Snakes
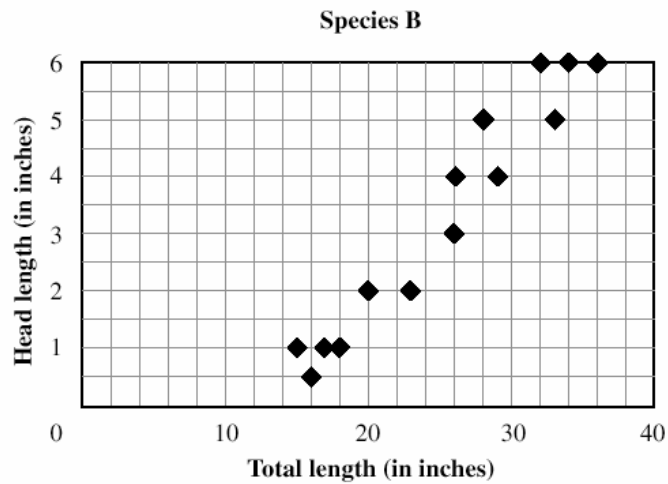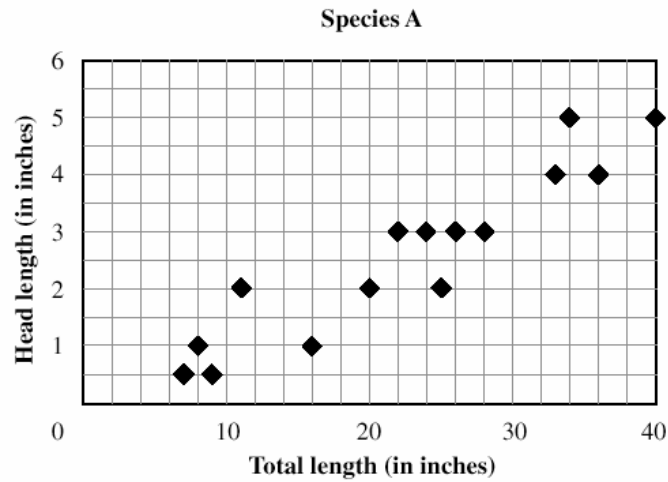
This problem gives you the chance to:
• interpret scatter plots and identify values that fit

Rita is a zoologist. She is studying two species of snake.

Rita measures the head length and the total length of some snakes of each species.

She records the measurements on two scatter plots, as shown below.

Species A

Species B

Snakes   Test 9: Form A

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Rita catches 5 more snakes.

She wants to know whether they belong to species A or to species B.

The measurements of these snakes are shown in the table below.

Snake	1	2	3	4	5
Total length (in inches)	36	39	9	16	18
Head length (in inches)	6	5	1	0.5	1

Use the scatter plots to decide whether these snakes belong to species A or species B.

Record your answers in the table below.

Snake	1	2	3	4	5
Species					

5

Snakes

The core elements of performance required by this task are:
• interpret scatter plots and identify values that fit

Based on these, credit for specific aspects of performance should be assigned as follows:

	Points	Section Points
Correctly completes the table:		

Snake	1	2	3	4	5
Species	B	A	A	B	B

	Points	Section Points
	5×1	5
Total Points		5

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Looking at Student Work – Snakes

Most students did very well on this task with almost 53% scoring all the points on the task. Their work however provides no insights into their thinking process, as most of them show no marks on their papers except filling in the letters in the table as shown by the work of Student A below.
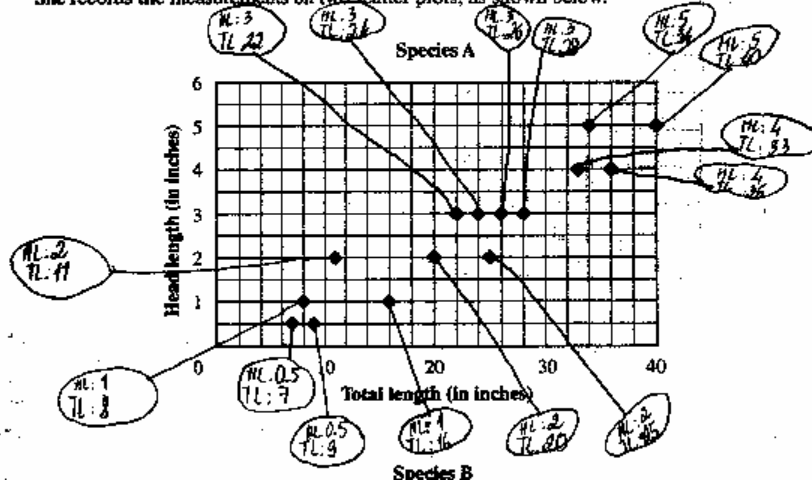
Student A

Snake	1	2	3	4	5
Species	B	A	A	B	B

In thinking about this task, students might have located the point on both graphs to look for reasonableness, labeled points already on graph to use for comparison (see work of Student B), or attempted a line of best fit to use for comparison (see work of student C). Only 3% of the students showed any marks on their paper beyond responses written in the table.
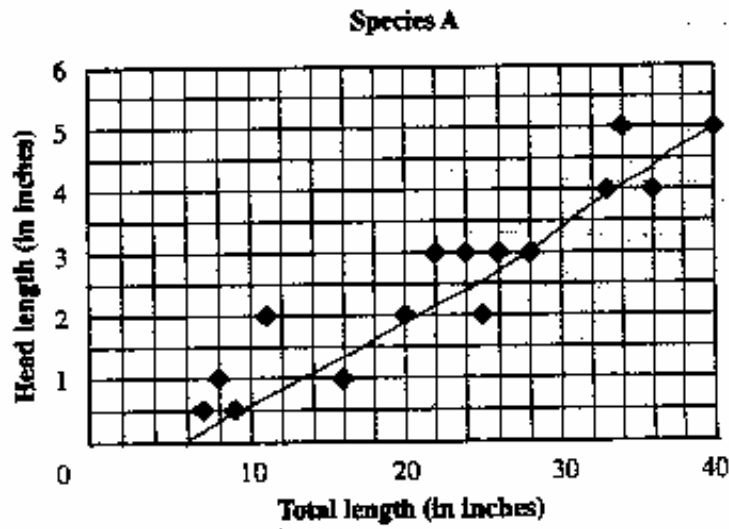
Student B

Rita measures the head length and the total length of some snakes of each species.

She records the measurements on two scatter plots, as shown below.

Student C

Species A

Approximately 8% of the students filled in the table with numbers instead of letters. See the work of Students D and E.

Student D

¡ respuestas en la tabla siguiente.

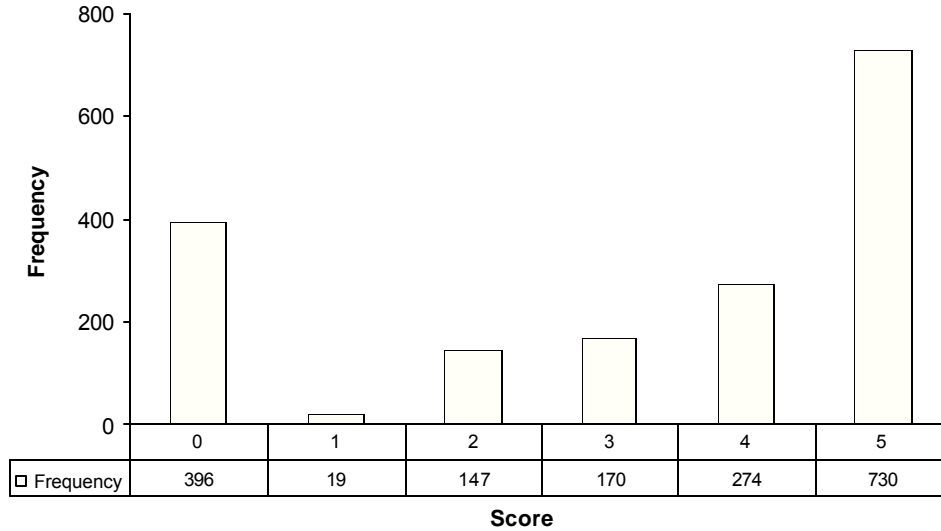| Serpiente	1	2	3	4	5
Especie	6	7	8	9	10

Student E

Snake	1	2	3	4	5
Species	5	5	3	4	4

Teacher Notes:

Snakes
Mean: 3.21, S.D.: 2.00

	0	1	2	3	4	5
☐ Frequency	396	19	147	170	274	730

Score

Score:	0	1	2	3	4	5
% < =	22.8%	23.9%	32.4%	42.2%	57.9%	100.0%
% > =	100.0%	77.2%	76.1%	67.6%	57.8%	42.1%

The maximum score available on this task is 5 points.
The cut score for a level 3 response is 3 points.

Most students (approximately 78%) could successfully identify the species of at least one of the snakes, usually 1 or 5. More than half the students could identify the species of 4 or more of the snakes. 42% of the students met all the demands of the task. Almost 23% of the students scored no points on this task. 52% of the students with scores of zero did not attempt the problem.

Snakes

Points	Understandings	Misunderstandings
0	Almost 30% of the students scored no points on this test. 48% of those students attempted the problem.	8% of all students used numbers instead of letters to fill in the table. Only 3% of the students showed any of their thinking by making marks on the graphs. Therefore evidence for analyzing error patterns or reasoning is lacking.
1	Students with this score could identify the correct graph for Snake 5.	
2	While there were a variety of correct combinations for this score, the most common pattern was to identify snake 1 and 3.	
3	Students could identify 3 snakes. They were more likely to identify combinations including 1 and 3 and less likely to have a combination including either 2,4 or 5.	
4	Students with this score could identify the species for 4 out of the 5 snakes.	The most common error was snake 4, followed by snake 5 or 2.
5	Students could read, interpret, and compare scatter plots to use data from a table to identify the species of a snake.	

Teacher Notes:

Based on teacher observations, this is what AlgebraOone students seemed to know and be able to do:
- Read and compare scatter plots.
- Correctly locate points on a grid.
- Interpret graph of best fit for information from a table.

Areas of difficulty for Algebra One students, Algebra One students struggled with:
- Attempting problems for which they were unsure of the solution.
- Interpreting relationships and fits for values that did not exactly fit the points on the grids.

Questions for Reflection on Snakes:
- What experiences have students had this year with interpreting scatter plots?
- When looking at data on graph, do you frequently ask students to describe trends or to look for correlations? Give some examples students have had this year in problem solving with data.
- What are your classroom norms for showing thinking when doing problem solving? Do you have any conjectures about why more students didn't use the grid to help them make the comparisons?
- What percentage of your students did not attempt the problem? What are some of the factors that may have contributed to this?

Teacher Notes:

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Implications for Instruction:
Students at this grade level should be familiar not only with plotting points and making scatter plots, but should see the pur pose and usefulness of scatter plots for looking at trends, making predictions, modeling situations, and solving problems. Students at this grade level also need to feel that their thinking is important and feel comfortable about showing their work and ha ve the confidence in their mathematical thinking to attempt unfamiliar problems.

Teacher Notes:

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Performance Assessment Task
Snakes Grade 9
The task challenges a student to demonstrate understanding of the relationship between two sets of data. A student must make sense of two sets of data displayed in two different scatter plots. A student must make sense of the table and look for trends including correlations and lines of best fit. A student must make inferences based upon the data and draw conclusions about a situation being modeled.
Common Core State Standards Math - Content Standards

High School – Statistics and Probability – Interpreting Categorical and Quantitative Data
Summarize, represent, and interpret data on two categorical and quantitative variables.
S-ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*
    b. Informally assess the fit of a function by plotting and analyzing residuals.
    c. Fit a linear function for a scatter plot that suggests a linear association.

Common Core State Standards Math – Standards of Mathematical Practice
MP.1 Make sense of problems and persevere in solving them. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. **MP.7 Look for and make use of structure.** Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well-remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3$(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Assessment Results
This task was developed by the Mathematics Assessment Resource Service and administered as part of a national, normed math assessment. For comparison purposes, teachers may be interested in the

results of the national assessment, including the total points possible for the task, the number of core points, and the percent of students that scored at standard on the task. Related materials, including the scoring rubric, student work, and discussions of student understandings and misconceptions on the task, are included in the task packet.

Grade Level	Year	Total Points	Core Points	% At Standard
9	2003	5	3	68 %