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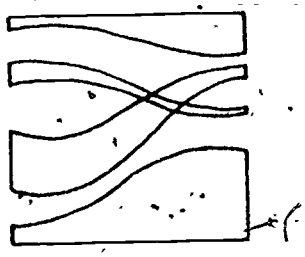
ABSTRACT

The purpose of this study was to relate children's cognitive processing capabilities and their grade level to their performance and to the strategies they used when working addition and subtraction problems. From two sets of data which assessed memory capacity and cognitive processing capacities, six groups of children with different cognitive characteristics were identified. For a sample of 44, children in five classes at Grades 1, 2, and 3 were selected and interviewed as they worked a set of addition and subtraction problems. Each child was interviewed on three occasions. Each interview consisted of six tasks given under four of six conditions. Codes for three or four categories were assigned to each child's response: model used, correctness, strategy, error, and if incorrect. These data were then summarized in terms of percent correct and general strategy. For both percent correct and strategy used, there were important variations due to problem set (size of number), to specific task, to instruction over time, and to grade. However, what is clear is that children who differ in cognitive processing capacity consistently performed differently regardless of the other important factors. (Author/MP)



Technical Report No. 580

Performance on Addition and Subtraction Problems: Results from Individual Interviews - Sandy Bay Study

by Thomas A. Romberg, Kevin F. Collis, and Anne E. Buchanan

November 1981

Wisconsin Research and Development Center for Individualized Schooling

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PERFORMANCE ON ADDITION AND SUBTRACTION PROBLEMS: RESULTS FROM INDIVIDUAL INTERVIEWS--SANDY BAY STUDY

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Thomas A. Romberg, Kevin F. Collis, and Anne E. Buchanan

Report from the Project on
Studies in Mathematics

The Research Committee of
The University of Wisconsin Graduate School

Wisconsin Research and Development Center
for Individualized Schooling
The University of Wisconsin
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Abstract

This paper reports the results of the third of a series of collaborative studies examining how young children acquire the skills to represent and solve verbal addition and subtraction problems. The purpose of this study was to relate children's cognitive processing capabilities and their grade level to their performance and to the strategies they used when working addition and subtraction problems.

From two sets of data which assessed memory capacity and cognitive processing capacities, we identified six groups of children with different specific cognitive characteristics. For a sample of 44, children in five classes at Grades 1, 2, and 3 were selected and interviewed as they worked a set of addition and subtraction problems. Each child was interviewed on three occasions. Each interview consisted of six tasks given under four of six conditions. Codes for three or four categories were assigned to each child's response: model used, correctness, strategy, error, and if incorrect. These data were then summarized in terms of percent correct and general strategy.

For both percent correct and strategy used, there were important variations due to problem set (size of number), to specific task, to instruction over time, and to grade. However, what is clear is that children who differ in cognitive processing capacity consistently performed differently regardless of the other important factors.

This paper reports the results from one of a series of related, collaborative studies carried out in Sandy Bay, Tasmania, Australia, in 1979 and 1980. In those studies, we examined how young children acquire the skills to represent and solve a variety of verbal addition and subtraction problems. We assumed that the evolution of children's performance on addition and subtraction tasks must be related both to their cognitive abilities and to their engagement in related instructional activities. The purpose of the study reported in this paper was to relate the children's cognitive capacity and their grade level to their performance and to the strategies they used when working addition and subtraction problems.

The Collaborative Studies

This series of studies was jointly funded by the Research Committee of the Graduate School at the University of Wisconsin, the University of Wisconsin Research and Development Center for Individualized Schooling, and the University of Tasmania. The principal investigators of the studies brought different backgrounds and skills to this collaborative effort. The identification of cognitive abilities grows out of Professor Collis' extensive work in cognitive development (for example, see Collis & Biggs, 1979). The classroom engagement ideas stem from Professor Romberg's research on teaching (see Romberg, Small, & Carnahan, 1979).

The strategy adopted for the sequence of collaborative studies has five steps:

1. Identify "M-space" for a population of children of ages 4-8.

2. Identify "cognitive processing capabilities" for the same set of children.

3. From (1) and (2) identify a well defined set of children with specific cognitive characteristics.

4. From (3) identify a sample of children and observe their engagement in instructional activities on related tasks for three months.

5. Repeatedly measure, on three occasions over the three month period, the sample's performance and note the strategies they use with addition and subtraction problems.

This procedure will allow us to relate performance at a given time (in terms of level achieved and strategy adopted) to the child's cognitive capability and to specific set of instructional activities the child has been engaged with. In this way, we can consider various questions about change in performance and strategy and their possible causes.

This Study

The importance of knowing how children learn the concepts of procedures of addition and subtraction should be self-evident. Also, it is frequently assumed that children must first master those computational skills and then begin to solve addition and subtraction problems. However it has been clearly demonstrated that children develop a variety of strategies for solving mathematical problems independent of instruction (c.f., Ginsburg, 1977; Resnick, 1978; Carpenter, & Moser, 1979). In fact, many

of the strategies they use are more sophisticated and demonstrate more insight than the procedures that are taught. This raises questions about the relationships of children's instructional experience and their capacity to their performance and their selection of strategies.

The population of children examined in the previous studies in this series (Romberg & Collis, 1980a; 1980b) were clinically interviewed on three occasions over a three month period in 1980 (February 27-29, April 9-11, and May 26-28). In each interview, a set of verbal problems was given to each student. Each child's performance and strategies were coded by the interviewer. This report presents the data from those interviews.

Cognitive Capacity

To identify children with differing cognitive capacities, a three-step procedure was followed. First, we identified memory capacity (M-space) for a population of children of ages 4-8 (Romberg & Collis, 1980a). Four M-space tests were administered.

Second, we identified cognitive processing capabilities for the same set of children (Romberg & Collis, 1980b). Fifteen different tests were given. From a factor analysis of those scores, a quantitative factor, a qualitative correspondence factor, and a logical reasoning factor were identified.

Third, from both sets of data, we identified six groups of children with different specific cognitive characteristics. A cluster analysis procedure was used to group the children.

Cognitive Level 1 children operate at M-space Level 1, are capable

of handling qualitative comparisons and transformations at a moderate level, and are incapable of dealing with quantitative tasks or logical reasoning. Cognitive Level 2 children operate at M-space Level 2, handle qualitative correspondence tasks, and cannot handle quantitative and logical skills (but were considerably better than Group 1 on all tasks). Cognitive Level 3 children also operate at M-space Level 2, are high on qualitative correspondence, have developed the specific counting skills of counting-on and counting-back, are inadequate in their use of those counting skills on transitive reasoning, and are inadequate on logical reasoning. Cognitive Level 4 children operate at M-space Level 3, are high on qualitative correspondence and all the quantitative tests, but are inadequate on the logical reasoning test. Cognitive Levels 5 and 6 are at M-space Levels 3 and 4. They reach the ceiling on the qualitative correspondence tests, have very high scores on all the quantitative tests, and also are high on logical reasoning.

Because these latter two groups were both small, included only third graders, and displayed no differences in cognitive processing scores, the interview data for these groups have been combined. The number of children selected to be interviewed in each group of children for each grade is shown in Table 1. Our intent was to have a sample of two to four students from each cognitive level. We began with rosters of students from each grade and their cognitive level. Then an initial selection of students was made. However, after school began, some students originally in one class were switched to another. The students by cognitive level and class in this study are shown in Table 1.

Table 1

Children in Each Cluster Group in Each Class

Cognitive Level	Sandy Bay Infant School		Waimea Heights Primary School		
	Class 1	2	3	4	5
	Grade 1	Grade 2	Grade 3	Grade 3	Grade 3
1	3	2	0	0	0
2	3	6	0	4	0
3	1	2	2	3	3
4	0	0	2	3	3
5,6	0	0	3	1	3
Totals	7	10	7	11	9

Interview Tasks

An interview consisted of six problem types (tasks) given under four of six conditions. The six types included two problems solvable by addition of the two given numbers and four problems solvable by subtraction of the two given numbers. The characterization for these six problem types is detailed in Moser (1979) and in Carpenter and Moser (1979).

Table 2 presents representative problems in the order in which the problems were administered to the children. The actual wording for each problem type differed in the four conditions, but the semantic structure remained constant.

Within each problem, two of three numbers from a number triple (x, y, z) defined by $x + y = z$, $x < y < z$, were given. In the two addition problems x, y were presented, with the smaller number x always given first. In the four subtraction problems, z and the larger addend y were presented. The order of presentation of y and z varied among problem types.

The six problem types used were presented under six conditions. Four conditions result from crossing smaller numbers vs. larger numbers with presence vs. absence of manipulative materials. Figure 1 shows these four conditions with the labels assigned to them. In the smaller number problems (the "B" problems), the addition guideline of $5 \leq z \leq 9$ was imposed. In the larger number problems (the "C" problems) the restriction on the sum was $11 \leq z \leq 15$.

For the interviews with third grade children, the domain of 2-digit numbers was included. In the 2-digit domain, two sub-domains were identified. In the first no regrouping (borrowing or carrying) is required to determine a difference or sum when a computational algorithm is used. In the second sub-domain, regrouping is required. The no regrouping set is called the "D" problem set while the regrouping set is referred to as the "E" problems. For the two-digit problems, the sum z is restricted to numbers in the 20s and 30s. All third-grade children took the C, D, and E problems.

Interview Method

Three trained interviewers (see Martin & Moser, 1980, for details of interviewer training and reliability) administered the interviews.

Table 2

Representative Problem Types

Task 1.	Joining (Addition)	Pam had 3 shells. Her brother gave her 6 more shells. How many shells did Pam have altogether?
Task 2.	Separating (Subtraction)	Jenny had 7 erasers. She gave 5 erasers to Ben. How many erasers did Jenny have left?
Task 3.	Part-Part-Whole Missing addend (Subtraction)	There are 5 fish in a bowl. 3 are striped and the rest are spotted. How many spotted fish are in the bowl?
Task 4.	Part-Part-Whole (Addition)	Matt has 2 baseball cards. He also has 4 football cards. How many cards does Matt have altogether?
Task 5.	Comparison (Subtraction)	Angie has 4 lady bugs. Her brother Todd has 7 lady bugs. How many more lady bugs does Todd have than Angie?
Task 6.	Joining Missing Addend (Subtraction)	Gene has 5 marshmallows. How many more marshmallows does he have to put with them so he has 8 marshmallows altogether?

		Number Size	
		smaller	larger
Presence of manipulatives	with	B+	C+
	without	B-	C-

Figure 1. Conditions for nonsymbolic problem types.

One interviewer worked at Sandy Bay Infant School and the other two at Waimea Heights Primary School. Each interviewer was able to conduct 8 to 12 interviews in a day, depending on the schools' schedules and on the task level. (Level C tasks took longer than Level B tasks.) At the schools, the interviewers were assigned interview areas, which, for the most part, were quiet rooms separate from distracting activities. The verbal tasks were read and reread to the child as often as necessary so that remembering the given numbers or relationships caused no difficulty. An individual interview required two sessions, one for the B tasks and the other for C tasks (or one for the C and the other for D and E). The sessions lasted 15-25 minutes each, with each child receiving the same sequence of problems. No child was interviewed twice in one day.

Coding Subject Responses

All of the possible codings of student responses are presented in detail in Cookson and Moser (1980). Only a brief description is presented here. The coding sheet upon which responses were recorded is shown in Figure 2. Three or four elements were coded for each child: model used, correctness, strategy, and if incorrect, error. The codes used were:

Model

C The child used cubes to model (all or part of) the problem.

F The child used fingers to model.

N The child used no physical model.

O The child used some other physical model, such as chairs, numerals on a clock face.

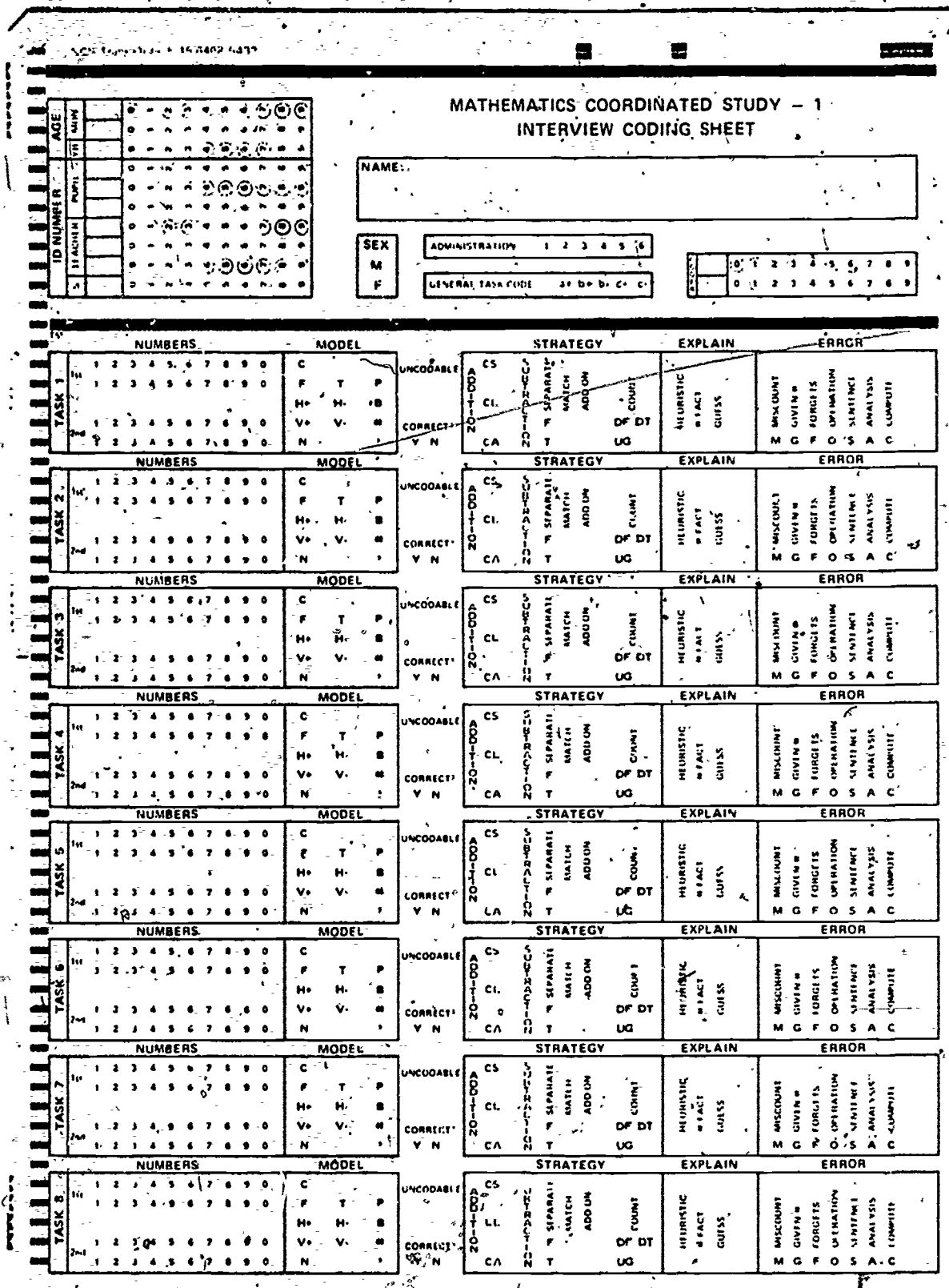

Figure 2. Electronically scored interviewer coding sheet.

H+	The child writes a horizontal addition sentence.
V+	The child writes a vertical addition sentence.
T	The child writes tally marks.
H-	The child writes a horizontal subtraction sentence.
V-	The child writes a vertical subtraction sentence.
P	The child draws a picture (or quasi-picture).
B	The child draws an organizing box.
#	The child writes numbers.

Correctness

Y	The answer was correct.
N	The answer was not correct.
UN	Uncodable: The child gave an answer, but the interviewer was unable to identify the strategy used.

Strategies

CS	The child counts on from smaller.
CL	The child counts on from larger.
S	The child subitizes
CA	The child counts all.
F	The child separates from.
T	The child separates to.
MA	The child matches.
AO	The child adds on.
DF	The child counts down from.
DT	The child counts down to.
UG	The child counts up from given.
HU	The child uses a heuristic.

#F	The child presents a number fact.
OP	The child uses a wrong operation.
AL	The child uses an algorithm.
AA	The child uses an additive algorithm.
AL/OP	The child uses an algorithm with wrong operation.
AA/OP	The child uses an additive algorithm with wrong operation.
QCS	The child uses a quasi-heuristic related to CS.
QCL	The child uses a quasi-heuristic related to CL.
QCA	The child uses a quasi-heuristic related to CA.
QDF	The child uses a quasi-heuristic related to DF.
QDT	The child uses a quasi-heuristic related to DT.
QUG	The child uses a quasi-heuristic related to UG.
UN	The child's response was uncodable.
?	The child was confused.

Errors

M	The child miscounts.
GI	The child repeats given number.
F	The child forgets data.
O	The child uses wrong operation.
S	The child uses wrong sentence.
A	The child uses wrong analysis.
BG	The child makes a computational error.
CO	The child makes a basic fact error.
R	The child makes a representational error.

Individual Student Profiles

A record of each subject's response to the tasks was compiled from the coding sheets. These profiles are the basis for all other statistical information appearing in this paper. The profiles for all subjects are contained in Appendix D. Figure 3 provides an example of a student profile. For each task at each level, the four coded entries in order from left to right are model, correctness, strategy, and error. The abbreviations used are explained in the previous section.

Data Aggregation and Analysis

The data gathered in this study have been summarized in terms of two categories: percent correct and general strategy. The model, strategy, and error data are aggregated into five independent general strategy categories for the B and C problems (direct modeling, use of counting, routine mental operations, non-routine mental operations, and inappropriate), and eight independent general strategy categories for the D and E data (non-sentence/direct modeling, non-sentence/counting, non-sentence/routine mental operation, non-sentence/non-routine mental operation, non-sentence/inappropriate, sentence/algorithms, sentence/non-algorithmic, inappropriate sentence). Details of what specific model, strategy, and error data were used to form these categories are presented in Appendix C.

The plan for analyses of the aggregated data was based on the design model shown in Figure 4. There are two primary dimensions in this model--differences in the level of problem administered and differences in

Student ID Number

415	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
B+	C Y CL -	C Y F -	C Y UG -	C Y CA -	C N OP O	N Y UG -
B-	F N CA M	N Y #F -	N Y HU -	N Y CS -	N Y UN -	N Y #F -
C+	C Y CA -	N N GI GI	C N F M	C Y CA -	C N F M	C Y AO -
C-	N Y CS -	F N F M -	N N UN -	F ? ? -	C Y MA -	N Y AL -

Problem Set Level

model
correct
strategy
error

Figure 3. Sample student profile for a single interview.

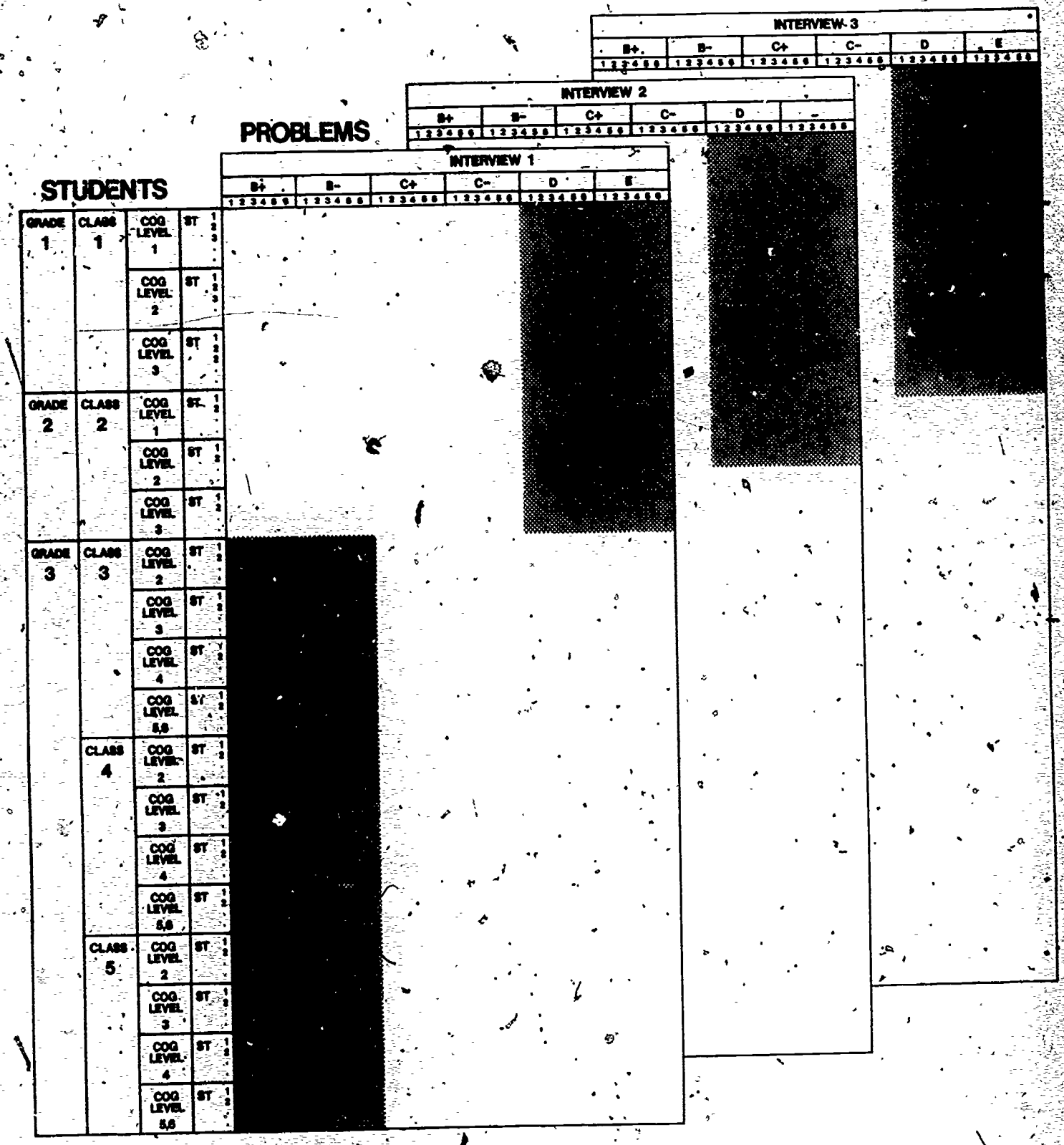

Figure 4. Basic design of the Sandy Bay study: Interviews of children with differing cognitive capability and their performance on verbal addition and subtraction problems.

children's cognitive capacity. The problem dimension involves a complexity crossed repeated assessment (three interviews) of six problem sets (B+, B-, C+, C-, D, and E) with six tasks in each set (joining, separating, . . .). The student dimension involves children nested in cognitive levels within classes and in turn within grades.

The raw data entries for the data matrix are percent correct and general strategy used by a student on each problem. It must be noted that the design yields an incomplete data matrix since Grade 1 and Grade 2 children did not take the D and E problems, the Grade 3 children did not take the B problems, and not all cognitive levels are represented in each grade level.

Ideally, statistical analyses to test main effects and interactions for such a data matrix involves developing log-linear models for an incomplete frequency table, using the Newton-Raphson algorithm for computation of maximum-likelihood estimates in terms of a series of weighted regression analyses, and then testing the estimates (using chi-square statistics) to explore the adequacy of each model (Haberman, 1978). Unfortunately, for this study such a complex analysis was not possible. The small number of subjects, the unequal cell sizes, the extensive incompleteness of the matrix, and lack of resources have limited us to describing the frequencies and testing a few of the differences with chi-square statistics.[1]

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[1] Because of the large number of trials and the lack of a systematic plan to test differences; an alpha level of .01 was arbitrarily chosen to test significance. In addition, tests which yielded probability values between an alpha of .05 and .01 ($.05 > p > .01$) were considered marginally significant. All χ^2 values were calculated via 2 x 2 contingency tables where frequency of correct answers or strategy use was dichotomized.

Correct Answers by Children

The data for percent of items answered correctly by children are summarized first by examining the differences due to problem level and then examining the differences for children with differing cognitive processing capabilities.[2]

Problem sets. The percent correct for the total population over all problem sets is shown in Table 3. Only the E problems are more difficult than any of the others. However, the similarity of percent correct over the B, C, and D problems is artificial since different groups of students were given the different problem types.

Table 3

Frequency and Percent Correct by Level for the Total Population

Level	N	f/%	Trials
B	300	430/72	600
C	774	1117/72	1548
D	456	330/72	456
E	456	282/62	456
Total	1986	2159/71	3060

[2]The basic tables used to construct the following tables appear in Appendix A.

Tasks. Within each problem set, one item representing each of six tasks (joining, separating, part-part-whole missing addend, part-part-whole addition, comparison, and joining missing addend) was given. The aggregated data over all interviews for each task at each level are presented in Table 4. Overall, not surprisingly, the two addition tasks (1 and 4) are easier (81% and 76% correct) than for the four subtraction tasks (2, 3, 4, and 6) (69%, 68%, 56%, and 73% correct). To illustrate some of the differences in percent correct, we have chosen to contrast performance on the separating (Task 2) and the comparison (Task 5) problems. The differences in percent correct on these two tasks (69% and 56%) is significant ($\chi^2 = 13.60$, $p < .01$).

Interviews. Each child was interviewed on three occasions. The first interview was at the start of the Australian school year (February). Thus, we expected some improvement in performance since addition and subtraction skills were emphasized in instruction in all classes. The aggregated data over all problem levels are presented in Table 5. An increase in percent correct occurred for each problem set from the first to third interview. These differences in percent correct were statistically significant for the B ($\chi^2 = 7.75$, $p < .01$), the D ($\chi^2 = 9.96$, $p < .01$) and the E ($\chi^2 = 17.55$, $p < .01$) problem sets. The differences for the C problems were only marginally significant ($\chi^2 = 3.97$, $.01 < p < .05$).

Cognitive level. To examine whether differences in cognitive capacity are reflected in different percentages of correct responses, separate tables are presented for each problem set. In Table 6, the data for the B problems which were given only to Grade 1 and Grade 2

Table 4

Frequency and Percent Correct by Task and Level for the Total Population

	f/%	Trials
Task 1 Joining (+)		
Level		
B	85/85	100
C	201/78	258
D,E	125/82	152
Total	411/81	510
Task 2 Separating (-)		
Level		
B	79/79	100
C	184/71	258
D,E	89/58	152
Total	352/69	510
Task 3 PPW, missing addend (-)		
Level		
B	68/68	100
C	190/74	258
D,E	88/58	152
Total	346/68	510

	f/%	Trials
Task 4 PPW (+)		
Level		
B	80/80	100
C	194/75	258
D,E	115/76	152
Total	389/76	510
Task 5 Comparison (-)		
Level		
B	41/41	100
C	157/58	258
D,E	90/59	152
Total	288/56	510
Task 6 Joining, missing addend (-)		
Level		
B	77/77	100
C	191/74	258
D,E	105/68	152
Total	373/73	510

Table 5

Frequency and Percent Correct by

Level and Interview for the Total Population

Level	Interview	f/%	Trials
B	1	130/64	204
	2	153/75	204
	3	147/77	192
C	1	357/68	528
	2	385/75	516
	3	375/74	504
D	1	100/64	156
	2	105/73	144
	3	125/80	156
E	1	79/51	156
	2	88/61	144
	3	115/74	156

children clearly shows that there is a significant increase in percent correct (56% to 75% to 88%) for children with higher cognitive capacity ($\chi^2 = 47.19$, $p < .01$).

For the C problems given to all children, the percent correct for children at different cognitive levels is shown in Table 7. The differences are striking. The Level 1 children only got 22% correct while for children at Levels 5 and 6 got 96% correct. There is significant increase from Level 1 to Level 2 (22% to 65%, $\chi^2 = 94.38$, $p < .01$), from Level 2 to Level 3 (65% to 81%, $\chi^2 = 26.74$, $p < .01$), and again from Level 4 to Levels 5,6 (83% to 96%, $\chi^2 = 20.49$, $p < .01$).

For the D and E problems given only to Grade 3 children, the pattern of correct responses are very similar (see Tables 8 and 9). Thus, for summary purposes the data have been combined in Table 10. For these students, the difference between correct for children at cognitive Levels 2 and 3 (49% and 67%) is significant ($\chi^2 = 11.76$, $p < .01$) as are the differences between Cognitive Level 4 and Cognitive Level 5,6 children (62% and 83%), $\chi^2 = 30.05$, $p < .01$). Also, there is a drop in performance between Cognitive Level 3 and Level 4 on both sets of problems but these differences are not significant.

Table 6

Frequency and Percent Correct

by Cognitive Level for All Level B Tasks

Cognitive Level	N	f/%	Trials
1	90	100/56	180
2	156	235/75	312
3	54	95/88	108
5,6			
Total	300	430/72	600

Table 7

Frequency and Percent Correct

by Cognitive Level for all Level C Tasks

Cognitive Level	N	f/%	Trials
1	90	40/22	180
2	228	206/65	456
3	198	320/81	396
4	132	220/83	264
5,6	126	241/96	252
Total	774	1117/72	1548

Table 8

Frequency and Percent Correct by

Cognitive Level for All Level D Tasks

	N	f/%	Trials
Cognitive Level			
1			
2	72	41/57	72
3	132	97/73	132
4	126	83/66	126
5,6	126	109/87	126
Total	456	330/72	456

Table 9

Frequency and Percent Correct by

Cognitive Level for All Level E Tasks

	N	f/%	Trials
Cognitive Level			
1			
2	72	30/42	72
3	132	79/60	132
4	126	72/57	126
5,6	126	101/80	126
Total	456	282/62	456

Table 10

Frequency and Percent Correct by Cognitive Level

for All Level D,E Tasks

	N	f/%	Trials
Cognitive Level			
1			
2	72	71/49	144
3	132	176/67	264
4	126	155/62	252
5,6	126	210/83	252
Total	456	612/67	912

Tasks by cognitive level. Within each problem set, one item representing each of six tasks (joining, separating, part-part-whole missing addend, part-part-whole addition, comparison, and joining missing addend) was given. The percent correct data for each cognitive level for each task in the B set of problems are presented in Table 11. The pattern of differences between cognitive levels is consistent with Level 3 children performing better than Level 2 who, in turn, perform better than the Level 1 children.

The percent correct data for each cognitive level on each task for the C set of problems are presented in Table 12. Again a consistent pattern of the higher cognitive level children getting as many or more items correct is apparent with one exception. On Task 3 (part-part-whole missing addend), the Level 4 children do not do as well as the Level 3 children.

The same data for the D and E sets of problems are shown in Table 13. And again, the same pattern is evident except for the Cognitive Level 4 children whose performance is marginally lower than Level 3 children on three of the six tasks (joining, separating, and comparison) and is lower than (about the same as) Level 2 children on the comparison tasks.

Interviews by cognitive level. Each child was interviewed on three occasions. Since the first interview was at the start of the school year and instruction in addition and subtraction comprised a large part of mathematics classes between interviews, we expected improved performance over time. The data for the children at cognitive levels for the three interviews on the B set of problems is shown in Table 14.

Table 11

Frequency and Percent Correct by Cognitive Level for Each Level B Task

	N	f/%	Trials
Task 1 Joining (+)			
Cognitive Level			
1	15	23/77	30
2	26	44/85	52
3	9	18/100	18
4			
5,6			
Total	50	85/85	100
Task 2 Separating (-)			
1	15	21/70	30
2	26	42/81	52
3	9	16/89	18
4			
5,6			
Total	50	79/79	100
Task 3 PPW, missing addend (-)			
1	15	12/40	30
2	26	40/77	52
3	9	16/89	18
4			
5,6			
Total	50	68/68	100
Task 4 PPW (+)			
Cognitive Level			
1	15	21/70	30
2	26	43/83	52
3	9	16/89	18
4			
5,6			
Total	50	80/80	100
Task 5 Comparison (-)			
1	15	7/23	30
2	26	22/42	52
3	9	12/67	18
4			
5,6			
Total	50	41/41	100
Task 6 Joining, missing addend (-)			
1	15	16/53	30
2	26	44/85	52
3	9	17/94	18
4			
5,6			
Total	50	77/77	100

Table 12

Frequency and Percent Correct by Cognitive Level for Each Level C Task

	N	f/%	Trials
Task 1 Joining (+)			
Cognitive Level			
1	15	9/30	30
2	38	55/72	76
3	33	57/86	66
4	22	40/91	44
5,6	21	40/95	42
Total	129	201/78	258
Task 2 Separating (-)			
1	15	7/23	30
2	38	52/68	76
3	33	51/77	66
4	22	34/77	44
5,6	21	40/95	42
Total	129	184/71	258
Task 3 PPW, missing addend (-)			
1	15	6/20	30
2	38	54/71	76
3	33	56/85	66
4	22	33/75	44
5,6	21	41/98	42
Total	129	190/74	258

	N	f/%	Trials
Task 4 PPW (+)			
Cognitive Level			
1	15	11/37	30
2	38	52/68	76
3	33	53/80	66
4	22	38/86	44
5,6	21	40/95	42
Total	129	194/75	258
Task 5 Comparison (-)			
1	15	1/03	30
2	38	30/39	76
3	33	49/74	66
4	22	38/86	44
5,6	21	39/93	42
Total	129	157/58	258
Task 6 Joining, missing addend (-)			
1	15	6/20	30
2	38	53/70	76
3	33	54/82	66
4	22	37/84	44
5,6	21	41/98	42
Total	129	191/74	258

Table 13

Frequency and Percent Correct by Cognitive Level for Each Level D,E Task

	N	f/%	Trials
Task 1 Joining (+)			
Cognitive Level			
1			
2	12	16/67	24
3	22	39/89	44
4	21	33/78	42
5,6	21	37/88	42
Total	76	125/82	152
Task 2 Separating (-)			
1			
2	12	10/42	24
3	22	27/61	44
4	21	21/50	42
5,6	21	31/74	42
Total	76	89/58	152
Task 3 PPW, missing addend (-)			
1			
2	12	9/38	24
3	22	22/50	44
4	21	22/52	42
5,6	21	35/83	42
Total	76	88/58	152

	N	f/%	Trials
Task 4 PPW (+)			
Cognitive Level			
1			
2	12	14/58	24
3	22	31/70	44
4	21	31/74	42
5,6	21	39/93	42
Total	76	115/76	152
Task 5 Comparison (-)			
1			
2	12	12/50	24
3	22	28/64	44
4	21	20/48	42
5,6	21	30/71	42
Total	76	90/59	152
Task 6 Joining, missing addend (-)			
1			
2	12	10/42	24
3	22	29/66	44
4	21	28/67	42
5,6	21	38/90	42
Total	76	105/68	152

Table 14

Frequency and Percent Correct by Cognitive Level and Interview for All Level B Tasks

	N	f/%	Trials
Interview 1			
Cognitive Level			
1	30	28/47	60
2	54	72/67	108
3	18	30/83	36
4			
5,6			
Total	102	130/64	204
Interview 2			
1	30	32/53	60
2	54	87/81	108
3	18	34/94	36
4			
5,6			
Total	102	153/75	204
Interview 3			
1	30	40/67	60
2	48	76/79	96
3	18	31/86	36
4			
5,6			
Total	96	147/77	192

Instruction would appear to have been most beneficial for Cognitive Level 1 children since their scores changed from 47% to 67% correct from the first interview to the third; however, there is clearly a ceiling effect for the children at higher cognitive levels. Also, the pattern of the higher percent correct being achieved by the higher cognitive levels remains constant.

The data for children at differing cognitive levels on the C tasks are shown in Table 15. Here, the performance of the few Level 1 children does not improve while all other groups improve (with one exception) over time and the pattern of higher level yielding higher achievement is generally consistent.

Similar data for the D and E problems sets are presented in Table 16. Here again both improvement over time and higher cognitive level getting higher percent correct is apparent with two exceptions: the Level 4 children slip from Interview 1 to 2 but improve by Interview 2; the Level 5,6 children fail to improve (slip a little) from Interview 2 to 3.

Grade by cognitive level. Since children were also in different grades, differences in children's cognitive levels within each grade were also examined. The data from Grades 1 and 2 on the B problem set appear in Table 17. There is no overall grade effect (68% correct at Grade 1 and 74% at Grade 2), although there is more within grade variance in Grade 2. (See Tables A1-A6 in Appendix A.)

Data for all three grades on the C problem are presented in Table 18. Here there is a significant grade effect. Grade 3 children answer 87% of the problems correct compared to 57% for the Grade 2 children

Table 15

Frequency and Percent Correct by Cognitive Level and Interview for All Level C Tasks

	N	f/%	Trials
Interview 1			
Cognitive Level			
1	30	15/25	60
2	78	89/57	156
3	66	96/73	132
4	48	79/82	96
5,6	42	78/93	84
Total	264	357/68	528
Interview 2			
1	30	17/28	60
2	78	106/68	156
3	66	109/82	132
4	42	72/86	84
5,6	42	81/96	84
Total	258	385/75	516
Interview 3			
1	30	8/13	60
2	72	101/70	144
3	66	115/87	132
4	42	69/82	84
5,6	42	82/98	84
Total	252	375/74	504

Table 16

Frequency and Percent Correct by Cognitive Level and Interview for All Level D,E Tasks

	N	f/%	Trials
Interview 1			
Cognitive Level			
1			
2	24	11/23	48
3	48	54/56	96
4	42	48/57	84
5,6	42	66/78	84
Total	156	179/57	312
Interview 2			
1			
2	24	27/56	48
3	36	50/69	72
4	42	43/51	84
5,6	42	73/87	84
Total	144	193/67	288
Interview 3			
1			
2	24	33/69	48
3	48	72/75	96
4	42	64/76	84
5,6	42	71/84	84
Total	156	240/77	312

Table 17

Frequency and Percent Correct by Cognitive Level and Grade for All Level B Tasks

	N	f/%	Trials
Grade 1			
Cognitive Level			
1	54	66/61	108
2	42	63/75	84
3	18	26/72	36
4			
5,6			
Total	114	155/68	228
Grade 2			
1	36	34/47	72
2	114	172/75	228
3	36	69/96	72
4			
5,6			
Total	186	275/74	372

Table 18

Frequency and Percent Correct by Cognitive Level and Grade for All Level C Tasks

	N	f/%	Trials
Grade 1			
Cognitive Level			
1	54	25/23	108
2	42	46/55	84
3	18	11/30	36
4			
5,6			
Total	114	82/36	228
Grade 2			
1	36	15/21	72
2	114	136/60	228
3	36	62/86	72
4			
5,6			
Total	186	213/57	372
Grade 3			
1			
2	72	114/79	144
3	144	247/86	288
4	132	220/83	264
5,6	126	241/96	252
Total	474	822/87	948

($\chi^2 = 136.89$, $p < .01$) and 36% for the Grade 1 difference ($\chi^2 = 25.64$, $p < .01$). However, the within grade data confirms the overall pattern of the higher the cognitive level the higher the performance.

In summary, although these are important variations in performance due to problem set (size of number), to specific task, to instruction over time and to grade, what is clear is that children who have been identified as having different cognitive processing capabilities consistently perform differently on these addition and subtraction tasks regardless of the other important factors.

Strategies Used by Children

As outlined in the first part of this paper, the data on strategies used by children have been summarized in terms of five categories for the B and C problem sets (direct modeling, counting, routine mental operations, non-routine mental operations, and inappropriate) and eight categories for the D and E problem sets (the same five no sentence categories as for B and C tasks and correct sentence-algorithmic, correct sentence-non-algorithmic, and incorrect sentence).

Problem sets.[3] The overall use of these strategies for the total population over all problem sets is shown in Table 19. No one strategy predominates even though the numbers get larger with different problem sets. For the B and C problems, four of the five categories of strategies are used almost equally overall, and the only shift is from

[3]The basic tables used to construct the following summary tables appear in Appendix B.

Table 19

Frequency of Use of Strategies by Level and Category for the Total Population

	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Level						
B	228/38	80/13	139/23	18/03	135/22	600
C	349/22	393/25	362/23	117/08	327/21	1548
Total	577/27	473/22	501/23	135/06	462/21	2148

	No sentence					Correct sentence		Incorrect sentence	
	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	All strategies f/%	Trials
Level									
D	88/19	106/23	82/18	18/04	60/13	95/21	4/01	3/01	456
E	90/20	90/20	57/12	4/01	100/22	101/22	4/01	10/02	456
Total	178/20	196/21	139/15	22/02	160/18	196/21	8/01	13/01	912

use of direct modeling to use of counting as one goes from the smaller B numbers to the larger numbers in the C problems. These differences in frequencies of use of direct modeling and of counting between the B and C problems out of the total set of responses are both statistically significant ($\chi^2 = 65.25$, $p < .01$; and $\chi^2 = 29.27$, $p < .01$). For the D and E problem sets, only 21% of the children wrote a sentence and worked it algorithmically, although classroom instruction had emphasized algorithmic work. The four major non-sentence categories of strategies continued to be used on the larger numbers in the D and E problem sets, which require regrouping. The only si ificant major shift in the strategy from D to E problems is the increase in use of inappropriate non-sentence strategies ($\chi^2 = 12.12$, $p < .01$). There is also a corresponding decrease in use of routine mental operations, doing the problem in one's head, which is only marginally significant ($\chi^2 = 5.30$, $.01 < p < .05$). Children probably try to work E problems in their heads and get mixed up rather than adopting an efficient strategy which they had been taught.

Tasks. Within each problem set, one item representing each of six tasks (joining, separating, part-part-whole missing addend, part-part-whole addition, comparison, and joining missing addend) is given. The aggregated strategy data over all interviews for each task are presented in Table 20. To illustrate the different strategies used for the tasks, we have again chosen to contrast performances on the separating (Task 2) and the comparison (Task 5) problems. The

Table 20

Frequency of Use of Strategies by Task and Level for the Total Population

	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	Incorrect sentence f/%
Task 1 Joining (+)								
Level								
B	45/45	11/11	27/27	9/09	8/08			
C	57/22	65/25	73/28	26/10	37/14			
D,E	14/09	13/09	49/32	2/01	13/09	59/39	2/01	0/0
Total	116/23	89/17	149/29	37/07	58/11	59/12	2/0	0/0
Task 2 Separating (-)								
B	54/54	5/05	24/24	2/02	15/15			
C	73/28	59/23	46/18	26/10	54/21			
D,E	45/30	18/12	12/08	1/0	20/13	48/31	4/03	4/03
Total	172/34	82/16	82/16	29/06	89/17	48/09	4/01	4/01
Task 3 PPW, missing addend (-)								
B	47/47	4/04	21/21	3/03	25/25			
C	73/28	58/22	57/22	23/09	47/18			
D,E	44/29	36/24	15/10	2/01	36/23	16/10	1/01	2/01
Total	164/32	98/19	93/18	28/05	108/21	16/03	1/0	2/0
Task 4 PPW (+)								
B	52/52	13/13	23/23	1/01	11/11			
C	66/26	73/28	64/25	12/05	43/17			
D,E	17/11	13/09	35/23	0/0	26/17	61/40	0/0	0/0
Total	135/26	99/19	122/24	13/03	80/16	61/12	0/0	0/0

(continued)

Table 20 (continued)

	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	Incorrect sentence f/%
Task 5 Comparison (-)								
Level								
B	15/15	9/09	14/14	1/01	61/61			
C	40/16	68/26	49/19	13/05	88/34			
D,E	27/18	58/38	11/07	7/05	37/24	7/05	0/0	5/03
Total	82/16	135/26	74/15	21/04	186/36	7/01	0/0	5/01
Task 6 Joining, missing addend (-)								
B	15/15	38/38	30/30	2/02	15/15			
C	40/16	70/27	73/28	17/06	58/22			
D,E	31/20	58/38	17/11	10/07	28/18	5/03	1/01	2/01
Total	86/17	166/32	120/23	29/06	101/20	5/01	1/0	2/0

differences in frequency of use of the direct modeling and inappropiate strategies on these two tasks was significant for those who took the D and E problem sets ($\chi^2 = 41.70$, $p < .01$ and $\chi^2 = 86.75$, $p < .01$). The differences in frequ ncy of use of the subtraction algorithm was also significant for those who took the D and E problem sets ($\chi^2 = 38.7$, $p < .01$). Clearly, although both problems can be solved by subtraction, the problems are perceived by students as being quite different, and hence, they use different strategies with each.

Interviews. Each child was interviewed on three occasions. Since the first interview was at the start of the school year and arithmetic instruction comprised a large part of mathematics classes between interviews, one would expect some shifts in use of strategies over time. The aggregated data on use of strategies over all tasks are presented in Table 21.

For the B tasks, there is some fluctuation in use of strategies over the interviews, although direct modeling, use of routine mental operations, and use of inappropriate strategies are most often used and change little from interview to interview.

For the C problems, there are two shifts that are significant. Use of direct modeling drops from 33% on the first interview to 14% on the third ($\chi^2 = 52.81$, $p < .01$). At the same time, use of routine mental operations increases from 10% to 32% ($\chi^2 = 74.19$, $p < .01$). Similarly, for the D and E problems, the use of algorithms increases from 17% to 30% from the first to third interviews ($\chi^2 = 16.45$, $p < .01$).

In both later cases, the increased use of routine arithmetic strategies is consistent with the instructional emphasis in the classes. In fact, what is surprising is that those strategies are only used in less than a third of the problems.

Table 21

Frequency of Use of Strategies by Level, Interview, and Category for the Total Population

Level	Interview	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	Incorrect sentence f/%
B	1	81/40	28/14	51/25	1/0+	43/21			
	2	81/40	17/08	41/20	10/05	55/27			
	3	66/34	35/18	47/24	7/04	37/19			
C	1	175/33	144/27	53/10	41/08	115/22			
	2	104/20	118/23	149/29	28/05	117/23			
	3	70/14	131/26	160/32	48/10	95/19			
D,E	1	69/22	76/24	35/11	11/03	65/21	52/17	2/01	2/01
	2	61/21	55/19	57/20	5/02	53/18	49/17	5/02	3/01
	3	48/15	65/21	47/15	6/02	42/13	95/30	1/00	8/03

In summation, each of the features of the problem dimension in this study yielded interesting results. Different types of strategies are used by children as the problem sets use larger and larger numbers. Different strategies are used with different tasks and there are a few shifts in strategy use from the first interview to the third. In all, this yields a complex picture in which a wide variety of strategies used by children for differing types of problems.

Cognitive level. To examine whether differences in cognitive capacity are reflected in different uses of strategies, separate tables are presented for each problem set. For the B problems given only to Grade 1 and 2 children (Table 22), there was a significant increase in use of routine mental operations (8% to 27% to 36%) for children with higher cognitive capacity ($\chi^2 = 36.97$, $p < .01$) and a corresponding significant decrease in use of an inappropriate strategy (39% to 18% to 7%) ($\chi^2 = 34.80$, $p < .01$). The frequency of use of the other categories remains constant over cognitive levels.

For the C problems given to all children, the strategy data for children with differing cognitive level are shown in Table 23. The picture here is more dramatic. Children at Cognitive Level 1 either directly model the problems (28% of the trials) or use an inappropriate strategy (70% of the trials). Use of an inappropriate strategy goes down consistently with Cognitive Level (70% for Level 1 children to 0% for Level 5,6 children). Direct modeling is the most often used strategy at Cognitive Level 2; counting at Level 3; and routine mental operations at Cognitive Levels 4, and 5,6 where counting was also used frequently.

Table 22

Frequency of Use of Strategy Cognitive Level and Category for All Level B Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Tria
Cognitive Level							
1	90	69/38	20/11	15/08	5/03	71/39	18
2	156	120/38	43/14	85/27	8/02	56/18	31
3	54	39/36	17/16	39/36	5/05	8/07	10
Total	300	228/38	80/13	139/23	18/03	135/22	60

Table 23

Frequency of Use of Strategies by Cognitive Level and Category for All Level C Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Cognitive Level							
1	90	50/28	1/0+	2/01	0/0	127/70	180
2	228	166/36	82/18	59/13	27/06	122/27	456
3	198	71/18	130/33	104/26	38/10	53/13	396
4	132	30/11	79/30	92/35	38/14	25/09	264
5,6	126	32/13	101/40	105/42	14/06	0/0	252
Total	774	349/22	393/25	362/23	117/08	327/21	1548

For the D problems which were taken only by the third-grade children. The strategy data are summarized in Table 24. Between Cognitive Level 2 and Level 5,6, there is a significant increase in use of counting strategies from 12% to 33% ($\chi^2 = 10.40$, $p < .01$) and a corresponding decrease in use of inappropriate strategies from 29% to 2% ($\chi^2 = 30.86$, $p < .01$).

The data for the E problems, also given only to third graders, are summarized in Table 25. As for the D problems from Level 2 to Level 5,6, use of counting strategies increased significantly from 4% to 32% ($\chi^2 = 20.50$, $p < .01$) and use of inappropriate strategies decreased from 44% to 5% ($\chi^2 = 46.52$, $p < .01$). For both Level D tasks and Level E tasks, there was no appreciable increase in use of algorithms by children at higher cognitive levels (D, 21% to 22%; E, 26% to 25%). Since the D and E problems are approached with similar strategies, the data have been combined in Table 26.

Tasks by Cognitive Level

Within each problem set, one item representing each of six tasks (joining, separate, part-part-whole missing addend, part-part-whole addition, comparison, and joining missing addend) was given. The strategy data for each cognitive level for each task for the B set of problems are presented in Table 27. A consistent inverse relationship between use of inappropriate strategies and cognitive level is apparent. Although the percentages of various strategies used with each of the tasks differs, the patterns of use seem to be consistent across cognitive level. For example, direct modeling is not used by very many students

Table 24

Frequency of Use of Strategies by Cognitive Level and Category for All Level D Tasks

	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	Incorrect sentence f/%
Cognitive Level								
2	14/19	9/12	8/11	3/04	21/29	15/21	1/01	1/01
3	29/22	27/20	24/18	5/04	21/16	25/19	0/0	1/01
4	25/20	28/22	23/18	9/07	15/12	24/19	1/01	2/02
5,6	20/16	42/33	27/21	1/01	3/02	31/25	2/02	0/0

Table 25

Frequency of Use of Strategies by Cognitive Level and Category for All Level E Tasks

	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	Incorrect sentence f/%
Cognitive Level								
2	5/07	3/04	7/10	2/03	32/44	19/26	2/03	2/01
3	28/21	30/23	17/13	0/0	30/23	24/18	1/01	2/01
4	29/23	17/13	17/13	1/01	32/25	27/21	0/0	2/02
5,6	28/22	40/32	16/13	1/01	6/05	31/25	1/01	3/02

Table 26

Frequency of Use of Strategies by Cognitive Level and Category for All Level D, E Tasks.

		No sentence					Correct sentence		Incorrect sentence	
	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	All strat. f/%	Trials
Cognitive Level										
2	72	19/13	12/08	15/10	5/03	53/37	34/24	3/02	3/02	144
3	132	57/22	57/22	41/16	5/02	51/19	49/19	1/0	3/01	264
4	126	54/21	45/18	40/16	10/04	47/19	51/20	1/0	4/02	252
5,6	126	48/19	82/32	43/17	2/01	9/03	62/25	3/01	3/01	252
Total	456	178/20	196/21	139/15	22/02	160/18	196/21	8/01	13/01	912

Table 27

Frequency of Use of Strategies by Cognitive Level and Category for Each Level B Task

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
			Task 1 Joining (+)				
Cognitive Level							
1	15	16/53	3/10	3/10	4/13	4/13	30
2	26	23/44	5/10	17/33	3/06	4/08	52
3	9	6/33	3/17	7/39	2/11	0/0	18
Total	50	45/45	11/11	27/27	9/09	8/08	100
			Task 2 Separating (-)				
1	15	17/57	1/03	2/07	0/0	10/33	30
2	26	27/52	3/06	16/31	2/04	4/08	52
3	9	10/56	1/06	6/33	0/0	1/06	18
Total	50	54/54	5/05	24/24	2/02	15/15	100
			Task 3 PPW, missing addend (-)				
1	15	12/40	1/03	2/07	0/0	15/50	30
2	26	26/50	1/02	14/27	1/02	10/19	52
3	9	9/50	2/11	5/28	2/11	0/0	18
Total	50	47/47	4/04	21/21	3/03	25/25	100

(continued)

Table 27 (continued)

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
			Task 4 PPW (+)				
1	15	17/57	3/10	3/10	1/03	6/20	30
2	26	25/48	8/15	14/27	0/0	5/10	52
3	9	10/56	2/11	6/33	0/0	0/0	18
Total	50	52/52	13/13	23/23	1/01	11/11	100
			Task 5 Comparison (-)				
1	15	2/07	1/03	2/07	0/0	25/83	30
2	26	10/19	7/13	4/08	1/02	30/58	52
3	9	3/17	1/06	8/44	0/0	6/33	18
Total	50	15/15	9/09	14/14	1/01	61/61	100
			Task 6 Joining, missing addend (-)				
1	15	5/17	11/37	3/10	0/0	11/37	30
2	26	9/17	19/36	20/38	1/02	3/06	52
3	9	1/06	8/44	7/39	1/06	1/06	18
Total	50	15/15	38/38	30/30	2/02	15/15	100

for the comparison and joining missing addend tasks regardless of cognitive level.

The strategy data for each cognitive level on each task for the C set of problems are presented in Table 28. Again, the use of direct modeling goes down at higher cognitive levels as does use of inappropriate strategies while routine mental operations in general increase. Cognitive Level I children directly model or use inappropriate strategies across all tasks. The use of other strategies varies by task.

The same data for the D and E sets of problems are shown in Table 29, and again the same pattern is evident. Direct modeling strategies are now used only for subtraction tasks. There seems to be no apparent pattern in use of rountine mental operations or algorithms across cognitive levels or different tasks.

Interviews by Cognitive Levels

Each child was interviewed on three occasions. Since the first interview was at the start of the school year and instruction in addition and subtraction comprised a large part of mathematics classes between interviews, we expected improvement in performance over time and perhaps change in strategies to use of routine mental operations and/or algorithms. The data for the children at different cognitive levels for the three interviews on the B set of problems are shown in Table 30. There is no apparent shift in use of strategies over interviews. While there is an increase over time in percent correct (see Table 14), it appears to be due to the most efficient use of various strategies rather than shift in type of strategy used.

Table 28

Frequency of Use of Strategies by Cognitive Level and Category for Each Level C Task

Cognitive Level	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Task 1 Joining (+)							
1	15	11/37	0/0	0/0	0/0	19/63	30
2	38	32/42	13/17	15/20	6/08	10/13	76
3	33	12/18	23/35	19/29	7/11	5/08	66
4	22	1/02	15/34	18/41	7/16	3/07	44
5,6	21	1/02	14/33	21/50	6/14	0/0	42
Total	129	57/22	65/25	73/28	26/10	37/14	258
Task 2 Separating (-)							
1	15	12/40	0/0	0/0	0/0	18/60	30
2	38	33/43	5/06	12/16	5/06	21/28	76
3	33	15/23	17/26	12/18	12/18	10/15	66
4	22	5/11	17/39	12/27	5/11	5/11	44
5,6	21	8/19	20/48	10/24	4/09	0/0	42
Total	129	73/28	59/23	46/18	26/10	54/21	258
Task 3 PPW, missing addend (-)							
1	15	11/37	0/0	1/03	0/0	18/60	30
2	38	32/42	14/18	8/10	5/06	17/22	76
3	33	19/27	17/26	17/26	8/12	5/08	66
4	22	4/09	14/32	11/25	8/18	7/16	44
5,6	21	7/17	13/31	20/48	2/05	0/0	42
Total	129	73/28	58/22	57/22	23/09	47/18	258

Table 28 (continued)

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
			Task 4 PPW (+)				
Cognitive Level							
1	15	11/37	0/0	0/0	0/0	19/63	30
2	38	34/45	18/24	10/13	0/0	14/18	76
3	33	9/14	28/42	17/26	4/06	8/12	66
4	22	7/16	11/25	17/39	7/16	2/04	44
5,6	21	5/12	16/38	20/48	1/02	0/0	42
Total	129	66/26	73/28	64/25	12/05	43/17	258
			Task 5 Comparison (-)				
1	15	1/03	0/0	0/0	0/0	29/97	30
2	38	14/18	12/16	4/05	6/08	40/53	76
3	33	9/14	24/36	16/24	2/03	15/23	66
4	22	9/20	12/27	14/32	5/11	4/09	44
5,6	21	7/17	20/48	15/36	0/0	0/0	42
Total	129	40/16	68/26	49/19	13/05	88/34	258
			Task 6 Joining, missing addend (-)				
1	15	4/13	1/03	1/03	0/0	24/80	30
2	38	21/28	20/26	10/13	5/06	20/26	76
3	33	7/11	21/32	23/35	5/08	10/15	66
4	22	4/09	10/23	20/45	6/14	4/09	44
5,6	21	4/10	18/43	19/45	1/02	0/0	42
Total	129	40/16	70/27	73/28	17/06	58/22	258

Table 29

Frequency of Use of Strategies by Cognitive Level and Category for Each Level D,E Task

		No sentence					Correct sentence		Incorrect sentence	
	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	All strat. f/%	Trials
Task 1 Joining (+)										
Cognitive Level										
2	12	1/04	2/08	2/08	0/0	6/25	12/50	1/04	0/0	24
3	22	7/16	6/14	15/34	1/02	2/04	12/27	1/02	0/0	44
4	21	2/05	2/05	16/38	1/02	5/12	16/38	0/0	0/0	42
5,6	21	4/10	3/07	16/38	0/0	0/0	19/45	0/0	0/0	42
Total	76	14/09	13/09	49/32	2/01	13/09	59/39	2/01	0/0	152
Task 2 Separating (-)										
2	12	4/17	0/0	2/08	0/0	8/33	8/33	1/04	1/04	24
3	22	15/34	7/16	2/04	1/04	6/13	13/29	0/0	0/0	44
4	21	13/31	6/14	6/14	0/0	4/10	11/26	1/02	1/02	42
5,6	21	13/31	5/12	2/05	0/0	2/05	16/38	2/05	2/05	42
Total	76	45/30	18/12	12/08	1/0	20/13	48/31	4/03	4/03	152
Task 3 PPW, missing addend (-)										
2	12	4/17	2/08	3/12	1/04	10/41	4/17	0/0	0/0	24
3	22	13/29	10/23	4/09	0/0	11/25	5/11	0/0	1/02	44
4	21	13/31	7/17	3/07	1/02	13/31	4/09	0/0	1/02	42
5,6	21	14/33	17/40	5/12	0/0	2/05	3/07	1/02	0/0	42
Total	76	44/29	36/24	15/10	2/01	36/23	16/10	1/01	2/01	152

(continued)

Table 29. (continued)

		No sentence					Correct sentence		Incorrect sentence	
	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	All strat. f/%	Trials
Task 4 PPW (+)										
Cognitive Level										
2	12	1/04	1/04	4/17	0/0	10/42	8/33	0/0	0/0	24
3	22	7/16	2/04	12/27	0/0	10/23	13/29	0/0	0/0	44
4	21	5/12	4/09	8/19	0/0	6/14	19/45	0/0	0/0	42
5,6	21	4/09	6/14	11/26	0/0	0/0	21/50	0/0	0/0	42
Total	76	17/11	13/09	35/23	0/0	26/17	61/40	0/0	0/0	152
Task 5 Comparison (-)										
2	12	4/17	4/17	2/08	0/0	12/50	2/08	0/0	0/0	24
3	22	8/18	16/36	3/07	1/02	11/25	3/07	0/0	2/04	44
4	21	9/21	13/31	3/07	5/12	10/24	0/0	0/0	2/05	42
5,6	21	6/14	25/60	3/07	1/02	4/09	2/05	0/0	1/02	42
Total	76	27/18	58/38	11/07	7/05	37/24	7/05	0/0	5/03	152
Task 6 Joining, missing addend (-)										
2	12	5/21	3/12	2/08	4/17	7/29	0/0	1/04	2/08	24
3	22	7/16	16/36	5/11	2/04	11/25	3/07	0/0	0/0	44
4	21	12/29	13/31	4/09	3/07	9/21	1/02	0/0	0/0	42
5,6	21	7/17	26/62	6/14	1/02	1/02	1/02	0/0	0/0	42
Total	76	31/20	58/38	17/11	10/07	28/18	5/03	1/01	2/01	152

Table 30

Frequency of Use of Strategies by Cognitive Level, Category, and Interview for All Level B Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Interview 1							
Cognitive Level							
1	30	23/38	7/12	6/10	0/0	24/40	60
2	54	48/44	16/15	27/25	1/01	16/15	108
3	18	10/28	5/14	18/50	0/0	3/08	36
Total	102	81/40	28/14	51/25	1/0+	43/21	204
Interview 2							
1	30	21/35	3/05	6/10	2/03	28/47	60
2	54	43/40	9/08	25/23	6/05	25/23	108
3	18	17/47	5/14	10/28	2/06	2/06	36
Total	102	81/40	17/08	41/20	10/05	55/27	204
Interview 3							
1	30	25/42	10/17	3/05	3/05	19/32	60
2	48	29/30	18/19	33/34	1/01	15/16	96
3	18	12/33	7/19	11/31	3/08	3/08	36
Total	96	66/34	35/18	47/24	7/04	37/19	192

The data for children at differing cognitive levels on the C tasks are shown in Table 31. There is an increase in use of routine mental operations and a corresponding decrease in direct modeling. This is apparent particularly for children at the higher cognitive levels. Thus, there is some influence of instruction. However, there is no apparent change in use of inappropriate strategies across interviews.

Similar data for the D and E problem sets are presented in Table 32. The effect of instruction is clearly evident in the increase in use of algorithms. This use is across all cognitive levels and not limited to the higher cognitive levels. At the same time, there is a corresponding decrease in the use of direct modeling and inappropriate strategies.

Grade by Cognitive Levels

Since children were also in different grades, differences in children at different cognitive levels within each grade were also examined. The data from Grades 1 and 2 on the B problem set appear in Table 33. A grade effect is apparent since there is an increased use of routine mental operations between grades from 18% at Grade 1 to 26% at Grade 2 and an increase in use of direct modeling from 30% at Grade 1 to 43% at Grade 2. There are also corresponding slight reductions in use of both inappropriate strategies and counting strategies.

Data for all three grades on the strategies used for the C problems are presented in Table 34. There is a reduction in the use of inappropriate

Table 31

Frequency of Use of Strategies by Cognitive Level, Category, and Interview for All Level C Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Interview 1							
Cognitive Level							
1	30	21/35	0/0	0/0	0/0	39/65	60
2	78	70/45	25/16	5/03	9/06	47/30	156
3	66	40/30	43/32	19/14	10/08	20/15	132
4	48	21/22	35/36	17/18	14/14	9/09	96
5,6	42	23/27	41/49	12/14	8/10	0/0	84
Total	264	175/33	144/27	53/10	41/08	115/22	528
Interview 2							
1	30	13/22	0/0	0/0	0/0	47/78	60
2	78	50/32	28/18	29/18	5/03	44/28	156
3	66	23/17	35/26	43/32	12/09	19/14	132
4	42	9/11	20/24	38/45	10/12	7/08	84
5,6	42	9/11	35/42	39/46	1/01	0/0	84
Total	258	104/20	118/23	149/29	28/05	117/23	516
Interview 3							
1	30	16/25	1/02	2/03	0/0	41/68	60
2	72	46/32	29/20	25/17	13/09	31/22	144
3	66	8/06	52/39	42/32	16/12	14/11	132
4	42	0/0	24/28	37/44	14/17	9/11	84
5,6	42	0/0	25/30	54/64	5/06	0/0	84
Total	252	70/14	131/26	160/32	48/10	95/19	504

Table 32

Frequency of Use of Strategies by Cognitive Level, Category, and Interview for All Level D,E Tasks

		No sentence					Correct sentence		Incorrect sentence	
	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Alg. f/%	Non-alg. f/%	All strat. f/%	Trials
Interview 1										
Cognitive Level										
2	24	3/06	4/08	5/10	3/06	24/50	8/17	1/02	0/0	48
3	48	15/16	26/27	8/08	3/03	25/26	18/19	1/01	0/0	96
4	42	19/23	21/25	10/12	3/04	14/17	16/19	0/0	1/01	84
5,6	42	32/38	25/30	12/14	2/02	2/02	10/12	0/0	1/01	84
Total	156	69/22	76/24	35/11	11/03	65/21	52/17	2/01	2/01	312
Interview 2										
2	24	13/27	2/04	10/21	1/02	14/29	6/12	1/02	1/02	48
3	36	21/29	11/15	14/19	0/0	17/24	9/12	0/0	0/0	72
4	42	17/20	12/14	17/20	4/05	18/21	14/17	1/01	1/01	84
5,6	42	10/12	30/36	16/19	0/0	4/05	20/24	3/04	1/01	84
Total	144	61/21	55/19	57/20	5/02	53/18	49/17	5/02	3/01	288
Interview 3										
2	24	3/06	6/12	0/0	1/02	15/31	20/42	1/02	2/04	48
3	48	21/22	20/21	19/20	2/02	9/09	22/23	0/0	3/03	96
4	42	18/21	12/14	13/15	3/04	15/18	21/25	0/0	2/02	84
5,6	42	6/07	27/32	15/18	0/0	3/04	32/38	0/0	1/01	84
Total	156	48/15	65/21	47/15	6/02	42/13	95/30	1/0	8/03	312

Table 33

Frequency of Use of Strategies by Cognitive Level, Category, and Grade for All Level B Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Grade 1							
Cognitive Level							
1	54	35/32	18/17	15/14	3/03	37/34	108
2	42	14/17	24/29	24/29	4/05	18/21	84
3	18	19/53	8/22	3/08	0/0	6/17	36
Total	114	68/30	50/21	42/18	7/03	61/27	228
Grade 2							
1	36	34/47	2/03	0/0	2/03	34/47	72
2	114	106/46	19/08	61/27	4/02	38/17	228
3	36	20/28	9/12	36/50	5/07	2/03	72
Total	186	160/43	30/08	97/26	11/03	74/20	372

Table 34

Frequency of Use of Strategies by Cognitive Level, Category, and Grade for All Level C Tasks

	N	Direct modeling f/%	Counting f/%	Routine mental op. f/%	Nonroutine mental op. f/%	Inapprop. f/%	Trials
Grade 1							
Cognitive Level							
1	54	35/32	0/0	2/02	0/0	71/66	108
2	42	36/43	14/17	3/04	2/02	29/34	84
3	18	15/42	2/06	0/0	0/0	19/53	36
4							
5,6							
Total	114	86/38	16/07	5/02	2/01	119/52	228
Grade 2							
1	36	15/21	1/01	0/0	0/0	56/78	72
2	114	116/51	23/10	19/08	6/03	64/28	228
3	36	16/22	26/36	5/07	20/28	5/07	72
4							
5,6							
Total	186	147/40	50/13	24/06	26/07	125/34	372
Grade 3							
1							
2	72	14/10	45/31	37/26	19/13	29/20	144
3	144	39/14	102/35	100/35	18/06	29/10	288
4	132	30/11	79/30	92/35	38/14	25/09	264
5,6	126	32/13	101/40	105/42	14/06	0/0	252
Total	474	115/12	327/34	334/35	89/09	83/09	948

strategies by grades; there is still a significant difference between use of inappropriate strategies and cognitive level of the students. Also, from first to third grade, there is a reduction in use of direct modeling strategies and an increase in the use of counting skills and routine mental operations. These are overall changes not restricted to cognitive level. Thus, while there is a distinct effect due to grade, the effect due to cognitive level is still very strong.

In Summary

There are important variations in strategies used due to problem set (size of number), to specific tasks, to instruction over time, and to grade. Yet, what is clear from all these data is that children who have been identified as having different cognitive processing capabilities consistently use different strategies on these addition and subtraction tasks regardless of the other important factors.

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Appendix A

BASIC PERCENT CORRECT TABLES

Appendix A1

Task 1 Joining (+)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	3	3/100	2/67	5/83	6	2	1/50	1/50	2/50	4
2	3	2/67	2/67	4/67	6	6	5/83	5/83	10/83	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	7	6/86	5/71	11/78	14	10	8/80	8/80	16/80	20
Interview 2										
1	3	3/100	2/67	5/83	6	2	1/50	2/100	3/75	4
2	2	1/50	1/50	2/50	4	7	7/100	7/100	14/100	14
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	5/83	4/67	9/75	12	11	10/91	11/100	21/95	22
Interview 3										
1	3	3/100	3/100	6/100	6	2	2/100	0/0	2/50	4
2	2	2/100	2/100	4/100	4	6	6/100	4/67	10/83	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	6/100	6/100	12/100	12	10	10/100	6/60	16/80	20

Appendix A2

Task 2 Separating (-)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	3	2/67	3/100	5/83	6	2	2/100	1/50	3/75	4
2	3	3/100	3/100	6/100	6	6	4/67	4/67	8/67	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	7	6/86	7/100	13/93	14	10	8/80	7/70	15/75	20
Interview 2										
1	3	3/100	1/33	4/67	6	2	2/100	0/0	2/50	4
2	2	1/50	2/100	3/75	4	7	6/86	6/86	12/86	14
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4
Total	6	5/83	3/50	8/67	12	11	10/91	8/73	18/82	22
Interview 3										
1	3	3/100	2/67	5/83	6	2	2/100	0/0	2/50	4
2	2	2/100	2/100	4/100	4	6	6/100	3/50	9/75	12
3	1	0/0	1/100	1/50	2	2	2/100	2/100	4/100	4
Total	6	5/83	5/83	10/83	12	10	10/100	5/50	15/75	20

Appendix A3

Task 3 · PPW, missing addend (-)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	3	2/67	0/0	2/33	6	2	1/50	0/0	1/25	4
2	3	3/100	2/67	5/83	6	6	4/67	4/67	8/67	12
3	1	0/0	1/100	1/50	2	2	2/100	2/100	4/100	4
Total	7	5/71	3/43	8/57	14	10	7/70	6/60	13/65	20
Interview 2										
1	3	2/67	0/0	2/33	6	2	1/50	1/50	2/50	4
2	2	2/100	2/100	4/100	4	7	5/71	6/86	11/78	
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	5/83	3/50	8/67	12	11	8/73	9/82	17/77	22
Interview 3										
1	3	1/33	2/67	3/50	6	2	1/50	1/50	2/50	4
2	2	1/50	1/50	2/50	4	6	4/67	6/100	10/83	12
3	1	0/0	1/100	1/50	2	2	2/100	2/100	4/100	4
Total	6	2/33	4/67	6/50	12	10	7/70	9/90	16/80	20

Appendix A4

Task 4 PFW (+)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	3	3/100	2/67	5/83	6	2	0/0	1/50	1/25	4
2	3	2/67	2/67	4/67	6	6	4/67	4/67	8/67	12
3	1	1/100	0/0	1/50	2	2	1/50	2/100	3/75	4
Total	7	6/86	4/57	10/71	14	10	5/50	7/70	12/60	20
Interview 2										
1	3	1/33	2/67	3/50	6	2	2/100	2/100	4/100	4
2	2	1/50	2/100	3/75	4	7	7/100	6/86	13/93	14
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	3/50	5/83	8/67	12	11	11/100	10/91	21/95	22
Interview 3										
1	3	2/67	2/67	4/67	6	2	2/100	2/100	4/100	4
2	2	2/100	2/100	4/100	4	6	6/100	5/83	11/92	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	5/83	5/83	10/83	12	10	10/100	9/90	19/95	20

Appendix A5

Task 5 Comparison, (-)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	3	0/0	1/33	1/17	6	2	0/0	0/0	0/0	4
2	3	1/33	1/33	2/33	6	6	3/50	3/50	6/50	12
3	1	0/0	0/0	0/0	2	2	1/50	2/100	3/75	4
Total	7	1/14	2/28	3/21	14	10	4/40	5/50	9/45	20
Interview 2										
1	3	1/33	1/33	2/33	6	2	0/0	0/0	0/0	4
2	2	1/50	1/50	2/50	4	7	2/28	4/57	6/43	14
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	3/50	3/50	6/50	12	11	4/36	6/54	10/45	22
Interview 3										
1	3	2/67	2/67	4/67	6	2	0/0	0/0	0/0	4
2	2	1/50	1/50	2/50	4	6	2/33	2/33	4/33	12
3	1	0/0	0/0	0/0	2	2	2/100	1/50	3/75	4
Total	6	3/50	3/50	6/50	12	10	4/40	3/30	7/35	20

Appendix A6

Task 6 Joining, missing addend (-)

Frequency and Percent Correct by Cognitive Level, Task Level (B+, B-), Grade, and Interview

	Grade 1					Grade 2				
		B+	B-	Total			B+	B-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1										
Cognitive Level										
1	2	2/67	1/33	3/50	6	2	0/0	0/0	0/0	4
2	3	2/67	2/67	4/67	6	6	2/33	5/83	7/58	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	7	5/71	4/57	9/64	14	10	4/40	7/70	11/55	20
Interview 2										
1	3	2/67	0/0	2/33	6	2	2/100	1/50	3/75	4
2	2	2/100	2/100	4/100	4	7	6/86	7/100	13/93	14
3	1	0/0	1/100	1/50	2	2	2/100	2/100	4/100	4
Total	6	4/67	3/50	7/58	12	11	10/91	10/91	20/91	22
Interview 3										
1	3	3/100	2/67	5/83	6	2	2/100	1/50	3/75	4
2	2	2/100	2/100	4/100	4	6	6/100	6/100	12/100	12
3	1	1/100	1/100	2/100	2	2	2/100	2/100	4/100	4
Total	6	6/100	5/83	11/92	12	10	10/100	9/90	19/95	20

Appendix A7

Task 1 Joining (+)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	2/67	0/0	2/33	6	2	1/50	0/0	1/25	4					
2	3	1/33	2/67	3/50	6	6	2/33	4/67	6/50	12	4	4/100	4/100	8/100	8
3	1	0/0	0/0	0/0	2	2	2/100	1/50	3/75	4	8	7/88	8/100	15/94	16
4											8	6/75	8/100	14/88	16
5,6											7	5/71	7/100	12/86	14
Total	7	3/43	2/29	5/36	14	10	5/50	5/50	10/50	20	27	22/81	27/100	49/91	54
Interview 2															
1	3	2/67	0/0	2/33	6	2	1/50	2/100	3/75	4					
2	2	1/50	1/50	2/50	4	7	6/86	4/57	10/71	14	4	4/100	4/100	8/100	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	6/75	14/88	16
4											7	7/100	6/86	13/93	14
5,6											7	7/100	7/100	14/100	14
Total	6	4/67	1/17	5/42	12	11	9/82	8/73	17/77	22	26	26/100	23/88	49/94	52
Interview 3															
1	3	1/33	0/0	1/17	6	2	0/0	0/0	0/0	4					
2	2	2/100	0/0	2/50	4	6	4/67	5/83	9/75	12	4	4/100	3/75	7/88	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	7/88	15/94	16
4											7	7/100	6/86	13/93	14
5,6											7	7/100	7/100	14/100	14
Total	6	4/67	0/0	4/33	12	10	6/60	7/70	13/65	20	26	26/100	23/88	49/94	52

Appendix A8

Task 2 Separating (-)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	2/67	1/33	3/50	6	2	1/50	0/0	1/25	4					
2	3	0/0	1/33	1/17	6	6	4/67	4/67	8/67	12	4	4/100	2/50	6/75	8
3	1	0/0	0/0	0/0	2	2	1/50	1/50	2/50	4	8	7/88	5/62	12/75	16
4											8	5/62	7/88	12/75	16
5,6											7	5/71	7/100	12/86	14
Total	7	2/29	2/29	4/29	14	10	6/60	5/50	11/55	20	27	21/78	21/78	42/78	54
Interview 2															
1	3	2/66	0/0	2/33	6	2	1/50	0/0	1/25	4					
2	2	2/100	1/50	3/75	4	7	6/86	5/71	11/78	14	4	3/75	3/75	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	1/50	3/75	4	8	6/75	6/75	12/75	16
4											7	6/86	6/86	12/86	14
5,6											7	7/100	7/100	14/100	14
Total	6	5/83	1/17	6/50	12	11	9/82	6/54	15/68	22	26	22/85	22/85	44/85	52
Interview 3															
1	3	0/0	0/0	0/0	6	2	0/0	0/0	0/0	4					
2	2	2/100	0/0	2/50	4	6	5/83	4/67	9/75	12	4	3/75	3/75	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	8/100	16/100	16
4											7	5/71	5/71	10/71	14
5/6											7	7/100	7/100	14/100	14
Total	6	3/50	0/0	3/25	12	10	7/70	6/60	13/65	20	26	23/88	23/88	46/88	52

Appendix A9

Task 3 PPW, missing addend -(-)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	2/67	0/0	2/33	6	2	1/50	0/0	1/25	4					
2	3	1/33	2/67	3/50	6	6	4/67	2/33	6/50	12	4	3/75	4/100	7/88	8
3	1	0/0	0/0	0/0	2	2	1/50	1/50	2/50	4	8	7/88	7/88	14/88	16
4											8	7/88	8/100	15/94	16
5,6											7	7/100	7/100	14/100	14
Total	7	3/43	2/29	5/36	14	10	6/60	3/30	9/45	20	27	24/89	26/96	50/93	54
Interview 2															
1	3	1/33	0/0	1/17	6	2	0/0	0/0	0/0	4					
2	2	2/100	2/100	4/100	4	7	6/86	2/28	8/57	14	4	3/75	3/75	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	7/88	15/94	16
4											7	3/43	5/71	8/57	14
5,6											7	7/100	7/100	14/100	14
Total	6	4/67	2/33	6/50	12	11	8/73	4/36	12/54	22	26	21/81	22/85	43/83	52
Interview 3															
1	3	1/33	0/0	1/17	6	2	1/50	0/0	1/25	4					
2	2	2/100	1/50	3/75	4	6	6/100	5/83	11/92	12	4	4/100	2/50	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	7/88	15/94	16
4											7	5/71	5/71	10/71	14
5,6											7	7/100	6/86	13/93	14
Total	6	4/67	1/17	5/42	12	10	9/90	7/70	16/80	20	26	24/92	20/77	44/85	52

Appendix A10

Task 4 PPW (+)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	2/67	1/33	3/50	6	2	1/50	0/0	1/25	4					
2	3	3/100	1/33	4/67	6	6	4/67	4/67	8/67	12	4	1/25	2/50	3/37	8
3	1	1/100	0/0	1/50	2	2	2/100	1/50	3/75	4	8	7/88	6/75	13/81	16
4											8	6/75	6/75	12/75	16
5,6											7	7/100	5/71	12/86	14
Total	7	6/86	2/29	8/57	14	10	7/70	5/50	12/60	20	27	21/78	19/70	40/74	54
Interview 2															
1	3	1/33	2/67	3/50	6	2	1/50	0/0	1/25	4					
2	2	1/50	1/50	2/50	4	7	6/86	3/43	9/64	14	4	4/100	4/100	8/100	8
3	1	0/0	0/0	0/0	2	2	2/100	2/100	4/100	4	8	7/88	7/88	14/88	16
4											7	7/100	7/100	14/100	14
5,6											7	7/100	7/100	14/100	14
Total	6	2/33	3/50	5/42	12	11	9/82	5/45	14/64	22	26	25/96	25/96	50/96	52
Interview 3															
1	3	2/67	0/0	2/33	6	2	1/50	0/0	1/25	4					
2	2	2/100	1/50	3/75	4	6	4/67	5/83	9/75	12	4	4/100	2/50	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	7/88	6/75	13/81	16
4											7	7/100	5/71	12/86	14
5/6											7	7/100	7/100	14/100	14
Total	6	5/83	1/17	6/50	12	10	7/70	7/70	14/70	20	26	25/96	20/77	45/86	52

Appendix A11

Task 5 Comparison (-)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	0/0	0/0	0/0	6	2	0/0	0/0	0/0	4					
2	3	2/67	1/33	3/50	6	6	2/33	1/17	3/25	12	4	3/75	2/50	5/62	8
3	1	0/0	0/0	0/0	2	2	2/100	1/50	3/75	4	8	7/88	5/62	12/75	16
4											8	7/88	6/75	13/81	16
5,6											7	7/100	7/100	14/100	14
Total	7	2/29	1/14	3/21	14	10	4/40	2/20	6/30	20	27	24/89	20/74	44/81	54
Interview 2															
1	3	1/33	0/0	1/17	6	2	0/0	0/0	0/0	4					
2	2	1/50	0/0	1/25	4	7	3/43	1/14	4/29	14	4	3/75	3/75	6/75	8
3	1	1/100	0/0	1/50	2	2	1/50	2/100	3/75	4	8	7/88	6/75	13/81	16
4											7	6/86	7/100	13/93	14
5,6											7	7/100	5/71	12/86	14
Total	6	3/50	0/0	3/25	12	11	4/36	3/27	7/32	22	26	23/88	21/81	44/85	52
Interview 3															
1	3	0/0	0/0	0/0	6	2	0/0	0/0	0/0	4					
2	2	0/0	0/0	0/0	4	6	1/17	1/17	2/17	12	4	3/75	3/75	6/75	8
3	1	0/0	0/0	0/0	2	2	2/100	2/100	4/100	4	8	6/75	7/88	13/81	16
4											7	6/86	6/86	12/86	14
5,6											7	6/86	7/100	13/93	14
Total	6	0/0	0/0	0/0	12	10	3/30	3/30	6/30	20	26	21/81	23/88	44/85	52

Appendix A12

Task 6 Joining, missing addend (-)

Frequency and Percent Correct by Cognitive Level, Task Level (C+, C-), Grade, and Interview

	Grade 1					Grade 2					Grade 3				
		C+	C-	Total			C+	C-	Total			C+	C-	Total	
	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials	N	f/%	f/%	f/%	Trials
Interview 1															
Cognitive Level															
1	3	1/33	0/0	1/17	6	2	0/0	0/0	0/0	4					
2	3	3/100	1/33	4/67	6	6	3/50	1/17	4/33	12	4	3/75	4/100	7/88	8
3	1	0/0	0/0	0/0	2	2	2/100	2/100	4/100	4	8	5/62	7/88	12/75	16
4											8	6/75	7/88	13/81	16
5,6											7	7/100	7/100	14/100	14
Total	7	4/57	1/14	5/36	14	10	5/50	3/30	8/40	20	27	21/78	25/93	46/85	54
Interview 2															
1	3	0/0	0/0	0/0	6	2	1/50	2/100	3/75	4					
2	2	2/100	1/50	3/75	4	7	6/86	3/43	9/64	14	4	3/75	3/75	6/75	8
3	1	1/100	0/0	1/50	2	2	2/100	1/50	3/75	4	8	7/88	8/100	15/94	16
4											7	6/86	6/86	12/86	14
5,6											7	6/86	7/100	13/93	14
Total	6	3/50	1/17	4/33	12	11	9/82	6/54	15/68	22	26	22/85	24/92	46/88	52
Interview 3															
1	3	1/33	0/0	1/17	6	2	1/50	0/0	1/25	4					
2	2	2/100	1/50	3/75	4	6	6/100	4/67	10/83	12	4	3/75	4/100	7/88	8
3	1	1/100	0/0	1/50	2	2	2/100	2/100	4/100	4	8	8/100	6/75	14/88	16
4											7	6/86	6/86	12/86	14
5,6											7	7/100	7/100	14/100	14
Total	6	4/67	1/17	5/42	12	10	9/90	6/60	15/75	20	26	24/92	23/88	47/90	52

Appendix A13

Task 1 Joining (+)

Frequency and Percent Correct by Cognitive Level, Task Level (D,E), and Interview

Grade 3

		D	E		
	N	f/%	f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	2/50	2/50	4/50	8
3	8	8/100	5/62	13/81	16
4	7	6/86	5/71	11/78	14
5,6	7	5/71	6/86	11/78	14
Total	26	21/81	18/69	39/75	52
Interview 2					
2	4	3/75	1/25	4/50	8
3	6	6/100	6/100	12/100	12
4	7	6/86	4/57	10/71	14
5,6	7	7/100	5/71	12/86	14
Total	24	22/92	16/67	38/79	48
Interview 3					
2	4	4/100	4/100	8/100	8
3	8	7/88	7/88	14/88	16
4	7	6/86	6/86	12/86	14
5,6	7	7/100	7/100	14/100	14
Total	26	24/92	24/92	48/92	52

Appendix A14

Task 2 Separating (-)

Frequency and Percent Correct by Cognitive Level

Task Level (D,E), and Interview

Grade 3

		D	E		
	N	f/%	f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	1/25	0/0	1/12	8
3	8	6/75	2/25	8/50	16
4	7	3/43	2/28	5/36	14
5,6	7	5/71	4/57	9/64	14
Total	26	15/58	8/31	23/44	52
Interview 2					
2	4	2/50	1/25	3/37	8
3	6	5/83	2/33	7/58	12
4	7	3/43	4/57	7/50	14
5,6	7	6/86	5/71	11/78	14
Total	24	16/67	12/50	28/58	48
Interview 3					
2	4	3/75	3/75	6/75	8
3	8	6/75	6/75	12/75	16
4	7	5/71	4/57	9/64	14
5,6	7	6/86	5/71	11/78	14
Total	26	20/77	18/69	38/73	52

Appendix A15

Task 3 PPW, missing addend (-)

Frequency and Percent Correct by Cognitive Level,

Task Level (D,E), and Interview

Grade 3

	N	D f/%	E f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	1/25	0/0	1/12	8
3	8	4/50	1/12	5/31	16
4	7	2/28	4/57	6/43	14
5,6	7	5/71	6/86	11/78	14
Total	26	12/46	11/42	23/44	52
Interview 2					
2	4	2/50	1/25	3/37	8
3	6	3/50	3/50	6/50	12
4	7	4/57	2/28	6/43	14
5,6	7	6/86	5/71	11/78	14
Total	24	15/62	11/46	26/54	48
Interview 3					
2	4	3/75	2/50	5/62	8
3	8	7/88	4/50	11/69	16
4	7	6/86	4/57	10/71	14
5,6	7	6/86	7/100	13/93	14
Total	26	22/85	17/65	39/75	52

Appendix A16

Task 4 PPW (+)

Frequency and Percent Correct by Cognitive Level

Task Level (D,E), and Interview

Grade 3

		D	E		
	N	f/%	f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	2/50	0/0	2/25	8
3	8	4/50	5/62	9/56	16
4	7	6/86	5/71	11/78	14
5,6	7	5/71	6/86	11/78	14
Total	26	17/65	16/61	33/63	52
Interview 2					
2	4	3/75	2/50	5/62	8
3	6	3/50	5/83	8/67	12
4	7	4/57	4/57	8/57	14
5,6	7	7/100	7/100	14/100	14
Total	24	17/71	18/75	35/73	48
Interview 3					
2	4	3/75	4/100	7/87	8
3	8	7/88	7/88	14/88	16
4	7	7/100	5/71	12/86	14
5,6	7	7/100	7/100	14/100	14
Total	26	24/92	23/88	47/90	52

Appendix A17

Task 5 Comparison (-)

Frequency and Percent Correct by Cognitive Level,

Task Level (D,E), and Interview

Grade 3

		D	E		
	N	f/%	f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	1/25	0/0	1/12	8
3	8	5/62	4/50	9/	16
4	7	3/43	2/28	5/36	14
5,6	7	6/86	4/57	10/71	14
Total	26	15/58	10/38	25/48	52
Interview 2					
2	4	3/75	4/100	7/87	8
3	6	6/100	4/67	10/83	12
4	7	3/43	4/57	7/50	14
5,6	7	7/100	5/71	12/86	14
Total	24	19/79	17/71	36/75	48
Interview 3					
2	4	2/50	2/50	4/50	8
3	8	4/50	5/62	9/56	16
4	7	4/57	4/57	8/57	14
5,6	7	4/57	4/57	8/57	14
Total	26	14/54	15/58	29/56	52

Appendix A18

Task 6 Joining, missing addend (-)

Frequency and Percent Correct by Cognitive Level, Task Level (D,E), and Interview

Grade 3

		D	E		
	N	f/%	f/%	Total	Trials
Interview 1					
Cognitive Level					
2	4	1/25	1/25	2/25	8
3	8	6/75	4/50	10/62	16
4	7	6/86	4/57	10/71	14
5,6	7	7/100	7/100	14/100	14
Total	26	20/77	16/61	36/69	52
Interview 2					
2	4	4/100	1/25	5/62	8
3	6	3/50	4/67	7/58	12
4	7	2/28	3/43	5/36	14
5,6	7	7/100	6/86	13/93	14
Total	24	16/67	14/58	30/62	48
Interview 3					
2	4	1/25	2/50	3/37	8
3	8	7/88	5/62	12/75	16
4	7	7/100	6/86	13/93	14
5,6	7	6/86	5/71	11/78	14
Total	26	21/81	18/69	39/75	52

Appendix B

BASIC STRATEGY TABLES

Appendix B1

Task 1 Joining (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies											
		CA		CS		CL		# Fact		Sub		Heur		Guess		Confused ?		Uncod		Giv #		Oper		Not adm	
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																									
Cognitive Level																									
1	3	1	2	1	1			1																	6
2	3	1			1			1	1			1						1							6
3	1	1	1																						2
Total	7	3	3	1	2	0		2	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	14
Interview 2, Grade 1																									
1	3	2	1					1				1							1							6
2	2		1			1												1	1							4
3	1	1	1																							2
Total	6	3	3	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	2	0	0	0	0	0	0	12
Interview 3, Grade 1																									
1	3	1	1		1			1		1	1															6
2	2	1			1	1	1																			4
3	1			1			1																			2
Total	6	2	1	1	2	1	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Interview 1, Grade 2																									
1	2	2	1																					1		4
2	6	5	3					1	3																	12
3	2	1						1	2																	8
Total	10	8	4	0	0	0	0	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	20

(continued)

Appendix B1' (continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation		Inappropriate Strategies												
		CA		CS		CL		# Fact		Sub		Heur		Guess		? Confused		Uncod		Giv.#		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 2, Grade 2																										
1	2		2							1								1								4
2	7	4	3					2	3	1	1															14
3	2	1						1	1		1															4
Total	11	5	5	0	0	0	0	3	4	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	22
Interview 3, Grade 2																										
1	2	2	1															1								4
2	6	3	2					3	3									1								12
3	2					1		1	1		1															4
Total	10	5	3	0	0	1	0	4	4	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	20

Appendix B2

Task 2 Separating (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies												
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																																
Cognitive Level																																
1	3	1	1	1												2								1							6
2	3	1	1							1						2	1															6
3	1	1	1																													2
Total	7	3	3	1	0	0	0	0	0	0	1	0	0	0	0	2	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	14
Interview 2, Grade 1																																
1	3	3								1														1		1						6
2	2															2	1					1										4
3	1	1																		1												2
Total	6	4	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	12
Interview 3, Grade 1																																
1	3	2	2																	1								1				6
2	2	1												1		1	1															4
3	1	1	1																													2
Total	6	4	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	12
Interview 1, Grade 2																																
1	2	2	1																											1		4
2	6	5	4									1				1	1															12
3	2		1													2	1															
Total	10	7	6	0	0	0	0	0	0	0	0	0	0	1	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	1	20

(continued)

Appendix B2 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies											
		F		T		MA		AO		DT		UG		DT		# Fact		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 2, Grade 2																															
1	2	2																		1				1							4
2	7	4	5													1	1						2	1							14
3	2	1	1							1						1															4
Total	11	7	6	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	0	1	0	0	2	2	0	0	0	0	0	0	22
Interview 3, Grade 2																															
1	2	2																		1						1					4
2	6	3	3													3	3														12
3	2	1	1													1	1														4
Total	10	6	4	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	1	0	0	0	0	0	1	0	0	0	0	20

Appendix B3

Task 3 PPW, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies											
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																															
Cognitive Level																															
1	3	2	1													1	2			1	2										6
2	3				1		1									1	2								1						6
3	1	1															1														2
Total	7	3	1	0	0	1	0	1	0	0	0	0	0	0	0	1	3	0	0	1	2	0	0	0	0	0	1	0	0	0	0	14
Interview 2, Grade 1																															
1	3	1														1				1				1	1	1					6
2	2	1	1														1	1													4
3	1	1	1																												2
Total	6	3	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	0	12
Interview 3, Grade 1																															
1	3	2			1							1				1									1						6
2	2										1					1									1	1					4
3	1	1	1																												2
Total	6	3	1	0	1	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	12
Interview 1, Grade 2																															
1	2	1																		1				1						1	4
2	6	4	4	1												1				1	1										12
3	2										1					2	1														4
Total	10	5	4	1	0	0	0	0	0	0	0	0	1	0	0	2	2	0	0	2	1	0	0	0	1	0	0	0	0	1	0	20

(continued)

Appendix B3 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies											
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 2, Grade 2																															
1	2	1	1																				1			1				4
2	7	4	4													1	1					2	1		1					14
3	2	1	1									1							1												4
Total	11	6	6	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	2	2	0	1	1	0	0	0	22
Interview 3, Grade 2																															
1	2	1	1																		1			1							4
2	6	2	2		1											3	3								1						12
3	2	1	1													1			1												4
Total	10	4	4	0	1	0	0	0	0	0	0	0	0	0	0	4	3	0	1	0	1	0	0	1	0	1	0	0	0	0	0	20

Appendix B4

Task 4 PPW (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies												
		CA		CS		CL		# Fact		Sub		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																										
Cognitive Level																										
1	3	1	1	1		1			2																	6
2	3				1	1		1	1						1			1								6
3	1	1																								2
Total	7	2	2	1	1	2	0	1	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	14
Interview 2, Grade 1																										
1	3	1	1						1						1			2								6
2	2	1	1						1									1								4
3	1	1	1																							2
Total	6	3	3	0	0	0	0	0	2	0	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	12
Interview 3, Grade 1																										
1	3	2	1		1													1	1							6
2	2	1			1	1	1																			4
3	1	1					1																			2
Total	6	4	1	0	2	1	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	12
Interview 1, Grade 2																										
1	2	2	1																					1		4
2	6	4	4			1		1	2																	12
3	2	1					1	1	1																	4
Total	10	7	5	0	0	1	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	20

(continued)

Appendix B4 (continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies												
		CA		CS		CL		# Fact		Sub		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 2, Grade 2																										
1	2	2	2																							4
2	7	5	3		1		1	2	1						1											14
3	2	1	1					1	1																	4
Total	11	8	6	0	1	0	1	3	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	22
Interview 3, Grade 2																										
1	2	1	2							1																4
2	6	3	3					2	3									1								12
3	2	1	1					1	1																	4
Total	10	5	6	0	0	0	0	3	4	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	20

Appendix B5

Task 5 Comparison (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies												
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																																
Cognitive Level																																
1	3				1											1				1	1		1			1	1					6
2	3									1	1						1						1			1	1					6
3	1																					1	1									2
Total	7	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	0	1	1	1	2	1	0	2	2	0	0	0	0	14
Interview 2, Grade 1																																
1	3															1	1			1						1	1			1	6	
2	2															1	1			1						1						4
3	1															1	1															2
Total	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	2	0	0	0	0	0	1	2	0	0	0	1	12
Interview 3, Grade 1																																
1	3				1								1							1	1					1	1					6
2	2											1	1									1	1			1	1					4
3	1																															2
Total	6	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	1	1	1	1	0	0	2	2	0	0	0	0	12
Interview 1, Grade 2																																
1	2																							1	1	1				1		4
2	6	2	1		1		1				1					1	2					2		1		1	3					12
3	2																							1								4
Total	10	2	1	0	0	1	0	0	1	0	0	0	1	0	0	1	2	0	0	0	0	2	0	2	1	2	3	0	0	0	1	20

(continued)

Appendix B5 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies												
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper.		Not adm		
	N	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	B+	B−	Trials
Interview 2, Grade 2																																
1	2																					1	1			1				1		4
2	7	1				1								2				1				1	1	2	1	2	2					14
3	2		1			1								1		1																4
Total	11	1	1	0	0	2	0	0	0	0	0	0	0	3	0	0	1	0	0	1	0	0	2	2	2	1	3	2	0	0	0	1	22
Interview 3, Grade 2																																
1	2																					1				2	1					4
2	6					2								1			1			1	1					3	3					12
3	2							1								1	1								1							4
Total	10	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0	1	2	0	0	1	1	0	1	0	1	5	4	0	0	0	0	20

Appendix B6

Task 6 Joining, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (B+, B-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies												
		F		T		MA		AO		DF		UG		DT		# Fact		Recur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 1, Grade 1																																
Cognitive Level																																
1	3							1				1	2			1				1												6
2	3											1	2			1	1			1												6
3	1											1	1																			2
Total	7	0	0	0	0	0	0	1	0	0	0	3	5	0	0	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	14
Interview 2, Grade 1																																
1	3											1				1				1	1					1				1		6
2	2											1				1	2															4
3	1												1									1										2
Total	6	0	0	0	0	0	0	0	0	0	0	2	1	0	0	2	2	0	0	1	1	1	0	0	0	0	1	0	0	0	1	12
Interview 3, Grade 1																																
1	3											2	3			1																6
2	2											2	2																			4
3	1											1	1																			2
Total	6	0	0	0	0	0	0	0	0	0	0	5	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Interview 1, Grade 2																																
1	2																			1				1	1					1		4
2	6							2	1			2	3			2	2															12
3	2												1			2	1															4
Total	10	0	0	0	0	0	0	2	1	0	0	2	4	0	0	4	3	0	0	1	0	0	0	1	1	0	0	0	0	0	1	20

(continued)

Appendix B6 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur.		Guess		Confused		Uncod		Giv #		Oper		Not dm	
	N	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	B+	B-	Trials
Interview 2, Grade 2																														
1	2	1						1				1																		1
2	7							2	2			1	2			2	2		1	1				1						14
3	2							1					1			1	1													4
Total	11	1	0	0	0	0	0	4	2	0	0	1	4	0	0	3	3	0	1	1	0	0	0	1	0	0	0	0	0	1	22
Interview 3, Grade 2																														
1	2							1	1			1								1										4
2	6							1	1			1	2			4	3													12
3	2										1					1	1	1												4
Total	10	0	0	0	0	0	0	2	2	0	1	2	2	0	0	5	4	1	0	0	1	0	0	0	0	0	0	0	0	0	20

Appendix B7

Task 1 Joining (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies												
		CA.		CS		CE		# Fact		Sub		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																										
Cognitive Level																										
1	3	2	1											1						1				1		6
2	3	2	2			1																		1		6
3	1	1																						1		2
Total	7	5	3	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3	14
Interview 2, Grade 1																										
1	3	2												1										1	2	6
2	2	2						1						1												4
3	1	1														1										2
Total	6	5	0	0	0	0	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	2	12
Interview 3, Grade 1																										
1	3	2	1											1										2		6
2	2	1		1	1									1												4
3	1					1										1										2
Total	6	3	1	1	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	2	12
Interview 1, Grade 2																										
1	2	1														1								1	1	4
2	6	4	3					1												2	1			1		12
3	2	1	1			1	1																			4
Total	10	6	4	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	2	1	0	0	1	2	20

(continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies										
		CA		CS		CL		# Fact		Sub		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 2, Grade 2																										
1	2	1														1								1	1	4
2	7	6	2		1	1			1				1							1					1	14
3	2	1					1					1	1													4
Total	11	8	2	0	1	1	1	0	1	0	0	1	2	0	0	0	1	0	0	0	1	0	0	1	2	22
Interview 3, Grade 2																										
1	2	1																1							2	4
2	6	5	4					1	1				1													12
3	2	1					2					1														4
Total	10	7	4	0	0	0	2	1	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	2	20
Interview 1, Grade 3																										
2	4	1			1		3	1				2														8
3	8	2	2	1	1	1	2	3	1			1	2													16
4	8			1	3	2	2	3	2			1	1	1												16
5,6	7	1				2	6	1				3	1													14
Total	27	4	2	2	5	5	13	8	3	0	0	7	4	1	0	0	0	0	0	0	0	0	0	0	0	54
Interview 2, Grade 3																										
2	4					2	1	2	3																	8
3	8	2		2		1	2	3	4										2							16
4	7		1			2	1	4	3			1	1		1											14
5,6	7					1	1	6	6																	14
Total	26	2	1	2	0	6	5	15	16	0	0	1	1	0	1	0	0	0	2	0	0	0	0	0	0	52

(continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies												
		CA		CS		CL		# Fact		Sub		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																										
2	4						1	3	1			1	1						1							8
3	8			1	1	2	4	5	2				1													16
4	7			2	1		1	4	2			1	2						1							14
5,6	7					2	2	4	4			1	1													14
Total	26	0	0	3	2	4	8	16	9	0	0	3	5	0	0	0	0	0	2	0	0	0	0	0	0	52

Appendix B8

Task 2 Separating (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies											
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																															
Cognitive Level																															
1	3	2	2																			1							1	6
2	3	1	1					1	1													1							1	6
3	1	1																											1	2
Total	7	4	3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	14
Interview 2, Grade 1																															
1	3	2																		1									1	2	6
2	2	1						1												2											4
3	1	1																				1									2
Total	6	4	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	1	2	12
Interview 3, Grade 1																															
1	3	2																		1					1					2	6
2	2	1														1				1							1				4
3	1	1																				1									2
Total	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	1	0	0	1	1	0	0	0	2	12
Interview 1, Grade 2																															
1	2	1																		1									1	1	4
2	6	6	3													1						1								1	12
3	2	1	1															1	1												4
Total	10	8	4	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	1	2	20

(continued)

Task 2 (continued)

#	N	Direct modeling: F C+	F C−	T C+	T C−	MA C+	MA C−	AO C+	AO C−	Counting: DF C+	DF C−	UG C+	UG C−	DT C+	DT C−	Routine mental operation: # Fact C+	# Fact C−	Nonroutine mental operation: Heur C+	Heur C−	Inappropriate strategies: Guess C+	Guess C−	Confused C+	Confused C−	Uncod C+	Uncod C−	Giv # C+	Giv # C−	Oper C+	Oper C−	Not adm C+	Not adm C−	Trials
Interview 2, Grade 2																															
1	2	1														1				1								1	1	4
2	7	5	2									1				1		1		1				3					1	14
3	2	1																1	1			1								4
Total	11	7	2	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	0	1	0	3	0	0	0	0	1	2	22
Interview 3, Grade 2																															
1	2	2																												2	4
2	6	4	2							1	1	1				1	1					1									12
3	2											1						2	1												4
Total	10	6	2	0	0	0	0	0	0	0	1	1	2	0	0	1	1	2	1	0	0	0	1	0	0	0	0	0	0	2		20
Interview 1, Grade 3																															
2	4	1						1				1						1	1	1	1					1					8
3	8	5								2	3	1				1			1		2			1							16
4	8	2		1						3	2	2	1			1			3		1										16
5,6	7	5								1	2	1	2			2			1												14
Total	27	13	0	1	0	0	0	0	1	6	7	5	3	0	0	4		1	6	1	4	0	0	0	1	0	1	0	0	0	0	54
Interview 2, Grade 3																															
2	4							1								3	2				1		1							4	8
3	8	3										1	3			2	3		1	1			1	1							16
4	7	2								2	1	1	2			2	3				1										14
5,6	7	2	1								1	2	4			2	1	1													14
Total	26	7	1	0	0	0	0	0	1	2	2	4	9	0	0	9	9	1	1	1	2	0	0	2	1	0	0	0	0	0	0	52

(continued)

Task 2 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Oiv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																														
2	4		1													2		1	2							1	1					8
3	8	1								1		2	3			3	3	1	2													16
4	7									1	2					3	3	1	1	1	1			1								14
5,6	7									1	2	2	2			3	2	1	1													14
Total	26	1	1	0	0	0	0	0	0	3	4	4	5	0	0	11	8	4	6	1	1	0	0	1	0	1	1	0	0	0	0	52

Appendix B9

Task 3 PPW, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies												
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																																
Cognitive Level																																
1	3	2	2																			1						1	6	
2	3	2						1	1											1									1	6	
3	1	1																											1	2	
Total	7	5	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3	14	
Interview 2, Grade 1																																
1	3	2																				1							1	2	6	
2	2	1	1										1			1															4	
3	1	1																				1									2	
Total	6	4	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	1	2	12
Interview 3, Grade 1																																
1	3	2														1				1										2	6	
2	2	1								1			1														1				4	
3	1	1																				1									2	
Total	6	4	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0	2	12
Interview 1, Grade 2																																
1	2					1																1							1	1	4	
2	6	6	2													1						2								1	12	
3	2	2											1					1													4	
Total	10	8	2	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	3	0	0	0	0	0	0	1	2	20

(continued)

Task 3 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused?		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 2, Grade 2																														
1	2	1																						1				1	1	4
2	7	5	2						1	1								1				1	1	1					1	14
3	2	1										1				1		1												4
Total	11	7	2	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	2	0	0	0	0	1	1	0	2	0	0	1	2	22
Interview 3, Grade 2																														
1	2	1																		1									2	4
2	6	4	1							1			2				2	1				1									12
3	2											1					1	1	1												4
Total	10	5	1	0	0	0	0	0	0	1	0	1	2	0	0	0	3	2	1	1	0	0	1	0	0	0	0	0	0	2		20
Interview 1, Grade 3																														
2	4	2							1		1		1	1				1		1												8
3	8	5							1	1	1	1	4				1	1			1											16
4	8	2								1	1	3	3				1	2	2					1								16
5,6	7	5								1			3			1	2		2													14
Total	27	14	0	0	0	0	0	0	2	3	3	4	11	1	0	1	4	3	5	1	1	0	0	0	1	0	0	0	0	0	0	54
Interview 2, Grade 3																														
2	4									2		1	1			1	1				1			1								8
3	8	3	1									1	1			3	4	1	1					1								16
4	7	1							1	1			2			3	1	1	1		1		1	1								14
5,6	7	1	1									3	2			3	4															14
Total	26	5	2	0	0	0	0	0	1	3	0	5	6	0	0	10	10	2	2	0	2	0	0	1	3	0	0	0	0	0	0	52

(continued)

		Direct modeling								Counting						Routine mental operations		Nonroutine mental operations		Inappropriate strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																														
2	4	1														1	1	1	1	1	1			1						8
3	8	2	1									2	3			4	3		1											16
4	7									1		1	1			2	4	1	1	1	1			1						14
5,6	7											1	3			6	4													14
Total	26	3	1	0	0	0	0	0	0	1	0	4	7	0	0	13	12	2	3	2	2	0	0	1	1	0	0	0	0	52

Appendix B10

Task 4 PPW (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies												
		CA		CS		CL		# Fact		Sub		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																										
Cognitive Level																										
1	3	2	2											1										1		6
2	3	2	1			1									1									1		6
3	1	1																						1		2
Total	7	5	3	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	3	14
Interview 2, Grade 1																										
1	3	1												1										1	3	6
2	2	2	2																							4
3	1	1																							1	2
Total	6	4	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	4	12
Interview 3, Grade 1																										
1	3	2												1		1									2	6
2	2	2					2																			
3	1					1																		1		2
Total	6	4	0	0	0	1	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	3	12
Interview 1, Grade 2																										
1	2	1																						1	2	4
2	6	6	3		1				1																1	12
3	2	2	1				1																			4
Total	10	9	4	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	20

(continued)

Task 4 (continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies											
		CA		CS		CL		# Fact		Sub		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 2, Grade 2																									
1	2	1												1										1	1	4
2	7	6	1		1				1					1				1	1		1				1	14
3	2	1				1						2														4
Total	11	8	1	0	1	1	0	0	1	0	0	0	2	0	2	0	0	1	1	0	1	0	0	1	2	22
Interview 3, Grade 2																										
1	2	2																						2		4
2	6	5	3					1	2							1										12
3	2						2					2														4
Total	10	7	3	0	0	0	2	1	2	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	2	20
Interview 1, Grade 3																										
2	4	1				2	2							1				1	1							8
3	8	2				5	4	1	3					1												16
4	8	3	2	1	1		1	2	2			1	1	1					1							16
5,6	7	3			1	3	4	1	2																	14
Total	27	9	2	1	2	10	11	4	7	0	0	1	1	1	2	0	0	1	2	0	0	0	0	0	0	54
Interview 2, Grade 3																										
2	4					3	2	1	2																	8
3	8	1				3	3	3	4					1					1							16
4	7	2			1		1	4	4			1	1													14
5,6	7	1	1		1	1	4	5	1																	14
Total	26	4	1	0	2	7	10	13	11	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	52

(continued)

		Direct modeling		Counting				Routine mental operation		Nonroutine mental operation				Inappropriate Strategies											
		CA		CS		CL		# Fact		Sub		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm	
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																									
2	4			1		2	1	1	1						1				1							8
3	8					5	3	2	4						1			1								16
4	7			2	2	1	1	3	2			1	2													14
5,6	7					2		5	6				1													14
Total	26	0	0	3	2	10	5	11	13	0	0	1	3	0	2	0	0	1	1	0	0	0	0	0	0	52

Appendix B11

Task 5 Comparison (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies												
		F		T		MA		AO		BF		UG		DT		# Fact		Heur		Guess		? Confused		Uncod		Giv #		Oper		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																																
Cognitive Level																																
1	3																									2	2			1	1	6
2	3							1			1							1			1					1					1	6
3	1	1																													1	2
Total	7	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	3	2	0	0	1	3	14
Interview 2, Grade 1																																
1	3					1														1										1	3	6
2	2																	1		1		1				1						4
3	1	1																													1	2
Total	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	1	0	0	0	1	0	0	1	4	12
Interview 3, Grade 1																																
1	3																			1						1				1	3	6
2	2																			1	1					1					1	4
3	1																					1									1	2
Total	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	0	0	0	2	0	0	0	1	5	12
Interview 1, Grade 2																																
1	2																					1								1	2	4
2	6	2	1	1				1			1										1	1	1			2	1				1	12
3	2	1										1											1		1							4
Total	10	3	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	2	2	0	1	2	1	0	0	1	3	20

(continued)

Task 5 (continued)

		Direct modeling										Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies											
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused?		Uncod		Giv #		Oper		Mot adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 2, Grade 2																																
1	2																								1				1	2	4
2	7					2						1	2									1	1	1	1	2	1	0	0	0	2	14
3	2							1					2											1								4
Total	11	0	0	0	0	2	0	1	0	0	0	1	4	0	0	0	0	0	0	0	0	1	1	2	1	3	1	0	0	1	4	22
Interview 3, Grade 2																																
1	2																			1						1				2		4
2	6					2		1				1						1			1					3	2			1		12
3	2											2	1					1														4
Total	10	0	0	0	0	2	0	1	0	0	0	3	1	0	0	0	0	2	0	1	1	0	0	0	0	4	2	0	0	0	3	20
Interview 1, Grade 3																																
2	4	1										1	2					1		1	2											8
3	8					2		1				4	1			1	3								2	1			1			16
4	8	2			1	2		2	1				2			2	1	1							2							16
5,6	7	1		1		1		1	1			3	5				1															14
Total	27	4	0	1	1	5	0	1	4	1	0	8	10	0	0	3	5	2	0	1	2	0	0	0	4	1	0	0	1	0	0	54
Interview 2, Grade 3																																
2	4	1										1	1			1	1		1		1			1								8
3	8	1				1						3	4			3	2	1							1							16
4	7	1				1				1		1	1			2	4	1	1					1								14
5,6	7		1			1						3	4			3	2															14
Total	26	3	1	0	0	3	0	0	0	0	1	8	10	0	0	9	9	1	3	0	1	0	0	2	1	0	0	0	0	0	0	52

(continued)

Task 5 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate strategies											
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Oper		Not adm	
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																															
2	4	1										1	1			1	1		1	1				1							8
3	8											2	4			4	3				1		1		1						16
4	7									1		2	3			3	2	1	1		1										14
5,6	7											3	2			4	5														14
Total	26	1	0	0	0	0	0	0	0	1	0	8	10	0	0	12	11	1	2	1	2	0	0	1	1	1	0	0	0	0	0	52

Appendix B12

Task 6 Joining, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (C+, C-), Grade, and Interview

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies.										
		F		T↔3		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused ?		Uncod		Giv #		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 1, Grade 1																														
Cognitive Level																														
1	3							1	1																	1	1	1	1	6
2	3							2	1											1	1								1	6
3	1							1																					1	2
Total	7	0	0	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	3	14
Interview 2, Grade 1																														
1	3																			1						1		1	3	6
2	2							1				1	1									1								4
3	1							1																					1	2
Total	6	0	0	0	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	4	12
Interview 3, Grade 1																														
1	3							1								1												1	3	6
2	2							1				1	1																1	4
3	1							1																					1	2
Total	6	0	0	0	0	0	0	3	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	5	12
Interview 1, Grade 2																														
1	2																							1				1	2	4
2	6							2	2			2								1	1		1			1	1		1	12
3	2								1			2	1																	4
Total	10	0	0	0	0	0	0	2	3	0	0	4	1	0	0	0	0	0	0	1	1	0	1	1	0	1	1	1	3	20

(continued)

Task 6 (continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		? Confused		Uncod		Giv #		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 2, Grade 2																														
1	2							1																				1	2	4
2	7							5				1	1			1	1		1										4	14
3	2											1				-1			1			1								4
Total	11	0	0	0	0	0	0	6	0	0	0	2	1	0	0	2	1	0	2	0	0	0	1	0	0	0	0	1	6	22
Interview 3, Grade 2																														
1	2											1												1					2	4
2	6							5	1			1	2				1								1					12
3	2											2	2																	4
Total	10	0	0	0	0	0	0	5	1	0	0	4	4	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	3	20
Interview 1, Grade 3																														
2	4	1										1	3					1	1					1						8
3	8	1						1	1			2	2			1	3	1	1	2	1									16
4	8	1				1		1	1			2	3			1	2	1	1	1				1						16
5,6	7							3	1			3	4				2	1												14
Total	27	3	0	0	0	1	0	5	3	0	0	8	12	0	0	2	7	4	3	3	1	0	0	1	1	0	0	0	0	54
Interview 2, Grade 3																														
2	4												1			3	2				1			1						8
3	8											2	3			5	5							1						16
4	7											1	2			4	4	1	1	1										14
5,6	7											3	5			4	2													14
Total	26	0	0	0	0	0	0	0	0	0	0	6	11	0	0	16	13	1	1	1	1	0	0	2	0	0	0	0	0	52

(continued)

		Direct modeling								Counting						Routine mental operation		Nonroutine mental operation		Inappropriate Strategies										
		F		T		MA		AO		DF		UG		DT		# Fact		Heur		Guess		Confused		Uncod		Giv #		Not adm		
	N	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	C+	C-	Trials
Interview 3, Grade 3																														
2	4											2	2			1	1	1	1											8
3	8											1	3			5	3	2						1		1				16
4	7												2			5	4	1	1					1						14
5,6	7											1	2			6	5													14
Total	26	0	0	0	0	0	0	0	0	0	0	4	9	0	0	17	13	4	2	0	0	0	0	1	1	0	1	0	0	52

Appendix B13

Task 1 Joining (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		No sentence																														Correct sentence				Incorrect sentence		
		Direct model		Counting			Routine mental op.				Nonroutine mental op.			Inappropriate																		Algorithmic		Non-algorithmic				
		CA		CS		CL	FF		AL		AA		S	Near	Quasi hear	Guess	Confused	Uncod	Giv #	Oper	AL/OP		AA/OP		Not adm						AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D E	D	E	D	E	D	E	D E	D E	D E	D E	D E	D E	D E	D E	D E		D E		D E		D E			D	E	D	E	D E		D E		Trials
Interview 1																																						
Cognitive Level																																						
2	4															1	1												1	3	2							8
3	8	1	1			2 1	1		2	2																			1	2	2		1					16
4	7	1	1		1	1		1		2	1							1												2	3							14
5,6	7	3	1			1				3	3																			1	2							14
Total	26	5	3	0	1	3 2	2	0	7	6	0	0	0 0	0 0	0 0	1	1	0	0	0	1	0	0	0	0	0	0	0	2	8	9	0	0	0	1	0	0	52
Interview 2																																						
2	4	1				1 1			1	1																			1	1			1					8
3	6	2	2				1		2	2								1												1	1							12
4	7						1		2	4				1															1	3	2							14
5,6	7						2		3	2																				4	3							14
Total	24	3	2	0	0	1 3	2	0	8	9	0	0	0 0	0 1	0 0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	9	6	0	0	0	1	0	0	48
Interview 3																																						
2	4																	1	1											3	3							8
3	8	1				1 2			2	3				1																3	3							16
4	7						1	1	1	2								1	1	1										3	3							14
5,6	7								3	2																				4	5							14
Total	26	1	0	0	0	1 2	1	1	6	7	0	0	0 0	1	0 0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	13	14	0	0	0	0	0	0	52

Appendix B14

Task 2 Separating (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		No sentence																																Correct sentence				Incorrect sentence		
		Direct model								Counting						Routine mental op.				Nonroutine mental op.				Inappropriate												Algorithmic		Non-algorithmic				
		F		T		MA		AO		DF		DC		DT		FF		AL		AA		S		Heur		Quasi heur		Guess		Confused		Uncod		Giv #		Oper		AL/OP		AA/OP		Not adm		AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	Trials
Interview 1																																																	
Cognitive Level																																																	
2	4	1																1								1	1			1									1		1				1				8
3	8	2	3							2	2													1		1						1						1	2	1							16
4	7	2	3							2						1		2																					2	2							14
5,6	7	5	5									1	1																										1					1			14
Total	26	10	11	0	0	0	0	0	0	4	3	1	0	0	1	0	3	0	0	0	0	0	1	0	0	0	2	1	0	0	1	0	0	1	0	0	0	0	0	0	0	2	5	4	0	0	0	1	0	1	52
Interview 2																																																	
2	4	2	1															1										1	1												1					1			8
3	6		2			1				1	1							1										1				1								3	1							12
4	7	2	3									1						1																				1		1	2		1			1			14
5,6	7		2									1						1														1		1						3	2		1	1		1			14
Total	24	4	8	0	0	1	0	0	0	1	1	2	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	2	0	0	1	2	0	0	1	0	0	0	0	0	0	1	7	6	0	0	2	1	0	3	48
Interview 3																																																	
2	4																									1		1												2	4							8
3	8	3	3			1						1						1											1												3	3							16
4	7	1	2							1	2							2																						1	3							14
5,6	7		1								1	1							1																					6	4							14
Total	26	4	6	0	0	1	0	0	0	1	3	2	0	0	0	0	3	1	0	0	0	0	0	0	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	12	14	0	0	0	0	0	0	52

Appendix B12

Task 3 FPM, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		do sentence																																						Correct sentence				Incorrect sentence		
		Direct model						Counting				Routine mental op.				Nonroutine mental op.				Inappropriate																		Algorithmic				Non-algorithmic			
		F		T		MA		AO		DF		UC		DT		FT		AL		AA		S		Maur		Quasi maur		Guess		Confused		Uncod		Giv #		Oper		AL/OP		AA/OP		Not adm		AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	Trials
Interview 1																																															
Cognitive Level																																															
2	4											1						1						1								1	1								1	1	1					8
3	8	2	1									1	4																			3	2							1	2						16
4	7	1	2					1				1	2					1						1				2				1		1										1			14
5,6	7	4	4									3	1			1																1														14
Total	26	7	7	0	0	0	0	0	0	1	0	6	7	0	0	0	1	1	1	0	0	0	0	2	0	0	0	0	2	0	0	4	5	0	0	1	0	0	0	0	0	0	2	3	1	0	0	0	0	1	0	52
Interview 2																																															
2	4	1	1													1	1											2				1								1							8
3	6	3	3									2				1																2		1												12
4	7	2	3									2				1												1	1				1						1		1	1					14
5,6	7	1	3									2	3			3																1														14
Total	26	7	10	0	0	0	0	0	0	0	0	4	5	0	0	0	1	5	1	0	0	0	0	0	0	0	0	0	0	3	1	0	0	3	1	0	0	0	2	0	1	0	0	0	2	1	0	0	0	1	0	48
Interview 3																																															
2	4	2										1																1		1												2						8
3	8	2	1				1					2	1					2	1									1		1												1	2			1		16
4	7	2	3										1			1												1		1	2											3					14
5,6	7		2									5	3			1																											1	2				14
Total	26	6	6	0	0	0	0	1	0	0	0	8	5	0	0	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	4	0	0	0	0	0	0	0	0	0	5	6	0	0	0	0	1	52

Appendix R16

Task 4 PPW, Joining (+)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		No sentence																												Correct sentence				Incorrect sentence		
		Direct model		Counting				Routine mental op.				Nonroutine mental op.				Inappropriate														Algorithmic				Non-algorithmic			
		CA		CS		CL		??		AL		AA		S		Near		Quasi hour		Guess		Confused		Uncod		Giv #		Oper		AL/OP		AA/OP		Not adm		AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	Trials
Interview 1																																											
Cognitive Level																																											
2	4	1				1				1										1	3												1										8
3	8	1	1				1			2	1									2				1										1		2	4							16
4	7	2	2			1				1	1																									3	4							14
5,6	7	2	1	1			1			2	3																									2	2							14
Total	26	6	4	1	0	2	2	0	0	6	5	0	0	0	0	0	0	0	0	3	3	0	0	1	0	0	0	0	0	0	0	0	0	0	2	7	10	0	0	0	0	0	0	52
Interview 2																																											
2	4									2	1																	1						1		2	1							8
3	6	1	2							2	2													2	1			1									1							12
4	7					2		1		2	1													1										2		2	3							14
5,6	7		1			2	1			1	1																									4	4							14
Total	24	1	3	0	0	4	1	1	0	7	5	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	1	0	0	0	0	0	3	8	9	0	0	0	0	0	0	48
Interview 3																																											
2	4																			1				1	1											2	3							8
3	8	1	1			1				3	2													1	1											2	4							16
4	7	1				1		1		1										1				1	1											3	4							14
5,6	7						1			3	1																									4	5							14
Total	26	2	1	0	0	2	1	1	0	6	4	0	0	0	0	0	0	0	0	1	1	0	0	3	3	0	0	0	0	0	0	0	0	0	0	11	16	0	0	0	0	0	0	52

Appendix H17

Task 5 Comparison (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		No sentence																																Correct sentence				Incorrect sentence		
		Direct model						Counting				Routine mental op.				Nonroutine mental op.				Inappropriate																Algorithmic		Non-algorithmic				
		F		T		MA		AO		DF		UG		DT		AL		AA		S		Heur		Quasi heur		Guess		? Confused		Uncod		Giv #		Oper		AL/OP		AA/OP		Not adm		AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	Trials
Interview 1																																															
Cognitive Level																																															
2	4											1				1	1									1	2			1									1								8
3	8	1	1							1		3	2									1					1			1	1			1				1	1	1						16
4	7		1					1				2	3									2				1				1	2			1											14
5,6	7	2	2									4	3									1									1									1						14
Total	26	3	4	0	0	0	0	1	0	0	1	10	8	0	0	0	0	1	1	0	0	0	0	4	0	0	0	2	3	0	0	3	4	0	0	0	2	0	0	0	0	1	2	1	1	0	0	0	0	0	0	52
Interview 2																																															
2	4	1	1			1																				1				2								1	1								8
3	6					1	1					2	3			2														1				1					1							12
4	7	2	1									3	2			1	1					1								1								2								14
5,6	7		1									5	5			2														1															14
Total	24	3	3	0	0	2	1	0	0	0	0	10	10	0	0	0	0	1	4	1	0	0	0	0	1	0	0	0	0	1	0	0	0	1	4	0	0	0	1	0	0	0	0	3	2	0	0	0	0	0	0	48
Interview 3																																															
2	4		1									2	1													1	1			1										1							8
3	8	2	2									1	4			1										1	1			1									1				1	1		16
4	7	2	1				1					3			1							1	1								1							1				2			14
5,6	7		1									4	4			1										1						1							1				1			14
Total	26	4	5	0	0	0	1	0	0	0	0	10	9	0	0	1	0	2	0	0	0	0	0	1	1	0	0	3	2	0	0	2	1	0	0	0	1	0	0	0	0	0	1	2	1	0	0	0	0	1	4	52

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Appendix B18

Task 6 Joining, missing addend (-)

Frequency of Use of Strategies by Category, Cognitive Level, Task Level (D,E), and Interview

		No sentence																																Correct sentence				Incorrect sentence		
		Direct model						Counting				Routine mental op.			Nonroutine mental op.			Inappropriate												Algorithmic		Non-algorithmic						
		F		T		MA		AO		DF		UG		DT		FF		AL		AA		S		Heur		Quasi heur		Guess		? Confused		Uncod		Giv #		Oper		AL/C		AA/OP		Not adm		AL		AA		(all other strategies)		(all strategies)		
	N	D	E	D	E	D	E	I	I	D	E	D	E	D	E	S	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	Trials
Interview 1																																																	
Cognitive Level																																																	
2	4	1										1												1	1			1	2											1									8
3	8		1									5	2											1					1						1				1	1	1	1						16
4	7	1	2									4	3																	2	2																	14
5,6	7		1					2				5	4											1																		1						14
Total	26	2	4	0	0	0	0	2	0	0	0	15	9	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	3	0	0	2	3	0	0	0	1	0	0	0	0	1	2	1	2	0	0	0	0	0	0	52
Interview 2																																																	
2	4	1	1													2								1																		1								8
3	6			1		1	1					1	1			1												1		3	1																	12
4	7	3	1									1	1			1		1						2				1		1												2								14
5,6	7							1	1			4	5					2	1																															14
Total	24	4	2	1	0	1	1	3	1	0	0	6	7	0	0	0	1	2	5	0	0	0	0	3	0	0	0	0	2	0	0	4	1	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	48
Interview 3																																																	
2	4											1	1											1								1	1													1	1	8
3	8	1	2									5	2					1	3					1	0							1																16
4	7	2	2					1				3	1			1	1							1																1		1						14
5,6	7		1						1			4	4					2	1													1																14
Total	26	3	5	0	0	0	1	0	1	0	0	13	8	0	0	1	1	3	4	0	0	0	0	2	1	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	1	52

Appendix C

CODES AND STRATEGY CATEGORIES

BC CODES

Models	
C	Cubes
F	Fingers
N	No Action
O	Other
Strategies	
CS	Count On From Smaller
CL	Count On From Larger
S	Subitizing
CA	Count All
F	Separate From
T	Separate To
MA	Match
AO	Add On
DF	Count Down From
UG	Count Up From Given
DT	Count Down To
HU	Heuristic
#F	Number Fact
GU	Guess
?	Confused
UN	Uncodable
GI	Given Number
OP	Wrong Operation
Errors	
M	Miscount
F	Forgets Data

BC STRATEGY CATEGORIES

1. Direct Modeling

   CA, F, T, MA, AO

2. Use of Counting

   CS, GL, DF, UG, DT

3. Routine Mental Operation

   #F

4. Non-routine Mental Operation

   S, HU

5. Inappropriate

   GU, ?, UN, GI, OP

DE CODES

Models

C	Cubes
F	Fingers
H+	Horizontal Addition Sentence
V+	Vertical Addition Sentence
N	No Action
T	Tallies
H-	Horizontal Subtraction Sentence
V-	Vertical Subtraction Sentence
O	Other
P	Picture
B	Organizing Box
#	Number

Strategies

CS	Count On From Smaller
CL	Count On From Larger
S	Subitizing
CA	Count All
F	Separate From
T	Separate To
MA	Match
AO	Add On
DF	Count Down From
DT	Count Down To
UG	Count Up From Given
HU	Heuristic
#F	Number Fact
GU	Guess
GI	Given Number
OP	Wrong Operation
AL	Algorithm
AA	Additive Algorithm
AL/OP	Algorithm/Operation
AA/OP	Additive Algorithm/Operation

Strategies (continued)	
QCS	Quasi-heuristic CS
QCL	Quasi-heuristic CL
QCA	Quasi-heuristic CA
QDF	Quasi-heuristic DF
QDT	Quasi-heuristic DT
QUG	Quasi-heuristic UG
UN	Uncodable
?	Confused
Errors	
M	Miscount
F	Forgets Data
S	Wrong Sentence
A	Wrong Analysis
BG	Computational Error
CO	Basic Fact Error
R	Representational Error

DE STRATEGY CATEGORIES

1. Non-sentence/direct modeling

   CA, F, AO, MA, T

2. Non-sentence/counting

   CS, CL, DF, DT, UG

3. Non-sentence/routine mental operation

   #F, AL, AA

4. Non-sentence/non-routine mental operations

   H, QCS, QCL, QCA, QDF, QDT, QUG

5. Non-sentence/inappropriate

   GU, GI, CP, AL/OP, AA/OP, UN, ?

6. Correct H±, V± sentence/algorithmic

   AL, AA

7. Correct H±, V± sentence/non-algorithmic

   any strategy except AL or AA

8. Incorrect sentence

   any strategy

Appendix D

SUBJECT PROFILES

STUDENT 550 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	C Y F -	C Y F -	F Y CL -	C Y UG -	N Y HU -
C-	N Y HU -	N Y HU -	F Y UG -	N Y #F -	N N UN -	N N GU -

STUDENT 551 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CA -	N Y GU -	N Y DT -	N N CL M	N Y UG -	N Y UG -
C-	N Y CL -	N N GU -	N Y HU -	N N UN F	N Y UG -	N Y UG -

STUDENT 548 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	F Y UG -	N Y HU -	N Y HU -	N Y #F -	N Y #F -
C-	N Y HU -	N Y HU -	N Y HU -	N Y #F -	N Y AO -	N Y HU -

STUDENT 549 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y DF -	F Y F -	N Y CL -	N Y UG -	F Y UG -
C-	F Y CL -	F Y HU -	N Y UG -	N Y CL -	N Y UG -	F Y UG -

STUDENT 543 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y FF -	N Y DF -	N N UG M	N Y #F -	N Y #F -	N Y UG -
C-	N Y #F -	N Y UG -	N Y UG -	N Y #F -	N Y #F -	N Y #F -

STUDENT 547 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	N Y DF -	F Y DF -	N Y CS -	N Y DF -	N N GU -
C-	N Y CS -	N Y DF -	N Y DF -	N N UN F	N N UN M	N Y UG -

STUDENT 537 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C N CL M	C N F M	N Y DF -	C Y CA -	C Y F -	C Y UG -
C-	N Y CL -	F Y UG -	N Y #F -	N Y CL -	N Y UG -	F Y UG -

STUDENT 538 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y UG -	N Y #F -	N Y #F -	N Y UG -	N Y HU -
C-	N Y CL -	N Y #F -	N Y UG -	N Y #F -	N Y UG -	N Y #F -

STUDENT 535 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	F Y DF -	C Y F -	C Y CA -	C Y F -	C Y AO -
C-	F Y CS -	F Y DF -	N Y HU -	F Y HU -	F Y AO -	F Y AO -

STUDENT 536 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
C-	F Y CL -	F Y DF -	F Y UG -	N Y CS M	F Y UG -	F Y UG -

STUDENT 531 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #K -	N Y DF -	N Y UG -	N N CL F	N Y UG -	N Y UG -
C-	N Y #F -	N Y DF -	N Y AO -	N Y #F -	N Y AO -	N Y AO -

STUDENT 534 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	F Y UG -	N Y UG -	N Y #F -	C Y MA -	C Y MA -
C-	N Y #F -	N Y HU -	N Y #F -	F Y CL F	F Y UG -	F Y UG -

STUDENT 528 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	C Y F -	C Y F -	C Y CL -	N Y AO -	C Y AO -
C-	F Y HU -	N Y #F -	N Y HU -	N Y #F -	N Y #F -	N Y #F -

STUDENT 530 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N N CL M	C N F M	C Y F -	N Y CL -	N Y UG -	N Y UG -
C-	N Y CL -	F Y UG -	N Y #F -	N Y CL -	N Y UG -	F Y UG -

STUDENT 526 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y T -	C Y AO -
C-	N Y CL -	F Y DF -	N Y HU -	F N CL M	F Y AO -	F Y AO -

STUDENT 527 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y UG -	N N DF M	N Y #F -	N Y #F -	N Y UG -
C-	N Y CA -	N Y DF -	F Y UG -	N N CL M	F Y UG -	N Y HU -

STUDENT 517 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	E N CS F	C N T F	F Y UG -	F N CA M	N Y HU -	N Y HU -
C-	F Y CL -	N Y HU -	F Y UG -	F Y CS -	F Y T -	F Y UG -

STUDENT 525 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C N CL M	C Y F -	C Y F -	N Y CL -	N N GI GI	N N GU -
C-	N Y CL -	N N GU -	F Y UG -	F Y CL -	F N UN M	F Y UG -

STUDENT 515 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y HU -	C Y F -	N N UN F	N Y HU -	N N UN M
C-	N Y CS -	N Y AO -	N Y AO -	N N GU -	N N GU -	N Y UG -

STUDENT 516 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y UG -	N N GU -	C N CL M	N N GU -	N Y HU -
C-	F Y CL -	N N GI GI	N Y UG -	F Y CL -	F N GU -	N Y HU -

STUDENT 512 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	C N F M	N Y HU -	F Y CA -	C N MA M	N Y UG -
C-	F Y CS -	N Y #F -	N Y UG -	N Y CA -	N Y UG -	N Y #F -

STUDENT 513 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C N F M
C-	F Y CA -	F N UN -	F Y DF -	F Y CL -	F N OP O -	F Y UG -

STUDENT 510 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C+	C Y CA -	N Y HU -	C N F M	C Y CA -	C Y UG -	F Y UG -
C-	F Y CL -	F N F M	F Y UG -	N Y CL -	N Y UN -	N Y UG -

STUDENT 511 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CS -	C Y F -	C Y F -	N Y CL -	N Y UG -	N Y #F -
C-	N Y CS -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 502 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y DF -	N Y HU -	N Y CL -	N Y UG -	N Y AO -
C-	N Y HU -	N Y DF -	N Y UG -	N Y CL -	N Y #F -	N Y #F -

STUDENT 505 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N N GU -	C N F M	C Y F -	N N GU -	C Y F -	C N F M
C-	N Y CL -	N N GU -	F Y UN -	F N CA M	N N UN -	N N UN -

STUDENT 488 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N N GU -	N Y #F -	C ? ? -	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GI GI	N Y #F -
C+	C N CA M	C Y F -	C N F M	C Y CA -	- ? ? -	N N GU -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	- ? ? -	N N GU -

15

STUDENT 489 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C N CA M	C Y F -	N N GU -	C N CA M	C N GI GI	N N GU -
B-						
C+						
C-						

STUDENT 485 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C N AO -
B-	F Y CA -	F N UG -	N N GU -	F N CA M	F Y AO -	F N AO N
C+	C N GI GI	C Y F -	C Y F -	C N CA M	C Y T -	C Y AO -
C-	F Y CA -	F Y F -	- ? ? -	F Y CA -	F Y AO -	F N AO -

13

STUDENT 487 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C N CA M	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y #F -
B-	N Y #F -	F Y F -	F Y F -	F Y CA -	N N GI GI	N Y UG -
C+	C N CA M	C N F M	C Y F -	C Y CA -	N N GI GI	C Y AO -
C-	F Y CA -	- ? ? -	- ? ? -	F Y CA -	N N GU -	- ? ? -

STUDENT 468 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	F N F -	C Y F -	N Y CL -	C Y MA -	C N UG M
B-	F Y CA -	F Y F -	F Y F -	F Y #F -	F Y UG -	F Y #F -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y UG -
C-	F Y CA -	F Y F -	F Y F -	F Y CA -	F N F M	F Y AO -

STUDENT 471 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y T -	C Y CA -	C Y F -	C N AO M
B-	N Y #F -	F N F M	F N F M	F N CA M	F Y F -	F Y UG -
C+	C Y CA -	C N F M	C N F M	C N CA M	C N F M	C N UG M
C-						

STUDENT 465 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C N F -	C N F F	C Y CA -	N ? ? -	C N UG M
B-	F N CA M	F Y F -	F Y F -	F Y CA -	F N GI GI	F Y UG -
C+	C N GI GI	C Y F -	C Y F -	C Y CA -	C N GI GI	C N GI GI
C-	F N GI GI	F Y F -	F N F M	F N CS M	F N GI GI	F N GI GI

STUDENT 467 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N N UN -	N Y GU -	N Y CL -	N N GU -	N N GU -
B-	N N CA M	N Y #F -	N N GU -	N Y #F -	N N GU -	N Y #F -
C+	N N GU -	C ? ? -	C N UN M	N N GU -		
C-						

STUDENT 459 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C N F M	C Y CA -	C ? ? -	C Y UG -
B-	F Y CA -	F Y F -	N Y #F -	F N CA M	F ? ? -	F Y UG -
C+	C N CA M	C N F M	C N F M	C Y CA -	C N F M	C N AO M
C-						

STUDENT 464 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y T -	C N F M	C Y CS -	C N MA M	C Y AO -
B-	F Y CA -	N Y #F -	F N GU -	F N CA F	N ? ? -	F N UG M
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	N N GI GI	C Y AO -
C-	F N CA M	F Y F -	F N F M	F N CA M	F N GI GI	F N AO M

3

STUDENT 456 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y MA -	C Y CL -	N N GI GI	C Y UG -
B-	F Y CS -	F Y F -	F N GI GI	F Y CS -	N N GI GI	F N UG M
C+	C N CA M	C ? ? -	C N F M	C Y CA -	N N GI GI	C Y AO -
C-						

4

STUDENT 458 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	C Y AO -	N N UN M	N Y DF -	N Y #F -
B-	N N UN M	N Y DF -	N Y #F -	N Y #F -	F N AO M	N Y UG -
C+	C N CA M	C N F M	C Y F -	C Y CA -	N Y HU -	N Y AO -
C-	N Y CA -	F N F M	N Y GU -	N N GU -	N N GU -	N N GU -

INDIVIDUAL STUDENT PROFILE BY ADMINISTRATION

STUDENT 453 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N N HU M	N Y #F -	N Y #F -	N Y #F -	N N UN -	N N GU -
B-	N Y #F -	N Y #F -	N Y #F -	N N GU -	N Y #F -	N Y #F -
C+	N Y CL -	N N AO M	N N AO M	N Y CL -	N Y UG -	N Y GU -
C-	N Y CA -	N Y AO -	N Y AO -	N Y CA -	N Y AO -	N Y AO -

STUDENT 454 ADMINISTRATION 1

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CS -	F Y F -	C Y F -	C Y CA -	C N GI GI	C Y UG -
B-	F Y CS -	F Y F -	F N F M	F Y #F -	F N GI GI	F N UG M
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C N GI GI
C-	F N GI GI	F N F M	F N F M	F Y CA -	N N GI GI	F N GI GI

STUDENT 551 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	N Y #F -	N Y UG -	N Y CL -	N N UN -	C N UN M
C-	N Y #F -	N Y #E -	F Y UG -	F Y CL -	N Y HU -	N Y UG -

STUDENT 549 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y UG -	N Y UG -	F Y CL -	F Y UG -	F Y UG -
C-	F Y CL -	F Y UG -	F Y UG -	F Y CL -	F Y UG -	F Y UG -

STUDENT 550 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CA -	C Y F -	F Y UG -	N Y CL -	C Y F -	N Y #F -
C-	N N UN F	F Y UG -	F Y UG -	F Y CL -	F Y UG -	N Y #F -

STUDENT 547 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CU -	N Y DF -	N N DF M	N Y CA -	N Y UN -	F Y UG -
C-	N Y CA -	F Y UG -	N N GU -	N Y #F -	N Y UG -	N N UG M

STUDENT 548 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	F Y UG -	N N HU -	F Y HU -	N Y HU -	N Y HU -
C-	N Y HU -	N Y #F -	N Y HU -	N Y HU -	N Y HU -	N Y HU -

STUDENT 542 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	N N UN -	N N DF M	N Y CL -	C Y F -	N Y #F -
C-	N Y #F -	F N GU -	F N UN -	N Y CL -	N Y UG -	N N GU -

STUDENT 543 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y UG -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 536 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y UG -	N Y #F -	N Y UG -	N Y #F -	N Y #F -

STUDENT 541 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y CS -	F Y UG -	C Y F -	C Y CA -	C N MA M	F N UN F
C-	F N UN M	F N UG M	F Y HU -	F Y CL -	F N HU -	F Y #F -

STUDENT 536 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	C Y F -	C Y F -	C Y CA -	C Y MA -	N Y #F -
C-	N Y #F -	F Y F -	F Y F -	F Y CA -	F N F M	F Y UG -

STUDENT 537 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CL -	C Y F -	N Y #F -	N Y #F -	N Y #F -	N N UG M
C-	N Y #F -	F Y DF -	N Y #F -	F Y CS -	F N UG M	F Y UG -

STUDENT 533 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 534 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	C N F M	C Y CA -	C Y F -	N Y #F -
C-	N Y CL -	N Y DF -	N Y AO -	F Y CS -	N Y #F -	N Y #F -

STUDENT 528 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y HU -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 530 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y UG -	N Y UG -	N Y #F -	C Y UG -	N Y #F -
C-	N Y #F -	F Y UG -	N Y #F -	N Y UG -	F Y UG -	F Y UG -

STUDENT 525 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	F Y UG -	N Y #F -	N Y UG -	N Y UG -
C-	N Y #F -	F Y UG -	F Y UG -	F Y CL -	F Y UG -	N Y UG -

STUDENT 527 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CS -	N N UN M	N Y #F -	N N GU -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N UN M	N Y #F -

STUDENT 517 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y CL -	F Y DF -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N N GU -	N Y #F -	F Y UG -	N Y #F -	F Y DF -	N Y #F -

STUDENT 525 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y CA -	C Y F -	C Y F -	F Y CL -	F Y UG -	F UG -
C-	F Y CL -	F Y HU -	F N UN M	F Y CL -	F Y UG -	F Y UG -

STUDENT 515 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 516 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y DF -	F Y CL -	F Y UG -	N Y #F -
C-	F Y CL -	F Y AO -	N Y GU -	N Y #F -	N N GU -	N Y #F -

STUDENT 512 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	C Y F -	N Y #F -	N Y #F -	C N MA M	N Y #F -
C-	N Y #F -	N Y UG -	N Y UG -	N Y #F -	N Y #F -	N Y UG -

STUDENT 513 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	C Y #F -	C Y F -	C Y F -	N Y CL -	N Y UG -	N Y UG -
C-	N Y #F -	N N UN -	F Y F -	N Y #F -	N Y UG -	N Y UG -

STUDENT 510 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	F Y UG -	N Y #F -	N Y #F -	N Y #F -
B-	N Y #F -	N Y UG -	N Y HU -	N Y #F -	N Y UG -	N Y #F -
C+	N Y HU -	N Y HU -	F Y UG -	F Y CL -	F N UN M	F Y UG -
C-	N Y HU -	N Y HU -	N Y HU -	N Y HU -	F Y UG -	N N UN M

STUDENT 511 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 502 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL	N N GU	N Y HU	N Y #F	N Y UG	N Y #F
C-	N Y CL	N Y UG	N Y #F	N N UN	N Y UG	N Y UG

STUDENT 505 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	Y #F	C N GU	N N UN	N Y #F	N Y #F	C N GU
C-	Y #F	N N GU	N N UN	F Y CL	N Y #F	N Y #F

STUDENT 488 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	C ? ? -	F Y UN -
B-	N Y #F -	N Y UN -	N Y UN -	N Y CL -	N ? ? -	N Y #F -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	- ? ? -	C Y UG -
C-	N Y #F -	N Y UN -	N N UN -	N N UN M	- ? ? -	

STUDENT 489 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y S -	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y F -
B-	F Y CA -	F N GU -	F Y F -	F Y CA -	F ? ? -	F Y UG -
C+	C Y CA -	C Y F -	C N F M	C Y CA -	C N GI GI	C Y AO -
C-	F ? ? -	N N GU -	N N GI GI	F N GU -		

STUDENT 485 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N UN M	C Y AD -
B-	F Y S -	F N F M	F Y E -	F Y CA -	F Y UN -	F Y AD -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N UN M	C Y AD -
C-	F Y CA M	F Y #F -	F N F M	F N GU -	F N UG M	

STUDENT 487 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y #F -
B-	N Y #F -	F Y F -	N N GI GI	N N GU -	N N GI GI	N Y #F -
C+	C Y CA -	N N GU -	C Y F -	C Y CA -	N N GI GI	C Y AD -
C-						

STUDENT 480 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
B-	F Y S -	F Y F -	F Y F -	F Y CA -	F Y F -	F Y UG -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y AO -	N Y #F -
C-	F Y CL -	- ? ? -	N Y #F -	N Y HU -	F Y UG -	N Y HU -

STUDENT 481 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C N UN M	C Y F -	C N UP U	C Y CA -	C ? ? -	C Y AO -
B-	F Y CA -	F N UN -	F N UN -	F Y CA -		
C+						
C-						

STUDENT 468 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	F Y F -	C Y F -	F Y CA -	F Y F -	F Y AO -
B-	F Y CA -	F Y F -	F Y F -	F Y CA -	F Y UG -	F Y AO -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
C-	F Y CS -	F Y F -	F Y AO -	F Y CS -	F N UN M	F Y UG -

STUDENT 471 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y S -	C N UN M	C Y F -	C Y CA -	C Y MA -	C Y UG -
B-	F Y CA -	F Y F -	F Y F -	F Y CS -	F Y UG -	F Y UG -
C+	C Y CA -	C Y F -	C N UN M	C N CA M	C Y MA -	C Y AO -
C-	F N GI GI	F N UN M	F N GI GI	F N GI GI		

STUDENT 465 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C N UN M	C Y CA -	C N GI GI	C N GU -
B-	F Y CA -	F Y F -	F Y F -	F Y CA -	F N GI GI	F Y UG -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	N N GI GI	C N AO M
C-	F Y CA -	F Y F -	F N F M	F Y CA -	F N GI GI	F Y #F -

STUDENT 467 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y #F -	C N UN M	C Y #F -	C Y #F -
B-	N Y UN -	N Y DF -	N N GU -	N Y #F -	N Y #F -	N N GU -
C+	C Y CA -	C Y F -	C Y F -	N N GU -	C N GU -	N N GI GI
C-	F N GU -	N N GU -	- ? ? -			

STUDENT 459 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C- Y CA -	C Y F -	C Y F -	C Y CA -	N Y #F -	- ? ? -
B-	F Y CA -	F N GU -	F Y F -	F Y CA -	F Y #F -	F Y UG -
C+	C Y CA -	C Y F -	C Y F -	C N CA M	C Y F -	C Y AD -
C-	F ? ? -	N ? ? -	N ? ? -			

STUDENT 464 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	C Y F -	N N GI GI	C N UN M	C N GU -	F Y UG -
B-	N N HU -	N N GI GI	N N GI GI	N N GU -		
C+						
C-						

3

STUDENT 456 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C N UN M	C N UN M	C Y F -	C Y CA -	C N GU -	C Y UG -
B-	F Y CA -	F Y #F -	F Y F -	F Y CA -	F N GI GI	F Y #F -
C+	C N CA M	C Y F -	C Y F -	C N CA M	N N GU -	N Y UG -
C-	N N GU -	N Y GU -	F Y F -	F Y CA -	N N GI GI	N Y UG -

4

STUDENT 458 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	F Y CL -	N Y HU -	N Y HU -	N N UN M	N Y #F -	N Y #F -
B-	N N UN M	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C+	C Y CA -	N Y AU -	N Y #F -	C Y CA -	N Y HU -	C Y AO -
C-	N Y #F -	N N GU -	N Y UG -	F N CA M	- ? ? -	- ? ? -

INDIVIDUAL STUDENT PROFILE BY ADMINISTRATION

STUDENT 453 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y UN -	N N UN F	N Y #F -	N N UN F	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y HU -	N Y HU -
C+	N Y CL -	N Y UG -	N Y DF -	N Y UN -	N Y UG -	N Y #F -
C-	N Y HU -	N Y UN -	N Y HU -	N Y #F -	N Y UG -	N Y HU -

STUDENT 454 ADMINISTRATION 2

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C N GU -
B-	F Y CA -	F N UN M	F N UN M	F Y CA -	F N GI GI	F N GI GI
C+	C Y CA -	C Y F -	C N F M	C N CA M	C Y MA -	N N GU -
C-						

STUDENT 550 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y CL -	F Y DF -	F Y UG -	F Y CL -	F N GI GI	N Y HU -
C-	F Y CL -	N Y HU -	F Y UG -	F Y CL -	F Y UG -	F N UN M

STUDENT 551 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y HU -	N Y HU -	N Y CL -	N Y UG -	N N HU -
C-	N Y HU -	N Y HU -	N Y HU -	N Y CL -	N Y UG -	N Y UG -

STUDENT 548 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y HU -	N Y HU -	N Y HU -	N Y HU -	N Y HU -
C-	N Y HU -	N Y HU -	N Y HU -	N Y HU -	N Y HU -	C N Y HU -

STUDENT 549 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y UG -	N Y UG -	N Y #F -	N Y #F -	F Y UG -	N Y UG -
C-	F Y CL -	F Y UG -	F Y UG -	N Y #F -	F Y UG -	F Y UG -

STUDENT 543 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y UG -	N Y #F -

STUDENT 547 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CS -	N N GU -	N N UN -	N Y CS -	N Y DF -	N N UN -
C-	N Y CS -	N N GU -	N N GU -	N Y CS -	N N GU -	N N UG -

STUDENT 541 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	F Y HU -	F Y F -	F N UN -	F N UN -	F Y UG -
C-	F Y CS -	F Y UG -	F Y UG -	F Y CL -	F N GU -	F Y UG -

STUDENT 542 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N N GI GI	C Y F -	C Y CS -	C Y F -	F Y UG -
C-	N N UN M	N Y HU -	F N UN M	N N UN M	F N UN M	F Y UG -

STUDENT 537 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	F Y UG -	N Y #F -	N Y CL -	F N UG M	N Y #F -
C-	N Y #F -	F Y DF -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 538 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

273

STUDENT 534 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N N GU -	N Y #F -	F N UG M	N Y #F -
C-	N Y HU -	N Y #F -	N Y #F -	N Y HU -	N Y UG -	N Y UG -

STUDENT 536 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y HU -	N Y DF -	F Y UG -	N Y CL -	F Y UG -	N Y #F -
C-	N Y #F -	F Y DF -	F Y UG -	N Y HU -	F Y UG -	F Y UG -

STUDENT 530 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	F Y CL -	F Y UG -	F N UG M	N Y #F -	N Y #F -	N Y #F -

STUDENT 531 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 527 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	F Y CL -	N Y #F -	N Y #F -
C-	F Y CL -	N Y #F -	N Y HU -	N Y #F -	F Y UG -	N Y #F -

STUDENT 528 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y HU -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 525 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y CS -	C Y F -	C Y F -	N Y CL -	F Y UG -	N Y HU -
C-	N Y HU -	N Y HU -	F Y F -	N N GU -	F Y UG -	F N GI GI

STUDENT 526 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y HU -	N Y HU -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 516 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y GU -	F Y CL -	N N GU -	F Y UG -
C-	F Y CL -	F Y F -	N N GU -	N N GU -	N Y HU -	N Y HU -

STUDENT 517 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	F Y CS -	N Y #F -	N Y #F -	F Y CS -	N Y #F -	N Y #F -
C-	F N UN M	N Y #F -	N Y #F -	F N CS M	N Y #F -	N Y #F -

STUDENT 513 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y CL -	N Y UG -	F Y UG -	N Y CL -	N Y UG -	N Y #F -
C-	N N CL M	F Y UG -	N N UG M	N N CL M	N Y UG -	F Y UG -

STUDENT 515 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N N GI GI	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 511 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

STUDENT 512 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N N UN M	N Y UG -	N Y #F -	N Y UG -	N Y #F -
C-	N Y #F -	N N DF -	N N UG M	N Y #F -	N Y UG -	N Y #F -

STUDENT 505 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	F Y DF -	N Y DF -	N Y CL -	N Y #F -	N Y #F -
C-	N Y CL	N Y DF -	N Y #F -	F N CL M	N Y #F -	N Y #F -

STUDENT 510 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y HU -
B-	N Y #F -	N Y #F -	N Y HU -	N Y #F -	N Y #F -	N Y DF -
C+	N Y HU -	N Y HU -	N Y HU -	N Y HU -	N Y UG -	F Y UG -
C-	F Y CL -	F Y UG -	N Y HU -	N Y CL -	F Y UG -	N Y UG -

STUDENT 489 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y S -	C N GI GI	C Y AO -
B-	F N CA M	F N GI GI	F Y F -	F Y CA -	F ? ? -	F Y AO -
C+	C N UN M	C N F M	C Y F -	C Y CA -	C N GU -	C N UN -
C-						

STUDENT 502 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+						
B-						
C+	N Y #F -	N Y UG -	N Y #F -	N Y CL -	N Y #F -	N Y #F -
C-	N Y CL -	N Y UG -	N Y #F -	N Y #F -	N Y #F -	N Y UG -

STUDENT 467 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GI GI	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GI GI	N Y #F -
C+	C Y CA -	N Y #F -	N Y DF -	F N CA M	N N GI GI	C Y AO -
C-	F Y CA -	F Y F -	N Y #F -	N Y #F -	N N GI GI	F Y UB -

STUDENT 468 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y UN -	N N GI GI	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GI GI	N Y #F -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	N N GI GI	C Y AO -
C-	F Y HU -	N Y #F -	N Y #F -	F Y CA -	N N GI GI	N N UN M

STUDENT 481 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C N UN -	C Y CA -	C N GI GI	C Y UG -
B-	N N UN M	N N GU -	N N GU -	F Y CA -	N N GI GI	F N GU -
C+	C N CA M	C N F M	N N GU -	C N CA M	C N GI GI	C Y UG -
C-						

STUDENT 485 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	G N F M	C Y CA -	C Y MA -	C Y AO -
B-	F N CA M	F N F M	F Y F -	F Y CA -	F N GU -	F Y AO -
C+	C N CA M	C Y F -	C Y F -	C N CA M	C N MA -	C Y AO -
C-	F Y CA -	N N DF M	F Y UG -	F Y CA -	F N AO M	F Y UG -

STUDENT 468 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y #F -
B-	N N UN	F Y F -	F Y F -	F Y CA -	F Y UG -	F Y UG -
C+	C Y CA -	C N F M	C Y F -	C Y CA -	C N MA M	C Y AO -
C-	F Y CA -	F Y F -	F Y F -	F Y CA -	F N GU -	F Y AO -

STUDENT 480 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	F Y CL -	C Y F -	C Y F -	C Y CA -	C Y AO -	C Y #F -
B-	F Y S -	F Y F -	F Y F -	F Y CA -	N N UN M	N Y #F -
C+	C Y CA -	C Y HU -	F Y UG -	N Y HU -	F Y UG -	N Y UG -
C-	F Y CL -	N Y HU -	N Y #F -	F Y CL -	N Y HU -	F Y UG -

STUDENT 465 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	C N GI GI	C Y CA -	C N GI GI	C Y UG -
B-	F Y CA -	F Y F -	F Y T -	F N CA M	F N GI GI	F Y UG -
C+	C N CA M	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y AO -
C-	F N CA M	- ? ? -	- ? ? -	- ? ? -		

STUDENT 467 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	C Y F -	C Y F -	C N UN M	C Y MA -	N Y #F -
B-	N Y CA -	F N OP O	F Y #F -	F N UN M	F Y UG -	F Y UG -
C+	C Y CA -	C N F M	C Y #F -	C Y CA -	C N GU -	N Y #F -
C-	F N CA M	N N GU -	N N GU -	- ? ? -		

STUDENT 459 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CS -	C N F M	C N F M	C Y CA -	C ? ? -	C Y UG -
B-	N Y CL -	F Y F -	F Y F -	N Y CL -	- ? ? -	F Y UG -
C+	C Y CL -	C Y F -	C Y F -	C Y CL -	C ? ? -	C Y AO -
C-	F ? ? -	N ? ? -	N ? ? -			

STUDENT 464 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	F Y CA -	N Y GU -	C N F M	C Y CA -	N N GI GI	C Y UG -
B-	F Y CS -	F Y F -	F N UG M	F Y CA -	N N GI GI	F N UG M
C+	C N CA M	C N GI GI	C N F M	C Y CA -	C N GI GI	C N AO M
C-						

STUDENT 456 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y CA -	C Y F -	N N GI GI	C Y CA -	C N GI GI	N Y UG -
B-	N Y CL F	N Y #F -	N N GI GI	N Y CL -	N N GI GI	N Y UG -
C+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y AO -
C-	N N CS M	N N GI GI	N N GI GI	N N UG -		

STUDENT 458 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y CL -	N Y HU -	N Y UG -	N Y CL -	N Y UG -	N Y UG -
B-	N Y CS -	N Y DT -	N Y #F -	N Y CS -	N Y UG -	N Y UG -
C+	N Y CS -	N Y #F -	N Y DF -	C Y CA -	N N GU -	N Y UG -
C-	N N GU -	N N GU -	N Y UG -	N Y UG -	N N GU -	N Y UG -

INDIVIDUAL STUDENT PROFILE BY ADMINISTRATION

STUDENT 453 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GU -	N Y #F -
B-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
C+	N Y #F -	N Y UG -	N Y HU -	N Y #F -	N Y UG -	N Y UG -
C-	N Y #F -	N Y UG -	N Y UG -	N Y #F -	N Y HU -	N Y #F -

STUDENT 454 ADMINISTRATION 3

	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6
B+	C Y S -	C Y F -	C N GI GI	C Y CA -	C Y GU -	C Y UG -
B-	F Y S -	F Y F -	F Y T -	F Y CS -	F Y GU -	F Y UG -
C+	C N GU -	C N F M	C N F M	C N GU -		
C-						

Cluster 6

D E Individual Profile Sheet

Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
N Y AL -	C,# N F M	C N F M	C,# y CA -	C Y UG -	C Y UG -

D E Individual Profile Sheet

Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	V+ Y AL -	# N GU -	N N HU -	N Y AL -	N Y AL -	N N HU M
	E	V+ Y AL -	V- N AL/OP F,O	N N AL BG,R	N N GU -	N N AL BG,R	N N GU -
2	D	V+ Y AL -	N Y AL -	N Y AL -	N Y AL -	C Y MA -	N Y HU -
	E	N N AL -	N N GU -	N N AL BG,R	N Y AL -	N N UN -	N N AL BG
3	D	N Y UN -	N Y UN -	N Y UN -	N Y UN -	N Y UN -	N Y UN -
	E	N Y UN -	V- N AL CO	N N UN -	N Y UN -	N N GU -	N N UN -
4	D						
	E						

1	D	V+ N AL BG	C Y F -	C N UN F	C Y CA -	N Y UN F	C Y F -
	E						
2	D	F Y CL -	C N F -	N N GU -	V+ Y AL -	V- Y AL -	F Y AO -
	E	F,V+ Y CL -	V- N AL S,BG	C N F M	V+ Y AL -	C N F M	C Y F -
3	D	V+ Y AL -	N N GU -	C Y F -	N N GU -	N N GU -	V- N -
	E	V+ Y AL -	V- N AL S,BG	V- Y F -	V+ Y AL -	Y N UN -	V- N AL S,BG
4	D						
	E						

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Check 2

D E Individual Profile Sheet

Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
JD 542							
1	D	√+ Y AL -	N N AL BG	V- N AL BG	F N CL M	F N UG M	F N UG F
	E	V+ Y AL -	V- N AL BG	V- N AL BG	# N GU -	N N GU -	N Y HU -
2	D	N Y AL -	C Y F -	C Y F -	N N AL CO	C Y F -	C Y F -
	E	N N CL -	C N F M	C N UN -	N N OP O	C N UN -	N N AL BG
3	D	V+ Y AL -	V- Y AL -	C N F M	V+ Y AL -	C N UG M	V+ N OP O,S
	E	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	C Y F -	N Y HU -
4	D						
	E						
551							
1	D	N N GU -	T N UN M	T Y UG -	N N GU -	N N GU -	N N GU -
	E	N N GU -	N N GU	T N UN M	N N GU -	N N GU -	N N GU -
2	D	C N CA M	N N GU -	N N GU -	V+ Y AL -	N N GU -	C Y AO -
	E	N I			V+	V+	V+
3	D	V+ Y AL -	V- Y AL -	T Y UG -	V+ Y AL -	T Y UG -	F N UG M
	E	V+ Y AL -	V- Y AL -	N N GU	V+ Y AL -	T Y UG -	T Y
4	D						
	E						

D E Individual Profile Sheet

Cluster 3

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	502	D	N Y #F -	N Y UG -	N Y UG -	C H CA M	N N UG M	N N UG M
		E	T N CA M	T N F M	N N UG M	T N CA M	T N OP O	T Y UG -
2		D	N Y AL -	V Y AL -	C Y F -	C N UN M	N Y AL -	T N UN M
		E	T Y UN -	T N GU -	T # N OP O	T N UN M	T N OP O	T N UN M
3		D	N N CL M	C # Y F -	# Y NO -	N Y AL -	# N GU -	# Y HU -
		E	N Y AL -	# N UG M	N Y GU -	N Y AL -	N N GU -	N Y AL -
4		D						
		E						
1	511	D	N Y AL -	N Y UG -	C Y F -		N Y AL -	N Y HU -
		E	N Y AL -	C Y F -	C N UG M	N Y AL -	C Y F -	C Y F -
2		D	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y AL -	N Y UG -
		E	N Y AL -	N N UN -	C Y F -	N Y AL -	N N UN -	N Y AL -
3		D	N Y AL -	C N F M	N Y AL -	N Y AL -	C N F M	N Y AL -
		E	N Y AL -	C Y F -	N Y AL -	N Y AL -	C Y F -	N Y AL -
4		D						
		E						

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Cluster 3

D. E. Individual Profile Sheet

196

Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
20 513	D	C Y CA -	C N F M	C N F M	N V GU -	NA	NA
1	E	NA	NA	NA	N A	N A	N A
	D	C Y CA -	C# N MA M	C# N F M	C Y CA -	C Y MA -	C Y MA -
2	E	C Y CA -	C# N F M	C# N F M	C Y CA -	C Y MA -	C Y MA -
	D	# Y HU -	C# N MA M	C N F M	C N CA M	C Y F -	N Y UG -
3	E	N N CL M	C Y F -	C N F M	C Y CA -	C N UG M	C N F M
	D						
4	E						
526	D	F Y - - -	N N GU -	N N UN -	N Y CA -	F Y UG -	F Y UG -
1	E	F N CL M	N N GI GI	N N N -	F Y CL -	N N GU -	N N GU -
	D	C Y CA -	N Y AL -	C Y F -	C N OP O	C Y UG -	C N UN M
2	E	C Y CA -	C Y F -	C N F M	C Y CA -	F Y UG -	N N GU -
	D	C Y CA -	C Y F -	C Y F -	C Y UN -	F N UN M	C Y F -
3	E	F Y CL -	C Y F -	F N UN -	F N UN M	C Y F -	C Y F -
	D						
4	E						

Cluster 3 — D E Individual Profile Sheet

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	527	D	# Y AL -	N Y HU -	N N UN -	N Y AL -	F Y UG -	N Y UC -
		E	# Y AL -	N N DF M	N N UG M	H+ N AL BG	F Y UG -	N N OP O
2		D	NA	NA	NA	NA	NA	NA
		E						
3		D	V+ Y AL -	V- Y AL -	F Y UG -	V+ Y AL -	F# Y UG -	F# Y UG -
		E	V+ Y AL -	H- Y AL -	V- N AL BG	V+ Y AL -	F Y UG -	F Y AL -
4		D						
		E						
1	531	D	H+ Y AL -	H- Y AL -	H- Y AL -	H+ Y AL -	# N UN -	H+ Y AL-GO
		E	H- Y AL -	F= Y DF -	# N UN -	H+ Y AL -	N Y DF -	H+ Y AA -
2		D	N Y #F -	F Y DF -	F N UN M	N Y AL -	N Y UG -	# N UN -
		E	N Y AL -	N Y DF	F# Y UG -	N Y AL -	N Y UG	V- Y AA' -
3		D	N Y AL -	N Y AL -	N Y [illegible] -	N Y [illegible]	N Y [illegible]	N N [illegible]
		E	N Y AL	V- Y AL'	V- N [illegible]	V+ Y [illegible]	# [illegible]	# N UG
4		D						
		E						

Cluster 3

D E Individual Profile Sheet

198

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1 D	541	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	C,# Y F -	C Y UG -
1 E		V+ Y AL -	# N F -	C N F M	V+ Y AL -	C,# N UN -	C N UN -
2 D		NA	NA	NA	N.A	N.A	N.A
2 E							
3 D		V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- N AL S,EG	C Y UG -
3 E		V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	V- N AL S,EG	F N UN -
4 D							
4 E							
1 D	550	F Y CL -	T Y F -	F N UN -	V+ Y AL -	F N UN -	F Y UG -
1 E		V+ Y HU -	V+ N AL -	F Y UG -	V+ Y AL -	F Y - -	F Y UG -
2 D		V+ Y AL -	V- Y AL -	T N UN -	V+ Y AL -	F N UN M	T Y T -
2 E		V+ Y AL -	V- N AL EG	F Y UG -	V+ Y AL -	F Y UG -	F Y UG -
3 D		V+ Y AL -	V- Y AL -	F Y Y -	V+ Y AL -	F Y UG -	F Y UG -
3 E		V+ Y AL -	F N UN M	F Y UG -	V+ Y AL -	F Y UG -	F Y Y -
4 D							
4 E							

Cluster 4

D E Individual Profile Sheet

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	505	D	NA	NA	N	N	N	N
		E						
2		D	N Y HU -	C N F M	C N F M	F N CL -	C N F -	C N F -
		E	N Y AL -	C N F M	N N GU -	N	V	V
3		D	V+ Y AL -	C N F M	C N F M	V+ Y AL -	C,# Y F -	C Y F -
		E	C N UN M	C N F M	C Y F -	V+ Y AL -	C N MA M	C Y MA -
4		D						
		E						
1	548	D	H+ Y AL -	C,F,H- Y AL -	# Y HU -	H+ Y AL -	# Y HU	# Y UN -
		E	H+ Y AL -	C,F,H- N AL BG	# N GU	H+ Y AL	# N UN	# N UN -
2		D	N Y AL -	F Y UG -	V- Y AL -	N Y AL -	N Y HU -	N Y HU -
		E	N N AL CO	V- Y AL -	N Y #F -	V+ Y AL -	N Y #F -	N Y - -
3		D	V+ Y AL -	F Y UG -	V- Y AL -	H+ Y AL -	N Y HU -	N Y HU -
		E	H+ Y AL -	H- Y AL -	N N UN -	V+ Y AL -	N Y UN -	H+ Y AA -
4		D						199
		E						

Cluster 4

D E Individual Profile Sheet

200

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	512	D	C,* y CA -	C,# N F M	C,# N F M	C,# N. CA M	C,# N AO M	C,# y UG -
		E	C y CA -	C y F -	C y F -	C N CA M	C N OP O	C N F M
2		D	H+ y AL -	V- N F -	# N GU F	H+ y AL -	F,# y UG -	C N F M
		E	H+ y AL -	C y F -	C y F -	H+ y AL -	C y UG -	N N GU F
3		D	N y AL -	N N UG M	C y F -	C y CA -	N N UG F	N y UG -
		E	V+ y AL -	C y F -	C y F -	V+ y AL -	V- y AL -	C y F -
4		D						
		E						
1	517	D	N N AL CO	N N AL CO	V+ N AL/OP O/S	V+ y AL -	F N GU -	F y UG -
		E	V+ N AL BG	F N DF F	F N GU -	V+ N AL BG	F y UG -	F N UN F
2		D	N y AL -	N y AL -	F y UG -	N N AL BG	F N UN -	F N UG M
		E	N N AL CO	V- N AL S,BG	N N AL/OP O	N N UN -	N N AL BG/R	N N AL -
3		D	N y UN -	N y UN -	N y UN -	N y UN -	C y UG -	F y UG -
		E	F y AL -	N N DF M	N N GU -	N N UN -	F N UU -	F y U -
4		D						
		E						

Counter 4

D E = Individual Profile Sheet

Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	F,# Y CL -	C,# N F M	C N OP O	F,# Y CL -	F,# Y UG -	C Y F -
	E	C Y CS -	C,# N F -	C Y F -	C Y CA -	C N F M	C Y F -
2	D	H+ Y AL -	C,# N F M	C Y F -	H+ Y AL -	C,# N F M	C N F M
	E	H+ Y AL -	C,# Y F -	C N F M	H+ Y AL -	C Y F -	C Y F -
3	D	V+ Y AL -	V- Y AL -	V- Y AL -	V+ Y AL -	C N F M	C Y F -
	E	V+ Y AL -	V- Y AL -	C Y F -	V+ Y AL -	C Y F -	C Y F -
4	D						
	E						

		530					
1	D	# Y AL -	H- Y AL -	# Y AL -	H+ Y AL -	N Y HL -	C,# Y UG -
	E	H+ Y AL -	H- N AL BG	C,# Y UG -	H+ Y AL -	C N UG M	C Y UG -
2	D						
	E						
3	D						
	E						
4	D						
	E						

Cluster 4

D E Individual Profile Sheet

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Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y #F -	N Y #F -	N N UG M	N Y AL -	N N UG M	C N UG M
	E	N Y AL -	C Y F -	N Y UG -	N Y AL -	N Y UG -	N Y UG -
2	D	N Y #F -	H- Y AL -	N Y UG -	N Y #F -	T,# Y UG -	N Y HU -
	E	N Y AL -	N. Y #F -	C N F M	N Y AL -	N Y UG -	N Y UG -
3	D	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
	E	N Y #F -	V- Y AL -	# Y UG -	N Y AL -	V- Y AL -	N Y #F -
4	D						
	E						

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1	D	V+ Y AL -	V- N AL BG	#. N DF M	N Y CA -	N N UN -	# Y UN -
	E	T N UN -	F N DF M	# N UN -	V+ Y AL -	N N UN -	F Y UG -
2	D	V+ N AL BG	N N UN -	N N UN -	N N CL M	N N UG M	N N UN -
	E	N/A	N/A	N/A	N/A	N/A	N/A
3	D	N N GI GI	N Y AL -	V- Y AL -	T Y CL -	N N US M	F Y UG -
	E	N Y AL -	N N UN -	N N UN -	N N GU		
4	D						
	E						

Cluster 5

D E Individual Profile Sheet

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	530	D	C N CA M	C,# Y F -	C N F M	N Y AL -	C,# Y UG -	C Y UG -
		E	N Y AL -	C,# Y F -	C,# Y F -	N Y AL -	C N F M	C,# Y UG -
2		D	N Y AL -	# Y AL -	# Y AL -	N Y AL -	# Y AL -	# Y AL -
		E	N Y AL -	C Y F -	C Y F -	N Y AL -	N N UG M	C Y UG -
3		D	V+ Y AL -	V+ Y AL -	F,# Y UG -	V+ Y AL -	# N UG M	F Y UG -
		E	V+ Y AL -	F,# Y UG -	F,# Y UG -	V+ Y AL -	F,# Y UG -	F,# Y UG -
4		D						
		E						
1	528	D	N Y		F Y		F Y UG -	
		E						
2		D	H+ Y AL -	H- Y AL -	N Y AL -	H+ Y AL -	# Y	N Y AL -
		E	N Y AL -	H- Y AL -	F Y UG	H+ Y AL -	F,# N	N Y AL -
3		D	N Y AL -	V- Y AL -	N Y #F -	N Y AL -	N Y AL -	N Y AL -
		E	N Y AL -	N Y AL -	Y- Y	V+ Y AL -	# N	N Y AL -
4		D						
		E						

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Cluster 5

D E Individual Profile Sheet

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Int.	ID	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	D	N Y AL -	C Y F -	F Y UG -	N N CS M	N Y UG -	N Y UG -
	E	N N AL BG	C N F M	N Y UG -	N Y AL -	N N UG M	N Y UG -
2	D	N Y AL ...	H- Y AL -	F N UG M	F Y CL -	F Y UG -	F Y UG -
	E	F Y CL -	H- Y AL -	F N OP -	F Y CL -	F Y UG -	F N UG M
3	D	N Y AL -	V- Y AL -	F Y UG -	N Y AL -	F Y UG -	F N UG M
	E	V+ Y AL -	Y- N AL CO	F Y UG -	F Y CL -	F Y UG -	F N UG M
4	D						
	E						
1	D						
	E						
2	D						
	E						
3	D						
	E						
4	D						
	E						

D E Individual Profile Sheet

Cluster 6

Int.	ID		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
1	526	D	V+ y AL -	V- y AL -	C y F -	V+ y AL -	T y F -	T y AO -
		E	V+ y AL -	V+ N AL/OP O,S	T N UN F	V+ y AL -	T N UN M	T y UG -
2		D	V+ y AL -	V- y AL -	C y F -	V+ y AL -	T y UG -	C y AO -
		E	V+ N AL RG	V- N AL SB	C N F M	V+ y AL -	C y F -	C y AO -
3		D	V+ y AL -	V- y AL -	N y UG -	V+ y AL -	N N UG M	N y UN -
		E	V+ y AL -	V- y AL -	C y F -	V+ y AL -	F y UG -	C N UG -
4		D						
		E						
1	528	D	C y CA -	C N F AI	C y UG -	V+ y AL -	N y AU -	C y UG -
		E	V+ y AL -	C,# y F -	C,# y F -	V+ y AL -	V- y AL -	V- y AL -
2		D	H+ y AL -	H- y HU -	# y AL -	H+ y AL -	# y UG -	# y UG -
		E	H+ y AL -	H- y UG -	# y UG -	H+ y AL -	# y UG -	# y UG -
3		D	V+ y AL -	V- y AL -	V- y AL -	V+ y AL -	V+ y AL -	N y AL -
		E	V+ y AL -	V- y AL -	V- y AL -	V+ y AL -	T,# y AL -	T, y AL -
4		D						
		E						

D E Individual Profile Sheet

Cluster 6

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Int.		Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
2D 536							
1	D	N Y AL -	C,# N F M	C N F M	C,# y CA -	C y UG -	C y UG -
	E	C Y CL -	C N F M	C y F -	C,# y CL -	C,# y UG -	C y UG -
2	D	H+ y AL -	# N OP O	F y UG -	H+ y AL -	F y UG -	F y UG -
	E	H+ N AL CO	F,# N UN M	F,# y UG -	H+ y AL -	F,# y UG -	F y UG -
3	D	V+ y AL -	V- y AL -	F,# y UG -	V+ y AL -	F,# y UG -	F,# y UG -
	E	V+ y AL -	V- N AL BG	F,# y UG -	V+ y AL -	F,# N UG M	F,# y UG -
4	D						
	E						
537							
1	D	C N CA M	C y F -	C y F -	C N CA M	C y F -	C y AL -
	E	C y CA -	C y F -	C y F -	C N CA -	C y F -	C y F -
2	D	# y AL -	F y UG -	F,# y UG	F# y CL -	F y UG	F y UG
	E	# y CL -	C y F -	C y F -	C y CA -	# y UG -	F y UG -
3	D	N y AL -	F N UG M	F N UG M	N y AL -	F N GU -	F y U -
	E	N y AL -	C,# y F -	C y F -	N y AL -	C N F M	C y F -
4	D						
	E						

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