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ABSTRACT

Reported are data from the second individual interview conducted in 1979 as part of a 3-year study on addition and subtraction using verbal problem solving. From three schools in Wisconsin that used the Developing Mathematical Processes program, 150 first-grade children were individually administered six problem types (two solvable by addition and four solvable by subtraction) given under four conditions involving size of number and presence or absence of manipulative materials. Answers were coded by model, correctness, and strategy. Discussed first are individual student profiles, followed by a summary of behaviors by task and level. Levels of difficulty, the comparative difficulty of addition and subtraction, the similarity of response patterns for the two addition tasks, subtraction strategies and problem structure, mental strategies, less frequently occurring strategies, and errors are each discussed. Finally, secondary analyses of data are presented. Appendices contain sample problem tasks and individual student profiles. (MNS)

Working Paper 285

Results From Second Individual Interview (January 1979), Coordinated Study #1

by

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MISSION STATEMENT

The mission of the Wisconsin Research and Development Center is to improve the quality of education by addressing the full range of issues and problems related to individualized schooling. Teaching, learning, and the problems of individualization are given concurrent attention in the Center's efforts to discover processes and develop strategies and materials for use in the schools. The Center pursues its mission by

- conducting and synthesizing research to clarify the processes of school-age children's learning and development
- conducting and synthesizing research to clarify effective approaches to teaching students basic skills and concepts
- developing and demonstrating improved instructional strategies, processes, and materials for students, teachers, and school administrators
- providing assistance to educators which helps transfer the outcomes of research and development to improved practice in local schools and teacher education institutions

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WISCONSIN RESEARCH AND DEVELOPMENT
CENTER FOR INDIVIDUALIZED SCHOOLING

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A major aim of mathematical instruction is to enable students to acquire concepts and skills requisite for solving problems of many types. A principle goal of mathematical education research is to understand how children acquire those concepts and skills and to understand how selected pedagogical and psychological factors are related to their acquisition. The Mathematics Work Group of the Wisconsin Research and Development Center for Individualized Schooling is presently conducting a program of research focused on a small set of those concepts and skills. Our interest lies in arithmetical learning, and in particular, in the acquisition of concepts and skills related to addition and subtraction of whole numbers.

The research program is attempting to relate pupil performance on selected arithmetic skills to pupil cognitive processes, instructional materials, and teachers' classroom behaviors. The interrelationship of these variables is depicted in Figure 1. Using this framework, we are proceeding to:

1. identify important addition and subtraction skills;
2. review past empirical data or collect new data on these skills;
3. re-examine these mathematical skills and hypothesize how they are related to underlying cognitive skills;
4. examine the instructional materials designed to teach these skills; and
5. conduct a series of empirical studies on the appropriateness of particular teacher classroom behaviors, the appropriateness of instructional materials, and the relationship of specific cognitive skills to

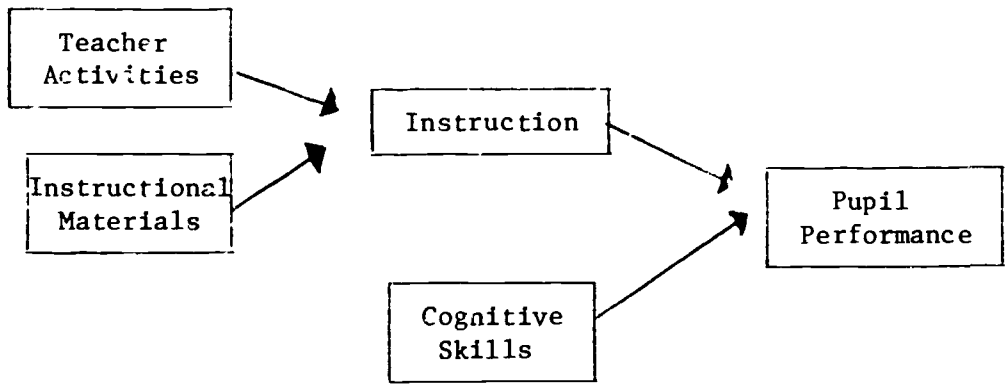

Figure 1. Factors influencing pupil performance.

mathematical skills.

The work of the Mathematics Work Group is built around the conceptual framework exemplified in Figure 1. The empirical and theoretical investigations generally involve two or more of the factors depicted, and have been organized into four major categories. These are a conceptual paper series, a set of short empirical studies, a major longitudinal study, and an invitational conference of scholars.

This paper relates to the longitudinal study. Approximately 150 students in three separate schools have been identified as subjects for the study and are being followed for about three years. Pupil performance will be measured in several ways:

1. Individual interviews. At several times during each school year, individual children are administered a set of problem tasks dealing with addition and subtraction. The interviewer attempts to ascertain the children's solution strategy, correctness of answer, type of errors made, and modeling procedures.

2. Group administered paper-and-pencil tests. There are two separate categories of tests:

   a. Achievement monitoring. These tests measure pupil progress toward a set of performance objectives that are contained in the instructional materials. By means of matrix sampling procedures, estimates are made of group performance. Achievement monitoring tests are given shortly after the completion of the instructional units related to arithmetic objectives.

   b. Topic inventories. These are very short tests that measure

pupil progress toward mastery of the objectives of a specific instructional unit, or topic. Every subject takes the same test, resulting in a measure of individual performance.

Instruction and classroom environment are assessed by direct classroom observation of teacher actions, pupil behaviors, and instructional materials. A trained observer is present each day the instructional units, or topics, dealing with arithmetic objectives are being used. Organizational and grouping measures are noted, along with indications of interactions between teacher and pupils, and among pupils. Measures of pupil engaged time are estimated by observing six target students.

The purpose of this paper is to report on the data from the second round of individual interviews for the Coordinated Study, which were carried out during January 1979. In the first major section we present all the background information on subjects and the manner of data collection. In the following two major sections, summaries and interpretations of the data are given. Some of the actual data collected in the interviews appears in the Appendices.

Background Information

This section contains background infromation needed to understand the data summaries given in the next section. As indicated in the various subsections, greater detail may be obtained by referring to other reports from the Mathematics Work Group.

Population and Curriculum Materials

The second interview of individual children was carried out during the period January 9-16, 1979, at the three participating schools:

School 1: a public school in Monona, Wisconsin.

School 2: a public school in Madison, Wisconsin.

School 3: a parochial school in Madison, Wisconsin.

The subjects for the study consisted of 150 first grade students, all from predominantly middle class areas, who had parental permission to participate in the interviews. Table 1 presents the number of children who participated in the study in each school and information about their age at the time of the second interview.

Each of the schools used as their mathematics curriculum the Developing Mathematical Processes (DMP) program (Romberg, Harvey. Moser, and Montgomery, 1974). The following sequence of topics was suggested to the eight teachers involved in the study: 15, 17, 19, 20, 21/23, 24, S-1, 26, S-2. 22. S-3, 28. Most teachers also did Topics 16 and 18. Topics S-1, S-2, and S-3 were specially prepared for Coordinated Study #1 (See Kouba and Moser, Note 1).

The interviews were begun following instruction in Topic 24. By this time in their mathematics instruction, the children had been introduced to naming and ordering the whole numbers 0-20. However, they had had no formal instruction in symbolically solving addition or subtraction problems.

Interview Tasks

The interview consisted of six problem types (tasks) given under four conditions. The four conditions are described later. 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 (Note 2) and in Carpenter and Moser (Note 3).

Table 2 present representative problems and 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. The actual problems administered are given in Appendix A.

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 were presented under four conditions that result from crossing smaller numbers vs. larger numbers with presence vs. absence of manipulative materials. Figure 2 shows these four conditions with the labels assigned to them. In the b+ and c+ conditions approximately 30 small plastic cubes about equally divided between blue cubes and orange cubes were available to the child to use as manipulatives if desired.

The actual number triples used in the problems are listed in Table 3. We hypothesized before the interviews began that the four conditions would constitute different levels of difficulty with the b+ condition proving the easiest and the c- the most difficult. The ordering of difficulty of b- and c+ was left to the empirical results. The four conditions became known as the four levels, and that terminology will be used in the remainder of this paper.

The assignment of the number triples (small and large domains) to problem types involved a six-by-six Latin square design resulting in six sets of the six problem types. These sets were uniformly and randomly distributed across subjects. The Latin squares for the small number domain (b) and the large

Table 1

Number and Age of Population by School

	School 1	School 2	School 3	Total
Number of children	66	49	35	150
Mean age	6 yr. 9 mo.	6 yr. 9 mo.	6 yr. 11 mo.	6 yr. 9 mo.
Maximum age	7 yr. 6 mo.	7 yr. 5 mo.	7 yr. 6 mo.	7 yr. 6 mo.
Minimum age	6 yr. 1 mo.	6 yr. 2 mo.	6 yr. 3 mo.	6 yr. 1 mo.
Male	36	25	24	85
Female	30	24	11	65

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?

Presence of manipulatives	Number Size: smaller	Number Size: larger
with	b+	c+
without	b-	c-

Figure 2. Conditions for nonsymbolic problem types.

Table 3

Listing of Number Triples Used in Verbal Problems

Smaller numbers	Larger numbers
2-3-5	3-8-11
2-4-6	4-7-11
2-5-7	5-7-12
3-4-7	4-9-13
3-5-8	6-8-14
3-6-9	6-9-15

number domain (c) are presented in Tables 4 and 5 respectively. The number in the box (☐) in each entry represents the solution the children were to find. The order of the other two given numbers in the tables corresponds to the order in which those numbers appeared in the problem (cf. Table 2). The assignment of problem sets to subjects is listed in Appendix C.

Task sets for a particular level were assigned to chil n so that the same number triple did not occur in the same problem type (task) in any subsequent interview.

Interview Method

Eight trained interviewers (see Martin & Moser Note 4 for details of interviewer training and reliability) administered the interviews. The entire interview process for all schools took one week, the 9th to 16th of January 1979. Two or three interviewers worked at a given school on each day. Interviews began soon after school started and continued through the day, with the usual breaks at lunch and recess. Table 6 details the assignment of interviewers to schools.

Each interviewer was able to conduct 8 to 18 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 interviewers went to the classroom to get a child, and they visited together on the way to the interview area. The verbal tasks were reread to the child as often as necessary so that remembering the given numbers or relationships caused no difficulty.

Table 4

12

b+ and b- Number Triples

Set Number	Task 1	2	3	4	5	6
1	3,6, [9]	7,5, [2]	5,3, [2]	2,4, [6]	4,7, [3]	5,8, [3]
2	3,5, [8]	7,4, [3]	6,4, [2]	3,6, [9]	3,5, [2]	5,7, [2]
3	2,5, [7]	8,3, [5]	9,6, [3]	3,4, [7]	4,6, [2]	3,5, [2]
4	3,4, [7]	6,4, [2]	8,5, [3]	2,3, [5]	5,7, [2]	6,9, [3]
5	2,4, [6]	5,3, [2]	7,5, [2]	3,5, [8]	6,9, [3]	4,7, [3]
6	2,3, [5]	9,6, [3]	7,4, [3]	3,4, [7]	5,8, [3]	4,6, [2]

Table 5

c+ and c- Number Triples

Set Number	Task 1	2	3	4	5	6
1	6,9, [15]	13,9, [4]	11,8, [3]	4,7, [11]	7,12, [5]	8,14, [6]
2	6,8, [14]	12,7, [5]	11,7, [4]	6,9, [15]	8,11, [3]	9,13, [4]
3	4,9, [13]	14,8, [6]	15,9, [6]	5,7, [12]	7,11, [4]	8,11, [3]
4	5,7, [12]	11,7, [4]	14,8, [6]	3,8, [11]	9,13, [4]	9,15, [6]
5	4,7, [11]	11,8, [3]	13,9, [4]	6,8, [14]	9,15, [6]	7,12, [5]
6	3,8, [11]	15,9, [6]	12,7, [5]	4,9, [13]	8,14, [6]	7,11, [4]

Table 6

Interviewer School Assignment

Interviewer Code #	Date							
	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16
12	Sch 1	Sch 1	Sch 1					
27	Sch 2	Sch 2						
30	Sch 1	Sch 1	Sch 2	Sch 3			Sch 3	Sch 3
32			Sch 3	Sch 3				
34	Sch 1	Sch 1	Sch 1					
38	Sch 3			Sch 3			Sch 3	
47	Sch 2	Sch 2						
58		Sch 2						

An individual interview required two sessions, one for b+ and b-, and the other for c+ and c- tasks. The sessions lasted 10-20 minutes each, with each child receiving the same sequence of problems. No child was interviewed twice in one day.

If a child had extreme difficulty in responding to b+ tasks, the interview was broken off at that level. After each level, the interviewer decided whether the child should proceed to the next level in the sequence b+, b-, c+, c-.

Coding Subject Responses

All of the possible student responses are presented in detail in Cookson and Moser (Note 5). Only a brief description is presented here. The coding sheet upon which responses were recorded is shown in Figure 3.

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.

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.

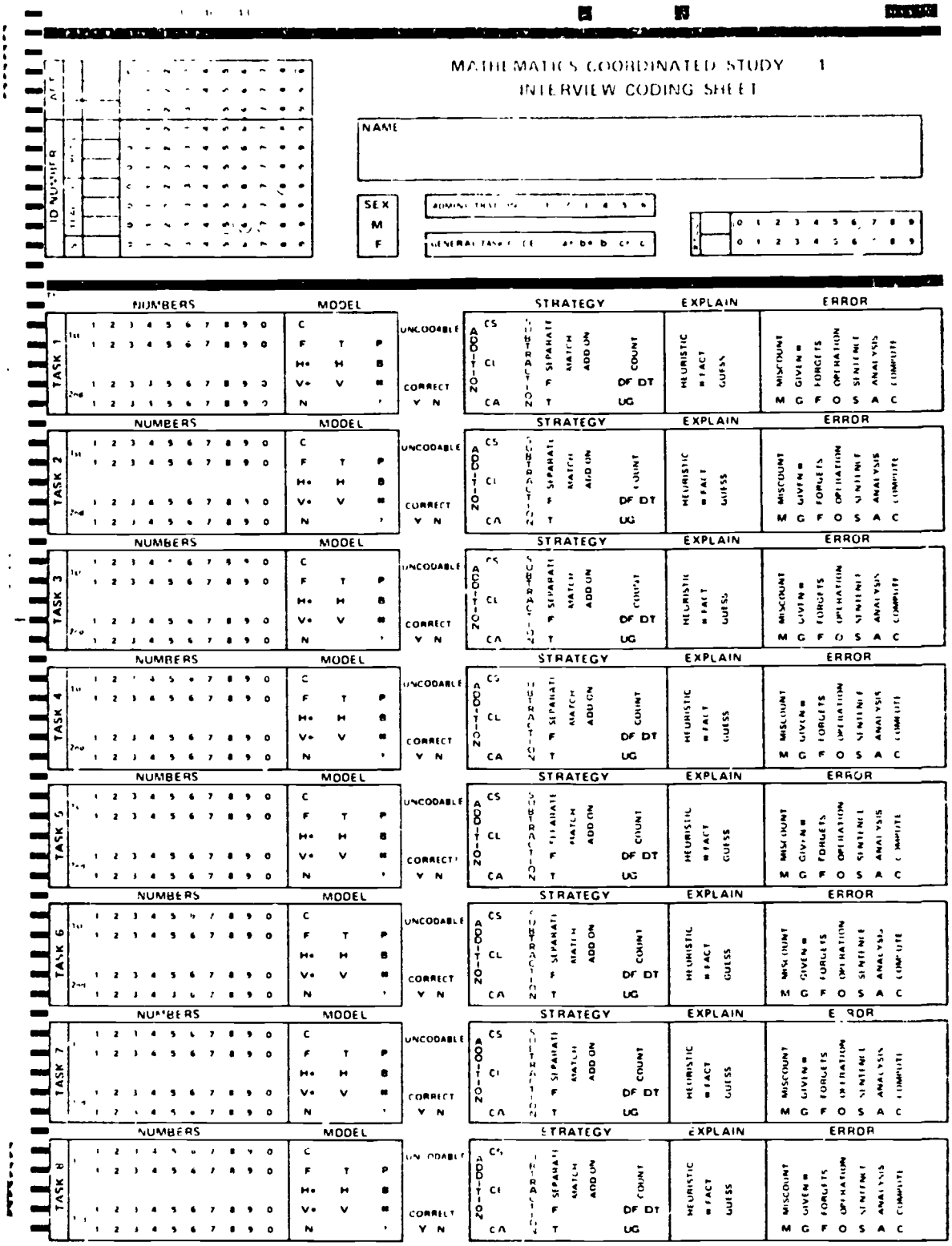

Figure 3. Electronically scored interviewer coding sheet.

Strategy

Addition:

CS Counting On from Smaller or Counting On from First Number: When counting cubes, fingers, or mentally the counting sequence began either with the smaller number (first number given in the story) or the successor of that number.

CL Counting On from Larger: The counting sequence began with the larger (second) given number or with the successor of that number.

CA Counting All: The child counted the complete union of the sets represented in the problem, with counting sequence started at "one, two, ..."

S Subitizing: The child models the two addends and "recognizes" the sum without counting.

Subtraction:

F Separate From: The child models the larger given set and then takes away or separates, one at a time, a number of cubes or objects equal to the smaller given number in the problem. Counting the remainder set gives the answer.

T Separate To: After the larger set is modeled, the child removes cubes or objects one at a time until the remainder is equal to the second given number in the problem. Counting the number of objects removed gives the answer.

MA Match: The child puts out two sets of cubes or objects, each set standing for one of the given numbers. The sets are then matched one-to-one. Counting the excess of the larger set over the smaller set gives the answer.

AO Add On: The child sets out a number of cubes or objects equal to the smaller given number (an addend). The child then adds cubes to that set one at a time until the new collection is equal to the larger given number. Counting the number of cubes added on gives the answer.

DF Count Down From: A child initiates a backwards counting sequence beginning with the larger given number. The backwards counting sequence contains as many counting number words as the smaller given number. The last number uttered in the counting sequence is the answer.

DT Count Down To: A child initiates a backwards counting sequence beginning with the larger given number. The sequence ends with the given smaller number. By keeping track of the number of counting words uttered in this sequence, the child determines the answer to be the number of counting words used in the sequence.

UG Count Up from Given: A child initiates a forward counting sequence beginning with the smaller given number. The sequence ends with the larger given number. Again, by keeping track of the number of counting words uttered in sequence, the child determines the answer.

Addition and Subtraction (Explain or Mental Processes):

HU Heuristic: Heuristic strategies were employed to generate solutions from a small set of known basic facts. These strategies usually were based on doubles or numbers whose sum was 10.

#F Number Fact: The child gave a correct answer with the justification that it was the result of knowing some basic addition/subtraction fact.

GU Guess: The child gave an answer with the justification that it was the result of guessing.

Error:

M Miscount: The child miscounted in some way.

G (GI) Given Number: The child responded that the answer was one of the two numbers given in the problem.

F Forgets: The child forgot one of the given numbers and thereby found an incorrect answer.

O (OP) Operation: The child used an addition strategy in a problem that must be solved through subtraction, or a subtraction strategy was employed in an addition problem.

None of the other items under model, strategy, and error on the coding sheets was used for this interview.

Presentation of the Data

Data were collected on children's behavior following presentation of a specific verbal problem. The six different verbal problem types were presented at four different levels, resulting in a maximum of 24 tasks for an individual child. For reasons to be explained later, not all children received all tasks. Of the 150 children who began the interviews only 88 were administered the complete set of 24 tasks.

This section begins with a discussion of individual student profiles, which comprise the basic raw data, followed by a summary of pupil response data. Several important aspects of the summary data are isolated for contrast and comment. The following major section will present some secondary analyses of combined data.

Individual Student Profiles

A record of each subject's response to the 24 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 F Figure 4 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. In the strategy column (as in much of the data analysis for this study) Uncodable (UN), Given Number (GI), and Operation (OP) were treated as strategies.

The hundreds digit of the student ID number identifies which school the student attended: 1, 2, or 3 (see Table 1).

The actual problem and numbers used in the problem for a given level and task can be obtained by using the following procedure. For example, what was the actual problem read to Student 111 for Task 2 at the b- level?

1. Use Appendix A, Problem Tasks by Level, to find the exact wording for Task 2 at the b- level:

> Alan had ____ crayons.
> He gave ____ crayons to Joan.
> How many crayons did Alan have left?

2. Use Appendix C, Number Set Assignment, to find what set was assigned to Student 111 at the b- level. The entry in the b- column for ID #111 is 2

3. Use Table 4, b+ and b- Number Triples, to find what number triple was assigned to set 2, Task 2. The entry in this table is 7, 4, [3] , where [3] indicates that 3 is the correct solution. Therefore, Student #111 was given the following problem for Task 2, level b-:

Student ID Number

Level	III 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 ? ? -		

model
correct
error
strategy

No entry: The interview was ended, probably because the child was becoming fatigued with the length of the interview.

Figure 4. Sample student profile.

Alan had 7 crayons.
He gave 4 crayons to Joan.
How many crayons did Alan have left?

Looking at the entry in Figure 4, we can reconstruct this child's behavior on Task 2 at the b- level. The N means that the child did not physically model the numbers, and, in fact, showed no action. The Y indicates that the child's answer was correct. The #F indicates that the child answered the problem quickly with a known number fact. Whether this fact was 4 + 3 = 7 or 7 - 4 = 3 is not indicated in the coding. The dash in the error column shows that the child made no error in solving the problem.

Some general understanding of individual students can be achieved by looking at a profile. For example, when considering Figure 4 for Student 111, one might conclude:

1. The student does not have a consistent strategy when solving addition problems (Tasks 1 and 4), but did use a Count All strategy in 3 of the 4 times when cubes were available.

2. The student knows only a few number facts.

3. The student uses no consistent model or strategy across tasks or levels.

A Summary of Behaviors by Task and Level

Each of the four major categories of responses - modeling, correctness, strategy, and error - have been summarized for each of the 24 tasks presented. As indicated in the first major section of this paper, a six-by-six Latin square design was used to distribute the number triples across tasks and across subjects. An initial, informal statistical analysis of the number

triples as a variable affecting subject responses showed that the triples have little effect. The triples 2, 3, 5 and 3, 8, 11 appeared to be somewhat easier than the other triples; however, these were spread uniformly across tasks, so there was little effect on the overall percentages of correct solutions.

Three population subsets. The general goal for the interviews was to present each child with the b+ and b- problems during the first interview session and with the c+ and c- problems during the second session a day or two later. However, not all children were capable of solving all problems. The interviewer had the responsibility to determine at what point a particular level was inappropriate for a child. These guidelines were used:

1. If during the b+ portion of the interview the child fails to use any coherent or identifiable strategies while trying to solve three of the first four problems, terminate the b portion.

2. If the child solves two of the first four b+ problems, but is baffled by the last two problems, i.e., solves two of the six problems, terminate the b portion of the interview.

The interview was terminated, not because three of the four problems were incorrect, but because the child was perplexed by the problem and employed highly inappropriate strategies or because the interviewer was unable to determine what strategies were being employed.

3. If the child solved at least two of the first four and at least one of the last two of the b+ problems, present the b- problems. The b- portion should be completed unless the child cannot solve three of the first four problems.

4. The decision whether the child should go on to the c portion was made at the end of the b interview.

The procedure for determining whether to terminate the c+ or c- level interview followed the same guidelines as those given above. The overriding issue was always the well-being of the child. It would have been unfair to interview further any child who was frustrated or unduly confused by the problems. In a few cases, a decision was made to branch only to c+ problems for some children who relied heavily on physical modeling and did well with the b+ problems, but failed to solve b- problems. For these children, then, it was inferred that they could not solve c- problems but that c+ problems might be within their problem solving abilities.

As a result of the policy of terminating the interview before completion for many children, three sets of subjects were identified.

Total population N=150. This is the total interview population and consists of all children who were interviewed, no matter when the interview terminated.

Real population $88 \leq N \leq 150$. This is the number of subjects who actually were administered each task. This number can change for each task or level.

Successful population N=88. This is the number of subjects who were administered all 24 tasks.

The results describe only the Total population, for that is the most representative of the childrens' responses. Although the decisions to terminate interviews resulted in incomplete data for some students, the decision rules were designed so that it is valid to assume that the child

would have given incorrect answers or used uncodable strategies on the questions that were presented. That is, the child consistently had been giving uncodable incorrect answers or was simply confused on all previous problems. Thus, it was a reasonable assumption that subsequent responses would follow the same pattern.

The statistics for the real and the successful population have been compiled and a copy may be obtained by writing the Mathematics Work Group at the R & D Center.

A table for each of the six tasks is presented (Table 7-12). All four levels for each task are contained in the same table. The uncodable (UN) and confused (?) responses are included in the strategy category. All data are based on the total of 150 subjects.

Levels of Difficulty

Prior to administration of the interviews, it was hypothesized that the four interview conditions, b+, b-, c+, c-, would represent sequential levels of difficulty. The number of students responding correctly to each task under each condition support this hypothesis. Table 13 shows the almost perfect ordering of difficulty for all tasks across all levels with the very slight differences for Tasks 3 and 4 between b- and c+.

Comparative Difficulty of Addition vs. Subtraction

Results from the second interview are consistent with previous research findings and the results of the first interview (October 1978) that addition tends to be easier than subtraction. The average number of correct responses per level for the two addition problems was compared to the average number of correct responses for all four subtraction problems. Since two of the

Table 7

Task 1 (Addition-Joining)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	100(67%)	0(0%)	100(67%)	0(0%)
F	Fingers	9(6%)	81(54%)	10(7%)	74(49%)
N	No Action	42(28%)	58(39%)	20(13%)	38(25%)
O	Other	0(0%)	2(1%)	0(0%)	1(1%)
Y	Correct	126(84%)	113(75%)	99(66%)	68(45%)
UN	Uncodable	11(7%)	17(11%)	5(3%)	15(10%)
?	Confusion	0(0%)	2(1%)	1(1%)	8(5%)
CS	Counts On from Smaller	7(5%)	15(10%)	12(8%)	25(17%)
CL	Counts On from Larger	13(9%)	14(9%)	18(12%)	22(15%)
S	Subitizing	1(1%)	5(3%)	0(0%)	0(0%)
CA	Counts All	83(55%)	52(35%)	80(53%)	26(17%)
HU	Heuristic	4(3%)	4(3%)	6(4%)	7(5%)
#F	Number Fact	25(17%)	26(17%)	2(1%)	1(1%)
GU	Guess	2(1%)	1(1%)	1(1%)	4(3%)
GI	Given Number	4(3%)	2(1%)	2(1%)	3(2%)
OP	Wrong Operation	0(0%)	0(0%)	0(0%)	0(0%)
M	Miscount	8(5%)	11(7%)	18(12%)	15(10%)
F	Forgets Data	3(2%)	2(1%)	2(1%)	3(2%)
	Not administered	0(0%)	12(8%)	23(15%)	39(26%)

Table 8

Task 2 (Subtraction-Separating)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	97(65%)	0(0%)	104(69%)	0(0%)
F	Fingers	11(7%)	81(54%)	7(5%)	58(39%)
N	No Action	45(30%)	56(37%)	14(9%)	40(27%)
O	Other	0(0%)	2(1%)	0(0%)	2(1%)
Y	Correct	108(72%)	92(61%)	80(53%)	31(21%)
UN	Uncodable	10(7%)	31(21%)	6(4%)	25(17%)
?	Confusion	0(0%)	5(3%)	3(2%)	18(12%)
F	Separate from	93(62%)	60(40%)	102(68%)	26(17%)
T	Separate to	1(1%)	0(0%)	0(0%)	2(1%)
MA	Match	0(0%)	0(0%)	0(0%)	0(0%)
AO	Add On	0(0%)	0(0%)	1(1%)	0(0%)
DF	Count Down from	5(3%)	5(3%)	1(1%)	9(6%)
UG	Count Up from Given	3(2%)	3(2%)	4(3%)	6(4%)
DT	Count Down to	0(0%)	0(0%)	0(0%)	2(1%)
HU	Heuristic	5(3%)	4(3%)	3(2%)	2(1%)
#F	Number Fact	17(11%)	15(10%)	2(1%)	2(1%)
GU	Guess	4(3%)	3(2%)	3(2%)	13(9%)
GI	Given Number	6(4%)	7(5%)	1(1%)	4(3%)
OP	Wrong Operation	6(4%)	5(3%)	1(1%)	2(1%)
M	Miscount	19(12%)	10(7%)	32(21%)	23(15%)
F	Forgets Data	1(1%)	1(1%)	2(1%)	2(1%)
	Not administered	0(0%)	12(8%)	23(15%)	39(26%)

Table 9

Task 3 (Subtraction-Part-Part-Whole, missing addend)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	87(58%)	0(0%)	93(62%)	0(0%)
F	Fingers	5(3%)	66(44%)	5(3%)	40(27%)
N	No Action	58(39%)	70(47%)	23(15%)	53(35%)
O	Other	0(0%)	1(1%)	0(0%)	1(1%)
Y	Correct	82(55%)	71(47%)	68(45%)	34(23%)
UN	Uncodable	29(19%)	32(21%)	22(15%)	27(18%)
?	Confusion	5(3%)	7(5%)	8(5%)	20(13%)
F	Separate from	45(30%)	28(19%)	67(45%)	12(8%)
T	Separate to	2(1%)	0(0%)	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)	1(1%)	0(0%)
AO	Add On	3(2%)	6(4%)	6(4%)	2(1%)
DF	Count Down from	1(1%)	2(1%)	0(0%)	2(1%)
UG	Count Up from Given	7(5%)	7(5%)	5(3%)	16(11%)
DT	Count Down to	0(0%)	0(0%)	1(1%)	0(0%)
HU	Heuristic	5(3%)	4(3%)	3(2%)	4(3%)
#F	Number Fact	12(8%)	19(13%)	3(2%)	1(1%)
GU	Guess	6(4%)	5(3%)	3(2%)	16(11%)
GI	Given Number	27(18%)	23(15%)	7(5%)	9(6%)
OP	Wrong Operation	8(5%)	5(3%)	1(1%)	1(1%)
M	Miscount	3(2%)	3(2%)	18(12%)	11(7%)
F	Forgets Data	1(1%)	3(2%)	5(3%)	0(0%)
	Not administered	0(0%)	12(8%)	23(15%)	40(27%)

Table 10

Task 4 (Addition-Part-Part-Whole)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	101(67%)	0(0%)	96(64%)	0(0%)
F	Fingers	9(6%)	71(47%)	9(6%)	53(35%)
N	No Action	40(27%)	62(41%)	17(11%)	41(27%)
O	Other	0(0%)	2(1%)	0(0%)	2(1%)
Y	Correct	123(82%)	108(72%)	107(71%)	68(45%)
UN	Uncodable	18(12%)	12(8%)	6(4%)	13(9%)
?	Confusion	0(0%)	1(1%)	2(1%)	8(5%)
CS	Counts On from Smaller	7(5%)	13(9%)	15(10%)	12(8%)
CL	Counts On from Larger	12(8%)	14(9%)	19(13%)	25(17%)
S	Subitizing	0(0%)	2(1%)	0(0%)	0(0%)
CA	Counts All	79(53%)	52(35%)	73(49%)	28(19%)
HU	Heuristic	9(6%)	8(5%)	5(3%)	6(4%)
#F	Number Fact	20(13%)	27(18%)	3(2%)	4(3%)
GU	Guess	2(1%)	6(4%)	0(0%)	3(2%)
GI	Given Number	3(2%)	0(0%)	1(1%)	2(1%)
OP	Wrong Operation	0(0%)	0(0%)	0(0%)	1(1%)
M	Miscount	10(7%)	10(7%)	10(7%)	12(8%)
F	Forgets Data	3(2%)	3(2%)	2(1%)	1(1%)
	Not administered	0(0%)	15(10%)	26(17%)	48(32%)

Table 11

Task 5 (Subtraction-Comparison)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	95(63%)	0(0%)	84(56%)	0(0%)
F	Fingers	9(6%)	58(39%)	6(4%)	37(25%)
N	No Action	42(28%)	76(51%)	32(21%)	49(33%)
O	Other	0(0%)	1(1%)	0(0%)	2(1%)
Y	Correct	84(56%)	76(51%)	61(41%)	42(28%)
UN	Uncodable	18(12%)	28(19%)	14(9%)	19(13%)
?	Confusion	4(3%)	3(2%)	4(3%)	7(5%)
F	Separate from	18(12%)	9(6%)	12(8%)	1(1%)
T	Separate to	2(1%)	1(1%)	0(0%)	0(0%)
MA	Match	36(24%)	4(3%)	45(30%)	0(0%)
AO	Add On	4(3%)	16(11%)	5(3%)	9(6%)
DF	Count Down from	1(1%)	2(1%)	0(0%)	1(1%)
UG	Count Up from Given	13(9%)	22(15%)	13(9%)	26(17%)
DT	Count Down to	0(0%)	0(0%)	0(0%)	0(0%)
HU	Heuristic	3(2%)	1(1%)	1(1%)	6(4%)
#F	Number Fact	7(5%)	13(9%)	2(1%)	3(2%)
GU	Guess	3(2%)	5(3%)	4(3%)	5(3%)
GI	Given Number	31(21%)	25(17%)	19(13%)	8(5%)
OP	Wrong Operation	7(5%)	4(3%)	4(3%)	4(3%)
M	Miscount	6(4%)	3(2%)	19(13%)	10(7%)
F	Forgets Data	3(2%)	5(3%)	1(1%)	1(1%)
	Not administered	3(2%)	17(11%)	27(18%)	61(41%)

Table 12

Task 6 (Subtraction-Joining, missing-addend)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	84(56%)	0(0%)	86(57%)	0(0%)
F	Fingers	10(7%)	68(45%)	10(7%)	46(31%)
N	No Action	56(37%)	65(43%)	30(20%)	39(26%)
O	Other	0(0%)	0(0%)	0(0%)	3(2%)
Y	Correct	120(80%)	110(73%)	86(57%)	59(39%)
UN	Uncodable	17(11%)	30(20%)	16(11%)	17(11%)
?	Confusion	2(1%)	1(1%)	3(2%)	1(1%)
F	Separate from	2(1%)	0(0%)	3(2%)	0(0%)
T	Separate to	0(0%)	0(0%)	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)	1(1%)	0(0%)
AO	Add On	68(45%)	43(29%)	65(43%)	16(11%)
DF	Count Down from	0(0%)	0(0%)	0(0%)	0(0%)
UG	Count Up from Given	24(16%)	24(16%)	18(12%)	39(26%)
DT	Count Down to	0(0%)	0(0%)	0(0%)	0(0%)
HU	Heuristic	4(3%)	3(2%)	6(4%)	3(2%)
#F	Number Fact	23(15%)	25(17%)	3(2%)	2(1%)
GU	Guess	0(0%)	3(2%)	6(4%)	3(2%)
GI	Given Number	4(3%)	4(3%)	2(1%)	6(4%)
OP	Wrong Operation	3(2%)	0(0%)	0(0%)	1(1%)
M	Miscount	5(3%)	3(2%)	14(9%)	5(3%)
F	Forgets Data	0(0%)	4(3%)	2(1%)	2(1%)
	Not administered	3(2%)	17(11%)	27(18%)	62(41%)

Table 13

Number of Correct Responses Per Task Across Levels

	Level			
Task	b+	b-	c+	c-
1	126	113	99	68
2	108	92	80	31
3	82	71	68	34
4	123	108	107	68
5	84	76	61	42
6	120	110	86	59

subtraction problems, Task 3; Part-Part-Whole, missing addend and Task 5: Comparison, proved to be much more difficult than the others, a comparison was also made between the averages for the two addition problems and the averages for the two easier subtraction problems. Either way, Table 14 demonstrates the relative difficulties.

Similarity of Response Patters for the Two Addition Tasks

An earlier pilot study (Carpenter, Hiebert and Moser, Note 6) used the same two addition tasks and found almost no difference in the responses given by children to those tasks. The results from the second interview reflect this same consistency of response. It would appear that children of the age represented by this sample do not differentiate between an action-oriented Joining addition problem and a static Part-Part-Whole addition problem. Table 15 presents the contrasts between the two problems on a level-by-level basis. Similar results were noted in the first interview.

Subtraction Strategies and Problem Structure

Unlike the monolithic characterization of addition in the previous section, subtraction is not amenable to a single simple interpretation. A number of writers (e.g., Gibb, 1956) have suggested three interpretations, or structures, underlying subtraction. They are the subtractive, the additive, and the comparative. The four problem tasks were chosen with this categorization in mind. Task 2, Separating, reflects the subtractive notion in that its semantic structure strongly suggests the use of the separating or take-away strategy. Task 6, Joining, missing addend, reflects the additive notion in that its semantic structure suggests the additive strategy of adding-on or making a smaller set larger. Task 5, Comparison, reflects the static notion of comparison by suggesting neither adding on

Table 14

Average Number of Correct Responses for

Addition and Subtraction Problems by Level

Type	Level b+	b-	c+	c-
Tasks 1, 4 (Addition)	102	111	103	68
Tasks 2, 3, 5, 6 (Subtraction)	99	87	74	42
Tasks 2, 6 (Easier Subtraction)	114	101	83	45

Table 15

Number of Responses on Two Verbal Addition Problems

	Model			Correct	Strategy				
	C	F	N	Y	CA	CS	CL	#F	HU
b+ Joining	100	9	42	126	83	7	13	25	4
Part-Part-Whole	101	9	49	123	79	7	12	20	9
b- Joining	0	81	58	113	52	15	14	26	4
Part-Part-Whole	0	71	62	108	52	13	14	27	8
c+ Joining	100	10	20	99	80	12	18	2	6
Part-Part-Whole	96	9	17	107	73	15	19	3	5
c- Joining	0	74	38	68	26	25	22	1	7
Part-Part-Whole	0	53	41	68	28	12	25	4	6

nor taking away, but rather a matching or contrasting of two sets. Task 3, Part-Part-Whole, missing addend, is the least suggestive of the four subtraction tasks since its semantic structure does not clearly indicate what strategy is most appropriate.

Pupils' choice of strategy for the four subtraction problems gives very strong evidence that problem structure was a major determining factor in that choice. For purposes of discussion, the Separating From (F), Separating To (T), Counting Down From (DF) and Counting Down To (DT) strategies will be aggregated into a single subtractive category. Similarly, the Adding On (AO) and Counting Up from Given (UG) strategies will be aggregated into a single additive strategy. And finally, Matching (MA) is essentially the comparative strategy. Table 16 presents the frequency of these combined strategy categories for each of the four subtraction problem types across the four levels.

For Separating and Joining, missing addend, the correspondence between problem structure and strategy used is obviously very strong. While the use of the comparative (Matching) strategy with the Comparison problem is not as predominant, the argument for the influence of problem structure on strategy choice is still supported in that the Matching strategy essentially appeared nowhere but in the Comparison problem. For those children who had the Matching strategy within their repertoire of problem-solving processes, the semantic structure of the Comparison problem was strong enough to evoke that strategy. Matching is virtually impossible without manipulatives, which accounts for the virtual absence of Matching at the b- and c- levels.

Although the subtractive strategies were the most popular ones for the Part-Part-Whole, missing addend problem, the proportion of their use compared

Table 16

Number of Responses for Different Subtraction Strategies by Problem and Level

Level	Problem Type	Strategies		
		Subtractive	Additive	Comparative
b+	Separating	99	3	0
	Joining, missing addend	2	92	0
	Comparison	21	17	36
	Part-Part-Whole, missing addend	48	10	0
b-	Separating	65	3	0
	Joining, missing addend	0	67	0
	Comparison	12	38	4
	Part-Part-Whole, missing addend	30	13	0
c+	Separating	103	5	0
	Joining, missing addend	3	83	1
	Comparison	12	18	45
	Part-Part-Whole, missing addend	68	11	1
c-	Separating	39	6	0
	Joining, missing addend	0	55	0
	Comparison	2	35	0
	Part-Part-Whole, missing addend	14	18	0

to the additive strategies is not nearly so overpowering as is the case with the Separating Problem. In fact in the c- level more children used an additive strategy than used a subtractive strategy. This reflects the somewhat ambiguous semantic structure of the Part-Part-Whole, missing addend problem.

The mental strategies of using number facts and heuristics are not included in this analysis because it was impossible to tell from the coding whether the number fact or heuristic used was additive or subtractive in nature.

The "Mental" Strategies

While the use of heuristics was a relatively rare occurrence, the use of number facts with the smaller numbers (0-10) was often the second or third most frequently used strategy. The largest frequency of use of facts came in addition problems and in the Joining, missing addend problems which the children view as having an additive structure.

Less Frequently Occurring Strategies

During this second interview a number of the possible student response behaviors were observed infrequently. The two counting down strategies, Counting Down From and Counting Down To, appeared rather infrequently, especially in the larger-number conditions. Apparently, backward counting skills are not highly developed in mid-year first-graders.

Errors

No task was free of error, although the greater difficulty of the Comparison (Task 5) and the Part-Part-Whole, missing addend problems (Task 3) is reflected in the higher incidence of inappropriate strategy errors (Given Number and Guess). The children's lack of comprehension of the structure

of these two problems appears to be the cause for the large number of cases in which one of the given numbers was supplied as the answer. Overall, miscounting was the most frequent error. This occurred whether the children used cubes or their fingers or just counted mentally. A summary of the frequency of errors is presented in Table 17.

Secondary Analyses of Data

The data analyses contained in this section concern pupil performance rather than results for specific tasks as in the previous section. The patterns apparent in an individual student's response will be considered. In the first two subsections the relationship between a particular type of strategy or model employed and the correctness of response is examined. In the third section we will examine the consistency of a particular strategy across several tasks.

Relationship of Strategy Employed to Correctness of Response

The basic question of interest in this analysis is, "If a child employed a particular strategy, was the problem also solved correctly?" Data answering this question are presented in Table 18 to 21, which aggregate information by levels b+, b-, c+, and c- respectively.

The results for the following behaviors do not appear in the tables because they are inappropriate to our discussion.

1. Number Fact. A requisite for coding Number Fact is that the child's response must be correct. There were 104 responses coded as Number Fact in b+, 125 in b-, 15 in c+, and 13 in c-.

2. ? or confusion. A requisite for this coding is that the child gives no answer; therefore it could not be coded right or wrong. There were 11 such

Table 17

Frequency of Errors Across the Six Problem Tasks

		Error Types					
Task	Level	Miscount	Forgets data	Use Wrong operation	Given #	Guess	Interview terminated
1	b+	8	3	0	4	2	0
Joining	b-	11	2	0	2	1	12
	c+	18	2	0	2	1	23
	c-	15	3	0	3	4	39
2	b+	18	1	6	6	4	0
Separating	b-	10	1	5	7	3	12
	c+	32	2	1	1	3	23
	c-	23	2	2	4	13	39
3	b+	3	1	8	27	6	0
Part-Part-Whole, missing addend	b-	3	3	5	23	5	12
	c+	18	5	1	7	3	23
	c-	11	0	2	9	16	40
4	b+	10	3	0	3	2	0
Part-Part-Whole	b-	10	3	0	0	6	15
	c+	10	2	0	1	0	26
	c-	12	1	1	2	3	48
5	b+	6	3	7	31	3	3
Comparison	b-	3	5	4	25	5	17
	c+	19	1	4	19	4	27
	c-	10	1	4	8	5	61
6	b+	5	0	3	4	0	3
Joining, missing addend	b-	3	4	0	4	3	17
	c+	14	2	0	2	6	27
	c-	5	2	1	6	3	62

Table 18

Level b+: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	7(100%)[a]	-	-	7(86%)	-	-	14(93%)
L	13(92%)	-	-	12(100%)	-	-	25(96%)
CA	83(89%)	-	-	79(87%)	-	-	164(88%)
F	-	93(80%)	45(91%)	-	18(78%)	2(50%)	158(82%)
T	-	1(100%)	2(100%)	-	2(100%)	0	5(100%)
MA	-	0	0	-	36(94%)	0	36(94%)
AO	-	0	3(100%)	-	4(100%)	68(96%)	75(96%)
DF	-	5(60%)	1(100%)	-	1(0%)	0	7(57%)
UG	-	3(100%)	7(100%)	-	13(92%)	24(92%)	47(94%)
DT	-	0	0	-	0	0	0
HU	4(75%)	5(100%)	5(100%)	9(89%)	3(67%)	4(75%)	30(87%)
GU	2(0%)	4(0%)	6(0%)	2(0%)	3(0%)	0	17(0%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Table 19

Level b-: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	15(80%)[a]	-	-	13(92%)	-	-	28(86%)
CL	14(100%)	-	-	14(100%)	-	-	28(100%)
CA	52(85%)	-	-	52(77%)	-	-	104(81%)
F	-	60(82%)	28(89%)	-	9(67%)	0	97(82%)
T	-	0	0	-	1(100%)	0	1(100%)
MA	-	0	0	-	4(100%)	0	4(100%)
AO	-	0	6(67%)	-	16(88%)	43(91%)	65(88%)
DF	-	5(100%)	2(50%)	-	2(100%)	0	9(89%)
UG	-	3(100%)	7(100%)	-	22(82%)	24(88%)	56(88%)
DT	-	0	0	-	0	0	0
HU	4(50%)	4(100%)	4(75%)	8(100%)	1(100%)	3(100%)	24(88%)
GU	1(0%)	3(0%)	5(0%)	6(0%)	5(20%)	3(67%)	23(13%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Level c+: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	12(50%)[a]	-	-	15(93%)	-	-	27(74%)
CL	18(94%)	-	-	19(95%)	-	-	37(95%)
CA	80(85%)	-	-	73(88%)	-	-	153(86%)
F	-	102(68%)	67(73%)	-	12(50%)	3(33%)	184(68%)
T	-	0	0	-	0	0	0
MA	-	0	1(100%)	-	45(78%)	1(100%)	47(79%)
AO	-	1(100%)	6(67%)	-	5(100%)	65(85%)	77(84%)
DF	-	1(100%)	0	-	0	0	1(100%)
UG	-	4(100%)	5(80%)	-	13(69%)	18(72%)	40(75%)
DT	-	0	1(100%)	-	0	0	1(100%)
HU	6(83%)	3(67%)	3(33%)	5(100%)	1(100%)	6(100%)	24(83%)
GU	1(0%)	3(0%)	3(33%)	0	4(0%)	6(0%)	17(6%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Table 21

Level c-: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	25(80%)[a]	-	-	12(92%)	-	-	37(84%)
CL	22(91%)	-	-	25(88%)	-	-	47(89%)
CA	26(65%)	-	-	28(68%)	-	-	54(67%)
F	-	26(27%)	12(58%)	-	1(100%)	0	39(38%)
T	-	2(50%)	0	-	0	0	2(50%)
MA	-	0	0	-	0	0	0
AO	-	0	2(100%)	-	9(56%)	16(94%)	27(81%)
DF	-	9(67%)	2(100%)	-	1(0%)	0	12(67%)
UG	-	6(83%)	16(63%)	-	26(77%)	39(82%)	87(77%)
DT	-	2(0%)	0	-	0	0	2(0%)
HU	7(71%)	2(0%)	4(50%)	6(100%)	6(67%)	3(100%)	28(71%)
GU	4(0%)	13(15%)	16(0%)	3(33%)	5(40%)	3(0%)	44(11%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

responses in level b+, 19 in b-, 21 in c+, and 62 in c-.

3. Uncodable. No strategy could be identified, even when the answer was correct. Of the 103 uncodable responses in level b+, 45% were correct; of the 150 uncodable responses in level b-, 55% were correct; of the 69 uncodable responses in level c+, 30% were correct; of the 116 uncodable reponses in level c-, 37% were correct.

4. Wrong Operation. If the children used the wrong operation (for example, adding instead of subtracting), the answer was always incorrect. There were 24 responses in level b+ that were coded wrong operation, 14 in b-, 6 in c+, and 9 in c-.

5. Given Number. If a child responded with a number given in the problem, it was always an incorrect answer. There were 75 such responses in level b+, 61 in b-, 32 in c+, and 32 in c-.

The entries in Tables 18-21 present the number of children who used a certain strategy for a certain task. That number is followed by a percentage figure in parentheses, which represents the portion of those children using the strategy who also got the correct answer.

For example, in the example below, of the 13 children who used the counting up from larger strategy for Task 1, 92% (which is to say, 12 of them) also solved the task correctly.

	Task	
Strategy	1	2
CL	13(92%)	-

In the example, a dash appears on the CL cell for Task 2. A dash indicates the strategy would be inappropriate for this task. In the example, CL is an addition strategy and this was not coded for Task 2, a subtraction problem.

In addition Tasks 1 and 4, Counting Up strategies appear to be the most successful. This may reflect the fact that the more skilled children, who would be successful anyway, are the ones who opt to use the more sophisticated strategies. On the other hand, no single subtraction strategy stands out as more related to successful performance than any other.

Relationship of Model Used to Correctness of Response

We also investigated the relationship between a particular modeling behavior and the rate of correct responses. Tables 22-25 present the results. In the Model category the possible responses were cubes, fingers, no action, other (physical), or a combination of cubes and fingers. Uncodable model responses, confused responses, and combination of models other than cubes and fingers were not considered in the tabulation of these results.

The tables present the number of children who used a particular model for each task and the percentage of those children whose answer to the task was correct.

In general, the data in the "Total" columns suggest that the children performed at about the same level of accuracy regardless of what model they used, cubes, fingers or no action.

Consistency of Student Response

We also investigated whether a child who exhibited a particular response on a problem task would tend to exhibit that behavior on another task. More specifically, does a child show a consistent pattern of response, exhibiting the same behavior every time it is appropriate? Such consistency of behavior could indicate a child's interpretation of the operation of addition or subtraction. If, in a given level, a child used an additive strategy consistently

over all four subtraction tasks, such consistency could indicate that the child has formed an interpretation of subtraction that is independent of the structure of a problem.

Consistency is examined in two ways. In the first, behavior was summarized across all the tasks administered within a specific level. In the second analysis, consistency was considered for a single task across all the levels in which it appeared. The total population of 150 subjects was used in this analysis. In addition to considering use of model, correctness, and strategies, this analysis treated several combined strategies. The combined strategies represent similar patterns of thinking. The following combined strategies have been created for this analysis:

CE - The student responded either CL (Counts Up from Larger) or CS (Counts Up from Smaller).

SEP- The student responded either F (Separates From) or T (Separates To).

CDT- The student responded either DF (Counts Down From) or DT (Counts Down To).

SF - The student responded either F (Separates From) or DF (Counts Down From).

AD - The student responded either AO (Add On) or UG (Counts Up From Given).

ST - The student responded either T (Separates To) or DT (Counts Down To).

ADV- The student responded either with #F (Number Fact) or HU (Heuristic).

In general the results show the following:

1. Within a level, once the children decide to use cubes or fingers as a model, they are fairly consistent in that use.

2. Overall, the children were not consistent in the use of strategies beyond a counts all in addition tasks across levels. Some of this "inconsistency" may be the result of the high "drop-out" rate of the children - 150 did

Table 22

Level b+: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	99(86%)[a]	94(71%)	84(54%)	101(85%)	94(62%)	81(84%)	553(74%)
Fingers alone	9(78%)	10(80%)	5(80%)	9(78%)	9(44%)	8(88%)	50(74%)
Cubes and Fingers	0	1(100%)	0	0	0	1(100%)	2(100%)
No action	41(80%)	43(70%)	55(58%)	40(75%)	41(51%)	53(81%)	273(69%)
Other	0	0	0	0	0	0	0

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Table 23

Level b-: Number of Children Employing a Model and Their Rate of Success

Model	Task 1	2	3	4	5	6	Total
Cubes alone	NA	NA	NA	NA	NA	NA	NA
Fingers alone	79(82%)[a]	77(52%)	62(55%)	70(86%)	53(49%)	67(84%)	408(71%)
Cubes and Fingers	NA	NA	NA	NA	NA	NA	NA
No action	55(82%)	52(73%)	66(53%)	61(75%)	71(63%)	64(83%)	369(71%)
Other	1(100%)	2(100%)	1(100%)	2(50%)	1(100%)	0	7(86%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Note: NA indicates the strategy is not applicable to this task.

Table 24

Level c+: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	97(79%)[a]	104(64%)	93(60%)	96(88%)	81(53%)	82(73%)	553(70%)
Fingers alone	7(71%)	7(71%)	5(40%)	9(78%)	4(75%)	6(67%)	38(68%)
Cubes and Fingers	3(67%)	0	0	0	2(100%)	4(50%)	9(67%)
No action	20(75%)	14(57%)	23(43%)	17(94%)	31(42%)	30(67%)	135(61%)
Other	0	0	0	0	0	0	0

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Table 25

Level c-: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	NA	NA	NA	NA	NA	NA	NA
Fingers alone	68(59%)[a]	57(30%)	40(48%)	53(70%)	34(59%)	45(78%)	297(57%)
Cubes and Fingers	NA	NA	NA	NA	NA	NA	NA
No action	34(65%)	40(30%)	53(26%)	41(71%)	46(41%)	38(58%)	252(47%)
Other	1(0%)	1(100%)	1(100%)	2(100%)	2(50%)	3(33%)	10(60%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Note: NA indicates the strategy is not applicable to this task.

Task 1, Level b+, but only 88 finished through Task 6, Level c-.

There are, however, cases in which some children were consistent. These cases are detailed in Tables 26 and 27.

Conclusion

This is the second in a series of reports on the data from the individual interviews for the Coordinated Study. Each report contains data for only one round of interviewing, and is not concerned with results or changes across time. The longitudinal findings will be presented in separate reports. For previous and subsequent reports in the individual interview series and for additional information and reports concerning the Coordinated Study, contact the Mathematics Work Group at the Wisconsin Research and Development Center for Individualized Schooling, Madison, Wisconsin.

Table 26

Number of Children Who Gave Response

Maximum Number of Times Across Levels

Model or strategy	Maximum responses possible	b+	b-	c+	c-
Cubes	6	53	NA	64	NA
Fingers	6	3	36	-	14
No action	6	21	28	6	20
Correct	6	38	36	19	5
CS	2	-	6	7	9
CL	2	3	3	8	13
CA	2	60	34	62	14
CE	2	4	14	21	28
UG	4	-	-	-	3
AD	4	-	-	-	3
#F	6	-	4	-	-
ADV	6	-	4	-	-

Note: NA indicates the strategy is not applicable to particular task.

dash (-) - The number of children responding the maximum number of times was less than three.

Table 27

Number of Children Who Gave Response

Maximum Number of Times Across Tasks

Model or strategy	Maximum responses possible	Task					
		1	2	3	4	5	6
Fingers	4	-	-	-	3	-	-
No action	4	11	8	9	12	16	12
Correct	4	42	22	21	52	21	44
CL	4	3	NA	NA	-	NA	NA
CA	4	7	NA	NA	8	NA	NA
F	4	NA	14	7	NA	-	-
SEP	4	NA	14	7	NA	-	-
SF	4	NA	19	8	NA	-	-
AO	4	NA	-	-	NA	-	8
UG	4	NA	-	-	NA	3	4
AD	4	NA	-	-	NA	5	21
ADV	4	-	-	-	3	-	-

NA - The strategy is not applicable to particular task.

dash (-) - The number of children responding the maximum number of times possible was less than 3.

Reference Notes

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4. Martin, C. & Moser, J.M. Interviewer training procedures (Working Paper). Madison: Wisconsin Research and Development Center for Individualized Schooling,

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6. Carpenter, T.P., Hiebert, J. & Moser, J.M. The effect of problem structure on first-graders' initial solution processes for simple addition and subtraction problems (Technical Report No. 516). Madison: Wisconsin Research and Development Center for Individualized Schooling, October 1979.

References

Gibb, E.G. Children's thinking in the process of subtraction. Journal of Experimental Education, 1956, 25, 71-80.

Romberg, T.A., Harvey, J.G., Moser, J.M. & Montgomery, M.E. Developing Mathematical Processes. Chicago: Rand McNally and Co., 1974.

APPENDIX A

PROBLEM TASKS BY LEVEL

b+

1. Addition-simple joining

Pam had _____ shells

Her brother gave her ____more

shells. How many shells did

Pam have altogether?

b+

2. Subtraction-simple separating

Jenny had ____erasers.

She gave _____erasers to Ben.

How many erasers did Jenny have

left?

b+

3. Subtraction-part,part,whole
missing addend

There are _____fish in a bowl.

____are striped and the rest are

spotted. How many spotted fish

are in the bowl?

b+

4. Addition-part,part,whole

Matt has _____baseball cards.

He also has _____football cards.

How many cards does Matt have

altogether?

b+

5. Subtraction-difference

Angie has _____lady bugs.

Her brother Todd has ____lady bugs.

How many more lady bugs does Todd

have than Angie?

b+

6. Subtraction-simple joining
missing addend

Gene has _____marshmallows.

How many more marshmallows does he have

to put with them so he has _____

marshmallows altogether?

Level b-

b-

1. Addition-simple joining

Beth had ____gumdrops

Her sister gave her ____more gumdrops. How many gumdrops did Beth have altogether?

b-

2. Subtraction-simple separating

Alan had ____crayons.

He gave _____crayons to Joan

How many crayons did Alan have left?

b-

3. Subtraction-part,part,whole missing addend

There are ____snowmen on the playground. _____have scarves and the rest have hats. How many snowmen with hats are on the playground?

b-

4. Addition-part,part,whole

Gwen has ____red buttons.

She also has _____black buttons.

How many bottons does Gwen have altogether?

b-

5. Subtraction-difference

Jerry has _____mice.

His brother Dan has _____mice.

How many more mice does Dan have than Jerry?

b-

6. Subtraction-simple joining missing addend

Kim has _____silver dollars.

How many more silver dollars does she have to put with them so she has _____ silver dollars altogether?

Level c+

c+

1. Addition-simple joining

Amy had _____beads.

Her father gave her _____more beads. How many beads did Amy have altogether?

c+

2. Subtraction-simple separating

Lisa had _____trucks.

She gave _____trucks to Paul.

How many trucks did Lisa have left?

c+

3. Subtraction-part,part,whole missing addend

There are _____cups on the table.

____have juice (in them) and the rest have milk (in them). How many cups have milk in them?

c+

4. Addition-part,part,whole

Chris had ____large blocks.

He also had _____small blocks.

How many blocks does Chris have altogether?

c+

5. Subtraction-difference

Adam has _____frogs.

His friend Julie has _____frogs.

How many more frogs does Julie have than Adam?

c+

6. Subtraction-simple joining missing addend

Teddy has _____flowers.

How many more flowers does he have to put with them so he has ____flowers altogether?

Level c-

c-

1. Addition-simple joining

Kathy had _____jacks.

Her friend gave her ____more jacks. How many jacks did Kathy have altogether?

c-

2. Subtraction-simple separating

Eric had _____stamps.

He gave _____of them to Gary.

How many stamps did Eric have left?

c-

3. Subtraction-part,part,whole missing addend

There are _____boots in the closet.

_are plain and the rest have fur.

How many fur boots are in the closet?

c-

4. Addition-part,part,whole

Brian has ____yellow bottle caps.

He also has _____green bottle caps.

How many bottle caps does Brian have altogether?

c-

5. Subtraction-difference

Jill has _____candy canes.

Her friend Randy has _____candy canes.

How many more candy canes does Randy have than Jill?

c-

6. Subtraction-simple joining missing addend

Vicky has ____whistles.

How many more whistles does she have to put with them so she has ____ whistles altogether?

APPENDIX B

INDIVIDUAL STUDENT PROFILES

101	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 Y #F –
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	N Y #F –	F Y AO –
c+	C N CA M	C N F M	C Y F –	C N CA M	C Y MA –	C Y AO –
c–	F N CA M	F N F M	– ? ? –	F N CL M	N N UN –	F Y AO –

2	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N UN –	N N GU –	N N GI GI	N Y UN –	N N UN –	N N UN –
b–						
c+						
c–						

103	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F N CA M	F N GI C	F Y F –	F Y CA –	F ? ? –	F Y AO –
b–	F N GI GI	F Y F –	F N GI GI	F Y CA –	F N GI GI	F N AO M
c+						
c–						

104	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 AO –
b–	F Y CA –	F Y F –	N N UN –	F Y CA –	F N UN –	F Y AO –
c+	F Y CA –	F Y F –	– ? ? –	C Y CA –	C Y AO –	C Y AO –
c–	– ? ? –	– ? ? –				

105	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CS -	F Y F -	N Y UN -	F Y UN -	F N GI GI	N Y #F -
b-	F Y CA -	F N F M	F N GI GI	F Y CA -	F N UN -	F N GI GI
c+	C Y CA -	F N F M	F Y F -	F Y CA -	C N GI GI	C N AO M
c-	F Y CA -	F N F M	F N F M	F Y CA -	F N GI GI	N N GI GI

106	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	N N GI GI	C Y CA -	N N UG F	N Y UG -
b-	F Y CA -	N N GU -	N N GI GI	F N CA F	N N UG F	N Y UG -
c+						
c-						

107	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN -	F Y F -	- ? ? -	F N CA F	F Y AO -	F Y AO -
b-	F Y CA -	F Y F -	F N OP O	F Y CA -	F Y AO -	F Y AO -
c+	F N CS M	C Y F -	C ? ? -	C Y CA -	C N MA -	C N F -
c-						

108	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL -	C Y F -	C N UN -	C Y CA -	C Y MA -	C Y AO -
b-	F Y CL -	N N GI GI	N Y #F -	F Y CA -	F N UN -	F N UN -
c+	C Y CA -	C Y F -	C N UN -	C Y CA -	C N MA M	C Y AO -
c-	F N UN -	F N F M	F N UN -	F Y CA -	F N UN -	F N UN -

109	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C N F -	Y CA -	N N GI GI	C N UN -
b-	F N CA M	F Y F -	F N GI GI	F N CA M	F N GI GI	F N AO F
c+						
c-						

110	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CS -	C Y MA -	C Y AO -
b-	F Y CS -	F Y F -	F Y F -	F Y CS -	F Y AO -	F Y AO -
c+	C N CS M	C Y F -	C N F F	C Y CS -	C Y MA -	C Y AO -
c-	F N CA M	- ? ? -	- ? ? -	- ? ? -		

111	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 ? ? -		

112	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N GI GI	C Y F -	C N GI GI	C Y CL -	C Y MA -	C Y #F
b-	F Y CA -	C Y F -	F N GI GI	F Y CL -	N Y GU -	F Y UG -
c+	C Y CL -	C Y F -	C Y F -	C Y CA -	C Y MA -	C N UN -
c-	F Y CL -	- ? ? -	N N UN -	N Y CL -	F N AO M	N Y UG -

113	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 -	N Y HU -
b-	F N CA M	F N F M	F Y F -	F Y CA -	F Y MA -	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F N UN -	F N F M	F N F M	F Y CA -	- ? ? -	F N GI GI

114	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C N OP O	C Y CA -	C Y MA -	C N OP O
b-	F ? ? -	F N UN -	F N OP O	F Y CA -	F N AO M	F Y AO -
c+	C Y CA -	F Y F -	C Y F -	C N GI GI	C Y MA -	C N UN -
c-	F ? ? -	F N HU -	- ? ? -	- ? ? -		

115	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN -	N Y UN -	N ? ? -	N Y UN -	N N UN F	N N UN -
b-	N N CA M	N ? ? -	N N GI GI	N N UN -		
c+						
c-						

116	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 Y F -	C N F M
b-	F Y CA -	F N F M	F N UN -	F Y CA -	F N UG F	F Y AO -
c+	C Y CA -	C Y F -	F N UN -	N N CL M	N N UN -	N N GU -
c-						

117	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	N N OP O	N Y #F -	N Y #F -	C Y #F -	C Y #F -
b-	N Y -	N Y UN -	N Y UG -	- ? ? -	N Y UG -	N Y #F -
c+	N Y #F -	- ? ?	N Y HU -	- ? ? -	- ? ? -	- ? ? -
c-						

118	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y T -	N Y UG -	N Y #F -	N Y UG -	N Y #F -
b-	N Y CL -	N Y UG -	N Y #F -	N Y CL -	N Y UG -	N Y #F -
c+	N N CS M	N Y UG -	N Y UG -	N Y CS -	N Y #F -	N Y #F -
c-	N Y CS -	N Y #F -	N Y #F -	N Y #F -	N N #F -	N Y HU -

119	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 AO -
b-	F Y CS -	F N OP O	F N AO M	F Y CA -	- ? ? -	F Y AO -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	- ? ? -	C Y AO -
c-	F Y UN -	F N F M	F Y AO -	F Y CL -	N N UN -	F Y AO -

120	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	N N GU -	C Y UN -	N N CU -	N Y UG -
b-	F Y CA -	N Y UN -	F Y #F -	F Y CA -	N Y UN -	F N UN -
c+	C Y CA -	C N F M	N N GU -	C Y CA -	N Y UG -	N N UG M
c-	F Y CA -	N Y GU -	N Y UN -	N N GU -	N Y UN -	N N GU -

122	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GI GI	C N GI GI	N N GI GI	N N GI GI	N N GI GI	C N GI GI
b-						
c+						
c-						

123	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 HU -	C Y MA -	C Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	N Y UG -	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F N CA M	F Y F -	V V GU -	F Y CS -	F Y UG -	F Y UG -

124	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y #F -	N Y #F -	C Y MA -	N Y #F -
b-	F Y CL -	F Y F -	N Y #F -	F Y CA -	N Y #F -	N Y UG -
c+	C Y CA -	C N F M	C Y #F -	C Y CS -	C Y MA -	C Y AO -
c-	F Y CS -	- ? ? -	- ? ? -	F Y CA -	F Y AO -	N N GU -

127	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y AO -	C Y CA -	C Y AO -	C Y AO -
b-	F Y CS -	F Y F -	F Y F -	F Y CS -	F Y AO -	F Y UN -
c+	C N CA F	C Y F -	C Y F -	C Y CL -	C Y MA -	C Y AO -
c-	F Y CA -	F N DF M	F N F M	F Y CA -	F Y UG -	F Y UG -

128	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y #F -	N N GI GI	N N UN -	N Y CL -	C Y MA -	N Y UG -
b-	N Y CL -	F N OP O	N ? ? -	N Y CL -	N N GI GI	F Y UG -
c+	F Y CA -	F Y F -	- ? ? -	F Y CL -	N N GI GI	F Y AO -
c-	F Y CL -	F Y F -	N N GU -	F Y CL -	N Y GU -	F Y AO -

129	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL -	C Y F -	C N GU -	C Y CA -	C Y MA -	C Y AO -
b-	F N #F F	F Y F -	F N F F	F Y CS -	F Y MA -	F Y AO -
c+	C Y CA -	C N UN F	N N UN -	C Y CA -	C N UN -	C Y AO -
c-	F Y CA -	F N F M	N N GU -	F N CA M		

130	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N N OP O	N Y HU -	N Y #F -	N N UN -	N Y #F -
b-	N Y #F -	N Y UN -	N Y HU -	N Y #F -	N Y UG -	N Y #F -
c+	N Y HU -	C Y F -	N N HU -	N Y #F -	N Y UN -	N Y #F -
c-	N Y CL -	N N GU -	N ? ? -	N Y HU -	N Y #F -	N Y UN -

131	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	F Y F -	C N GI GI	C N CA M	C Y UN -	C Y AO -
b-	F Y CA -	F N F M	F N GI GI	F Y CA -	F Y #F -	F Y #F -
c+	C Y CA -	C Y F -	N N GI GI	C N CA M	C N MA M	C N GU -
c-						

132	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	F Y CL -	C N F M	N Y #F -
b-	N Y UN -	F Y UN -	F N UN -	N Y #F -	N N GI GI	F Y AO -
c+	C N UN -	F Y F -	N N GI GI	N Y #F -	F N UN -	N N GU -
c-	N Y #F -	F Y UN -	N Y UN -	F Y CA -	F N OP O	F Y UN -

133	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N UN -	N Y #F -	N N GI GI	N N UN -		
b-						
c+						
c-						

134	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C F -	C Y F -	C N CA M	C Y MA -	C Y AO -
b-	N N UN -	N N GU -	N N GI GI	N N GU -		
c+						
c-						

135	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 UN -	C Y AO -
b-	F Y CA -	F N GI GI	N N -	F Y CA -	F Y UN -	N Y #F -
c+	C Y UN -	C N F M	N Y #F -	C Y CA -	N N GI GI	N Y UG -
c-	F Y CA -	F N F M	N N GU -	F Y CA -	N N GU -	F Y AO -

136	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	N Y UN -	C Y CA -	C N GI GI	C Y AO -
b-	F Y CA -	F Y F -	N N GI GI	F Y CA -	F N GI GI	F N GI GI
c+						
c-						

137	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS -	C Y F -	C N GI GI	C Y CA -	C N GI GI	C Y AO -
b-	F Y CA -	F Y F -	F N GI GI	F Y CL -	V V GI GI	F Y AO -
c+	C Y CA -	C Y F -	N N GI GI	C N CA F	N N GI GI	C Y AO -
c-	F Y CL -	F ? ? -	N N GI GI	F Y CS -	N N GI GI	N Y UG -

139	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N UN F	C Y F -	N Y UN -	C Y CA -	C Y MA -	C Y AO -
b-	F Y CS -	F Y F -	F N UN -	F Y UN -	F N UN -	F Y AO -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	C N MA -	C N UN -
c-	F Y CS -	F Y UN -	F N GI GI	F N CA M	N N UN -	F Y AO -

140	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C Y F -	N Y #F -	N Y #F -	C N GI GI	F N HU M
b-	N Y #F -	F Y F -	F Y F -	F Y CA -	F N GI GI	N Y #F -
c+	C Y CA -	C Y F M	C N F M	C Y CA -	C N GI GI	C Y AO -
c-	- ? ? -	N OP O	- ? ? -	- ? ? -		

142	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N GI GI	C Y F -	C N UN -	C N UN -		
b-						
c+						
c-						

143	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CS -	C Y MA -	C Y AO -
b-	F Y CS -	O Y F -	O Y F -	O Y CA -	F Y MA -	F Y #F -
c+	C Y CS -	C Y F -	C Y F -	C Y CS -	C Y MA -	C Y AO -
c-	O N CA M	O Y F -	O Y F -	O Y CA -	O Y AO -	O Y AO -

144	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y AO -	C Y UN -	C Y MA -	C ? ? -
b-	O Y CA -	N Y F -	N N UN -	N N GU -	N Y UG -	N Y GU -
c+	C Y CA -	C Y F -	C N GI GI	C Y CA -	C Y MA -	C Y AO -
c-	N N GU -	N N GU -	N N GU -			

145	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	C Y F -	C N OP O	C Y CA -	C N OP O	C N UN -
b-						
c+						
c-						

149	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y HU -	C Y F -	C Y F -	C Y CS -	C Y F -	C Y AO -
b-	F Y CL -	F Y F -	F Y F -	F N UN -	F Y AO -	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
c-	F Y CS -	F Y DF -	F Y DF -	F N CA -	F Y UN -	F Y UG -

150	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GI GI	N Y UN -	N N UN -	N N GI GI	N N GI GI	N N GI GI
b-						
c+						
c-						

151	Task 1	Task 2	Tas 3	Task 4	Task 5	Task 6
b+	N N UN -	N N UN -	N N GU -	N N UN -	N N GU -	N N UN -
b-						
c+						
c-						

152	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C Y F -	C Y AO -	C Y CA -	C Y MA -	N N UN -
b-	F Y CA -	N N UN -	F N UN -	F N CA M	N N UN -	N N UN -
c+						
c-						

153	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–	N N CS M	N Y UN –	– ? ? –	N Y CS –	N Y F –	N Y UG –
c+	C Y CA –	C Y F –	C Y F –	Y CA –	C Y MA –	C Y AO –
c–	N Y CL –	N ? ? –	N N GU –	N Y CL –	N N UG M	N N UG M

154	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N GU –	C Y CA –	C N OP O	C Y AO –
b–	N Y #F –	F N UN –	N N UN –	N N GU –	N N UN –	N Y UN –
c+	C Y CA M	C Y F –	C Y F –	C Y CL –	C N UN –	C Y AO –
c–	F Y HU –	N N UN –	N N GU –	N Y CL –	N N GU –	N Y UG –

155	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N UN –	C N UN –	C N F M	C Y HU –
b–	N N HU –	N Y DF –	N N DF F	N Y #F –	N Y UG –	N Y UG –
c+	C Y CA –	C Y F –	C N F M	C Y CA –	C N F M	C Y AO –
c–	N N CS M	N Y T –	N N UG M	N Y CS –	N Y UG –	N N UG F

157	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GU –	N N GU –	N N GI GI	N N GU –		
b–						
c+						
c–						

158	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 Y AO -
b-	F Y CS -	F Y F -	F Y UN -	F Y CA -	- ? ? -	F Y AO -
c+	C Y CL -	C Y F -	C Y F -	C Y CS -	C Y F -	C Y AO -
c-	F N CS -	F ? ? -	- ? ? -	F N CS M		

159	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N CL M	C Y F -	N Y #F -	N Y CL -	N Y F -	N N UG M
b-	N Y #F -	N N F M	N Y #F -	N N #F F	N N GI GI	N N #F -
c+						
c-						

160	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N Y UN -	N Y T -	N Y #F -	C N OP O	N Y #F -
b-	N Y CL -	- ? ? -	N _ F -	N Y CS -	N Y UG -	N Y UG -
c+	C Y CS -	- ? ? -	C Y AO -	- ? ? -	- ? ? -	N Y UG -
c-	N ? ? -	N N T M	N Y UG -	N Y CL -	N N UG -	N N UG -

161	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA F	C Y F -	N N GI GI	C Y UN -	N Y UG -	C N UG M
b-	F N UN -	- ? ? -	N N GI GI	N Y CL -	N Y UG -	F Y AO -
c+	C ? ? -	C N F M	- ? ? -	C Y CA -		
c-						

162	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	N Y #F -	N Y HU -	C Y CA -	N N UN -	N Y #F -
b-	F Y UN -	N Y DF -	N N UN -	N Y #F -	F N GU -	F Y UN -
c+	N N GU -	N N GU -	N N #F F			
c-						

163	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS -	C Y F -	C Y F -	C Y #F -	C Y AO -	C Y AO -
b-	N Y #F -	N N #F -	N Y #F -	N Y HU -	F N F F	N Y #F -
c+	C Y CA -	C N F M	C N F M	C Y CL -	C Y AO -	C Y AO -
c-	F Y CL -	F Y UG -	F Y UG -	F Y CL -	F N HU -	F Y UG -

164	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CS -	F Y F -	N N GI GI	C N CA M	C Y MA -	C Y AO -
b-	N Y #F -	N Y #F -	N N GI GI	N Y CL -	N N GU -	N Y #F -
c+	C Y CA -	C Y F -	- ? ? -	C Y CA -	C Y MA -	C Y AO -
c-	N N CS M	N ? ? -	N N GI GI			

165	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA F	C N F M	C N UN -	C N CA M	N N GI GI	C N AO -
b-	F Y CA -	F Y F -	N N GI GI	N N UN -	N N GI GI	F N GI GI
c+						
c-						

166	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y #F -	C Y MA -	C Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	F Y F -	F Y AO -
c+	C N CA M	C N F M	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	C Y CA -	F N F F	F Y F -	F Y CA -	F N AO M	F Y AO -

167	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CS -	C N HU -	N Y UG -
b-	F N HU -	F N F F	F Y AO -	F Y HU -	F N GU -	F Y AO -
c+	C Y CL -	C Y F -	C N UN M	C Y CL -	C N UN -	C N UN -
c-	F N HU -	F N GU -	- ? ? -			

168	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y UG -	N Y #F -	N Y #F -	N N OP O	N Y UG -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N OP O	N Y UG -
c+	N Y CL -	N Y UG -	N N UG F	N Y CL -	N N OP F	N Y UG -
c-	N Y CL -	N Y UG -	N N UG M	N Y CL -	N N OP O	N Y UG -

169	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 CL -	C N OP O	C Y AO -
b-	F Y CS -	F Y F -	F Y F -	F Y CA -	F N OP O	F Y AO -
c+	C N CA M	C Y F -	C Y F -	C Y CA -	C N OP O	C Y HU -
c-	F Y CA -	F N F M	F Y F -	F Y CA -	F N OP O	F Y AO -

171	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	N Y CA -	C N MA -	N Y UG -
b-	F Y CA -	F Y F -	F Y F -	N Y HU -	N Y AO -	F Y AO -
c+	C N CA M	C Y F -	C Y F -	C N CA M	C Y MA -	C Y AO -
c-	F N GI GI	F N F M	- ? ? -	F Y CA -	F N AO M	N Y UG -

172	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N LU -	C Y HU -	N Y #F -	C N CS M	C Y UN -	C Y #F -
b-	N Y #F -	F N F M	F Y UN -	N Y HU -	F Y AO -	F Y UN -
c+	C Y CA -	C N F M	N Y #F -	C Y UN -	N Y UN -	N Y UG -
c-	F Y CS -	- ? ? -	F Y UG -	F Y CS -	F Y UG -	F Y UG -

173	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 AO -
b-	N Y UN -	N Y HU -	- ? ? -	F Y UN -	F N GI GI	F Y AO -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	C N GI GI	C Y AO -
c-	F Y CA -	F Y UN -	F Y UN -	F Y CA -	F N OP O	F Y AO -

175	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N Y #F -	C N OP O	C Y CA -	F Y UG -	F Y UG -
b-	F Y CA -	F Y F -	N N HU -	F Y #F -	F Y AO -	F Y AO -
c+	C Y CA -	C Y F -	C N GI GI	C Y CA -	C N UG M	C N F M
c-	F N UN -	F Y UN -	N N GI GI	F N CA M	F Y UG -	N Y #F -

176	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
	C Y CA –	C Y #F –	C Y F –	C Y #F –	C Y UN –	C Y #F –
b–	N Y #F –	N Y HU –	F Y F –	N Y #F –	N Y UG –	N Y #F –
c+	F Y CA –	C Y F –	C Y F –	C Y CA –	C Y AO –	C Y AO –
c–	F Y CA –	F N F M	F Y F –	F Y CA –	F Y UN –	F Y UG –

177	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS –	C Y F –	C ? ? –	C Y CA –	C Y MA –	C Y AO –
b–	F Y CA –	F N F M	F N UN –	F Y CA –	O Y UN –	F Y AO –
c+	C Y CA –	C Y F –	C N F F	C Y CL –	C Y MA –	C N AO M
c–	F N CA M	F N UN –	F N UG M	F N CA F	F Y AO –	F Y AO –

203	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y HU –	N Y #F –	N Y #F –	N Y UG –
b–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	N Y CL –	C Y F –	C Y F –	N Y #F –	C Y F –	C Y AO –
c–	F T CL –	F Y DF –	N N HU –	N Y CL –	F N DF M	F Y UG –

205	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	C Y F –	C N GI GI	C Y CA –	N N GI GI	C Y AO –
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	N N GI GI	F Y AO –
c+	N Y CA –	C Y F –	C N F M	F Y CA –	N N GI GI	F Y AO –
c–	F Y CA –	N Y UN –	N Y UN –	N N OP O	N N GI GI	F Y AO –

206	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N F M	C N UN –	C Y CA –	– ? ? –	C Y AO –
b–	F Y CS –	F ? ? –	– ? ? –	F Y CS –	– ? ? –	– ? ? –
c+	C Y CA –	C Y F –	– ? ? –	C Y CA –	– ? ? –	C N UN –
c–	F ? ? –	– ? ? –	– ? ? –			

207	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S –	C N F M	C Y F –	C Y CA –	C Y F –	N Y #F –
b–	F Y S –	F Y F –	Y F –	F Y S –	F Y F –	F Y AO –
c+	C Y CL –	C N F M	C Y F –	C Y CS –	C Y MA –	C Y AO –
c–	F Y CA –	F Y F –	N Y UG –	N N UN –	F Y UG –	F Y UG –

208	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F –	C N F M	C N UN –	C Y UN –	C Y MA –	N Y UN –
b–	F N CA M	N Y UN –	N Y UN –	N Y #F –	N Y UN –	N Y UN –
c+	C Y CL –	C Y F –	C Y F –	C Y CS –	C Y MA –	C Y UG –
c–	N Y CS –	N N GU –	N N GU –	N Y CL –	N Y UG –	N Y HU –

210	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F –	C Y F –	C Y F –	N Y UN –	N Y HU –	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 –	C Y F –	C Y F –	C Y CA –	N Y UG –	N Y UN –
c–	N Y HU –	N N UN –	N Y UG –	N N CL M	N N HU –	N Y UG –

211	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N OP O	N N GI GI	C Y CA -	C N GI GI	C Y AO -
b-	F Y CA -	F N GI GI	F N GI GI	F Y #F -	F N GI GI	F N UN -
c+	C N UN -	C N UN -	C N UN -			
c-						

213	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	C Y F -	C N GI GI	C Y CA -	C N GI GI	C N UN -
b-	F Y CA -	F Y F -	F N UN -	F Y S -	F N GI GI	F Y UN -
c+	C Y CA -	C Y F -	C N UN M	C N CA M	C N GI GI	C Y AO -
c-	F N GI GI	F N F M	F N GI GI	F N UN -	F N GI GI	F N GI GI

215	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	C N F M	- ? ? -	C N CA M	C N GI GI	C Y AO -
b-	F Y S -	F N F M	F Y UN -	F Y CA -	N N GI GI	F Y UG -
c+	C Y CA -	C N F M	C Y F -	C N CA M	N N GI GI	C Y AO -
c-	F N CS M	- ? ? -	- ? ? -	F Y CS -	N N GI GI	F N UG M

217	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN -	F Y F -	N N GI GI	F N CA M	N N GI GI	F N UN -
b-	N Y UN -	N N UN -	N N UN -	N N CA M	N N GI GI	N Y UN -
c+	C N CA M	C Y F -	C Y AO -	C Y CA -	C N GI GI	F Y UG -
c-	F Y CL -	F N UN -	F ? ? -	F Y UN -	N N GI GI	- N UN -

218	sk 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 N AO M
b-	N N CS M	O Y F -	N Y UG -	N Y CL -	N N UN -	N N UN -
c+	C Y CA -	C Y F -	C Y UN -	C N UN F	C Y MA -	C N AO M
c-	N N GI GI	- ? ? -	- ? ? -	N Y CA -	N ? ? -	N N UG M

220	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	F Y F -	C Y HU -	C Y MA -	C Y UG -
b-	N Y #F -	N Y UN -	F Y UG -	F Y CL -	F Y AO -	F Y UG -
c+	C Y CA -	C N F M	C Y F -	C Y CA -	C Y UG -	C Y UG -
c-	F Y UN -	F N F F	N N UN -	N Y HU -	N Y UG -	N N UN -

222	Task 1	Task. 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y #F -	N Y #F -	C Y CA -	C Y F -	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	F Y #F -	N Y #F -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	C Y F -	C Y F -
c-	F Y CS -	F Y F -	F Y UG -	F Y CL -	N Y UN -	F Y UG -

223	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 #F -	C Y F -	C Y AO -
b-	N Y UN -	F Y F -	N Y #F -	N Y HU -	N Y UN -	N Y #F -
c+	C Y CS -	C Y F -	C Y F -	C Y CL -	C N MA M	C Y AO -
c-	F Y CS -	F Y DF -	F Y UG -	F Y CS -	N Y HU -	F Y UG -

224	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 N UN -	N Y #F -	N Y #F -	N Y #F -
c+	N Y HU -	N Y #F -	N N GU -	N Y HU -	N Y #F -	N Y #F -
c-	N Y HU -	N N GU -	N Y HU -	N Y #F -	N Y #F -	N Y #F -

225	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N OP O	C N OP O	C Y CA -	C Y MA -	N N UN -
b-	F Y CA -	F N OP O	F N OP O	F Y CA -	N N OP O	N Y UN -
c+	C Y CA -	C N UN -	C Y MA -	C Y CA -	C Y MA -	C Y MA -
c-	F ? ? -	F ? ? -	- ? -	F Y CA -	O N UN M	O N UN -

226	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N N GU -	C N OP O	C Y CA -	C N GI GI	C Y AO -
b-	N N UN -	N N UN -	N N GU -	N N CA -	N N GU -	N N GU -
c+	C Y CA -	C N F M	C Y F -	C Y CA -	C N GI GI	C N AO M
c-						

227	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	C N GI GI	C N GI GI	C Y CA -	N N GI GI	C Y AO -
b-	F Y CA -	F N UN -	F N UN -	F Y CA -	F N GI GI	F N GI GI
c+	C Y CA -	C N F M	C N UN -	C Y CA -	C N GI GI	C ? ? -
c-						

229	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	N N UN -	N N UN -	N N UN -	N Y UN -	- ? ? -
b-						
c+						
c-						

230	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C N F M	C N UN F	C Y CA -	C N F M	C Y AO -
b-	F N UN M	- ? ? -	- ? ? -	N N GU -	N Y UN -	N N UG F
c+	C Y CA -	C N F -	C N F M	C Y CA -	N N GU -	C Y AO -
c-						

231	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F N CA M	F Y F -	F Y F -	F Y CA -	F Y AO -	F Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	F Y AO -	F Y AO -
c+	C Y CS -	F N F M	F N UN -	F Y CS -	F Y AO -	F N AO M
c-	F Y CL -	- ? ? -	F Y UN -	F N CL M	F Y AO -	F Y AO -

235	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N OP O	C Y F -	C Y CA -	C Y UN -	C N OP O
b-	N Y UN -	N N UN -	N Y UN -	N N CA M	N N UN -	N N UN -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C N UN -
c-	F N UN -	F N UN -	F N UN -	F N UN -	F N UN -	N Y UG -

236	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	F Y S -	F Y F -	F N GI GI	F Y CL -	F Y AO -	F Y AO -
c+	C Y CA -	C Y F -	C N UN -	C Y CA -	C N MA M	C Y AO -
c-	F Y CS -	F Y F -	F N GI GI	F Y CS -	F Y UN -	F Y AO -

237	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y UN -	C Y F -	C Y F -	C Y CS -	N Y UG -	N Y UG -
b-	F Y CS -	F Y F -	F Y UN -	F Y CA -	F N GI GI	F Y UN -
c+	C Y CA -	C Y AO -	C N AO M	C Y CL -	C Y MA -	C Y AO -
c-	F Y CL -	F N F M	F Y UN -	F Y CA -	F Y GU -	F Y AO -

238	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N N UN -	N Y UN -	C N GI GI	N Y UN -
b-	N Y UN -	F N GI GI	N N GI GI	N N UN -	N N GI GI	N Y UN -
c+	C Y CL -	N N GU -	N Y UN -	C Y CL -	N N GI GI	N N UG M
c-						

239	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 N OP O
b-	F Y CA -	N N UN -	F N UN -	F N CA M	N N GI GI	N N UN -
c+	C Y CA -	C Y F -	C Y UN -	C Y CA -	C N GI GI	C N AO M
c-						

241	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N GI GI	- ? ? -	C Y CA -	C N OP O	C Y AO -
b-	F Y S -	F Y F -	- ? ? -	F Y CA -	F N UN -	F N AO M
c+	C N CA M	C Y F -	C N F M	C Y CA -	C N UN -	C Y AO -
c-	F N UN -	N N UN -	F N UN -			

242	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C N OP O	C Y CA -	C N UN -	C Y UN -
b-	F Y UN -	F Y UN -	N N OP O	N UN -	F Y UN -	F Y UN -
c+	C Y CA -	C N F M	C Y F -	C Y CA -	C N MA M	C Y AO -
c-	N Y CA -	N N UN -	N N UN -	N N UN -	N N UN -	N N UN -

244	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	C N F M	N N GI GI	C Y CA -	C Y UN -	C Y AO -
b-	N Y #F -	N Y #F -	N Y UN -	N Y UN -	N N UG F	N Y AO -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	C Y MA -	C N UN -
c-	N N CA M	N N GU -	N N GI GI	N Y GU -	N Y UN -	F U UN -

246	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N UN -	N N UN -	N N GI GI	N N GI GI	N N UN -	N N UN -
b-						
c+						
c-						

247	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N N DF M	N N UN –	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 UG M	N Y #F –
c+	N Y CL –	C Y F –	– ? ? –	C Y CA –	C Y F –	N Y UG –
c–	N Y CL –	N Y DF –	N N GU –	N Y #F –	N Y UG –	N N UN –

249	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N UN –	N Y UN –	N Y UN –	C N UN –	N N UN –	N Y UN –
b–	N N UN –	N Y UN –	N Y UN –	O N UN –	N Y UN –	N N UN –
c+	C N CA M	C Y UN –	C N UN –	C Y CA –	C N UN –	C N UN –
c–						

251	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	N Y UN –	C Y CA –	N Y UN –	C Y AO –
b–	N Y #F –	N Y #F –	N Y UN –	N Y #F –	N Y UN –	N Y UN –
c+	C N CA M	C N F M	C Y AO –	C Y CA –	N Y HU –	N Y UN –
c–	N Y CA –	N N UN –	N N UN –	N Y CA –	N N UN –	N Y UN –

252	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N F M	C N GI GI	C N CA M	C N GI GI	C Y AO –
b–	F N GI GI	F N GI GI	F N GI GI			
c+	C Y CA –	C N F M	C N UN –	C N CA M	C N GI GI	C Y AO –
c–						

253	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N GU -	N N GU -	N N GU -	N N GU -	N N GU -	N N GI GI
b-						
c+						
c-						

254	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 -	N Y UG -
b-	F Y CA -	F N F M	F Y F -	F Y CA -	F Y F -	F Y AO -
c+	C Y CA -	C N F M	C Y F -	C Y CS -	C Y MA -	C Y AO -
c-	F N CA M	F N UN -	- ? ? -	- ? ? -		

256	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N OP O	C N OP O	C Y CA -	C N GI GI	C Y AO -
b-	F Y CA -	F N OP O	N N GI GI	N N CA M	F N OP O	N Y UN -
c+	C Y CA -	C N OP O	N N UN -	C Y CA -	C N GI GI	C N AO M
c-	N N UN -	N N OP O	N N UG M	N N CA M	N N GI GI	N N UN -

257	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y UN -	N Y UG -	N Y CL -	N Y UN -	N Y UN -
b-	N N UN -	N N UN -	F Y AO -	N Y UN -	N Y UN -	N Y #F -
c+	C Y CA -	C Y F -	C N F -	N Y UN -	F Y AO -	N Y HU -
c-	F Y UN -	F N UN -	N N GU -	- ? ? -	F Y UG -	F Y UG -

258	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	C Y F -	C Y F -	C Y #F -	C Y MA -	C Y AO -
b-	F Y S -	F N OP O	N N GI GI	F N CA M	F N UN -	F Y AO -
c+	C Y CL -	C N UN M	C Y F -	C Y CS -	C Y MA -	C Y AO -
c-	N Y CL -	N N GU -	N N GU -	N Y CL -	F Y UG -	F Y UG -

260	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 CA -	F Y F -	F Y AO -	F Y CS -	F N GI GI	F Y AO -
c+	C N GI GI	C N F M	C Y F -	C Y CA -	C N UN -	C Y AO -
c-	F Y CL -	- ? ? -	F N F M	F N CA M	F N AO M	F Y AO -

261	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 Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CL -	F Y F -	F Y UN -
c+	C Y CA -	C N F M	C N UN -	C Y CA -	C Y MA -	C ? ? -
c-	F Y CS -	- ? ? -	- ? ? -	F Y CS -	- ? ? -	F N AO F

262	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 AO -
b-	N Y UN -	F N UN -	F N UN -	F N CA M	N N GI GI	F Y AO -
c+	C N CA M	C N F M	C N AO F	C Y CA -	C N GI GI	C N GI GI
c-						

264	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y UN -	N Y #F -	N Y #F -	N N #F -
b-	N Y #F -	N Y UN -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N Y #F -	C Y F -	C Y F -	N Y CL -	N Y UG -	N Y UN -
c-	F Y CA -	N N GI GI	N N UN -	N Y CL -	F Y UG -	F Y UG -

266	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	F Y F -	F N OP O	F Y CA -	F N GI GI	F Y AO -
b-	F Y CA -	F N GI GI	F N OP O	F Y CA -	F N UN -	F Y AO -
c+	F Y CS -	F Y DF -	F N OP O	F N CS M	F Y UG -	F N UG M
c-	F Y CL -	F Y DF -	F N OP O	F Y CL -	N Y UN -	N Y UN -

267	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y UG -	N N GI GI	N Y HU -	N Y HU -	N Y UG -
b-	N Y UN -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y HU -
c+	N Y HU -	N Y HU -	N N UN -	N Y HU -	N N UN M	N N GU -
c-	N N UN -	N Y #F -	N N UN -	N N UN M	N Y HU -	N N GU -

268	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL -	F Y F -	C Y F -	N Y #F -	C Y T -	F Y AO -
b-	F Y CS -	F Y F -	F Y AO -	F Y CL -	F Y AO -	N Y UG -
c+	C N CS M	C Y F -	C Y F -	F Y CS -	C Y MA -	C Y AO -
c-	F Y CS -	F Y F -	F Y F -	N N UN -	F Y UG -	N Y HU -

269	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 MA -	C Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	F Y AO -	F Y UN -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y HU -
c-	C Y CL -	F Y DF -	F Y DF -	F Y CL -	F N UG F	F Y UG -

270	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C N GI GI	C N UN -	C N F M	C Y AO -
b-	N N GU -	N Y UN -	N N GU -	N Y #F -	N Y #F -	N Y UN -
c+	C Y CA -	C Y F -	C N GI GI	C Y CA -	C N GU -	C N UN -
c-	N Y CA -	N N UN -	N N UN -	N N GI GI	N N UN -	N N GI GI

271	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C N F M	C Y UN -	C Y UN -	C N GI GI	C Y AO -
b-	N Y CL -	N Y #F -	N N GI GI	N N UN -	N N GI GI	N Y #F -
c+	C N CL M	C Y F -	C N F M	C Y CA -	C N GI GI	C Y AO -
c-	N Y UN -	N N UN -	- ? ? -	N Y UN -	N N GI GI	N Y UG -

301	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N UN -	N Y DF -	C Y F -	C Y CL -	C N GI GI	N Y #F -
b-	N ? ? -	N N UN -	N ? ? -			
c+						
c-						

302	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 –	N Y UN –
b–	F Y HU –	F Y UN –	N Y UG –	F Y CA –	N Y UN –	N Y UN –
c+	C Y CA –	C N F M	C Y F –	C Y CA –	C Y MA –	C Y AO –
c–	F N CA M	F N F M	F N UN –	F N CA M		

303	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y HU –	N Y HU –	N Y HU –	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 #F –	N Y DT –	N Y HU –	N N UN –	C Y UN –
c–	N Y HU –	N Y UN –	N Y UN –	N Y HU –	N Y UN –	N Y UN –

304	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y UN –	C Y CA –	C Y MA –	C Y AO –
b–	F Y CA –	F Y F –	F N UN –	F Y CA –	F N F F	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CS –	C Y MA –	C Y AO –
c–	F Y CS –	N Y UN –	F N UN –	F Y CS –	N N GU –	F N UN –

305	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y HU –	N Y UN –	N Y HU –	N Y UG –	N Y #F –
b–	N Y CL –	N Y HU –	N Y #F –	N Y #F –	N Y #F –	N Y UG –
c+	N Y CL –	C N F M	N Y UG –	N Y CL –	N N UG M	C Y AO –
c–	N Y CL –	F N DT –	F Y UG –	N Y CL –	F Y UG –	F N UG M

306	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N GI GI	C N GI GI	C N UN -	C N GI GI	C N GI GI
b-						
c+						
c-						

307	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CS -	N Y #F -	C Y F -	N N #F F	N Y #F -	N Y UG -
b-	F Y CL -	F Y F -	F Y #F -	N Y CL -	N Y UN -	F Y UN -
c+	F N CS M	C Y F -	C Y F -	C Y CA -	N N GU -	N N GU -
c-	N N CS M	N N GI GI	- ? ? -	F Y CA -	N N UG M	F Y UG -

308	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CS -	N Y HU -	N N GI GI	C Y CS -	N Y UG -	C Y AO -
b-	F Y CL -	N Y UN -	F Y F -	N N GU -	N N GI GI	N Y GU -
c+	C N GI GI	C Y F -	C Y F -	C Y CA -	N N UN -	N Y UG -
c-	F Y CS -	N N UN -	N Y UN -	N N UN -	N N UN -	N N UN -

309	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 ? ? -	C Y AO -
b-	F Y CA -	F N UN -	N N UN -			
c+						
c-						

310	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N F M	C N F M	C Y CA –	C Y MA –	C Y AO –
b–	F N CA M	F Y F –	F N F M	F N CA M	F Y AO –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C N CA M	C N OP O	C Y AO –
c–	F Y CA –	F N F M	F ? ? –	F Y CA –	F ? ? –	F N UN –

311	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CL –	C Y MA –	N Y UG –
b–	F Y CA –	F N GI GI	N N GU –	N Y #F –	N Y UG –	N Y UG –
c+	C Y CL –	C Y F –	C N F M	C N CA M	C N OP O	N N GU –
c–	N N GU –	N N GU –	N N GU –			

312	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	C Y F –	N Y UG –	F Y CL –	C Y F –	N Y UG –
b–	N Y #F –	N Y DF –	N Y UN –	N Y #F –	N Y DF –	N N UG F
c+	N N HU –	C Y F –	C Y F –	N Y HU –	C N MA M	N N UG M
c–	F N CL F	N N GU –	N N UG M	N Y HU –	N N UG M	N Y UG –

313	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N UN –	C N CA M	C N GI GI	N Y UG –
b–	N Y CA –	F Y F –	N N UN F	N Y CA –	F N AO M	N N UN –
c+	C N CA M	C Y F –	C N UN –	C Y CA –	C Y MA –	C Y AO –
c–	F N UN –	N N GI GI	N N UN –	N N UN –		

314	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y HU –	N Y #F –	N N HU F	N Y UG –	N Y UG –
b–	N N CS F	F Y F –	N Y UG –	N Y CL –	N Y UG –	N Y UG –
c+	N Y HU –	N N UN –	F Y UN –	F N UN –	N N UG M	N N GI GI
c–	F Y CS –	N N DT M	N Y HU –	F Y CS –	F N UG M	F Y UG –

315	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y UG –	F Y UG –	F Y CA –	F Y UG –	F Y AO –
b–	F Y CS –	F Y F –	F Y F –	F Y CS –	F Y F –	F Y AO –
c+	C Y CA –	C N F M	C N UN –	C Y CS –	C N F M	N Y HU –
c–	F N HU F	F Y UG –	F N UG M	F Y CL –	F Y UG –	F Y UG –

316	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N N UN –	N Y UN –	N Y HU –	F N UN –	N Y #F –
b–	N Y #F –	F N F M	N N UN –	N Y #F –	N N UN –	N Y UG –
c+	C N UN –	C ? ? –	C ? ? –			
c–						

317	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	N Y HU –	F N GI GI	C N AO –
b–	N Y #F –	F Y F –	F Y F –	F Y UN –	N Y HU –	N Y HU –
c+	N N UN –	C Y F –	C Y F –	C Y CL –	C N F M	C N AO M
c–	F N CL M	F N DF M	N N GU –	N Y HU –	N Y HU –	F Y UG –

318	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 Y MA –	C Y AO –
b–	F Y CA –	F N UN –	N N GU –	F Y CA –	F Y UN –	F Y AO –
c+	C Y CA –	C Y F –	N N UN –	C N UN –	C Y MA –	N Y UN –
c–	N N UN –	N N GU –	N N GU –			

319	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y HU –	C Y F –	C N GI GI	C Y CA –	C Y MA –	C Y AO –
b–	F N CA M	F N UN –	F N GI GI	N N GU –	F Y T –	N Y UN –
c+	C Y CA –	C N F M	C N F M	C Y CA –	C Y MA –	C Y AO –
c–	N N GU –	N N GU –	N N UN –	N N GU –		

320	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N F M	C Y F –	C Y CA –	C Y MA –	C Y AO –
b–	N Y CL –	N Y UN –	F N UN –	F N CS M	F Y AO –	F Y #F –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y AO –
c–	F Y CS –	F N UG M	F Y F –	F Y UN –	F Y F –	F Y UG –

321	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C N CA M	C Y UN –	C Y AO –
b–	F Y UN –	F Y F –	F Y F –	F Y CS –	F N F –	F Y #F –
c+	C Y CA –	C N F M	C Y F –	C Y CA –	C N F M	C Y AO –
c–	F N GU –	F N UN –	F N UN –			

322	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N Y #F -	N Y #F -	C Y CA -	C N MA M	C Y AO -
b-	F Y CA -	F Y F -	F N GI GI	F Y CA -	F Y MA -	F Y AO -
c+	C Y CL -	C Y F -	C Y F -	C Y CL -	C Y MA -	C Y AO -
c-	F Y CS -	F Y GU -	N N GI GI	F Y CL -	F Y AO -	F Y UG -

323	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F F	C N F M	C Y CA -	C Y F -	C Y AO -
b-	F N CA M	F Y F -	F N F M	F Y CA -	N Y UG -	F N AO M
c+	C Y CL -	C Y F -	C Y F -	C Y CA -	C N MA M	C Y AO -
c-	F N CA M	F N F M	F N F M	O Y CS -	N Y UG -	O N GI GI

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y # -	N Y #F -	N Y #F -	C Y CA -	C Y MA -	C Y UN -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y UN -	N Y HU -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	N Y UG -
c-	F ? ? -	F N F M	F ? ? -	F ? ? -		

325	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	F N DF -	C N GU -	C Y CA -	C Y UG -	C F -
b-	F Y CS	N N GU -	F N AO -	F Y CS -	N Y UN -	N Y UN -
c+	F Y CS -	N N GU -	N Y GU -	F Y CL -	N N GU -	F Y UG -
c-	F Y CS -	F N DF M	N N GU -	F Y CL -	F Y UG -	F N OP C

326	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F -	C Y F -	C Y HU -	C N GI GI	C Y AO -
b-	F Y CA -	F Y UN -	F Y UN -	F Y CA -	F N GI GI	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N MA M	C Y AO -
c-	F ? ? -	F N UN -	F Y AO -	- ? ? -		

327	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N N UN -	N Y UN -	C Y CA -	C Y T -	C Y AO -
b-	F Y CA -	F Y UN -	F Y F -	F Y CS -	F Y UG -	F Y UG -
c+	C Y CA -	C N F M	C Y F -	C Y UN -	C N F M	C Y UN -
c-	F Y UN -	F N UN -	F Y UN -	F Y UN -	- ? ? -	

328	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 AO -
b-	F Y CA -	F Y F -	N Y UN -	F Y CA -	N N GI GI	F Y AO -
c+	C Y CA -	C N F M	C N GI GI	C Y CA -	N N GI GI	C N AO M
c-	F N UN -	F N GI GI	N N GI GI	F N GI GI		

329	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 CA -	F Y F -	F Y F -	F N CA F	F Y UG -	F Y AO -
c+	C Y CA -	C N F F	C Y F -	C Y CA -	C Y MA -	C N AO F
c-	F Y CA -	F ? ? -	F Y F -	F N CA M	N ? ? -	N ? ? -

331	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y HU -	N Y CA -	N Y #F -	N Y UG -
b-	N Y CA -	N Y HU -	N Y HU -	N Y #F -	N Y DF -	N Y UG -
c+	N Y HU -	N N HU -	C Y UN -	N Y HU -	N Y UN -	C Y HU -
c-	N Y HU -	N Y UN -	N N UN -	N Y HU -	N Y HU -	N N GI GI

332	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA	N Y #F -	C N GI GI	C Y CL -	N Y UG -	N Y HU -
b-	N Y HU -	N Y UG -	N N GI GI	N Y HU -	N Y UG -	N Y UG -
c+	N Y CL -	N Y UG -	C Y AO -	N Y CL -	N Y UG -	N Y UN -
c-	N Y CL -	- ? ? -	N Y UN -	N Y UN -	- ? ? -	N Y UN -

333	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	N Y UG -	N Y #F -	N Y UG -	C Y UG -
b-	N Y #F -	N Y UG -	N Y UG -	N Y CL -	N Y UG -	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	N Y UG -	N Y HU -
c-	N Y CS -	N N UN -	N N HU -	N Y CL -	N Y UG -	N Y UG -

334	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y #F -	N Y DF -	N Y CL -	N N DF M	N Y #F -
b-	N Y CL -	N Y UN -	N Y #F -	N Y #F -	N Y #F -	
c+	N Y CL -	N Y UG -	N Y UG -	N Y CL -	N N UG M	N Y UG -
c-	N Y CL -	N Y UG -	N Y UG -	N Y CL -	F Y UG -	N Y UG -

335	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y DF –	N N UN –	N Y HU –	C Y MA –	N Y UG –
b–	N Y CL –	F Y DF –	N Y UG –	N Y HU –	N Y UG –	N Y UG –
c+	N N CS M	C N F M	N N HU –	F Y CS –	N Y UG –	N N UG F
c–	F Y CS –	N N HU –	F N GU –	N Y #F –	N N UN –	F N UG M

336	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y DF –	N Y UG –	N Y CL –	N Y UG –	N Y UG –
b–	N Y CL –	N Y DF –	N Y DF –	N Y HU –	N Y UG –	N N UG F
c+	N Y CL –	N Y HU –	N Y UG –	N Y CL –	N Y UG –	N Y UG –
c–	N Y CL –	N Y UG –	N Y UG –	N Y CL –	N Y UG –	N Y UG –

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+						
b–						
c+						
c–						

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+						
b–						
c+						
c–						

APPENDIX C

NUMBER SET ASSIGNMENT FOR NUMBER TRIPLES

Number Se. Assignment

student ID #

Level	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
b+	1	3	1	4	3	3	4	4	2	2	5	2	5	1	5	6
b-	4	6	4	1	6	6	1	1	5	5	2	5	2	4	2	3
c+	3	2	3	5	2	2	5	5	1	1	6	1	6	3	6	4
c-	5	4	5	1	4	4	1	1	3	3	2	3	2	5	2	6

student ID #

Level	117	118	119	120	122	123	124	127	128	129	130	131	132	133	134	135
b+	1	6	6	6	3	3	6	2	6	3	4	2	5	2	1	2
b-	3	2	3	3	5	5	2	4	2	5	6	4	1	4	3	1
c+	6	2	4	4	5	5	2	4	2	5	3	4	1	4	6	6
c-	5	1	6	6	4	4	1	3	1	4	2	3	6	3	5	3

student ID #

Level	136	137	139	140	142	143	144	145	149	150	151	152	153	154	155	157
b+	4	4	1	4	2	3	4	5	6	2	3	6	3	5	6	5
b-	6	6	3	3	1	2	3	1	5	1	2	1	2	4	1	4
c+	3	3	6	3	6	1	3	1	5	3	1	5	1	4	1	4
c-	2	2	5	6	3	4	6	6	2	3	4	2	4	1	5	1

student ID #

Level	158	159	160	161	162	163	164	165	166	167	168	169	171	172	173	175
b+	6	1	4	4	5	1	1	6	4	3	1	1	6	2	5	3
b-	5	6	2	2	3	6	6	4	2	1	5	5	4	6	3	4
c+	5	2	3	3	6	2	2	2	3	4	5	5	2	1	6	5
c-	2	5	4	4	1	5	5	3	4	5	6	6	3	2	1	3

student ID #

Level	176	177	203	205	206	207	208	210	211	213	215	217	218	220	222	223
b+	5	5	4	4	4	3	3	5	1	1	3	3	6	1	1	4
b-	4	6	2	6	6	1	4	4	4	4	6	6	5	6	6	1
c+	4	4	3	3	3	4	5	4	3	3	2	2	5	2	2	5
c-	**1**	**2**	**4**	**2**	**2**	**5**	**3**	**1**	**5**	**5**	**4**	**4**	**2**	**5**	**5**	**1**

Number Set Assignment

Level	student ID #	224	225	226	227	229	230	231	235	236	237	238	239	241	242	244	246
	b+	4	4	2	1	1	6	1	2	2	5	5	5	1	5	6	6
	b-	2	1	5	3	3	4	5	5	6	3	1	2	5	2	3	3
	c+	3	5	1	6	6	2	5	1	1	6	1	6	5	6	4	4
	c-	4	1	3	5	5	3	6	3	2	1	6	2	6	2	6	6

Level	student ID #	247	249	251	252	253	254	256	257	258	260	261	262	264	266	267	268
	b+	3	2	3	2	4	6	6	3	5	4	3	2	5	2	6	3
	b-	5	1	4	1	3	2	2	1	3	3	2	6	4	4	1	2
	c+	5	6	5	6	3	2	2	4	6	3	1	1	4	4	1	1
	c-	4	3	3	3	6	1	1	5	1	6	4	2	1	3	5	4

Level	student ID #	269	270	271	301	302	303	304	305	306	307	308	309	310	311	312	313
	b+	2	6	6	1	2	3	4	3	4	4	4	6	3	2	2	2
	b-	4	4	5	3	3	5	3	2	2	1	3	2	2	4	4	5
	c+	4	2	5	6	6	5	3	1	3	5	3	2	1	4	4	1
	c-	3	3	2	5	5	4	6	4	4	1	6	1	4	3	3	3

Level	student ID #	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329
	b+	2	5	6	4	1	6	5	2	5	1	1	6	4	2	6	5
	b-	5	2	5	1	6	2	6	1	2	4	4	3	6	1	3	1
	c+	1	6	5	5	2	2	5	6	6	3	3	4	3	6	4	1
	c-	3	2	2	1	5	1	2	3	2	5	5	6	2	3	6	6

Level	student ID #	331	332	333	334	335	336
	b+	5	5	4	5	3	3
	b-	4	4	6	1	6	5
	c+	4	4	3	1	2	5
	c-	1	1	2	6	4	4

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Center Director

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Area Chairperson
Studies in Language:
Reading and Communication

Marvin J. Fruth
Area Chairperson
Studies in Implementation
of Individualized Schooling

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Studies of Instructional Programming
for the Individual Student

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