

# Global Strategy Stage: GloSS assessments

Interview forms 1–4

Additional Information

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# Contents

<b>PART A: GLOBAL STRATEGY STAGE ASSESSMENTS</b> .....	<b>1</b>
INTRODUCTION .....	1
<i>Features of the new GloSS interviews</i> .....	1
THE GLOSS COMPONENTS .....	2
ADMINISTRATION AND MARKING .....	2
<i>Planning for the administration</i> .....	2
<i>Administering the tests</i> .....	3
<i>Assigning numeracy stages</i> .....	4
<b>PART B: TECHNICAL INFORMATION</b> .....	<b>6</b>
SELECTION OF TASKS .....	6
MEASUREMENT OF TASK DIFFICULTY .....	6
TASK DESCRIPTORS .....	8
REFERENCES.....	9

## Tables

Table 1	Target Numeracy Framework stages for sets of tasks.....	2
Table 2	Example of student response to an interview .....	5
Table 3	Difficulty level of tasks .....	7
Table 4	Mathematical description of tasks.....	8

# Part A: Global Strategy Stage assessments

## Introduction

The Global Strategy Stage (GloSS) assessments are a set of face-to-face interviews designed primarily to assist classroom teachers in determining students' best-fit strategy stages on the Number Framework (Ministry of Education, 2008, pp. 15–17). GloSS is designed for students in Years 1 to 8, but may well be used with secondary students, especially those in Years 9 and 10.

This edition of GloSS retains much of the same feel and style of the previous forms. Many of the tasks come from the original GloSS Forms E, H, I, J and K. New tasks developed by a panel of teachers and mathematics specialists are also included.

This manual and the four new GloSS interview forms have been prepared by staff at the New Zealand Council for Educational Research under contract to the Ministry of Education.

## Features of the new GloSS interviews

- (1) Four new interviews have been developed (Interview 1 to Interview 4) with 22 tasks in each.
- (2) The interviews are designed to be of equivalent overall difficulty. Tasks in different interview forms with the same task number are also of approximately equal difficulty.
- (3) The interviews forms are organised into nine sections. Each section focuses on a specific target stage or stages on the Number Framework. Teachers should ask **all** the questions in a section and then make a decision on whether to continue to the next set of questions based on the student's responses.
- (4) To align the interview with the National Standards (Ministry of Education, 2009) Stages 5 to 8 of the Number Framework have each been divided into two sub-stages; for example, Stage 5 is now divided into Early Stage 5 and Stage 5. Table 1 shows how each section is associated with the Number Framework, curriculum and National Standards.
- (5) A new recording template is provided. This gives space to record the Number Framework stage that best categorises the student's response on each task and the details of the strategy they employed. At the conclusion of the interview, the recording template allows teachers to record the stage a student is working at for each operational domain.

Table 1 **Target Numeracy Framework stages for sets of tasks**

<b>Section</b>	<b>Task numbers</b>	<b>Target Numeracy stage/s</b>	<b>Curriculum level</b>	<b>National Standard</b>
<b>1</b>	1	1	Early 1	
<b>2</b>	2	2–3	Early1	After one year
<b>3</b>	3–5	4– Early 5	At 1 Early 2	After two years After three years
<b>4</b>	6–8	5	At 2	End of Year 4
<b>5</b>	9–11	Early 6	Early 3	End of Year 5
<b>6</b>	12–14	6	At 3	End of Year 6
<b>7</b>	15–17	Early 7	Early 4	End of Year 7
<b>8</b>	18–20	7	At 4	End of Year 8
<b>9</b>	21–22	Early 8	Early 5	

## **The GloSS components**

The following components are associated with each interview form:

- (1) A brief set of **instructions** for the administration of the interview.
- (2) A list of **materials** needed for the interview.
- (3) An **interview schedule**, which includes:
  - a) the student tasks, which are organised into nine sections
  - b) a scoring guide for each task
  - c) a decision rule on whether to continue the interview at the end of each section.
- (4) A set of **student task cards** to be shown to the student. Tasks 1 has no associated task card.
- (5) A **GloSS recording sheet** template. A recording sheet is required for each student interview.

## **Administration and marking**

### **Planning for the administration**

- (1) Teachers should make themselves familiar with the interview materials and instructions. A brief familiarisation session for staff might be advantageous.
- (2) Give students the kind of notice that is normally given for regular assessments. A sense of occasion is to be avoided.
- (3) Where possible, the interviews should be administered in a location free from interruption. Try to minimise disruptions during the interview. A notice, “GloSS interview in progress. Please do not disturb” can be hung outside.
- (4) Have all of the following: the interview form; the task cards; the materials mentioned on the interview form; and a recording sheet for each student.

- (5) For each student, decide the appropriate point to begin the interview. The following principles should help guide this decision:
  - Commence the interview with the section targeted just below the Number Framework stage you think the student is at.
  - When in doubt opt for a lower starting point. Be willing to move on quickly, or even jump some sections if this level is patently too low.
  - If the student finds the first section they are given too hard, go back to a previous section that they can cope with.
  - Do not start the interview any later than Section 7.

### Administering the tests

- (1) Questions are designed so that they can be answered mentally.
- (2) Begin the interview at the appropriate starting point (see 5 above). The target Number Framework stage (or stages) is given at the beginning of each set of questions (see Table 1).
- (3) Read each task to the student and show them the related task card. For Tasks 1–5, perform the actions indicated.
- (4) Give the student time to answer the task (you may sometimes need to wait for a few minutes). If necessary, prompt the student. For example, ask “*How did you work that out?*” or “*Can you talk me through what you were thinking?*”
- (5) Allow the student the space to demonstrate higher level strategies. If they use a simpler strategy (e.g., counting) say, “*Can you do it another way?*” If there is some doubt, continue the interview rather than stop it.
- (6) Use the scoring guide associated with each task to allocate a Number Framework stage. Generally the decision is whether they are **at or above** the stage targeted by the set of questions in the section, or **below** the target stage. *Example:* If the target level is Stage 6, responses that are at or above this level are coded as “6”, and those that are below it are coded as “E6”. Circle the Number Framework Stage on the recording sheet that corresponds with the most sophisticated strategy the student used (even if their numerical answer is not correct).
- (7) For each task, make notes on the strategies used in the space entitled “Observations”.
- (8) Ask **all** tasks within a section. Generally these are on the two face-to-face pages, and cover the *Addition and Subtraction*, *Multiplication and Division* and *Proportions and Ratios* domains respectively.
- (9) Use the decision rule provided at the end of each section to decide whether to stop or continue the interview.
  - If the student is rated at the target stage for **any** of the tasks in that section, then **continue** the interview, otherwise **stop** the interview.
  - The exception is for Section 3. Here the interview should continue if the student is rated at the target stage (Early 5) for **any** tasks, or if they are rated at Stage 4 for **both** Task 3 and Task 4.

- If in any doubt, **continue** the interview to see if the student can cope with the next section. Students may have used lower level strategies, and more complicated tasks may evoke higher-level strategies.

### Assigning numeracy stages

At the completion of an interview, record the highest numeracy stage demonstrated for each operational domain in the spaces provided at the bottom of the recording sheet.

### **Example of determining a student's numeracy stages**

The following page shows a recording sheet for a hypothetical interview.

- The interview terminated at the end of Section 5, as the student used no Early Stage 6 strategies (the target stage for that section).
- The student was rated at Stage 5 in the *Addition and Subtraction* domain. This was the highest strategy they demonstrated in this domain (observed in Task 6).
- The student was rated as Stage 4 in the *Multiplication and Division* domain as this was the highest strategy they demonstrated in this domain (observed in Task 4).
- The student was rated as Stages 3–4 in the *Proportions and Ratios* domain as they could equally share. Note how this utilises the stage indicator in parentheses, and that the Number Framework does not distinguish between Stages 3 and 4 in the *Proportions and Ratios* domain.

Table 2 Example of student response to an interview

**GLOSS recording sheet – Form 1 2 3 4** (circle as appropriate)

Name: Ted Stubbs Year Level: 5 Date: 29/2/2012

	Addition and Subtraction	Multiplication and Division	Proportions and Ratios
Section 1	Task 1 Observation: _____ Stage: 0/1		
Section 2	Task 2 Observation: <u>Used materials</u> Stage: 1/2 3		
Section 3	Task 3 Observation: <u>8, 9, 10, ..., 13</u> Stage: 3/4/E5	Task 4 Observation: <u>6, 12, 18</u> Stage: 3/4/E5	Task 5 Observation: <u>Used equal sharing 1-1</u> Stage: 4/E5
Section 4	Task 6 Observation: <u><math>36 + 20 = 56</math> <math>56 + 2 = 58</math></u> Stage: E5	Task 7 Observation: <u>5, 10, 15, ...</u> Stage: E5/5	Task 8 Observation: <u>Couldn't do it.</u> Stage: E5/5
Section 5	Task 9 Observation: <u><math>128 + 10 + 10 + \dots + 198</math> <math>199, 201, 201, 202</math></u> Stage: 5/E6	Task 10 Observation: <u>15, 30, 45,</u> Stage: 5/E6	Task 11 Observation: <u>Knew <math>3 \times 6 = 18</math></u> Stage: 5/E6
Section 6	Task 12 Observation: _____ Stage: E6/6	Task 13 Observation: _____ Stage: E6/6	Task 14 Observation: _____ Stage: E6/6
Section 7	Task 15 Observation: _____ Stage: 6/E7	Task 16 Observation: _____ Stage: 6/E7	Task 17 Observation: _____ Stage: 6/E7
Section 8	Task 18 Observation: _____ Stage: E7/7	Task 19 Observation: _____ Stage: E7/7	Task 20 Observation: _____ Stage: E7/7
Section 9		Task 21 Observation: _____ Stage: 7/E8	Task 22 Observation: _____ Stage: 7/E8

**Stage summary:**  
 Addition & Subtraction: 5    Multiplication & Division: 4    Proportions & Ratios: 3/4  
*For each domain, highlight the largest stage number circled in positions b and c of "Stage a/b" or "Stage a/b/c".*



## Part B: Technical information

### Selection of tasks

The four interview forms include a total of 88 tasks (22 per form). Many of the tasks came from the original GloSS forms E, H, I, J and K. A few of these have been slightly modified. In addition, a number of new tasks have been used in the interviews.

A total of 120 tasks were trialled in the GloSS Psychometric Study (Neill, Lawes, Robertson, & Darr 2011). The study located the tasks on the *patm* scale, a linear measurement scale developed for PAT: Mathematics (Darr, Neill, Stephanou, & Ferral, 2009). The final 88 tasks were selected from this pool using the following criteria:

- The four interview forms should have approximately the same average difficulty level.
- Groups of tasks within each section (aimed at the same target level) have approximately the same average difficulty level.
- Tasks with the same number should be of approximately the same difficulty level across the forms.
- The tasks within each group of three tasks should relate to the Number Framework stage or stages at which they are targeted.
- Within each form, the tasks should be independent. This means that the mathematical content as well as the context of the tasks should be diverse. This reduces the impact of each task upon subsequent ones.

At times, compromises between these criteria were made. Most notably, within a section, the difficulty level for tasks in the *Proportions and Ratios* domain was often of greater difficulty than the corresponding tasks in the other two domains. This was because the fit to the Number Framework stages was prioritised over the task difficulty.

### Measurement of task difficulty

Table 3 presents the difficulty measures of the GloSS tasks. These measurements are in *patm* units—the measurement units used in the PAT: Mathematics assessment. The measure for each task is based on data collected during the GloSS Psychometric Study. This study used Rasch modelling techniques to establish a link between the GloSS and PAT: Mathematics assessments.

Some of the task difficulty measures are slightly different from those reported in the GloSS Psychometric Study. This is due to some minor changes made to the marking rubrics used on the GloSS Psychometric Study data so that those rubrics would better reflect the Number Framework. Some further modifications in the rubric for Task 2 may also have a slight overall effect upon the measures.

Table 3 **Difficulty level of tasks**

Section	Task	Interview 1		Interview 2		Interview 3		Interview 4		Average	
		Difficulty	s.e	Difficulty	s.e	Difficulty	s.e	Difficulty	s.e	Difficulty	s.e
Stages 1-3	1	-	-	-	-	-	-	-	-	-	-
	2	-25.1	1.4	-24.8	1.3	-29.5	1.4	-27.5	1.2	-26.7	0.7
Stage 4- Early stage 5	3	10.5	0.8	8.2	0.8	9.9	0.9	8.0	0.7	9.2	0.4
	4	19.2	0.7	19.2	0.7	18.7	0.7	19.2	0.7	19.1	0.4
	5	26.7	0.9	30.6	0.9	33.4	0.9	33.4	0.9	31.0	0.5
Stage 5	6	29.3	0.9	34.3	0.9	34.0	0.9	30.3	1.1	32.0	0.5
	7	38.2	0.9	38.9	0.9	40.3	0.9	39.4	0.9	39.2	0.5
	8	45.9	0.9	41.1	0.9	39.6	0.9	43.1	0.9	42.4	0.5
Early Stage 6	9	39.4	0.9	39.9	0.9	34.4	1.0	35.0	0.9	37.2	0.5
	10	46.2	0.9	46.2	0.9	49.3	1.0	45.8	0.9	46.9	0.5
	11	46.6	1.1	46.3	0.9	54.5	0.9	54.5	1.1	50.5	0.5
Stage 6	12	49.7	0.9	49.2	1.0	56.2	0.9	53.4	0.9	52.1	0.5
	13	52.8	0.9	53.6	0.9	52.6	1.1	50.1	1.0	52.3	0.5
	14	57.3	1.1	63.4	1.3	56.8	0.9	63.4	1.1	60.2	0.5
Early Stage 7	15	64.8	1.1	63.0	1.1	66.6	1.3	66.0	1.0	65.1	0.6
	16	64.0	1.2	55.7	1.1	62.9	1.0	56.8	1.0	59.9	0.5
	17	62.4	1.1	66.1	1.2	61.9	1.0	63.6	1.1	63.5	0.6
Stage 7	18	78.3	1.5	69.8	1.4	67.5	1.1	67.1	1.2	70.7	0.7
	19	65.4	1.3	72.9	1.3	68.0	1.3	68.9	1.1	68.8	0.6
	20	68.9	1.1	69.4	1.4	71.0	1.1	71.2	1.2	70.1	0.6
Early Stage 8	21	79.5	2.2	83.0	2.0	74.3	1.3	83.6	2.0	80.1	0.9
	22	78.8	1.9	76.5	1.7	77.7	1.6	74.3	1.3	76.8	0.8
	Av.	47.6	0.2	47.7	0.2	47.6	0.2	47.6	0.2		

No data were available for Task 1, as all or virtually all students in the calibration study got these questions correct.

## Task descriptors

The following table gives a mathematical description of all 22 tasks in each of the four interview forms. These give the formulation of each problem as it is stated. Students may well have interpreted or transformed the problem to an equivalent problem using inverse operations etc.

Table 4 **Mathematical description of tasks**

Task	Interview 1	Interview 2	Interview 3	Interview 4
1	Count 8 items	Count 9 items	Count 7 items	Count 6 items
2	$3 + 6 = ?$	$2 + 5 = ?$	$2 + 4 = ?$	$3 + 4 = ?$
3	$9 + 7 = ?$	$8 + 6 = ?$	$8 + 5 = ?$	$8 + 7 = ?$
4	$6 \times 5 = ?$	$5 \times 5 = ?$	$3 \times 6 = ?$	$5 \times 5 = ?$
5	$4 \times ? = 20$ or $1/4$ of $20 = ?$	$3 \times ? = 15$ or $1/3$ of $15 = ?$	$4 \times ? = 12$ or $1/4$ of $12 = ?$	$4 \times ? = 12$ or $1/4$ of $12 = ?$
6	$57 - 25 = ?$	$84 - 7 = ?$	$36 + ? = 58$	$49 + 27 = ?$
7	$24 = 2 \times ?$	$30 = 5 \times ?$	$45 = 5 \times ?$	$110 = 10 \times ?$ or $110 \div 10 = ?$
8	$12 \times 1/4 = ?$	$3 \times 1/4 = ?$	$8:4 = 1:? $	$5 = 1/4$ of $?$
9	$? + 26 = 86$	$476 - 123 = ?$	$128 + 74 = ?$	$147 + 36 = ?$
10	$8 \times 6 = ?$	$88 = 8 \times ?$ or $88 \div 8 = ?$	$6 \times 15 = ?$	$60 = 5 \times ?$ or $60 \div 5 = ?$
11	$6:18 = 3:? $	$1/2$ of $20$ c.f. $1/4$ of $40$	$1/2$ of $1/4$	$1/2$ of $1/4$
12	$? + 148 = 176$	$82 - ? = 44$	$231 - 78 = ?$	$143 = 89 + ?$
13	$(40 - 8) \div 4 = ?$	$72 \div 8 = ?$ or $8 \times ? = 72$	$6 \times 15 = ?$	$5 \times 24 = ?$
14	$32:4 = ?:12$	$1/3 = 8$ so $2/3 = ?$	3 share 2	$1/3 = 8$ so $2/3 = ?$
15	$4.3 + 5.15 = ?$	$23.12 - 22.63 = ?$	$5.33 - 2.9 = ?$	$0.8 + ? = 1.25$
16	$33 \times 12 = ?$	$6 \times 36 = ?$	$81 \div 3 = 27$ or $3 \times ? = 81$	$7 \times 27 = ?$
17	$3/5$ of $20 = ?$	$3/8$ of $24 = ?$	$1/2$ of $3/4 = ?$	$1:1/5 = 23:? $ rounded up
18	$10.6 - ? = 9.69$	$0.885 + ? = 1.5$	$1.845 + ? = 2.3$	$0.67 + ? = 0.9$
19	$114 \div 6 = ?$ or $114 = 6 \times ?$	$12 \times ? = 180$ or $180 \div 12 = ?$	$0.075 \times ? = 1.5$	$330 \div 15 = ?$ or $330 = 15 \times ?$
20	3:2 c.f. 8:6	$24:16 = a:b$ and $a + b = 10$	$4/5$ of $? = 40$	$6 \times 3/4 = ?$
21	$0.375 \times ? = 4.5$	$0.38 \times 25 = ?$	$210.9 \times 40 = ?$	$1/5$ of $18.5 = ?$
22	$32/40 = x\%$	$8:6 = 20:? $	$40:16 = ?:6$	$6:14 = ?:21$

## References

- Darr, C., Neill, A., Stephanou, A., & Ferral, H. (2009). *Progressive Achievement Test: Mathematics—Teacher manual* (2nd ed.). Wellington: NZCER Press.
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**GloSS recording sheet**—Interview form: **1 2 3 4** (*circle as appropriate*)

Name: \_\_\_\_\_ Year level: \_\_\_\_\_ Date: \_\_\_\_\_

**Addition and Subtraction    Multiplication and Division    Proportions and Ratios**

<b>Task 1</b> <u>Observation:</u>	<b>Stage: 0 / 1</b>		
<b>Task 2</b> <u>Observation:</u>	<b>Stage: 1 / 2 / 3 / 4</b>		
<b>Task 3</b> <u>Observation:</u>	<b>Stage: 3 / 4 / E5</b>	<b>Task 4</b> <u>Observation:</u>	<b>Task 5</b> <u>Observation:</u>
<b>Task 6</b> <u>Observation:</u>	<b>Stage: E5 / 5</b>	<b>Task 7</b> <u>Observation:</u>	<b>Task 8</b> <u>Observation:</u>
<b>Task 9</b> <u>Observation:</u>	<b>Stage: 5 / E6</b>	<b>Task 10</b> <u>Observation:</u>	<b>Task 11</b> <u>Observation:</u>
<b>Task 12</b> <u>Observation:</u>	<b>Stage: E6 / 6</b>	<b>Task 13</b> <u>Observation:</u>	<b>Task 14</b> <u>Observation:</u>
<b>Task 15</b> <u>Observation:</u>	<b>Stage: 6 / E7</b>	<b>Task 16</b> <u>Observation:</u>	<b>Task 17</b> <u>Observation:</u>
<b>Task 18</b> <u>Observation:</u>	<b>Stage: E7 / 7</b>	<b>Task 19</b> <u>Observation:</u>	<b>Task 20</b> <u>Observation:</u>
		<b>Task 21</b> <u>Observation:</u>	<b>Task 22</b> <u>Observation:</u>
		<b>Stage: 7 / E8</b>	<b>Stage: 7 / E8</b>

**Stage summary:**

**Addition & Subtraction:** \_\_\_\_\_ **Multiplication & Division:** \_\_\_\_\_ **Proportions & Ratios:** \_\_\_\_\_

*For each domain, highlight the largest stage number circled in positions b and c of “Stage a/b” or “Stage a/b/c”.*