Appendix H

Research Team in the TIMSS 1999 Video Study of Mathematics Teaching

This page left intentionally blank.

Director of TIMSS 1999 Video Study of Mathematics Teaching
James Hiebert

Directors of TIMSS 1999 Video Study
Ronald Gallimore
James Stigler

National Research Coordinators

Australia
Jan Lokan
Barry McCrae

Czech Republic
Jana Strakova

Hong Kong SAR
Frederick Leung

Japan
Shizuo Matsubara
Yasushi Ogura
Hanako Senuma

Netherlands
Klaas Bos

Switzerland
Primary: Kurt Reusser
Swiss-French: Norberto Bottani
Swiss-German: Christine Pauli
Swiss-Italian: Emanuele Berger

United States
Patrick Gonzales

U.S. Steering Committee
Thomas Cooney
Douglas Grouws
Carolyn Kieran
Glenda Lappan
Edward Silver

Chief Analyst
Helen Garnier

Country Associates/ Mathematics Code Development Team

Australia
Hilary Hollingsworth

Czech Republic
Svetlana Trubacova

Hong Kong SAR
Angel Chui
Ellen Tseng

Netherlands
Karen Givvin

Switzerland
Nicole Kersting

United States
Jennifer Jacobs

Teams Working Outside the United States

Australia
Brian Doig
Silvia McCormack
Gayl O'Connor

Switzerland
Kathya Tamagni Bernasconi
Giulliana Cossi
Olivier de Marcellus
Ruhal Floris
Isabelle Hugener
Narain Jagasia
Miriam Leuchter
Francesca Pedrazzini-Pesce
Dominik Petco
Monika Waldis

Questionnaire Coding Team
Helen Garnier
Margaret Smith

Mathematics Quality Analysis Team
Phillip Emig
Wallace Etterbeek
Alfred Manaster
Barbara Wells

Problem Implementation Analysis Team
Christopher S. Hlas
Margaret Smith

Mathematics Problem Analysis Team
Eric Sisofo
Margaret Smith
Diana Wearne

Field Test Team
Karen Givvin
Jennifer Jacobs
Takako Kawanaka
Christine Pauli
Jean-Paul Reeff
Nick Scott
Svetlana Trubacova

Questionnaire Development Team
Sister Angelo Collins
Helen Garnier
Kass Hogan
Jennifer Jacobs
Kathleen Roth

Text Analysis Group
Steve Druker
Don Favareau
Takako Kawanaka
Bruce Lambert
David Lewis
Fang Liu
Samer Mansukhani
Genevieve Patthey-Chavez
Rodica Waivio
Clement Yu

Chief Videographers
Maria Alidio
Takako Kawanaka
Scott Rankin

Videographers
Sue Bartholet
Talegon Bartholet
Michaela Bractalova
Gabriel Charmillot
Matthias Feller
Ruud Gort
Christopher Hawkins
Kurt Hess
Rowan Humphrey
Narian Jagasia
LeAnne Kline
Tadayuki Miyashiro
Silvio Moro
Selin Ondül
Mike Petterson
Stephen Skok
Sikay Tang
Giovanni Varini
Sofia Yam
Jiri Zeiner
Andreas Zollinger

Field Test Videographer
Ron Kelly

Computer Programming
Paul Grudnitski
Daniel Martinez
Ken Mendoza
Carl Manaster
Rod Kent

Consultants
Justus J. Schlichting
Genevieve Patthey-Chavez
Takako Kawanaka
Rossella Santagata

Transcription and Translation Directors

Lindsey Engle
Don Favareau
Wendy Klein
Petra Kohler
David Olsher
Susan Reese

Transcribers and Translators

Australia

Marco Duranti
Hugh Grinstead
Amy Harkin
Tammy Lam
Tream Anh Le Duc
James Monk
Aja Stanman
Elizabeth Tully
Daniella Wegman

Czech Republic

Barbara Brown
Jana Hatch
Peter Kasl
Vladimir Kasl
Jirina Kyas
Alena Mojhova
Vaclav Plisek

Hong Kong SAR

Stella Chow
Khue Duong
Ka (Fiona) Ng
Constance Wong
Jacqueline Woo
Kin Woo
Lilia Woo

Japan

Kaoru Koda
Yuri Kusuyama
Ken Kuwabara
Emi Morita
Angela Nonaka
Naoko Otani
Jun Yanagimachi

Netherlands

Hans Angessens
Tony DeLeeuw
Neil Galanter
Maaike Jacobson
Maarten Lobker
Yasmin Penninger
Linda Pollack
Silvia Van Dam

Switzerland

Michele Balmelli
Valérie Bourdet
Laura Cannon
Chiara Ceccarelli
Ankara Chen
Sabina del Grosso
Anne de Preux
Andrea Erzinger
Maria Ferraiuolo
Véronique Gendre
Ueli Halbheer
Sandra Hay
Nicole Kersting
Petra Kohler
Leata Kollart
Nur Kussan
Anita Lovasz
Malaika Mani
Céline Marco
Annamaria Mauramatti
Giovanni Murialdo
Luisa Murialdo
Philippe Poirson
Astrid Sigrist
Doris Steinemann
Simona Torriani
Emilie Tran
Mélanie Tudisco
Nathalie Vital
Esther Wertmüller
Rebekka Wyss
Salome Zahn

United States

Ginger (Yen) Dang
Jake Elsas
Jordan Engle
Steven Gomberg
Barry Griner
Jaime Gutierrez
Sydjea Johnson
Keith Murphy
Kimberly Nelson
Raoul Rolfes
Tosha Schore
Budie Suriawidjaja

Administrative Support

Maria Alidio
Cori Busch
Ellen Chow
Olivier de Marcellus
Melanie Fan
Tammy Haber
Christina Hartmann
Gail Hood
Rachael Hu
Brenda Krauss
Samuel Lau
Francesca Pedrazzini-Pesce
Liz Rosales
Rossella Santagata
Eva Schaffner
Yen-lin Schweitzer
Cynthia Simington
Kathya Tamagni-Bernasconi
Vik Thadani
Sophia Yam
Andreas Zollinger

Video Processing

Don Favareau
Tammy Haber
Petra Kohler
Brenda Krauss
Miriam Leuchter
David Martin
Alpesh Patel
Susan Reese
Liz Rosales
Steven Schweitzer

School Recruiters

Australia

Silvia McCormack

United States

Marty Gale
Elizabeth Tully

International Video Coding Team

Australia

David Rasmussen
Amanda Saw

Czech Republic

Jana Hatch
Alena Mojhova
Tom Hrouda

Hong Kong SAR

Angel Chui
Ellen Tseng

Japan

Jun Yanagimachi
Kiyomi Chinen

Netherlands

Yasmin Penninger
Linda Pollack
Dagmar Warvi

Switzerland

Giuliana Cossi
Natascha Eckstein
Domenica Flütsch
Isabelle Hugener
Kathrin Krammer
Anita Lovasz
Rossella Santagata
Ursula Schwarb
Regina Suhner
Monika Waldis

United States

Samira Rastegar
Bayard Lyons
Girlie Delacruz
Budie Suriawidjaja

Mathematics Education Experts

Australia

Judy Anderson
Rosemary Callingham
David Clarke
Neville Grace
Alistair McIntosh
Will Morony
Nick Scott
Max Stephens

Czech Republic

Jiri Kadlecek
Daniel Pribik
Vlada Tomasek
Miloslav Fryzek
Iveta Kramplova

Hong Kong SAR

P.H. Cheung
C.I. Fung
Fran Lopez-Real
Ida Mok
M.K. Siu
N.Y. Wong

Japan

Hanako Senuma
Kazuhiko Souma

Switzerland

Gianfranco Arrigo
Susan Baud
Pierre Burgermeister
Alain Correvon
Olivier de Marcellus
Kurt Eggenberger
Ruhal Floris
Christian Rorbach
Beat Wälti

United States

Thomas Cooney
Megan Franke
Douglas Grouws
Carolyn Kieran
Magdalene Lampert
Glenda Lappan
Eugene Owen
Edward Silver
Diana Wearne

Typical Lesson Analysis

Australia

Barry McCrae
Alistair McIntosh
Will Morony

Hong Kong SAR

P.H. Cheung
T.W. Fung
K.K. Kwok
Arthur Lee
Ida Mok
K.L. Wong
N.Y. Wong
Patrick Wong

United States

Thomas Cooney
Douglas Grouws
Carolyn Kieran
Glenda Lappan
Edward Silver

Westat (Weights and Sampling)

Justin Fisher
Susan Fuss
Mary Nixon
Keith Rust
Barbara Smith-Brady
Ngoan Vo

Appendix I

TIMSS 1999 Video Study Mathematics Video Coding Manual

This page left intentionally blank.

TIMSS
VIDEO STUDIES

Third International Mathematics and Science Study

TIMSS 1999 Video Study

MATHEMATICS VIDEO CODING MANUAL

Important Note:

We decided not to make any changes to the coding manual to codes after their reliability had been established. However, as a result of ongoing quality control checks it became necessary to clarify some existing codes.

These additions or clarifications to existing codes have been placed in the coding manual at the relevant places. For easy identification they are marked by a box and contain the actual date of the addition. Within the box the changes are bolded.

INTRODUCTION: CODING SYSTEM OVERVIEW

Code Types

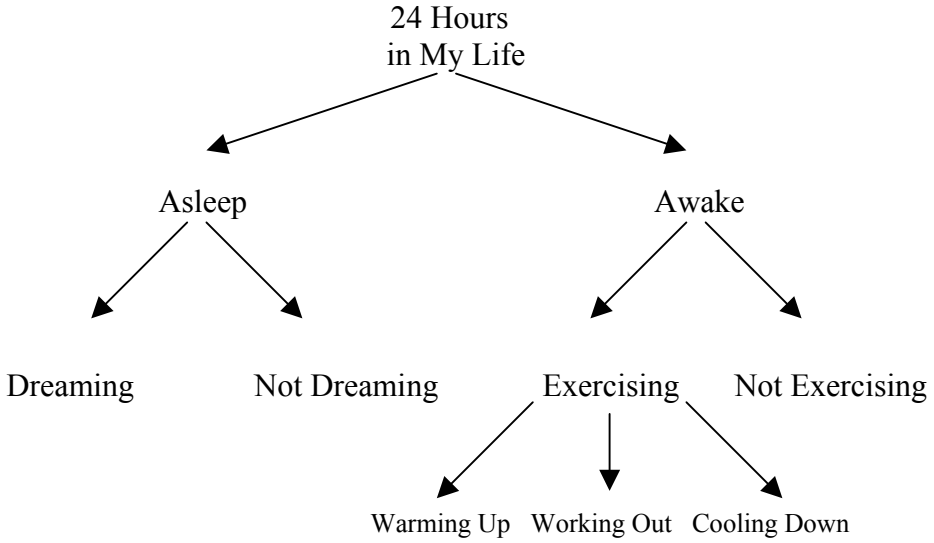
We use two types of codes: coverage and occurrence codes.

Coverage codes are used to code a lesson, or a defined portion of a lesson, in its entirety. All coverage codes have at least 2 mutually exclusive and exhaustive options. Only one of these options can be applied to any defined period of time. The option will always have an in-point and an out-point.

Occurrence codes are codes that are marked anytime they occur (i.e., their definition is met) within a lesson. An occurrence code may be found several times within one lesson, or it may never occur within a particular lesson. We want to know: 1) how many times the code occurred within a particular lesson, and 2) where the code occurred within a particular lesson.

Examples of Coverage Codes

If you wanted to code a 24-hour period of your life in its entirety, you could do so with coverage codes. At the broadest level, you might choose to code whether you were asleep or awake. These are mutually exclusive and exhaustive codes. You *have* to be *either* one or the other. You could subdivide the "asleep" and "awake" segments with other, mutually exclusive and exhaustive codes. See the following illustration:



Some Observations:

- It may have occurred to you that the distinction between "asleep" and "awake" isn't always clear. How do you code the period of time during which you doze off? How do you code the period of time spent between hitting the snooze button and being wide awake? In order to ensure that you (and other coders) code these instances consistently (or reliably), you would need to come up with rules for deciding what makes a case fall into one category versus another. These rules can be arbitrary. For instance, you may decide that when your eyes have been open for 10 consecutive seconds, you are awake. Your "awake" segment would start when your eyes opened at the beginning of the 10 seconds. Much of this manual will provide you with rules for making coding decisions.

- You may have also noticed that the hierarchy of coverage codes is heavily influenced by the topic that interests you. If you created the illustration above and showed it to someone who knew nothing about what you wanted to study, that person could deduce several things:

    1. You feel that a 24-hour period is an important unit of analysis.

    2. You feel that wakefulness is an important distinction; it differentiates, in some important way, the manner in which you spend your time. It might also mean that the period of time in which you're interested doesn't include time spent sleeping. Creating the "asleep-awake" distinction will help you to later focus on segments of wakefulness.

    3. You're interested in exercising. You also see the time you spend exercising or not exercising as an important distinction.

Examples of Occurrence Codes

There may be things that happen in your day that cannot be coded with "coverage codes," but are interesting to capture nonetheless. They may be brief happenings – or occurrences. For instance, you might be interested in the moments that you wipe the sweat from your brow or reach for your water bottle. You might have particular hypotheses about when these events are likely to occur. (For example, you might expect these particular occurrences to be more frequent while "awake" than while "asleep" and more frequent during "working out" than during "warming up.") To code these occurrences, you would need to identify the event (e.g., "wipe brow" or WB), the numerical order of the event that day (e.g., WB#3), and the times at which the event started and stopped.

Chapter 1. PASS 1: BEGINNING & END OF LESSON + CLASSROOM INTERACTION

The first pass is designed to provide the coder with an overview of the lesson. The lesson features to be marked are at the most general level.

1.1 Time of the Lesson (LES)

1.1.1 Marking the Beginning of the Lesson

The code "time of lesson" is to be coded as an occurrence code. The in-point is the beginning of the lesson and the out-point is the end of the lesson.

The **beginning of lesson** is marked by the first "public talk" of the teacher that requires all students' attention, e.g. the teacher saying," OK, now we will begin …,"Good morning …,"Today we will study …", Please be quiet, so we can begin …", or "Take out your homework …". At this point, a good student in class would recognize the lesson as beginning and would pay attention.

"Public talk" is intended for the *entire class*. (The talk may or may not be related to mathematics.) This implies that all (or most) of the students should be in the classroom when the class begins.

Notes:
If materials belonging to the mathematics class are passed out more than one minute prior to any public statement by the teacher, then the lesson begins at the start of this activity.

If students start working independently without any public statement from the teacher, the lesson begins when the bell rings or, if there is no bell, when the majority of students are working.

If it seems obvious that the lesson began prior to the start of the video footage, check the student tape to find the exact time. If the exact time cannot be found on the student tape then mark the first in-time of the video footage as the beginning of the lesson.

Examples:

FT-CZ-021	00:16
M-HK-096	00:19
Z-FT-NL-0047	00:57

1.1.2 Marking the End of the Lesson

The **end of lesson** is marked by the last public talk of the teacher that requires all students' attention, e.g. "That's it for today …", "We'll take a break now …", "Have a good day …". At this point a good student in class would recognize the lesson as ending.

"Public talk" is intended for the *entire class*. (The talk may or may not be related to mathematics.) This implies that all (or most) of the students should be in the classroom when the class ends.

Note:
If students are working independently and the teacher doesn't close the lesson with a public statement, the lesson ends when the bell rings or, if there is no bell, when the majority of students pack up their mathematics materials or leave the classroom.

Examples:

FT-CZ-020	45:10
M-HK-096	33:08
Z-FT-NL-0047	43:32

1.2 Patterns of Public/Private Classroom Interaction (CI)

Patterns of Public/Private Classroom Interaction (CI) is a coverage code. That is, all points in the lesson must be coded as one of the following five, mutually exclusive categories. Mark a change in public/private interaction regardless of any change in any other dimension. *(Note: The classroom talk needn't be math-relevant.)*

In general, there are three categories of Classroom Interaction (CI) patterns:

- Entirely Public Interaction (1.2.1)
- Mixed (Public and Private) Interaction (1.2.2)
- Entirely Private Interaction (1.2.3)

Within the "mixed" category, there are 3 types of interaction patterns:

- Public Information Provided by Teacher, *Optional* for Student Use (1.2.2.1)
- Public Information Provided by Student, *Optional* for Student Use (1.2.2.2)
- Mixed Private and Public Work, *Not Optional* (1.2.2.3)

Code a shift in CI patterns only if another pattern lasts for ***more than one minute.***

However at the opening and closing of a lesson there is no minimum time requirement. That is, at the beginning or end of a lesson there may be a CI pattern that lasts less than one minute. These segments should be coded without regard to their length.

Some General Tips: Sometimes you may not be sure whether a CI pattern really lasts for 1 full minute based solely on the time codes from the lesson transcript. In these close cases, it will be necessary to refer the video and take note of the exact in and out points of the segment.

Sometimes it is difficult to decide which of the public/private patterns should be coded. If this is the case, check first if a teacher's announcement can help to make a decision. If not, revert to the student tape for clarification.

1.2.1 Entirely Public Interaction

1.2.1.1 Type 1: Public Interaction (CI 1)

There is public dialog directed by the teacher or one or more students. Students' participation may, however, be minimal. Dialog may or may not be accompanied by written information. (When public written information is evident, it is usually provided by the teacher and is in the form of explanations on the chalkboard or overhead projector. When private written information is evident, it is usually in the form of students' notes.) The intent is that all students participate or listen (i.e., not optional). There may be *brief* periods (i.e., ***less than 1 minute***) of private work during this time, as when the teacher asks Ss to complete a small task. If the private work time lasts for ***more than one minute***, then code the private work time as CI 5 (Private Work) or CI 2 (Public Information Provided by Teacher, *Optional* for Student Use – to be described in 1.2.3.1). Otherwise, continue to code the segment as public.

Examples:

FT-CZ-021	00:16-01:35
FT-CZ-021	34:36-36:36
M-HK-029	3:03-4:22
M-US-001	8:03-9:49 (no public, written information (15 minute)
M-SW-065	25:16-27:34

1.2.2 Mixed (Public and Private) Interaction

1.2.2.1 Type 2: Public Information Provided by Teacher, Optional *for Student Use (CI 2)*

The teacher presents information publicly, in either verbal or written form. Students may choose whether to attend to it. If students choose not to attend, they instead work on an assignment privately. (That assignment may be the same as or different from the one presented publicly.)

Note:
The teacher must *clearly signal* that student attention is *optional*.

Examples:
M-NL-011 00:42, 01:10
Z-FT-NL-0049 38:50-40:05-40:37 (assistance to an individual, given on BB)
Z-FT-NL-0049 35:08-37:04 (verbal instructions @ 35:26, 36:45, 36:48)

1.2.2.2 Type 3: Public Information Provided by Student, Optional *for Student Use (CI 3)*

A student presents information publicly in written form. There may be a verbal interaction between the student and the teacher about the written work (and there may even be input from the seated students). Other students may choose whether to attend to the written information. This pattern normally occurs when all students (both at the board and at their seats) are working on the same assignment and the teacher is assessing the understanding of the student at the board.

Note:

If a student is working *behind* the board and their work is not "publicly available" to the class, code as Type 5.

Examples:
M-CZ-007 8:29-9:11
FT-CZ-021 1:32-3:06

Addition/Clarification to the coding manual: 1.2.2.2 CI Pattern TYPE 3: Public Information Provided by Student, Optional for Student.

03/01/2000

A student or a small group of students presents information publicly, in written form. The seated students may choose whether to attend to the written information provided. **When the student(s) at the board is/are no longer actively presenting information in written form (i.e., when the students return to their seats), it is no longer CI3.**

CI3 can appear in (at least) two ways. (1) There may be verbal interaction between the student(s) at the board and the teacher about the written work and there may even be input from the seated students. **(2) Students might present written information in silence without the teacher commenting, as when the teacher asks some students to write their solutions on the board while other students continue to work on the assignment.**

Example of CI3 → CI5: M-HK-049 (CI3: 25:52 - 29:15; CI5: 29:15 - 31:11)

1.2.2.3 Type 4: Mixed Private and Public Work*, Not Optional *(CI 4)

The teacher divides the class into groups. Some students are assigned to work privately on problems, while the rest of the class works publicly with the teacher.

Note:
This pattern is rare.

1.2.3 Entirely Private Interaction

1.2.3.1 Type 5: Private Work (CI 5)

All students work at their seats. Students may discuss problems with one another. The teacher may assist individual students or small groups of students, either verbally or both verbally and in writing. The teacher may also speak publicly to the class. If the public talk lasts for ***more than one minute***, then code it as either CI 1 (Public Interaction Between the Teacher and Student(s)) or CI 2 (Public Information Provided by Teacher, *Optional* for Student Use). Otherwise, continue to code as private work.

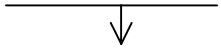
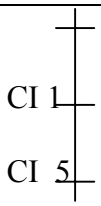
Examples:
M-US-002 28:33-34:15
M-US-001 00:17-00:45
M-NL-012 38:05 – 38:40 (public announcement during private work)
FT-SW-065 34:48-36:18

1.3 Pass 1 Coder Protocol

- Print the lesson transcript
- Watch the lesson to get a general feel
- Code the in- and out-points of the Lesson [LES]
- Code the Classroom Interaction [CI] patterns

1.4 Pass 1 Transcript Marking

- Draw all LINES in the first column (left of the time codes)
- Use the following symbols for marking pass 1
- Write in or circle the exact time of each shift in the text

	Draw a line with an arrow pointing down at the beginning of the lesson
	Draw a line with an arrow pointing up at the end of the lesson
	Draw a line during the time of the segment and indicate the type of Classroom Interaction next to the line. Draw a small line on the line to mark a shift in types. Also put a double slash // at the exact point in the text.

- The line in column one should have no gap from beginning to end, and all time marks should be at least one minute apart .
- The label uses for each segment must be either CI 1, CI 2, CI 3, CI 4, or CI 5
- The codes to be applied in Pass 1 are:

LES	Lesson	Length of the entire lesson
CI	Classroom Interaction	Public and private classroom interaction types 1 = Public 2 = Public by Teacher, Optional 3 = Public by Student, Optional 4 = Mix, Not Optional 5 = Private

1.5 How to print the lesson transcript

- Open the Lesson
- Select PRINT from the FILE menu
- Choose Transcript Report 1 in the REPORT NAME window.
- Highlight the unit's transcript (the lesson number) to be printed , and click PRINT
- Click OK in the *Laser writer 8 page set up*
- In the next window, under GENERAL ➔ select LAYOUT ➔ 2 pages per paper (select the setting with page 1 on the left and page 2 on the right)
- To staple the transcript, go back to the LAYOUT ➔ choose PRINTER SPECIFIC OPTIONS ➔ stapler➔ click PRINT

1.6 Where to find the Additional Materials for a lesson

(Additional materials include: textbook pages, worksheets, overheads used in the lesson, etc.)

36. Make sure you are connected to the Lesson Lab Drive (Chooser - Apple Share - Main Server - Lesson Lab Drive)
37. Select LLI Directory
38. Select Public Documents
39. Select Scanned Materials
40. Select Add_Mats
41. Select Math_AM
42. Double click on the lesson
43. Click OK on the screen saying the lesson is locked
44. Chose Acrobat Exchange to open the lesson

Chapter 2. PASS 2: CONTENT ACTIVITY CODES

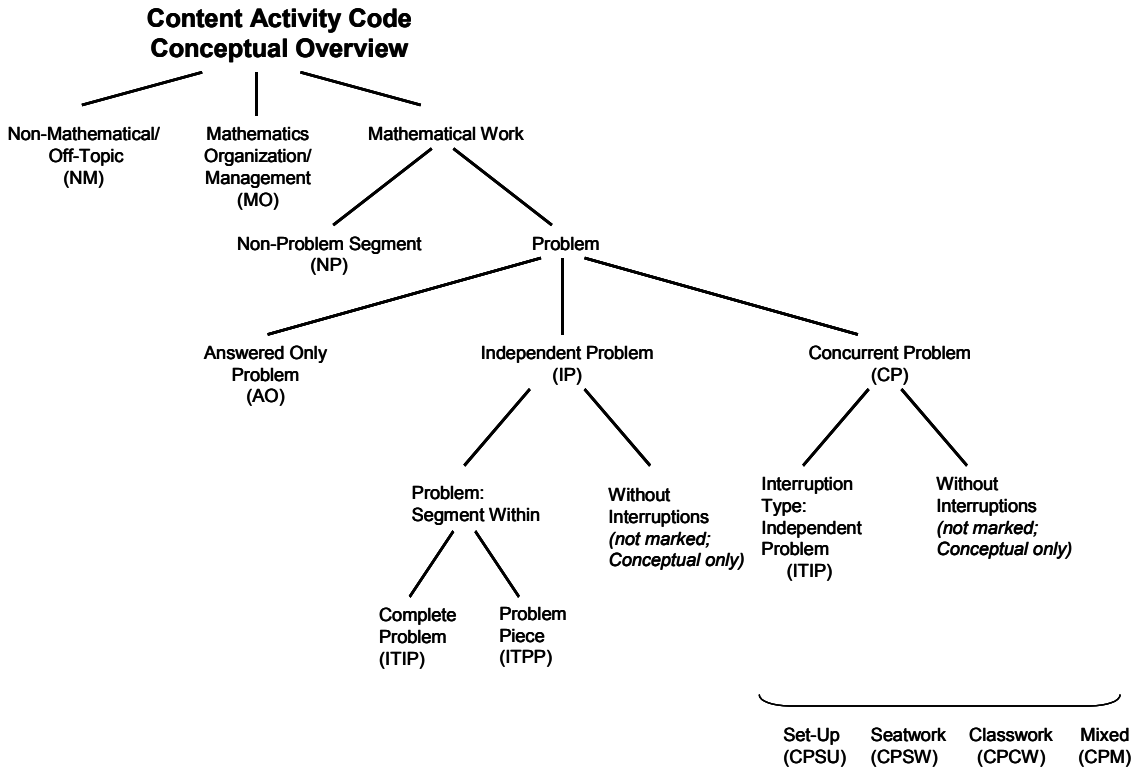
During the second pass we will code the Content Activity in the lesson. This coverage code will segment the lesson exhaustively.

The 13 content activity categories are:

Non-mathematical/Off Topic (NM)
Mathematics Organization/Management (MO)
Independent Problem (IP)
Answered Only Problem (AO)
Concurrent Problem Set-Up (CPSU)
Concurrent Problem Seat Work (CPSW)
Concurrent Problem Class Work (CPCW)
Concurrent Problem Mixed Activity (CPM)
Interruption Type: Independent Problem (ITIP)
Interruption Type: Problem Piece (ITPP)
Non-Problem (NP)
Break (BK)
Technical Problem (TP)

Everything you need to know about these categories you will find on the following pages.

This diagram displays the conceptual links between the content activity categories:



2.1 What Are Non-Mathematical/Off-Topic Segments? (NM)

Definition:
Non-mathematical/Off-Topic Segments (NM) contain no mathematical content. They offer no opportunities for students to learn mathematics. Non-mathematics segments must last ***at least 30 seconds*** in order to be coded as such.

Examples:

- Announcements by the teacher about school activities (e.g., field trips, vacation days).
- Interruptions by someone outside of the class requesting the teacher's attention (e.g., a student entering the room to collect the lunch count, a question of the teacher over the public address system).
- Following the bell at the beginning of the lesson, interactions between Ss or T/Ss that precede any mathematical work or organization. For example, the teacher taking roll.

- Discussions by the teacher of non-mathematical events (e.g., the music concert the night before).

- Disciplinary actions by the teacher in response to students' misbehavior.

- At the beginning and end of lessons, the appropriate content activity category should be applied, without any time constraints. However, where a NM segment is less than 30 seconds it should be merged with the following segment in the case of the beginning of the lesson, or the preceding segment at the end of the lesson. For example, the lesson may begin: "*Good morning class. Let's start.* First we will solve the following problem together". The NM (in italics) is less than 30 seconds, so it would be merged with the next segment (in this case a problem segment).

M-HK-030	43:23-47:19
FT-AU-04	2:43-4:32
Z-FT-NL-0048	1:11-1:40
M-CZ-026	2:10-3:37

2.2 What Are Mathematics Organization/Management Segments? (MO)

Definition:
Mathematics organization/management segments (MO) include references to mathematics (e.g., mathematics tools, resources, homework, tests), but do *not* contain mathematical content. As soon as any content is presented or the teacher begins to assign problems, it will NOT be coded as MO.
MO segments must last ***at least 30 seconds*** in order to be coded as such.

Note: MO segments that form the opening and closing of a lesson (the first or last segments coded) needn't meet the minimum time requirement. Code them no matter how short the segments are.

Examples of segments to be coded as MO:

- General organizational description of a future test or a quiz (e.g., "The test you are taking tomorrow will take the full class period….").

- Description of the grading policy on the test or quiz recently completed (e.g., "90% and higher was an A"). The comments are limited to general issues regarding testing and grading, not issues specific to a problem.

- The teacher and/or students passing out a worksheet that is not the next activity.

M-HK-050	30:12-32:00
M-US-002	16:16-17:56
M-US-011	2:39-3:34

Exception: (Segment not to be coded as MO)

- If the teacher discusses a lesson agenda/goal that includes mathematical content, this will not be coded as MO. (Instead code this as a Non-Problem segment (NP); see Section 2.16). An example would be the teacher describing the organization of the lesson in mathematical terms: "Today we will be studying systems of linear equations, but first we will review solving individual equations and then we will…"

2.3 General Definition of a Problem

Definition:
Problems contain an explicit or implicit Problem Statement (PS, Section 2.4.1) that includes an unknown aspect, something that must be determined by applying a mathematical operation (Section 2.5), and they contain a Target Result (TR, Section 2.4.2). When a solution is checked, this is considered part of the problem (Section 2.8).

2.4 Finding Problem Statements (PS) and Target Results (TR)

Mathematical problems have implicit or explicit Problem Statements (PS) as well as Target Results (TR). In order to code a problem, we first need to identify the PS and the TR.

2.4.1 What is a Problem Statement (PS)?

The **Problem Statement (PS)** describes the task to be completed. It may be verbal or written. The answer to the PS is the Target Result (TR).

Sometimes the PS is incomplete but clearly implied. In these cases the intention to solve a particular problem must appear to be known to students. For example, the students may have just worked on several very similar problems in the lesson (see M-US-004 example below).

The teacher may indicate a problem by referring to a particular textbook page and number (e.g., "Please solve problem #2 on page 18.") or indicate a problem on a worksheet (e.g., "Do the fifth problem."). In this case the announcement counts as the PS. Furthermore, a spoken PS can be an abbreviated, less specific, or incomplete version of a written problem.

Examples of some Problem Statements:

- "Solve the linear equation"
- "Which of the following numbers is bigger?"

- "We're gonna shingle the roof" (implied: How much will it cost, including tax?) [M-US-004]

Note:
General goal statements or topic announcements do not have TRs. PSs have particular TRs.

2.4.2 What is a Target Result (TR)?

The **Target Result (TR)** is the answer or solution to the Problem Statement (PS) obtained by applying the relevant operations. Mark the first complete and accurate public presentation of the solution.

The TR may be a number, an algebraic expression, a geometric object, a strategy for solving problems, and even the creation of a new problem. The teacher, the students, or both, may work out the solution to the problem.

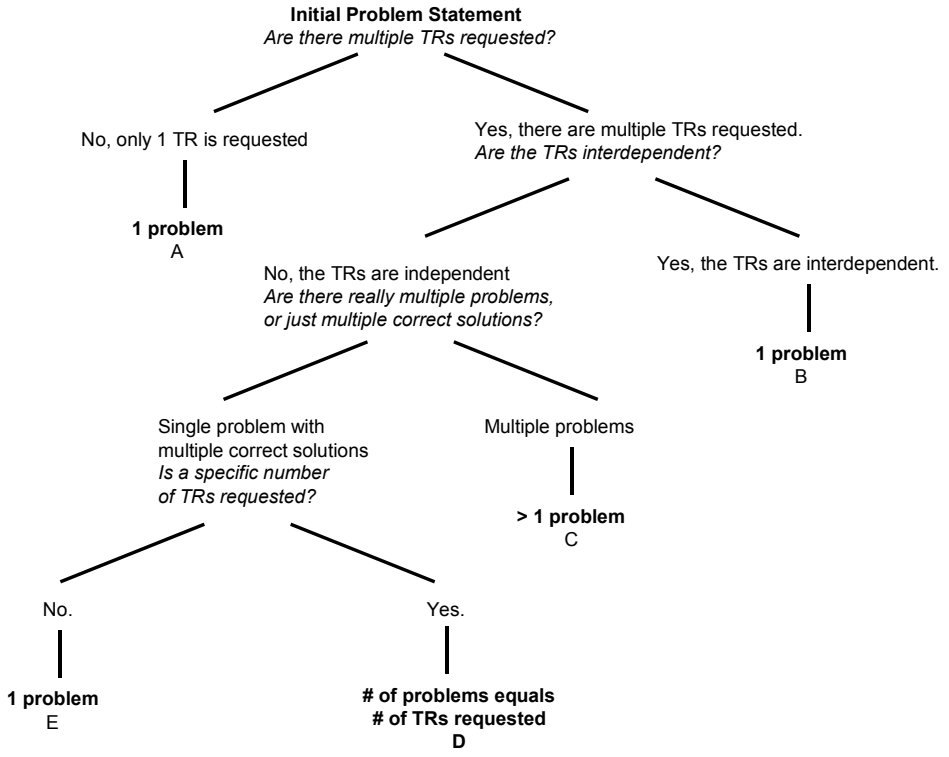
The TR may be explained, corrected, further elaborated, or checked. This type of continued discussion about the TR will be included as part of the problem.

Not all problems in a lesson will be worked through to their TRs.

2.4.3 Determining How Many Problems to Code

A Problem Statement (PS) may ask for one Target Result (TR) (e.g., solve the equation for x) or it may ask for several TRs (e.g., using the two given points create an equation, fill in a value table and graph the function). Because the number of TRs is generally used to determine the number of problems coded, sometimes it might be difficult to reliably decide how many problems there actually are.

The decision tree below is designed to help you make reliable decisions about how many problems to code. "**Interdependent**" means that one of the requested TRs **MIGHT BE USED** to get to a second TR.

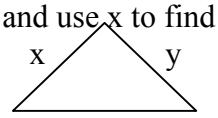


A. Examples of Problem Statements with a ***single Target Result*** (ONE problem):

- Find x in the equation $3x - 5 = 10$
- Find the area of the parallelogram with a base of 8 cm and a height of 4 cm.

B. Examples of Problem Statements asking for ***multiple, interdependent Target Results*** *(ONE problem):*

- In the triangle below, find x and use x to find y:



70

- Make a value table and graph the equation: $3x = 2y - 1$

C. Example of a Problem Statement asking for ***multiple, independent Target Result****s (MULTIPLE problems):*

- Solve the following equations:
  a) $3x + 1 = 8$
  b) $x - 7 = 42$ (= 2 problems)

- Given the following equation: $3x = 2y - 1$

  a. Make a table using the format

x	0	1	2	3
y				

  b. Graph (= 2 problems)

*D. Examples of single problems with **multiple correct solutions** and a **specific number of Target Results** requested (# of problems = # of independent TRs requested):*

- Name two triangles that can be used to tessellate triangle QRS, give the lengths of their sides and explain why they can be used to tessellate (2 independent TRs, therefore 2 problems -- each with 3 interdependent TRs).
- Name 3 decimal numbers between 11.8 and 11.9 (= 3 problems)

*E. Examples of single problems with **multiple correct solutions** and the **number of Target Results unspecified** (ONE problem):*

- Name a triangle that can be used to tessellate triangle QRS, and give its perimeter.
- Name some decimal numbers between 11.8 and 11.9

Note:

- For problems on worksheets, the above decision tree will also be applied. Worksheet problems often contain "subproblems" -- such as #1a,b,c. Each subproblem is considered a new "initial problem statement."
  Example:

  A wall in the city has two advertising posters on it. A tax of 75 guilders must be paid to the city per dm^2. Therefore, we must know the surface area of the posters.

- Calculate the surface area of the two posters.
- What is the tax due to the city on the first poster?
- What is the tax due to the city on the second poster?

  (a = 2 problems; b = 1 problem; c = 1 problem)

2.5 What is a mathematical operation?

Mathematical problems must have at least one mathematical operation.

A mathematical operation could be:

1) a procedure applied to:
   - numbers
   - variables
   - algebraic expressions
   - geometric objects
   - a geometric construction
   - a graph or map

2) a method of mathematizing a real-world situation:
- measuring objects
- manipulating symbols

Addition to the coding manual: 2.5 What is a Mathematical Operation?

3/2/00

A mathematical operation could be:

2) a method of mathematizing a real-world situation:
- measuring objects
- manipulating symbols
- **applying statistical concepts**

Types of operations include:
- adding, subtracting, multiplying, dividing, squaring, etc.
- combining like terms
- combining exponents
- factoring
- simplifying
- expanding
- manipulating equations
- changing representation form (e.g., writing a story problem as an equation)
- solving equations
- substituting numbers for variables
- plotting graphs
- reading graphs
- applying formulas, rules or theorems
- applying tools for measuring angles
- estimating measurements
- rounding off numbers
- rotating, reflecting, constructing angles, lines and curves
- drawing charts
- proving identities
- comparing solution strategies
- identifying real life applications of a formula
- interpreting a complex mathematical figure

Note: Labeling a figure is *not* an operation, however manipulating a label or symbol to generate a new result *is* an operation.

Mathematical problems require **mathematical thought.** Although the amount or depth of thought may be relatively small, the problem must make some demands on students'

thought by requiring that students recognize the mathematical objects that must be acted on and then apply the mathematical operation(s) to obtain the result.

Example:
FT-AU-04 18:32-22:05

2.6 Distinguishing Problems from Steps

Many mathematical problems require one or more "steps" to reach the solution. Steps, by themselves WITHIN a problem, do NOT count as separate mathematical problems. A step is a mathematical operation that occurs between the Problem Statement (PS) and the Target Result (TR). A step is used to reach the TR.

Sometimes it may be difficult to determine if an operation (or set of operations) qualifies as a step or as a new problem. Look to see if there is a larger Problem Statement (said or clearly implied). If so, then the operation(s) are steps.

Example of steps:

We are going to graph the following function -- 3X+Y=12 (Problem Statement)
First we need to make a table to determine some coordinates (Steps)
Now let's plot the points and make the graph (Target Result)

2.7 Examples and Special Cases

Examples of problems include:

- Adding simple whole numbers (e.g., 3 + 5) is NOT a problem, but adding simple fractions is a problem (because, for some eighth graders, fractions are mathematical objects that require some recognition/analysis but small whole numbers are, by this time, routine).
- Counting how many of five circles are shaded is NOT a problem, but counting the number of terms in an algebraic expression is a problem (because, for some eighth graders, algebraic terms require recognition/analysis but shaded circles do not).
- Recalling the convention for labeling a single angle is NOT a problem, but manipulating labels to generate new ways of naming an angle is a problem.

  Example:
  FT-AU-04 8:47-14:45

Special Cases To Be Coded as Problems:

- Teaching how to translate a mathematics operation onto a calculator/computer counts as a problem, <u>regardless</u> of the difficulty level.

Examples:
Use your calculator to find the square root of 100.

Use your calculator to add 3 and 5.

However, where a calculator/computer is clearly being used as a tool to complete a step towards the solution of a problem (e.g., to determine the value of cosine θ, or to convert a decimal number into degrees with seconds, as in HK 044) then this "step" is not a problem.

- If the TR is a formula, rule, definition, etc., it will ONLY be coded as a problem IF it is worked on for ***at least 2 minutes*** (from the Problem Statement to the Target Result) ***and at least 2 operations*** are applied. If the same operation is repeated, it is counted as a separate mathematical operation. (We include these extra conditions here to exclude those cases where the teacher asks students simply to recall a rule or formula from memory.)

Special Cases NOT To Be Coded as Problems:

Simple questions by the teacher that ask students to "fill in the blank" with information that one could expect all eighth-grade students to have over-learned or know by common sense, or that is suggested so strongly by the question itself that no other answers seem reasonable, are not problems.

Examples:
- "So what is two and five?"
- "Here are two halves; how many of them are shaded?"
- "Remember, first you combine the x's and then you combine the...?"

2.8 Checking

Checking will always be coded as part of the problem, even if the check itself meets the definition of a problem.

Checking means:
- making sure the Target Result (TR) is correct, often by "plugging" the answer into the original question.
- making sure an alternative solution is incorrect.
- making sure that one solution method yields the same TR as a different solution method.

In the last case, the teacher/textbook must clearly state (before the problem is worked on) that the goal of using these 2 solution methods is to check that they yield the same result. If the goal of checking is not clearly indicated, then use the rule below.

If the teacher explicitly asks students to work the problem using another strategy than they have used the first time (and does NOT refer to this as checking), it is coded as a new problem; if the teacher asks students to report alternative strategies (or solutions) that they have already found, this is coded as a continuation of the original problem.

An activity that makes use of students' solutions (e.g., connecting the dots to make a picture, when the dots are labeled with successive solutions; M-CZ-016), is considered checking – and therefore not a problem unto itself.

2.9 How to Identify the In- and Out-Points of Problems

Once we have identified a Problem Statement (PS) and a Target Result (TR), we have to determine where the problem begins and where it ends. This section will explain where to mark the in- and out-points of each problem so that the problem will be a meaningful segment for future analyses.

2.9.1 In-Point of the Problem

We will mark the in-point of a mathematical problem when the problem is first stated or assigned (whichever comes first).

However, if the teacher **explicitly/directly relates the preceding discussion** to the problem, we will include this discussion as part of the problem. In this case the in-point of the problem will be marked at the beginning of the discussion.

Also, if the immediately preceding activity involves preparing for working-on the problem by distributing materials, referring to the relevant textbook page or worksheet, displaying overhead transparencies, rearranging into groups, calling student(s) to the board, and so on, then the problem will begin with this activity.

If a problem is *referred to* with the intent of working on it later in the lesson, it will not be opened when it is first referred to. The problem will instead be opened when it is intended by the teacher to be worked on.

The "Set-Up" for a group of problems will be included with the first problem of the group.

2.9.2 Out-Point of the Problem

We will mark the out-point of a mathematical problem after a solution has been stated, the "check" of the solution is completed, or after the discussion around the solution has finished, whichever comes last.

Teachers may summarize the solution strategy used for the problem after the Target Result (TR) has been stated. This summary is considered part of that problem. However,

summary statements that refer to several problems should not be included as part of the problem. Instead, they should be coded as separate "Non-Problem" segments, as discussed in Section 2.16.

If the teacher collects students' papers immediately after the problem is solved or after the problem has been worked-on, the out-point is marked after this activity is concluded. If the teacher begins a new segment while collecting papers, the out-point of the problem is marked at the beginning of the new segment.

For references back to the problem which occur after the TR has been reached (in the present lesson) AND another activity has started, the coder will have to decide whether or not the reference should be considered part of the problem.

- If the reference contains an *explanation* or extended discussion of the solution process or TR, then it should be coded as part of the problem. In this case, the new activity will be coded as part of the problem as well.
- If the reference is very brief and just mentions the problem or repeats the TR or a small step, or it is very far removed from the problem itself, then it should be coded as a separate, "Non-Problem" segment.

2.9.3 Transition Segments

A **transition statement** is a statement of less than 20 seconds, between two segments. We will put the transition statement into the succeeding segment (the second of the two segments). Therefore, the end-point of the first segment will be marked before the transition statement, and the in-point of the second segment will be marked at the beginning of the transition statement.

2.10 What are Answered Only Problems (AO)?

Definition: Answered Only (AO) problems are problems completed before the present lesson (and *not worked on* during the present lesson). Answers are shared either verbally or in written form. AO problems have NO public discussion of a solution strategy, and NO private working on time.

Examples:

- The teacher gives answers to homework verbally, on the chalkboard, or on a handout.
- The teacher gives answers to a test/quiz verbally, on the chalkboard, or on a handout.
- The teacher provides solution strategies in written form only (there is no discussion) (e.g., the teacher provides a hand-out with the steps students should have used to solve the equation).
- M-US-002 6:50-8:31

Notes:

- If anything more than answers are discussed -- for example, if there is any public discussion of solution strategies -- the problem is coded as an Independent Problem (IP, see Section 2.11 below).
- AO problems should be lettered consecutively.
- Sometimes the class goes through a series of AO problems, but they then decide to work out or have a lengthy discussion about one of the problems. If the class returns to work on an AO that has already been opened and closed, that problem will be coded twice: first as an AO problem, and later as an Independent Problem (IP).

AO a	AO b	AO c	IP 1	AO d
$3x^2 + x = 6$	$x^2 + 3x = 8$	$x^3 + 2x = 7$	$x^2 + 3x = 8$	$x^2 + x^2 = 8$

2.11 What are Independent Problems (IP)?

Definition: Independent Problems (IPs) are problems on which the teacher expects students to spend time during the present lesson. They are worked-on by themselves. The exact time the whole class spends working on the particular problem is known.

IPs may be worked on entirely publicly or they may contain a private working on phase.

IPs should be numbered consecutively, together with Concurrent Problems (CPs; Pass 3).

Examples:
FT-AU-03 12:10-14:11
FT-SW-065 9:11-13:41

Special Cases:

- If problems are initially introduced as a group (e.g., a poster, worksheet, or textbook), but are then worked on one by one they will be coded as IPs since the time devoted to each single problem is known. The in-point of the first IP will be when the group of problems is first set-up or assigned.

- For a problem that has been completed prior to the lesson, if there is any public discussion of solution strategies, the problem is coded as an IP.

2.12 What are Concurrent Problems (CP)?

Definition: Concurrent Problems (CPs) are those problems that share some private working on time (CI 2, CI 3, CI 4, or CI 5). During that private time it is not known on

which problems students are working. Thus, the exact time spent working on each of the CPs is unknown**.**

Note:
Problems that are completely public (CI 1) cannot be coded as CPs.

2.13 What are Concurrent Problem Phases?

Concurrent Problems (CPs) cannot serve as activity segments in this coding system. Instead, use the following four CP phases as content activity segments:

Concurrent Problem Set-Up (CPSU)
Concurrent problem Seat Work (CPSW)
Concurrent Problem Class Work (CPCW)
Concurrent Problem Mixed Activity (CPM)

Note:
If there are any CPs open there should always be a CP phase coded.

2.13.1 Concurrent Problem Set-up (CPSU)

Definition: CP Set-Up (CPSU) is a segment during which the teacher assigns multiple problems. To qualify as a CPSU segment, during the activity that immediately follows students must work on the assigned problems. If any other activity (e.g., checking homework, reviewing from a previous lesson) occurs between the initial assignment of CPs and the working-on segment, then the initial assignment of problems is **NOT** coded as a CPSU phase. In this case the CPSU phase would be the reassignment of the problems immediately preceding the working-on segment.

The in-point of the CPSU is signaled by any of the following markers:

- The first problem of the set of problems is stated.
- The teacher passes out worksheets or asks a student(s) to pass out worksheets.
- The teacher asks students to look at worksheets they already have from a previous lesson or to open their textbooks to a particular page.
- The teacher indicates group work or working with a partner.
- The teacher passes out other materials or asks students to distribute materials.

Below are three possible scenarios of CPSU segments:

Scenario 1: The teacher assigns three CPs to be worked on in Seatwork. (This is the most simple/ straightforward case).

CP Set-Up (CPSU)	CP Seatwork (CPSW)
CP1	
CP2	
CP3	

It may occur that teacher and students work out example problems to their completion during the CPSU segment. Two different scenarios can be distinguished:

Scenario 2: The teacher assigns three CPs and does one example problem that does not belong to the group of CPs assigned during the CPSU phase. We will call the example problem an IP/ITIP. The numbering of the problems is as follows: CP1-3 and IP4.

CPSU			CPSW
CP1			
CP2			
CP3			
	ITIP IP4		

Scenario 3: The teacher assigns three CPs and does one of the CPs as an example problem during the CPSU phase. In this case the example problem is no longer a CP but an ITIP/IP. The numbering of the problems is as follows: CP1-2 and IP3.

CPSU			CPSW
CP1			
CP2			
	ITIP IP3		

Notes:

- Remember, problems that are assigned with the explicit intent to be solved at a later time during the lesson will not be opened when they are first referenced to.

- If the students have already started working on the assigned CPs and the teacher then decides to solve one of the problems together as a whole class we code the CP Phase as CPCW. That problem is NOT an ITIP/IP but a CP.

- Problems that are part of an assigned set of CPs but that have been solved to completion prior, will be subtracted from the total number of assigned problems.

The **out-point** of the CPSU segment is coded 1) after the last CP is presented and students may start working (see Scenarios 1 and 2 below), or 2) the first operation is requested (see Scenario 3 below).

Notes:

- For all CPs assigned during the present lesson, code a CPSU phase. Only if there is no assignment of CPs in the present lesson (for example, students know how to proceed without instruction -- in classrooms with totally individualized learning, weekly work plans, or warm-up problems written on the board), can a CPSU phase be missing.

- If additional CPs are assigned during CPSW, code another CPSU Phase.

- This segment includes the period of time spent passing out worksheets and continues until the teacher has passed out worksheets to all students.

- If the teacher gives instructions or hints *before* students have begun working, this is part of the Set-Up. But, if any problem is worked out to its TR, it is an IP/ITIP (Section 2.14) as described above.

- If the teacher gives instructions or hints *after* students have begun working, this is not part of the Set-Up. It will either be coded as Seatwork or Classwork (to be described below).

- In some lessons, the teacher may set-up some CPs and then have the students work on them privately. After they have already started working privately, the teacher may additionally set-up more problems. In this case, there would be a CPSU segment, followed by a CPSW segment, and then another CPSU segment.

Examples:
M-NL-008 24:50-25:13
M-US-050 32:04-33:03
M-HK-087 36:31-37:03

(These are the same scenarios shown in Section 3.1.)

Scenario 1

CPSU	CPSW	CPCW
CP1		
CP2		
CP3		
CP4		

Scenario 2

CPSU	CPSW	CPSU	CPSW	CPCW
CP1				
CP2				
		CP3		
		CP4		

Scenario 3

CPSU	CPSW	CPSU	CPSW	CPCW
CP1				
		CP2		

2.13.2 CP Seatwork (CPSW)

Definition: CP Seatwork (CPSW) is the segment when students actively work on concurrent problems (CPs) at their seats (privately). They may work individually, in pairs, or in small groups.

The **in-point** of the CPSW Segment is when all students start working privately at their seats. This is often indicated by teachers comments such as: "Start working now," "You can start now," or physical markers by the teacher such as starting to monitor students' work, sitting down at the desk, working out constructions or problems on the chalkboard.

The **out-point** of the CPSW Segment is marked either 1) immediately before students publicly share the work they completed privately, (indicated by comments such as "Let's compare results" or "Let's go over the problems together"), or 2) if there is no public sharing of private work and another segment begins.

Notes:

- If additional CPs are assigned during CPSW, code another CPSU Phase.

CPSU	CPSW	CPSU	CPSW	CPCW
CP1				
CP2				
		CP3		
		CP4		

- While most of the class is working at their seats, one or more students may be working at the chalkboard. This should still be marked as CPSW.

Addition/Clarification to the coding manual: 2.13.2 CP Seatwork (CPSW). 03/03/2000
While most of the class is working at their seats, one or more students may be working at the chalkboard. This should still be marked as CPSW. **This is true *even if* there is public talk between the student and the teacher, and *even if* the student at the chalkboard reaches a target result.**
Example: M-CZ-048, 35:38-41:49

- Normally, there are no time requirements for the CP phases. There is **one exception**: The teacher may make brief announcements to the class, as students are working on problems at their seats. If these announcements last less than one minute, the segment remains "CP Seatwork" (CPSW). However, if the announcements last more than one minute, the segment should then shift to "CP Classwork" (CPCW).

- Also, any time the teacher goes over a problem or its TR publicly (even if this lasts less than one minute), the segment should shift to CP Classwork (CPCW).

- This segment includes the period of time spent collecting worksheets and continues until the teacher has collected worksheets from all students.

Examples:
M-NL-008 25:13-48:08
M-US-050 3:03-42:31
M-HK-087 37:03-40:32

2.13.3 CP Classwork (CPCW)

Definition: CP Classwork (CPCW) is the segment when the teacher/students actively work on or discuss Concurrent Problems (CPs) as a whole class (publicly).

In **in-point** of the CPCW Segment is when students begin to publicly share work they completed at their seats. This can be indicated by comments such as, "Let's look at what you got," or "What about number 12?".

The **out-point** of the CPCW Segment is when the TR of the last problem of the group has been stated or the related discussion to that problem or the entire set of problems has finished and a new segment begins.

Notes:

- There is no minimal time requirement for CPCW.

- In some lessons, the teacher may not go over any CP publicly -- although there may be some general public discussion about the assignment. This means that the CPs will close at the end of the CPSW segment. However, a CPCW segment would still follow, without any CPs open, because the discussion is about some general feature of the problems (e.g., the teacher may summarize what students should have learned from working the problems without going over any particular problem.). See the diagram below.

CPSU	CPSW	CPCW
← CPs open	CPs close →	

- This segment includes the period of time spent collecting worksheets and continues until the teacher has collected worksheets from all students.

Examples:
M-US-050 42:31-47:58
M-HK-087 40:32-42:08

2.13.4 CP Mixed Activity Segment (Seatwork & Classwork) (CPM)

Definition: The teacher explicitly divides the class into groups, and assigns them different activities. One group works privately at their seats, while at the same time another group works publicly with the teacher.

Note:
This situation is rare. It generally overlaps with one of the mixed Classroom Interaction (CI) patterns. (See Section 1.2.2.)

2.14 What Happens if an Independent Problem (IP) Interrupts Another Problem(s)?

2.14.1 What Happens if an Independent Problem (IP) Interrupts another Independent Problem (IP)?

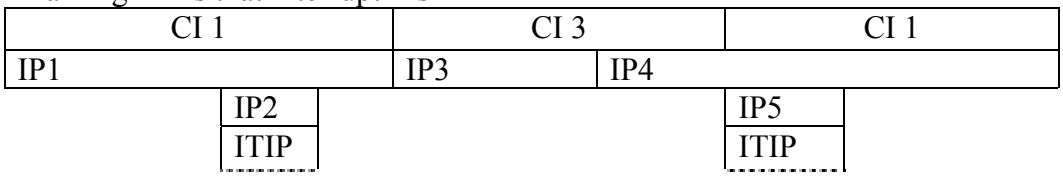
Definition: A new Independent Problem (IP) may be started and solved before another IP is completed. We code both problems as IPs, and number each one consecutively. However, this means that a period of time will be covered by two activity segments. Therefore we will also code this period of time (covered by the 2 IPs) as ITIP – Interruption of Type Independent Problem.

The times marked for the **beginning** and the **end** of an ITIP segment should be the same as the interrupting IP.

Example:

M-US-004 12:32-12:53

Marking ITIPs that interrupt IPs

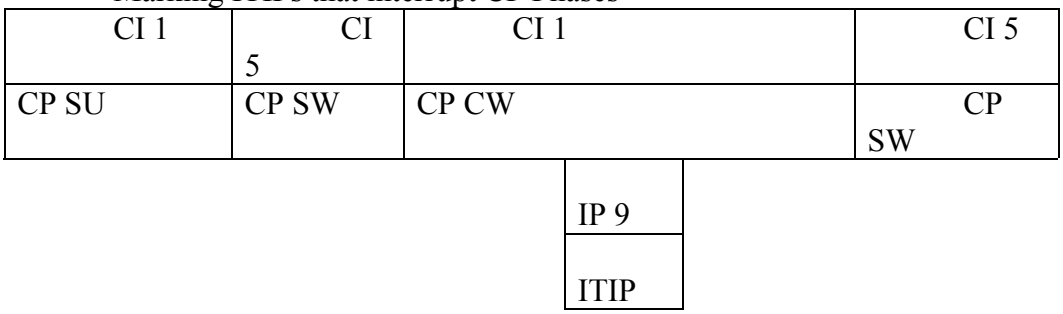


2.14.2 What Happens if an Independent Problem (IP) Interrupts a Concurrent Problem Phase?

An Individual Problem (IP) can interrupt a CP Phase (usually the CPSU or CPCW phase). However, this means that a period of time will be covered by two activity segments. Therefore we will also code this period of time (covered by the CP Phase and IP codes) as ITIP – Interruption of Type Independent Problem.

The times marked for the **beginning** and the **end** of an ITIP segment should be the same as the interrupting IP.

Marking ITIPs that interrupt CP Phases



Addition/Clarification to the coding manual: 2.14 What Happens if an Independent Problem (IP) Interrupts Another Problem(s)?

04/10/00

ITIP: The code ITIP was designed to preserve the time spent on a particular problem that gets interrupted by another problem. As ITIPs can occur within IPs (2.14.1), but also within CPSU, CPM and CPCW (2.14.2), we need to further specify which of the content activity segments it interrupts.

ITIP: The original code ITIP describes the case where a problem interrupts another IP.
IIPSU (Interruption of Type Independent Problem To a CPSU): This code describes the case where a problem interrupts a CPSU.
IIPCW (Interruption of Type Independent Problem To a CPCW): This code describes the case where a problem interrupts a CPCW.
IIPM (Interruption of Type Independent Problem To a CPCW): This code describes the case where a problem interrupts a CPM.

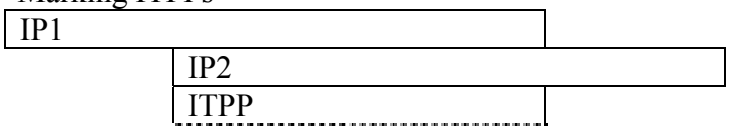
2.15 What Happens if a Piece of an Independent Problem (IP) Interrupts Another Problem(s)?

Definition: Sometimes the class works publicly on one Independent Problem (IP) up to a certain point without finishing it. The class then starts working publicly on another Individual Problem (IP) which also remains unfinished. The class then goes back to finish the first problem and then completes the second. The problems are broken up into different pieces.

We code both problems as IPs, and number each one consecutively. However, this means that a period of time will be covered by two activity segments. Therefore we will also code this period of time (covered by the 2 IP codes) as ITPP – Interruption of Type Problem Piece.

The ITPP segment should be the time when the two IPs overlap. See diagram below.

Marking ITPPs



Example:
M-HK-031 1:58-19:00

2.16 What is a Non-Problem Segment? (NP)

Definition:
Non-problem segments (NP) contain mathematical information. They do not contain problems, but may reference problems. NP Segments must last ***at least 20 seconds***. If a segment seems to fit the definition but is ***less than 20 seconds***, code it as part of the segment before or after - whichever is most relevant.

NP segments that form the opening and closing of a lesson (the first or last segments coded) needn't meet the minimum time requirement. Code them no matter how short the segment is.

Examples of Non-Problem segments:

- Assignment of homework
- Historical background
- Lesson goal/topic (today or future)
- Meta-cognitive strategies
- Presentation of new information (concepts or resources)
- Real life connection/ application
- Reference to a prior problem (summary or repetition)
- Reference to a future problem
- Review of old information

Notes:

45. NP segments often are brief lectures by the teacher or interactions between the teacher and students where the questions the teacher asks do not meet the definition of a problem.
46. NP segments CANNOT interrupt problems. If you see something that looks like a NP segment, but it occurs within a problem, simply consider it as part of the problem.

Examples:
Z-FT-NL-0048 29:12-31:12
M-CZ-026 3:55-5:33
M-US-024 13:03-15:07

2.17 What if there is an Official Break in the Lesson? (BK)

Definition: Time during the lesson (or in-between double lessons) that the teacher has designated as a Break (BK) for students. The in-point of the BK is when the teacher publicly announces that students may take a break. The out-point of the BK is when the interaction clearly shifts back into a mathematics lesson.

If the teacher announces that students may have a break, but then an activity takes place that we would otherwise call "mathematics organization" or "mathematics work", do not code the period of time as "BK". Instead, use the most appropriate content activity category.

2.18 What if there are Technical Problems with the Video? (TP)

You may come across a video that has a Technical Problem (TP). For instance, the video may start late or lack audio. These difficulties may prevent you from making a confident coding decision. In these cases, use Technical Problem (TP) as a content activity category to mark the difficult section. The **in-point** of a TP segment is where the coding difficulty begins. The **out-point** is where you have sufficient information to make a coding decision.

2.19 What happens if another Content Coverage Code seems to interrupt an Independent Problem or Concurrent Problem Phase?

Our coding system ONLY allows for a very specific type of interruption to an Independent Problem (IP) or Concurrent Problem Phase (CP Phase): Independent Problems (ITIPs) or Problem Pieces (ITPPs) -- see Sections 2.14 and 2.15. No other content activity category may interrupt a problem. That is, Non-Mathematics (NM), Mathematics Organization (MO) and Non-Problem (NP) segments cannot interrupt either IPs or CP phases.

2.20 Reference Table: Types of Problems

		Worked On	
	Answered Only Problems (AOs)	**Independent Problem (IPs)**	**Concurrent Problems (CPs)**
Definition	AO problems are problems completed before the present lesson (and *not during* the present lesson). Answers are shared either verbally or in written form. Answered only problems have NO public discussion of a solution strategy, and NO private working on time.	IPs are those problems that are presented/ worked on by themselves. The exact time spent working on the problem in class is known.	CPs are those problems that share some private working on time. The exact time spent working on each of the CPs is unknown.
In-Point	The point when the problem is first stated. If the immediately preceding discussion or activity is explicitly/directly related to the problem, we will include this discussion as part of the problem and mark the in-point at the beginning of this discussion.	The point when the problem is first stated or assigned (whichever comes first). If the immediately preceding discussion or activity is explicitly/directly related to the problem, we will include this discussion as part of the problem and mark the in-point at the beginning of this discussion.	
Out-Point	The point when the solution is stated.	The point when the solution is stated, the "check" of the solution is completed, or when the discussion around the solution has finished, whichever comes last.	
Phases to Mark	None	None	CP Set-Up (CPSU), CP Seatwork (CPSW), CP Classwork (CPCW), CP Mixed Activity (CPM)
Labeling	Consecutive lettering.	Consecutive numbering for all worked on problems.	

2.21 Tips for Coders

To code a problem accurately, you must watch the video. Never rely on the transcript only. Sometimes, when a teacher/student presents a question, his/her verbal expression is insufficient.

Example: The teacher is presenting to students the difference between $(-3)^2$ and -3^2. However, verbally there is no difference. You can only tell the exact content of her presentation by looking closely at what the teacher writes on the blackboard.

Textbook Problems

Don't necessarily follow the labeling of problems in the textbook. Identify problems by using the definition given in this manual. It may be the case that you must label a single textbook problem as two problems.

Coding Answered Only Problems (AO)

Sharing homework is a likely place to find AO problems. Be aware that even though many of the homework problems may be answered only, some could be Independent Problems (IP) if a discussion about the solution method takes place.

If there is any brief segment (e.g., *20 seconds or less*) that is difficult to categorize based on the content of the segment, code it as part of the segment which follows.

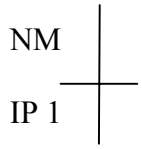
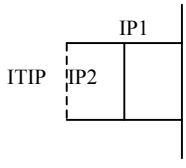
There should only be one Content Activity category marked at any time except for when an ITIP or ITPP occurs.

2.22 Pass 2 Coder Protocol

- Divide the lesson into Content Activity categories. Each Content Activity category must have an in point and an out point.
- For each problem, identify the Problem Statement (PS) and Target Result (TR).

2.23 Pass 2 Transcript Marking

- Mark all of the Content Activity categories in the second column (left of "Speaker")
- Use the following symbols for marking Pass 2
- Write in or circle the exact time of each shift in the text

	Draw a vertical line indicating the time of the segment and write the Content Activity type. Draw a horizontal line to indicate shifts between content activity segments. At each shift, also put a || at the exact point in the text.
<u>PS1 / TR1</u>	Underline the PS and TR of each IP in the text, and number them with the same number as their IP. If a PS is written on the board or overhead (and not included in the lesson transcript), write it in the transcript at the appropriate lesson time for easy future reference). For problems with interdependent TRs, mark each one as a portion of the TR. (e.g., If the first problem (IP1) has 3 TRs then we would label them: TR1-1, TR1-2, TR1-3)
	Draw a dashed line to indicate interruptions (ITIP/ITPP) to IPs and CP Phases.

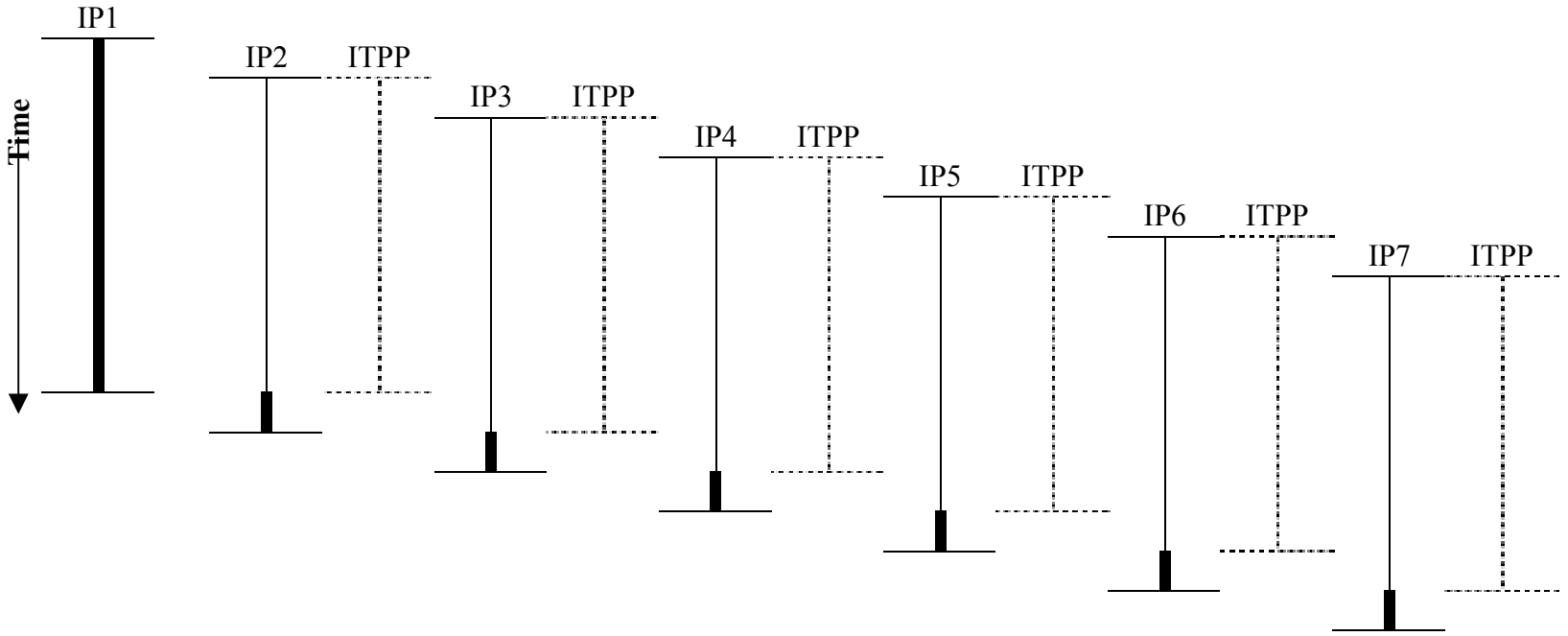
- Each segment in Pass 2 must be labeled as one of the following:

NM	Non Math	A non-mathematics or off-topic segment
MO	Mathematics Organization	A mathematics organization or management segment
AO	Answered Only Problem	Problem not worked on in the present lesson, but the answers are shared
IP	Independent Problem	Problem worked on by itself
CPSU	CP Set-Up	A segment in which concurrent problems are set-up
CPSW	CP Seatwork	A segment in which concurrent problems are worked on by students individually, in pairs, or small groups
CPCW	CP Classwork	A segment in which concurrent problems are worked on or shared publicly, as a class
CPM	CP Mixed Activity	A segment in which some students work on concurrent problems privately and some work publicly
ITIP	Interruption: Independent Problem	The segment when an IP overlaps with another IP or CP Phase.
ITPP	Interruption: Problem Piece	The segment when pieces of 2 IPs overlap.
NP	Non Problem	A segment containing mathematics information, but not a mathematics problem
BK	Break	An official lesson break
TP	Technical Problem	A technical problem in the videotape

Marking Interruptions of Type Problem Piece (ITPPs)

In-point: The point at which the interrupting problem piece starts
Out-point: The out-point of the problem that closed immediately prior.
# of ITPPs: One less than the number of problems (i.e., IPs – 1).

In the figure below, an IP opens and before it closes, 6 other IPs open. Once all 7 IPs have opened, each is discussed in turn and closed. The result is 7 IPs and 6 ITPPs – and a complicated situation to mark!



How do I mark situations like this?
The in- and out-points of each IP are marked. For the first IP, you need to do nothing more. For each of the interrupting IPs, you must also mark an ITPP. (Therefore, the total number of ITPPs is equal to the total number of problems minus 1.) For each interrupting IP, start the ITPP when the IP opens. End the ITPP when the immediately prior problem closed. For example, for IP**3**, open an ITPP when IP**3** opens and close the ITPP when IP**2** closes.

How does this solve our need to code TIME spent on problems?
Because we know exactly how much time is spent on each problem, we can't code these problems as CPs. It may seem counterintuitive then, that the way we've marked these problems doesn't reflect the actual time spent working on each problem. What this system will produce is not an accurate time per problem, but an accurate total time for all the problems (and an accurate average time for each).

Chapter 3. PASS 3: CONCURRENT PROBLEMS

In Pass 3 we will count and mark Concurrent Problems (CPs).
In addition, at the end of this Pass coders will enter the coded data into vPrism.

3.1 How to count and mark Concurrent Problems (CPs)

Concurrent Problems (CPs) are problems that share some private working on time. The exact time spent working on each CP is unknown**.**

Examples:
Z-FT-NL-0049 46:37-51:14
M-HK-024 10:39-21:47

Notes:
- The in and out points of CPs are usually marked the same as the in and out points for Independent Problems (IPs).
- Remember, whenever CPs are open there should also be a corresponding CP phase marked.

Rules for deciding how many CPs to open:
- Follow the decision tree presented in Chapter 2 (see Section 2.4.3).
  F. In general, all of the problems on a worksheet or textbook page will open UNLESS the teacher specifies **a particular subset** of these problems for students to work on.
- When just 1 student in the class is working on a different set of CPs than the rest of the class (e.g., taking a make-up test), do NOT open those CPs.
- When the teacher assigns different CPs to all students or groups of students (e.g. all the boys do problems 1-5 and girls do problems 6-10), open all of the CPs.

The following scenarios explain how to mark the in- and out-points of CPs.

Scenario 1

The teacher assigns at least two problems on which students are required to work privately, (e.g., problems from a worksheet, textbook, transparency). If the CPs share a common Set-Up, then the in-point of each CP within that group will be marked at the same time. **The out-point of each CP is marked when the Target Result (TR) is reached and public discussion of the particular CP ends (see CP1 – CP3 in the diagram below). If there is no public discussion of the CP, it closes when the CP Seatwork segment (CPSW) ends (see CP4 in the diagram below).**

Illustration of Scenario 1: Four problems are assigned at the same time and share a Seatwork phase. The results of 1, 2, and 3 are shared in Classwork.

CP Set-Up (CPSU)	CP Seatwork (CPSW)	CP Classwork (CPCW)
CP1		
CP2		
CP3		
CP4		

Scenario 2

The teacher assigns at least two problems on which students are required to work privately, (e.g., problems from a worksheet, textbook, transparency). If students have started working on the initial set of CPs and the teacher then assigns another set of problems also to be completed during that Seatwork time, then the two groups of problems have different in-points. **The in-point for each group of CPs is marked when that group is set up or assigned.** In Scenario 2, the only CP discussed publicly is CP4.

Illustration of Scenario 2:

CPSU	CPSW	CPSU	CPSW	CPCW
CP1				
CP2				
		CP3		
		CP4		

Example:
FT-AU 02 11:43 –24:41 CP1 and 13:25-31:41 CP2

Addition/Clarification to the coding manual: 3.1 How to Count and Mark Concurrent Problems (CPs)

3/9/00

If students are assigned additional problems privately and it appears that the assignment is intended for *most* students, open the additional problems when you see them being assigned to the first student. Because this happens privately, there will not be a CP Set-Up. (If the additional problems assigned do not appear to be intended for most students, disregard them.)

Example:
M-CZ-043 (29:06-46:00)

Scenario 3:
The teacher assigns a problem that is first worked-on by students privately (i.e., in seatwork). After the students begun working on the problem, but before they have finished with it, the teacher assigns one or more additional problems to be worked on privately. All of the problems share some Seatwork time.

In the scenario below, CP1 began as an IP, but was recoded as a CP when an additional problem was assigned (because it is now impossible to know how much time was devoted to CP1).

Illustration of Scenario 3:

CPSU	CPSW	CPSU	CPSW	CPCW
CP1				
		CP2	CP1-2	CP1-2

3.1.1 Examples of how to apply Pass 2 and 3 codes when there are Concurrent Problems (CPs)

EXAMPLE 1.

	LESSON ACTIVITY	**Pass 2 Codes**	**Pass 3 Codes**
1.	Teacher assigns textbook problems. S/He gives some hints, but doesn't do any of the problems to their TR.	CPSU	CPs open
2.	Class begins working on the problems at their seats (privately)	CPSW	
3.	Teacher assigns a few more problems.	CPSU	Additional CPs open
4.	Students work at their seats (privately)	CPSW	
5.	Teacher goes over one of the CPs with the entire class (publicly), to its TR	CPCW	One CP ends
6.	Teacher goes over another CP with the class (publicly), to its TR	CPCW	Another CP ends
7.	Students continue working at their seats (privately)	CPSW	Remaining CPs end
8.	Class starts a new activity.		

EXAMPLE 2.

	LESSON ACTIVITY	Pass 2 Codes	Pass 3 Codes
1.	Teacher passes out a worksheet.	CPSU	
2.	Class works on one of the worksheet problems together (publicly).	CPSU IP ITIP	
3.	Teacher tells the class to work on the rest of the worksheet problems at their seats (privately)	CPSU	CPs open
4.	Class begins working on the problems at their seats (privately)	CPSW	
5.	Teacher goes over one of the worksheet problems with the class (publicly), to its TR	CPCW	One CP ends
6.	Teacher goes over a new problem (not on the worksheet) publicly	CPCW IP ITIP	
7.	Students continue working on the worksheet at their seats (privately).	CPSW	

EXAMPLE 3.

	LESSON ACTIVITY	Pass 2 Codes	Pass 3 Codes
1.	Teacher passes out a handout.	MO (because a NP segment follows)	
2.	Class works on something else related to math, but not a mathematics problem.	NP	
3.	Teacher instructs the class to begin working on the handout.	CPSU	CPs open

CPn

Sometimes you might not know how many CPs were actually assigned by the teacher (to be worked on by the students). Other times you might know the number of a subset of all assigned CPs but not the entire set. This creates a difficulty in continuously numbering problems throughout the lesson.
We distinguish between two cases:

CASE 1:
If the number of assigned CPs is completely unknown, code the unknown number of CPs as CPn. The in-point of CPn is the same as the in-point of CPSU and the out-point of CPn usually is the same as the out-point of CPSW. Number the next problem(s) following the CPn segment as n+1, n+2 (on your transcript).

PASS 2 CC	IP 1	IP 2	CPSU	CPSW	IP n+1	IP n+2
PASS 3 CPs			CPn			

CASE 2:
If some of the assigned CPs are known mark for those CPs the in-and out-points and number them as usual. Code the CPs whose number is unknown as CPn. Number the next problem(s) following the CPn segment as n+1, n+2 (on your transcript).

PASS 2 CC	IP 1	IP 2	CPSU	CPSW	CPCW	IP n+1
PASS 3 CPs			CP3			
			CP4			
			CP5			
			CPn			

Note:
If there are several sets of CPs containing an unknown number in one lesson, code the first set as CPn, the second set as CPn+k, etc.

3.2 Pass 3 Coder Protocol

47. Mark the in-point and out-point of each Concurrent Problem (CP).
48. Fill in the "Content Activity" columns of the Lesson Table.
49. Enter all of the codes from Passes 1-3 into vPrism.
50. Fill in the "Time" column of the Lesson Table.

3.3 Pass 3 Transcript Marking

- Draw a line in the third column (left of transcript) to mark where CPs occur.
- Write in or circle the exact time of each shift in the text.
- Use the following symbols in pass 3.

PS1 / TR1	Underline the PS and TR of each CP in the text, and number them with the same number as their CP. If a PS is written on the board or overhead (and not included in the lesson transcript), write it in the transcript at the appropriate lesson time for easy future reference.
CP 1-7 |	Draw a vertical line in column three to mark the time where CPs occur. Number each CP consecutively (that is, including IPs). E.g. Number the CPs 1-7 if there are seven CPs; number them 1-n if the number of CPs is unknown.
| ● > CP	Draw a dot on the line to indicate where the CP ends in the segment. (i.e. when a CP ends, mark the text at the spot with > at where it exactly ends, and also put a dot on the line to indicate the change)

Chapter 4. PASS 4: CONTENT OCCURRENCE CODES

Most codes marked to this point have been coverage codes. In this pass, we will be marking occurrence codes. To refresh your memory of what occurrence codes are, please refer to the Introduction.

There are two types of occurrence codes in this Pass: General and Special Case. General occurrence codes can be applied anywhere in the lesson. Special case occurrence codes can only be applied during specific content activity segments.

All occurrence codes must be marked with in-points. Only one, Non-Mathematics Within Problems (NMWP), will be marked with out-points.

Notes:

- The in-point should be marked at the beginning of the discussion that contains the occurrence code. That is, once you find an occurrence code, mark the in-point to provide *just enough* context for that occurrence code to be easily understood.
- It sometimes happens that two occurrence codes of the same type occur close together in time. If the break between them is ***less than 2 minutes***, code them together as a single occurrence. (The break is defined as the time between the end of the first and the beginning of the second.) In this situation, the in-point of the code will be the in-point of the first occurrence.

Addition 4-26-2000

- For ALL occurrence codes: There may be multiple occurrences of the same occurrence in quick succession. To determine how many to mark, check the time of the break between *adjacent* occurrences. That is, determine whether the break between *occurrence 1* and *occurrence 2* is greater than 2 minutes, and whether the break between *occurrence 2* and *occurrence 3* is greater than 2 minutes. Do not measure the break between *occurrence 1* and *occurrence 3*.

- Occurrence codes can be applied anywhere that there is public interaction (including public talk in CI5 segments).

4.1 General Occurrence Codes

4.1.1 Assignment of Homework (AH)

Definition: The teacher assigns homework for the students to complete after the lesson ends. Mark the in-point when the teacher *announces* that a particular assignment is homework. This means that the task itself may not be stated by the teacher. For instance, if the teacher writes an assignment on the blackboard during CPSW, doesn't refer to it until CPCW, and then simply says, "Your homework for tonight is on the board," you'll mark the AH at the teacher's announcement.

Examples:
M-AU-004 29:33-30:01
M-HK-031 34:51-36:43

Addition/Clarification to the coding manual: 4.1.1 Assignment of homework (AH)

03/10/00

The teacher assigns homework for the students to complete after the lesson ends. Two different types of homework assignment may occur:

- The teacher assigns (a) specific problem(s) that have to be completed by all students, e.g. "For your homework please do problems 2 though 5 on page 124 in your textbook" and "Since we have no more time finish the problems at home."
- The teacher encourages students to study or review certain topics or concepts, e.g. "Please review for the test next week," "If you feel you need more practice there are more problems of this type on page 154 in your book" and "Go over the proof we did today one more time and be able to explain it." This type of assignment has an optional character. It is usually the students' responsibility to assess their understanding of the material in deciding whether to complete the assignment.

Note: The teacher's offer for private re-instruction at lunch time or after school is not coded as homework: "If you feel you still have questions on this see me during lunch time."

4.1.2 Goal Statement (GS)
Definition: Explicit verbal or written statements made by the teacher about the specific mathematics topic that will be covered in today's lesson. The topic must be the mathematics that students will learn in the entire lesson, or in a large part (that is, more than a third) of the lesson.

Examples:
FT-CZ-03 6:56-7:47
M-CZ-007 19:15-19:36
M-CZ-021 1:53-1:58

4.1.3 Historical Background (HB)

Definition: The teacher and/or the students connect mathematical content to its historical background (e.g., Pythagoras as the originator of a mathematical theorem).

Example:
FT-SW-063 11:05-12:35

4.1.4 Outside Interruptions (OI)

Definition: An outside interruption is any incident that disrupts classroom activities, such as announcements over the intercom, fire drills, a teacher remarking on a student(s) late arrival, or some individual from outside requiring the teacher's attention.

Notes:

- Even if an announcement over the intercom doesn't appear to disrupt the class, it should be marked as an OI.

Addition/Clarification to the coding manual: 4.1.4 Outside Interruptions (OI).

03/09/2000

- Any occurrence of an announcement over the intercom or **instance of the telephone ringing** should be marked, **even if it occurs during CI 5 (private work)** and/or it doesn't appear to disrupt the class.

- If a student enters the classroom late, only mark this as an OI if the teacher comments about it.

Examples:

FT-AU-04	1:19:51-1:21:06
Z-FT-NL-0049	24:01-24:17
M-US-013	18:24-18:26

4.1.5 Summary of Lesson (SL)

Definition: A summary of the mathematical content of the current lesson. These statements refer to work that has been completed during the lesson, or describe the main point of the lesson. The summary should occur near the end of (the public portion of) the lesson.

Examples:

M-HK-025	34:34-36:04
M-HK-047	32:57-34:00

4.2 Special Case Occurrence Codes

These Special Case Occurrence Codes can only be applied during specific Content Activity segments.

4.2.1 Non-Mathematics Within Problems (NMWP)[22]

Definition: A Non-Mathematics Within Problem segment is a period of time of AT LEAST 30 SECONDS that contains no mathematical content. That is, there is no opportunity for students to learn mathematics.

This code can occur only during IPs, CPSUs, CPCWs, CPM, or CPSWs (during a public announcement).

Mark both in-and out-points.

Note:
- Non-Mathematics Within Problems (NMWP) is conceptually the same as a Non-Mathematics (NM) segment.
- To qualify as an NMWP the Non-Mathematics must be the primary activity for the majority of students. The example M-AU-050 (14:56-15:52) would not be coded as an NMWP because working on problems is the primary activity and taking roll is a secondary activity.
- An Outside Interruption (OI) might also be coded as an NMWP, if it meets the definition.

Example:
M-NL-020 20:15-21:20 (ignore segment from 20:42-20:45)

4.2.2 Real Life Connection/Application - Non Problem (RLNP)
Definition: The teacher and/or the students explicitly connect or apply mathematical content to real life/the real world/experiences beyond the classroom. For example, connecting the content to books, games, science fiction, etc.

This code can occur only during Non-Problem (NP) segments.

Example:
M-HK-030 4:56-5:45

[22] Non-Mathematics Within Problems is not a separate code, but rather a means of identifying extended non-mathematical segments that occur during periods of time marked as problems. These segments are identical in nature to those marked as Non-Mathematics in Pass 2 (see section 2.1). The time spent on NMWP will be added to the time spent on NM (outside of problems) in order to obtain the correct total non-mathematics time.

4.3 Pass 4 Coder Protocol

- Mark all occurrence codes with in-points.
- Mark Non-Mathematics Within Problems (NMWP) with both in- and out-points.
- There is no minimum time requirement for occurrence codes, except for NMWP.
- If an occurrence code appears **within 2 minutes** of the same occurrence code, combine them as a single occurrence code and mark them as 1 occurrence.
- Occurrence codes can be applied anywhere that there is public interaction (including public talk in CI5 segments).

The codes to be applied in Pass 4 are:

General	
AH	Assignment of Homework
GS	Goal Statement
HB	Historical Background
OI	Outside Interruption
SL	Summary of Lesson
Special Case	
NMWP	Non-Mathematics Within Problems • Apply only to IP, CPSU, CPCW, & CPSW segments. • Must last 30 seconds or more. • Mark out-point.
RLNP	Real Life Connection /Application • Only apply to NP segments.

4.4 Pass 4 Transcript Marking

AH [*For the remaining questions, go home and finish them…..*	Use brackets to indicate the in-point of the occurrence code in the text; label the category beside the brackets
….so the next step in this problem is to subtract 5 from both sides. **NMWP [***Oh. Before I forget. Those of you who haven't yet bought tickets for Saturday's Homecoming dance, please do so by Thursday. I'm sure it'll be a lot of fun. It was fun last year, wasn't it? So don't miss out. Be sure to bring your money for the tickets by Thursday*.**]** **NMWP** *So we were subtracting 5 from both sides, right?*	For **NMWP**s, use brackets to indicate the in- and out-points; label the category beside the brackets

Chapter 5. PASS 5: PROBLEM-LEVEL CODES

The goal of Pass 5 is to more closely examine what happens during problems. The following 15 codes should be applied to all types of problems as coded in Pass 2 (IPs, CPs, AOs).

5.1 Homework (H)

Definition: Code whether each problem is designated as homework.

Mark one of the following choices:

0 = Not a homework problem.
1 = Previously assigned as homework to be completed for today's lesson.
2 = Assigned today as homework to be completed for a future lesson.

Examples:

- NL-057, 3:46 "Homework: forty-two through fifty. Get it out in front of you. We are not going to discuss everything, just a couple of problems…" (code as 1)
- US-056, CPs 11-25 (see 30:20; code as 2)

5.2 How Many Students (HS)

Definition: Code whether the problem is intended for all students to work on in this lesson, or just a specified group of students.

Mark one of the following choices:

1 = all students
2 = fewer than all students

Notes:

- "Fewer than all students" applies when the class is divided into groups, and each group does a different problem or set of problems. The groups might be pairs of students, all the boys in the class, etc.
- "All students" applies when the whole class is expected to work on the problem, or follow along as someone else works on the problem. For example, when the class watches or listens to the teacher or a student solve the problem.

Examples:

- The teacher assigns problems 1-10 to all students and assigns 11-15 to those who finish quickly. Problems 1-10 are for all students. Problems 11-15 are for fewer than all students.

5.3 Required or Optional (RO)

Definition: Code whether each problem presented to the students was required or optional.

Mark one of the following choices:
1 = required
2 = optional

Example:

- The teacher assigns problems 1-10 to all students and assigns 11-15 to those who finish quickly. Problems 1-10 are required. Problems 11-15 are optional.
- It may be helpful to describe possible scenarios with combinations of the HS and RO codes:

		RO:	
		Required = 1	Optional = 2
HS:	All students = 1	Everyone solves problems 1-10.	
	Fewer than all students = 2	Students are split into two groups. One group solves problems 1-5, another solves 6-10.	Students who are fast to complete problems 1-10 are given the choice to continue onto problems 11-15.

5.4 Problem Context (PC)

Definition: Code the context within which the problem set-up or statement is presented. When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.4 Problem Context (PC)

09/01/00

If additional materials are missing, you **MUST** code PC as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices[23]:

1 = The problem set-up or statement is presented using mathematical language or symbols only
2 = The problem set-up or statement is presented using a context that contains more than mathematical language or symbols but is not a story
3 = The problem set-up or statement is presented as a story
99 = *missing*

Notes:

- A story contains narrative that is critical for solving the problem. Often stories contain characters and events and there is often a present or upcoming action. Stories tend to be 2 or more sentences.
- If a problem is integrally related to a story from a prior problem, code it as a "3", even if the story is not repeated. This often occurs on worksheets, where a story is presented and then a series of related questions are asked. It may also occur when the teacher presents problems in a similar manner verbally.
- References to or drawings of standard mathematical 2-D and 3-D shapes are considered mathematics language and symbols. They should be coded as "1" unless they are accompanied by an illustrative example or story (e.g., "this shape is like a milk carton")

Addition/Clarification to the Coding Manual - 5.4 Problem Context (PC)

9/29/00

Problem statements containing only numbers/symbols and measurement units **of any kind** (e.g., km, m, kg, ounce, minutes, hours, **monetary units, degrees**) should be coded as "1".

Examples:

- HK-006, "Find an estimated value by rounding off the numbers correct to 1 significant figure: $51.6 \times 11.71 \div 5.09$ (code as 1)
  HK-006, "Estimate the area of the stamp drawn below" (code as 2)
  HK-006, "Estimate the volume of the refrigerator depicted below" (code as 2)

- CZ-050, IP4 (code as 1), IP5 (code as 2), IP6 (code as 3)

- Graph the following equation: y=2x+37 (code as 1)
  "Graph the result of our long jump trials" (code as 2)
  "Karen is collecting data on the amount of time she spend driving to and from work on a typical day. For one week she records her travel times. Draw a graph to illustrate how her travel time varies by day of the week." (code as 3)

- Find the volume of a given cube. (code as 1)

[23] Coding choices 2 & 3 will be combined when computing reliability and running analyses using this code.

- Water is poured to fill up 3/4 of a given cube. Find the volume of the water. (code as 2)

- Jen has a glass of soda, with a diameter of 9 cm. Before drinking however, she decides to remove the ice from the glass. Assume that there are two perfect cubes of ice, with sides measuring 2cm. If she removes them, what will be the reduction in the height of the soda in her bottle? (code as 3)

5.5 Real Life Connection (RLC)

Definition: Code whether the problem is connected to a situation in real life. Real life situations are those that students might encounter outside of the mathematics classroom. These might be actual situations that students could experience or imagine experiencing in their daily life, or game situations in which students might have participated.
Code all AOs as "98."
When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.5 Real Life Connection (RLC)

09/01/00

If additional materials are missing, you **MUST** code RLC as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices:

0 = no real life connection

1 = problem statement or set-up

The problem statement or set-up contains a real life connection.

2 = working on only

Neither the problem statement nor the set-up contains a real life connection, but a connection is brought into the discussion while the problem is worked on or discussed. In this case, noting the similarity between the problem and situations that are confronted outside of school often provides the relevant information.

Addition/Clarification to the Coding Manual - 5.5 Real Life Connection (RLC)

10/23/00

The following sentences apply just to coding option "2" (working on only):
The real life connection must occur during public interaction time. "Public" means all CI patterns except CI5 (unless a public announcement is made during CI5).

98 = *code doesn't apply because the problem is an AO*
99 = *missing*

Notes:
- References to or drawings of standard mathematical 2-D and 3-D shapes are not considered to be real life connections. They should be coded as "0" unless they are accompanied by an illustrative example or story (e.g., "this shape is like a cereal box").
- Problems containing only numbers/symbols and measurement units (e.g. km, m, kg, ounce, minutes, hours) should be coded as "0".
- If a problem is integrally related to a real life connection contained in a prior problem, code it as a "1", even if the real life connection is not repeated. This often occurs on worksheets, where a real life connection is presented and then a series of related questions are asked. It may also occur when the teacher presents problems in a similar manner verbally.

Examples:
- CZ-050, IP5 (code as 1), IP6 (code as 1), IP4 (code as 2)

5.6 Forms of Representation

For each problem code the forms of representation used **at any point in the problem**. Mark whether each of the following forms is evident.

5.6.1 Graphs (GR)

Definition: Code whether one or more graphs (bar graphs, line graphs and so on) are present in the problem. They can either be part of the problem statement, used in the solution process, or mentioned in some way during the problem.

Code all AOs as "98."
When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.6.1 Graphs (GR)

09/01/00

If additional materials are missing, you **MUST** code GR as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices:

0 = no graphs
1 = one or more graphs
98 = code doesn't apply because the problem is an AO
99 = *missing*

Note:

- If the teacher indicates that students should draw a graph, code this as a graph present in the problem.

Example:

- HK-033, IP7 (16:17-22:25) (code as 1)

5.6.2 Tables (TA)

Definition: Code whether one or more tables are present in the problem. They can either be part of the problem statement, used in the solution process, or mentioned in some way during the problem.

A table is an arrangement of numbers, signs, or words that exhibits a set of facts or relations in a definite, compact, and comprehensive form. Typically, the rows and/or columns of a table are labeled and have borders.

Code all AOs as "98."
When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.6.2 Tables (TA)

09/01/00

If additional materials are missing, you **MUST** code TA as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices:

0 = no tables
1 = one or more tables
98 = code doesn't apply because the problem is an AO
99 = *missing*

Note:
If the teacher indicates that students should draw a table, code this as a table present in the problem.

Example:
- HK-059, CPs 7-11 (see 17:29; code as 1)

5.6.3 Drawings or Diagrams (DD)

Definition: Code whether one or more drawings or diagrams are present in the problem. They can either be part of the problem statement, used in the solution process, or mentioned in some way during the problem.

To count as a drawing or diagram, the drawing must include information relevant for solving the problem. It does not count as a drawing if the symbols are spatially arranged to highlight certain features, if arrows are pointing to certain symbols to highlight them, or if arrows or other nonstandard marks are used in place of standard symbols (e.g., an arrow is used instead of an equal sign).

Code all AOs as "98."
When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.6.3 Drawings or Diagrams (DD)

09/01/00

If additional materials are missing, you **MUST** code DD as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices:

0 = no drawings or diagrams
1 = one or more drawings or diagrams
98 = code doesn't apply because the problem is an AO
99 = *missing*

Notes:

- If the teacher indicates that students should make a drawing or diagram, code this as a drawing or diagram present in the problem.
- Maps count as drawings/diagrams.
- A "motivational" drawing/diagram doesn't count. The drawing/diagram has to provide some information needed to work on the problem.
- Drawing a "tree," (such as a factor tree or a probability tree) does ***not*** count as a drawing or diagram.

Example:

- US-056, CPs 19-21 (see 36:53; code as 1)

5.7 Physical Materials (PM)

Definition: Code whether materials are used/manipulated when presenting or solving each problem. Materials can be use/manipulated by the teacher and/or students, during either public or private interaction.

These materials include:

- measuring instruments (e.g., ruler, protractor, compass)
- special mathematical materials (e.g., tiles, tangrams, base-ten blocks)
- geometric solids
- cut-out plane figures (e.g., triangles and trapezoids cut from paper).

Papers, pencils, calculators and *computers* are **not** included here.

Code all AOs as "98."
When there is not enough information to make a coding decision, e.g. materials are missing, code the problem as "99."

Mark one of the following choices:

0 = no materials manipulated
1 = teacher manipulates materials
2 = students manipulate or have the opportunity to manipulate materials
3 = both teacher and students manipulate materials
98 = *code doesn't apply because the problem is an AO*
99 = *missing*

Notes:

- The use of measuring instruments for non-measurement purposes, such as underlining or drawing straight lines with a ruler, or drawing a circle of unspecified measure with a compass, does **not** count. If it is unclear whether or not measuring instruments are being used to measure, assume they are **not**.
- Using graph paper to plot points on the coordinate plane does not count, but using graph paper to measure the surface area of a student's hand, or to find shapes with a

common area of 12 cm^2 does. That is, using graph paper as a measuring tool counts as a use of physical materials.

Examples:
- HK-027, IP1, 23:47 (code as 1)
- JP-003, IP1, 37:00 (code as 2)\

Addition/Clarification to the Coding Manual - 5.7 Physical Materials (PM)
08/29/00

To be coded as a 1, 2, or 3 materials must actually be used by the teacher or students to demonstrate, show, or do something mathematical. Do not code the problem as a 3 if the teacher only prepares or distributes materials, or assists students to obtain materials.

5.8 Degree of Student Choice in Selecting Solution Method (SC)

Definition: Students may be allowed and even encouraged to use a method of their choice, they may be provided with options from which to choose, or it may be impossible to determine from the video the degree of student choice in selecting solution procedures. A teacher's statement about student choice will usually occur during public interaction but may occur during private interaction.

When there is not enough information to make a coding decision, code the problem as "99."

Addition/Clarification to the Coding Manual - 5.8 Degree of Student Choice in Selecting Solution Method (SC)

09/01/00

If additional materials are missing, you **MUST** code SC as "99." Do not use information available from the video, or make assumptions about what might appear on the additional materials.

Mark one of the following choices:

1 = **open choice**

The teacher (or textbook) *explicitly states* that students are allowed, encouraged, or requested to use whatever method they wish to solve the

problem. No constraints are placed on the methods. Some possible methods may have been demonstrated or identified, but it is clear that students are free to use any method they wish.

If the teacher does not explicitly state that students can use any method they wish, but (a) students share answers (that are accepted by the teacher) that clearly come from different solution methods, or (b) the teacher invites students to share an additional method, but no student actually shares, code the problem as open choice.

If the problem was started in a previous lesson or as homework, and the teacher explicitly states that students had an "open choice" of solution methods, code it as open choice.

2 = **limited choice**

Two or more solution methods are presented or identified before the problem is solved and students are explicitly asked to use one of these methods.

If students are given what seems to be an open choice and later in the problem it becomes apparent that their choice was in fact restricted, code this as a limited choice.

If the problem was started in a previous lesson or as homework, and the teacher explicitly states that students had a "limited choice" of solution methods, code it as limited choice.

3 = **no choice or nothing made explicit about choice of solution method AND the problem is first assigned in this lesson**

Mark this category if:
1) there is insufficient information to code the problem as open choice or limited choice **OR** that it is clear that students are supposed to use a particular method, **AND**
2) the problem is first assigned in this lesson

Examples:
- The teacher demonstrates one method and asks students to solve a similar problem.
- The teacher assigns a problem without discussing appropriate methods and then only one method or just the target result is presented.
- The teacher presents several methods and tells students which one(s) they **must** use.

4 = **no choice or nothing made explicit about choice of solution method**

AND the problem was previously worked on as homework or in a prior lesson

Mark this category if:
1) it is unknown whether students were given an open or limited choice **OR** if it is clear that students were supposed to use a particular method, **AND**
2) the problem was previously worked on as homework or in a prior lesson

99 = **missing**

Examples:

- JP-007, IP2 (see 10:14; code as 1)
- CZ-037, IP4 (see 23:01, 23:07; code as 2)
- NL-057, IP1 (see 3:46; code as 4)

5.9 Proof/Verification/Derivation (PVD)

Definition: Code whether each problem is a proof, verification, or derivation.

Addition/Clarification to the Coding Manual - 5.9 Proof/Verification/Derivation (PVD)

10/23/00

Code whether each problem is **or contains** a proof, verification, or derivation.
E.g. JP 027, IP2

Proof is defined as the process of establishing the validity of a statement, especially by derivation from other statements in accordance with principles of reasoning.

Verification is defined as the act or process of ascertaining the truth or correctness of a rule, especially by examination or comparison.

Derivation is defined as a sequence of statements (as in logic or mathematics) showing that a result is the necessary consequence of previously accepted statements.

To qualify as a PVD:

- the TR must apply to a class of problems, not just a single problem, e.g. proof of the Pythagorean Theorem, or
- the TR is non-numeric and is arrived at through deductive reasoning (that is, moving from known properties or relationships to "new" ones by employing a careful sequence of general theorems or previously established 'truths".), e.g. prove that the sides of these two congruent triangles are equal.

When there is not enough information to make a coding decision, e.g. materials are missing, code the problem as "99."

Mark one of the following choices:

0 = not a PVD
1 = PVD
99 = *missing*

Notes:

- PVDs might be found more often in geometry lessons than in algebra or arithmetic lessons.
- If the TR contains variables, the problem is likely to be a PVD. That is, the TR is likely to be a statement about the properties of geometric figures, algebraic expressions or trigonometric expressions. If the TR contains a numeric value, the problem is unlikely to be a PVD.
- Checking would not count as a PVD as it would only apply to a particular case.
- Problem statements that contain the word "proof" (common in CZ and HK lessons) are not necessarily PVDs by our definition.

Examples:

- Showing that $-b \pm \sqrt{b^2} -4ac / 2a$ is an expression that generates the solutions to equations of the form $ax^2 + bx + c = 0$ *is a PVD*.
- Showing that -6 and 1/2 are the solutions to $2x^2 +11x - 6 = 0$ *is not a PVD*.
- Showing that **any point** on a semi-circle forms a right angle with the endpoints of the diameter *is a PVD*.
- Showing that a **particular point** on a semi-circle generates a right angle when it is connected to the endpoints of the diameter *is not a PVD*.

5.10 Number of Different Numerical or Geometric Target Results (NTR)

Definition: Code the number of different numerical or geometric answers that are **publicly** presented or discussed (either by the teacher or the students) and are accepted by the class as being correct. *Public* means all CI patterns except CI5 (unless the TR is announced publicly during CI5). Don't count answers that are different forms of the same number (e.g., 7/5 and 1 2/5).

Addition/Clarification to the coding manual: 5.10 Number of Different Numerical or Geometrical Target Results (NTR)
08/31/2000

Code TR as a "0" if the target result is written in the textbook, on the worksheet, or on an answer key, but **not** publicly presented or discussed.

Addition/Clarification to the coding manual: 5.10 Number of Different Numerical or Geometrical Target Results (NTR)
09/01/2000

Answers that are mathematically equivalent count as 1 TR. For example,
2x - 7 = 3 and
-7 + 2x = 3
are a single, target result.

Addition/Clarification to the coding manual: 5.10 Number of Different Numerical or Geometrical Target Results (NTR)
09/08/2000

If the problem statement is unknown, you **MUST** code NTR as "99."

Addition/Clarification to the coding manual: 5.10 Number of Different Numerical or Geometrical Target Results (NTR)
10/31/2000

If the target result is publicly presented but not clear/visible/identifiable, you **MUST** code NTR as "99."

Mark the number of target results presented. For example:
0 = no TR presented
1 = 1 TR presented
2 = 2 TRs presented
3 = 3 TRs presented
etc….
99 = PS is unknown

Notes:

- The TR is the answer to the problem statement. Sometimes, different solution methods are presented that lead to the same TR. Count this as 1 TR. (Solution methods are descriptions of the steps that will produce the solution or target result. To count as a method, enough of the steps need to be described so that an attentive student would be able to follow the description and use the steps to produce the solution.)
- Interdependent or partial TRs (as marked in Pass 2) count as 1 TR for this code. For example completing a value table counts as 1 TR.
- If data collection generates TRs that have the same numeric value, count these as separate TRs. For example, if students measure their hands and two students have the same measurement, count each of them as a TR.
- If the teacher accepts both "3.22" and "3" (as a rounded representation of 3.22), count this as 1 TR.

Example:

- US-056, IP7 (see 21:19-22:02; code as 7)

5.11 Number of Different Forms of the Target Results (DFTR)

Definition: Code whether more than one form of the TR is publicly presented and accepted by the class as being correct. If multiple TRs are publicly presented and accepted, code whether *any* of the single TRs is presented in more than one form. *Public* means all CI patterns except CI5 (unless the TR is announced publicly during CI5).

Addition/Clarification to the coding manual: 5.11 Number of Different Forms of the Target Results (DFTR)
09/08/2000

If the problem statement is unknown, you **MUST** code DFTR as "99."

Addition/Clarification to the coding manual: 5.11 Number of Different Forms of the Target Results (DFTR)
10/31/2000

If the target result is publicly presented but not clear/visible/identifiable, you **MUST** code DFTR as "99."

Mark the number of target results presented. For example:

0 = no TR presented
1 = 1 form of the TR
2 = > 1 form of the TR
99 = PS is unknown

Note:

- The TR is the answer to the problem statement. Sometimes, different solution methods are presented that lead to the same TR. Count this as 1 form of the TR. (Solution methods are descriptions of the steps that will produce the solution or target result. To count as a method, enough of the steps need to be described so that an attentive student would be able to follow the description and use the steps to produce the solution.)
- If the teacher accepts both "3.22" and "3" (as a rounded representation of 3.22), count this as more than one form of the TR.

Examples:

- US-056, IP10 (6/5 and 1 1/5)
- JP-003, IP2 ("opposite angles" and "facing angles")
- .25 & $\frac{1}{4}$

Addition/Clarification to the coding manual: 5.11 Number of Different Forms of the Target Results (DFTR)
09/01/2000

- 2x - 7 = 3 & -7 + 2x = 3 are 2 forms of a single, mathematically equivalent target result

5.12 Length of Working-On (LWO)

Definition: Code whether each problem is *publicly worked on* for at least 45 seconds. *Public* means all CI patterns except CI5. *Working on* the problem includes all public talk directly related to the problem, even if that time is also relevant to another problem.

Do not include:
- time spent assigning the CPs if that time includes no mathematical discussion.
- time spent in CI1 when the work is actually private. (This will be the case if the private work was less than 1 minute and therefore the segment was too short to shift to CI5.)

Mark one of the following choices:
0 = less than 45 seconds
1 = greater or equal to 45 seconds

Notes:
- To determine whether CPs are publicly worked on for at least 45 seconds, look over the public CP phases in the transcript and mark the times devoted to each CP.
- When totaling the time spent on a CP, include only discussions that occur between the in- and out-points of that CP.
- When totaling the time spent on an IP, include all public discussion between the in- and out-points of the problem.
- Sometimes problems share a common discussion time. In order for that time to count toward the 45 seconds of public working-on time for a given problem, the problem must be explicitly referenced by the teacher for at least 45 seconds.

Addition/Clarification to the coding manual:5.12Length of Working-On (LWO)
11/10/2000

- When determining the length of working-on time of a problem during CI3, include the time when the problem is first publicly worked on (verbally or in a written form) till the out-point of the problem. The public written presentation of the problem counts, regardless of whether or not there is any public discussion.
- If several CPs are worked on simultaneously during CI3, then count the shared working on time towards each CP.

Scenario:

CI3	
CP1 (20 sec)	
CP2 (20 + 15 sec)	
CP3 (20 + 15 + 33 sec)	

5.13 Facilitating Exploration (FE)

Code whether each problem meets the requirements for Facilitating Exploration. This code has 3 decision points. To qualify as Facilitating Exploration, there must be:

- An open choice (SC = 1) or limited choice (SC = 2)
- A public presentation of 2 or more solution methods◊ (at least one of which must be provided by a student)
- A discussion that includes at least one of the following
- a critique. This means discussing the strengths/weaknesses of a particular solution method/procedure.
- an extended examination. This means a lengthy discussion related to a particular solution method/procedure.
- a comparison of the solution method. This means, in discussing one method, a verbal reference is made to another method

When the problem is an AO **or** is less than 45 seconds (i.e., LWO = 0) **or** its target result is not presented/discussed publicly (i.e., NTR = 0), code the problem as "98."

Mark one of the following options:

0 = doesn't qualify as FE
1 = qualifies as FE, but there is **no** comparison made
2 = qualifies as FE, and there is a comparison made
98 = *not applicable*

- *the problem is an AO,* ***or***
- *the problem is less than 45 seconds (i.e., LWO = 0),* ***or***
- *the target result is not presented/discussed publicly (i.e., NTR = 0),* ***or***

Addition/Clarification to the coding manual 5.13 Facilitating Exploration (FE)

9/8/2000

G. the information necessary to code Student Choice is missing (i.e., SC = 99)

Note:

- ◊A solution method is a sequence of steps that is used to produce a target result. The sequence connects the problem statement and the target result. To count as a method, enough of the steps need to be described so that an attentive student would be able to follow the description and use the steps to produce the solution. Every problem that is solved (correctly or incorrectly) has a solution method, but some are more visible than others.

  Example:
  - JP007, IP1 (code as 2)

5.14 Coder Protocol

For each lesson you code, you will complete a Pass 5 codesheet. These will be provided for you, with problem information already exported into the table (see Angel).

Record all Pass 5 codes on the hardcopy of the codesheet. When complete, note your progress in your country's "Lesson Tracking" document, place the original in the designated folder to be used for data entry, and place a copy in the relevant lesson folder in the file cabinet.

5.15 Pass 5 Coding Cheat Sheet

Homework (H)
0 = not a homework problem
1 = previously assigned as homework to be completed for today's lesson
2 = assigned today as homework to be completed for a future lesson

How Many Students (HS)
1 = all students
2 = fewer than all students

Required or Optional (RO)
1 = required
2 = optional

Problem Context (PC)
1 = the problem set-up or statement is presented using mathematical language or symbols only
2 = the problem set-up or statement is presented using a context that contains more than mathematical language or symbols but is *not* a story
3 = the problem set-up or statement is presented as a story
99 = missing

Real Life Connection (RLC)
0 = no real life connection
1 = problem statement or set-up
2 = working on only
98 = code doesn't apply because the problem is an AO
99 = missing

Graphs (GR)
0 = no graphs
1 = one or more graphs
98 = code doesn't apply because the problem is an AO
99 = missing

Tables (TA)
0 = no tables
1 = one or more tables
98 = code doesn't apply because the problem is an AO
99 = missing

Drawings or Diagrams (DD)
0 = no drawings or diagrams
1 = one or more drawings or diagrams
98 = code doesn't apply because the problem is an AO
99 = missing

Physical Materials (PM)
0 = no materials manipulated
1 = teacher manipulates materials
2 = students manipulate or have the opportunity to manipulate materials
3 = both teacher and students manipulate materials
98 = code doesn't apply because the problem is an AO
99 = missing

Degree of Student Choice in Selecting Solution Method (SC)
1 = open choice
2 = limited choice
3 = no choice or nothing made explicit about choice of solution method AND the problem is first assigned in this lesson
4 = no choice or nothing made explicit about choice of solution method AND the problem was previously worked on as homework or in a prior lesson
99 = missing

Proof/Verification/Derivation (PVD)
0 = not a PVD
1 = PVD
99 = missing

Number of Different Numerical or Geometric Target Results (NTR)

0 = no TR presented
1 = 1 TR presented
2 = 2 TRs presented
3 = 3 TRs presented
etc.

Number of Different Forms of the Target Results (DFTR)

0 = no TR presented
1 = 1 form of the TR
2 = > 1 form of the TR

Length of Working-On (LWO)

0 = less than 45 seconds
1 = greater or equal to 45 seconds

Facilitating Exploration (FE)

0 = doesn't qualify as FE
1 = qualifies as FE, but there is **no** comparison made
2 = qualifies as FE, and there is a comparison made
98 = code doesn't apply because the problem is an AO, is less than 45 seconds, or its target result is not presented/discussed publicly

Unit ID	Event		IN			OUT			H	HS	RO	PC	RLC	GR	TA	DD	PM	SC	PVD	NTR	DFTR	LWO	FE
M-JP-007	**IP**	**3**	0	53	24	10	14	3															
M-JP-007	**IP**	**4**	10	14	3	31	48	23															
M-JP-007	**CP**	**5**	31	48	23	49	10	22															
M-JP-007	**CP**	**6**	31	48	23	49	10	22															
M-JP-007	**CP**	**7**	31	48	23	49	10	22															
M-JP-007	**CP**	**8**	31	48	23	49	10	22															
M-JP-007	**CP**	**9**	31	48	23	49	10	22															
M-JP-007	**CP**	**10**	31	48	23	49	10	22															

5.16 TIPS FOR CODERS: A Pass 5 Checklist

Please be sure that your Pass 5 coding has followed these rules.

If….	Then….
H=1	SC = 4 or 99
PC = 2 or 3	RLC ≠ 0
RLC = 1	PC ≠ 1
PC = 99	RLC, GR, TA, DD & SC = 99
SC = 99	FE = 98
SC = 3 or 4	FE ≠ 1 or 2
NTR = 0	FE = 98
DFTR = 0	FE = 98
NTR = 99	FE = 98
DFTR = 99	FE = 98
NTR = 99	DFTR = 99
LWO = 0	FE = 98
AO	RLC, GR, TA, DD, PM & FE = 98 (regardless of whether or not materials are missing)
CPN	PC, RLC, GR, TA, DD, PM, SC, PVD, NTR, DFTR, = 99 LWO = 0 FE = 98

Chapter 6. PASS 6: CODES ABOUT RESOURCES, PROBLEMS, NON PROBLEM SEGMENTS & PRIVATE WORK

In this Pass, we will look at the resources used in the lesson, further describe problems and non-problem segments, and closely examine what happens during private work.

6.1 Resources Used

Code whether the following resources are used in the lesson for mathematical purposes. The resources must be clearly identified by the teacher or visible on the videotape. The resources may be used by the whole class, a group, or an individual.

Note:
- If multiple resources are used simultaneously, code each resource as being used in the lesson.
- A single resource may be double-coded.

Examples:
- The teacher uses a ruler to draw a triangle on the chalkboard - code special mathematical material and chalkboard as "1".
- A special OHP calculator is used - code calculator and projector as "1".
- A teacher presents a computer simulation of the rotation of a 3-D model - code computer and special mathematical material as "1".
- Students use a calculator on the computer - code calculator and computer as "1".

6.1.1 Chalkboard (CH)

Definition: Code whether a chalkboard/whiteboard is used at any time in the lesson. If the teacher refers to something that has been written on the chalkboard (e.g., notes, definitions) code this a chalkboard use even if the information was not written during the videotaped lesson.

Mark one of the following options:

0 = Chalkboard not used
1 = Chalkboard used

Example:

- US-026, 05:57; HK-018, 05:33 (code as 1)

6.1.2 Projector (PRO)

Definition: Code whether an overhead projector, video projector, or computer projector is used at any time in the lesson.

Mark one of the following options:

0 = Projector not used
1 = Projector used

Example:

- US-026, 11:01; HK-018, 08:44 (code as 1)

6.1.3 Television or Video (TV)

Definition: Code whether a television or video is used at any time in the lesson. This includes prerecorded or live footage, film clips, etc. This does *not* include instances where a tv is used as a computer monitor or other projection device.

Mark one of the following options:

0 = Television or video not used
1 = Television or video used

- US-042, 07:56 (code as 1)

6.1.4 Textbook or Worksheet (TXW)

Definition: Code whether textbooks or worksheets (e.g., review sheets, study sheets, homework sheets) are used at any time in the lesson.

Mark one of the following options:

0 = Textbooks or worksheets not used
1 = Textbooks or worksheets used

Example:

- US-026, 05:03, HK-018, 06:19 (code as 1)

6.1.5 Special Mathematical Material (SMM)

Definition: Code whether there are any mathematical materials used for a mathematical purpose at any time in the lesson. These materials are usually commercially produced, however they can be pre-prepared by the teacher.

For example: special paper for graphing (i.e. paper with grids of common units used for drawing graphs), graph boards, Hundreds Tables, geometric solids, Base-ten blocks, rulers, measuring tape, compasses, protractors, and computer software that simulates constructions or models.

Write on the front page of the transcript each type of special mathematical material used in the lesson, and note the approximate in-point time(s). Also, list this information in the vPrism event note field for SMM.

Notes:

- Rulers used to draw mathematical figures count as SMM.
- Rulers used only to underline or highlight text do *not* count as SMM.
- Materials such as mathematics dictionaries, formula books, log books etc., count as SMM.
- Do not count models or materials made by the T or Ss in class. Do count models or materials made by the T prior to the lesson.
- Exclude calculators and computers. (Code them as CALC and COMP, respectively.)

Mark one of the following options:

0 = Special mathematical material not used
1 = Special mathematical material used

Example:

- US-026, 11:36; HK-018, 08:44 (code as 1)

6.1.6 Real-World Object (RWO)

Definition: Code whether real-world objects (e.g., cans, beans, toothpicks, maps, common geometric puzzles, dice, newspapers, magazines, springs) are used or shown at any time in the lesson for mathematical purposes. Real-world objects are those typically found outside the classroom.

Write on the front page of the transcript each type of real-world object used in the lesson, and note the approximate in-point time(s). Also, list this information in the vPrism event note field for RWO.

Notes:

- Include copies of actual newspaper or magazine articles, but exclude pictures of newspaper or magazine articles shown in textbooks, worksheets, OHPs, or elsewhere.

- Exclude pictures or drawings of real world objects shown in textbooks, worksheets, OHPs, or elsewhere.
- Exclude overhead projectors. (Code them as PRO.)
- Exclude rulers, compasses, protractors and measuring tapes. (Code them as SMM.)
- Exclude television and video. (Code them as TV.)
- Exclude calculators and computers. (Code them as CALC and COMP, respectively.)

Mark one of the following options:

0 = Real-world objects not used
1 = Real-world objects used

Example:
- US-026, 07:43 (code as 1)

6.1.7 Calculator (CALC)

Definition: Code whether calculators (i.e., regular calculators and graphing calculators) are used at any time in the lesson, and note whether or not they are used for graphing.

In order to code for calculator use you must either see calculators being used on the videotape, or hear a verbal reference related to the use of calculators in that lesson.

Mark one of the following options:

0 = Calculators not used
1 = Calculators used, not for graphing
2 = Calculators used, for graphing

Example:
- US-026, 14:17; HK-018, 38:22 (code as 1)

6.1.8 Computer (COMP)

Definition: Code whether computers are used at any time in the lesson.

Mark one of the following options:

0 = Computers not used
1 = Computers used

- HK-018, 08:44 (code as 1)

6.2 Multiple Solution Methods (MSM)

Definition: For each problem (IP, CP, AO), code whether more than one solution method is publicly presented (all CI patterns except CI5).

A solution method is a sequence of steps that is used to produce a target result. Every problem has a solution method but some are presented in more detail than others. The method might be presented in written or verbal form. A solution method can be presented solely by the teacher, worked out collaboratively with students, or presented solely by students.

Each solution method needs to use mathematically different steps. This means that the steps can not just be a sub-set of the steps from another method. The details of each step do not need to be made explicit and the target result does not even need to be re-calculated, but the key steps need to be described. Doing exactly the same steps in a different order does not count -- unless the teacher strongly emphasizes that they represent different solution methods.

Methods that are just referred to by names or labels do not count. Each solution method must be presented in enough detail so that an attentive student (who might have been absent recently) could follow the steps that are presented and use the method to produce the target result.

The teacher must accept each method as different and legitimate, rather than treating the one as a correction or elaboration of another.

Mark one of the following options:

0 = zero or one solution method publicly presented
1 = more than one solution method publicly presented, none was suggested by students
2 = more than one solution method publicly presented, at least one was suggested by students
98 = not applicable, because either:

- the problem is an AO
- CPN has been coded

Notes:

- "Suggesting a solution method" can range from naming the method (or providing a brief description of the first step) to actually presenting the method.
- If there are multiple TRs, and different solution methods are publicly presented for them, code this as MSM=1 or 2.
- If the teacher summarizes various solution methods generated by students during private work (and the teacher did not suggest the methods previously during the problem "set-up"), code this as MSM=2.
- Sometimes the teacher explicitly notes that the same problem will be solved using a different method, and this has been coded as a new problem. When this happens, the method for the second problem is not marked including multiple solutions because there is only one method presented for each problem. That's OK. This is captured in another analysis.

Examples:

- HK035, IP4 (code as 1)
- JP007, IP1 (code as 2)
- CZ020, IP23 (code as 2)

- Solve 6x + 4 –2x = x + 16
  Student 1: 4x + 4 = x + 16; 3x + 4 = 16; 3x = 12; x = 4
  Student 2: 6x + 4 = 3x + 16; -12 = -3x; -4 = -x; 4 = x or x = 4 (different steps)
  (code MSM=2)

- Solve 6x + 4 –2x = x + 16
  Student 1: 4x + 4 = x + 16; 3x + 4 = 16; 3x = 12; x = 4
  Student 2: 3x = 12; x = 4 (fewer steps)
  (code MSM=0)

- "We could solve this system of equations by 'substitution' or by 'addition,' does everyone remember how? Yes? OK, let's look at the next one."
  (code MSM=0)

- "This problem we could solve like the last one, by getting the x on the left side of the equation, so let's look at the next one."
  (code MSM=0)

6.3 Problem Summary (PSM)

Definition: Code whether there is a summary for each problem. The summary can occur at any point in the lesson – during the problem, during a Non Problem segment, etc.

The summary might take the form of:

- a restatement of the major steps involved
- stating or pointing out an important or critical mathematical rule, principle, or procedure in the problem

Summary statements are typically made by teachers. They always occur **after the target result** is reached publicly.

When the problem is an AO or is less than 45 seconds (i.e., LWO = 0) or its target result is not presented/discussed publicly (i.e., NTR = 0), code PSM as "98".

Mark one of the following options:

0 = no summary
1 = summary
98 = not applicable, because either:

- the problem is an AO
- CPN has been coded

- the problem is less than 45 seconds (i.e., LWO = 0)
- the target result is not presented/discussed publicly (i.e., NTR = 0)

Notes:
- Statements that only repeat a Target Result or a simple step **immediately following the Target Result** marked in Pass 2 do not count as problem summaries (e.g. M-NL-027, IP5).
- Sometimes students publicly solve a problem (in written form or orally), and then the teacher goes over the problem again to confirm or correct what the student did. This should be coded as PSM=0.
- Students might ask the teacher to repeat a step in the problem. Code this as PSM=0 unless the teacher emphasizes that the step is a critical one.
- Sometimes an incorrect TR is presented publicly, and later corrected. Only code PSM=1 if the summary occurs after the corrected TR.
- Summaries that occur outside of a problem (e.g. in an NP segment or within another problem) must clearly relate back to the problem -- specifically, the problem statement or the target result. For example, when a general rule is given following a sequence of problems, there must be a clear reference back to a specific problem in order for that problem to be coded as PSM=1.
- For problems that have multiple TRs, only one target result needs to be summarized in order to code the problem as PSM=1.

Examples:
- M-HK-112; IP 4, code as "1",
- M-CZ-059, IP 4 , code as "1" . (Note: The summary occurs in the NP segment immediately following IP 4.)
- M-AU-006, IPs 5-8, code as "1".

6.4 Types of Information or Activity in Non-Problem (NP) Segments

For every Non-Problem (NP) Segment code whether any of the following types of information or activity are present. Every NP Segment should include *at least one* of these 4 codes.

6.4.1 Contextual Information (CON)

Definition: Information presented during the NP segment provides some context for the mathematics work that takes place in the lesson. The contextual information must take one of the following forms:
- a goal statement (see definition for GS in Pass 4)
- a discussion of some historical background (see definition for HB in Pass 4)
- a real life example (see definition for RLNP in Pass 4, RLC in Pass 5, & RWO in Pass 6)
- connecting particular mathematical ideas discussed or worked on in the current lesson, to a past or future lesson. Connections to the past always count as long as a particular

mathematical idea is referenced. Connections to the future include agenda setting, but do *not* include assigning homework or tests.

Mark one of the following options:

0 = No contextual information presented
1 = Contextual information presented

Note:
- If GS, HB or RLNP has been coded in the NP segment, code the segment as CON=1.

Examples:
- M-US-068, 10:11 and 32:20, code as "1".
-

6.4.2 Mathematical Concept/Theory/Idea (CTI)

Definition: There is information presented during the NP segment regarding a particular mathematical concept, theory or idea. The information about the concept, theory or idea might be presented in varying degrees of detail. However to qualify, it must involve more than simply naming the concept, theory or idea.

The information might take the form of:
- an introduction of a new concept/theory/idea,
- a review of a mathematical concept/theory/idea previously learned,
- a summary of concepts/theories/ideas worked on in the current lesson, or
- an illustrative example that highlights a mathematical concept/theory/idea.

Mark one of the following options:

0 = No information related to a mathematical concept/theory/idea presented
1 = Information related to a mathematical concept/theory/idea presented

Notes:
- The discussion of a particular mathematical formula or theorem in an NP segment (which is necessarily outside of the context of a problem) would be marked as 1.
- If students are asked to read information about a mathematical concept, theory or idea, during the NP segment, code this as "1" (e.g., M-NL-073, 23:43).

Examples:
- M-CZ-013, 02:01, code as “0.”
- M-CZ-013, 11:32 and 16:24, code as “1.”
- M-US-068, 10:11 and 32:20, code as ".1"

6.4.3 Activity (AC)

Definition: The NP segment contains an activity. Discussion of an activity counts, as long as the activity takes place in the current lesson. Activities will be specifically related to mathematics in some way but not to any particular mathematical problem (i.e. IP or CP).

The activity might take the form of:
- A game (e.g. Bingo, Hangman, trivia game, flashcard drill, word search)
- Any task that does not involve problems (e.g. worksheet page not coded as containing problems).

✎ Mark one of the following options:

0 = No activity presented
1 = Activity presented

Notes:
- If students write down a homework assignment in their journal or write down notes, do not count this as an "activity" - code this as "0".
- Showing students how to use a calculator or computer during a NP segment does not count as AC - code this as "0" (e.g., M-SW-283, 17:14).

Examples:
- M-AU-013, 2:49 & 48:24, code as "1".

6.4.4 Announcing or Clarifying Homework or Test (HT)

Definition: The teacher announces or clarifies a future homework assignment or a test.

Mark one of the following options:

0 = No announcing/clarifying homework or test
1 = Announcing/clarifying homework or test

Note:
- If AH (see Pass 4) has been coded in the NP segment, code the segment as HT=1.

Examples:
- M-US-068, 02:21, code as "1".

6.5 Private Work Assignment (PWA)

Definition: For each CI4 & CI5 segment (see sections 1.2.2.3 & 1.2.3.1), code whether students work on an assignment that requires them to repeat steps, do more than repeat steps, or is a mix. For CI4 segments, code the assignment that students work on privately.

The assignment can include many problems, one problem, or just part of a problem. (If the assignment doesn't include any problems, code as "98".)

Use questions 5 & 6 from the Teacher Questionnaire regarding what is "mainly new" and "mainly review" to help make coding decisions. Refer also to the additional materials and

lessons tables to help determine what the assignment is. (Most teacher questionnaires and additional materials are located on Video 5 → Scanned Materials.)

For each CI4 & CI5 segment mark the in-point and one of the following choices:

1 = not able to make judgement
Use this coding option when it is not clear whether the assignment is "repeating steps" or "more than repeating steps".

For example, you might not be able to make a coding decision when:

a) Students commence work on a set of problems without any introduction by the teacher, and there is no other indication about whether the problems are new or review. For example, a lesson that follows a weekly work plan (e.g., M-NL-054). OR,

b) CPN has been coded within the segment (e.g., M-NL-014). (Assignments containing CPN could be coded as "mix" if at least one problem is "repeating steps" and one problem is "more than repeating steps".)

2 = repeating steps

The students work on an assignment that requires them to repeat steps, or sequences of steps, that they have already done/seen in a previous lesson, or in the current lesson. The mathematical concept(s) and solution method(s) are known to the students.

If the teacher states that the assignment is "practice/review", either during the lesson or on the Teacher Questionnaire, this is a strong indication that the assignment is "repeating steps".

Sometimes the exact steps for how to do an assignment are shown in the textbook/worksheet (e.g. M-AU-001, 27:58). In these cases, code the assignment as "2".

Sometimes a "worked example" is shown in the textbook/worksheet, and the assignment is to do problems with the same steps as the example. Look to see if the teacher points out the "worked example" or if the class works through similar problems publicly. If so, code it as "2". If there is no reference to the worked example, and the assignment would otherwise be coded as "more than repeating steps", code it as "3".

3 = more than repeating steps

The students work on an assignment that requires them to do *more than* simply repeat steps or sequences of steps that they have already done/seen. The mathematical concept(s) may or may not be known to the students.

The assignment might require students to adjust a known solution method, create a new solution method, or put known steps together in a novel way. The assignment might require students to do some sort of discovery or exploration of a concept (e.g. finding a new mathematical rule or pattern).

Problems that are "open choice" (as coded in Pass 5) and involve sharing different solution methods, often indicate that students had to do "more than repeat steps" (e.g., M-SW-233, 5:57 & 16:24, code as "3").

Do not rely solely on the information provided by the teacher to code the assignment as "3", because his/her notion of "new" may not match ours.

4 = mix

The assignment contains several problems. At least one of the problems can be classified as "repeating steps", and at least one of the problems can be classified as "more than repeating steps".

Note: You don't have to make a decision about *every* problem in the assignment. As long as one problem is "repeating steps" and at least one is "more than repeating steps", you can code the assignment as a "mix" (e.g., M-US-005).

98 = not applicable
The CI4 or CI5 segment does not contain problems (e.g., NP, MO, or NM from Pass 2 was coded).

Notes:

- It is important to note that the PWA code is applied to the **assignment** given during a CI4 or CI5 segment. For instance, if the class works together on a new problem, but then the students do some of the *known* steps in that problem privately, the assignment should be coded as "2" (e.g. , M-CZ-028, 14:24)
- For assignments that contain CPs, think about what the required steps are for each problem in comparison to the steps that students already know. Watch how the problems are solved publicly (e.g. CPCW), or if they are not solved publicly, try to solve them yourself.
- If there are two CI4 or CI5 segments in a lesson where the assignment students work on stays **exactly the same**, both segments should have the same code. However, if the nature of the **assignment changes** (e.g. the teacher shows students how to do the assignment or some of the critical steps), then the segments may have different codes.
- **Word or story problems** need to be looked at carefully:
  In many cases, students can solve these problems by first transforming the words into equations, and then applying known steps in a familiar way (code as "2").

  But, if the word problem requires students to adjust a known solution method, create a new solution method, or put steps together in a novel way, then it meets the definition of "more than repeating steps" (e.g., M-SW-233, 5:57 & 16:24, code as "3").

Examples:

- M-CZ-064, 04:05, code as "2"
- M-CZ-028, 44:08, code as "2"
- M-HK-038, 27:42, code as “2”
- M-JP-010, 10:21, code as “3”
- M-AU-001, 4:32, code as “3”
- M-SW-106, 11:46, code as “4”

6.6 Private Work Segments

Codes in this section are to be applied only to segments previously marked as CI5 (Private Work, see 1.2.3.1).

6.6.1 Organization of Students (OS)

Definition: For each private work segment, note how the *majority* of students appear to be working -- individually, in pairs, or in groups.

Organization of Students (OS) is marked as a coverage code for each CI5 segment. Within a single CI5 segment there may be shifts in OS.

Notes:

- Note that the students seating arrangement does not necessarily tell you how students are working. For example, if students are seated in a group arrangement but the majority work independently on an assignment, code this as "1".
- Sometimes students work on an assignment individually, but are allowed to talk to their neighbors. In these cases, code how the *majority* of students appear to be working.
- Sometimes there are CI5 segments during which students do not work on an assignment. Code these segments as "1".
- In order to code for OS, you may need to watch the end of the previous public segment, listening for teacher instructions.

Code one of the following coverage codes:

0 = unknown organization

1 = the majority of students appear to work individually

2 = the majority of students appear to work in pairs

3 = the majority of students appear to work in groups

Examples:

- JP-044 (CI5: 28:18- 43:29). Shift from OS = 1 (28:18-38:24) to OS = 2 (38:24 – 43:29).

- CZ-002 (CI5: 10:18-17:31). At 10:04 teacher says, “work in groups". Code as OS = 3.

6.6.2 Display Information (DI)

Definition: Code whether the teacher displays mathematical information on the board or overhead projector for each CI5 segment.

Displaying Information should take one of the following forms:
- Displaying mathematical information for all students to see
- Organizing the blackboard or overhead in preparation for classwork
- Positioning props used for teaching (e.g. posters, cut-outs)

Code one of the following options:

0 = no display of information

1 = display of information

Displaying Information	NOT Displaying Information
• Writing problem statements or target results on the board or overhead • Writing mathematics information on the board or overhead transparency (even if it's not discussed publicly) • Putting a prepared poster on the board	• Writing the page or problem numbers of the current assignment or homework • Putting a prepared transparency on the overhead projector • Erasing the board • Writing information on the board as part of a Public Announcement (PA) or while assisting a student

Examples:

- JP044 (CI5: 3:26-9:26) , teacher writes on board @4:31, code as 1.
- JP044 (CI5: 28:18-43:29) , teacher writes on board @ 39:20, code as 1.
- CZ002 (CI5: 27:55-28:55), teacher writes on board @28:09, code as 1.

6.6.3 Administrative Activity (AA)

Definition: Code whether the teacher engages in administrative activity that is *unrelated to the students' current assignment* at any point during each Private Work (CI5) segment.

The AA may take the form of private, verbal exchanges between the teacher and student(s) (e.g., the teacher checking with students to see if their homework is complete), or it may not involve students at all.

Examples of AA include:
- distributing papers that are not the current assignment
- grading papers
- taking roll

Code one of the following options:

0 = no administrative activity

1 = administrative activity

Administrative Activity	NOT Administrative Activity
• Teacher writes notes at his/her desk, and the content of the notes is unclear	• Teacher walks around the classroom and makes observational notes regarding students' progress on the current assignment (e.g., JP-044)
• Teacher has an extended conversation, or several brief conversations with different students, of an administrative or organizational nature	• Teacher has a brief conversation (i.e., 1-2 sentences) with an individual student of an administrative or organizational nature • Public Announcements (PA) of an administrative or organizational nature • Erasing the board

Examples:

- CZ002 (CI5: 10:18-17:31) Teacher takes roll and writes on her booklet @11:15 – 12:04, code as 1.
- NL036 (CI5: 4:41-5:53) Teacher checks with students to see if their homework is completed @ 4:50- 5:50, code as 1.

6.6.4 Public Announcements (PA)

Definition: Public announcements are those remarks made by the teacher during private work that are intended for or addressed to all students.

Mark each Public Announcement with an in-point only.

Code a new PA each time there has been a pause of **at least 10 seconds** in the teacher's public talk.

6.6.4.1 Type of Public Announcement

Code one of the following choices for each Public Announcement:

1 = Mathematical Information Related to the Current Assignment

> The Public Announcement contains mathematical information that is intended for students to use in completing the mathematics of the current assignment. For example, the teacher clarifies or explains a problem or its solution, affirms an answer, step, or procedure, or clarifies the use of tools needed for the current assignment.

Examples:

- "I see a lot of you forgetting to add the base of the pyramid when finding it's total surface area. Remember to do that."
- "When you're drawing the line to represent the linear question, be sure that all of your points fall on that line. If they don't, you've done something wrong."
- "With this equation, you're working with fractions. So what's representation of pi will you want to use? Right. Twenty-two over seven."

2 = Organizational Information Related to the Current Assignment

> The Public Announcement contains an organizational reference to mathematics work, but it is not necessary for students to complete the mathematics of the current assignment. For example, the teacher provides general, administrative information about an assignment or assesses students' progress on an assignment.

Examples:

- "Check your answer with the answer written on the board."
- "Don't forget to put your name on your paper."
- "If you finish quickly, continue with problems 5-10."
- "If you're finished, let me check your answer."
- "You have five more minutes to work on this assignment."
- "Who's done with number 2?"
- S: "Are we supposed to do problems 1 and 2?" T: "Yes, 1 and 2."

3 = Information Unrelated to the Current Assignment

The Public Announcement contains either no mathematical information (e.g., the teacher responds to disciplinary problems or makes off-topic announcements) or mathematical information that is completely unrelated to the current assignment.

Examples:

- "Remember to bring back your permission slips for the museum visit tomorrow."
- "HEY! It's way too noisy in here. Tone it down!"

4 = Unknown

Use this coding option only when there is not enough audio available to determine what type of public announcement is taking place, or when the meaning of the teacher announcement is unclear.

Consider these options hierarchically. For example, if an announcement contains information related to the current assignment, only some of which is mathematical in nature, code the PA as 1.

Addition/ Clarification to the coding manual 6.6.4 Public Announcements (PA) 2/7/01

The "Current Assignment" refers to the activity that the majority of students are asked to do in that particular CI5 segment. This can be mathematics problems, non-problem mathematics work, or even non-mathematics or mathematics organization.

For example, if students are asked to copy notes from the blackboard, the current assignment is the note-taking activity. Any Public Announcement made during this time that is unrelated to the note-taking should be coded as PA3.

Notes:

- Public announcements where the teacher gives homework may be coded in different ways, depending on whether or not the homework is to finish the private work assignment.
- If the homework is to finish the seatwork assignment, code PA as "2".
- If the homework is something other than finishing the seatwork assignment, code PA as "3".
- If the homework is to finish the seatwork assignment *and* do something else, code PA as "2".
- If you are not sure what the homework is, code PA as "4".
- The volume level of the teacher's voice does not by itself indicate a Public Announcement. For example, if the teacher uses a loud voice to talk to a single student, this does not count as a PA.

Examples:

- NL 036 (CI5: 27:48-43:04) PA at 28:33 , code as 3.

- JP 044 (CI5: 3:26-9:26) PA at 3:36, code as 2; PA at 6:49, code as 1; and PA at 8:11, code as 2.
- JP 044 (CI 5: 28:18 – 43:29) PA at 35:29, code as 3; and PA at 37:57, code as 1.

6.7 Pass 6 Coder Protocol

First, write in the codes by hand, onto the codesheet. Then, enter them into vPrism and Excel (see Table below)

Pass 6 Codes	Apply To	vPrism or excel
Resources (8 codes)	Lessons	vPrism (in-points at start of lesson)
Multiple Solution Methods	Problems	Pass 5 Excel codesheet
Problem Summary	Problems	Pass 5 Excel codesheet
Non-Problem Types (4 codes)	NP segments	vPrism (same as NP segments)
Private Work Assignment	CI4 & CI5 segments	vPrism (in-points at start of CI4 or CI5)
Organization of Students	CI5 segments	vPrism (in & out points)
Board Preparation	CI5 segments	vPrism (in-points at start of CI5)
Administrative Activity	CI5 segments	vPrism (in-points at start of CI5)
Public Announcement	Occurrences throughout CI5 segments	vPrism (in-points)
Type of Public Announcement	Public announcements	See Public Announcement

Chapter 7. PASS 7: PURPOSE CODE

7.1 Purpose (P)

The Purpose (P) code is a coverage code. That is, all points in the lesson must be coded as one of the following 3 mutually exclusive categories: Addressing Content Introduced in Previous Lessons (P1), Introducing New Content (P2), or Practicing/Applying Content Introduced in the Current Lesson (P3).

Incorporate Non Math, Mathematics Organization, Technical Problem and Break segments into the immediately following Purpose segment. If there is a NM or MO segment at the very end of the lesson, include it into the immediately preceding Purpose segment.

Code one of the following options:

1 = Addressing Content Introduced in a Previous Lesson(s) (P1)
The class goes over content that has been previously introduced. The purpose of this segment may be to review, reinforce, secure knowledge, re-teach, re-instruct, lead into new content, check homework, or evaluate students.

Activities during this segment may take the form of:
- Warm-up problems/ games/ mental math
- Review problems
- Teacher lecture/ class discussion
- Checking previously completed work/ homework
- Quiz/ grading

P1 segments are typically of the following nature:
- Practice or application of a topic learned in a prior lesson, or
- Review of an idea, concept, theory, or formula learned previously.

P1 Notes:
- During a P1 segment the teacher expects students to know the content being reviewed. If the students do not appear to know this content, the teacher may briefly provide re-instruction.
- A segment coded as P1 addresses only content that has been introduced previously. As soon as a teacher introduces any new content, shift to P2. It does not matter how smoothly the transition to new content occurs, or even if it appears that the teacher intends for the previously learned content to lead into the new content.
- If students are working on CPs that meet the definitions of both P1 and P3 (i.e. a mix of review and practice of new), code the segment as P3.

2 = Introducing New Content (P2)
The class is introduced to content that has not been worked on in a previous lesson. The purpose of this segment may be to acquire knowledge, concepts, procedures, or skills.

Activities during this segment may take the form of:
- Exposition/ demonstration/ illustration
- Teacher led exploration/ student exploration
- Class discussion
- Reading from the text/ taking notes
- Assigning a task involving new content, which is intended to be worked on in the current lesson
- Working on a problem in order to introduce an idea, content, theory, or formula for the first time

P2 segments are typically of the following nature:
- A new idea, concept, theory, or formula is presented. Immediately after it is presented, it may be reviewed or summarized (see related Note below).

P2 Notes:
- During a P2 segment, the teacher does not expect students to know all the content being presented, or to be able to answer his/her questions regarding that content.
- A Goal Statement (GS), or some other form of "foreshadowing" new content, does not by itself indicate a shift to P2. Rather, the teacher must actually introduce content that is new.
- If a Goal Statement (GS) immediately precedes the introduction of new content, include the GS as part of the P2 segment.
- If in Pass 6, a PWA was coded as "more than repeating steps" or "mix," (i.e., PWA = 3 or 4, respectively), Purpose should be coded as P2.
- Summaries of ideas, concepts, theories or formulas learned today should be coded as part of the purpose segment that *precedes* it. For example, if the summary comes immediately after students work on practice/application problems on a topic learned in this lesson (P3), it should be coded as P3. If the summary comes immediately after the presentation of a new idea, concept, theory or formula (P2), it should be coded as P2.
- Sometimes following the introduction of new material and prior to the practice/ application/consolidation of that material, there is mathematical content that does not precisely fit either P2 or P3 – include this as part of the P2 segment.

3 = Practicing/Applying/Consolidating Content Introduced in the Current Lesson (P3)
The class is involved in practicing or applying some of the content that has been introduced in the current lesson. The purpose of this segment may be to practice, consolidate knowledge, or apply knowledge, concepts, procedures, or skills.

Activities during this segment may take the form of:
- Assigning a practice/application task

- Working on a problem(s) to practice or apply an idea, concept, theory, or formula that was introduced in this lesson.
- Sharing/ class discussion of problems
- Re-instruction
- Concluding

P3 segments are typically of the following nature:
- Practice or application of a topic already learned in this lesson.
- An idea, concept, theory, or formula already presented in this lesson is discussed, reviewed, or summarized AFTER the class has engaged in some practice/application problems on a topic learned in this lesson (see related Note below).

P3 Notes:
- During P3 segments, the teacher expects students to be able to work on problems using their knowledge of the new content introduced.
- PWA (from Pass 6) should be coded as either "not able to make judgment," "repeating steps," or "not applicable," (i.e., PWA = 1, 2, or 98, respectively).
- Summaries of ideas, concepts, theories or formulas learned today should be coded as part of the purpose segment that *precedes* it. For example, if the summary comes immediately after students work on practice/application problems on a topic learned in this lesson (P3), it should be coded as P3. If the summary comes immediately after the presentation of a new idea, concept, theory or formula (P2), it should be coded as P2.
- If students are working on CPs that meet the definitions of both P1 and P3 (i.e. a mix of review and practice of new), code the segment as P3.

98 = Not Able To Make Judgement (P98)
Use this coding option in those rare instances where you are not able to make a judgement regarding purpose. For example, the entire lesson is coded as CPN and there is no other information provided by the teacher in the questionnaire to inform you of the purpose.

General Notes:
- You may use ideas created with your National Research Coordinator during the International Meeting to assist in making coding decisions, as long as these ideas don't violate the definitions listed above.

Examples:
- M-AU-041
  00:42-10:00 = P1
  10:00-16:29 = P2
  16:29-end = P3
- M-CZ-081
  Entire lesson = P1
- M-SW-101
  1:20-5:25 = P1
  5:25-23:54 = P2
  23:54-end = P3

7.2 Pass 7 Tips for Coders

Before coding for Purpose, collect information regarding what is new and review in the lesson from the following sources:

Teacher Questionnaire (original questionnaires are located on Video 5 -> Scanned Materials -> TQ; translated questionnaire files are located on LessonLab Drive -> Public Documents -> Deliverable Backups -> TQ translation)

PWA coding from Pass 6 (refer to vPrism data entry or lesson folder)

Usually shifts in Purpose correspond to shifts in Pass 2 coding.

7.3 Pass 7 Coder Protocol

Note purpose shifts on the printed transcript
Enter times into vPrism
Export from vPrism to check data entry

Chapter 8: CREATING EXTENDED LESSON TABLES

PART A: ADDITIONAL INFORMATION TO INCLUDE[24]
MATHEMATICAL GENERALIZATIONS
LABELS & SYMBOLS
LINKS

PART B: CONSTRUCTING ELTs

Extended Lesson Tables will be created for a subset of the lessons, by specially trained coders. In Part A, we will mark additional items interest for the extended lesson tables: Mathematical Generalizations, Labels & Symbols, Link to the Current Lesson, and Link to a Different Lesson. In Part B, we will create the extended lesson tables.

8.1 Mathematical Generalizations (MGs)

Definition: There are two conditions that must be evident for a period of time in the lesson to be marked as containing an MG:

There must be generalized mathematical information (i.e., MGs must apply to a class of problems, beyond any particular set of problems worked on in the current lesson).

There must be an explicit attempt to point out the generality (i.e. there should be a clear verbal or written marker indicating the teacher's or student's intent to generalize).

Statements about generalized mathematical information do not by themselves count as an MG. To count as MGs, such statements must simultaneously synthesize the mathematics and highlight the generality.

MGs can be presented orally or in written form, using words or symbols. However, if they are presented in written form they must be referred to publicly. MGs might contain specific numbers if they are presented in a generalized way. For example, "the angles of a square always add up to 360 degrees".

MGs can only be marked in public interaction (i.e. in CI 1 to CI 4 or in public announcements during CI 5). MGs will be marked as Occurrences with in-points only.

[24] These additional items included in the Extended Lesson Tables are not codes. That is, reliability will not be computed and analyses will not be run on them.

MGs are likely to be found when:

- An explicit request is made for generalized information. This information may be "review" or "new" for the class. If there is a request for an MG and an attempt to answer it that is accepted, then we must code it as an MG. A request is not marked as an MG unless there is an attempt to provide an answer.
- Premises, definitions or summary statements related to the solving of problems are presented.

Occasionally Problem Statements and Target Results will include generalizations. These should be counted as MGs. Also, a single step in a problem might qualify as an MG if it meets the definition.

MGs must contain enough mathematical information so that an average student can recall and apply the information.

Counter-examples:

- *"Distance OA, how do I calculate it? Let's ask Erine. Well it's Pythagoras." (M-SW-242, 8:18)*
- *"Always take the following figure if you want to round. Not the one that's indicated, but you have to keep in mind the following figure." (M-SW-242, 11:07)*

8.1.1 Types of Mathematical Generalizations (MGs)

There are three different kinds of MGs: **procedural, definitional** and **conceptual**. All MGs should clearly fall into one of these categories, although we will not mark them as such.

Procedural MGs describe general solution procedures used for a class of problems.

Examples:

- *"To solve equations first calculate like terms, secondly simplify, thirdly isolate x."*
- *"We calculate the surface area of any geometrical solid by first calculating the single surface areas and then adding them up."*
- *"One of the rules for statistical analysis that we looked at last week was that when you're analyzing numbers in statistics it's often a good idea to write them in order, smallest to largest." (M-AU-006, 15:21)*

Definitional MGs resemble "traditional" or "accepted" mathematical definitions and conventions. Definitions and conventions are culturally agreed upon statements or procedures that are not subject to proof. To count as an MG, there must be more than simply labeling or naming a mathematical term. That is, there must be some discussion of the distinguishing or specific properties of the mathematical term.

Examples:

- *"A cube (mathematical term) is a prism (larger group) that has equal sides and right angles (properties)"*

- *"Linear functions (mathematical term) are functions (larger group) that result in a straight line (properties)"*
- *"Prisms have a parallel base and top area."*
- *"We always write percent with the symbol %, and x% means x/100".*

Notes:
- If labeling is accompanied by a definition of the mathematical term, mark this as an MG.
- Conversions between standard units of measurements **do not** count as MGs (e.g., 1 cm = 10 mm, $1.00 = 100 cents, 1 week = 7 days)
- Discussions about the linguistic roots of words (e.g., "iso" is from the Greek, meaning "the same") do not, by themselves, count as MGs.

Conceptual MGs describe the conceptual or structural nature of mathematics.

Conceptual MGs may be theorems , properties or formulas.

Theorems state or summarize mathematical claims that can be proven. The mathematical claim should be either verbally (sentence statement) or symbolically expressed.

Properties describe special characteristic features of mathematical objects or operations. They often take the form of axioms or beginning assumptions (premises). They apply to large numbers of cases.

Formulas are symbolic expressions with variables that describe a mathematical operation or procedure for the general case. Formulas often capture mathematical properties with special clarity and precision.

Examples:
- *"Every angle with the vertex on a circle that intercepts a diameter AB is a right angle" or "$a^2+b^2=c^2$".*
- *"The commutative property for multiplication states that factors can be multiplied in any order without altering the result."*
- *"... the commutative property can be expressed as $a \cdot b=b \cdot a$."*
- $a^m \cdot a^n=a^{n+m}$

Notes:
- If a number of properties are discussed or described, count each individual property as a separate MG. (e.g.-"*Uh do you remember the triangles' conditions of congruence that [you] all studied before…What was the first one? The three pairs of sides are each equal* [MG1]. *The two sides and the angle they contain are equal* [MG2]. *One pair of sides and the angles at either end of them are each equal* [MG3] *(M-JP-026, 40:16-40:57*)).
- If several forms of the same formula are discussed or described, count each form as a separate MG. (e.g., "So who will tell me how to calculate the area of a triangle? *A times VA over two* [MG1]. *B times VB over two* [MG2]. *C times VC over two* [MG3]. *(M-CZ-096, 07:00-07:45)).*

- If a formula is written or discussed in the context of solving a problem publicly, count it as an MG (e.g., "*Dylan will come to the blackboard now. And he will try to calculate the perimeter of the triangle. O equals A plus B plus C* [MG4R]. (*M-CZ-096, 10:32*)).
- If a formula is both written on the board and stated verbally, count this as one MG.
- If a generalization is rephrased to highlight a different concept or idea, mark these as separate MGs. (e.g. ("*A number is divisible by two if the digit in the ones place is divisible by two* [MG1]. 21:00-*How do you know a number is divisible by two? If it's an even number* [MG2]. *M-US-57, 20:46*).
- Geometric figures that are drawn without specific measurements are usually intended to represent general cases.

8.1.2 Marking the In-point of an MG

The **in-point** of the MG is marked the first time that the mathematical generalization is clearly stated. If the request for the MG is necessary to understand the generalization, the in-point should be at the request.

MGs should be numbered consecutively as they appear in the lesson. For example: MG1, MG2, MG3, etc.

8.1.3 Repeated MGs (MGR)

Repeated MGs should also be marked with an in-point and an "R". For example: MG1, MG2, MG3, MG2R, MG4. To be marked as a repeated MG, the MG must be repeated in a new context *(i.e. a shift in a Pass 2 content activity segment)* or a new problem. If an MG is repeated several times within the same context or problem, mark only the first clear statement as an MGR.

Example of Repeated MG:

- M-HK-029 9:22-10:01

8.2 Labels & Symbols (LAS)

Definition: LAS is marked when an explicit attempt is made to use precise mathematical language to point out the "name" given to the particular mathematical idea/concept or its symbolic representation.

The purpose of marking Labels & Symbols is to capture times when the teacher emphasizes precise mathematical terms, and makes a special effort to call attention to those terms. Just using the terms or symbols is not enough to mark LAS.

Details of the idea/concept itself may or may not also be provided. If labeling, as defined above, is accompanied by a definition of the mathematical term, mark this as both LAS and MG.

LAS can only be marked in public interaction (i.e. in CI 1 to CI 4 or in public announcements during CI 5). LASs will be marked as Occurrences with in-points only.

A) Labels

LAS is marked when an explicit attempt is made to point out the "name" of a mathematical idea/concept.

Examples:

- *"Remember, these are called isosceles triangles"*
- *"What's this called? Yes, a linear equation."*
- *"So how about this number 11? It is uneven, an odd number and it is not divisible. That's exactly what we're talking about today, divisibility." (M-US-57; 18:56)*

LAS is <u>not</u> marked when the "name" is simply used in a sentence:

Counter-Examples:

- *"What are the lengths of the sides in this isosceles triangle?"*
- *"When we solve this linear equation we have to divide both sides by 2."*
- *"Remember to combine the exponents first and then simplify the rest."*
- *"T: How do I calculate this problem?*
  S: Using the Pythagorean formula." (M-SW-242, 8:09)

Classification tasks, by themselves, do <u>not</u> count as LAS:

Counter-Examples:

- *"First of all, what operations do you know? Yes? There's multiplication…division…the additions and the subtractions." (M-SW-266, 19:43-20:05)*
- *"Of these 4 expressions, which ones are equations and which ones are not equations." (M-AU-056, 1:19)*

Measurement terms do <u>not</u> count as LAS:

Counter-Examples:

- *Leap year, liter, acre*

B) Symbols

LAS is marked when symbols are (1) defined or (2) pointed out explicitly.

Examples:
a) "We always write percent with the symbol %, and x% means x/100."
b) "When we label the angles in a triangle, let's use capital letters and write A, B, and C."
c) "The way to write 'equivalence' is with three horizontal bars."

LAS is not marked when the symbol just is used in a sentence or written without drawing special attention to it.

Counter-Examples:
a) "So this should be 78 percent" (or written 78% on chalkboard).
b) "What's the size of angle A in the triangle?"
c) "We can prove that $a^2 - b^2 = (a + b)(a - b)$*."*

8.2.2 Marking the In-point of LAS

The **in-point** of LAS is marked in the same way as MGs. That is, the first time that the label or symbol is clearly stated. If the request for the LAS is necessary to understand the generalization, the in-point should be at the request.

LASs should be numbered consecutively s as they appear in the lesson. For example: LAS1, LAS2, LAS3…

8.2.3 Repeated LAS (LASR)

Repeated LASs should also be marked the same way as MGs. That is, with an in-point and an "R". For example: LAS1, LAS2, LAS3, LAS2R, LAS4. To be marked as a repeated LAS, the LAS must be repeated in a new context or a new problem. If a LAS is repeated several times within the same context or problem, mark only the first clear statement as an LASR.

8.3 Links

8.3.1 Link to the Current Lesson (LC)

Definition: An explicit verbal reference by the teacher that **connects particular mathematical ideas** discussed or worked on within the current lesson. Simply repeating a mathematical idea does not count as a link. It must be *connected* with another idea. The link should help students organize related information.

Links can only be marked in public interaction (i.e. in CI 1 to CI 4 or in public announcements during CI 5). Links will be marked as Occurrences with in-points only.

Examples:
- Comparing two solution methods presented by different students during the lesson.
- Contrasting two problems done during the lesson.
- Taken from transcript (M-CZ-021, 10:39): So, we have said that if we multiply fractional expression by whole expression we take similar steps as if we multiply a fraction by integer. So, how do we multiply a fractional expression by the whole expression? HENRY, tell us the rule. We multiply the numerator by the whole expression and the denominator doesn't change. Yes, and why doesn't the denominator

change? We are able to justify it. We can write the whole expression as fraction? Yes, then I can use the rule for multiplication of fractions thus, even with fractional expressions as we will see today. Numerator times numerator, denominator times… Denominator.

Note:

- Lesson summaries and goal statements do not count as LC unless an explicit connection between mathematical ideas is made.

8.3.2 Link to a Different Lesson (LD)

Definition: A verbal reference by the teacher to **particular mathematical ideas** discussed or worked on in the current lesson to another lesson (either past or future).

Links to the past always count as long as a particular mathematical topic or idea is referenced. Links to the future only count if the connection between particular mathematical ideas is made explicit. For example, activities such as setting a test, assigning homework, or stating the agenda for a future class, do not count unless an explicit connection is made.

Links can only be marked in public interaction (i.e. in CI 1 to CI 4 or in public announcements during CI 5). Links will be marked as Occurrences with in-points only.

Examples:

- Taken from transcript (M-CZ-021, 01:36) *So, last week we have learned to multiply fractional expressions by whole expressions. We have said that, in fact, the steps are the same as if we multiply fractions by integers. We have found out that if we multiply or extend or simplify fractional expressions, the procedure is the same as with the fractions. Today we will add the multiplication of fractional expressions by fractional expressions.*
- Taken from transcript (M-CZ-021, 04:08) *Last time, in our ten minute test, I forgave you if you had forgotten or had wrong conditions. Today the conditions will be a part of the grade, so, watch out for it.*
- Taken from transcript (M-HK-047, 23:45) *Do you still remember what descending powers means? We previously had a chapter in the book that specifically talked about powers, right? Arrange it according to the powers of the variable, arranging them from high to low.*
- Taken from transcript (M-NL-022, 10:00 not LD)-"*Right, the total...looks a little bit like question fourteen, doesn't it?"* (17:06 LD)-"*Looks a little bit like question fourteen. There it said, at fourteen, what percent. And at number fifteen, what percentage is fourteen of two hundred and twenty?"*

Counter Example:

- Taken from transcript (M-SW-266, 2:06-2:57) If a teacher appears to be making a reference to the past in order to establish an agenda, then do not mark as a link. (e.g., *"Before we get into the corrections directly, what do you need to work out the*

solutions to these problems?…The papers with the formulas. Yes…Anything else? The formulas that we've learned. And then Steve, he tells us 'The formulas that we've learned.' Good! So then we need to agree on this point. These formulas, we …have them on a piece of paper or in our heads.").

8.4 Constructing Extended Lesson Tables

An Extended Lesson Table is constructed to provide a country-blind or anonymous summary of the content flow of the lesson. All references that might identify the country in which the lesson was conducted (e.g., names of teacher or students, names of money units, written words on the chalkboard) are removed or replaced with country-neutral references.

Extended Lesson Tables are used to (1) provide a quick and easily accessible overview of the lesson for later reference, (2) to provide a clear record from which problems can be linked with entries in the topic list, and (3) to afford the possibility for others to code further the nature and quality of content using country-blind data. In this section, we describe how to construct an Extended Lesson Table.

We will create 2 files for each Extended Lesson Table: a text file and a graphics file. The text file will be created in Microsoft Word, and will not contain any pictures or graphics. The graphics file will be created in HomePage, and will contain all accompanying pictures & graphics.

8.4.1 Text File

8.4.1.1 Heading

The top of each table includes the following headings:

TIMSS 1999 Video ID:
ELT ID:
Materials:

8.4.1.1.1 TIMSS 1999 Video ID

Write the original TIMSS 1999 Video ID# of the lesson here. This will include the name of the country in which the lesson was videotaped. This number will be masked when the table is given to other coders.

8.4.1.1.2 Extended Lesson Table ID

A new number will be assigned to the Extended Lesson Table using an index of TIMSS 1999 Video ID#s and Extended Lesson Table ID#s. This number always will remain on the

table and will be used to connect the Extended Lesson Table with the videotape via the index.

8.4.1.1.3 Materials

List all materials (instructional aids) introduced or used during the lesson. The material must be clearly identified by the teacher or visible on the videotape, as coded in Pass 6.

- Chalkboard
- Overhead projector
- Television or videotapes
- Textbook or worksheets (including review sheets, study sheets, homework sheets)
- Student workbook (including notebooks, formula books, journals, diaries)
- Mathematical models and construction aids (for example, graph paper, Hundreds tables, geometric solids, maps, Base-Ten Blocks, rulers, compasses, protractors)
- Real-world objects (for example, cans, beans, toothpicks [i.e. objects from outside the classroom])
- Calculators (including regular calculators and graphing calculators)
- Computers

8.4.1.2 Table Columns

Each table will include the following 4 columns:

Time Code	Classroom Interaction	Content Activity & Occurrence Codes	Description

8.4.1.2.1 Time

Mark the In-Point of all lesson segments identified in columns 2-5. Each in-point will begin a new row in the Extended Lesson Table. The first In-Point is the beginning of the lesson. The last In-Point is the time the lesson ends.

8.4.1.2.2 Classroom Interaction

Enter the appropriate Classroom Interaction code (CI 1 - CI 5), from Pass 1, for each segment. As a reminder, the possible codes are the following:
CI 1: Public Interaction

CI 2: Public Information Provided by Teacher, Optional for Student Use
CI 3: Public Information Provided by Student, Optional for Student Use
CI 4: Mixed Private and Public, Not Optional
CI 5: Private Work

Private Work (CI5) segments are further coded in Pass 6, according to the organization of students. List this information in brackets. The possible codes are:
Unknown Organization
Individual
Pairs
Groups

8.4.1.2.3 Content Activity & Occurrence Codes

Enter the appropriate Content Activity Segment from Passes 2 & 3. The possible segments are:
AO: Answered Only Problem
CP: Concurrent Problem
IP: Independent Problem
CPSU: Concurrent Problem Set-Up
CPSW: Concurrent Problem Seatwork
CPCW: Concurrent Problem Classwork
NP: Non-Problem
MO: Mathematics Organization
NM: Non Math
TP: Technical Problem
BK: Break

Non-Problem segments are further coded in Pass 6. List these codes in brackets. The possible codes are:
CON: Contextual Information
CTI: Mathematical Concept/Theory/Idea
AC: Activity
HT: Setting/Clarifying Homework or Test

Enter all Occurrence codes from Pass 4. The possible codes are:
AH: Assignment of Homework
GS: Goal Statement
HB: Historical Background
OI: Outside Interruption
RLNP: Real Life Within Non-Problem Segments
SL: Summary of Lesson

Enter the following Occurrence codes from Pass 6:
PA1: Mathematical Content Public Announcement

(Mathematical Content Announcement made during private work)
The NP categories: CON: Contextual Information
CTI: Mathematical Concept/Theory/ Idea
AC: Activity
HT: Setting/ Clarifying Homework or Test

Mark the In time of the following Pass 6 codes in your exported table:
PSM: Problem Summary
MSM: Multiple Solution Methods

Enter all Mathematical Generalizations, Links, and Labels & Symbols:
MG: Mathematical Generalization
LC: Link to Current Lesson
LD: Link to Different Lesson
LAS: Labels & Symbols
For easy reference to MGs and LASs in the exported table, before you type in the description for these in the V-prism note fields, enter their corresponding number first by using a 2 letters 3 digits format, e.g. MG001:, LA002: ….

8.4.1.2.4 Description

a. General information

- The description column should contain sufficient contextual information to enable someone who does not have access to the video to get a sense of the mathematical content and the key pedagogical decisions.
- If you can convey information clearly and succinctly directly from text, do so and use quotes. Otherwise, summarize.
- Indicate who is speaking using T, S, SN (new student) or Ss (multiple students)
- When possible, use mathematical symbols for ease of reading
- All measurement units should be metric. All monetary units should be dollars.
- Organize the rows according to shifts in the Pass 2 and 3 coding. Arrange everything inside the rows by chronological order (as they occurred in the lesson)
- Left justify all text
- If something is not mathematically accurate, but clearly accepted by the class, write [sic]

b. Information regarding problems

- Include the following information for all AO, IP and CPs:
- Problem Statement - write PS001 in bold
- Solution Method(s) - include all steps that are publicly presented
- Target Result(s) - write TR001 in bold

- If the problem is solved publicly in written form, include all written steps
- If the problem is solved publicly through discourse, include enough talk to show what steps were taken
- Include all answers (correct and incorrect) that are dealt with publicly. Note if an answer is regarded as incorrect and how it is corrected.
- If there are multiple solution methods publicly presented, include all of them.
- If students are given an open or limited choice, note this.
- If problems are assigned to less than all students as coded in Pass 5, note and explain.
- Include the following information for CP segments:
    - CPSU-indicate which CPs are assigned
    - CPSW
    - CPCW
    - CPs -- include only those worked on publicly (move the other CPs, including their problem statements and target results to the graphics document)

c. Information regarding other segments

- Provide a 1-line description for all Mathematics Organization and Non-Mathematics segments.
- For Pass 4 Occurrence Codes, provide a 1-2 line description.
- For Outside Interruptions (OI) indicate the duration.
- Briefly describe each Public Announcement listed in Column 3.
- For MGs provide all needed context. This should include the most complete statement of the MG. When the MG is short, write it verbatim.
- Provide a brief description of each Link.

d. Description of Other Important Mathematical Information

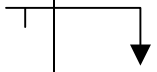
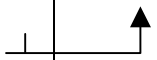
- Include any extended discussions about mathematical labels.
- Include instances when students publicly identify errors.
- Include instances which indicate good mathematical thinking on the part of students such as student initiated questions.
- All important mathematical information should be captured. For example, statements that contain "Because" or elaborations of a conceptual nature, etc.
- Include statements indicating whether the content is new or review.
- Indicate in the last row the time of the end-point of the lesson.
- For currency, use pesos (=dollars) and centavos (=cents)

8.4.2 Graphics File

- Include graphics when they carry mathematical information that can't be easily expressed in words
- Include graphics when they help to clarify the solution method or TR
- Include graphics when unique SMMs or RWOs are used.

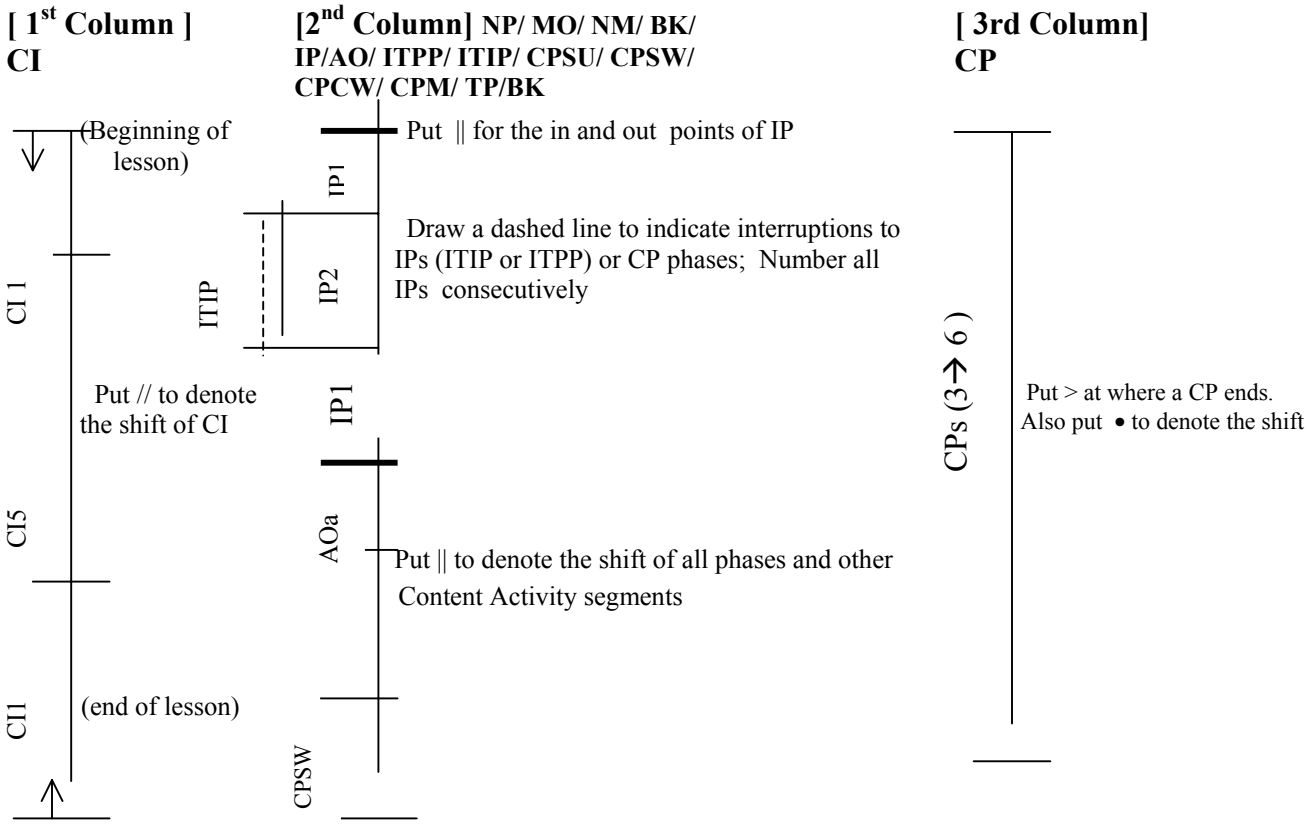
- All graphics should be referenced in the Description column of the text file.
- Graphics should *not* contain any extensive written information, as this may indicate the country. If the written information is important to include, type it in yourself.
- Ensure that all inserted graphics are clearly legible. If not, add typed comments to clarify.
- It is not necessary to repeat the same (or very similar) graphics.
- Lengthy text (e.g. from a textbook, on the board) should be typed and included as part of the text file, not the graphics file. Otherwise, this will be an indication that the lesson was from an English-speaking country.
- Include all CPs that are assigned, but not gone over publicly, as part of the graphics file. List each CP as a separate row, and note its problem statement and target result (i.e, not given

Appendix A. Transcript Marking

CODE	NAME	PASS	COLUMN POSITION	COLUMN SYMBOL	TEXT SYMBOL	MINIMUM TIME REQUIRED	TIME REQUIRED: EXCEPTIONS	NOTE TIME	COUNTING & LABELLING
-	Beginning of Lesson	1	-	-		-	-	Yes	-
-	End of Lesson	1	-	-		-	-	Yes	-
CI 1 to 5	Classroom Interaction 1 to 5	1	Left		//	1 minute	Beginning or End of Lesson: no Minimum	Yes	-
PS	Problem Statement	2	-	-	Underline	-	-	No	PS**1**, PS**2**… or PS(PRT**1a**, **1b**, **2a**, **2b**…)
TR	Target Result	2	-	-	Underline	-	-	No	TR**1**, TR**2**… or TR(PRT**1a**, **1b**, **2a**, **2b**…)
AO	Answered Only Problem	2	Right		-	-	-	Yes	AO**a**, AO**b**…
IP	Independent Problem	2	Right		{ … }	-	-	Yes	IP**1**, CP(**2-5**), IP**6**, ITIP**7**…
CP	Concurrent Problem	2	Right		<<..<.>.>>	-	-	Yes	CP(**1-4**), IP**5**, CP(**6-n**)…

CODE	NAME	PASS	COLUMN POSITION	COLUMN SYMBOL	TEXT SYMBOL	MINIMUM TIME REQUIRED	TIME REQUIRED: EXCEPTIONS	NOTE TIME	COUNTING & LABELLING
PRT	Partial Result Task	2	Right	(from **[** …) (…to **]**) 	**[…]**	-	-	Yes	PS(PRT**1a**, **1b**, **2a**, **2b**…) TR(PRT**1a**, **1b**, **2a**, **2b**…)
ITIP	Interruption of Type: Independent Problem	2	Right		**{ … }**	-	-	Yes	IP**1**, ITIP**2,** IP**3**, ITIP**4**…
ITPP	Interruption of Type: Problem Piece	2	Right		**(…)**	-	-	Yes	-
NM	Non-Mathematics Segment	3	Center		-	30 seconds	Beginning or End of Lesson: no Minimum	Yes	-
MO	Mathematics Org/ Mgmt Segment	3	Center		-	30 seconds	Beginning or End of Lesson: no Minimum	Yes	-
CPSU	Concurrent Problem Set-Up	3	Center		||	-	-	Yes	-

CPSW	Concurrent Problem Seat Work	3	Center		||	-	Announcement must be **longer than 1 minute** to shift out of CPSW to CPCW or CPM	Yes	-
CPCW	Concurrent Problem Class Work	3	Center		||	-		Yes	-
CPM	Concurrent Problem Mixed	3	Center		||	-		Yes	-
NP	Non-Problem Segment	2	Center		-	20 seconds or 3 utterances	-	Yes	-
BK	Official Break	2	Center		-	-	-	Yes	-



CI	Classroom Interaction 1=public; 2=public by teacher optional; 3=public by student optional; 4=mix, not optional; 5=private	Code a shift only if another pattern lasts for ***more than one min*** No minimum time at the opening and closing of lesson
AO	Answered only problem; letter AO a	
IP	Independent problem; number	If the TR is a formula, rule, definition etc., it will only be coded as a Prob if it is worked for ***at least 2 mins*** and at least 2 operations are applied
CP	Concurrent problem; number	
ITIP	Interruption: Independent problem; number	
ITPP	Interruption: Problem Piece	
NM	Non Math	MO & NM must last ***at least 30 secs*** For MO and NP (Not NM) no minimun time requirements at the beginning and end of the lesson.
MO	Mathematics Organization	
NP	Non Problem	NP must last ***at least 20 secs***
TP	Technical problem	
BK	Break	
CPSU	CP Set-Up	No time requirement for CP phases. Exception: ***more than a min*** Public announcement during CPSW is coded as CPCW. However going over a prob publicly to its TR should shift to CPCW (even if this lasts less than a min).
CPSW	CP Seatwork	
CPCW	CP Classwork	
CPM	CP Mixed	

A transition statement is a statement of ***less than 20 sec***, between two segments. We will put the transition statement into the succeeding segment (the second of the two segments).

Appendix B. Decisions regarding Difficult Coding Segments

LESSON	TOPIC	TIME CODE	QUESTION(S)	RESOLUTION	RATIONALE	CONSEQUENCES FOR FUTURE CODING
M-AU-002	area of a circle	4:21 - 31:25	Is CP5 a PVD?	Yes	CP5 is the culmination of deductive reasoning, seen from CP2-CP5.	-
M-AU-003	peer assessment of games project	00:00:39-00:37:27	Concurrent Problems or Non Problem?	Concurrent Problems	evidence of students working on specific problems while testing games (eg 00:11:29)	-
M-AU-007	algebraic fractions	00:02:03-00:08:23	Concurrent Problems or Independent Problems with Interruptions of Type Problem Piece (ITPP)?	Independent Problems with ITPPs	actual time worked on each problem is known	decision to mark these problems on additional pages due to complexity of marking needed
M-AU-008	Pythagoras theorem and procedural text type	00:09:08-00:30:32	Procedural text writing activity/task - problem or Non Problem?	Non Problem	task does not fit definition of Problem; important aspects of task should be captured in analyses of NPs	-
M-AU-017	Multiple topics	Whole lesson	Self paced/ individualized instruction using multiple booklets from a single publisher.	CPN	Different students work on different unidentified problems.	Not applicable for lesson tables analysis.
M-AU-020	Statistics-graphing on computer	Whole lesson	Students have to graph their own data with Excel, is it one IP ? or CPN ?	I IP	It is like one problem statement with multiple target results.	

M-AU-031	Measurement and Ratio	15:45 – 42:58	How many questions are there? Where do they open and end?	There are altogether 7 CPs. The first 4 CPs open at 15:35 and end at 28:27. The fifth to seventh CPs open at 25:42; 5th ends at 38:55; 6th ends at 41:41; and the 7th ends at 42:58. There are two CPSU within this segment.	Making a table is counted as one problem only if the entries for the table are directly correlated; and they follow a certain format given. (e.g. a table for a linear function with x valued corrected with the y value) However in this lesson, the table is used to present the 4 different measurements and they are basically independent. They are counted as 4 problems. With the 3 problems in part (2), there are altogether 7 CPs.	Look at the structure of the table to identify the number of problem. It is not necessary that a table is a problem, sometimes a table may be a representation of several questions.
M-AU-034	Trigono-metric Ratio (tangent)	6:01-11:35 23:38-26:25	How many CP's are there?	15 CPs	Because each group does 3 problems (construct 3 triangles for a given gradient), and there are 5 gradients altogether, the total number of CPs worked out by the class is 3x5, which is 15 CPs	If teacher assign different problems to different groups of students during CPSU, the total number of CPs should be the total number of problems given out by the teacher, (even though not everyone in class has a chance to work out all of them)
M-AU-034	Trigono-metric Ratio (Tangent)	26:25 – 29:58	What kind segment is it? IP or CPs??	1 IP	The problem statement given by the teacher is to look for the relationship between the gradient and the angle constructed by that gradient. Students can pick any triangle and look for the linkage, however the target result expected by the teacher should be one: whenever you got the angle of tangent , you got the gradient.	Look for the bigger problem statement, if the other problem examples are only to demonstrate the result of the big problem statement. There should be only one independent problem.

M-AU-073	Revision for semester test	05:27 - 41:12	Type of segment? CPs? Other?	CPs 1-n	The additional materials supplied by the T include several tests from previous years; it appears that Ss might be working on one/more of these; the exact number of CPs however cannot be determined	-
M-AU-078	Exterior angles of a polygon	06:15 - 40:30	Investigation - one IP or several CPs?	One IP	This particular investigation is considered one problem comprised of several interdependent component parts	Problems of this type need to be carefully considered on an individual basis; they should only be marked as IPs when the component parts are interdependent, otherwise they might be comprised of a number of CPs
M-CZ-023	Simultaneous Equations	39:59-47:59	Teacher provides "extra problems" to 3 students during CPSW, and then goes over the problems publicly. When should we open the problems?	2 IPs	Open the problems when they are opened/discussed publicly. Not when they are provided privately to only a few students.	-
M-CZ-038	Equations	3:47-13:50	Three Ss work privately on 1 unique problem each (as an examination). The rest of the class works on another problem. What kind segment is it? IP or CPs?	1 IP	The 3 Ss who each work on their own problem privately are in a situation similar to a single S who takes a test late. Those problems are not open to all Ss. To open 4 CPs in this segment would be misleading.	▪ We will need to keep the code (in Pass 5): "Is this problem completed by all Ss?" ▪ We will need to capture "examining" in the Purpose dimension.
M-CZ-043	Word Problems about motion	29:06-46:00	Ss finish an IP privately. When the T sees that individual Ss are finished, she assigns them, individually, a set of problems. Where do the CPs start?	(The IP becomes a CP.) The CPs start when we see the first S being assigned the set of problems. There is no CPSU.	This will give us the best estimate of the length of time spent on the problems.	If Ss are assigned CPs privately, open the CPs when you see the first student being assigned the set of problems.

M-CZ-048	Graphing	35:38-41:49	Ss are working on CPs. One S solves each of the CPs at the board, speaking publicly with the T. Is it CPSW or CPCW?	CPSW	We already have a rule (2.13.2) that "while most of the class is working at their seats, one or more students may also be working at the chalkboard. This still should be marked as CPSW."	We will add a clarification to the manual that public talk may also occur if this occurs during CI3. (Even if the S reaches a TR, code it as CPSW.)
M-HK-018	Pythagorean Formula	22:03-26:43	Are Physical Materials used for IPs 11-17?	No	Teacher shows a "grid" on the overhead, but this doesn't count.	Grids, shown on the overhead or blackboard, do not count as Physical Materials.
M-HK-030	Interest Rate	00:41:18-00:47:23	Is that a break ?	Break	If the teacher has clearly indicated the period of time as a break, any non mathematical public talks within this period (e.g. riddles) is part of the break. It would not be coded as NM.	-
M-HK-087	Factorization	00:22:04-00:23:49	Is that really a break for the lesson?	It is a break (BK)	Even though the break includes the student asking mathematics problems privately, it should be coded as a break.	During the break, there is no classroom interaction type coded.
M-JP-002	Congruence	18:11 - 48:51	Is IP2 a PVD? What type of Student Choice?	Not a PVD. Open Choice.	The problem is not a PVD b/c no deductive reasoning is visible (next problem is a PVD). SC is open b/c they are not limited with regard to the method, just the conditions.	-

M-NL-017	Interpreting tables	#7, 9, and 10 on worksheet	Should PC be coded as "2" or "3"?	#7f = "2," all other problems = "3"	The set-up for #7 is insufficient to be counted as a story. When the text of "f" is added, it is still insufficient to be a story.	-
M-NL-027	Area & Volume	21:08-25:15	Open HW correction as CPs?	Yes, CPs.	1) Ss will clearly work on HW correction, 2) we have the answer sheet, and 3) the answer sheet shows solution strategies, not just answers.	Open HW as problems if students clearly work on them and they are provided with more than answers alone.
M-NL-050	Probability	41:54-47:49	Are these problems?	Yes.	See rationale for M-US-017	See consequences for M-US-017
M-SW-003	Equations & equations in word problems	11:15-22:20	When there is a CPM how are the problems coded? Are the publicly solved problems coded as ITIPs, CPS or IPs?	All problems are coded as CPs	There have been 8 other cases of this type all of which coded the problems as CPs. There is no really good way to represent adequately what is going on during that time during the lesson and we felt after exploring all different coding options that coding CPs is the least misrepresenting one.	We would like to be made aware of any other lesson that poses the same problem and decide on a case by case basis. If we find many more lessons of this type we might have to reconsider the coding.
M-US-001	Probability	8:03-26:35	Are there problems? How many?	One long IP, with 3 ITIPs.	The teacher gives the p.s. -- look for examples of probability in this story -- before they read the book. Therefore, the entire segment is an IP, with some interrupting problems.	-
M-US-017	Statistics - Methodology	27:07-32:44	Teacher and textbook questions about research methodology (sampling) are phrased as "problems", although there is not a clear "operation".	Count them as problems.	In statistics, these questions seem to be considered as problems, both by the teacher and the textbook. They have a clear problem statement and target result. We will add "applying statistical concepts" to our list of operations.	Add to our definition of mathematical operation - within "a method of mathematizing a real-world situation" - Applying Statistical Concepts.

M-US-034	Adding/Subtracting Negative Numbers	3:40-13:12 & 40:34-43:88	The class works on 16 CPs. Then, at the end of the class, they discuss one of the CPs. Should it remain open the entire lesson?	Open 15 CPs from 3:40-13:12. Then open 1 IP from 40:34-43:88.	This solution works best for this lesson -- given the nature of the problems, and the lesson itself.	
M-US-038	Ratio	5:20-18:05	TV comes on while students are working on problems.	Outside Interruption & Non-Mathematics Within Problems	The tv clearly interrupts many (and at times all) of the students as they are working on CPs.	-
M-US-052	Inequality	26:10 – 30: 52	The teacher is teaching the 7th graders in class while the 8^{th} graders are doing their assigned classwork in seat. Is that segment CPM?	CPM for this segment. CI 4 for classroom interaction.	This is CPM, because the teacher is working with the group of 7^{th} graders (who are regarded as part of the class as they joined the lesson) publicly, while the other group is working privately at their seats.	It is a prototypical CPM. CPM happens when one group of students are working with the teacher publicly and the other group of students are working privately. The teacher intentionally divided the class into groups.

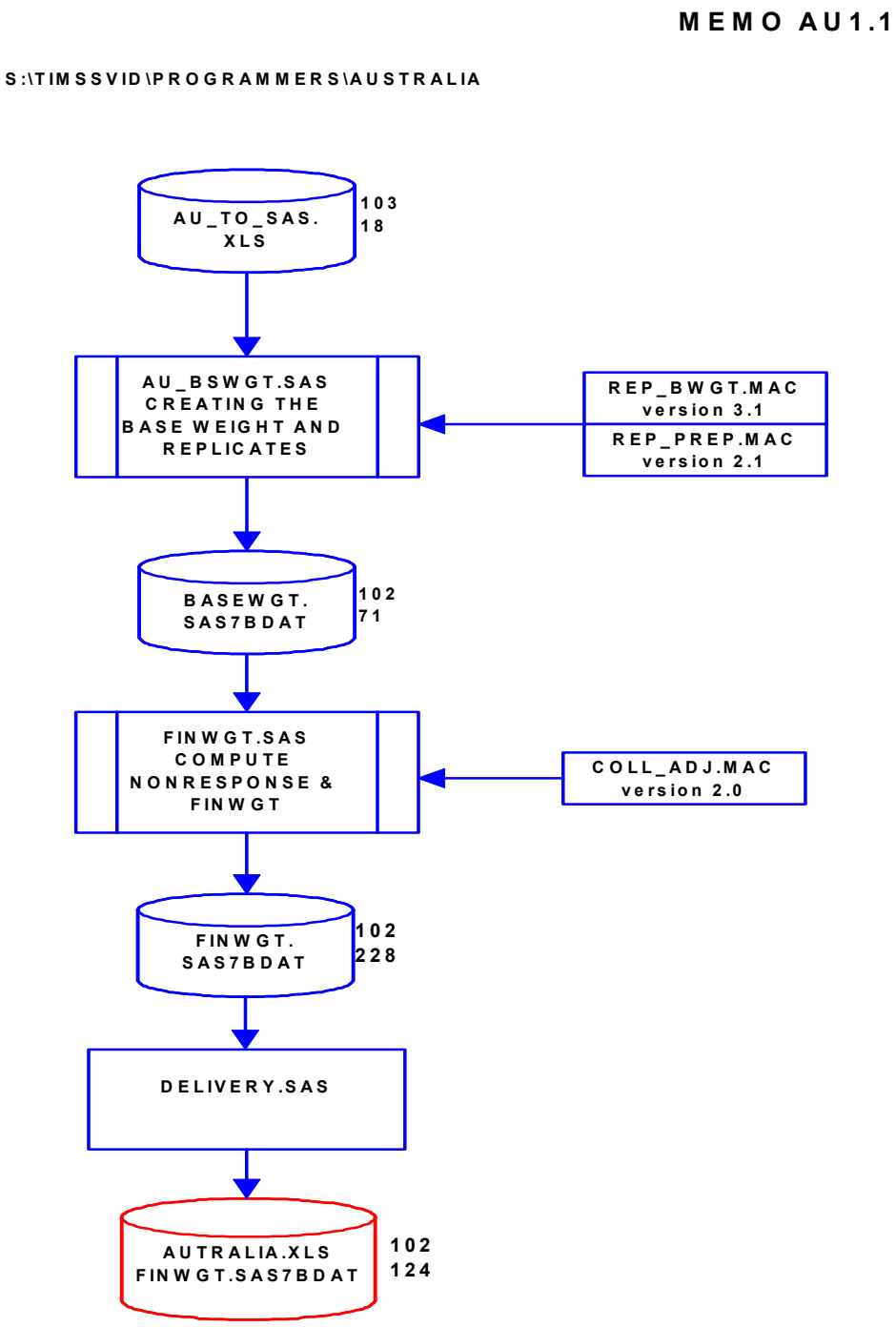
This page left intentionally blank.

Appendix J

Steps for Weighting the Data for Each Country

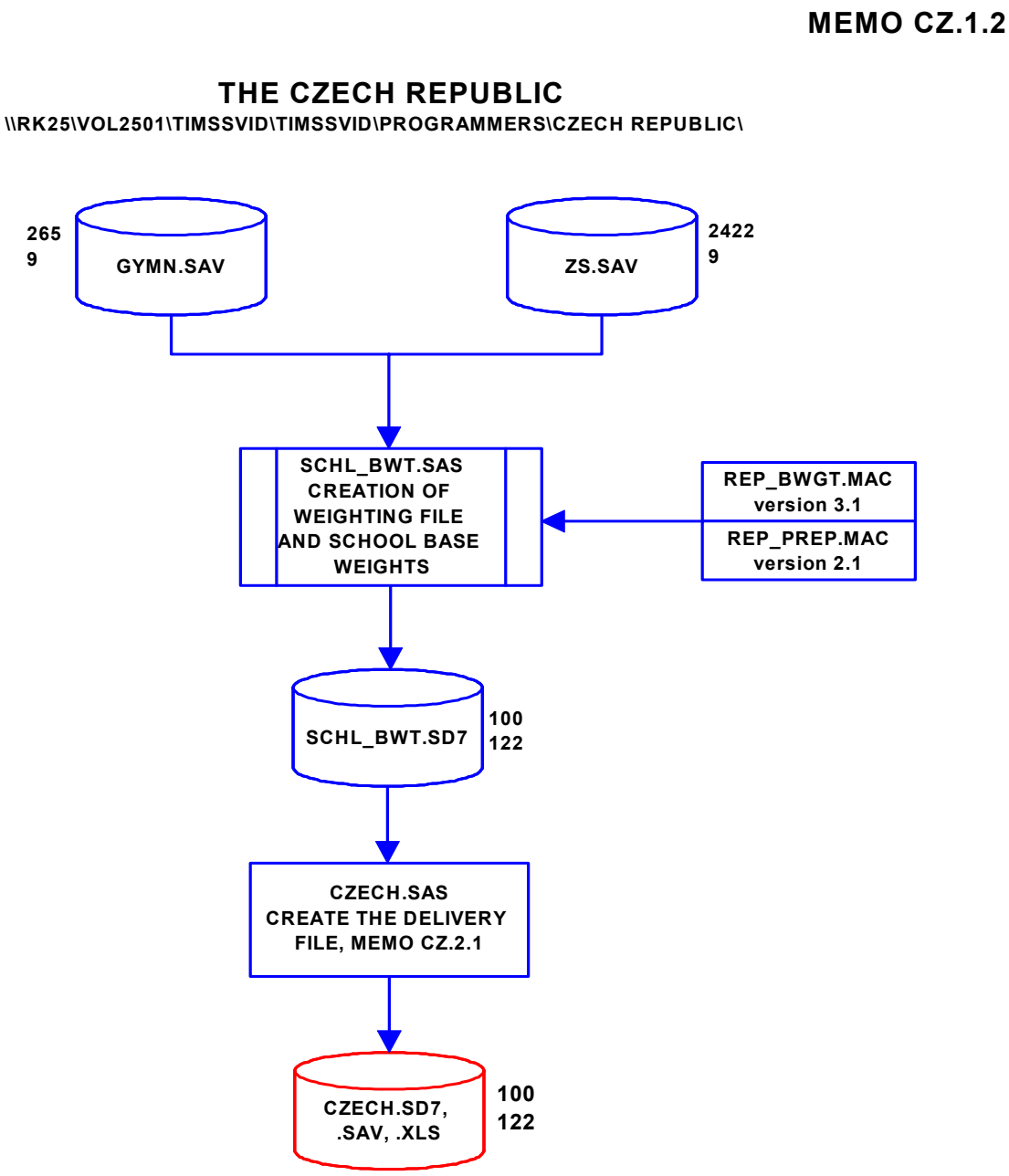
This page left intentionally blank.

Figure 1. Steps for Weighting the Data for Australia



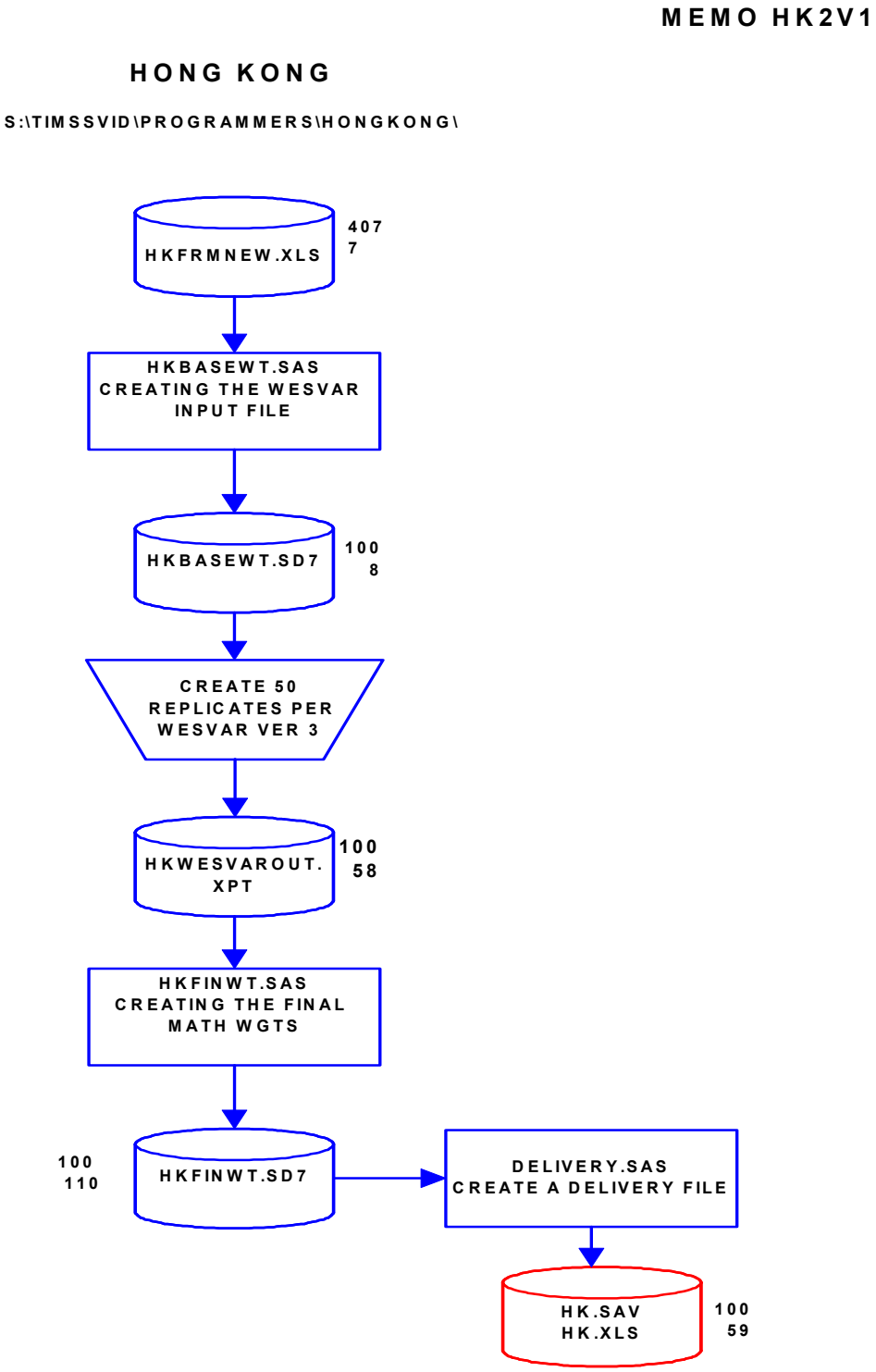
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 2. Steps for Weighting the Data for the Czech Republic



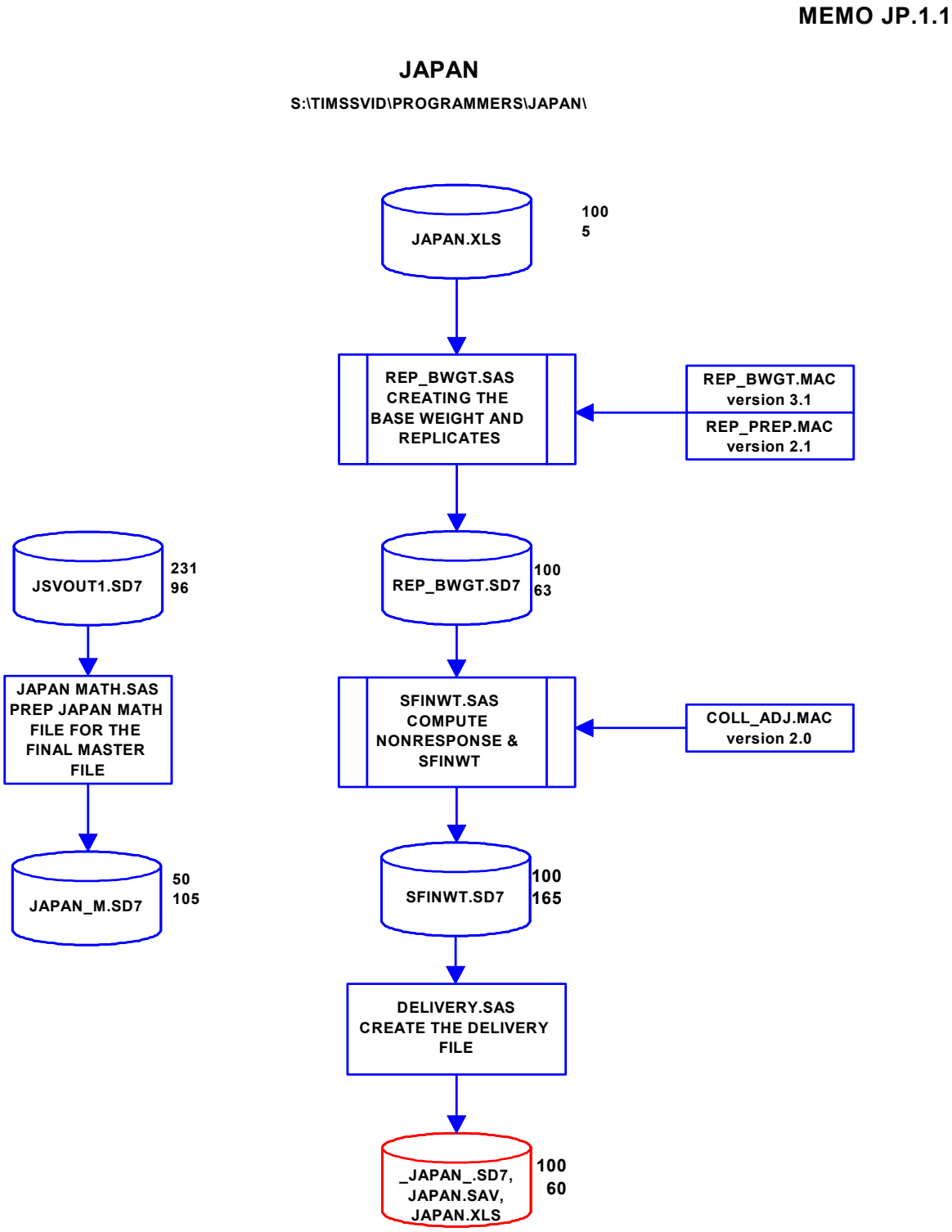
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 3. Steps for Weighting the Data for Hong Kong SAR



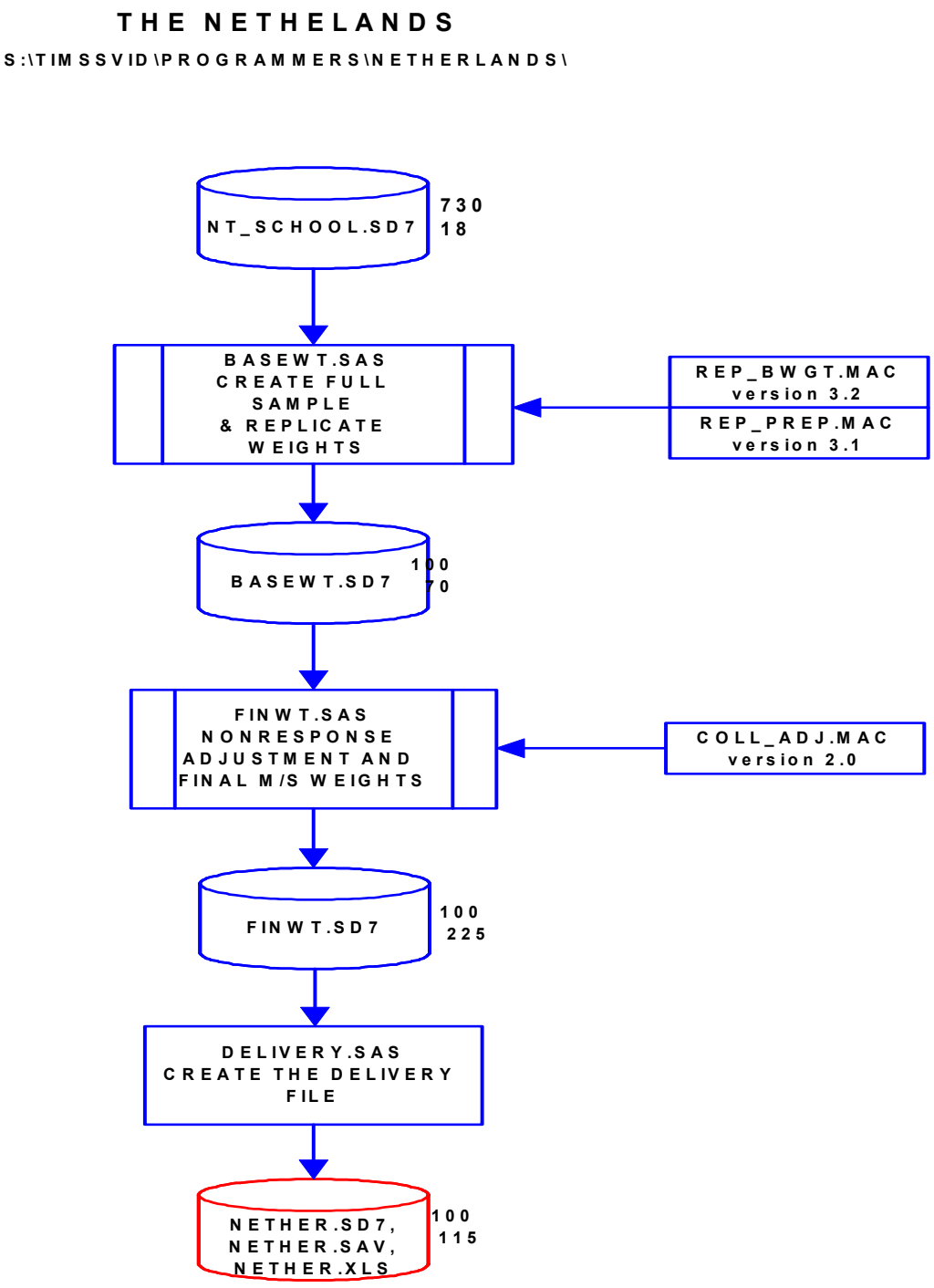
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 4. Steps for Weighting the Data for Japan



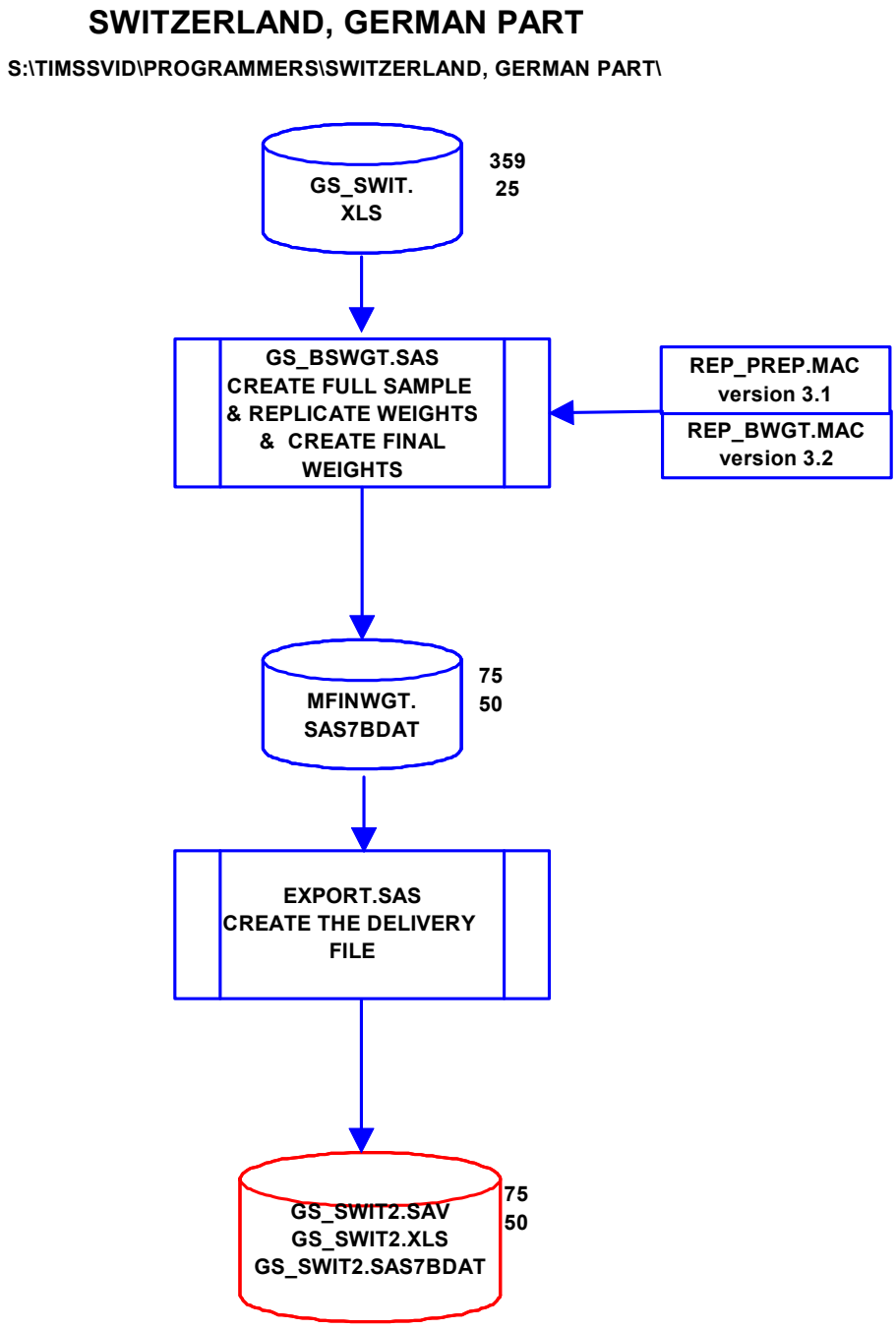
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 5. Steps for Weighting the Data for the Netherlands



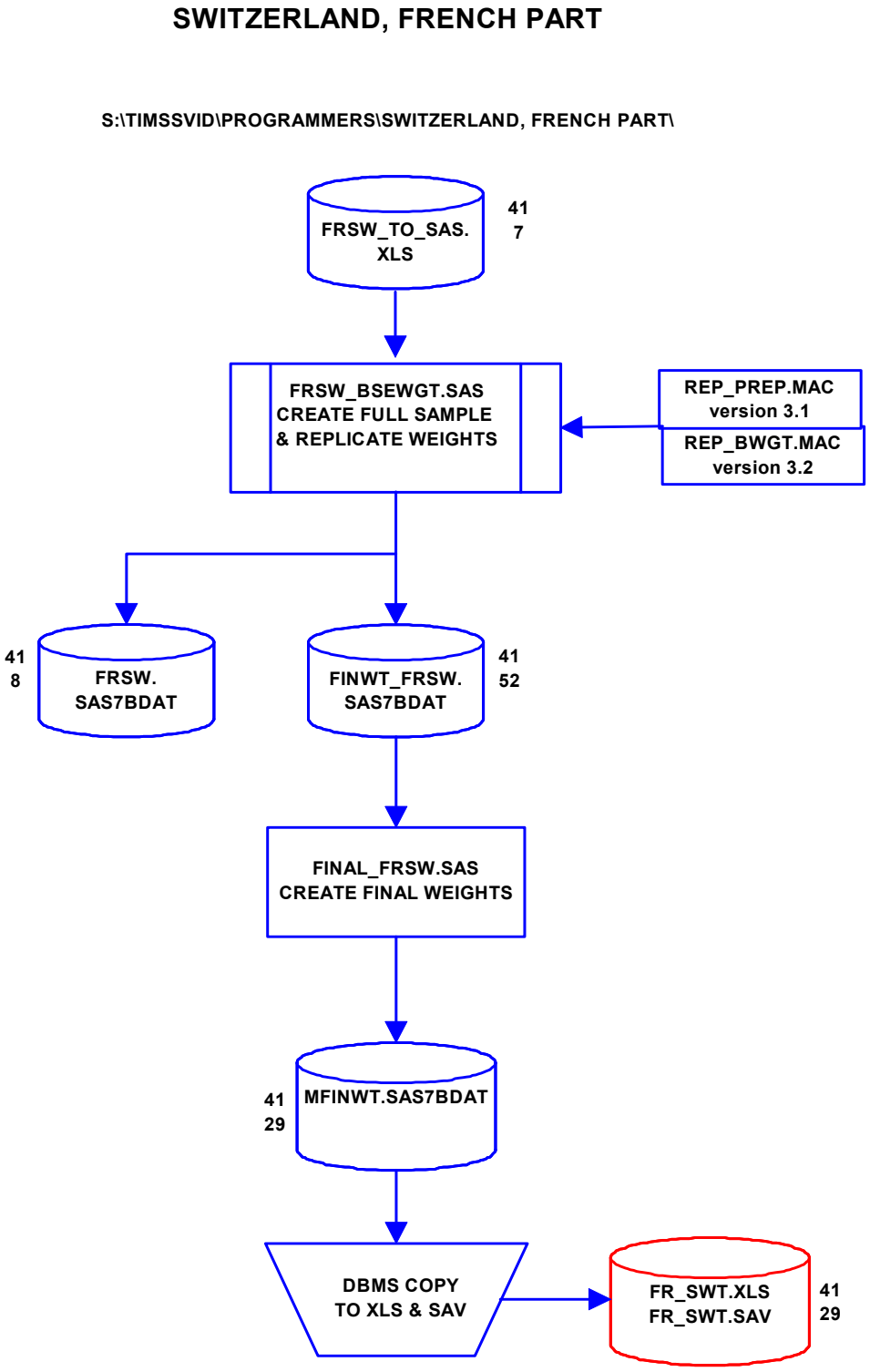
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 6. Steps for Weighting the Data for German-Speaking Switzerland



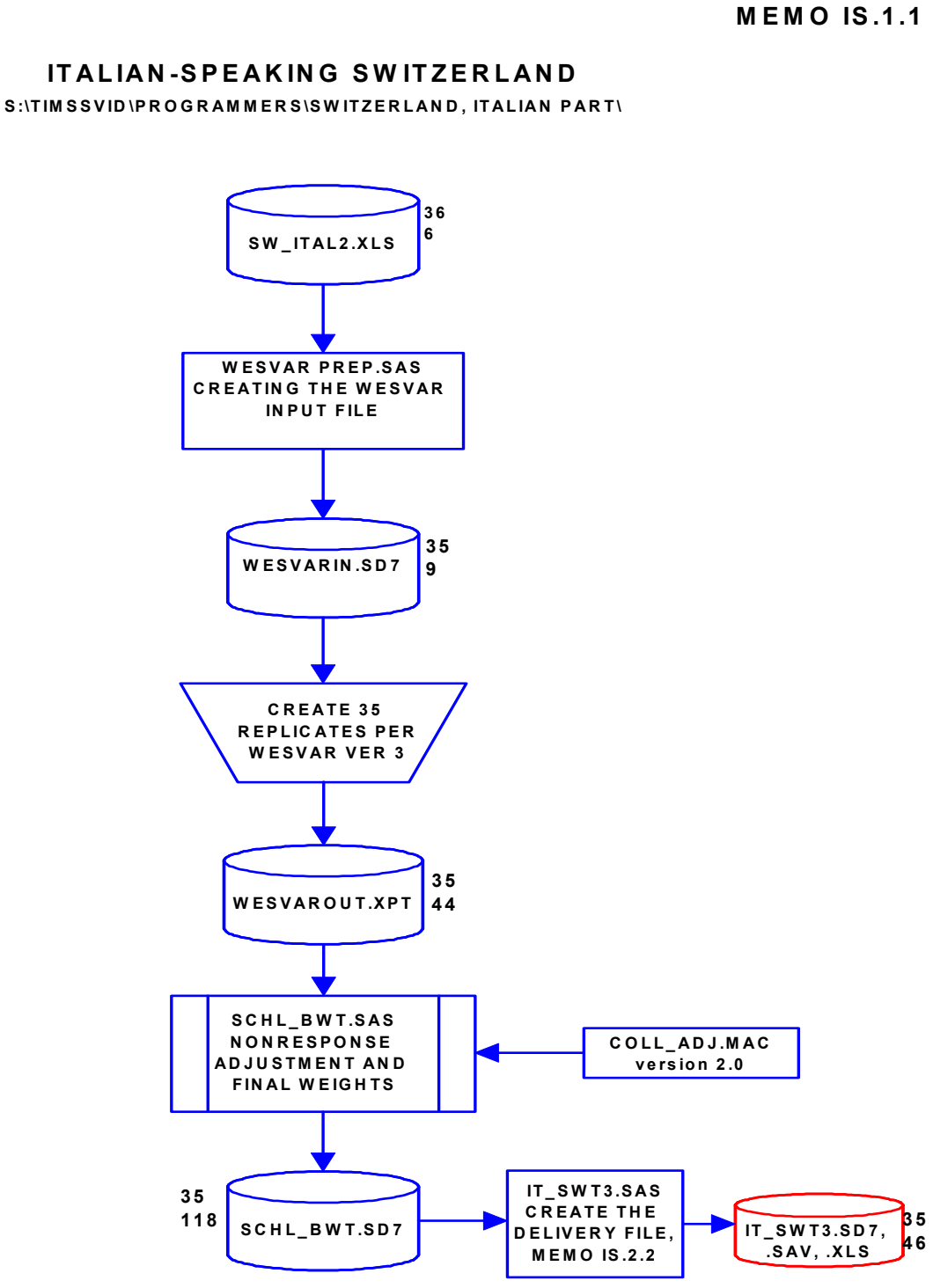
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 7. Steps for Weighting the Data for French-Speaking Switzerland



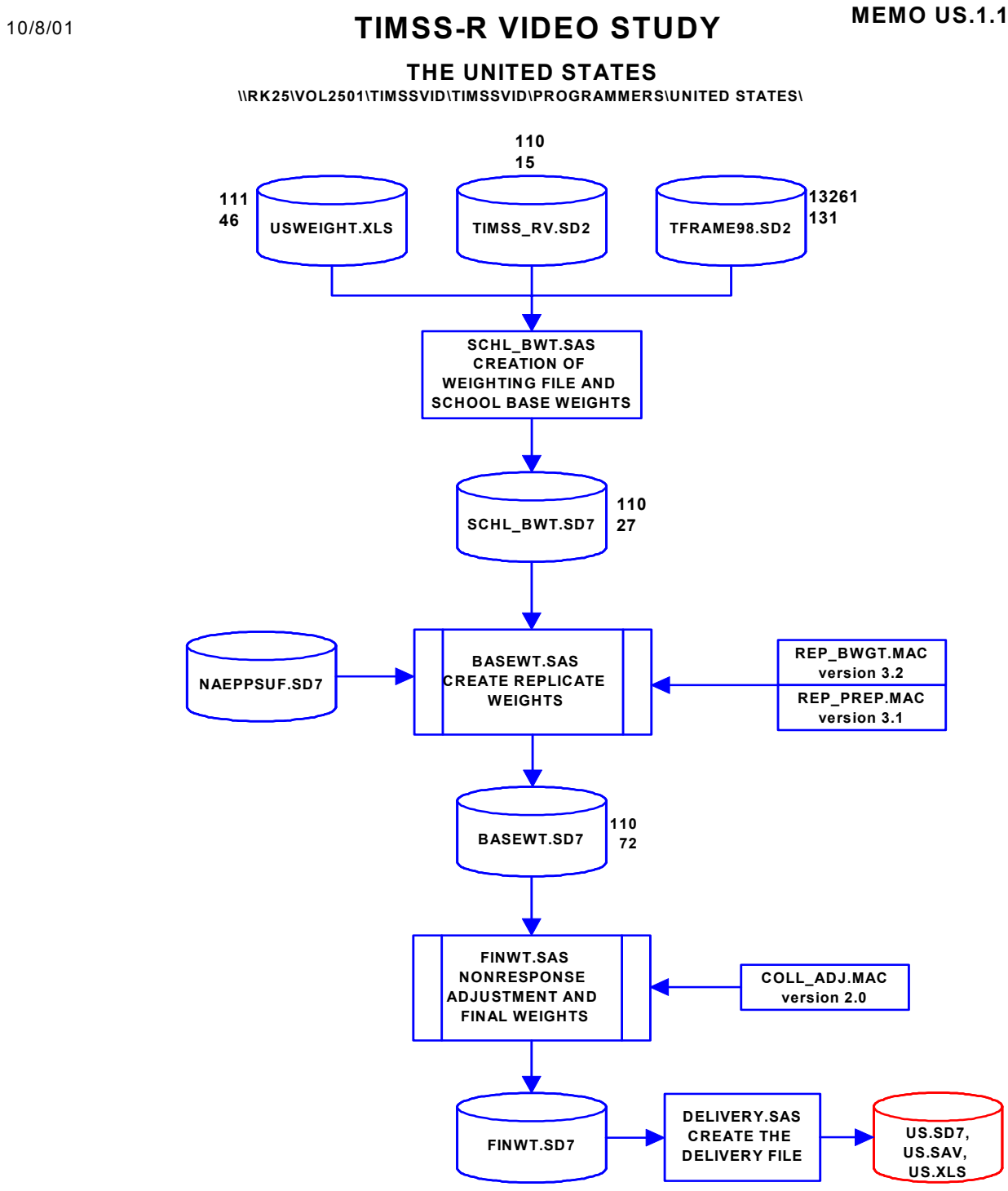
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 8. Steps for Weighting the Data for Italian-Speaking Switzerland



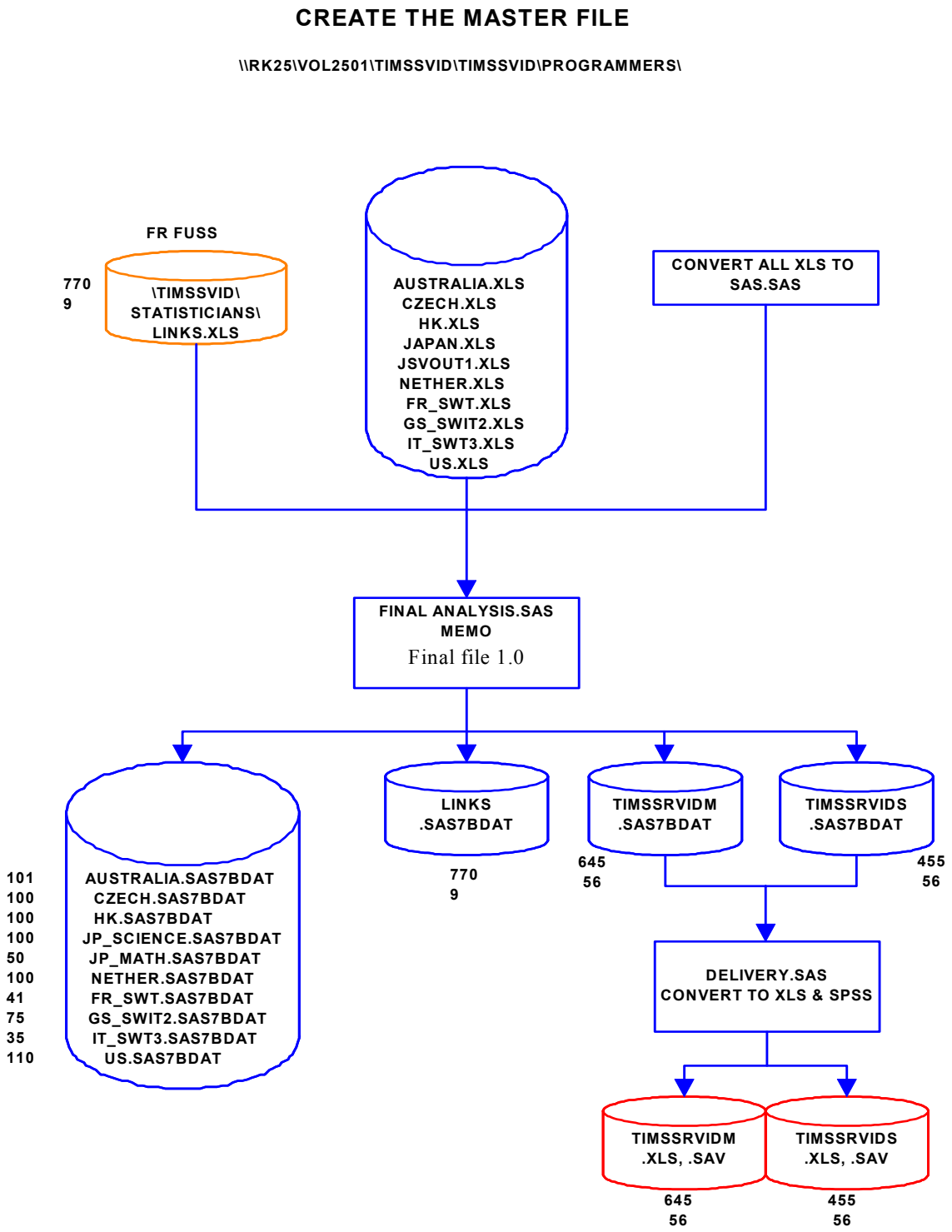
SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 9. Steps for Weighting the Data for the United States



SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.

Figure 10. Steps for Creating the Master File for Weighting the Data



SOURCE: U.S. Department of Education, National Center for Education Statistics, Third International Mathematics and Science Study, Video Study, 1999.