MATHEMATICS ASSESSMENT RESULTS 2005

NATIONAL EDUCATION MONITORING PROJECT

Mathematics

Assessment Results 2005

Lester Flockton, Terry Crooks, Jeffrey Smith & Lisa F. Smith
Educational Assessment Research Unit

NEMP Report 37

NEMP

National Education Monitoring Project

NEW ZEALAND

Mathematics

Assessment Results

2005

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NATIONAL EDUCATION MONITORING REPORT 37

MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

NEMP REPORTS

CYCLE 1

1995	1	Science
	2	Art
	3	Graphs, Tables and Maps
1996	4	Music
	5	Aspects of Technology
	6	Reading and Speaking
1997	7	Information Skills
	8	Social Studies
	9	Mathematics
1998	10	Listening and Viewing
	11	Health and Physical Education
	12	Writing

CYCLE 2

1999	13	Science
	14	Art
	15	Graphs, Tables and Maps
	16	Māori Students' Results
2000	17	Music
	18	Aspects of Technology
	19	Reading and Speaking
	20	Māori Students' Results
2001	21	Information Skills
	22	Social Studies
	23	Mathematics
	24	Māori Students' Results
2002	25	Listening and Viewing
	26	Health and Physical Education
	27	Writing
	28	Māori Students' Results

CYCLE 3

2003	29	Science
	30	Visual Arts
	31	Graphs, Tables and Maps
2004	32	Music
	33	Aspects of Technology
	34	Reading and Speaking
2005	35	Information Skills
	36	Social Studies
	37	Mathematics
	38	Māori Students' Results

Note that reports are published the year after the research is undertaken i.e. reports for 2006 will not be available until 2007.

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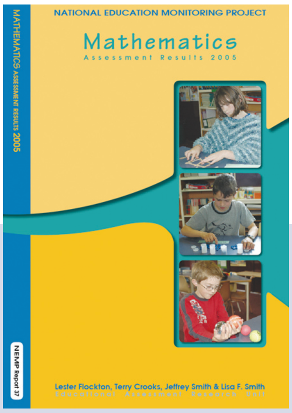

NATIONAL EDUCATION MONITORING REPORT 37

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- Stephen Porteners and other staff members of the Ministry of Education
- members of the Project's National Advisory Committee
- members of the Project's Mathematics Advisory Panel
- principals and children of the schools where tasks were trialled
- principals, staff and Board of Trustee members of the 248 schools included in the 2005 sample
- the 2879 children who participated in the assessments and their parents
- the 96 teachers who administered the assessments to the children
- the 44 senior tertiary students who assisted with the marking process
- the 172 teachers who assisted with the marking of tasks early in 2006.

Summary

New Zealand's National Education Monitoring Project commenced in 1993, with the task of assessing and reporting on the achievement of New Zealand primary school children in all areas of the school curriculum. Children are assessed at two class levels: year 4 (halfway through primary education) and year 8 (at the end of primary education). Different curriculum areas and skills are assessed each year, over a four-year cycle. The main goal of national monitoring is to provide detailed information about what children can do so that patterns of performance can be recognised, successes celebrated and desirable changes to educational practices and resources identified and implemented.

Each year, small random samples of children are selected nationally, then assessed in their own schools by teachers specially seconded and trained for this work. Task instructions are given orally by teachers, through video presentations, on laptop computers, or in writing. Many of the assessment tasks involve the children in the use of equipment and supplies. Their responses are presented orally, by demonstration in writing, in computer files or through submission of other physical products.

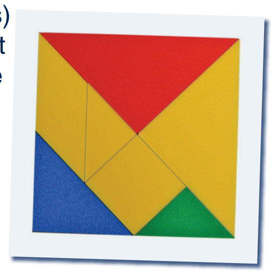
Many of the responses are recorded on videotape for subsequent analysis.

The use of many tasks with both year 4 and year 8 students allows comparisons between the two levels. Because some tasks have been used twice, in 2001 and 2005, trends in performance across the four-year period can also be analysed.

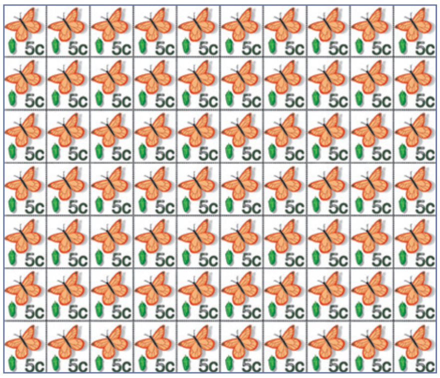
In 2005, the third year of the third cycle of national monitoring, three areas were assessed: mathematics, social studies and information skills. This report presents details of the mathematics assessments.

ASSESSING MATHEMATICS

Chapter 2 explains the place of mathematics in the New Zealand curriculum and presents the mathematics framework. It identifies four areas of content (number and algebra, measurement, geometry, and statistics) linked to eight processes. The importance of attitudes and motivation is also highlighted.

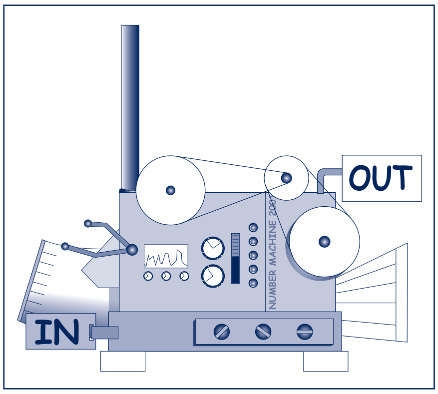


NUMBER AND ALGEBRA



Chapter 3 presents the students' results on 50 number and algebra tasks. Averaged across 143 task components administered to year 4 and year 8 students, 31 percent more year 8 than year 4 students succeeded with these components. Year 8 students performed better on every component. Differences were larger on the more difficult tasks, possibly reflecting tasks where year 4 students had yet to receive much instruction.

There was a moderate net decline in performance in year 4 from 2001 to 2005. Averaged across 109 task components, five percent fewer year 4 students in 2005 were successful than in year 2001. This difference is attributable to 71 task components that involved recall of facts or simple calculations with the four basic arithmetic operations, where students in 2001 outperformed 2005 students by nine percent. On the other hand, on the 38 task components involving algebra, logic, finding patterns, estimation and identifying sequences, year 4 students in 2005 outperformed the 2001 cohort by three percent.



There were 145 task components in common for 2001 and 2005 for year 8, with no net difference between the two years. Following the pattern of the year 4 results, year 8 students did not perform as well on facts and simple problems (a net decrease of three percent averaged across 84 tasks). On the positive side, averaged across 61 tasks, there was a four percent gain from 2001 to 2005 on task components involving algebra, logic, finding patterns, estimation and identifying sequences.

MEASUREMENT

Chapter 4 presents the results for 27 measurement tasks. Averaged across 79 task components administered to both year 4 and year 8 students, 29 percent more year 8 than year 4 students succeeded with these components. Year 8 students performed better on 78 of 79 components.

There was little evidence of change between 2001 and 2005. Averaged across 53 trend task components attempted by year 4 students in both years, one percent more students succeeded in 2005 than in 2001. Gains occurred on 28 of the 53 components. At the year 8 level, with 65 task components included, again there was one percent gain from 2001 to 2005. Gains occurred on 29 of 65 components.

The measurement tasks represented a broad range of skills related to the processes and applications of making and using measurements. There were some problems in basic measurement tasks, especially in year 4. However, student performance was uniformly stronger in the areas of making and reading measurements in straightforward applications than in the areas related to using measurements and measurement processes to solve problems.

GEOMETRY

Chapter 5 presents the results for 15 geometry tasks. There were 31 task components administered to both year 4 and year 8 students. In each of these, the year 8 students showed a higher success rate than the year 4 students. On average, year 8 students outperformed year 4 students by 21 percent. Differences between year 4 and year 8 students were fairly consistent across the tasks.

There were 16 task components in common for 2001 and 2005 for year 4 students. Eight of those components showed a gain over the four-year period, and the other eight showed a decline. The net difference over the 16 task components was a decline of one percent. There were 19 task components in common for 2001 and 2005 for year 8. Eleven of those components showed a gain over the four years and eight showed a decline, with a net gain of one percent.

STATISTICS

Chapter 6 presents the results of seven statistics tasks. The two tasks administered to both year 4 and year 8 show substantial growth over those years. On average, there was a 36 percent increase in performance on tasks from year 4 to year 8. There was also a small improvement from 2001 to 2005 at year 4 level (an average of two percent) and a moderate improvement between 2001 and 2005 at year 8 level (average of five percent). These trends were based on a small number of task components, so should be interpreted cautiously.

MATHEMATICS SURVEY

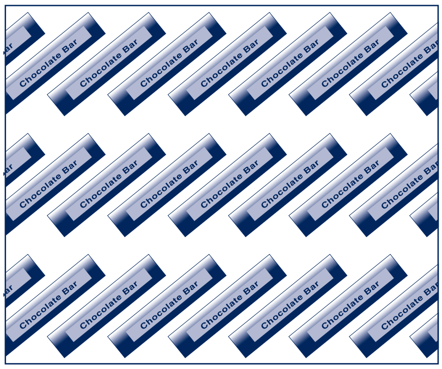
Chapter 7 focuses on the results of a survey that sought information from students about their strategies for, involvement in, and enjoyment of mathematics. Mathematics was the second most popular option for year 4 students and the third most popular option for year 8 students, at both levels – one place higher than in 2001. At year 4 level it was chosen by seven percent more students in 2005 than in 1997, and at year 8 level it was chosen by 6 percent fewer students in 2005 than in 1997. It should be noted that two additional options (dance and drama) were added between 1997 and 2005, which might have reduced the percentages choosing mathematics.

An open-ended question asked students, *"What are some interesting maths things you do in your own time?"* The emphasis on basic facts and tables among year 4 students declined substantially between 2001 and 2005, mentioned by 56 percent of students in 2001 but only 36 percent of students in 2005.

The student responses to 11 rating items showed that about 10 percent more year 8 than year 4 students have distinctly negative views about studying mathematics in school and about their own capabilities, while 33 percent more year 8 than year 4 students are negative about doing maths in their own time. These patterns have stayed quite consistent from the first survey in 1997 to the 2005 survey. Over the same period, there have been worthwhile reductions, at both year levels but especially year 8, in the percentages of students who said that they didn't know how good their parents thought they were at maths, or how good their teacher thought they were at maths. There is considerable scope for further reduction in the percentage of students who do not know what their teacher thinks about their mathematical capabilities.

PERFORMANCE OF SUBGROUPS

Chapter 8 details the results of analyses comparing the performance of different demographic subgroups. Community size, school size, school type (full primary, intermediate, or year 7 to 13 high school), and geographic zone did not seem to be important factors predicting achievement on the mathematics tasks. The same was true for the 2001 and 1997 assessments. However, there were statistically significant differences in the performance of students from low, medium and high decile schools on 62.5 percent of the tasks at year 4 level (compared to 87 percent in 2001 and 85 percent in 1997) and 65 percent of the tasks at year 8 level (compared to 76 percent in 2001 and 77 percent in 1997). The change for year 4 students is noteworthy.



For the comparisons of boys with girls, Pakeha with Māori, Pakeha with Pasifika students, and students for whom the predominant language at home was English with those for whom it was not, effect sizes were used. Effect size is the difference in mean (average) performance of the two groups, divided by the pooled standard deviation of the scores on the particular task. For this summary, these effect sizes were averaged across all tasks.

Year 4 boys averaged slightly higher than girls, with a mean effect size of 0.08 (very similar to the mean effect size of 0.10 in 2001). Year 8 girls averaged slightly higher than boys, with a mean effect size of 0.03 (the same as in 2001). Pakeha students averaged moderately higher than Māori students, with mean effect sizes of 0.37 for year 4 students and 0.35 for year 8 students (the corresponding figures in 2001 were 0.46 and 0.42). Year 4 Pakeha students averaged moderately higher than Pasifika students, with a mean effect size of 0.35 (compared to 0.59 in 2001). This is a noteworthy change. Year 8 Pakeha students averaged substantially higher than Pasifika students, with a mean effect size of 0.51 (compared to 0.53 in 2001). Compared to students for whom the predominant language at home was English, students from homes where other languages predominated averaged slightly lower, with mean effect sizes of 0.10 for year 4 students and 0.10 for year 8 students. Comparative figures are not available for the assessments in 2001.

SUMMARY OF TREND INFORMATION

In the 2001 report on Mathematics, evidence was reported on gains (from 1997 to 2001) in the areas of number, algebra and statistics. There was little change in measurement or geometry at Year 4, and a small decline in geometry at year 8. Linked with the current trend results, this suggests that gains are continuing in algebra/statistics, but that the gains in number have not been maintained. It should be pointed out that from 1997 to 2001, gains were seen in number facts as well as tasks involving more complex thinking skills. In 2005, there is a clear decline in tasks involving number facts, but a continued increase in the more complex tasks.

The National Education Monitoring Project 1

This chapter presents a concise outline of the rationale and operating procedures for national monitoring, together with some information about the reactions of participants in the 2005 assessments. Detailed information about the sample of students and schools is available in the Appendix.

Purpose of National Monitoring

The New Zealand Curriculum Framework (1993, p26) states that the purpose of national monitoring is to provide information on how well overall national standards are being maintained, and where improvements might be needed.

The focus of the National Education Monitoring Project (NEMP) is on the educational achievements and attitudes of New Zealand primary and intermediate school children. NEMP provides a national “snapshot” of children’s knowledge, skills and motivation, and a way to identify which aspects are improving, staying constant, or declining. This information allows successes to be celebrated and priorities for curriculum change and teacher development to be debated more effectively, with the goal of helping to improve the education which children receive.

Assessment and reporting procedures are designed to provide a rich picture of what children can do and thus to optimise value to the educational community. The result is a detailed national picture of student achievement. It is neither feasible nor appropriate, given the purpose and the approach used, to release information about individual students or schools.

Monitoring at Two Class Levels

National monitoring assesses and reports what children know and can do at two levels in primary and intermediate schools: year 4 (ages 8-9) and year 8 (ages 12-13).

National Samples of Students

National monitoring information is gathered using carefully selected random samples of students, rather than all year 4 and year 8 students. This enables a relatively extensive exploration of students’ achievement, far more detailed than would be possible if all students were to be assessed. The main national samples of 1440 year 4 children and 1440 year 8 children represent about 2.5 percent of the children at those levels in New Zealand schools, large enough samples to give a trustworthy national picture. At year 8 level only, a special sample of 96 children learning in Māori immersion schools or classes is selected. Their achievement will be reported in a separate report.

Three Sets of Tasks at Each Level

So that a considerable amount of information can be gathered without placing too many demands on individual students, different students attempt different tasks. The 1440 students selected in the main sample at each year level are divided into three groups of 480 students, comprising four students from each of 120 schools. Each group attempts one third of the tasks.

Timing of Assessments

The assessments take place in the second half of the school year, between August and November. The year 8 assessments occur first, over a five-

	YEAR	NEW ZEALAND CURRICULUM		
1	2003 (1999) (1995)	Science Visual Arts Information Skills: *graphs, tables, maps, charts & diagrams*	Communication skills Problem-solving skills Self-management and competitive skills Social and cooperative skills Work and study skills	Attitudes
2	2004 (2000) (1996)	Language: *reading and speaking* Aspects of Technology Music		
3	2005 (2001) (1997)	Mathematics: *numeracy skills* Social Studies Information Skills: *library, research*		
4	2006 (2002) (1998)	Language: *writing, listening, viewing* Health and Physical Education		

week period. The year 4 assessments follow, over a similar period. Each student participates in about four hours of assessment activities spread over one week.

Specially Trained Teacher Administrators

The assessments are conducted by experienced teachers, usually working in their own region of New Zealand. They are selected from a national pool of applicants, attend a week of specialist training in Wellington led by senior Project staff and then work in pairs to conduct assessments of 60 children over five weeks. Their employing school is fully-funded by the Project to employ a relief teacher during their secondment.

Four-Year Assessment Cycle

Each year, the assessments cover about one quarter of the areas within the national curriculum for primary schools. The New Zealand Curriculum Framework is the blueprint for the school curriculum. It places emphasis on seven essential learning areas, eight essential skills and a variety of attitudes and values. National monitoring aims to address all of these areas, rather than restrict itself to pre-selected priority areas.

The first four-year cycle of assessments began in 1995 and was completed in 1998. The second cycle ran from 1999 to 2002. The third cycle began in 2003 and will finish in 2006. The areas covered each year and the reports produced for cycle 2 and the first three years of cycle 3 are listed opposite the contents page of this report.

Some of the tasks are kept constant from one cycle to the next. This re-use of tasks allows trends in achievement across a four-year interval to be observed and reported. Starting from 2002, the percentage of tasks retained was increased from 35 to 45 percent, so that trends will be able to be reported more thoroughly.

Important Learning Outcomes Assessed

The assessment tasks emphasise aspects of the curriculum which are particularly important to life in our community, and which are likely to be of enduring importance to students. Care is taken to achieve balanced coverage of important skills, knowledge and understandings within the various curriculum strands, but without attempting to follow slavishly the finer details of current curriculum statements. Such details change from time to time, whereas national monitoring needs to take a long-term perspective if it is to achieve its goals.

Wide Range of Task Difficulty

National monitoring aims to show what students know and can do. Because children at any particular class level vary greatly in educational development, tasks spanning multiple levels of the curriculum need to be included if all children are to enjoy some success and all children are to experience some challenge. Many tasks include several aspects, progressing from aspects most children can handle well to aspects that are less straightforward.

Engaging Task Approaches

Special care is taken to use tasks and approaches that interest students and stimulate them to do their best. Students' individual efforts are not reported and have no obvious consequences for them. This means that worthwhile and engaging tasks are needed to ensure that students' results represent their capabilities rather than their level of motivation. One helpful factor is that extensive use is made of equipment and supplies which allow students to be involved in hands-on activities. Presenting some of the tasks on video or computer also allows the use of richer stimulus material, and standardises the presentation of those tasks.

Positive Student Reactions to Tasks

At the conclusion of each assessment session, students completed evaluation forms in which they identified tasks that they particularly enjoyed, tasks they felt relatively neutral about and tasks that did not appeal. Averaged across all tasks in the 2005 assessments, 75 percent of year 4 students indicated that they particularly enjoyed the tasks. The range across the 131 tasks was from 91 percent down to 46 percent. As usual, year 8 students were more demanding. On average, 57 percent of them indicated that they particularly enjoyed the tasks, with a range across 181 tasks from 89 percent down to 23 percent. Four tasks were more disliked than liked, by year 8 students only. These were two mathematics tasks involving fractions, a social studies task about the role of the Governor General, and an information skills task summarising a passage about Dame Kiri Te Kanawa.

Appropriate Support for Students

A key goal in Project planning is to minimise the extent to which student strengths or weaknesses in one area of the curriculum might unduly influence their assessed performance in other areas. For instance, skills in reading and writing often play a key role in success or failure in paper-and-pencil tests in areas such as science, social studies and mathematics. In national monitoring, a majority of tasks are presented orally by teachers, on video, or on computer, and most answers are given orally or by demonstration rather than in writing. Where reading or writing skills are required to perform tasks in areas other than reading and writing, teachers are happy to help students to understand these tasks or to communicate their responses. Teachers are working with no more than four students at a time, so are readily available to help individuals.

To free teachers further to concentrate on providing appropriate guidance and help to students, so that the students

achieve as well as they can, teachers are not asked to record judgements on the work the students are doing. All marking and analysis is done later, when the students' work has reached the Project office in Dunedin. Some of the work comes on paper, but much of it arrives recorded on videotape. In 2005, about half of the students' work came in that form, on a total of about 3600 videotapes. The video recordings give a detailed picture of what students and teachers did and said, allowing rich analysis of both process and task achievement.

Four Task Approaches Used

In 2005, four task approaches were used. Each student was expected to spend about an hour working in each format. The four approaches were:

- *One-to-one interview*
  Each student worked individually with a teacher, with the whole session recorded on videotape.
- *Stations*
  Four students, working independently, moved around a series of stations where tasks had been set up. This session was not videotaped.
- *Team*
  Four students worked collaboratively, supervised by a teacher, on some tasks. This session was recorded on videotape.
- *Group and Independent*
  Four students worked collaboratively, supervised by a teacher, on some tasks. This was recorded on videotape. The students then worked individually on some paper-and-pencil tasks.

Professional Development Benefits for Teacher Administrators

The teacher administrators reported that they found their training and assessment work very stimulating and professionally enriching. Working so closely with interesting tasks administered to 60 children in at least five schools offered valuable insights. Some teachers have reported major changes in their teaching and assessment practices as a result of their experiences working with the Project. Given that 96 teachers served as teacher administrators in 2005, or about half a percent of all primary teachers, the Project is making a major contribution to the professional development of teachers in assessment knowledge and skills. This contribution will steadily grow, since preference for appointment each year is given to teachers who have not previously served as teacher administrators. The total after 11 years is 1070 different teachers, 39 of whom have served more than once.

Marking Arrangements

The marking and analysis of the students' work occurs in Dunedin. The marking process includes extensive discussion of initial examples and careful checks of the consistency of marking by different markers.

Tasks which can be marked objectively or with modest amounts of professional experience usually are marked by senior tertiary students, most of whom have completed two or three years of pre-service preparation for primary school teaching. Forty-four student markers worked on the 2005 tasks, employed five hours per day for about five weeks.

The tasks that require higher levels of professional judgement are marked by teachers, selected from throughout New Zealand. In 2005, 172 teachers were appointed as markers. Most teachers worked either mornings or afternoons for one week. Teacher professional development through participation in the marking process is another substantial benefit from

national monitoring. In evaluations of their experiences on a four-point scale ("dissatisfied" to "highly satisfied"), 67 to 94 percent of the teachers who marked student work from 2005 chose "highly satisfied" in response to questions about:

- the instructions and guidance given during marking sessions
- the degree to which marking was professionally satisfying and interesting
- its contribution to their professional development in the area of assessment
- the overall experience.

Analysis of Results

The results are analysed and reported task by task. Most task reports include a total score, created by adding scores for appropriate task components. Details of how the total score has been constructed for particular assessment tasks can be obtained from the NEMP office (earu@otago.ac.nz).

Although the emphasis is on the overall national picture, some attention is also given to possible differences in performance patterns for different demographic groups and categories of school. The variables considered are:

- *Student gender:*
  - – male
  - – female
- *Student ethnicity:*
  - – Māori
  - – Pasifika
  - – Pakeha (including Asian)
- *Home language:*
  (predominant language spoken at home)
  - – English
  - – any other language
- *Geographical zone:*
  - – Greater Auckland
  - – other North Island
  - – South Island
- *Size of community:*
  - – main centre over 100,000
  - – provincial city of 10,000 to 100,000
  - – rural area or town of less than 10,000
- *Socio-economic index for the school:*
  - – lowest three deciles
  - – middle four deciles
  - – highest three deciles
- *Size of school:*
  YEAR 4 SCHOOLS
  - – less than 25 year-4 students
  - – 25 to 60 year-4 students
  - – more than 60 year-4 students

  YEAR 8 SCHOOLS
  - – less than 35 year-8 students
  - – 35 to 150 year-8 students
  - – more than 150 year-8 students
- *Type of school*: (for year 8 sample only)
  - – full primary school
  - – intermediate school
  - – year 7–13 high school

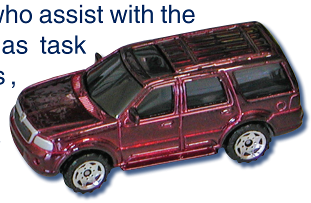
  (some students were in other types of schools, but too few to allow separate analysis).

Categories containing fewer children, such as Asian students or female Māori students, were not used because the resulting statistics would be based on the performance of less than 70 children, and would therefore be unreliable.

An exception to this guideline was made for Pasifika children and children whose home language was not English because of the agreed importance of gaining some information about their performance.

Funding Arrangements

National monitoring is funded by the Ministry of Education, and organised by the Educational Assessment Research Unit at the University of Otago, under the direction of Professor Terry Crooks and Lester Flockton. The current contract runs until 2007. The cost is about $3 million per year, less than one tenth of a percent of the budget allocation for primary and secondary education. Almost half of the funding is used to pay for the time and expenses of the teachers who assist with the assessments as task developers, teacher administrators or markers.



Reviews by International Scholars

In June 1996, three scholars from the United States and England, with distinguished international reputations in the field of educational assessment, accepted an invitation from the Project directors to visit the Project. They conducted a thorough review of the progress of the Project, with particular attention to the procedures and tasks used in 1995 and the results emerging. At the end of their review, they prepared a report which concluded as follows:

> *The National Education Monitoring Project is well conceived and admirably implemented. Decisions about design, task development, scoring and reporting have been made thoughtfully. The work is of exceptionally high quality and displays considerable originality. We believe that the project has considerable potential for advancing the understanding of and public debate about the educational achievement of New Zealand students. It may also serve as a model for national and/or state monitoring in other countries.*
>
> *(Professors Paul Black, Michael Kane & Robert Linn, 1996)*

A further review was conducted late in 1998 by another distinguished panel (Professors Elliot Eisner, Caroline Gipps and Wynne Harlen). Amid very helpful suggestions for further refinements and investigations, they commented that:

> *We want to acknowledge publicly that the overall design of NEMP is very well thought through… The vast majority of tasks are well designed, engaging to students and consistent with good assessment principles in making clear to students what is expected of them.*

Further Information

A more extended description of national monitoring, including detailed information about task development procedures, is available in:

Flockton, L. (1999). *School-wide Assessment: National Education Monitoring Project.* Wellington: New Zealand Council for Educational Research.

Assessing Mathematics 2

The aims of mathematics education, like those of other learning areas, are developed and shaped to reflect understandings and processes that are meaningful, important and useful to individuals and society. Just as knowledge expands, circumstances alter and needs change with time, so too is the content and structure of mathematics programmes adjusted and refined from time to time to reflect current needs and future visions for learners. Expecting students to get the right answers in the shortest possible time with the least amount of thinking is no longer a prime goal of mathematics education. For most students a major aim is to help them develop attitudes and abilities to be flexible, creative thinkers who can cope with open-ended, real-world problems. This requires them to become confident in their understanding and application of mathematical ideas, procedures and processes.

Because much conceptual knowledge and skill in mathematics takes time to develop, fundamental ideas introduced at the early years of schooling are repeatedly elaborated on and extended as students progress through their years at school. It is appropriate, therefore, that assessment in mathematics included a substantial proportion of tasks which allow us to observe the extent of progress in conceptual knowledge and skill over time.

Although conceptual understanding is clearly one of the major goals of mathematics education, students' capacity for exploring, applying and communicating their mathematical understandings within real-world contexts is also important. Mathematics education is very much concerned with such matters as students' confidence, interest and inventiveness in working with a range of mathematical ideas. The NEMP assessment framework recognises this by making provision for students to demonstrate their mathematical skills through a range of situations which involve them in asking questions, making connections, and applying understandings and processes to novel, as well as familiar, situations. Although the place for assessing confidence and efficiency in basic knowledge of facts is recognised in NEMP assessments, there is also a substantial focus on thinking, reasoning and problem-solving skills that require more open tasks that allow students to demonstrate their number sense, to reason, to make decisions and to explain.

Framework for Assessment of Mathematics

National monitoring task frameworks are developed with the Project's curriculum advisory panels. These frameworks have two key purposes. They provide a valuable guideline structure for the development and selection of tasks, and they bring into focus those important dimensions of the learning domain which are arguably the basis for valid analyses of students' skills, knowledge, understandings and attitudes.

The assessment frameworks are intended to be flexible and broad enough to encourage and enable the development of tasks that lead to meaningful descriptions of what students know and can do. They are also designed to help ensure a balanced representation of important learning outcomes.

The mathematics framework has a central organising theme and four areas of content linked to eight processes. Key aspects of content are listed under each heading and attention is drawn in the final section of the framework to the importance of students' attitudes and motivation.

The most important message emerging from the use of the framework is the pervasive interrelatedness that exists among mathematics content, processes and attitudes. To regard each as a discrete entity of learning, whether for teaching or assessment purposes, assumes clear-cut boundaries that frequently do not exist. In developing and administering tasks, it was sometimes difficult to assign tasks specifically to one aspect rather than another. However, for purposes of reporting assessment information, tasks were allocated to particular categories according to the balance of emphasis. The results are arranged in chapters according to the content areas.

NEMP MATHEMATICS FRAMEWORK

Confident mathematical thinking and application of ideas, procedures and processes

CONTENT

NUMBER & ALGEBRA
- properties/principles of number operations
- patterns, relationships and generalisations
- number knowledge
- number strategy
- symbols, equations, graphs and diagrams

MEASUREMENT
- systems of measurement and their use
- selecting and using measuring devices
- measurement sense
- issues of measurement and accuracy

GEOMETRY
- shape and space
- position and orientation
- transformation

STATISTICS
- collection, organisation, display and interpretation of statistical data
- estimation of probabilities and use of probabilities for prediction
- critical interpretation of others' data

PROCESSES

- making sense and finding connections
- posing questions and solving problems
- visualising and representing
- using and interacting with technologies
- reflecting and communicating
- estimating and being precise
- seeking patterns and generalising
- verifying and proving

ATTITUDES AND MOTIVATION

– Valuing –

– Perseverance –

– Interest and enjoyment –

– Confidence and willingness to take risks –

– Voluntary engagement –

The Choice of Tasks for National Monitoring

The choice of tasks for national monitoring is guided by a number of educational and practical considerations. Uppermost in any decisions relating to the choice or administration of a task is the central consideration of validity and the effect that a whole range of decisions can have on this key attribute. Tasks are chosen because they provide a good representation of important knowledge and skills, but also because they meet a number of requirements to do with their administration and presentation. For example:

- Each task with its associated materials needs to be structured to ensure a high level of consistency in the way it is presented by specially trained teacher administrators to students of wide-ranging backgrounds and abilities, and in diverse settings throughout New Zealand.
- Tasks need to span the expected range of capabilities of year 4 and 8 students and to allow the most able students to show the extent of their abilities while also giving the least able the opportunity to show what they can do.
- Materials for tasks need to be sufficiently portable, economical, safe and within the handling capabilities of students. Task materials also need to have meaning for students.
- The time needed for completing an individual task has to be balanced against the total time available for all of the assessment tasks, without denying students sufficient opportunity to demonstrate their capabilities.
- Each task needs to be capable of sustaining the attention and effort of students if they are to produce responses that truly indicate what they know and can do. Since neither the student nor the school receives immediate or specific feedback on performance, the motivational potential of the assessment is critical.
- Tasks need to avoid unnecessary bias on the grounds of gender, culture or social background while accepting that it is appropriate to have tasks that reflect the interests of particular groups within the community.

National Monitoring Mathematics Assessment Tasks and Survey

One hundred mathematics tasks were administered, together with an interview questionnaire that investigated students' interests, attitudes and involvement in mathematics.

Twenty-eight tasks were administered in one-to-one interview settings, where students used materials and visual information. Two tasks were presented in team or group situations involving small groups of students working together. Twenty-six tasks were attempted in a stations arrangement, where students worked independently on a series of tasks, some presented on laptop computers. The final 44 tasks were administered in an independent approach, where students sat at desks or tables and worked through a series of paper-and-pencil tasks.

Thirty-five of the tasks were identical for year 4 and year 8 students. A further 20 tasks included common components for both years, together with more challenging components for year 8 students and/or less demanding components for year 4 students. Of the remaining tasks, nine were specifically for year 4 students and 36 for year 8 students. Some of these single-year tasks had parallel components at the other level, but with different stimulus material or significantly different instructions.

Trend Tasks

Thirty-six of the tasks were previously used in the 2001 mathematics assessments. These were called link tasks in the 2001 report, but were not described in detail to avoid any distortions in the 2005 results that might have occurred if the tasks had been widely available for use in schools since 2001. In the current report, these tasks are called trend tasks and are used to examine trends in student performance: whether they have improved, stayed constant or declined over the four-year period since the 2001 assessments.

Link Tasks

To allow comparisons between the 2005 and 2009 assessments, 47 of the tasks used for the first time in 2005 have been designated link tasks. Results of student performance on these tasks are presented in this report, but the tasks are described only in general terms because they will be used again in 2009.

Marking Methods

The students' responses were assessed using specially designed marking procedures. The criteria used had been developed in advance by Project staff, but were sometimes modified as a result of issues raised during the marking. Tasks that required marker judgement and were common to year 4 and year 8 were intermingled during marking sessions, with the goal of ensuring that the same scoring standards and procedures were used for both.

Task-by-task Reporting

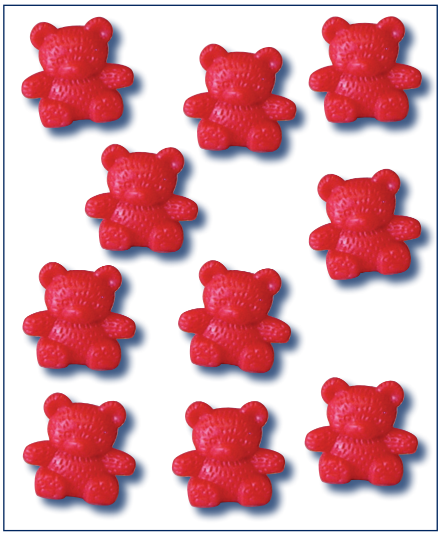
National monitoring assessment is reported task by task so that results can be understood in relation to what the students were asked to do.

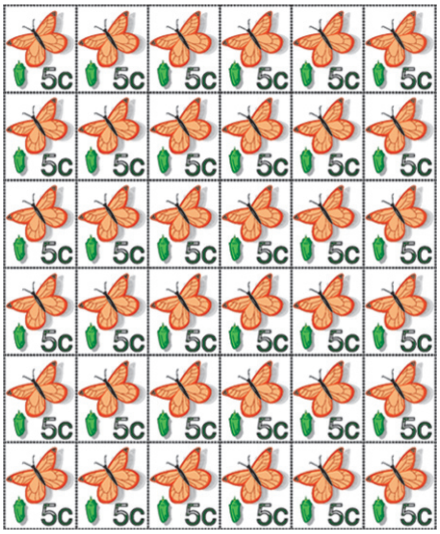
Access Tasks

Teachers and principals have expressed considerable interest in access to NEMP task materials and marking instructions, so that they can use them within their own schools. Some are interested in comparing the performance of their own students to national results on some aspects of the curriculum, while others want to use tasks as models of good practice. Some would like to modify tasks to suit their own purposes, while others want to follow the original procedures as closely as possible. There is obvious merit in making available carefully developed tasks that are seen to be highly valid and useful for assessing student learning.

Some of the tasks in this report cannot be made available in this way. Link tasks must be saved for use in four years' time, and other tasks use copyright or expensive resources that cannot be duplicated by NEMP and provided economically to schools. There are also limitations on how precisely a school's administration and marking of tasks can mirror the ways that they are administered and marked by the Project. Nevertheless, a substantial number of tasks are suitable to duplicate for teachers and schools. In this report, these access tasks are identified with the symbol above, and can be purchased in a kit from the New Zealand Council for Educational Research (P.O. Box 3237, Wellington 6000, New Zealand). Teachers are also encouraged to use the NEMP web site (http://nemp.otago.ac.nz) to view video clips and listen to audio material associated with some of the tasks.

3 Number & Algebra





The assessments included 50 tasks investigating students' understandings, processes and skills in the areas of number and algebra. Number includes the ways numbers are represented, their value, operations on number, accuracy and efficiency in calculating, estimating and making approximations. Algebra involves patterns and relationships in mathematics in the real world, the use of symbols, notation, graphs and diagrams to represent mathematical relationships and ideas, and the use of algebraic expressions for solving problems.

Sixteen tasks were identical for both year 4 and year 8. Eleven tasks had overlapping versions for year 4 and year 8 students, with some parts common to both levels. Seventeen tasks were attempted by year 8 students only and six tasks were attempted by year 4 students only. Sixteen are trend tasks (fully described with data for both 2001 and 2005), ten are released tasks (fully described with data for 2005 only) and 24 are link tasks (to be used again in 2009, so only partially described here).

The tasks are presented in three sections: trend tasks, then released tasks and finally link tasks. Within each section, tasks attempted (in whole or part) by both year 4 and year 8 students are presented first, then tasks where year 4 and year 8 students did parallel tasks, then tasks attempted by only year 4 students, followed by tasks attempted by year 8 students.

Averaged across 143 task components administered to both year 4 and year 8 students, 31 percent more year 8 than year 4 students were successful. Year 8 students performed better on every component. As might be expected, the differences were larger on the more difficult tasks. These tasks are ones where the year 4 students might not yet have had much opportunity to learn those skills in school. Also, the relatively lower percentages of success at year 4 allows for more room to grow by year 8.

Averaged across 109 task components, five percent fewer year 4 students in 2005 were successful than in year 2001. This decrease was almost entirely attributable to task components involving addition, subtraction, multiplication and division facts and simple problems. There were a total of 71 task components in these areas (60 were addition and multiplication facts), and nine percent more 2001 year 4 students were successful than 2005 year 4 students. On the other hand, on eight of the nine remaining tasks (with 38 task components), 2005 year 4 students outperformed 2001 students by three percent. These tasks involved algebra, logic, finding patterns, estimation and identifying sequences.

Averaged across 145 task components, there was no change in net performance for year 8 students from 2001 to 2005. Mirroring the year 4 results, year 8 students did not perform as well on facts and simple problems (a net decrease of three percent averaged across 84 tasks). On the positive side, averaged across 61 tasks, there was a four percent gain from 2001 to 2005 on tasks involving algebra, logic, finding patterns, estimation and identifying sequences.

There are several results in this area that stand out: first, there are strong increases from year 4 to year 8. This indicates a substantial growth in mathematical achievement across these years, particularly in areas such as fractions, number patterns and estimation. Second, even in areas where solid year 4 to year 8 growth is seen, there is room for improvement. An examination of performance levels on the individual tasks is the best way to look for areas of improvement. Third, there is a clear shift in performance from 2001 to 2005. Students are improving in tasks that require quantitative reasoning skills, but declining in basic mathematics facts and solving simple number problems.

Trend Task: Number Facts (Addition)

Approach:	Station	**Year:**	4 & 8
Focus:	Recalling addition facts		
Resources:	Computer program on laptop computer, answer booklet		

Questions / instructions:

This activity uses the computer.

Click on the button that says **Number Facts (Addition)** to begin the task.

[Problems were presented on a computer screen at four second intervals. Students responded in answer booklets that showed each problem and had a blank for entering the response.]

3 + 6 = 9	1 + 7 = 8	0 + 4 = 4
4 + 2 = 6	0 + 6 = 6	6 + 9 = 15
5 + 7 = 12	9 + 7 = 16	8 + 0 = 8
3 + 0 = 3	2 + 8 = 10	8 + 5 = 13
8 + 9 = 17	5 + 4 = 9	4 + 3 = 7
0 + 5 = 5	9 + 9 = 18	8 + 4 = 12
4 + 6 = 10	6 + 6 = 12	3 + 9 = 12
6 + 8 = 14	5 + 9 = 14	7 + 4 = 11
2 + 6 = 8	7 + 6 = 13	4 + 9 = 13
7 + 8 = 15	8 + 3 = 11	3 + 7 = 10

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Total score:	30	22 (43)	64 (68)
	27–29	23 (34)	28 (28)
	24–26	14 (7)	5 (3)
	21–23	7 (6)	1 (0)
	18–20	9 (1)	0 (1)
	15–17	9 (2)	1 (0)
	12–14	7 (2)	0 (0)
	9–11	3 (2)	0 (0)
	6–8	3 (1)	0 (0)
	0–5	3 (2)	0 (0)

Commentary:

Year 8 students showed a solid command of their addition facts. Many year 4 students have not mastered these facts. There was a substantial decrease in performance from 2001 to 2005 at year 4 level. Particular difficulty was seen where the sum is greater than 10, e.g. 8 + 9 = 17.

Trend Task: Number Facts (Multiplication)

Approach:	Station	**Year:**	4 & 8
Focus:	Recalling multiplication facts		
Resources:	Computer program on laptop computer, answer booklet		

Questions / instructions:

This activity uses the computer.

Click on the button that says **Number Facts (Multiplication)** to begin the task.

[Problems were presented on a computer screen at four second intervals. Students responded in answer booklets that showed each problem and had a blank for entering the response.]

4 × 7 = 28	8 × 8 = 64	5 × 2 = 10
9 × 1 = 9	5 × 5 = 25	8 × 6 = 48
3 × 9 = 27	0 × 0 = 0	2 × 1 = 2
6 × 4 = 24	7 × 3 = 21	7 × 0 = 0
9 × 8 = 72	6 × 7 = 42	9 × 9 = 81
0 × 7 = 0	4 × 8 = 32	9 × 3 = 27
8 × 7 = 56	0 × 1 = 0	1 × 6 = 6
3 × 5 = 15	9 × 2 = 18	4 × 4 = 16
6 × 9 = 54	7 × 5 = 35	1 × 8 = 8
2 × 4 = 8	3 × 6 = 18	9 × 4 = 36

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Total score:	30	2 (7)	41 (47)
	27–29	7 (10)	25 (30)
	24–26	5 (9)	11 (9)
	21–23	9 (9)	7 (6)
	18–20	11 (12)	4 (3)
	15–17	12 (13)	5 (2)
	12–14	19 (14)	2 (1)
	9–11	14 (8)	2 (1)
	6–8	8 (6)	0 (1)
	3–5	7 (6)	1 (0)
	0–2	6 (6)	0 (0)

Commentary:

Year 4 students varied widely in terms of knowledge of multiplication facts, with a decline in performance from 2001 to 2005. Year 8 students showed a strong command of these facts but a slight decline in performance from 2001 to 2005 was evident.

Trend Task: Algorithms (Division)

Approach:	Independent	Year:	4 & 8
Focus:	Dividing without a calculator		
Resources:	Answer booklet		

Questions / instructions:

Write your answers in the white boxes. You can use the shaded area to do your working.

Question		Answer	% response 2005 ('01) year 4	year 8
1.	6 ÷ 2 =	3	67 (62)	95 (92)
2.	3) 9	3	50 (50)	90 (92)
3.	12 ÷ 4 =	3	53 (53)	91 (90)
4.	7) 21	3	38 (36)	88 (89)
5.	3) 135	45	6 (6)	45 (55)
6.	5) 8	1.6	0 (0)	9 (13)
		1 r 3	6 (10)	49 (57)
YEAR 8 ONLY:				
7.	3) 14	4.6 or 4.7 only	•	8 (12)
		4 r 2	•	49 (52)
8.	8) 26	3.2	•	14 (16)
		3 r 2	•	44 (45)
9.	7) 83	11.8 or 11.9 only	•	7 (11)
		11 r 6	•	40 (39)
10.	6) 7208	1201.3	•	9 (13)
		1201 r 2	•	26 (34)
Total score:		14–15	•	4 (5)
		12–13	•	3 (4)
		10–11	•	14 (21)
		8–9	•	27 (28)
		6–7	1 (3)	19 (18)
		4–5	31 (29)	19 (13)
		2–3	28 (27)	11 (8)
[Note: Maximum score of 7 for year 4]		0–1	40 (41)	3 (5)

Commentary:

Students at year 4 level had difficulty with division, especially with remainders. Year 8 students had mastered the basics but had problems with division with remainders. Performance at year 4 level was similar between 2001 and 2005. Performance at year 8 level has declined somewhat.

Trend Task: Algorithms (Subtraction)

Approach:	Independent	Year:	4 & 8
Focus:	Subtraction calculation		
Resources:	Answer booklet		

Questions / instructions:

Write your answers in the white boxes. You can use the shaded area to do your working.

Question		Answer	% response 2005 ('01) year 4	year 8
1.	27 − 5	22	78 (71)	93 (91)
2.	67 − 43	24	65 (73)	95 (93)
3.	684 − 32	652	56 (64)	91 (90)
4.	87 − 79	8	24 (33)	75 (77)
5.	54 − 26	28	27 (35)	76 (77)
YEAR 8 ONLY:				
6.	472 − 234	238	•	72 (74)
7.	715 − 417	298	•	63 (67)
8.	500 − 215	285	•	57 (63)
9.	8238 − 3529	4709	•	66 (69)
Total score:		9	•	36 (33)
		7–8	•	35 (40)
		5–6	15 (22)	10 (10)
		3–4	39 (38)	14 (10)
		1–2	34 (26)	5 (6)
[Note: Maximum score of 5 for year 4]		0	12 (15)	1 (1)

Commentary:

Year 4 students showed difficulty when subtraction required regrouping. Year 8 students were much stronger at the basics but had some difficulty with more complex problems. There was a slight decline at year 8 level from 2001 to 2005, and a more substantial decline at year 4 level.

Trend Task:

Maths Helper

Approach:	One to one	**Year:**	4 & 8
Focus:	Demonstrating understanding of number operations		
Resources:	7 cards, packet of 25 wooden cubes		

Questions / instructions:

Let's imagine that you have been chosen to be a maths helper in your classroom.

I'll ask the questions, and you can try to explain how the maths works. You will need to say more than "yes" or "no" — to help others to understand. Use the cubes to help show what you mean.

Encourage the student to use the cubes and explain answers, rather than just saying yes, no or maybe.

Show cards 1a and 1b.

4 + 2   2 + 4

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
1. Is 4 plus 2 the same as 2 plus 4? Show me using the cubes.	98 (99)	98 (98)
PROMPT: *Can you explain that a bit more to me?*		
Demonstration:		
demonstrated using cubes	86 (80)	87 (87)
no demonstration but valid argument	7 (5)	8 (9)

Show cards 2a and 2b.

4 – 2   2 – 4

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
2. What about 4 minus 2 and 2 minus 4? Are they the same? Show me using the cubes.	60 (63)	80 (82)
PROMPT: *Can you explain that a bit more to me?*		
Demonstration:		
demonstrated using cubes	39 (46)	63 (58)
no demonstration but valid argument	4 (3)	4 (5)

Show cards 3a and 3b.

3 × 4   4 × 3

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
3. Does 3 times 4 give the same answer as 4 times 3? Show me using the cubes.	87 (85)	96 (99)
PROMPT: *Can you explain that a bit more to me?*		
Demonstration:		
demonstrated by rearranging cubes and arguing no difference	16 (16)	30 (42)
demonstrated by making two seperate arrangements and counting	26 (26)	34 (29)

Show card 4. Note — cubes are not used for these questions.

Place card with "8" on it in front of the student.

8

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
YEAR 4 ONLY:		
4. Is there a number you can add to 8, yet the 8 still stays the same? If you know, tell me what it is.		
gave 0 - number used in addition	53 (56)	•
5. Is there a number you can take away from 8, yet the 8 still stays the same? If you know, tell me what it is.		
gave 0 – number used in subtraction	56 (55)	•
6. Is there a number you can multiply (or times) 8 by, yet it still stays the same? If you know, tell me what it is.		
gave 1 – number used in multiplication	43 (45)	•
YEAR 8 ONLY:		
4. Is there a number you can add to, or take away from 8, yet the 8 still stays the same? If you know, tell me what it is.		
gave 0 – number used in addition or subtraction	•	73 (64)
5. What about multiplying or dividing? Is there a number you can multiply (or times) 8 by, or divide it by, so that the number stays the same? If you know, tell me what it is.		
gave 1 – number used in multiplication or division	•	74 (73)

Total score:		year 4	year 8
	10–12	22 (22)	35 (35)
	8–9	25 (22)	33 (36)
	6–7	27 (31)	20 (17)
	4–5	18 (17)	9 (9)
	2–3	8 (7)	2 (2)
[Note: Maximum score of 11 for year 8]	0–1	1 (1)	0 (0)

Commentary:

Students demonstrated a basic understanding of equivalency. Performance from 2001 to 2005 was stable.

Trend Task: Page of Stamps

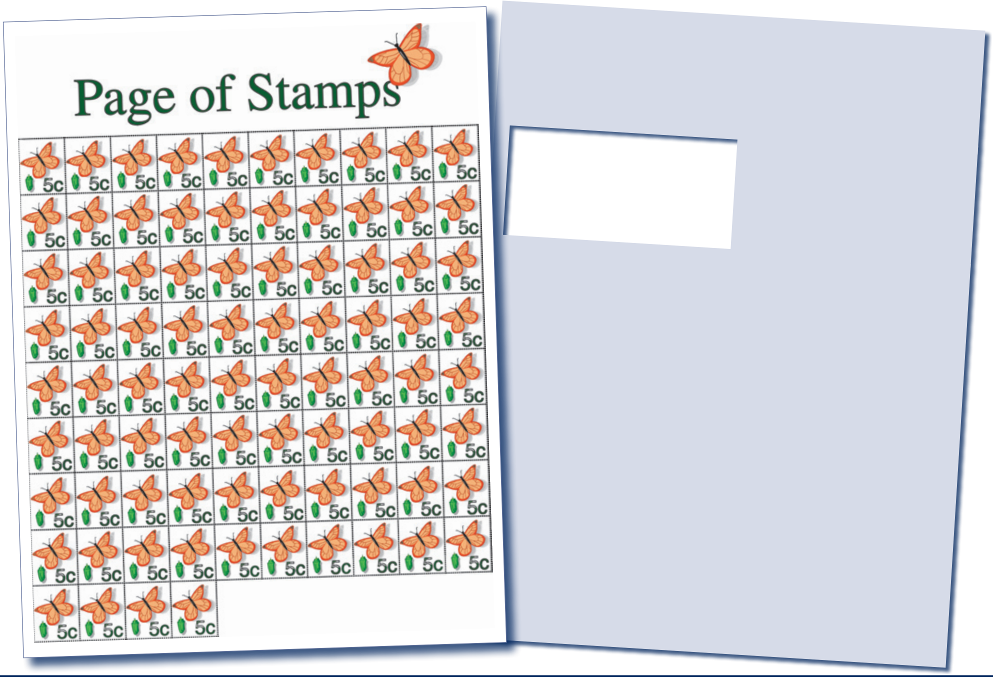
Approach:	One to one	Year:	4 & 8
Focus:	Estimating and calculating		
Resources:	Page of 5c stamps, guide sheet		

NEMP Access Task

Questions / instructions:

I'm going to show you a page of stamps. I want you to have a quick look at it, then tell me about how many stamps are on the page.

Show the page of stamps for 3 seconds (count silently to yourself: one higgledy piggledy, two higgledy piggledy, three higgledy piggledy), then turn the page face down.



		% response 2005 ('01) year 4	% response 2005 ('01) year 8
1. About how many stamps were on the sheet?	60 –110	57 (46)	72 (65)
Now I'll give you a longer look at the page of stamps, so that you can check your estimate. Then you can tell me again how many stamps are on the sheet. But please don't try to count every stamp. Try to think of a quicker way to work it out.			
Show sheet of stamps, and allow about half a minute.			
2. Now how many stamps do you think are on the page?	84	51 (42)	76 (68)
3. How did you work that out?			
	counted in rows of 10, then added or subtracted the balance	23 (16)	9 (5)
	counted across (10), counted down (9), multiplied (90), subtracted 6 (84).	2 (0)	5 (9)
	counted across (10), counted down to last complete row(8), multiplied (80), added 4 (84)	33 (29)	67 (64)
	counted across (10), counted down (9), multiplied (90), didn't correct for incomplete row	3 (1)	4 (4)
	tried to count all, or counted part way and estimated balance	5 (8)	1 (1)

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Place the guide sheet over the page of stamps so that 5 x 2 stamps are shown.			
4. Explain to me how you would work out how much it would cost to buy this number of stamps. Don't tell me how much yet. Just tell me how you would work out the cost.			
	added 5 cents for each stamp	47 (55)	21 (15)
	found number of stamps by counting, multiplied by 5	6 (7)	23 (24)
	found number of stamps by multiplication, multiplied by 5	3 (3)	18 (23)
	found cost of row then doubled	11 (3)	16 (11)
	found cost of column then added or multiplied by 5	19 (7)	14 (16)
Allow time.			
5. Now tell me how much it would cost to buy this number of stamps.	50c	80 (72)	93 (93)
Total score:	5	27 (21)	53 (46)
	4	24 (20)	24 (27)
	2–3	21 (29)	15 (15)
	0–1	27 (30)	9 (12)

Commentary:

Students showed moderate levels of success at this task, with solid increases from year 4 to year 8. There were moderate gains in performance from 2001 to 2005.

Trend Task: Digits

Approach:	One to one	Year:	4 & 8
Focus:	Ordering and reading numbers		
Resources:	Digit cards (3, 5, 8, 1), decimal point card, recording book		

Questions / instructions:

Questions / instructions		% response 2005 ('01) year 4	year 8
In this activity we are going to be using 3, 5, 8 and 1.			
Put digit cards (3, 5, 8, 1) in front of student.			
1. Use these 4 cards to make the biggest number you can.	8 5 3 1	83 (79)	98 (97)
Record the number the student makes.			
2. Read your number to me.	read correctly with all usual place values	73 (67)	97 (91)
3. Now use the 4 cards to make the smallest number you can.	1 3 5 8	84 (79)	97 (95)
Record the number the student makes.			
4. Read your number to me.	read correctly with all usual place values	74 (69)	97 (92)
YEAR 8 ONLY:			
Put the decimal point card in front of the student.			
5. Now use this decimal point card and the other 4 cards. Make the biggest number you can, with only one number after the decimal point.	8 5 3 . 1	•	79 (80)
Record the number the student makes.			
6. Read your number to me.	read correctly with all usual place values plus "point"	•	87 (76)
7. Now use the 5 cards to make the smallest number you can with two numbers after the decimal point.	1 3 . 5 8	•	79 (76)
Record the number the student makes.			
8. Read your number to me.	read correctly with all usual place values plus "point"	•	63 (50)
Total score:	18	•	46 (29)
	15–17	•	38 (47)
	12–14	•	10 (14)
	9–11	•	3 (8)
	6–8	73 (71)	2 (1)
	3–5	15 (14)	1 (0)
[Note: Maximum score of 8 for year 4]	0–2	12 (15)	0 (0)

Commentary:

Overall, students performed quite well on this task. Year 8 students displayed a solid command of the use of decimals. Gains from 2001 to 2005 were seen, particularly at year 8 level.

Trend Task: 12 Bears

Approach:	One to one	Year:	4 & 8
Focus:	Understanding fractions		
Resources:	Packet of 12 bears, recording book		

Questions / instructions:

Questions / instructions		% response 2005 ('01) year 4	year 8
Place 12 bears on the table.			
1. Here are 12 bears. You can have half of them. Show me, and tell me, how many bears that is. **Record student response.**	6	97 (97)	99 (100)
Place 12 bears on the table.			
2. Here are the 12 bears again. This time you can have one third of them. Show me, and tell me, how many bears that is. **Record student response.**	4	38 (25)	73 (66)
Place 12 bears on the table.			
3. Here are the 12 bears again. This time you can have two thirds of them. Show me, and tell me, how many bears that is. **Record student response.**	8	21 (15)	65 (54)
Put the bears to the side.			
4. Imagine there were 20 bears, and you could have one quarter of them. How many bears would that be? **Record student response.**	5	51 (51)	88 (83)
5. Imagine there were 20 bears, and you could have three quarters of them. How many bears would that be? **Record student response.**	15	38 (42)	81 (73)
Total score:	5	15 (10)	59 (48)
	4	6 (5)	10 (10)
	3	23 (29)	17 (22)
	2	22 (19)	7 (10)
	1	32 (35)	8 (10)
	0	2 (2)	0 (0)

Commentary:

Students at year 8 level showed a strong command of these concepts, whereas year 4 students had difficulty with all but the simplest components of the task. Large gains were seen from year 4 to year 8, with solid gains from 2001 to 2005.

Trend Task: 9 x 7

Approach:	One to one	**Year:**	4 & 8
Focus:	Multiplication strategies		
Resources:	2 equation cards		

Questions / instructions:	% response 2005 ('01) year 4	year 8
Place card 1 (9 x 7) in front of the student. Suppose that I couldn't remember that 9 x 7 is 63. Explain to me how I could figure it out if I didn't have something like a calculator to help me.		
no appropriate response	34 (33)	12 (14)
added seven 9s together	16 (15)	13 (20)
added nine 7s together	18 (24)	13 (21)
multiplied 10 by 7, got 70, subtracted one 7, got 63	8 (4)	14 (7)
mulitplied 9 by 10, got 90, took away 9 by 3, got 63	2 (1)	2 (1)
finger process *(explained adequately)*	7 (9)	25 (19)
went through times table, got to nearest response, then added or subtracted 7s as required	3 (4)	7 (7)
chanted times table, hoped it jogged memory	2 (2)	2 (2)
tried to remember it the other way around	4 (3)	3 (2)
any other valid response	6 (5)	10 (7)
Place card 2 (19 x 7) in front of the student. Explain to me how you would figure out 19 x 7 if you didn't have something like a calculator to help you.		
no appropriate response	55 (53)	30 (30)
added 19 seven times	12 (18)	10 (16)
added 7 nineteen times	10 (16)	4 (8)
multiplied 20 by 7, got 140, subtracted one 7, got 133	5 (2)	15 (6)
noted that 9 x 7 is 63 added 10 x 7 is 70, got 133	14 (6)	24 (20)
finger process *(explained adequately)*	1 (0)	0 (0)
normal multiplication algorithm *(clearly explained)*	2 (3)	15 (18)
any other valid response	2 (3)	3 (2)
Total score: 6	6 (2)	11 (5)
5	0 (1)	3 (3)
4	11 (6)	25 (18)
3	8 (6)	18 (16)
2	22 (33)	18 (29)
1	24 (23)	20 (20)
0	29 (29)	6 (9)

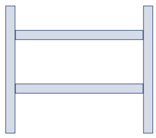
Commentary:

Both year 4 and year 8 students in 2005 were more likely to employ effective approaches such as noticing patterns in numbers than the 2001 cohort.

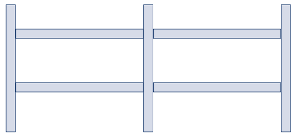
Trend Task: Fence

Approach:	Stations	**Year:**	4 & 8
Focus:	Using algebraic reasoning to solve problems		
Resources:	16 fence sticks		

With 4 sticks I can make this fence section:



With 7 sticks I can make a fence with 2 sections:



Questions / instructions:	% response 2005 ('01) year 4	year 8
1. Use the sticks to make a fence with 4 sections. Draw the fence here.		
correctly drawn with 4 sections *(5 verticals)*	57 (64)	87 (84)
YEAR 8 ONLY:		
2. Write a rule for this pattern.		
number of sticks = 3x + 1 *(any letter, any order)*	•	5 (3)
rule for number of sticks described in words clearly	•	10 (9)
other valid rule *(e.g. 1 more post than number of sections)*	•	17 (20)
3. How many rails would be needed to make a fence with 10 sections? 31	•	27 (30)
4. How many rails would be needed to make a fence with 100 sections? 301	•	14 (17)
Total score: 6	•	4 (2)
5	•	4 (5)
4	•	6 (8)
3	•	10 (11)
2	•	16 (18)
1	•	50 (44)
0	•	10 (13)

Commentary:

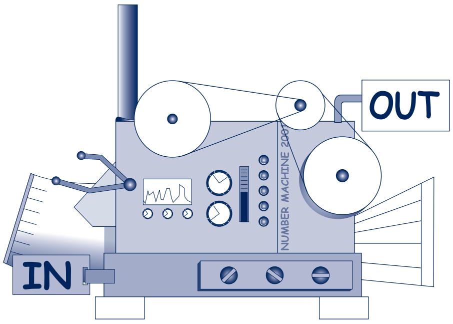
Just over half of the year 4 students could construct the fence as requested. This increased to 87 percent at year 8, but few of the year 8 students could provide an adequate rule for the process or calculate more difficult tasks. 2001 and 2005 results were similar.

Approach:	Independent	Year:	4 & 8
Focus:	Basic algebra and patterns		
Resources:	Answer booklet		

NEMP Access Task

Questions / instructions:

This is a machine that changes numbers.

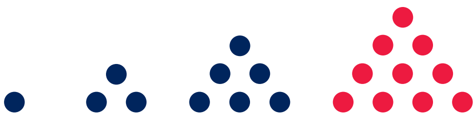


It multiplies the number you put in by 3, and then adds 2 more. So, if you put in 4, it puts out 14.

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
1. If you put in a 5, what number will the machine put out?	17	19 (20)	83 (75)
2. If you put in a 10, what number will the machine put out?	32	20 (18)	81 (74)
YEAR 8 ONLY:			
3. If you got out a 41, what number was put in?	13	•	43 (32)
4 If "X" is the number put into the machine, and "Y" is the number coming out, write down a formula which will give the value of "Y" whatever the value of "X".	y = 3x + 2	•	22 (3)
	or equivalent	•	5 (21)

YEAR 4 ONLY:

3. Make the next triangle and write the number under it.



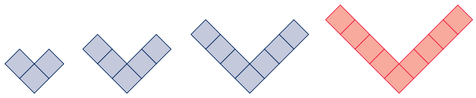
1 3 6 10

	year 4	year 8
drawing and number correct	36 (28)	
one correct, but other omitted	10 (12)	

4. Which number is equal to 3 tens plus 5 tens?

		year 4	year 8
A 8			
B 80	B	76 (67)	
C 180			
D 1800			

5. How many blocks will be needed to make the next shape in this pattern?



		% response 2005 ('01) year 4	% response 2005 ('01) year 8
	9	57 (52)	

YEAR 4 & 8:
[question 5 for Year 8]

6. The Jones Kids

		year 4	year 8
What is the smallest number of children in the Jones family if each child has at least one brother and at least one sister?	4	23 (19)	37 (38)

Total score:		year 4	year 8
	7	3 (1)	•
	6	5 (4)	7 (1)
	5	10 (8)	11 (7)
	4	17 (13)	17 (17)
	3	16 (18)	26 (28)
	2	22 (20)	21 (22)
	1	19 (21)	6 (7)
[Note: Maximum score of 6 for year 8]	0	9 (14)	12 (18)

Commentary:

Year 8 students were able to handle the calculations based on an algebraic system but had difficulty in generating the underlying equation. Year 4 students had trouble with most of the questions here. Progress was seen for both year 4 and year 8 from 2001 to 2005.

Trend Task: Number Patterns

Approach: Independent | **Year:** 4 & 8
Focus: Assessing numbers in sequence
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

In this activity you are going to complete some number patterns.

Here is an example:

2, 4, 6, 8, ☐, ☐.

The next two numbers are 10 and 12.

The numbers are getting larger by 2.

Write down the missing numbers in each of these patterns:

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
1. 1, 4, 7, 10, ☐, ☐.			
13 and 16:	both correct	68 (62)	95 (91)
	one correct in the right place	5 (6)	2 (3)
2. ☐, ☐, 4, 8, 16, 32.			
1 and 2:	both correct	25 (22)	73 (67)
	one correct in the right place	21 (27)	12 (12)
3. 2, 3, 5, 8, 12, 17, ☐, ☐.			
23 and 30:	both correct	22 (21)	68 (61)
	one correct in the right place	5 (6)	7 (7)
4. ☐, ☐, 13, 10, 7, 4, 1.			
19 and 16:	both correct	44 (44)	85 (78)
	one correct in the right place	5 (5)	3 (4)
5. 2, 3, 6, 11, 18, 27, ☐, ☐.			
38 and 51:	both correct	6 (3)	35 (32)
	one correct in the right place	4 (6)	14 (15)
Total score:	10	3 (2)	27 (23)
	8–9	7 (8)	34 (32)
	6–7	18 (16)	22 (19)
	4–5	21 (21)	8 (13)
	2–3	28 (31)	7 (10)
	0–1	22 (23)	1 (4)

Commentary:

Year 8 students were able to detect all but the most difficult patterns. Many year 4 students had trouble with all but the simplest patterns. There was moderate growth seen between 2001 and 2005 at year 8 level but not at year 4 level.

Trend Task: Number A (Y4)

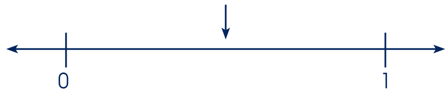
Approach: Independent | **Year:** 4
Focus: Understanding number and number operations
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

		% response 2005 ('01) year 4	year 8
Add one hundred			
1. 700	800	84 (87)	
2. 15 735	15 835	56 (48)	
Multiply by one hundred			
3. 12	1200	17 (29)	
4. 316	31 600	8 (12)	

5.



What fraction is shown by the arrow on the line? — $\frac{1}{2}$ — 31 (27)

any other fraction between 0.45 and 0.55 *(exclud. $\frac{1}{2}$)* — 2 (12)

6. The number that is 4 less than 500 is... — 496 — 46 (41)

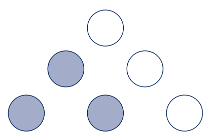
7. How much is shaded?

A $\frac{1}{2}$

B $\frac{2}{6}$

C $\frac{4}{6}$

D $\frac{4}{2}$



A — 68 (61)

8. The chart shows…

A $\frac{2}{3}$ of the days are rainy

B $\frac{1}{2}$ of the days are rainy

C $\frac{3}{5}$ of the days are rainy

D $\frac{2}{5}$ of the days are rainy — D — 41 (38)

Total score:		year 4
	8–9	7 (7)
	6–7	19 (18)
	4–5	25 (26)
	2–3	31 (29)
	0–1	18 (19)

[Year 8 version on adjacent page.]

Commentary:

Performance on these questions varied widely, especially for year 4 students. While 86 percent of the year 4 students could successfully add 100 to 800, only one third could estimate a fraction represented on a number line. No gains were seen between 2001 and 2005.

Trend Task:

Number A (Y8)

Approach: Independent **Year:** 8

Focus: Understanding number and number operations

Resources: Answer booklet

NEMP Access Task

Questions / instructions:

% response 2005 ('01) year 8

Add one hundred

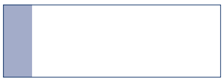
		year 8
1. 700	800	94 (97)
2. 15 735	15 835	92 (88)
3. 23 940	24 040	77 (73)

Multiply by one hundred

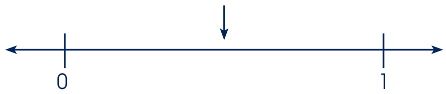
		year 8
4. 12	1200	62 (66)
5. 316	31 600	53 (57)
6. 5.3	530	34 (29)

7. Which number best describes the amount of the box shaded?

A 0.02
B 0.12 — B — 58 (51)
C 0.30
D 0.32
E 0.52



8.



Estimate the decimal shown by the arrow on the number line. — 0.5 — 60 (57)

0.45 - 0.55 *(exclud. 0.5)* — 5 (7)

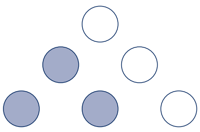
9. The number that is 4 less than 34,000 is … — 33 996 — 65 (58)

10. Without working them out, which is the greatest number?

A 29 + 0.8
B 29 × 0.8 — ✘ B — [68 (77)]
C 29 ÷ 0.8 — ✔ C — 7 (5)
D 29 – 0.8

11. How much is shaded?

A $\frac{1}{2}$ — A — 86 (84)
B $\frac{2}{6}$
C $\frac{4}{6}$
D $\frac{4}{2}$



12. Without working out answers, choose the answer that represents the larger amount.

A 145 × 4
B 144 + 146 + 148 + 150 — B — 67 (70)
C 140 + 142 + 144 + 150
D 140 + 142 + 148 + 150

% response 2005 ('01) year 8

13. The chart shows…

A $\frac{2}{3}$ of the days are rainy
B $\frac{1}{2}$ of the days are rainy
C $\frac{3}{5}$ of the days are rainy
D $\frac{2}{5}$ of the days are rainy — D — 82 (75)

14. What is another name for $\frac{15}{4}$?

A $4\frac{1}{5}$ — ✘ A — [31 (38)]
B $2\frac{1}{4}$
C $7\frac{4}{5}$
D $3\frac{3}{4}$ — ✔ D — 46 (39)

15. Write this number as a decimal.

$4\frac{2}{10}$ — 4.2 — 50 (44)

Total score:		year 8
	15–16	12 (5)
	13–14	15 (21)
	11–12	20 (21)
	9–10	20 (18)
	7–8	15 (12)
	5–6	10 (11)
	0–4	8 (11)

Commentary:

Performance at year 8 level showed substantial improvement over year 4 (see p20), particularly in those questions involving calculation. Modest gains were seen between 2001 and 2005.

Trend Task: Beans

Approach:	One to one	Year:	8
Focus:	Explaining how to solve subtraction problems, with and without counters		
Resources:	4 film canisters filled with 10 beans in each, subtraction card		

Questions / instructions:

% response 2005 ('01) year 8

Show student subtraction card *(35 take away 19).*

This activity is called **Beans**. I'm going to ask you to explain how you would work out an answer. I don't need to know the answer. I need to know how you would work it out.

1. This card says 35 take away 19.

   Tell me how you could work this out.

	year 8
sophisticated strategy, such as changing problem to 36–20	43 (16)
conventional subtraction problem	20 (42)
counting process, such as adding on or using counters	11 (16)
no satisfactory explanation	26 (25)

Put containers of beans in front of the student.

2. Here are 4 containers, each with 10 beans. Show me, and tell me, how you would work out 35 take away 19 using the beans.

	year 8
strategy made good use of fact that beans came in 10s	25 (16)
strategy in which five beans were removed, then 19, then all remaining beans were counted	29 (62)
strategy in which all beans were tipped out, then 35 counted, then 19 removed, then remaining beans counted	13 (0)
no statisfying explanation	33 (22)

Commentary:

In comparing performance in 2001 to 2005, year 8 students were clearly moving away from counting and conventional strategies toward more sophisticated strategies.

Trend Task: Flies at the Barbecue

Approach:	Independent	Year:	8
Focus:	Solving an algebraic word problem		
Resources:	Answer booklet		

NEMP Access Task

Questions / instructions:

% response 2005 ('01) year 8

At a family barbecue 1 fly arrives in the 1st minute after the meat is put on the barbecue. In the 2nd minute 3 more flies arrive. In the 3rd minute 5 more flies arrive. In the 4th minute 7 more flies arrive. This pattern continues for the whole barbecue.

1. How many **more flies** arrive in the 10th minute?

   Show how you work out your answer.

	year 8
19	52 (46)
Working out: *(method, not accuracy)*	
rule identified *(2n-1)* or equivalent	4 (2)
adding 2 repeatedly	52 (47)
other appropriate method	8 (10)

2. What is the **total number of flies** at the barbecue after 10 minutes?

   Show how you work out your answer.

	year 8
100	26 (18)
Working out: *(method, not accuracy)*	
rule identified *(n2)* or equivalent	0 (0)
adding the 10 numbers	23 (22)
other appropriate method	6 (9)

3. How many **more flies** arrive in the 50th minute?

   Show how you work out your answer.

	year 8
99	15 (9)
Working out: *(method, not accuracy)*	
rule identified *(2n-1)* or equivalent	5 (3)
adding 2 repeatedly	6 (4)
other appropriate method	7 (8)

Total score:		year 8
	7–8	3 (2)
	5–6	9 (8)
	3–4	21 (20)
	1–2	42 (37)
	0	25 (34)

Commentary:

This was a difficult algebra word problem, especially questions 2 and 3. Students in 2005 showed a moderate increase in solving these problems over the 2001 cohort.

Trend Task: Numbers on Lines

Approach:	Independent	Year:	8
Focus:	Identifying numbers, especially decimals, on a number line		
Resources:	Answer booklet		

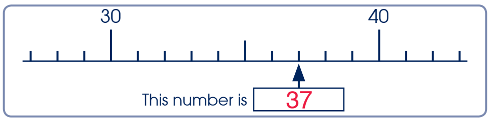
NEMP Access Task

Questions / instructions:

% response 2005 ('01) year 8

Write the answers in the boxes

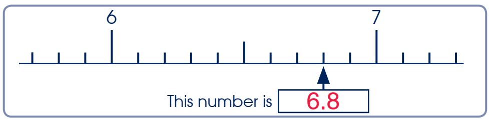
1.



91 (84)

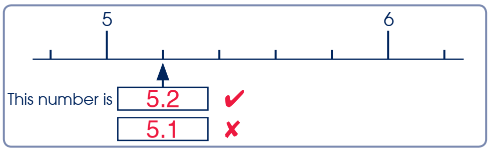
Give the next answers as decimals

2.



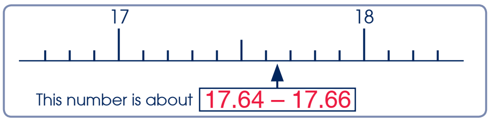
86 (86)

3.



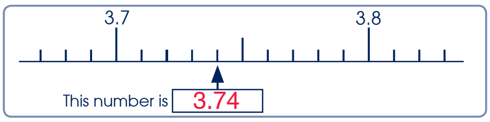
51 (53)
[35 (33)]

4.



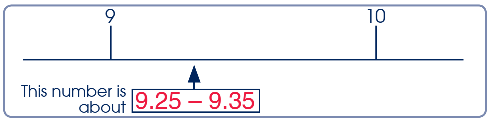
50 (41)

5.



66 (52)

6.



61 (54)

Total score:		year 8
	6	24 (19)
	5	22 (20)
	3–4	36 (33)
	0–2	19 (28)

Commentary:

Students were very good at placing whole numbers on lines and determining simple decimals. They were somewhat less able with more complex problems. Solid gains were seen from 2001 to 2005.

Task: Tangram

Approach:	One to one	Year:	4 & 8
Focus:	Fractions of a whole		
Resources:	Tangram puzzle		

Questions / instructions:

Hand student the tangram.

Here is a puzzle called a tangram.

It is a square made up of 7 pieces.

As I point to different pieces, decide what fraction of the whole tangram that piece is. You can take the pieces out and move them around if you want to.

		% responses y4	y8
Point to red piece.			
1. What fraction of the whole tangram is this red piece?	$\frac{1}{4}$	38	77
2. How do you know that?	clear explanation	19	54
	some explanation	15	20
	vague or no explanation	65	26
Point to blue piece.			
3. What fraction of the whole tangram is this blue piece?	$\frac{1}{8}$	6	35
4. How do you know that?	clear explanation	2	23
	some explanation	4	11
	vague or no explanation	94	66
YEAR 8 ONLY:			
Point to green piece.			
5. What fraction of the whole tangram is this green piece?	$\frac{1}{16}$	•	32
6. How do you know that?	clear explanation	•	21
	some explanation	•	9
	vague or no explanation	•	70
Total score:	9	•	16
	7–8	•	9
	5–6	3	11
	3–4	19	25
	1–2	16	17
[Note: Maximum score of 6 for year 4]	0	62	22

Commentary:

Students had difficulty in estimating fractions in this visual task. They were not strong at explaining their approach. Substantial growth was seen, however, from year 4 to year 8.

Task: What's My Number?

Approach: One to one | **Year:** 4 & 8
Focus: Verifying and proving
Resources: 3 cards

Questions / instructions:

I am going to show you some cards with numbers that are missing.

Hand student card 1.

Card 1: $6 = 4 + \_\_$

One child thinks that the missing number is 10.

		% responses y4	% responses y8
1. Do you think that child is correct?	no	60	90
2. Why do you say that?	10 + 4 = 14	17	35
	4 + 2 = 6	26	45
	any other valid reason	10	10

Hand student card 2.

Card 2: $6 + 2 = \_\_ + 5$

		% responses y4	% responses y8
3. What is the missing number?	3	11	54
4. Why do you say that?	6 + 2 = 8 and 3 + 5 = 8	9	48
	any other valid response	2	8

YEAR 8 ONLY:

Hand student card 3.

Card 3: $3 + \_\_ = \_\_ + 6$

		% responses y4	% responses y8
5. What do you think the missing numbers could be?	valid pair of numbers such as (3, 0) or (4, 1)	•	59
6. Could you have any other numbers?	yes	•	69
7. Why do you say that?	clear generalisation showing that the second number must always be 3 less than the first missing number	•	7
	explanation based on specific examples	•	24
	some explanation given but not clear	•	25
	any other response	•	44

Total score	% responses y4	% responses y8
8	•	7
6–7	•	39
4–5	9	17
2–3	44	30
0–1	47	8

[Note: Maximum score of 4 for year 4]

Commentary:

Students at year 8 level were quite proficient with the simpler questions and over half could handle the more complex ones. The task was more difficult for the year 4 students.

Task: Fractions

Approach: Independent | **Year:** 4 & 8
Focus: Calculations with fractions
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

Write your answers to the fraction problems in the boxes.

Question	Answer	% responses y4	% responses y8
1. $\frac{3}{7} + \frac{1}{7} =$	$\frac{4}{7}$	17	58
2. $\frac{1}{2} + \frac{1}{2} =$	1	16	54
	$\frac{2}{2}$	12	15
3. $\frac{3}{4} + \frac{3}{4} =$	$1\frac{1}{2}$	2	23
	$1\frac{2}{4}$	2	11
	$\frac{6}{4}$	9	14
4. $\frac{1}{2} + \frac{1}{4} =$	$\frac{3}{4}$	7	42
5. $2\frac{1}{5} + 1\frac{1}{5} =$	$3\frac{2}{5}$	7	44
6. $1 - \frac{1}{3} =$	$\frac{2}{3}$	7	45
YEAR 8 ONLY: 7. $1\frac{1}{4} - \frac{1}{2} =$	$\frac{3}{4}$	•	39
8. $2 \times \frac{1}{2} =$	1	•	46
	$\frac{2}{2}$	•	7
9. $\frac{1}{4} \times \frac{1}{2} =$	$\frac{1}{8}$	•	22
10. $3 \times 2\frac{1}{3} =$	7	•	24
	$\frac{21}{3}$	•	2
11. $\frac{1}{4} \div 2 =$	$\frac{1}{8}$	•	22
12. $2 \div \frac{1}{2} =$	4	•	12
13. $1\frac{1}{3} \div \frac{1}{3} =$	4	•	13

Total score	% responses y4	% responses y8
16–18	•	6
13–15	•	14
10–12	•	14
7–9	2	14
4–6	6	14
1–3	24	21
0	67	17

[Note: Maximum score of 9 for year 4]

Commentary:

Year 4 students generally did not know how to solve fraction problems. There was substantial growth seen at year 8 level but the more difficult problems were challenging to the year 8 students.

Task: Problems (Y4)

Approach: One to one **Year:** 4
Focus: Number strategy
Resources: 4 problem cards, recording book

NEMP Access Task

Questions / instructions:

Follow the number problems as I read them to you. You can write in the recording book to help you work them out if you want.

Hand recording book and pencil to the student.

Hand and read card 1 to the student.

> Hoani and Jane each have $5 and Kelsey has $8. How much money have they got altogether?

Question	Response	% responses y4
1. What is your answer to this problem?	✔ $18	31
	✘ $13	[56]
2. Tell me how you worked it out.	combination of methods	11
	addition	84
	subtraction	0
	multiplication	1
	division	1
	strategy showing how numbers were combined	51

Hand and read card 2 to the student.

> Akila earns $6 a week cleaning cars after school. How much will he earn in 4 weeks?

Question	Response	% responses y4
3. What is your answer to this problem?	$24	68
4. Tell me how you worked it out.	combination of methods	9
	addition	54
	subtraction	0
	multiplication	25
	division	12
	strategy showing how numbers were combined	35

Hand and read card 3 to the student.

> Tom has $25. He spends $6 at the movies. How much does he have left?

Question	Response	% responses y4
5. What is your answer to this problem?	19	82
6. Tell me how you worked it out.	combination of methods	3
	addition	2
	subtraction	90
	strategy showing how numbers were combined	51

Hand and read card 4 to the student.

> Jin Ho gave her brother 6 of her stickers. She now has 12. How many stickers did she have to start with?

Question	Response	% responses y4
7. What is your answer to this problem?	18	23
8. Tell me how you worked it out.	combination of methods	6
	addition	74
	subtraction	7
	multiplication	3
	division	1
	strategy showing how numbers were combined	23

Total score:	% responses y4
5	20
4	37
3	22
2	13
1	6
0	2

Commentary:

Students did well at finding the answers involving straightforward story settings, calling clearly for certain calculations. Performance dropped off considerably when the approach to problem solution was not readily apparent.

Task: Problems (Y8)

Approach: One to one **Year:** 8
Focus: Number strategy
Resources: 4 problem cards, recording book

NEMP Access Task

Questions / instructions:

Follow the number problems as I read them to you. You can write in the recording book to help you work them out if you want.

Hand recording book and pencil to the student.

Hand and read card 1 to the student.

> Tim and Jay each have $12 and Sharon has $18. How much money have they got altogether?

Question	Response	% responses y8
1. What is your answer to this problem?	✔ $42	34
	✘ $30	[61]
2. Tell me how you worked it out.	combination of methods	10
	addition	88
	subtraction	0
	multiplication	1
	division	1
	strategy showing how numbers were combined	43

Hand and read card 2 to the student.

> Josh earns $18 a week cleaning cars after school. How much will he earn in 4 weeks?

Question	Response	% responses y8
3. What is your answer to this problem?	$72	73
4. Tell me how you worked it out.	combination of methods	21
	addition	18
	subtraction	0
	multiplication	54
	division	0
	strategy showing how numbers were combined	33

Hand and read card 3 to the student.

> In a fruit salad there are 3 apples for every 4 oranges. If a fruit salad has 9 apples, how many oranges are needed?

Question	Response	% responses y8
5. What is your answer to this problem?	12	61
6. Tell me how you worked it out.	$3 \times 3 = 9$ and $4 \times 3 = 12$	37
	$9 \div 3 = 3$ and $4 \times 3 = 12$	9
	any other valid strategy	14

Hand and read card 4 to the student.

> It takes 10 pizzas to feed 15 people. How many pizzas does it take to feed 21 people?

Question	Response	% responses y8
7. What is your answer to this problem?	14	11
8. Tell me how you worked it out.	10 is $\frac{2}{3}$ of 15 and $\frac{2}{3} \times 21 = 14$	3
	any other valid strategy	7

Total score:	% responses y8
5	4
4	23
3	32
2	26
1	13
0	1

Commentary:

Students were able to complete the simpler problems but had difficulty with problems involving ratios or subtlety in the framing of the problem.

Task: Number Line Game (Y4)

Approach:	Team	Year:	4
Focus:	Fractions, decimals and percentages		
Resources:	2 felt boards, 2 sets of 8 cards, 2 recording sheets		

Questions / instructions:

Put the eight whole number cards in a pile face down on the table. Lie the felt board flat on the floor or desk so that the side marked 15 and 25 is face up.

This is a number line.

Each of you is going to take a card from this pile and put it on the number line where you think it should go. To start, each person puts the card on the number line on their own. Later on you will work together to change some of the cards around.

Have Student 1 (or a confident maths student) start by taking the first card and putting it on the number line. Then have Student 2 place the next card on the number line. Keep going until all the cards are placed.

As a team I want you to discuss if you think all the cards on the number line are all in the right places. If you all agree, you can move the cards to other places on the number line.

When you have decided everything is in the correct place, I'll copy it onto this sheet.

Allow time.

1. Have you got the cards all in the right places?

If you are finished, I'll copy down your number line.

Record on recording sheet 1 where all the cards are placed in their final positions.

Accuracy of placement:

[Note: Scores are based on team responses.]

Card		% responses y4
5	inner zone *(5 – 5.5)*	39
	outer zone *(5 – 6)*	18
	not within zones	42
10	inner zone *(9 – 11)*	76
	outer zone *(8 – 12)*	18
	not within zones	6
12	inner zone *(11 – 13)*	77
	outer zone *(10 – 14)*	22
	not within zones	1
20	inner zone *(19 – 21)*	85
	outer zone *(18 – 22)*	9
	not within zones	7
26	inner zone *(25.5 – 27)*	95
	outer zone *(25 – 28)*	4
	not within zones	1
29	inner zone *(28 – 30)*	73
	outer zone *(27 – 31)*	22
	not within zones	5
30	inner zone *(29 – 31)*	69
	outer zone *(28 – 32)*	25
	not within zones	6
35	inner zone *(34.5 – 35)*	68
	outer zone *(34 – 35)*	13
	not within zones	19

Put the eight fraction cards in a pile face down on the table. Lie the felt board flat on the floor or desk so that the side marked 0, 1 and 2 is face up. Point to the 0, 1 and 2 on the number line.

This is number line between 0 and 2.

Repeat instructions in shaded box adjacent.

2. Have you got the cards all in the right places?

If you are finished, I'll copy down your number line.

Record on recording sheet 2 where all the cards are placed in their final positions.

Accuracy of placement:

Card		% responses y4
$\frac{1}{4}$	inner zone *(0.15 – 0.35)*	32
	outer zone *(0.1 – 0.4)*	5
	not within zones	63
$\frac{1}{3}$	inner zone *(0.25 – 0.4)*	34
	outer zone *(0.2 – 0.45)*	6
	not within zones	61
$\frac{1}{2}$	inner zone *(0.4 – 0.6)*	31
	outer zone *(0.3– 0.7)*	5
	not within zones	64
$\frac{2}{3}$	inner zone *(0.6 – 0.75)*	26
	outer zone *(0.5 – 0.85)*	10
	not within zones	64
$\frac{7}{8}$	inner zone *(0.75 – 0.95)*	30
	outer zone *(0.7 – 1.0)*	1
	not within zones	69
$\frac{2}{2}$	inner zone *(0.95 – 1.05)*	21
	outer zone *(0.9 – 1.1)*	2
	not within zones	77
$1\frac{1}{2}$	inner zone *(1.4 – 1.6)*	41
	outer zone *(1.3 – 1.7)*	8
	not within zones	51
$1\frac{3}{4}$	inner zone *(1.65 – 1.85)*	30
	outer zone *(1.55 – 1.95)*	18
	not within zones	52

Total score:		% responses y4
	26–30	13
	21–25	14
	16–20	46
	11–15	26
	6–10	2
	0–5	0

Commentary:

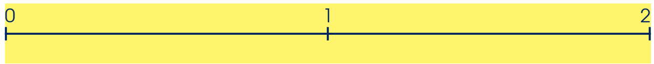
Students were highly accurate with simple placements of whole numbers but had more difficulty with fractions. Some teams were successful across almost all tasks.

Task: Number Line Game (Y8)

Approach: Group **Year:** 8
Focus: Fractions, decimals and percentages
Resources: Felt board, 12 cards, 2 recording sheets

Questions / instructions:

Put the cards in a pile face down on the table.
Lie the felt board flat on the floor or desk.
Point to the 0, 1 and 2 on the number line.



This is a number line between 0 and 2.

Each of you is going to take a card from this pile and put it on the number line where you think it should go.

To start with, each person puts the card on the number line on their own. Later on you will work together to change some of the cards around.

Have Student 1 (or a confident maths student) start by taking the first card and putting it on the number line.

Record on recording sheet 1 where the card is placed.

Then have Student 2 place the next card on the number line. Record on recording sheet 1 where the card is placed.

Keep going until all the cards are placed.

As a team I want you to discuss if you think all the cards on the number line are in the right places. If you all agree, you can move the cards to other places on the number line.

When you have decided everything is in the correct place, I'll copy it onto this sheet.

Allow time.

1. Have you got the cards all in the right places?

If you are finished, I'll copy down your number line.

Record on the recording sheet where all the cards are placed in their final positions.

Accuracy of placement:
[Note: Scores are based on team responses.]

		% responses y8
12.5%	inner zone *(0.05 – 0.2)*	42
	outer zone *(0.0 – 0.3)*	26
	not within zones	33
0.3	inner zone *(0.2 – 0.4)*	52
	outer zone *(0.1 – 0.5)*	28
	not within zones	20
40%	inner zone *(0.3 – 0.5)*	51
	outer zone *(0.4 – 0.6)*	16
	not within zones	33
$\frac{1}{2}$	inner zone *(0.4 – 0.6)*	49
	outer zone *(0.3 – 0.7)*	6
	not within zones	45
$\frac{5}{8}$	inner zone *(0.55 – 0.7)*	29
	outer zone *(0.45 – 0.8)*	12
	not within zones	59
$\frac{2}{3}$	inner zone *(0.55 – 0.75)*	32
	outer zone *(0.5 – 0.85)*	13
	not within zones	56
0.75	inner zone *(0.65 – 0.85)*	69
	outer zone *(0.55 – 0.95)*	14
	not within zones	17
1.2	inner zone *(1.1 – 1.3)*	78
	outer zone *(1.05 – 1.4)*	10
	not within zones	12
125%	inner zone *(1.15 – 1.35)*	73
	outer zone *(1.05 – 1.45)*	11
	not within zones	17
$\frac{3}{2}$	inner zone *(1.4 – 1.6)*	58
	outer zone *(1.3 – 1.7)*	13
	not within zones	28
$1\frac{1}{2}$	inner zone *(1.4 – 1.6)*	88
	outer zone *(1.3 – 1.7)*	9
	not within zones	3
200%	inner zone *(1.9 – 2.1)*	96
	outer zone *(1.8 – 2.1)*	0
	not within zones	4

Total score:	% responses y8
22–24	18
19–21	17
16–18	20
13–15	18
10–12	20
7–9	4
4–6	2
0–3	2

Commentary:

More than half of the teams placed the cards in the inner zones for eight of the 12 task components. Placement of $\frac{5}{8}$ and $\frac{2}{3}$ caused the most difficulty. Some groups were highly accurate across all components. On the placement of $\frac{1}{2}$, many teams thought they were placing $\frac{1}{2}$ of 2, producing an incorrect result.

Task: Another Way

Approach:	Independent	Year:	8
Focus:	Fractions – simplified and mixed		
Resources:	Answer booklet		NEMP Access Task

Questions / instructions:

Look at the fractions. Write down another way they can be written. The first one has been done for you.

	% responses y8
1. $\frac{2}{4}$ is the same as ... $\boxed{\frac{1}{2}}$	
2. $\frac{3}{3}$ is the same as ... $\boxed{1}$	97
appropriate fraction form ($\frac{6}{6}$, $\frac{5}{5}$, *etc)*	28
3. $\frac{5}{2}$ is the same as ... $\boxed{2\frac{1}{2}}$	25
appropriate fraction form ($\frac{15}{6}$, $\frac{10}{4}$, *etc)*	15
4. $2\frac{1}{3}$ is the same as ... $\boxed{2\frac{2}{6}}$ or $\boxed{2\frac{3}{9}}$	10
appropriate fraction form ($\frac{7}{3}$, $\frac{14}{6}$, *etc)*	24
Total score: 6	1
5	18
4	14
3	9
2	20
1	14
0	24

Commentary:

Students had some difficulty with this task, particularly with regard to putting the answer into proper form.

Task: Place It

Approach:	Independent	Year:	8
Focus:	Decimal place value		
Resources:	Answer booklet		NEMP Access Task

Questions / instructions:

Circle the right answer.

1. 0.30 is the same as:
   - **A** 3 ones
   - **B** 3 tens
   - **C** 3 tenths
   - **D** 3 hundredths

2. 0.07 is the same as:
   - **A** 7 ones
   - **B** 7 tens
   - **C** 7 tenths
   - **D** 7 hundredths

		% responses y8
1.	C	58
2.	D	50
Total score:	2	45
	1	18
	0	37

Commentary:

Roughly half of the students were able to identify the correct name for these decimals. For the most part, students could name either both or neither of the decimals.

Task: Equivalents

Approach:	Independent	Year:	8
Focus:	Conversions among fractions, decimals and percentages		
Resources:	Answer booklet		NEMP Access Task

Questions / instructions:

Fill in the empty boxes so that each row has an equivalent percentage and decimal.

The first one is done for you.

Fraction	Percentage	Decimal	% responses y8
$\frac{1}{2}$	50%	0.5	
$\frac{1}{10}$	10%		77
		.1	77
$\frac{1}{3}$	33.33% or $33\frac{1}{3}$%		30
		.333 or .3	45
$\frac{3}{5}$	60%		44
		.6	43
$\frac{3}{3}$	100%		66
		1 *or* 1.0	55
$\frac{5}{4}$	125%		23
		1.25	21

		% responses y8
Total score:	10	13
	8–9	15
	6–7	17
	4–5	15
	2–3	23
	0–1	18

Commentary:

Students were successful on simple conversions such as $\frac{1}{10}$ to 10% or .1 . They had difficulty, however, with conversions such as $\frac{5}{4}$ to 125% or 1.25. Roughly one in eight students got them all correct.

LINK TASK: 1
Approach: One to one
Year: 4 & 8
Focus: Addition, strategy, patterns

Total score:	% responses y4	y8
14–16	4	29
11–13	17	32
8–10	27	26
5–7	29	11
2–4	18	5
0–1	6	1

LINK TASK: 2
Approach: One to one
Year: 4 & 8
Focus: Addition & subtraction of fractions using equipment

Total score:	% responses y4	y8
18–20	•	15
15–17	•	27
12–14	6	18
9–11	14	14
6–8	28	14
3–5	37	9
0–2	15	2

[Note: Maximum score of 12 for year 4]

LINK TASK: 3
Approach: Station
Year: 4 & 8
Focus: Division facts

Total score:	% responses y4	y8
16	0	22
14–15	0	20
12–13	3	13
10–11	5	13
8–9	6	9
6–7	6	8
4–5	15	8
2–3	20	4
0–1	44	3

LINK TASK: 4
Approach: Station
Year: 4 & 8
Focus: Estimation

Total score:	% responses y4	y8
1	53	69
0	47	31

LINK TASK: 5
Approach: Station
Year: 4 & 8
Focus: Placing measurements in order

Total score:	% responses y4	y8
1	75	91
0	25	9

LINK TASK: 6
Approach: Station
Year: 4 & 8
Focus: Patterns – draw, complete table

Total score:	% responses y4	y8
9		4
7–8		21
5–6		23
3–4		31
0–2		22

[Note: No totals at year 4]

LINK TASK: 7
Approach: Station
Year: 4 & 8
Focus: Multiplication

Total score:	% responses y4	y8
1	33	74
0	67	26

LINK TASK: 8
Approach: Station
Year: 4 & 8
Focus: Understanding place values

Total score:	% responses y4	y8
5	64	92
4	0	0
3	12	2
2	3	0
1	17	4
0	4	1

LINK TASK: 9
Approach: Station
Year: 4 & 8
Focus: Subtraction facts

Total score:	% responses y4	y8
16	5	35
14–15	10	30
12–13	18	19
9–11	26	10
6–8	16	4
8–5	13	1
0–2	12	1

LINK TASK: 10
Approach: Independent
Year: 4 & 8
Focus: Addition and subtraction place value

Total score:	% responses y4	y8
8	•	37
7	•	24
6	•	14
5	•	9
4	•	5
3	27	3
2	23	3
1	27	2
0	22	2

[Note: Maximum score of 3 for year 4]

LINK TASK: 11
Approach: Independent
Year: 4 & 8
Focus: Multiplying without a calculator

Total score:	y4	Total score:	y8
8	18	14	19
6–7	23	12–13	28
4–5	21	10–11	15
2–3	18	8–9	9
0–1	21	6–7	8
		4–5	4
		2–3	10
		0–1	6

[Note: Year 4 & year 8 tasks are not the same.]

LINK TASK: 12
Approach: One to one
Year: 4
Focus: Fractions of an amount

Total score:	% responses y4	y8
4	14	
3	16	
2	29	
1	26	
0	15	

LINK TASK: 13		% responses y4	y8
Approach:	One to one		
Year:	4		
Focus:	Computation strategies		
Total score:	5	36	
	4	8	
	3	3	
	2	14	
	1	6	
	0	32	

LINK TASK: 14		y4	y8
Approach:	Independent		
Year:	4		
Focus:	Adding without a calculator		
Total score:	8	54	
	6–7	5	
	4–5	23	
	2–3	1	
	0–1	10	

LINK TASK: 15		y4	y8
Approach:	Independent		
Year:	4		
Focus:	Doubling fractions and whole numbers		
Total score:	5–6	7	
	3–4	17	
	1–2	48	
	0	28	

LINK TASK: 16		y4	y8
Approach:	One to one		
Year:	8		
Focus:	Verifying and proving		
Total score:	5		21
	4		24
	3		13
	2		0
	1		19
	0		22

LINK TASK: 17		y4	y8
Approach:	One to one		
Year:	8		
Focus:	Fractions of an amount		
Total score:	4		36
	3		17
	2		19
	1		16
	0		11

LINK TASK: 18		y4	y8
Approach:	One to one		
Year:	8		
Focus:	Computation strategies		
Total score:	5		43
	4		16
	3		3
	2		20
	1		5
	0		13

LINK TASK: 19		% responses y4	y8
Approach:	One to one		
Year:	8		
Focus:	Understanding fractions		
Total score:	8–9		22
	6–7		22
	4–5		18
	2–3		23
	0–1		15

LINK TASK: 20		y4	y8
Approach:	Station		
Year:	8		
Focus:	Deriving rules		
Total score:	9–10		6
	7–8		8
	5–6		11
	3–4		24
	1–2		42
	0		10

LINK TASK: 21		y4	y8
Approach:	Station		
Year:	8		
Focus:	Problem solving: addition, multiplication, division		
Total score:	5		14
	4		19
	3		25
	2		18
	1		16
	0		9

LINK TASK: 22		y4	y8
Approach:	Independent		
Year:	8		
Focus:	Adding without a calculator		
Total score:	10		43
	8–9		35
	6–7		12
	4–5		6
	2–3		2
	0–1		2

LINK TASK: 23		y4	y8
Approach:	Independent		
Year:	8		
Focus:	Doubling fractions and whole numbers		
Total score:	5–6		30
	3–4		38
	1–2		23
	0		8

LINK TASK: 24		y4	y8
Approach:	Independent		
Year:	8		
Focus:	Estimation		
Total score:	4		18
	3		23
	2		36
	1		14
	0		9

Measurement 4

The assessments included 27 tasks investigating students' understandings, processes and skills in the area of measurement. Measurement includes knowledge, understanding and use of systems of measurement, the use of measurement apparatus, and processes of predicting, calculating and recording. This chapter includes tasks relating to money.

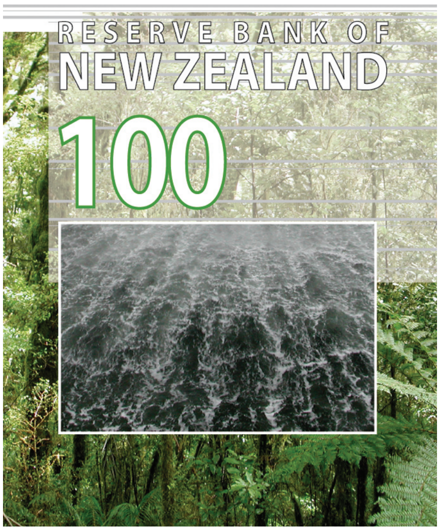
Nine tasks were identical for both year 4 and year 8. Six tasks had overlapping versions for year 4 and year 8 students, with some parts common to both levels. Two tasks were attempted by year 4 students only, and nine tasks by year 8 only. Eleven tasks are trend tasks (fully described with data for 2001 and 2005), four are released tasks (fully described with data for 2005 only) and 12 are link tasks (to be used again in 2009, so only partially described here).

The tasks are presented in three sections: trend tasks, then released tasks, and finally link tasks. Within each section, tasks attempted (in whole or part) by both year 4 and year 8 students are presented first, followed by parallel tasks, then tasks attempted by year 8 only.

Averaged across 79 task components administered to both year 4 and year 8 students, 28.9 percent more year 8 than year 4 students succeeded with these components. Year 8 students performed better on 78 of 79 components. As expected, the differences were larger on more difficult tasks that allow for more room for growth. These were often tasks that year 4 students had not had much opportunity to learn in school.

There was little evidence of change between 2001 and 2005. Averaged across 53 trend task components attempted by year 4 students in both years, slightly less than one percent more students succeeded in 2005 than in 2001. Gains occurred on 28 of the 53 components. At the year 8 level, with 65 task components included, again there was a slightly less than one percent gain from 2001 to 2005. Gains occurred on 29 of 65 components.

The measurement tasks represented a broad range of skills related to the processes and applications of making and using measurements. There were some problems in performance with basic measurement tasks, especially for year 4. However, student performance was uniformly stronger in the areas of making and reading measurements in straightforward applications, than in the areas related to using measurements and measurement processes to solve problems.



Trend Task: Balls

Approach:	One to one	**Year:**	4 & 8
Focus:	Estimating weights		
Resources:	Pink foam ball, silver petanque ball, yellow tennis ball, orange cricket ball, recording book		

Questions / instructions:

Here are four different balls. I want you to tell me how much you think each one would weigh.

Before you tell me, have a hold of each ball to get an idea of how heavy each one is.

Give the four balls to the student.

Now I want you to tell me how much you think each ball weighs. You need to tell me the unit of measurement, like grams or kilograms.

As each answer is given, write it on the recording sheet, ensuring that the units of measurement as given by the student are recorded.

1. How much do you think the pink foam ball weighs?

   Record student answer.

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Accepted *(actual =12g)*:	6 – 24g	9 (8)	23 (20)
	< 6g	45	41
	> 24g	32	29
	any other response	14	7
Unit given:	grams	54	84
	any other response	46	16

2. How much do you think the yellow tennis ball weighs?

   Record student answer.

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Accepted *(actual =58g)*:	29 – 116g	7 (6)	30 (22)
	< 29g	51	38
	>116g	34	27
	any other response	8	5
Unit given:	grams	54	82
	any other response	46	18

3. How much do you think the orange cricket ball weighs?

   Record student answer.

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Accepted *(actual =164g)*:	82 – 328g	3 (3)	21 (13)
	< 82g	49	39
	> 328g	40	36
	any other response	9	4
Unit given:	grams	47	74
	any other response	53	26

4. How much do you think the silver petanque ball weighs?

   Record student answer.

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Accepted *(actual =726g)*:	363 – 1452g	15 (12)	34 (31)
	< 363g	25	18
	> 1452g or 1.452kg	51	41
	any other response	10	6
Unit given:	kilograms	61	60
	grams	30	34
	any other response	9	6
Ball weights:			
	weights in increasing sequence	75 (79)	92 (92)
	any other response	25 (21)	8 (8)

		% response 2005 ('01) year 4	% response 2005 ('01) year 8
Total score:	8–9	2 (2)	13 (11)
	6–7	13 (13)	37 (31)
	4–5	35 (36)	31 (39)
	2–3	38 (39)	13 (15)
	0–1	11 (10)	5 (3)

Commentary:

This was a difficult task for all students. Although progress was seen from year 4 to year 8, at most, one third of the students estimated the weight with much accuracy. Moderate improvement was seen in year 8 from 2001 to 2005.

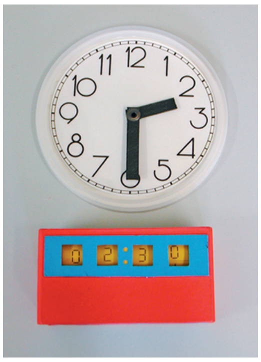
Trend Task:

Show Me the Time (Y4) / What's the Time? (Y8)

Approach: One to one **Year:** 4 & 8
Focus: Interpreting a calender, date calculations
Resources: 2 model clocks, recording book

Questions / instructions:

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
This activity is about telling the time.		
We will use these model clocks to show the time.		
Give student clocks.		



I am going to show you some times on these clocks and I want you to tell me what they are.

Show 3:00 on analogue clock.

	year 4	year 8
1. What is this time? **Record what the student said.** student gave correct time	95 (89)	99 (98)

Show 6:30 on digital clock.

	year 4	year 8
2. What is this time? correct time **Record what the student said.**	91 (92)	99 (99)

Now I am going to tell you some times, and I want you to show those times to me on both model clocks.

	year 4	year 8
3. Show me one o'clock. Show me one o'clock on both model clocks. **Record the time the student made on each clock.**		
Analogue: correct time	93 (89)	98 (97)
Digital: correct time *(1:00 or 01:00)*	80 (76)	98 (99)
4. Show me eleven-thirty. **Record the time the student made on each clock.**		
Analogue: correct time	56 (53)	85 (85)
Digital: correct time *(11:30)*	91 (87)	98 (96)
5. Show me quarter to nine. **Record the time the student made on each clock.**		
Analogue: correct time	43 (32)	80 (82)
Digital: correct time *(8:45 or 08:45)*	25 (19)	85 (82)

Remove digital clock.

	year 4	year 8
6. Make the time that is half an hour after 4:30. **Record the time the student made.** correct time *(5 o'clock)*	49 (49)	90 (87)
7. Make the time that is 20 minutes before 9 o'clock. **Record the time the student made.** correct time *(8:40)*	32 (30)	75 (82)

Remove analogue clock, give student digital clock.

	year 4	year 8
8. Make the time that is quarter of an hour before 7 o'clock. **Record the time the student made.** correct time *(6:45 or 06:45)*	29 (27)	84 (86)
9. Make the time that is 10 minutes before 5 past 11. **Record the time the student made.** correct time *(10:55)*	24 (24)	66 (69)

Total score:	year 4	year 8
12	9 (6)	37 (43)
10–11	13 (18)	44 (35)
8–9	19 (20)	15 (12)
6–7	30 (29)	3 (9)
4–5	19 (21)	2 (1)
0–3	10 (6)	0 (0)

Commentary:

Students at year 8 level were strong in all aspects of this task. Year 4 students were able to read the times quite well but were poor in tasks involving adding or subtracting time or showing time such as *quarter to nine*. Changes from 2001 to 2005 were negligible.

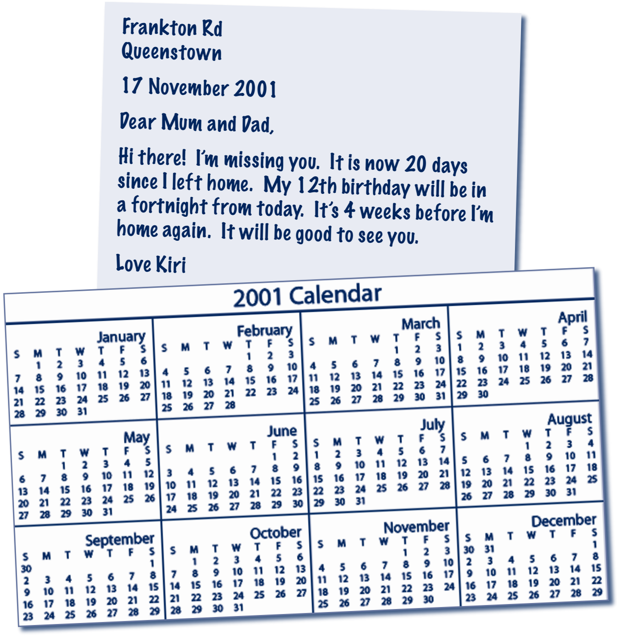
Trend Task: Letter

Approach:	Station	**Year:**	4 & 8
Focus:	Interpreting a calender; date calculations		
Resources:	Letter, calendar		

NEMP Access Task

Questions / instructions:

Here is a letter from Kiri to her Mum and Dad.
Use the letter and the calendar to help you answer the questions.


Frankton Rd
Queenstown

17 November 2001

Dear Mum and Dad,

Hi there! I'm missing you. It is now 20 days since I left home. My 12th birthday will be in a fortnight from today. It's 4 weeks before I'm home again. It will be good to see you.

Love Kiri

		% response 2005 ('01) year 4	year 8
1. What day of the week was the letter written?	Saturday	32 (37)	73 (71)
2. On what date did Kiri leave home?	28 October	20 (23)	45 (46)
3. What date is her birthday?	1 December	13 (17)	59 (59)
4. In what year was she born?	1989	16 (21)	50 (64)
5. How many days are there from her birthday until Christmas Day?	24	20 (20)	47 (56)
6. What date will she be back home again?	15 December	19 (17)	54 (54)
Total score:	5–6	2 (4)	28 (34)
	3–4	15 (17)	37 (38)
	1–2	40 (39)	29 (20)
	0	43 (40)	5 (8)

Commentary:

This task showed strong growth from year 4 to year 8. There were small declines in performance from 2001 to 2005.

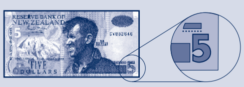
Trend Task: How Much Change? (Y4) / Change (Y8)

Approach:	Independent	**Year:**	4 & 8
Focus:	Calculating change		
Resources:	Answer booklet		

NEMP Access Task

Questions / instructions:

Write the amount of change in the empty boxes.

Price	Money given	How much change?	% response 2005 ('01) year 4	year 8
55c	50 20	15c 15	48 (38) 6 (14)	86 (84) 4 (4)
35c	50	15c 15	38 (28) 4 (12)	83 (80) 6 (4)
$1.30	$2	70c 70	34 (27) 3 (10)	80 (80) 5 (3)
$3.80		$1.20 1.20	24 (14) 4 94)	75 (68) 5 (5)
75c	50 20 20	15c 15	35 (28) 5 (11)	83 (77) 5 (4)
$7.25		$2.75 2.75	16 (12) 3 (4)	65 (61) 4 (6)

		% response 2005 ('01) year 4	year 8
Total score:	12	10 (6)	54 (49)
	10–11	10 (6)	17 (18)
	8–9	10 (8)	9 (11)
	6–7	8 (8)	8 (7)
	4–5	11 (15)	4 (4)
	2–3	15 (15)	4 (4)
	0–1	38 (42)	4 (7)

Commentary:

There was very large growth from year 4 to year 8. Year 4 students also show a moderate increase from 2001 to 2005. Year 8 students showed a modest increase over this time span.

Trend Task: Picture Frame

Approach:	Independent	Year:	4 & 8
Focus:	Measuring length and drawing to requirement		
Resources:	Ruler		NEMP Access Task

Questions / instructions:

Draw a frame around this picture.

The frame should be 2 centimetres wide on each side.

		% response 2005 ('01) year 4	year 8
Left side:	straight line at both top and bottom within range 15-25mm	45 (47)	88 (82)
Top:	straight line at both top and bottom within range 15-25mm	47 (49)	88 (82)
Right side:	straight line at both top and bottom within range 15-25mm	45 (45)	88 (82)
Bottom:	straight line at both top and bottom within range 15-25mm	44 (47)	88 (83)
Total score:	8	27 (28)	79 (72)
	6–7	7 (11)	6 (4)
	4–5	8 (7)	3 (6)
	2–3	7 (4)	2 (1)
	0–1	50 (50)	10 (17)

Commentary:

Slightly less than half of the year 4 students were successful at this task and little change was seen from 2001 to 2005. On the other hand, year 8 students showed a strong mastery of the task and solid growth from 2001 to 2005.

Trend Task: Money

Approach:	Independent	Year:	4 & 8
Focus:	Money computations		
Resources:	Answer booklet		NEMP Access Task

Questions / instructions:

		% response 2005 ('01) year 4	year 8
1. Mere had been putting only 10 cent coins in her money box. After a long time she opened it and counted the money. **YEAR 4:** She has $3.50. How many 10 cent coins were in the money box?	35	38 (37)	•
YEAR 8: She has $38.50. How many 10 cent coins were in the money box?	385	•	60 (53)
YEAR 4 & 8: 2. Pam had $150. She spent 100% of it. How much money did she have left? **A** $0 **B** $50 **C** $100 **D** $150	A	28 (26)	80 (75)
3. Alan changed a $5 note into 20 cent coins. How many coins would he get? **A** 4 **B** 5 **C** 20 **D** 25	D	61 (60)	78 (86)
Total score:	3	11 (10)	47 (43)
	2	26 (28)	32 (34)
	1	41 (37)	15 (17)
	0	22 (25)	5 (6)

Commentary:

Students at year 4 level displayed difficulty with this task but year 8 students were generally proficient. There was little change from 2001 to 2005.

Trend Task: Measurement A (Y4)

Approach: Independent
Focus: Understanding a variety of measurements
Resources: Answer booklet

Year: 4

NEMP Access Task

Questions / instructions:

% response 2005 ('01) year 4

Draw hands on the clocks so that they show the same time as the oven clocks.

1. 

96 (95)

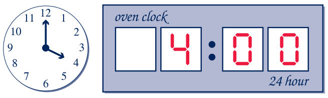
2. 

60 (60)

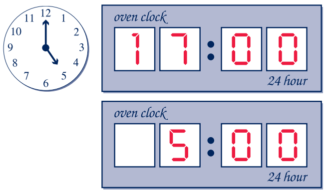
3. 

34 (30)

Write numbers on the oven clocks so that they show the same time as the wall clock.

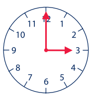
4. Morning (a.m.) 

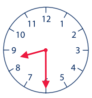
70 (69)

5. Afternoon (p.m.) 

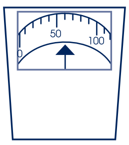
10 (9)
61 (62)

6. How many minutes until twenty to three?  40 — 18 (22)

7. Draw hands on the clock to show 3.00p.m.  90 (91)

8. Draw hands on the clock to show 8.30p.m.  65 (64)

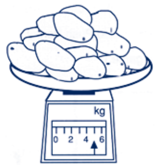
9. What is the weight shown on this scale?



A 6 kg
B 7 kg
C 51 kg — ✘ C [63 (67)]
D 60 kg — ✓ D 28 (26)

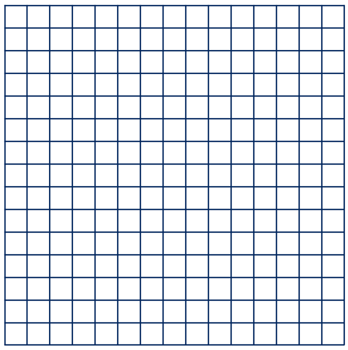
% response 2005 ('01) year 4

10. How much do the potatoes weigh?



5 kg — 66 (56)
5 — 4 (5)

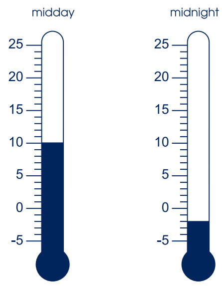
11. On the grid below, draw a rectangle with an area of 12 square units.



is one square unit

correct — 35 (43)

12. At midday the thermometer read 10°C. At midnight it read –2°C. By how many degrees had the temperature dropped?



12 — 24 (19)

Total score:	% response 2005 ('01) year 4
11–13	6 (6)
9–10	17 (14)
7–8	31 (30)
5–6	25 (28)
3–4	14 (17)
0–2	6 (5)

Commentary:

Year 4 students understood the basics of telling time but had difficulty with 24 hour clocks. They also had difficulty with other measurements. Overall, no change was seen from 2001 to 2005.

Approach:	Independent	Year:	8
Focus:	Understanding a variety of measurements		
Resources:	Answer booklet		

NEMP Access Task

Questions / instructions:

% response 2005 ('01) year 8

Draw hands on the clocks so that they show the same time as the oven clocks.

1. 

98 (94)

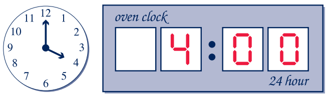
2. 

89 (78)

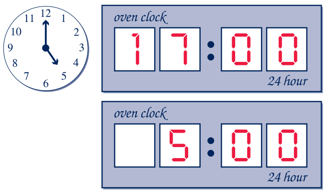
3. 

58 (68)

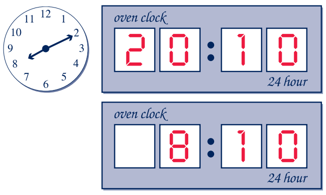
Write numbers on the oven clocks so that they show the same time as the wall clock.

4. Morning (a.m.) 

79 (85)

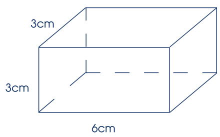
5. Afternoon (p.m.) 

60 (60)
27 (26)

6. Evening (p.m.) 

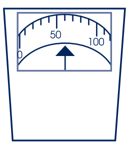
58 (54)
24 (23)

7. What is the volume of this cuboid?
   - A 12 cm^3
   - B 36 cm^3
   - C 54 cm^3
   - D 72 cm^3



C — 40 (46)

8. What is the weight shown on this scale?
   - A 6 kg
   - B 7 kg
   - C 51 kg
   - D 60 kg



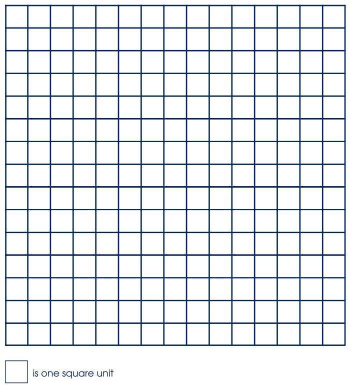
✘ C — [46 (43)]
✓ D — 52 (55)

9. What is the distance between the midpoint of MN and the midpoint of OP shown here?

   - A 18 cm
   - B 24 cm
   - C 28 cm
   - D 30 cm
   - E 48 cm

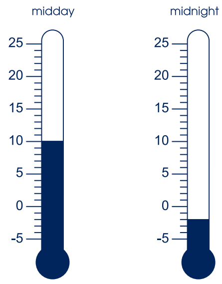
D — 30 (31)

10. On the grid below, draw a rectangle with an area of 12 square units.



correct — 71 (71)

11. At midday the thermometer read 10°C. At midnight it read –2°C. By how many degrees had the temperature dropped?



12 — 69 (65)

Total score:	% response 2005 ('01) year 8
11	6 (8)
9–10	26 (26)
7–8	25 (25)
5–6	25 (22)
3–4	15 (15)
0–2	3 (3)

Commentary:

Year 8 students did well on most aspects of telling time but had difficulty with complex tasks involving measurements. Overall performance between 2001 and 2005 was quite similar.

Trend Task: Snacks

Approach: Independent | **Year:** 4 & 8

Focus: Money computations

Resources: Answer booklet

NEMP Access Task

Questions / instructions:

$1.00 $1.20 $1.40 $1.50

Imagine that you have $5.

You are going to buy three of these snacks.

You only buy one of each type of snack.

	% response 2005 ('01) year 4	year 8
1. Draw a ring around the snacks you would buy. How much would the snacks you have chosen cost altogether?		
correct calculation of three snacks shown as a cost	53 (59)	79 (78)
2. How much change would you get from $5?		
correct calculation	24 (30)	74 (76)
Total score: 4	20 (21)	65 (63)
3	2 (1)	2 (3)
2	31 (32)	16 (18)
1	2 (6)	0 (2)
0	46 (40)	16 (14)

Commentary:

Students in year 8 were generally able to calculate the cost of their purchase and determine the change they should receive. Students in year 4 had particular difficulty in determining the change. There was no difference from 2001 to 2005.

Trend Task: Thermometer

Approach: Independent | **Year:** 4 & 8

Focus: Reading thermometers and comparing temperatures

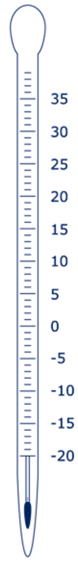
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

Here are the temperatures on the 1st July in six different places.

Los Angeles	+32°
Hamilton	+10°
Waiouru	-15°
London	+20°
Toronto	+25°



	% response 2005 ('01) year 4	year 8
1. Put a **tick** beside the lowest temperature. ✓ Waiouru –15	44 (36)	85 (80)
✘ Hamilton +10	[37 (39)	5 (9)]
2. Mark the temperature for Waiouru on the picture of the thermometer.		
Accurate marking for Waiouru: –15	53 (46)	88 (88)
3. Write the temperatures in order from highest to lowest.		
Correct order from highest to lowest: +32, +25, +20, +10, –15	36 (29)	77 (72)
Correct order from lowest to highest: –15, +10, +20, +25, +32	5 (4)	7 (10)
Incorrect order misplacing the negative temperature: +32, +25, +20, –15, +10 *(or other order)*	23 (34)	2 (4)
Total score: 4	25 (20)	68 (59)
3	10 (9)	13 (20)
2	12 (9)	7 (9)
1	19 (19)	5 (6)
0	34 (44)	6 (6)

Commentary:

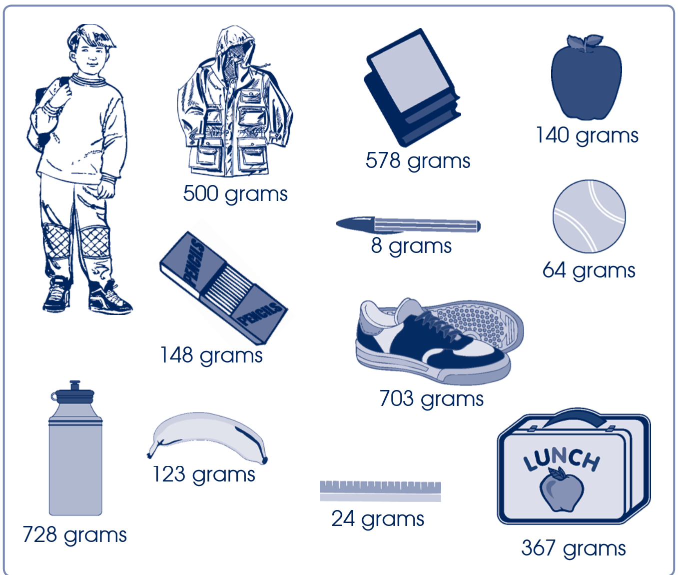
Large gains were seen from year 4 to year 8 in this task. There were also substantial gains from 2001 to 2005, particularly for year 4 students.

Trend Task: Backpack (Y8)

Approach: Independent | **Year:** 8
Focus: Adding weights
Resources: Answer booklet

NEMP Access Task

Questions / instructions:



Ben wants to carry as many of these things as he can in his backpack — but he doesn't want to carry more than 1 kilogram.

		% response 2005 ('01) year 8
1. How many of these things can he fit in his backpack?	7	40 (35)
2. Circle the things he should choose.		
	correct with units given	22 (31)
	correct without units given	15 (22)
3. What is the total weight of these circled things?		
	total weight given is no more than 1 kilogram	62 (53)
Total score:	4	13 (15)
	3	12 (17)
	2	22 (20)
	1	29 (18)
	0	24 (29)

Commentary:

This task was challenging for year 8 students. There were mixed results from 2001 to 2005 but, overall, a slight decline in performance.

Trend Task: Super Sale

Approach: Independent | **Year:** 8
Focus: Discount calculations
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

A shop is having a sale.

Write down how much is taken off the old price. Then write down the new sale price.

Example: 10% off

Savings: 20c
Sale price: $1.80

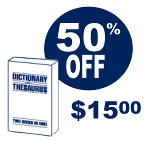
			% response 2005 ('01) year 8
1.	**Savings:**	45c or 45	39 (38)
	Sale price ($4.05):	correctly calculated, given first answer	65 (75)
2.	**Savings:**	$1.00 or 1.00	34 (35)
	Sale price ($4.00):	correctly calculated, given first answer	67 (71)
3.	**Savings:**	$20.00 or 20.00	43 (46)
	Sale price ($60.00):	correctly calculated, given first answer	59 (63)
4.	**Savings:**	$7.50 or 7.50	58 (57)
	Sale price ($7.50):	correctly calculated, given first answer	69 (73)
5.	**Savings:**	$2 or 2.00	15 (14)
	Sale price ($14.00):	correctly calculated, given first answer	36 (37)
	Total score:	15	10 (11)
		13–14	6 (5)
		11–12	10 (14)
		9–10	11 (12)
		7–8	11 (10)
		5–6	15 (13)
		3–4	12 (13)
		1–2	11 (13)
		0	13 (11)

Items:

1. 

2. 

3. 

4. 

5. 

Commentary:

Students were less able to calculate a discount than subtracting the discount to get a discounted price. There was little change in performance from 2001 to 2005.

Task: Torn Tape

Approach:	One to one	**Year:**	4 & 8
Focus:	Measurement sense		
Resources:	Torn" measuring tape, bookmark, snake, ribbon, recording book,		

Questions / instructions:

In this activity you will be measuring three different things – a bookmark, a ribbon and a snake.

Give the student the "torn" measuring tape.

This piece of measuring tape has been torn, but never mind. It can still be used for measuring.

Give the student the bookmark.

1. How wide is the bookmark?

Record answer. If no units are given, ask the student what they are.

		% responses y4	y8
	3.5	13	58
	2.5 – 3.4 or 3.6 – 4.5	20	24
Units provided:	units correct	71	94
	units incorrect	14	4

Give the student the piece of ribbon.

2. How long is the piece of ribbon?

Record answer. If no units are given, ask the student what they are.

		y4	y8
	37	9	19
	36 – 36.9 or 37.1 – 38.5	18	37
Units provided:	units correct	69	93
	units incorrect	15	5

YEAR 8 ONLY:

Give the student the snake.

3. How long is the snake?

Record answer. If no units are given, ask the student what they are.

		y4	y8
	25.5 to 26.5	•	8
	24.0 – 25.4 to 26.6 – 28	•	27
Units provided:	units correct	•	89
	units incorrect	•	8

		y4	y8
Total score:	11–12	•	8
	9–10	•	41
	7–8	9	36
	5–6	28	11
	3–4	35	3
[Note: 8 points maximum for year 4]	0–2	27	1

Commentary:

This was a difficult task for students, especially for objects that were not fixed and straight. Year 8 students showed substantial improvement over year 4 students.

Task: Car Box

Approach:	Station	**Year:**	4 & 8
Focus:	Measurement sense		
Resources:	Ruler, toy car, paper		

Questions / instructions:

Put the toy car on the paper. Use the ruler to find out how long, how wide and how high this toy car is.

(Note: Measurement required in centimeters for year 4 and in millimeters for year 8.)

1. How long is the car?

		% responses y4	y8
Y4 only:	7 or 8 cm	60	
	7.2 – 7.7 cm	7	
Y8 only:	72 – 77 mm		40
	7.2 – 7.7 cm		3

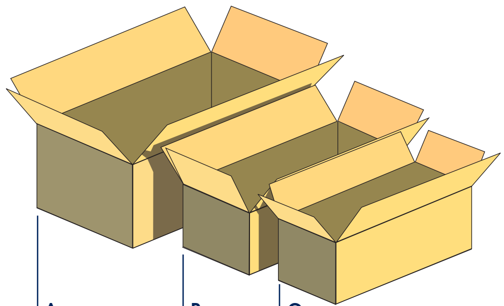
2. How wide is the car?

		y4	y8
Y4 only:	2.8 – 3.2 cm	42	
Y8 only:	28 – 32 mm		58
	2.8 – 3.2 cm		2

3. How high is the car?

		y4	y8
Y4 only:	2.6 – 3.0 cm	25	
Y8 only:	26 – 30 mm		35
	2.6 – 3.0 cm		2

Here is a picture of some boxes with their measurements.



	A	B	C
Year 4:	9 cm x 5 cm x 4 cm	8 cm x 4 cm x 3 cm	7 cm x 3 cm x 3 cm
Year 8:	90 mm x 50 mm x 40 mm	80 mm x 40 mm x 30 mm	70 mm x 30 mm x 30 mm

4. Which box would best fit the car?

		y4	y8
	A	19	47
Total score:	7–8	4	17
	5–6	31	20
	3–4	34	30
	0–2	32	22

Commentary:

This was a very difficult task for year 4 students. Only 4 percent were completely successful.

Task: **Ten Million Dollars**

Approach: Team **Year:** 8

Focus: Problem solving

Resources: 20 $100 notes (play), calculator, 4 rulers, wallet box, 1 team answer sheet, 4 individual answer sheets

Questions / instructions:

[Wallet box = plain cardboard carton, 432mm x 330mm x 254mm.]

Imagine your school has just won ten million dollars and you've been chosen to go and collect it. The ten million dollars is in $100 notes. Before you go, your team has to decide how many cardboard boxes you will need to pack the money into.

Hand students the wallet box and the play money.

Here is some play money and a box like the one you will use for packing the money. As a team, plan how you can work out how many boxes you will need. Make sure that everyone has something to do. You can have a few minutes to discuss it and write down your plan. Then tell me what you have decided.

Hand out team answer sheet. Allow time.

1. Now tell me what you have planned to do.

	% responses y8
Allocation of activities:	
each person has something to do	60
some people are allocated tasks	11
Measuring money: all dimensions	23
measuring length of $100 notes *(approximately 15 cm)*	69
measuring width of $100 notes *(approximately 7 cm)*	63
measuring thickness of wad of $100 notes *(approximately 2mm for 20 notes)*	76
Measuring box: all dimensions	17
measuring length of box *(approximately 42cm)*	79
measuring width of box *(approximately 32cm)*	73
measuring depth of box *(approximately 25cm)*	93
Determining efficient arrangement of stacks of notes in box:	
25cm vertical stacks, in 2x6 layout	16
six 42cm horizontal rows, plus 4cm vertical stacks in 2x6 layout	4
some arrangement of money on bottom of box	52
calculating how many $100 notes fit into box *(about 300cm, about 30,000 notes, eg. 12 stacks of about 2500 notes)*	41
calculating how many $100 notes up $10,000,000 *(100,000)*	49
Number of boxes needed:	
4 boxes *(or 3.x boxes)*	8
on right track but computational error	41

As a team, try to work out how many boxes you will need for your school's ten million dollars.

When you have finished I would like you to tell me what you found out.

Hand students calculator, rulers and four individual answer sheets. Allow time.

2. Explain to me what you found out.
3. Did you have to make any adjustments to your plan?

	% responses y8
Description of investigation:	
clear, coherent account of investigation	14
some but not all steps described	31
vague description	37
Total score: 9–10	18
7–8	33
5–6	24
3–4	13
0–2	12

Commentary:

This task requires many steps and multiple calculations. Some groups performed quite well on the task, but many struggled.

LINK TASK: 25		% responses y4	y8
Approach:	Station		
Year:	4 & 8		
Focus:	Measuring volume and capacity		
Total score:	4	1	4
	3	16	31
	2	37	40
	1	38	19
	0	8	6

LINK TASK: 26		% responses y4	y8
Approach:	Station		
Year:	4 & 8		
Focus:	Calculating length, height, width and volume		
Total score:	18–20	•	8
	15–17	•	14
	12–14	•	23
	9–11	5	24
	6–8	21	15
	3–5	46	9
[Note: Maximum score of 9 for year 4]	0–2	28	7

LINK TASK: 27		% responses y4	y8
Approach:	Station		
Year:	4 & 8		
Focus:	Weighing, reading a table		
Total score:	9	0	8
	7–8	5	42
	5–6	21	31
	3–4	32	12
	0–2	42	7

LINK TASK: 28		% responses y4	y8
Approach:	Station		
Year:	4 & 8		
Focus:	Capacity estimation		
Total score:	7–8	1	15
	5–6	4	26
	3–4	9	24
	1–2	30	18
	0	56	17

LINK TASK: 29		% responses y4	y8
Approach:	Independent		
Year:	4 & 8		
Focus:	Units of measurement		
Total score:	8	•	20
	6–7	9	44
	4–5	34	23
	2–3	34	10
[Note: Maximum score of 6 for year 4]	0–1	23	3

LINK TASK: 30		% responses y4	y8
Approach:	Independent		
Year:	4 & 8		
Focus:	Measurement sense		
Total score:	5	5	17
	4	4	7
	3	17	35
	2	17	18
	1	26	16
	0	31	6

LINK TASK: 31		% responses y4	y8
Approach:	Station		
Year:	4		
Focus:	Problem solving		
Total score:	4	9	
	3	19	
	2	35	
	1	13	
	0	24	

LINK TASK: 32		% responses y4	y8
Approach:	Station		
Year:	8		
Focus:	Problem solving		
Total score:	5		46
	4		19
	3		12
	2		15
	1		4
	0		4

LINK TASK: 33		% responses y4	y8
Approach:	Independent		
Year:	8		
Focus:	Perimeter and area		
Total score:	13–14		8
	11–12		8
	9–10		4
	7–8		9
	5–6		13
	3–4		30
	1–2		10
	0		17

LINK TASK: 34		% responses y4	y8
Approach:	Independent		
Year:	8		
Focus:	Integers		
Total score:	2		43
	1		30
	0		27

LINK TASK: 35		% responses y4	y8
Approach:	Independent		
Year:	8		
Focus:	Reflecting and communicating		
Total score:	3		17
	2		47
	1		12
	0		24

LINK TASK: 36		% responses y4	y8
Approach:	Independent		
Year:	8		
Focus:	Measuring area		
Note: no totals			

5 Geometry

The assessments included 15 tasks investigating students' understandings, processes and skills in the area of geometry. Geometry is concerned with geometrical relations in two and three dimensions, and their occurrence in the environment. It also involves recognition of the geometrical properties of everyday objects and the use of geometric models as aids to solving problems.

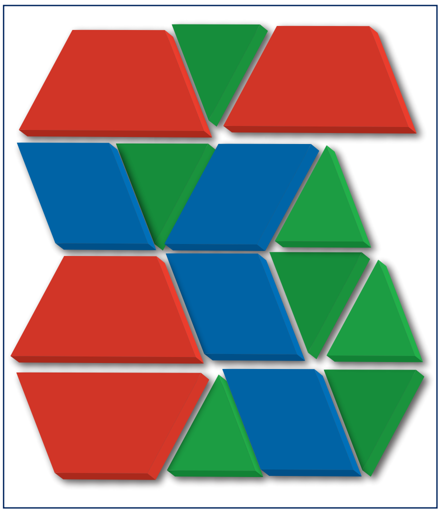
Eleven of the tasks were identical for both year 4 and year 8. Four of the tasks were given to year 8 only. Five of the tasks are trend tasks (fully described with data for both 2001 and 2005), three are released tasks (fully described with data for 2005 only) and seven are link tasks (to be used again in 2009, so only partially described here).

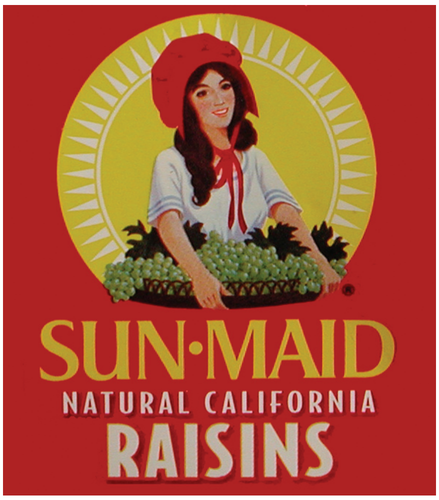
The tasks are presented in three sections: trend tasks, then released tasks and finally link tasks. Within each section, tasks attempted by both year 4 and year 8 students are presented first, followed by tasks attempted only by year 4 students and then tasks attempted only by year 8 students.

There were 31 task components administered to both year 4 and year 8 students. In each of these, the year 8 students showed a higher success rate than the year 4 students. On average, year 8 students out-performed year 4 students by 20.6%. Differences between year 4 and year 8 students were fairly consistent across the tasks.

There were 16 task components in common for 2001 and 2005 for year 4. Eight of those tasks showed a gain over the four-year period, and the other eight showed a decline. The net difference over the 16 tasks was a decrease of slightly less than one percent. There were 19 task components in common for 2001 and 2005 for year 8. Eleven of those tasks showed a gain over the four years and eight showed a decline, with a net increase of slightly less than one percent. The largest declines came in the area of finding symmetry in a pattern (see *Kōwhaiwhai Pattern*, p45), and the largest gains came in the area of drawing geometric figures (see *Dot to Dot*, p46).

In the new tasks that were released for this year, year 8 students showed some level of difficulty in using protractors to measure angles and in representing mental rotations of two dimensional objects.





Trend Task: Packages

Approach:	One to one	Year:	4 & 8
Focus:	Describing 3D shapes		
Resources:	*Toblerone* box, raisin box, *Rolo* packet		

Questions / instructions:

Put three boxes in front of student.

In this activity we will be talking about these three packages.

1. Pick up the *Toblerone* box and have a good look at it. Tell me all the different things you can about the shape of the box.

PROMPT: *Is there anything else you can tell me about the shape of the box?*

	% response 2005 ('01) year 4	year 8
Refers to triangles: triangular prism	13 (17)	39 (38)
ends are triangles/3D triangle	18 (29)	18 (18)
mentions triangles	62 (52)	38 (40)
any other response *(including prism)*	7 (6)	6 (4)
sides are rectangles	12 (10)	9 (9)
long *(relative to x-section)*	29 (29)	33 (34)
ends are parallel	2 (0)	1 (1)
regular shape *(equilateral triangles, rectangles same)*	4 (2)	5 (5)
number of faces/sides = 5	6 (15)	20 (12)
number of edges = 9	3 (6)	10 (6)
number of corners = 6	9 (13)	13 (9)

2. Pick up the raisin box and have a good look at it. Tell me all the different things you can about the shape of the box.

PROMPT: *Is there anything else you can tell me about the shape of the box?*

	% response 2005 ('01) year 4	year 8
Refers to rectangles:		
rectangular prism/cuboid	8 (10)	24 (18)
rectangle/oblong *(3D sense)*/ rectangular cube	17 (11)	35 (21)
all sides rectangles/oblongs	7 (4)	5 (4)
rectangles/oblongs mentioned	34 (43)	18 (40)
any other response *(including prism)*	33 (31)	18 (17)
opposite faces parallel *(or equivalent)*	3 (4)	8 (7)
number of faces/sides = 6	14 (22)	30 (23)
number of edges = 12	3 (4)	8 (7)
number of corners = 8	14 (19)	21 (14)

3. Pick up the *Rolo* packet and have a good look at it. Tell me all the different things you can about the shape of the package.

PROMPT: *Is there anything else you can tell me about the shape of the package?*

	% response 2005 ('01) year 4	year 8
Refers to cylinder:		
cylinder/circular prism	26 (34)	59 (56)
ends are circles/round *(3D)*	14 (15)	5 (10)
round, circular	50 (40)	30 (29)
any other response *(including prism)*	10 (10)	6 (5)
ends are parallel	2 (0)	2 (1)
long *(relative to x-section)*	18 (17)	17 (20)
number of flat faces/sides = 2	12 (19)	21 (15)
other face is rectangle rolled out	1 (1)	2 (1)
number of edges *(circular)* = 2	5 (5)	8 (6)
number of corners = 0	14 (19)	17 (12)

Total score:	year 4	year 8
17–27	1 (1)	4 (1)
14–16	3 (3)	7 (4)
11–13	5 (8)	16 (16)
8–10	15 (21)	29 (29)
5–7	32 (34)	30 (32)
2–4	41 (31)	13 (17)
0–1	3 (2)	1 (1)

Commentary:

This task involved the use of geometry terminology and the ability to describe shapes. Students in year 8 were much more likely to use precise terminology but many students at both year levels did not do so. There was little change between 2001 and 2005.

Trend Task: Kōwhaiwhai Pattern

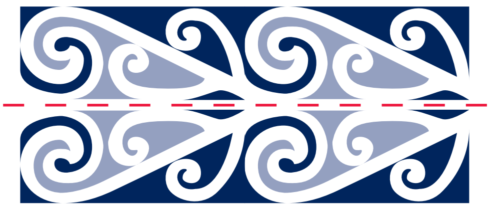
Approach:	Station	**Year:**	4 & 8
Focus:	Assessing symmetry		
Resources:	4 pattern pieces, glue stick, ruler, red pencil		NEMP Access Task

Questions / instructions:

The letter A has a dotted line through it called a line of symmetry.

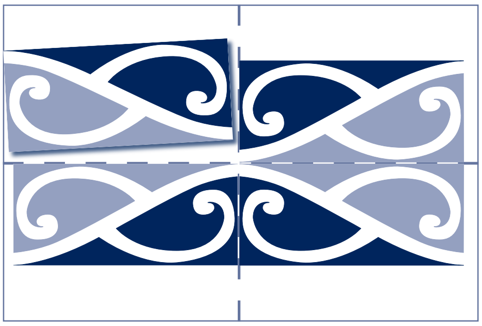
One side is exactly the same as the other.

1. Rule one line of symmetry on this pattern:



	% response 2005 ('01) year 4	year 8
only one line of symmetry drawn *(horizontally)*	57 (66)	70 (75)

2. Put four pieces of pattern together so that they fit with the two lines of symmetry. Glue them here.



Pattern put together:

	year 4	year 8
4 pieces, with the two lines of symmetry	39 (47)	61 (69)
4 pieces, with one line of symmetry only	26 (28)	21 (20)
any other response	35 (25)	18 (11)
Total score: 3	24 (33)	45 (56)
2	30 (33)	29 (25)
1	29 (23)	17 (16)
0	17 (11)	8 (3)

Commentary:

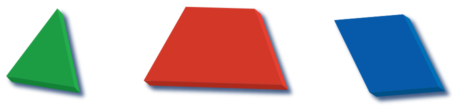
Students showed modest success in this task, with moderate growth evident between year 4 and year 8. Students did not perform as well as in 2001 but the difference was small.

Trend Task: Trapezium

Approach:	Station	**Year:**	4 & 8
Focus:	Creating geometry shapes		
Resources:	3 shapes: red trapezium, green triangle, blue parallelogram		

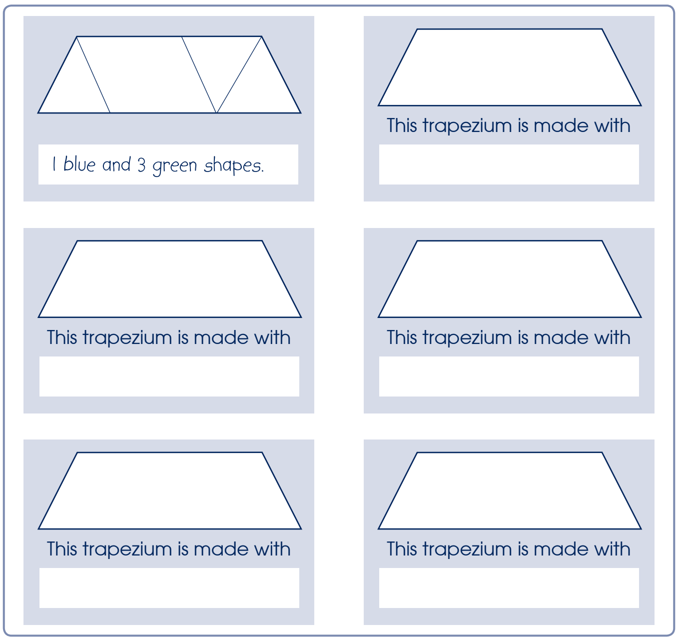
Questions / instructions:

Look at the 3 shapes.



If you had a bucket full of these shapes, there would be different ways you could make a trapezium.

Draw the different ways you could make trapeziums, showing the shapes you would use for each one. One has been done for you.



Number of different trapeziums made correctly:	% response 2005 ('01) year 4	year 8
5	33 (29)	39 (38)
4	24 (22)	27 (30)
3	14 (13)	11 (10)
2	9 (7)	6 (5)
1	9 (9)	6 (4)
0	12 (19)	11 (13)

Commentary:

Most students were able to make at least four different versions of the trapezium. Differences between year 4 and year 8 were small. There was little change between 2001 and 2005.

Trend Task: Dot to Dot

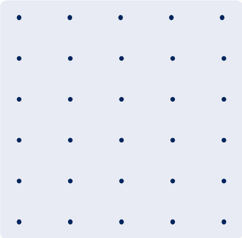
Approach:	Independent	Year:	4 & 8
Focus:	Drawing geometric figures		
Resources:	Ruler		

NEMP Access Task

Questions / instructions:

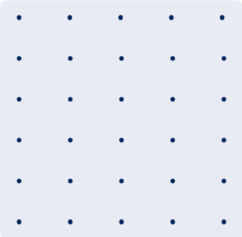
% response 2005 ('01)

1. Join dots to draw a right angle triangle.



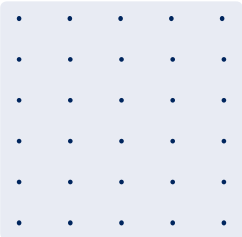
	year 4	year 8
correct	27 (21)	70 (57)

2. Join dots to draw a rectangle.



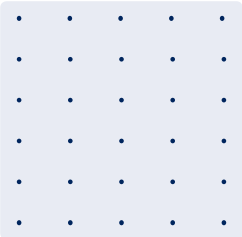
	year 4	year 8
correct	89 (77)	77 (88)
correct – drew a square	2 (12)	19 (6)

3. Join dots to draw a square.



	year 4	year 8
correct	89 (84)	95 (94)

4. Join dots to draw a hexagon (the sides don't need to be equal).



	year 4	year 8
correct	26 (25)	53 (41)

Total score:	year 4	year 8
5	8 (6)	36 (27)
4	30 (26)	32 (35)
3	45 (44)	22 (28)
2	9 (12)	8 (6)
1	6 (8)	2 (1)
0	2 (4)	0 (2)

Commentary:

Year 4 students were successful with the rectangle and the square but had difficulty with the right angle triangle and the hexagon. Year 8 students were much better with the triangle and hexagon. Students in 2005 outperformed the 2001 cohort, particularly on the more difficult shapes.

Trend Task: Nets

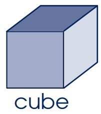
Approach:	Independent	Year:	4 & 8
Focus:	Visualising 3D objects		
Resources:	Answer booklet		

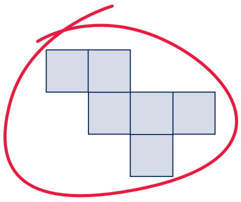
NEMP Access Task

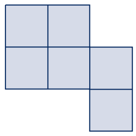
Questions / instructions:

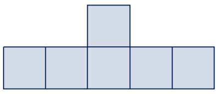
% response 2005 ('01)

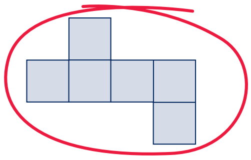
Draw circles around the nets that can be folded to make a cube (no cutting allowed).

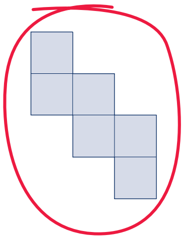












	year 4	year 8
circled	41 (32)	60 (61)
circled	67 (74)	87 (88)
circled	36 (25)	44 (41)
circled	64 (80)	88 (91)
circled	51 (44)	79 (77)
circled	78 (79)	96 (94)

Total score:	year 4	year 8
6	7 (5)	29 (25)
5	10 (12)	27 (30)
4	28 (30)	26 (24)
3	20 (25)	10 (15)
2	25 (22)	7 (6)
1	3 (5)	0 (0)
0	7 (1)	0 (0)

Commentary:

Responses by year 4 students were only slightly better than guessing, whereas year 8 students displayed a good command of this visualisation skill. There were only small differences between 2001 and 2005.

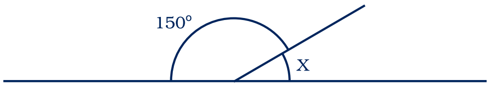
Trend Task: Angles

Approach: Independent **Year:** 8
Focus: Calculating and estimating angles
Resources: Answer booklet

NEMP Access Task

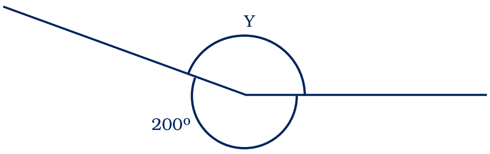
Questions / instructions:

% response 2005 ('01) year 8



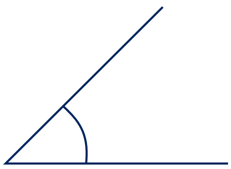
1. What is the measure of the angle X ?

	year 8
30 (with or without °)	48 (51)



2. What is the measure of the angle Y ?

	year 8
160 (with or without °)	47 (50)



3. Estimate the measure of this angle ?

A 45°
B 80°
C 90°
D 100°

	year 8
A	70 (71)

Total score:	year 8
3	36 (40)
2	16 (14)
1	27 (23)
0	22 (23)

Commentary:

About half of the students were able to calculate an angle from the diagram and 70 percent were able to estimate an angle from a drawing. 2005 results show little change from 2001 results.

Task: Angle Measures

Approach: Station **Year:** 8
Focus: Measuring angles
Resources: Protractor

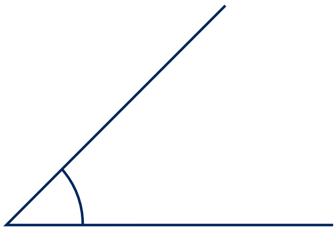
NEMP Access Task

Questions / instructions:

Use the protractor to measure these angles.

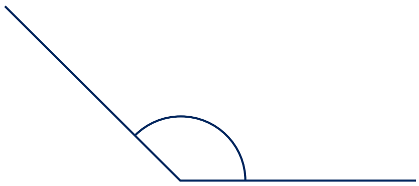
Write the size of each angle.

1.



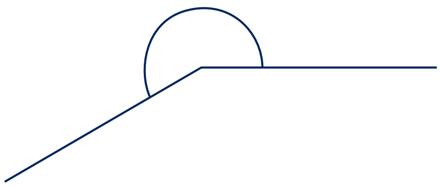
	% responses y8
45°	53
40-44° or 46-50°	5
135°	10
any other response	33

2.



	% responses y8
135°	43
130-134° or 136-140°	10
45°	9
any other response	38

3.



	% responses y8
210°	34
200-209° or 211-220°	7
30°	4
150°	15
any other response	41

Total score:	% responses y8
10	25
8–9	8
6–7	18
4–5	8
2–3	13
0–1	27

Commentary:

Less than half of the students could use the protractor to measure angles with a consistent degree of accuracy.

Task: Rotations

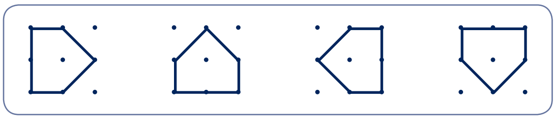
Approach:	Independent	Year:	8
Focus:	Mental rotations		
Resources:	Ruler		

NEMP Access Task

Questions / instructions:

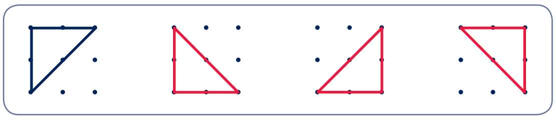
% responses y8

This shape has been rotated through three 90° turns.



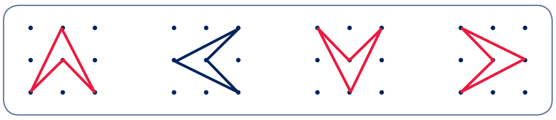
Draw these shapes as they are rotated through 90° turns. *[Results in red beneath each shape.]*

1.



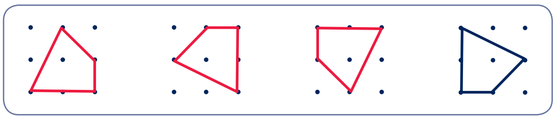
42% 60% 38%

2.



55% 53% 73%

3.



26% 44% 28%

Total score:	y8
8–9	15
6–7	16
4–5	23
2–3	25
0–1	20

Commentary:

Students were moderately successful in visualising and representing rotations of closed forms.

Task: Awesome Angles

Approach:	Independent	Year:	8
Focus:	Estimating angles		
Resources:	Answer booklet		

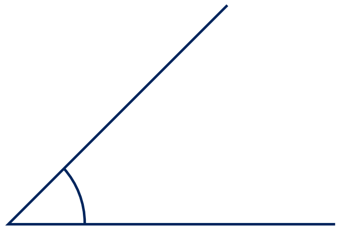
NEMP Access Task

Questions / instructions:

% responses y8

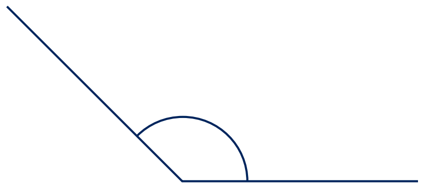
Circle the letter that matches each angle.

1.



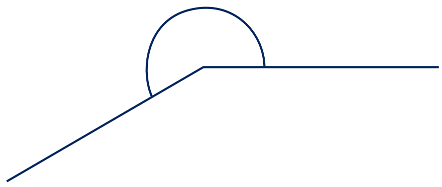
A 30°
B 45° — B — 57
C 60°
D 135°

2.



A 110°
B 120°
C 135° — C — 41
D 150°

3.



A 150°
B 190°
C 210° — C — 38
D 225°

Total score:	y8
3	12
2	35
1	30
0	23

Commentary:

Students were fairly good at estimating acute angles, but weaker with obtuse and reflex angles.

LINK TASK: 37
Approach: One to one
Year: 4 & 8
Focus: Understanding angles

Total score:	% responses y4	% responses y8
9	•	0
8	•	11
7	•	18
6	0	15
5	3	18
4	9	15
3	23	9
2	26	6
1	21	5
0	17	4

[Note: Maximum score of 6 for year 4]

LINK TASK: 38
Approach: Independent
Year: 4 & 8
Focus: Identifying shapes of cross sections

Total score:	% responses y4	% responses y8
4	5	35
3	11	19
2	33	16
1	24	12
0	28	18

LINK TASK: 39
Approach: Independent
Year: 4 & 8
Focus: Finding symmetry

Total score: Y4 only:	% responses y4	% responses y8
4	70	
3	14	
2	14	
1	1	
0	1	
Total score: Y8 only:		
23–24		55
21–22		32
19–20		6
17–18		4
0-17		3

LINK TASK: 40
Approach: Independent
Year: 4 & 8
Focus: Visualising and representing

Total score:	% responses y4	% responses y8
5	•	43
4	•	20
3	43	20
2	1	5
1	37	9
0	19	4

[Note: Maximum score of 3 for year 4]

LINK TASK: 41
Approach: One to one
Year: 8
Focus: Patterns

Total score:	% responses y4	% responses y8
6		19
5		22
4		12
3		17
2		23
1		13
0		4

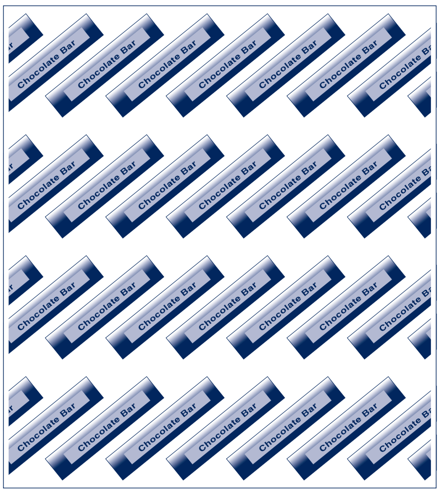
LINK TASK: 42
Approach: Independent
Year: 8
Focus: Enlargement and reduction

Total score:	% responses y4	% responses y8
2		32
1		27
0		41

LINK TASK: 43
Approach: Independent
Year: 8
Focus: Sketching nets for 3D solids

Total score:	% responses y4	% responses y8
15–16		35
13–14		21
11–12		17
9–10		7
7–8		6
5–6		3
3–4		2
1–2		2
0		7

6 Statistics



The assessments included seven tasks investigating students' understandings, processes and skills in the area of statistics. Statistics is concerned with the collection, organisation and analysis of data, and the estimation of probabilities and use of probabilities for prediction.

Three tasks are trend tasks, with data for 2005 as well as 2001. Four tasks are link tasks (to be used again in 2009, so only partially described here). Two of the trend tasks were identical for year 4 and year 8. One of the trend tasks was administered for year 8 only.

The two tasks administered for both year 4 and year 8 showed substantial growth over those years. On average, there was a 36 percent increase in performance on tasks from year 4 to year 8. There was also a small improvement from 2001 to 2005 in year 4 (an average of 2.2 percent) and a moderate improvement between 2001 and 2005 in year 8 (average of 5.4 percent). In year 8, the tasks involving probability and combinations showed gains from 2001 to 2005, but the task involving computing averages did not.

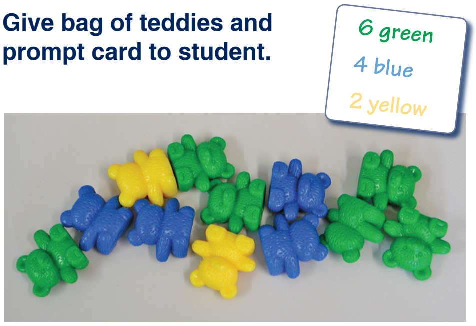
Trend Task: Pick a Teddy

Approach: One to one **Year:** 4 & 8
Focus: Probability
Resources: Bag of 12 teddies, prompt card

Questions / instructions:

There are 12 teddies in this bag. Six are green, 4 are blue and 2 are yellow.

Give bag of teddies and prompt card to student.



Shake the bag so the teddies are mixed up.

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
1. If I were to close my eyes and pick a teddy out of this bag, what colour will I most likely get?		
green	81 (79)	97 (94)
2. Why do you say that?		
most likely to get most common colour	70 (70)	96 (93)
3. What is the chance of taking out a yellow teddy?		
2 out of 12 or two twelfths *or* one sixth *or* about 16%	3 (2)	44 (32)
less/least/little chance than green and blue	37 (43)	19 (27)
4. What is the chance of taking out a green teddy?		
6 out of 12 or six twelfths *or* one half *or* one out of 2 *or* 50%	4 (2)	52 (43)
greatest/great chance	42 (49)	13 (23)
Total score: 6	2 (1)	41 (28)
4–5	31 (33)	22 (34)
2–3	40 (40)	34 (34)
0–1	27 (26)	3 (4)

Commentary:

Students in year 4 and year 8 showed a basic understanding of the relationship between frequency and probability. Explaining that reasoning and turning it into a precise probability has begun to develop in some of the year 8 students. Year 8 students were more likely to get all questions correct in 2005 than in 2001.

Trend Task: Pizza Lunch

Approach: Independent **Year:** 4 & 8
Focus: Combinations
Resources: Answer booklet

NEMP Access Task

Questions / instructions:

Each meal has one kind of pizza and one kind of drink.

	% response 2005 ('01) year 4	% response 2005 ('01) year 8
How many different kinds of meal could be ordered? 12	14 (13)	63 (56)
Show how you work out your answer.		
mulitplying numbers of options	4 (2)	21 (19)
listing possibilities systematically	14 (17)	38 (34)
listing possibilities randomly	7 (8)	5 (5)
Total score: 4	4 (2)	21 (19)
3	7 (7)	34 (29)
2	8 (10)	7 (9)
1	9 (11)	10 (9)
0	72 (70)	29 (35)

Commentary:

Substantial gains in working with combinations were seen from year 4 to year 8. Results were fairly similar in 2001 and 2005.

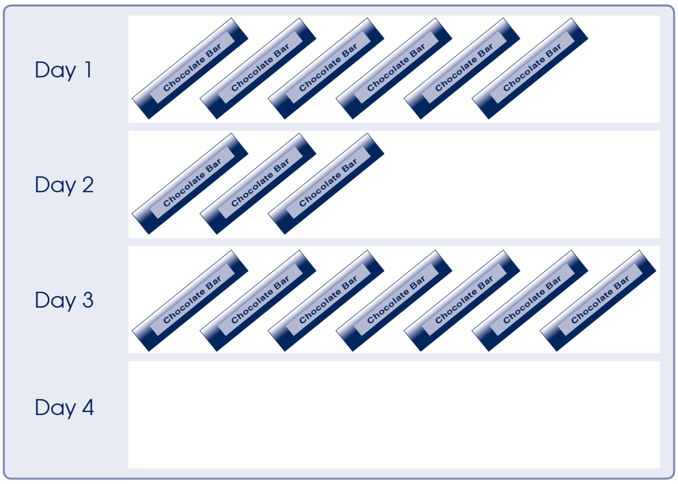
Trend Task: Chocolate Bars

Approach:	Independent	Year:	8
Focus:	Calculating average		
Resources:	Answer booklet		

NEMP Access Task

Questions / instructions:

Angela is selling chocolate bars for her class camp.
This picture shows the number of bars she sold during the first 3 days.



		% response 2005 ('01) year 8
How many chocolate bars must Angela sell on day 4 so that the average number of bars sold each day is 5?	4	55 (57)

Commentary:

Just over half of the year 8 students were successful in this task. Results were consistent with the findings from four years ago.

Link Tasks 44 – 47

LINK TASK: 44
Approach: One to one
Year: 4 & 8
Focus: Reading graphs

Total score:	% responses y4	y8
7	1	5
6	14	34
5	27	39
4	28	13
3	17	5
2	8	3
1	5	1
0	1	0

LINK TASK: 45
Approach: Station
Year: 4
Focus: Tallying

Total score:	% responses y4	y8
9–10	0	
7–8	58	
5–6	14	
3–4	11	
1–2	11	
0	6	

LINK TASK: 46
Approach: One to one
Year: 8
Focus: Probability

Total score:	% responses y4	y8
11–12		3
9–10		14
7–8		33
5–6		34
3–4		13
0–2		3

LINK TASK: 47
Approach: One to one
Year: 8
Focus: Reading graphs

Total score:	% responses y4	y8
7–9		1
5–6		6
3–4		51
1–2		38
0		4

Mathematics Survey

Students' attitudes, interests and liking for a subject can have a bearing on their achievement. The mathematics survey sought information from students about their curriculum preferences and perceptions of their own achievement. The questions were the same for year 4 and year 8 students. The survey was administered to the students in an independent session (four students working individually on tasks, supported by a teacher). The questions were read to year 4 students, and also to individual year 8 students who requested this help. Writing help was available if requested.

The survey included 11 items which asked students to record a rating response by circling their choice, one item which asked them to select three preferences from a list, one item which asked them to nominate up to six activities, and three items which invited them to write comments.

In the Social Studies survey, administered during the 2005 assessments, students were asked to select their three favourite school subjects from a list of 12 subjects. Full details are in the social studies report, but it is appropriate to summarise here how mathematics fared. Mathematics was second in popularity of the 14 subjects among year 4 students, chosen by 48 percent of them. Physical education and sport was slightly higher, at 53 percent, with a large gap below mathematics to the next subject at 31 percent. Mathematics was third in popularity for year 8 students, chosen by 28 percent of students, but well below the 68 percent for physical education and sport and 44 percent for technology.

MATHS ACTIVITIES STUDENTS LIKE DOING AT SCHOOL: *[• = question not asked in that year.]*	year 4 2005 ('01) ['97]	year 8 2005 ('01) ['97]
doing maths work sheets	44 (41) [41]	35 (33) [30]
maths problems and puzzles	41 (39) [30]	58 (60) [43]
using equipment	37 (35) [21]	44 (43) [27]
work in my maths book	36 (40) [34]	27 (22) [21]
maths tests	30 (30) [23]	10 (16) [16]
using a calculator	28 (29) [31]	33 (27) [26]
maths competitions	24 (22) [18]	23 (25) [17]
using maths textbooks	16 (14) [11]	21 (17) [14]
explaining my maths ideas	9 (•) [•]	12 (•) [•]
something else	• (5) [3]	• (10) [7]

Students were presented with a list of nine mathematics activities and asked to nominate up to three that they liked doing at school. The responses are shown adjacent, in percentage order for year 4 students. Comparative figures are given for 1997 and 2001, but it should be noted that four additional choices were available in 1997 and a new one was added in 2005, so the percentages are not strictly comparable.

The most notable changes from year 4 to year 8 are that "maths problems and puzzles" are substantially more popular at year 8 level, while taking maths tests is substantially less popular at year 8 level. Comparing the 1997 and 2005 results, "maths problems and puzzles" and "using equipment" have become more popular at both levels, while taking maths tests has become less popular among year 8 students.

An open-ended question asked students to nominate what they considered to be some very important things a person needs to learn or do to be good at maths. They were asked to try to think of three things. Their responses were coded into eight categories and the results shown in the table adjacent are percentage totals from the sets of three ideas. If a student listed two or more ideas in the same category (such as learning addition facts and multiplication tables), only one was counted. Basic facts and tables were seen by students in both years to be most important, with several other factors given fairly equal importance.

A second open-ended question asked students, *"What are some interesting maths things you do in your own time?"* Their responses were coded into seven categories, and the results shown in the table are percentage totals, out of those students who responded. Year 4 students placed more emphasis on basic facts and tables, while year 8 students made more diverse choices. The emphasis on basic facts and tables among year 4 students declined dramatically between 2001 and 2005.

The third open-ended question asked, *"If you have something really hard to do in maths, what do you do?"* Students' responses were coded into seven categories, and the results shown in the table are percentage totals, out of those students who responded. Year 8 students were more inclined to ask for help, particularly from a teacher. There is an apparent shift for year 4 students, between 2001 and 2005, away from *"ask a teacher"*.

Rating Items

Responses to the 11 rating items are presented in separate tables on the following page for year 4 and year 8 students.

The student responses to the rating items showed the pattern found to date in all subjects except technology: year 8 students are less likely to use the most positive rating than year 4 students. In other words, students become more cautious about expressing high enthusiasm and self-confidence over the four additional years of schooling. It is also clear, however, that about 10 percent more year 8 than year 4 students have distinctly negative views about studying mathematics in school and their own capabilities, while 33 percent more year 8 than year 4 students are negative about doing maths in their own time. These patterns have stayed quite consistent from the first survey in 1997 to the 2005 survey. Over the same period, there have been worthwhile reductions, at both year levels but especially year 8, in the percentages of students who said that they didn't know how good their parents thought they were at maths, or how good their teacher thought they were at maths. There is considerable scope for further reduction in the percentage of students who do not know what their teacher thinks about their mathematical capabilities.

IMPORTANT FOR LEARNING AND BEING GOOD AT MATHS: *Factors nominated by students as being very important for learning maths or for being very good at maths.*	y4	y8
basic facts and tables	43	53
classroom behaviours *(seeking help, discussing with others, paying attention)*	24	15
work skills *(practise, study, revision, homework)*	21	18
personal attributes *(good attitudes, concentration, focus, enjoyment)*	18	23
maths knowledge *(algebra, money, percentages, use of calculators, etc.)*	14	23
intelligence *(thinking, being brainy, being smart, being able to understand)*	17	15
skills and abilities in related subjects *(reading, writing)*	7	7
problem-solving skills	3	9

MATHS ACTIVITIES STUDENTS DO IN THEIR OWN TIME:	year 4 2005 ('01)	year 8 2005 ('01)
basic facts and tables	36 (56)	20 (21)
puzzles, quizzes and games	25 (23)	23 (24)
maths homework	8 (7)	9 (10)
math skills *(excluding basic facts)*	14 (9)	16 (25)
life skills maths *(counting money, banking, calculating animal feed, fencing for paddocks, etc.)*	3 (3)	12 (15)
none	7 (8)	18 (16)
other	16 (8)	14 (12)

STRATEGIES STUDENTS USE WHEN THEY HAVE SOMETHING IN MATHS THAT IS VERY HARD TO DO:	year 4 2005 ('01)	year 8 2005 ('01)
ask a teacher	18 (31)	33 (42)
try harder; persevere	31 (33)	31 (24)
ask for help *(no specific people indicated)*	21 (16)	31 (25)
ask family/friends for help	10 (6)	18 (22)
quit/nothing	11 (8)	10 (4)
guess	1 (3)	1 (1)
other	21 (10)	12 (9)

YEAR 4 MATHEMATICS 2005 (2001) [1997]

[• = question not asked in that year]

	more	about the same	less
1. Would you like to do more, the same or less maths at school?			
	37 (38) [36]	41 (39) [46]	22 (23) [18]

2. How much do you like doing maths at school?				
	50 (51) [52]	34 (30) [31]	10 (10) [10]	6 (9) [7]
3. How good do you think you are at maths?				
	33 (41) [40]	55 (45) [46]	8 (10) [11]	4 (4) [3]

					don't know
4. How good does your teacher think you are at maths?					
	39 (46) [37]	30 (25) [29]	6 (5) [5]	1 (1) [1]	24 (23) [28]
5. How good does your Mum or Dad think you are at maths?					
	63 (65) [60]	21 (15) [19]	4 (4) [3]	2 (1) [1]	10 (15) [16]

6. How much do you like doing maths on your own?				
	50 (53) [•]	26 (23) [•]	14 (14) [•]	10 (10) [•]
7. How much do you like doing maths with others?				
	59 (55) [•]	25 (27) [•]	7 (9) [•]	7 (9) [•]
8. How much do you like helping others with their maths?				
	60 (56) [•]	22 (25) [•]	9 (9) [•]	9 (10) [•]
9. How do you feel about doing things in maths you haven't tried before?				
	47 (47) [39]	31 (28) [35]	14 (15) [20]	8 (10) [6]
10. How much do you like doing maths in your own time (not at school)?				
	40 (37) [41]	26 (23) [26]	14 (16) [14]	20 (24) [19]
11. How do you feel about learning or doing maths as you get older?				
	64 (•) [•]	24 (•) [•]	6 (•) [•]	6 (•) [•]

YEAR 8 MATHEMATICS 2005 (2001) [1997]

[• = question not asked in that year]

	more	about the same	less
1. Would you like to do more, the same or less maths at school?			
	14 (13) [14]	59 (59) [63]	27 (28) [23]

2. How much do you like doing maths at school?				
	25 (26) [25]	48 (40) [49]	19 (23) [18]	8 (11) [8]
3. How good do you think you are at maths?				
	23 (22) [14]	56 (58) [60]	16 (16) [22]	5 (4) [4]

					don't know
4. How good does your teacher think you are at maths?					
	20 (20) [15]	39 (34) [36]	8 (10) [6]	3 (3) [2]	30 (33) [41]
5. How good does your Mum or Dad think you are at maths?					
	31 (35) [26]	43 (32) [39]	10 (7) [9]	2 (1) [2]	14 (25) [24]

6. How much do you like doing maths on your own?				
	26 (23) [•]	38 (42) [•]	22 (21) [•]	14 (14) [•]
7. How much do you like doing maths with others?				
	46 (49) [•]	37 (34) [•]	14 (11) [•]	3 (6) [•]
8. How much do you like helping others with their maths?				
	33 (30) [•]	38 (40) [•]	21 (20) [•]	8 (10) [•]
9. How do you feel about doing things in maths you haven't tried before?				
	32 (33) [26]	45 (38) [46]	17 (21) [22]	6 (8) [6]
10. How much do you like doing maths in your own time (not at school)?				
	11 (9) [13]	22 (22) [28]	31 (33) [33]	36 (36) [26]
11. How do you feel about learning or doing maths as you get older?				
	32 (•) [•]	50 (•) [•]	14 (•) [•]	4 (•) [•]

8 Performance of Subgroups

Although national monitoring has been designed primarily to present an overall national picture of student achievement, there is some provision for reporting on performance differences among subgroups of the sample. Eight demographic variables are available for creating subgroups, with students divided into subgroups on each variable, as detailed in Chapter 1 (p5).

Analyses of the relative performance of subgroups used the total score for each task, created as described in Chapter 1 (p5).

SCHOOL VARIABLES

Five of the demographic variables related to the schools the students attended. For these five variables, statistical significance testing was used to explore differences in task performance among the subgroups. Where only two subgroups were compared, differences in task performance between the two subgroups were checked for statistical significance using t-tests. Where three subgroups were compared, one-way analysis of variance was used to check for statistically significant differences among the three subgroups.

Because the number of students included in each analysis was quite large (approximately 450), the statistical tests were quite sensitive to small differences. To reduce the likelihood of attention being drawn to unimportant differences, the critical level for statistical significance for tasks reporting results for individual students was set at p = .01 (so that differences this large or larger among the subgroups would not be expected by chance in more than one percent of cases). For tasks administered to teams or groups of students, p = .05 was used as the critical level, to compensate for the smaller numbers of cases in the subgroups.

For the first four of the five school variables, statistically significant differences among the subgroups were found for slightly less than 16 percent of the tasks at both year levels. For the remaining variable, statistically significant differences were found on nearly two thirds of the tasks at both levels. In the detailed report below, all differences mentioned are statistically significant (to save space, the words "statistically significant" are omitted).

School Size

Results were compared from students in larger, medium size, and small schools (exact definitions were given in Chapter 1 (p5).

For year 4 students, there were differences among the three subgroups on two of the 64 tasks. Students attending small schools scored lowest on *Number Facts (Multiplication)* (p13) and on *Link Task 5* (p29). There were no differences on questions of the *Mathematics Survey* (p55).

For year 8 students there were differences among the three subgroups on one of the 91 tasks. Students from medium size schools scored highest on *Link Task 42* (p49). There were no differences on questions of the *Mathematics Survey* (p55).

Community Size

Results were compared for students living in communities containing over 100,000 people (main centres), communities containing 10,000 to 100,000 people (provincial cities) and communities containing less than 10,000 people (rural areas).

For year 4 students, there were differences among the three subgroups on six of the 64 tasks. Students from provincial cities scored lowest and students from main centres scored highest on five of these tasks: *Algorithms (Division)* (p14), *Number Facts (Multiplication)* (p13), *Link Task 3* (p29), *Link Task 12* (p29) and *Link Task 13* (p30). Students from main centres scored highest and students from rural areas scored lowest on the remaining task, *Algorithms (Subtraction)* (p14). There were no differences on questions of the *Mathematics Survey* (p55).

For year 8 students, there was a difference among the three subgroups on one of the 91 tasks. Students from provincial cities scored lowest on *Link Task 22* (p30). There were no differences on questions of the *Mathematics Survey* (p55).

School Type

Results were compared for year 8 students attending full primary and intermediate (or middle) schools, and students attending year 7 to 13 high schools.

In comparing students attending full primary and intermediate (or middle) schools, there were statistically significant differences on three of the 91 tasks. Students attending full primary schools scored higher than students attending intermediate (or middle) schools on *Thermometer* (p38) and *Link Task 19* (p30). Students attending intermediate (or middle) schools scored higher than students attending full primary schools on *Link Task 20* (p30). There was one difference on the questions of the *Mathematics Survey* (p55). Students attending full primary schools reported significantly higher ratings for the item, *"How much do you like doing maths in your own time?"* as compared to the students attending intermediate (or middle) schools.

In comparing students attending intermediate (or middle) schools to those attending year 7 to 13 high schools, there were statistically significant differences on six of the 91 tasks. Students attending year 7 to 13 high schools scored higher than students attending intermediate (or middle) schools on all six tasks: *Numbers on Lines* (p23), *Equivalents* (p28), *Thermometer* (p38), *Awesome Angles* (p48), *Link Task 6* (p29) and *Link Task 39* (p49). There were no differences on questions of the *Mathematics Survey* (p55).

Zone

Results achieved by students from Auckland, the rest of the North Island, and the South Island were compared.

For year 4 students, there were differences among the three sub-groups on nine of the 64 tasks. Students from the Auckland scored highest on 7 tasks: *Number Facts (Multiplication)* (p13), *Algorithms (Division)* (p14), *Page of Stamps* (p16), *Number Patterns* (p19), *Fractions* (p24), *Link Task 3* (p29) and *Link Task 11* (p29). Students from the South Island scored highest on the remaining two tasks: *Letter* (p34) and *How Much Change?* (p34). Students from the South Island scored lowest on two tasks: *Number Facts (Multiplication)* (p13) and *Link Task 11* (p29); students from the rest of the North Island scored lowest on all remaining tasks. There was one difference on the questions of the *Mathematics Survey* (p55). Students from Auckland were most positive and students from the South Island were least positive on the question, *"How do you feel about doing things in maths you haven't tried before?"*

For year 8 students, there were differences among the three subgroups on seven of the 91 tasks. Students from the South Island scored highest on six tasks: *Fractions* (p24), *Change* (p34), *Nets* (p46) *Pick A Teddy* (p51), *Link Task 43* (p49), and *Link Task 44* (p52). Students from the rest of the North Island scored highest on the remaining task, *Tangram* (p23). Students from Auckland scored lowest on six tasks: *Tangram* (p23), *Fractions* (p24), *Change* (p34), *Nets* (p46), *Pick a Teddy* (p51) and *Link Task 44* (p52). Students from the rest of the North Island scored lowest on the remaining task, *Link Task 43* (p49). There was one difference on the questions of the *Mathematics Survey* (p55). Students from the South Island were most positive and students from Auckland were least positive on the question, *"How much do you like doing maths in your own time?"*

Socio-Economic Index

Schools are categorised by the Ministry of Education based on census data for the census mesh blocks where children attending the schools live. The resulting index takes into account household income levels and categories of employment. It uses 10 subdivisions, each containing 10 percent of schools (deciles 1 to 10). For our purposes, the bottom three deciles (1-3) formed the low decile group, the middle four deciles (4-7) formed the medium decile group and the top three deciles (8-10) formed the high decile group. Results were compared for students attending schools in each of these three groups.

For year 4 students, there were differences among the three subgroups on 40 of the 64 tasks. Because of the number of tasks involved, the specific tasks are not listed here. In each case, performance was lowest for students in the low decile group. Students in the high decile group performed better than students in the medium decile group on all but five tasks; however, these differences were quite small. There were significant differences on three of the questions on the *Mathematics Survey* (p55). Students in the low decile group were more positive than students in the high decile group on two questions: *"How much do you like doing maths on your own?"* and *"How much do you like doing maths with others?"* Students in the low decile group were more positive than students in the high and middle decile groups on the question, *"How much do you like doing maths in your own time?"*

For year 8 students, there were differences among the three subgroups on 59 of the 91 tasks. Because of the number of tasks involved, the specific tasks are not listed here. In each case, performance was lowest for students in the low decile group. Students in the high decile group performed better than students in the medium decile group on all but two tasks; however, these differences were quite small. There were no differences among groups on the questions of the *Mathematics Survey* (p55).

STUDENT VARIABLES

Three demographic variables related to the students themselves:

- *Gender:* boys and girls
- *Ethnicity:* Māori, Pasifika and Pakeha (this term was used for all other students)
- *Language used predominantly at home:* English and other.

During the cycle of the Project that took place from 1999-2002, special supplementary samples of students from schools with at least 15 percent Pasifika students enrolled were included. These allowed the results of Pasifika students to be compared with those of Māori and Pakeha students attending these schools. By 2002, with Pasifika enrolments having increased nationally, it was decided that from 2003 onwards a better approach would be to compare the results of Pasifika students in the main NEMP samples with the corresponding results for Māori and Pakeha students. This gives a nationally representative picture, with the results more stable because the numbers of Māori and Pakeha students in the main samples are much larger than their numbers previously in the special samples.

The analyses reported compare the performances of boys and girls, Pakeha and Māori students, Pakeha and Pasifika students, and students from predominantly English-speaking and non-English-speaking homes.

For each of these three comparisons, differences in task performance between the two subgroups are described using effect sizes and statistical significance.

For each task and each year level, the analyses began with a t-test comparing the performance of the two selected subgroups and checking for statistical significance of the differences. Then the mean score obtained by students in one subgroup was subtracted from the mean score obtained by students in the other subgroup, and the difference in means was divided by the pooled standard deviation of the scores obtained by the two groups of students. This computed effect size describes the magnitude of the difference between the two subgroups in a way that indicates the strength of the difference and is not affected by the sample size. An effect size of +.30, for instance, indicates that students in the first subgroup scored, on average, three tenths of a standard deviation higher than students in the second subgroup.

For each pair of subgroups at each year level, the effect sizes of all available tasks were averaged to produce a mean-effect size for the curriculum area and year level, giving an overall indication of the typical performance difference between the two subgroups.

Gender

Results achieved by male and female students were compared using effect-size procedures.

For year 4 students, the mean-effect size across the 63 tasks was .08 (boys averaged 0.08 standard deviations higher than girls). This difference is small. There were statistically significant differences ($p < .01$) favouring boys on eight of the 63 tasks: *Algorithms (Subtraction)* (p14), *12 Bears* (p17), *How Much Change?* (p34), *Link Task 5* (p29), *Link Task 9* (p29), *Link Task 10* (p29), *Link Task 11* (p29) and *Link Task 30* (p42). There were differences on two questions of the *Mathematics Survey* (p55). Boys were more positive than girls for the question, *"How good does your teacher think you are at maths?"* and girls were more positive than boys in response to the question, *"How much do you like doing maths in your own time?"*

For year 8 students, the mean-effect size across the 89 tasks was .03 (girls averaged 0.03 standard deviations higher than boys); this is a small difference. There were statistically significant differences on seven of the 89 tasks, with girls performing better on all seven tasks: *Letter* (p34), *Snacks* (p38), *Trapezium* (p45), *Link Task 7* (p29), *Link Task 11* (p29), *Link Task 14* (p30) and *Link Task 39* (p49). There was one difference on the questions of the *Mathematics Survey* (p55). Boys gave a more positive response than girls to the question, *"How do you feel about doing things in maths you haven't tried before?"*

Ethnicity

Results achieved by Māori, Pasifika, and Pakeha (all other) students were compared using effect-size procedures. First, the results for Pakeha students were compared to those for Māori students. Second, the results for Pakeha students were compared to those for Pasifika students.

Pakeha-Māori Comparisons

For year 4 students, the mean-effect size across the 63 tasks was .37 (Pakeha students averaged 0.37 standard deviations higher than Māori students). This is a moderate difference. There were statistically significant differences ($p <. 01$) on 41 of the 63 tasks. Pakeha students scored higher than Māori students on all 41 tasks. Because of the number of tasks showing differences, they are not listed here. There was one difference on questions of the *Mathematics Survey* (p55). Māori students were more positive than Pakeha students in response to the question, *"How much do you like doing maths at school?"*

For year 8 students, the results were similar. The mean-effect size across the 89 tasks was .35 (Pakeha students averaged 0.35 standard deviations higher than Māori students). This is a moderate difference. There were statistically significant differences on 52 of the 89 tasks. Pakeha students scored higher than Māori students on all 52 tasks. Because of the number of tasks showing differences, they are not listed here. There was one difference on the questions of the *Mathematics Survey* (p55). Māori students were more positive than Pakeha students in response to the question, *"How good does your teacher think you are at maths?"*

Pakeha-Pasifika Comparisons

Readers should note that only 31 to 41 Pasifika students were included in the analysis for each task. This is lower than normally preferred for NEMP subgroup analyses, but has been judged adequate for giving a useful indication, through the overall pattern of results, of the Pasifika students' performance. Because of the relatively small numbers of Pasifika students, $p = .05$ has been used here as the critical level for statistical significance.

For year 4 students, the mean-effect size across the 63 tasks was .35 (Pakeha students averaged 0.35 standard deviations higher than Pasifika students). This is a moderate difference. There were statistically significant differences on 25 of the 63 tasks. Pakeha students scored higher on all 25 tasks. Because of the number of tasks showing differences, they are not listed here. There were also differences on four questions of the *Mathematics Survey* (p55). Pasifika students were more positive than Pakeha students in response to the questions, *"How good do you think you are at maths?" "How much do you like doing maths with others?", "How much do you like helping others with their maths?"* and *"How do you feel about learning or doing maths as you get older?"*

For year 8 students, the mean-effect size across the 89 tasks was .51 (Pakeha students averaged 0.51 standard deviations higher than Pasifika students). This is a large difference. There were statistically significant differences on 60 of the 89 tasks. Pakeha students scored higher on all 60 tasks. Because of the number of tasks showing differences, they are not listed here. There were no differences on questions of the *Mathematics Survey* (p55).

Home Language

Results achieved by students who reported that English was the predominant language spoken at home were compared, using effect-size procedures, with the results of students who reported predominant use of another language at home (most commonly an Asian or Pasifika language). Because of the relatively small numbers in the "other language" group, p = .05 has been used here as the critical level for statistical significance.

For year 4 students, the mean-effect size across the 63 tasks was 0.10 (students for whom English was the predominant language at home averaged 0.10 standard deviations higher than the other students). This is a small difference. There were statistically significant differences on five of the 63 tasks: *Maths Helper* (p15), *Torn Tape* (p40), *Trapezium* (p45), *Pick a Teddy* (p51) and *Link Task 29* (p42). For each of these five tasks, the students for whom English was the predominant language at home performed significantly better than the students who reported using another language at home. There were statistically significant differences on seven questions of the *Mathematics Survey* (p55): *"How much do you like doing maths at school?", "Would you like to do more, the same or less maths at school?", "How much do you like doing maths on your own?", "How much do you like helping others with their maths?", How do you feel about doing things in maths you haven't tried before?", "How much do you like doing maths in your own time?"* and *"How do you feel about learning or doing maths as you get older?"* The students who reported using another

language at home were more positive than the students for whom English was the predominant language at home on all seven questions.

For year 8 students, the mean-effect size across the 89 tasks was .10 (students for whom English was the predominant language at home averaged 0.10 standard deviations higher than the other students). This is a small difference. There were statistically significant differences on nine of the 89 tasks. Students for whom English was the predominant language spoken at home scored higher on eight of these tasks: *Maths Helper* (p15), *Show Me The Time* (p33), *Torn Tape* (p40), *Nets* (p46), *Chocolate Bars* (p52), *Link Task 29* (p42), *Link Task 34* (p42) and *Link Task 47* (p52). Students who reported using a language other than English at home scored higher on *Flies at the Barbecue* (p22). There were also differences on three questions of the *Mathematics Survey* (p55): *"How much do you like doing maths in your own time?", "How much do you like helping others with their maths?"* and *"How do you feel about learning or doing maths as you get older?"* The students who reported using another language at home were more positive than the students for whom English was the predominant language at home on all three questions.

Summary, with Comparisons to Previous Mathematics Assessments

Community size, school size, school type (full primary, intermediate, or year 7 to 13 high school), and geographic zone were not important factors predicting achievement on the mathematics tasks. The same was true for the 2001 and 1997 assessments. However, there were statistically significant differences in the performance of students from low, medium and high decile schools on 62.5 percent of the tasks at year 4 level (compared to 87 percent in 2001 and 85 percent in 1997), and 65 percent of the tasks at year 8 level (compared to 76 percent in 2001 and 77 percent in 1997). The change for year 4 students is noteworthy.

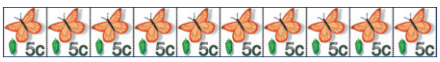
For the comparisons of boys with girls, Pakeha with Māori, Pakeha with Pasifika students, and students for whom the predominant language at home was English with those for whom it was not, effect sizes were used. Effect size is the difference in mean (average) performance of the two groups, divided by the pooled standard deviation of the scores on the particular task. For this summary, these effect sizes were averaged across all tasks.

Year 4 boys averaged slightly higher than girls, with a mean effect size of 0.08 (very similar to the mean effect size of 0.10 in 2001). Year 8 girls averaged slightly higher than boys, with a mean effect size of 0.03 (the same as in 2001). As was also true in 2001, the mathematics survey results at both year levels showed some evidence that boys were more positive than girls about mathematics activities.

Pakeha students averaged moderately higher than Māori students, with mean effect sizes of 0.37 for year 4 students and 0.35 for year 8 students (the corresponding figures in 2001 were 0.46 and 0.42). The responses to the questions of the mathematics survey yielded only one difference at each year level.

Year 4 Pakeha students averaged moderately higher than Pasifika students, with a mean effect size of 0.35 (compared to 0.59 in 2001). This is a noteworthy change. Year 8 Pakeha students also averaged substantially higher than Pasifika students, with a mean effect size of 0.51 (compared to 0.53 in 2001). The responses to the *Mathematics Survey* (p55) showed some differences at year 4, with the Pasifika students indicating more positive responses than the Pakeha students.

Compared to students for whom the predominant language at home was English, students from homes where other languages predominated averaged slightly lower, with mean effect sizes of 0.10 for year 4 students and 0.10 for year 8 students. Comparative figures are not available for the assessments in 2001. Year 4 students who reported speaking a language other than English at home were generally more positive about mathematics than students whose predominant language at home was English. These differences largely subsided at year 8.



Appendix : The Sample of Schools and Students in 2005

Main Samples, Assessed in English

In 2005, 2879 children from 248 schools were in the main samples to participate in national monitoring. Half were in year 4, the other half in year 8. At each level, 120 schools were selected randomly from national lists of state, integrated and private schools teaching at that level, with their probability of selection proportional to the number of students enrolled in the level. The process used ensured that each region was fairly represented. Schools with fewer than four students enrolled at the given level were excluded from these main samples, as were special schools and Māori immersion schools (such as Kura Kaupapa Māori).

In May 2005, the Ministry of Education provided computer files containing lists of eligible schools with year 4 and year 8 students, organised by region and district, including year 4 and year 8 roll numbers drawn from school statistical returns based on enrolments at 1 March 2005.

From these lists, we randomly selected 120 schools with year 4 students and 120 schools with year 8 students. Schools with four students in year 4 or 8 had about a one percent chance of being selected, while some of the largest intermediate (year 7 and 8) schools had a more than 90 percent chance of inclusion.

Māori Immersion Sample, Assessed Predominantly in Te Reo

Details of the sample for the Māori immersion assessments will be reported separately.

Pairing Small Schools

At the year 8 level, five of the 120 chosen schools in the main sample had fewer than 12 year 8 students. For each of these schools, we identified the nearest small school meeting our criteria to be paired with the first school. Wherever possible, schools with eight to 11 students were paired with schools with four to seven students, and vice versa. However, the travelling distances between the schools were also taken into account.

Similar pairing procedures were followed at the year 4 level. Three pairs of very small schools were included in the sample of 120 schools.

Contacting Schools

In late May and early June, we attempted to telephone the principals or acting principals of all schools in the year 8 sample. In these calls, we briefly explained the purpose of national monitoring, the safeguards for schools and students, and the practical demands that participation would make on schools and students. We informed the principals about the materials which would be arriving in the school (a copy of a 20-minute NEMP videotape plus copies for all staff and trustees of the general NEMP brochure and the information booklet for sample schools). We asked the principals to consult with their staff and Board of Trustees and confirm their participation by the end of June.

A similar procedure was followed at the end of July with the principals of the schools selected in the year 4 samples, and they were asked to respond to the invitation by the end of August.

Response from Schools

Of the 248 schools originally invited to participate, 247 agreed. A year 7 to 13 integrated high school in the year 8 sample declined to participate because of heavy external demands in the previous year. It was replaced by another integrated school. One very small school in the year 4 sample that was willing to participate was replaced by a similar school because the number of students available in the original school declined to less than the number required (eight).

Sampling of Students

Each school sent a list of the names of all year 4 or year 8 students on their roll. Using computer-generated random numbers, we randomly selected the required number of students (12 or four plus eight in a pair of small schools), at the same time clustering them into random groups of four students. The schools were then sent a list of their selected students and invited to inform us if special care would be needed in assessing any of those children (e.g. children with disabilities or limited skills in English).

For the year 8 sample, we received 103 comments about particular students. In 43 cases, we randomly selected replacement students because the children initially selected had left the school between the time the roll was provided and the start of the assessment programme in the school, or were expected to be away or involved in special activities throughout the assessment week, or had been included in the roll by mistake. Two more were replaced because they were in Māori immersion classes. The remaining 58 comments concerned children with special needs. Each such child was discussed with the school and a decision agreed. Eight students were replaced because they were very recent immigrants or overseas students who had extremely limited English-language skills. Twenty-nine students were replaced because they had disabilities or other problems of such seriousness that it was agreed that the students would be placed at risk if they participated. Participation was agreed upon for the remaining 21 students, but a special note was prepared to give additional guidance to the teachers who would assess them.

For the year 4 sample, we received 128 comments about particular students. Forty-seven students originally selected were replaced because a student had left the school or was expected to be away throughout the assessment week. Thirteen students were replaced because of their NESB status and very limited English, and two because they were in Māori immersion classes. Twenty-five students were replaced because they had disabilities or other problems of such seriousness the students appeared to be at risk if they participated. Special notes for the assessing teachers were made about 41 children retained in the sample.

Communication with Parents

Following these discussions with the school, Project staff prepared letters to all of the parents, including a copy of the NEMP brochure, and asked the schools to address the letters and mail them. Parents were told they could obtain further information from Project staff (using an 0800 number) or their school principal, and advised that they had the right to ask that their child be excluded from the assessment.

At the year 8 level, we received a number of phone calls including several from students or parents wanting more information about what would be involved. Six children were replaced because they did not want to participate or their parents did not want them to.

At the year 4 level we also received several phone calls from parents. Some wanted details confirmed or explained (notably about reasons for selection). Five children were replaced at their parents' request.

Practical Arrangement with Schools

On the basis of preferences expressed by the schools, we then allocated each school to one of the five assessment weeks available and gave them contact information for the two teachers who would come to the school for a week to conduct the assessments. We also provided information about the assessment schedule and the space and furniture requirements, offering to pay for hire of a nearby facility if the school was too crowded to accommodate the assessment programme. This proved necessary in several cases.

Results of the Sampling Process

As a result of the considerable care taken, and the attractiveness of the assessment arrangements to schools and children, the attrition from the initial sample was quite low. Less than one percent of selected schools in the main samples did not participate, and less than three percent of the originally sampled children had to be replaced for reasons other than their transfer to another school or planned absence for the assessment week. The main samples can be regarded as very representative of the populations from which they were chosen (all children in New Zealand schools at the two class levels apart from the one to two percent who were in special schools, Māori immersion programmes, or schools with fewer than four year 4 or year 8 children).

Of course, not all the children in the samples actually could be assessed. One student place in the year 4 sample was not filled because insufficient students were available in that schools. Ten year 8 students and 12 year 4 students left school at short notice and could not be replaced. Five year 8 students were overseas or on holiday for the week of the assessment. One year 8 and one year 4 student withdrew or were withdrawn by their parents too late to be replaced. Fourteen year 8 students and 14 year 4 students were absent from school throughout the assessment week. Some other students were absent from school for some of their assessment sessions, and a small percentage of performances were lost because of malfunctions in the video recording process. Some of the students ran out of time to complete the schedules of tasks. Nevertheless, for almost all of the tasks over 90 percent of the sampled students were assessed. Given the complexity of the Project, this is a very acceptable level of participation.

Composition of the Sample

Because of the sampling approach used, regions were fairly represented in the sample, in approximate proportion to the number of school children in the regions.

REGION

PERCENTAGES OF STUDENTS FROM EACH REGION:		
REGION	% YEAR 4 SAMPLE	% YEAR 8 SAMPLE
Northland	4.2	4.2
Auckland	33.3	32.5
Waikato	10.0	10.0
Bay of Plenty/Poverty Bay	8.3	8.3
Hawkes Bay	4.2	3.3
Taranaki	2.5	3.3
Wanganui/Manawatu	5.0	5.8
Wellington/Wairarapa	10.8	10.0
Nelson/Marlborough/West Coast	4.2	4.2
Canterbury	11.7	11.7
Otago	4.2	4.2
Southland	1.7	2.5

DEMOGRAPHY

DEMOGRAPHIC VARIABLES: PERCENTAGES OF STUDENTS IN EACH CATEGORY			
VARIABLE	CATEGORY	% YEAR 4 SAMPLE	% YEAR 8 SAMPLE
Gender	Male	51	52
	Female	49	48
Ethnicity	Pakeha	70	74
	Māori	21	18
	Pasifika	9	8
Geographic Zone	Greater Auckland	33	32
	Other North Island	45	46
	South Island	22	22
Community Size	< 10,000	14	16
	10,000 – 100,000	25	25
	> 100,000	61	59
School SES Index	Bottom 30 percent	28	22
	Middle 40 percent	40	47
	Top 30 percent	32	31
Main Language at Home	English	87	87
	Other	13	13
Size of School	< 25 y4 students	19	
	25 – 60 y4 students	41	
	> 60 y4 students	40	
	<35 y8 students		18
	35 – 150 y8 students		37
	> 150 y8 students		45
Type of School	Full Primary		32
	Intermediate or Middle		48
	Year 7 to 13 High School		14
	Other *(not analysed)*		6

MATHEMATICS ASSESSMENT RESULTS 2005

Mathematics is pervasive. We encounter and use mathematical ideas and processes in our ordinary everyday lives and, in varying degrees of sophistication, it is used in all fields of industry, commerce, the sciences and technology.

In order to fully understand the world around us and exercise effective control over our own affairs, we all need to develop mathematical understandings, skills and attitudes.

National monitoring provides a "snapshot" of what New Zealand children can do at two levels, at the middle and end of primary education (year 4 and year 8).

The main purposes for national monitoring are:

- to meet public accountability and information requirements by identifying and reporting patterns and trends in educational performance
- to provide high quality, detailed information which policy makers, curriculum planners and educators can use to debate and review educational practices and resourcing.

NEMP National Education Monitoring Project

MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo

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