student scores are reported at five achievement levels: *Advanced, Mastery, Basic, Approaching Basic,* and *Unsatisfactory*. The percentage of students scoring at each level is reported for individual schools, districts, and the state. General definitions for the achievement levels are given on page 2. Achievement level descriptors for all content areas can be found on the Louisiana Department of Education Web site at www.louisianaschools.net. Click on "Testing" at the top of the page and then on "Achievement Level Descriptors" in the drop-down menu under GEE.

General Achievement Level Definitions

Achievement Level	Definition
Advanced	A student at this level has demonstrated superior performance beyond the level of mastery.
Mastery	A student at this level has demonstrated competency over challenging subject matter and is well prepared for the next level of schooling.
Basic	A student at this level has demonstrated only the fundamental knowledge and skills needed for the next level of schooling.
Approaching Basic	A student at this level has only partially demonstrated the fundamental knowledge and skills needed for the next level of schooling.
Unsatisfactory	A student at this level has not demonstrated the fundamental knowledge and skills needed for the next level of schooling.

Purpose of This Document

This document presents student work in the Mathematics test, which was completed as part of a GEE assessment. The document includes examples of multiple-choice and constructed-response items that exemplify what students scoring at specified achievement levels should know and be able to do. A discussion of each item highlights knowledge and skills the item is intended to measure, as well as strengths and weaknesses in the student work on the item.

As you review the items, it is important to remember that a student's achievement level is based on his or her total test score (cumulative score for all questions in the test) in a content area, not on one particular item or section, and that sample items included in this report represent a small portion of the body of knowledge and skills measured by the GEE tests. Additional items will be released in future years of the GEE.

Mathematics

The GEE Mathematics test is composed of sixty multiple-choice and four constructed-response items. A student earns 1 point for each correct answer to a multiple-choice item and from 0 to 4 points for the answer and work shown for each constructed-response item.

The general scoring rubric for constructed-response items is:

Score	Description
4	• The student's response demonstrates in-depth understanding of the relevant content and/or procedures. • The student completes all important components of the task accurately and communicates ideas effectively. • Where appropriate, the student offers insightful interpretations and/or extensions. • Where appropriate, the student uses more sophisticated reasoning and/or efficient procedures.
3	• The student completes most important aspects of the task accurately and communicates clearly. • The student's response demonstrates an understanding of major concepts and/or processes, although less important ideas or details may be overlooked or misunderstood. • The student's logic and reasoning may contain minor flaws.
2	• The student completes some parts of the task successfully. • The student's response demonstrates gaps in conceptual understanding.
1	• The student completes only a small portion of the task and/or shows minimal understanding of the concepts and/or processes.
0	• The student's response is incorrect, irrelevant, too brief to evaluate, or blank.

Note: It is important to recognize that score points for constructed-response items and GEE achievement levels do not share a one-to-one correspondence. For example, it should not be assumed a student who scores at the *Advanced* level in the assessment has earned a score of 4 on each constructed-response item.

It is possible for a GEE student to earn a total of 76 points on the Mathematics test. The number of raw score points that a student would have to achieve to reach each achievement level may change slightly from year to year, given the difficulty of that particular form of the test. The spring 2007 raw score range for each achievement level is listed on the next page.

Spring 2007 GEE Mathematics Test

Achievement Level	Raw Score Range
Advanced	67 – 76 points
Mastery	57.5 – 66.5 points
Basic	38.5 – 57 points
Approaching Basic	31 – 38 points
Unsatisfactory	0 – 30.5 points

The following section of this document presents four multiple-choice items selected to illustrate results from four of the five achievement levels used to report GEE results—*Advanced, Mastery, Basic,* and *Approaching Basic.* Examples of *Unsatisfactory* work are not included; by definition, work classified as *Unsatisfactory* exhibits a narrower range of knowledge and skills than work classified as *Approaching Basic.* Information shown for each item includes

- the correct answer,
- the achievement level,
- the strand and benchmark each item measures, and
- commentary on the skills/knowledge measured by the item.

In addition, one constructed-response item with its scoring rubric and sample student responses at scores 0 to 4 is included. Each student response is annotated to explain how its score was derived and the strengths and weaknesses of the response.

Note: Items may have been reduced in size for this document. Font size on the GEE test is typically 12 points.

Strand N: Number and Number Relations

Benchmark N-5-H: Selecting and using appropriate computational methods and tools for given situations (for example, estimation, or exact computation using mental arithmetic, calculator, symbolic manipulator, or paper and pencil)

Achievement Level: *Advanced*

The Game Store is having a 15 percent off sale on their best-selling games. Which **single** arithmetic operation can be used to find the sale price?

  A. Divide the original price by 0.15.

  B. Divide the original price by 0.85.

  C. Multiply the original price by 0.15.

* D. Multiply the original price by 0.85.

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* correct answer

This item would most likely be answered correctly by students who score at the *Advanced* level. This item requires students to select a procedure or method to solve a problem. Selecting the procedure that will be used is frequently the first, and most difficult, step in solving a problem. The ability to select the correct procedure to use in solving a problem is often called a process skill rather than an application skill. Process skills normally involve more complex thinking on the part of the student. In this item, students must decide which single procedure can be used to find the sale price of a game. The price of a game is reduced by 15%; therefore, the sale price can be found by subtracting: 100% – 15% = 85%. Since the sale price is 85% of the original price, the actual amount of the sale price can be found by changing 85% to a decimal number (85% = 0.85) and multiplying. Answer option D is the correct response. The use of a calculator is not allowed on this item.

Strand M: Measurement

Benchmark M-2-H: Demonstrating an intuitive sense of measurement (for example, estimating and determining reasonableness of results as related to area, volume, mass, rate, and distance)

Achievement Level: *Mastery*

In Ireland, a sign on the tee of a golf hole says that the hole is 357 meters away. About how far away is the hole in yards?

   A. 310 yards

   B. 340 yards

 * C. 390 yards

   D. 430 yards

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* correct answer

This item would most likely be answered correctly by students who score at the *Mastery* level and above. This item requires students to use their intuitive sense of measurement to estimate how many customary units are equivalent to a metric measurement. In this case, students need to use the fact that 1 yard is slightly shorter than 1 meter. Because the estimate can be found using only the intuitive relation—1 yard is slightly shorter than 1 meter—no computation is needed. Students must select a number of yards that is slightly greater than 357. Answer option C is the correct response. The use of a calculator is not allowed on this item.

Strand P: Patterns, Relations, and Functions

Benchmark P-4-H: Analyzing the effects of changes in parameters (for example, coefficients and constants) on the graphs of functions, using technology whenever possible

Achievement Level: *Basic*

Use the graph below to answer the following question.

Water Flowing by St. Louis

The graph represents the Mississippi River's average flow rate at St. Louis for one day, which was 80,000 cubic feet per second. On the same day, the Mississippi's average flow rate at Baton Rouge was 240,000 cubic feet per second. Which graph represents the volume of water that flowed by Baton Rouge that day?

A.

Water Flowing by Baton Rouge

B.

Water Flowing by Baton Rouge

* C.

Water Flowing by Baton Rouge
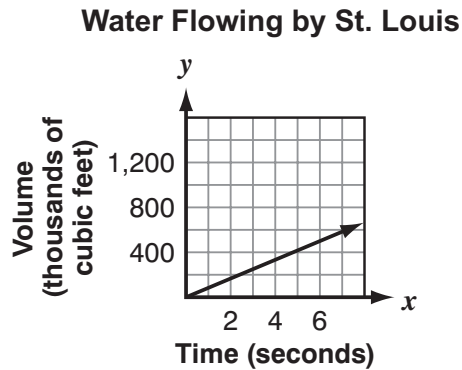

D.
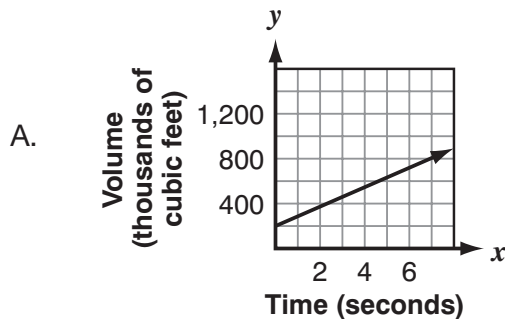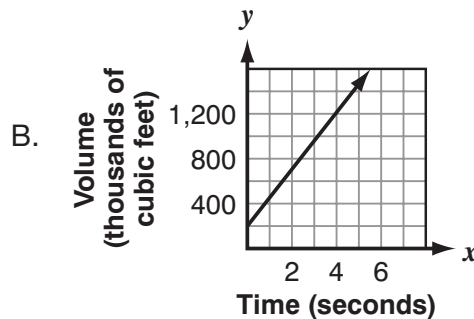
Water Flowing by Baton Rouge

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* correct answer

This item would most likely be answered correctly by students who score at the *Basic* level and above. This item requires students to determine which graph correctly represents the numerical characteristics described in the text of the item. In mathematics, these numerical characteristics are often referred to as parameters. The parameters that describe a line are the y-intercept (starting point of the observations) and slope (steepness of the l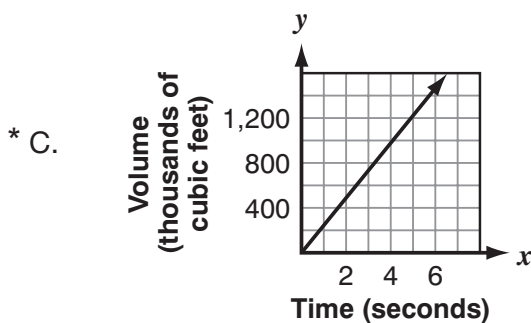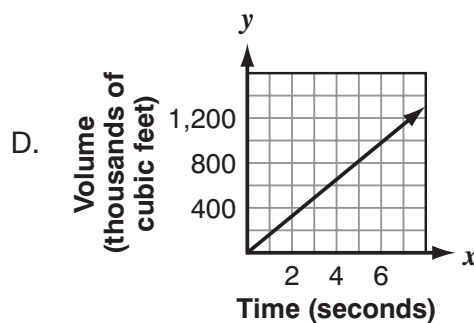ine). Since the starting point of the measurement of water flowing by Baton Rouge occurs at zero (0) seconds, the volume at that time is also zero. Therefore, the y-intercept of the correct line must be the point (0, 0), which is called the origin. The slope (steepness) of the line is the parameter that reflects the rate at which water is flowing by Baton Rouge— 240,000 cubic feet per second. The slope is indicated by a line that shows a rise of 240,000 cubic feet for every additional 1 second of time. Students must analyze the graphs to determine which graph has a y-intercept of 0 and a slope of $\frac{240,000}{1}$. Answer option C is the correct response. This item does not require the use of a calculator.

Strand D: Data Analysis, Probability, and Discrete Math

Benchmark D-4-H: Demonstrating an understanding of the calculation of finite probabilities using permutations, combinations, sample spaces, and geometric figures

Achievement Level: *Approaching Basic*

This design shows a floor made up of light and dark tiles.

If a tile on the floor is selected at random, what is the probability that the tile will be dark?

A. $\dfrac{1}{35}$

B. $\dfrac{1}{17}$

*C. $\dfrac{17}{35}$

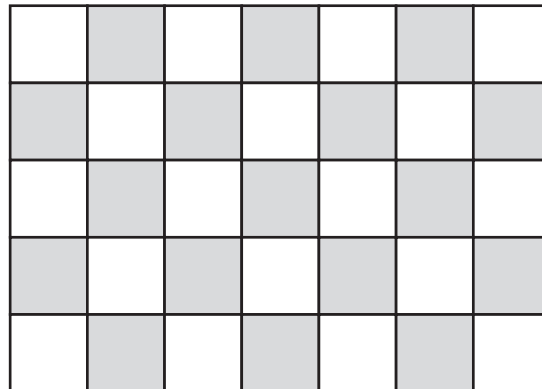D. $\dfrac{17}{18}$

* correct answer

This item would most likely be answered correctly by students who score at the *Approaching Basic* level and above. This item requires students to determine a simple probability. Simple probability is found by determining the ratio of two numbers: $\frac{\text{Number of All Possible Successful Outcomes}}{\text{Total Number of All Possible Outcomes}}$. For this item, a successful outcome is the selection of a dark tile. The number of possible successful outcomes can be found by counting the dark tiles that are used in the floor. The design shows there are 17 dark tiles in the floor. Since it is possible that a tile which is randomly selected could be either light or dark, the total number of all possible outcomes is the total number of tiles in the floor. The design shows there are 35 total tiles in the floor. The simple probability of randomly selecting a dark tile can be written $\frac{17}{35}$. Answer option C is the correct response. This item does not require the use of a calculator.

The following pages present a mathematics constructed-response item, a scoring rubric, and examples of student work at scores of 0 to 4. The original item is shown below, and the scoring rubric is on page 12. One of the content standards for this item is **Measurement.** In problem-solving investigations, students demonstrate an understanding of the concepts, processes, and real-life applications of measurement.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

Scoring Rubric

Score	Description
4	6 points
3	5 points **OR** correct answers to all 3 parts
2	3 or 4 points
1	1 or 2 points **OR** Response demonstrates minimal understanding of distance/rate/time relationships.
0	Response is incorrect, irrelevant, too brief to evaluate, or blank.

Part A (2 points)

- 2 points for correct average speed [52 (mph)] with sufficient work shown or explanation to indicate correct strategy
  OR

- 1 point for correct average speed with insufficient or no work shown OR for correct strategy with error(s) in arithmetic and/or time unit conversion

Part B (2 points)

- 2 points for correct arrival time [2:15 (P.M.), or correct based on incorrect answer in part A] with sufficient work shown or explanation to indicate correct strategy
  OR

- 1 point for correct time (including P.M.) with insufficient or no work shown OR for correct strategy with error(s) in arithmetic and/or time unit conversion

Part C (2 points)

- 2 points for correct reduction in time [16 min., or will arrive at 1:59, or correct based on incorrect answer(s) in parts A and/or B] with sufficient work shown or explanation to indicate correct strategy
  OR

- 1 point for correct time reduction with insufficient or no work shown OR for correct strategy with error(s) in arithmetic and/or time unit conversion

Note: If student does not convert fractional hours to minutes in parts B and C, do not penalize twice. Award full credit for one part if strategy is correct except for lack of conversion.

Score Point 4

Below is the work of a student who received a score of 4 for his or her response. A score of 4 is given when a student completes all important components of the task and communicates his or her ideas effectively. The response should demonstrate in-depth understanding of the content area, and all important components of the task should be complete.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

Time: 12:15 − 11:30

distance: 126 − 87 = 39

$$\frac{12\overset{11}{:}\overset{60}{15}}{-11:30} \over 45$$ $\frac{3}{4}$ hour.

Speed: $\frac{distance}{time} = \frac{39}{\frac{3}{4}} = \frac{\overset{13}{39}\times 4}{8} = 52$ ∴ 52 miles/hour

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

time: $\frac{distance}{speed} = \frac{87}{52} \approx 1\frac{35}{52} \approx$ 1 hour & 40 min.

12:15 + 20 min. = 12:35

+ 1:40
_____

about   2:15

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

$\frac{87}{62} = 1\frac{25}{62} \approx$ 1 hour & 24 min.

∴ about 16 min earlier.

This response demonstrates the mathematical skills required to correctly answer all parts of the question, with complete support where required. The student provides a correct answer for each part, with work shown supporting how the answers were derived. This response is correct and complete, and the student earns a total of 6 points for a score of 4.

Score Point 3

Below is the work of a student who received a score of 3 for his or her response. A score of 3 is given when a student completes the most important aspects of the required task and communicates his or her ideas clearly. The response should demonstrate the student's understanding of major concepts and/or processes, although the student may have overlooked or misunderstood one part of the problem.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

From 11:30A.M. to 12:15P.M., 0.75 hours passed. Amanda travelled 39 miles in this time (126-87). You can divide the 39 miles by 0.75 to find her average speed to be 52 miles per hour.

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

She has 87 miles to go, and at 52 mph (see above), it will take another 96 minutes (approximation → 87/52) to get there. Adding the 20 minutes and then the 96 - to the 12:15 P.M., she will get home at 2:11 P.M.

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

10 mph more would be 62mph. 87/62 is about 1.4, meaning 84 minutes. Using the above estimate of 96, you can subtract to find she should arrive 12 minutes sooner.

This response demonstrates the mathematical skills required to answer most of the question correctly, but contains a minor error in one part. In part A, the student provides the correct answer with an explanation indicating the correct

procedure was used. In part B, the explanation demonstrates the correct procedure for deriving the answer but contains a time unit conversion error. In part C, the student has the correct answer (based on part B) with explanation indicating the correct procedure was used. The student earns a total of 5 points (2 points in part A, 1 point in part B, and 2 points in part C) for a score of 3.

Score Point 2

Below is the work of a student who received a score of 2 for his or her response. A score of 2 is given when a student completes some parts of the task successfully. The student's response demonstrates gaps in his or her conceptual understanding.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

52 miles an hour

you find out how far she went then divide that by the time it took her to get there then multiply it by sixty.

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

120 minutes

at 2:15 pm she would be home

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

109 minutes

at 2:04 she would be home

This response demonstrates the mathematical skills required to correctly answer 2 parts of the question but is lacking valid justification in one part. In part A, the student provides the correct answer with explanation supporting how the answer was derived. In part B, the student provides the correct answer but the support shown is incomplete. In part C, the answer is incorrect and there is no support that indicates the correct procedure was used. The student earns a total of 3 points (2 points in part A, and 1 point in part B) for a score of 2.

Score Point 1

Below is the work of a student who received a score of 1 for his or her response. A score of 1 is given when a student completes only a small portion of the task, or when the student's response demonstrates minimal understanding of the concepts and/or processes.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

87MPh

126 − 87 = 39

39 ÷ 45min. = 8666

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

1:35 Pm Cause 12:15 + 20 = 12:35

87 miles to go

12:35 + 1 hr. = 1:35

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

He would be about 15 min. earlier

This response demonstrates the mathematical skills required to correctly answer one part of the question (based on a previous part) with work shown supporting how the answer was derived. In part A, the answer is incorrect and there is no correct work shown. In part B, the student has the correct answer based on part A with work shown that indicates the correct strategy was used. In part C, the answer is incorrect with no work or explanation given. The student earns a total of 2 points in part B for a score of 1.

Score Point 0

Below is the work of a student who received a score of 0 for his or her response. A score of 0 is given when a student's response is incorrect, irrelevant, too brief to evaluate, or blank.

Amanda was driving home from her grandmother's house. At 11:30 A.M., she was 126 miles from home. At 12:15 P.M., she was 87 miles from home.

A. What was Amanda's average speed, in miles per hour, for this period? Show or explain how you found your answer.

39 miles per hour.

$$\begin{array}{r} 124 \\ -87 \\ \hline 39 \end{array}$$

213 miles
all 2-gether

B. At 12:15 P.M., Amanda stopped for 20 minutes to fill her car with gas and get something to eat. If she drove at the same average rate as in part A the rest of the way home without stopping, what time would she get home? Show or explain how you found your answer.

$$\begin{array}{r} 12:15 \\ +20 \\ \hline 12:35 \; P.M \end{array}$$

C. Suppose Amanda's average speed for the last 87 miles was 10 miles per hour **more** than the average speed found in part A. How much earlier would she arrive at home? Express your answer in minutes, and show or explain how you found your answer.

$$\begin{array}{r} 87 \\ -10 \\ \hline 77 \; miles \end{array}$$

$$\begin{array}{r} 12:15 \\ -10 \\ \hline 12:05 \; P.M. \end{array}$$

This response is incorrect and does not demonstrate minimal understanding of distance/rate/time relationships. The student does not provide a correct answer to any part of the question, nor is there explanation or work shown in any part that demonstrates some understanding of the skill being measured.

GEE

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