PROFILES OF LEARNING

The Basic Skills Testing Program in New South Wales: 1989

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Overview

The Basic Skills Testing Program (BSTP), introduced by the New South Wales Government in 1989, provides the most comprehensive picture yet compiled of literacy and numeracy learning in Australian primary schools. Through this annual program, Year 3 and Year 6 students in government schools are tested in aspects of literacy and numeracy achievement, and detailed reports of students' performances on each aspect of the tests are forwarded to parents and teachers.

This book describes how BSTP tests are developed, how students' results are analysed, and how results are reported to parents and schools. The chapters that follow provide important new information on how students in government primary schools are performing on essential skills in language and mathematics.

The Basic Skills Testing Program is fundamentally different from some other assessment programs that estimate and monitor standards of achievement at the system level only. Those programs report the performances of small samples of students at perhaps five-yearly intervals and provide information that is primarily of interest to policy makers. In contrast, BSTP tests provide parents and teachers with systematically collected information on the achievements of individual students in key areas of the curriculum; they also provide schools with reliable, annual data on the performances of their students in relation to statewide achievement levels. BSTP test questions are written in close collaboration with language and mathematics staff of the New South Wales Department of School Education, are matched to NSW syllabus statements, and are designed to complement teachers' routine classroom assessments.

BSTP tests are designed to serve a number of purposes simultaneously. This book shows how individual students' test performances are interpreted normatively (that is, in terms of the typical performances of Year 3 and Year 6 students in NSW government schools) and in terms of the knowledge, skills and understandings that each student has mastered. It also shows how different kinds of information are generated for parents, teachers, school principals, the Education Department, and the general public, including diagnostic information about individual students

and details of statewide standards.

The materials developed for the Basic Skills Testing Program include a variety of innovative tasks designed to be more realistic and more interesting to students than the questions often found in standardised machine-scored tests. In some of the 1989 tasks, students were asked to underline errors in other students' writing, shade parts of drawings, and draw paths on a map. All responses were scanned and analysed by computer. A useful spin-off of the Basic Skills Testing Program has been the successful development of novel kinds of machine-scorable test questions.

The Basic Skills Testing Program has also broken new ground in the analysis and reporting of test performances. The BSTP analyses conducted in 1989 constitute the most extensive application of modern measurement theory (or 'Item Response Theory') yet undertaken in this country. These analyses have yielded valuable insight into the nature of student progress in each of the five aspects of the BSTP tests and have provided a basis for the specially-designed reports for parents, teachers and schools described in Part III of this book.

The overall picture that emerges from the 1989 BSTP testing is a picture of widespread success in learning. Within each of the aspects of literacy and numeracy, most students show mastery of the basic knowledge and skills expected of Year 3 and Year 6 students. Between a quarter and a third of Year 6 students demonstrate high levels of mastery likely to be uncommon even among adults. These results suggest effective teaching and are evidence that, for most students, schools are providing solid foundations for further learning.

This generally optimistic picture of learning in New South Wales schools is overshadowed, however, by those students at the other end of the continuum who clearly have not achieved even the most basic literacy and numeracy skills. For each aspect of literacy and numeracy tested, significant numbers of students have mastered only the most elementary skills. These students will require special attention if they are not to fall further behind in their learning.

Introduction

Many students currently in our primary schools will still be in secondary and higher education in the late 1990s and after the turn of the century. These students will take their places in a society and workforce of the 21st century that will need to be more highly skilled, better informed, and more adaptable than at any time in our past. To participate fully in adult society, today's students will require skills and competencies not expected or demanded of earlier generations.

Technological advances of the next decade will provide all Australians with much greater access to information. In an information-rich society there will be a need for well-developed skills in locating, interpreting and using information, in analysing relevance, and in evaluating the quality of information. At the same time, advances in communication, travel and international trade will provide a shrinking world where language skills—the ability to produce and interpret communications—and facilities in languages other than English will be vital, not only to personal participation in the global community, but also to the economic well-being of the nation.

At the beginning of the current century, Australian children often received very little formal education and entered the workforce with limited skills in reading, writing and arithmetic. Some were able to do little more than sign their names. As the years children spent in school increased, it became an expectation that all students would achieve certain elementary survival skills. All students were expected to leave school with at least the ability to read for important factual information, to write an intelligible letter, and to carry out simple calculations with money. Surveys toward the end of the 20th century show that almost all students are now achieving these minimum levels of skill. Alarmingly, however, many students leave our schools having achieved little more than this.

In the world of the 21st century that today's students will enter, survival skills in reading, writing and arithmetic will not be enough. Full participation in society will require skills that go beyond extracting information from text to analysing and interpreting written material. As a nation we will require a greater proportion of our population who not only can locate factual information, but

who also can critically evaluate what they read, and whose writing skills go beyond writing a letter to being able to write scientifically, technically, creatively and persuasively. We will also require greater numbers of people with mathematical skills that go beyond manipulating columns of numbers and performing basic arithmetic operations to being able to reason mathematically and to use mathematics in the solution of everyday problems.

The task of building the personal, social and intellectual skills of Australia's children falls largely to our schools. This task is shared with the family and other social institutions, but it is schools that shoulder major responsibility for equipping each generation of students with the knowledge, attitudes and skills necessary for participation in adult society. In a time of rapid economic and social change, schools have a special responsibility to ensure that all students receive a broad, general education that includes a solid foundation of basic literacy and numeracy learning; an understanding of Australia's history, cultural heritage and place in the world; a mastery of basic scientific and technological principles and skills; and a readiness for a lifetime of ongoing learning.

Studies of what makes some schools especially effective in providing successful learning experiences for *all* their students highlight the importance of a clear sense of purpose: a carefully articulated set of goals for student learning[1]. In these schools, the systematic monitoring of student learning is seen as an integral part of the teaching/learning process, providing diagnostic feedback on the progress of individual learners and information about the extent to which a school's goals are being met. This information is shared with parents who are treated as partners in the educational process. Reporting to parents is most effective when it provides a description of what a student has achieved and a guide to the kinds of learning experiences that are likely to be most helpful at that point in the student's learning.

The Basic Skills Testing Program is an initiative of the Government of New South Wales to provide parents and teachers with systematically-collected information on aspects of students' literacy

[1] Beare, H., Caldwell, B.J. and Millikan, R.H. (1989). *Creating an Excellent School: Some New Management Techniques.* Routledge, London.

and numeracy skills[1]. The program also provides the Education Department and the broader community with evidence on standards of literacy and numeracy learning in government primary schools.

Through the BSTP, Year 6 students' skills in two aspects of literacy (Reading and Language) and three aspects of numeracy (Number, Measurement and Space) are assessed. In August 1989, tests were taken by some 53 800 Year 6 students. Parents and schools received reports in early November. Other tests in Reading and Number were taken by about 2300 Year 3 students to assess the feasibility of extending the testing program to all Year 3 students in 1990.

Parents of students who take BSTP tests receive a one-page report on their child's results. This report displays pictorially the student's level of achievement in each aspect of the tests and describes the kinds of knowledge, understanding and skill associated with that level.

Teachers receive additional details of students' results in the form of a two-page report for each student listing the questions answered correctly and those answered incorrectly. Reports for teachers are designed to facilitate the identification of unexpected results (easy questions answered incorrectly, for example, or difficult questions answered correctly) to assist in the diagnosis of individuals' special strengths and weaknesses.

Other reports received by each school include an alphabetical list of students showing their results on the five aspects of the tests and their overall results in literacy and numeracy; school and state averages; a breakdown of the performances of various subgroups for the school and for the state; and the percentages of students choosing each of the available answers to each test question for the school and state. In this way, schools are provided with detailed information about how their students perform in these aspects of the curriculum in relation to other students. This information should be of value to schools in reviewing and evaluating school programs. Reports received by parents, teachers and schools are

[1] NSW Ministry of Education and Youth Affairs (1989). *Excellence and Equity. New South Wales Curriculum Reform.* Sydney.

described in detail in Part III of this report.

Skills assessed by BSTP tests are based directly on the Department of School Education's syllabus statements for language and mathematics. Tests are developed by ACER research staff in collaboration with staff of the New South Wales Department to reflect and support the learning objectives emphasised in those statements. Through the close matching of BSTP tests to the principles and content of the NSW syllabus it is intended that the tests will complement teachers' classroom assessments.

The Basic Skills Testing Program is not intended to cover all facets of literacy and numeracy learning in primary schools. BSTP tests do not, for example, assess students' writing, listening or speaking skills, all of which are important in literacy learning. Because they assess only some aspects of student learning, BSTP tests are referred to as tests of *Aspects of Literacy* and *Aspects of Numeracy.*

In developing BSTP tests, a special effort is made to design tasks that will be inherently interesting to Year 3 and Year 6 students. For the 1989 tests, attractive stimulus materials in the form of a newspaper (*NSW Today*), a magazine (*Young Aussie*), and a catalogue (*Big X Spring Sale*) were developed to provide realistic contexts for test questions and to emphasise the relevance of mathematics and language learning to everyday activities. Tests are carefully screened and pilot-tested in an attempt to identify questions that might unfairly disadvantage students of a specific gender, geographical or cultural group.

In most machine-scored tests students choose answers labelled *A, B, C, D* or *E* and record their answers on specially-printed answer sheets. In BSTP tests, students record their answers directly in their test booklets, often by shading drawings of calculator buttons, coins, furniture, or three-dimensional shapes. In one section of the 1989 test, students underlined errors in other students' writing. These novel question types resemble familiar classroom tasks and reduce the likelihood that some students will be advantaged or disadvantaged by experience with more traditional machine-scored tests. Part IV describes in more detail how BSTP tests are developed.

An important feature of the Basic Skills Testing Program arises from

the way in which 'basic' skills are defined. Basic skills are defined in BSTP tests not as low-level, rudimentary survival skills, but as major areas of learning that have a central role in the school curriculum. Reading, for example, is seen as a 'basic' skill because of its fundamental importance to all areas of school learning. A distinction can be drawn between BSTP tests and tests designed to assess students' mastery of low-level survival skills only. 'Minimum competency' tests of this kind ask students to complete tasks such as reading instructions on a medicine bottle, locating factual information in a newspaper, reading a timetable, and carrying out basic calculations with money. The tests given to samples of 10- and 14-year old students in the Australian Studies of Student Performance (ASSP) in 1975 and 1980 were of this kind[1]. So were the tests developed for statewide minimum competency testing programs in the United States in the 1970s.

In contrast, BSTP tests contain questions at a range of skill levels: from low levels of achievement to higher-order skills that are likely to be found only among more advanced students. These questions mark out a continuum of skill development and provide a picture of what students find easier and harder in each of the five aspects of the tests. The skill levels defined by the 1989 BSTP tests are described in detail in Part I of this book and the methods used to construct those levels are outlined in Part IV.

Performances on each aspect of the tests are summarised for various subgroups of students in Part II. Results are reported separately for boys, girls, several age groupings, Aboriginal/Torres Strait Islander students, and students with recent non-English-speaking backgrounds.

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[1] Keeves, J.P. and Bourke, S.F. (1976). *Australian Studies in School Performance.* Education Research and Development Committee Report No.8, Canberra.

Bourke, S.F., Mills, J.M., Stanyon, J. and Holzer, F. (1981). *Performance in Literacy and Numeracy: 1980.* Australian Education Council, Canberra.

PART I

ASPECTS OF BASIC SKILLS

The five basic skills assessed by BSTP tests are Reading, Language (knowledge of conventions of written English), Number, Measurement, and Space. The three aspects of numeracy correspond to the three major strands of the NSW mathematics syllabus. In the pages that follow, these five areas of student learning are introduced and explained. Examples of the questions asked of students are provided and students' success rates on those questions are reported.

For each aspect of the tests, a set of skill levels is defined. These skill levels provide a picture of increasing achievement in each area of learning. The lowest levels are made up of elementary knowledge and limited kinds of understanding that almost all students should have mastered by the end of Year 6. Higher levels of skill reflect more sophisticated understandings and more advanced problem-solving processes. The highest level of skill for each aspect represents a level of achievement attained by only a small percentage of Year 6 students.

The skill levels constructed for each aspect of the tests are based on an analysis of students' test performances and an analysis of the skills required to answer individual questions. They show the kinds of questions that students find easier and the kinds of questions they find more difficult. The analysis of what makes some questions more difficult than others provides valuable insight into how competence develops within each area of learning.

These skill levels also provide the framework that has been used to report students' results to parents and schools. Reports for parents indicate individuals' skill levels in each of the five aspects of the tests and describe the knowledge, understandings and skills typically associated with those levels. Procedures used to construct the skill levels are described in Part IV.

Students make progress in reading at different rates and at different times in their schooling.

Reading

Reading is essential to almost all areas of the primary school curriculum and is a key to success in secondary school. Indeed, it is difficult to imagine an area of school learning with as much potential to influence progress at school. Students with poorly developed reading skills by the end of primary school are likely to experience increasing difficulty and frustration with learning in secondary schools.

It might be thought that 'learning to read' occurs for most children in the first year or two of school and that, once a child has 'learnt to read', all that remains is to learn the meaning of more difficult words. In reality, students' reading skills continue to develop throughout their schooling.

Reading involves much more than being able to recognise letters and words on a page. When students read, they use their knowledge of language and their knowledge of the world around them to make sense of what they read. As they become better readers, they are better able to predict what is coming in a piece of writing, they develop skills in locating information, and they become more sensitive to writers' purposes and to subtleties in writing. Students make progress in reading at different rates and at different times in their schooling, but advanced reading skills rarely come quickly or easily. An understanding of the varied devices that writers use to convey meaning, an ability to bring together and to integrate diverse information in text, a sensitivity to tone—these are mature reading skills that develop with practice and over time.

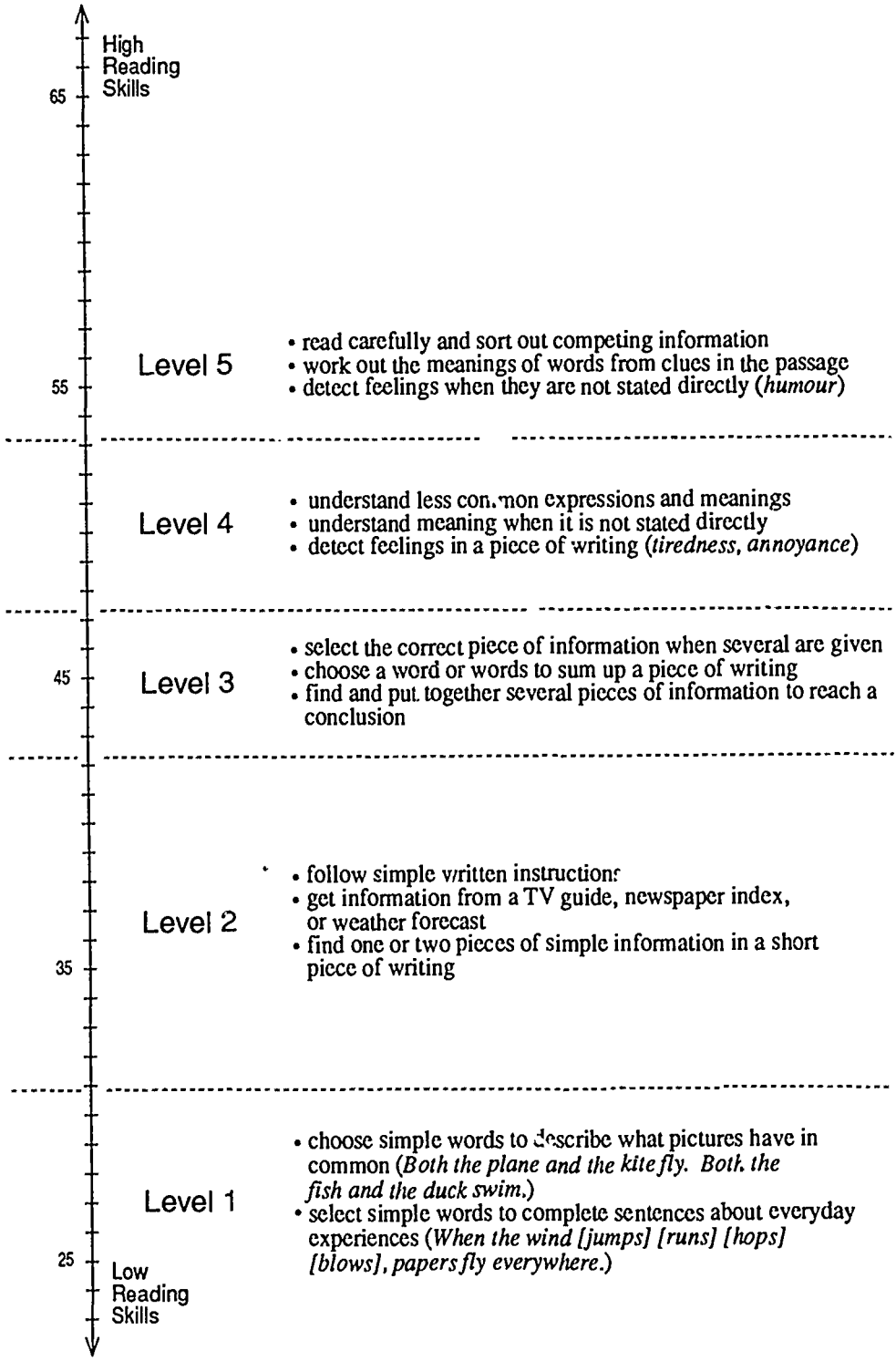
BSTP Reading tests are based on a view of reading as an ongoing developmental process. Through this process students are able to carry out increasingly demanding reading tasks to construct meaning from text. Analysis of the 1989 Reading tests shows that children with early reading skills are able to perform relatively easy tasks, such as providing words to complete simple sentences about familiar topics and locating one or two pieces of factual information in a short passage. More advanced readers are

able to bring together and combine several pieces of information and to infer meaning that is not stated directly. Still more advanced readers are sensitive to the tone of a passage and are able to handle more sophisticated devices that writers use such as irony and humour.

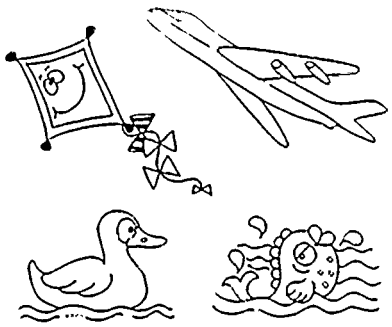
Questions developed for BSTP Reading tests are designed to assess reading skills over a wide range of this developmental continuum. The Year 3 test includes questions to assess early reading skills in matching words to pictures and completing sentences. Both the Year 3 and Year 6 tests contain questions to assess skills in locating information, drawing together multiple clues in text, and inferring meaning. Some of the questions on the Year 6 test are designed to assess relatively sophisticated reading skills and to challenge the better readers.

In general, a student's ability to answer questions about a passage of writing depends on the nature and complexity of the text, the student's prior knowledge of the subject matter, the form of questioning used, and the student's motivation or interest in the reading material. In selecting materials for BSTP tests, an attempt is made to use passages that will be inherently interesting to children of each age and that depend on background knowledge that all children are likely to have.

Through the analysis of performances on the 1989 tests, five broad levels of reading skill have been developed. These are shown on the facing page. The lowest level of reading skill is labelled Level 1; the highest is labelled Level 5. These five skill levels have been constructed by grouping similar reading tasks (see pages 116 to 120). Some examples of the kinds of skills characterising each level are listed. The pages that follow describe these five levels of reading skill in more detail and provide samples of reading tasks at each level.


High Reading Skills
65
Level 5
• read carefully and sort out competing information
• work out the meanings of words from clues in the passage
• detect feelings when they are not stated directly (*humour*)
55
Level 4
• understand less common expressions and meanings
• understand meaning when it is not stated directly
• detect feelings in a piece of writing (*tiredness, annoyance*)
45
Level 3
• select the correct piece of information when several are given
• choose a word or words to sum up a piece of writing
• find and put together several pieces of information to reach a conclusion
Level 2
• follow simple written instructions
• get information from a TV guide, newspaper index, or weather forecast
• find one or two pieces of simple information in a short piece of writing
35
Level 1
• choose simple words to describe what pictures have in common (*Both the plane and the kite fly. Both the fish and the duck swim.*)
• select simple words to complete sentences about everyday experiences (*When the wind [jumps] [runs] [hops] [blows], papers fly everywhere.*)
25
Low Reading Skills

What do they do?



Both the plane and the kite

- ● fly.
- ○ run.
- ○ sail.
- ○ drive.

TOM'S WEEKEND

Colour in the circle next to the best word to use instead of each ∿∿∿ .

Saturday was Tom's birthday. He invited some friends to a ∿∿∿ . They all arrived at 2 o'clock. There were ∿∿∿ candles on his cake because he was eight years old. After blowing out the candles on his cake, Tom opened the ∿∿∿ that his friends had brought. The children had a great time playing together.

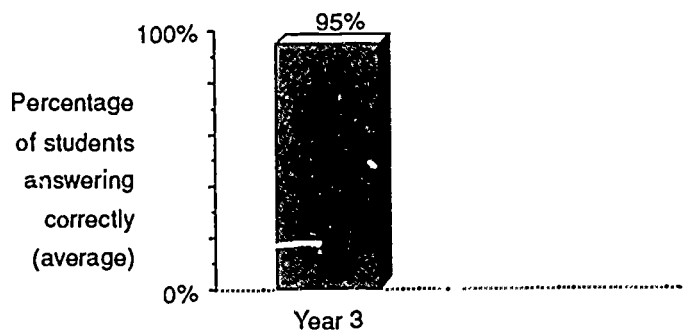
○ school	● party
○ cake	○ grade
○ six	○ seven
● eight	○ nine
○ eyes	○ door
○ cake	● presents

Early independent reading skills include the ability to choose words to describe what pictures have in common, to read short passages about everyday happenings, and to provide words to complete simple sentences. The questions on the facing page illustrate this level of reading skill.

The 'Plane and Kite' question is an example of a task requiring the recognition and understanding of simple everyday words describing pictures. This activity—matching words to pictures—is familiar to young children.

The three questions about 'Tom's Weekend' illustrate early independent reading skill in anticipating and predicting words in text. These questions require an understanding of the surrounding text, an ability to make connections across sentences, and an ability to use background knowledge (for example, that friends bring *presents* to a party) to make sense of a piece of writing. The second question is slightly more difficult than the other two because it can be answered only by reading forward to discover that Tom was *eight* years old.

Level 1 Reading questions were not given to Year 6 students: they were included only in the Year 3 test. The graph below shows that, on average, 95 percent of Year 3 students were able to answer questions of the kind illustrated on the facing page. (The actual percentages of students giving correct answers to questions from this skill level ranged from 92 percent to 97 percent.)



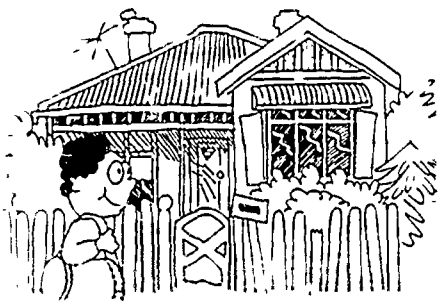
LOTTIE'S HOUSE

Lottie was Arthur's friend from school. She invited him to spend the night at her place while his parents were away.

When Arthur reached the front porch he saw there were scratch marks on the door. They looked like the claw marks of wild animals. Arthur knocked quietly. If nobody heard him, he thought he would just have to go back home.

But Lottie was expecting him. She heaved open the creaking door and said "Arthur! Welcome! Come on in and make yourself at home."

Lottie's house was nothing like Arthur's house. The hallway was dark, and the air felt cold. The carpet was worn and the walls were streaked in stains of faded yellow. The furniture looked old and broken, and the light switches were sticky to touch.



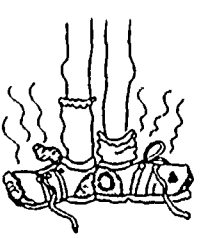
The door was

- ○ unmarked.
- ● scratched.
- ○ freshly painted.
- ○ used by wild animals.

Arthur knocked

- ○ loudly.
- ○ noisily.
- ● gently.
- ○ roughly.

SMELLY SNEAKERS



Eva Park was very happy. She won the Annual Smelly Sneaker Competition at her school. Eva's sneakers were the smelliest among 30 stinkers. The prize: a new pair of sneakers, of course.

Her new sneakers have tabs. She will not trip over her laces any more. Eva loves her new sneakers.

Eva has a new pair of sneakers because she

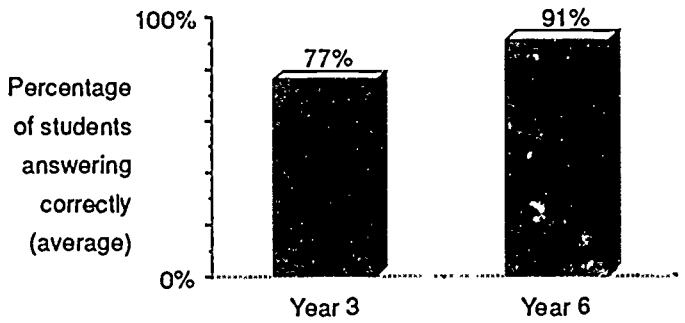
- ● won them.
- ○ bought them.
- ○ found them.
- ○ borrowed them.

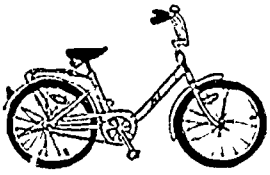
One step beyond early independent reading is the ability to extract one or two pieces of relatively straightforward factual information from text. Examples of reading tasks at this level of skill are: locating a program in a TV guide, locating the weather forecast in a newspaper, and using the index of a newspaper to locate football results and cartoon strips.

The two questions on 'Lottie's House' assess skills in finding a piece of information in text and using this information to choose a best answer. For the first question students are required to locate the phrase *there were scratch marks on the door.* For the second question they must locate the words *Arthur knocked quietly.* The 'Smelly Sneakers' question is another example of a task requiring the recognition of information provided directly in text.

Questions assessing this level of reading skill were included in both the Year 3 and Year 6 tests. Some of these questions appeared only on the Year 3 test, some appeared only on the Year 6 test, and some appeared on both tests.

The graphs below show that, on average, 77 percent of Year 3 students and 91 percent of Year 6 students were able to answer questions of the kind illustrated on the facing page. (The actual percentages of Year 3 students giving correct answers to questions from this skill level ranged from 68 to 91 percent, and for Year 6 students, from 87 to 97 percent.)





The parents of an eight-year-old are keen to buy a second-hand bike. They are prepared to spend $35 - $45. Which bike would you recommend?

- ● RACER
- ○ ROYAL
- ○ SPORTY
- ○ STATUS
- ○ WONDER

Classified Ads

Bikes

KEY
GC good condition
EC excellent condition

Boys yellow RACER with gold frame new rubber pedals with luminous lights 50cm tyres suit 8 years old and over $40 Ring 8800909

Girls bike suit 8-12yrs SPORTY footbrakes chain guard. GC $60. Call 6568745

Girls 50cm bike. STATUS pink frame adjustable seat handbrakes EC. chrome mud. guards & chrome chain guard $80 Phone 990555

ROYAL 40cm bike. 2yrs old red & white would suit 4-8yr old $80 Contact 5912326

WONDER boys bike needs new seat & pedals suit 6 yr old $40 (431)2006758

$$ CONSUMER COLUMN $$

"It's hard to keep cool when you've just put your last eighty cents in a machine and you haven't got the chocolate bar you were looking forward to," said Robert.

What can you do if you put money in a vending machine to buy a drink or a packet of chips and nothing comes out?

The manager of the largest suppliers of vending machines in Australia gave us the following advice.

The first thing you should do is to try the reject lever. It's surprising the number of people who ignore the reject lever! It's there to give you your coins back if they can't be used by the machine."

"There are several reasons why a machine might reject your coins. Maybe the coins are bent, perhaps your selection is not available, or maybe you've put in a dollar coin and the machine is out of change. Before you use a machine, look to see if there are any lights on.

There might be a 'selection not available' light on, or a 'use correct change' light to tell you the machine is out of change. It's amazing how many people ignore the lights!"

"Of course there are times when a machine just eats your money and gives you nothing back. In that case you should complain. On our machines, there's a right of redress sticker above the slot where you put your coins in. It states the address and phone number to contact in case of service difficulties or faults. All you have to do is write to the address, or phone the number, and we'll refund the money you lost in the machine plus the money you spent on the phone call or stamp. We'll also send a service person out to look at the machine."

"At some places, such as at major shopping malls or swimming pools, we do provide the management with a 'float' of five to ten dollars. This means they can reimburse people who've lost money in our machines on the spot."

The advice given is that the first thing that customers should do before using a vending machine is to

- ○ check if they have enough change.
- ● check whether any lights are on.
- ○ check the price of the items.
- ○ make sure that there are goods in it for sale.

The Snore Machine

Martine Kirby was a popular girl until the class went to camp.
Late on the first night she and her friends got ready to go to sleep.

Martine blinked once or twice at the ceiling, shut her eyes and fell asleep instantly.

And snored.

It wasn't ordinary snoring. It could best be described as a combination of a hippopotamus with sinus trouble, an electric sander, a truck dumping a load of gravel, peak-hour traffic along a six-lane highway, and a dam bursting its banks.

Everyone sat up in bed saying things such as, 'I say, Martine, do you mind . . .' and 'Martine, excuse me, but do you realize . . .' But none of that had any effect and they started to bellow at her instead. They all had their hands clapped over their ears to block out the sound of Martine snoring, and didn't realize how loudly they were yelling until Miss Lewis opened the door, glaring.

She wasn't very sympathetic. 'You'll just have to get used to it,' she said crossly. 'Put some cotton wool in your ears.'

Tracey, Paula and Bronwyn tried cotton wool, plus shredded tissues and the hoods of their sleeping bags over that, but nothing could blot out the sound of Martine Kirby's snoring. She kept it up all night, not missing one single beat. In the morning she bounced out of bed, glowing with health, all ready for a brisk five-kilometre run before breakfast. No one else in that room looked rested. They all had tired red eyes.

In the morning when Martine woke up she was ∿∿∿

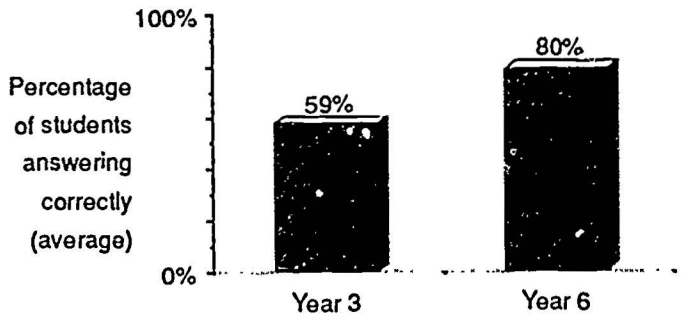
- ○ sorry
- ○ peaceful
- ○ forceful
- ● energetic

Reading skills at this level include the ability to locate several pieces of information and to integrate multiple clues in text. The 'Classified Ads' question is an example of a task of this kind. Students are required to keep in mind two pieces of information (the age of the child and the price of the bike) to choose among five different advertisements.

An important skill at this level is the ability to identify a correct piece of information from a number of possibilities. The 'Consumer Column' question asks students to find the *first* thing that customers are advised to do. This is stated explicitly: *Before you use a machine, look to see if there are any lights on.* But that advice is embedded in a variety of other suggestions and possible problems (*selection is not available, coins are bent, use correct change*). In the 1989 Reading tests, the ability to locate appropriate information in the presence of plausible and distracting alternatives represents a higher level of skill than the location of isolated facts.

Skills at this level also include the ability to draw together and summarise several clues. In the 'Snore Machine' question, for example, students must use the clues *bounced out of bed, glowing with health,* and *all ready for a brisk five kilometre run* to conclude that Martine was *energetic.*

The percentage of Year 3 students correctly answering questions from this level ranged from 51 to 64 percent. For Year 6 students, the percentage ranged from 72 to 85 percent.



Reading

What did the reporter mean when she wrote that 'The mosquitoes gave us an enthusiastic reception'?

The mosquitoes

- O attacked the balloon.
- ● bit them frequently.
- O were not active due to the rain.
- O ignored them completely.

Everyone sat up in bed saying things such as, 'I say, Martine, do you mind . . .' and 'Martine, excuse me, but do you realize . . .' But none of that had any effect and they started to bellow at her instead. They all had their hands clapped over their ears to block out the sound of Martine snoring, and didn't realize how loudly they were yelling until Miss Lewis opened the door, glaring.

She wasn't very sympathetic. 'You'll just have to get used to it,' she said crossly. 'Put some cotton wool in your ears.'

Firstly her friends sat up in bed and asked her ~~~ to stop but they soon found themselves blocking their ears

- ● politely
- ○ harshly
- ○ sternly
- ○ firmly

Miss Lewis was ~~~ .

- ○ concerned
- ● annoyed
- ○ understanding
- ○ sorry

The hunters were ~~~ themselves from the wind

- O defending
- ● protecting
- O excusing
- O swirling

Some might have considered her a trifle ostentatious with her gold sashes. But as she rose to the occasion, 'Royal Lady' looked majestic.

'Royal Lady looked majestic' means that she was

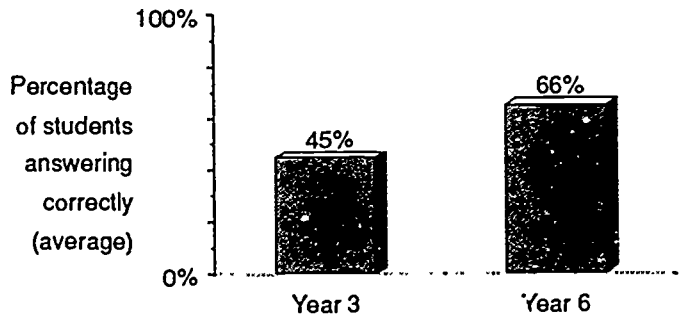
- O colourless.
- O attractive.
- ● magnificent.
- O powerful.

As reading skills develop, students become increasingly able to 'read between the lines' and to interpret writers' meanings even when they are not stated. With practice, students' abilities develop beyond locating and integrating literal information to being sensitive to subtleties in the use of language, to tone, and to nuances in meaning.

To answer the 'Balloon' question, for example, students must infer the nature of the *enthusiastic reception* that the mosquitoes gave the occupants of the balloon. To answer such a question, readers must understand that writers do not always express their intentions literally and that they sometimes use metaphor and irony.

The two questions on the 'Snore Machine' require a sensitivity to tone. The writer's intention is to convey the message that the girls began by asking Martine *politely* to stop snoring. Rather than stating this directly, the message is conveyed through tone of voice: *I say, Martine, do you mind...* and *Martine, excuse me, but do you realise...* The second question assesses students' abilities to infer how Miss Lewis felt from the fact that she was *glaring* and from her lack of sympathy. The two questions at the bottom of the facing page require a sensitivity to nuances in meaning and an ability to choose the most appropriate word for each context.

Questions from this level of reading skill were answered correctly by 40 to 47 percent of Year 3 students and 64 to 69 percent of Year 6 students.



or lying on the sand. If they wanted to lounge on the beach, Alan carried Jodie. Her father even offered to carry her mother but she told him not to be stupid. "If you try that sort of nonsense, you'll ruin your back," she said, "and then you'll be a pain in the neck for the rest of the week."

Mr Carpenter offered to carry Mrs Carpenter to the beach because

- ○ it was difficult for her to walk.
- ○ a wheelchair was not suitable.
- ● he enjoyed teasing his wife.
- ○ he liked making helpful suggestions.

"Of course there are times when a machine just eats your money and gives you nothing back. In that case you should complain. On our machines, there's a right of redress sticker above the slot where you put your coins in. It states the address and phone number to contact in case of service difficulties or faults. All you have to do is write to the address, or phone the number, and we'll refund the money you lost in the machine plus the money you spent on the phone call or stamp. We'll also send a service person out to look at the machine."

One way your money can be refunded if the machine 'eats your money and gives you nothing back' is to

- ○ jolt or shake the machine.
- ○ check if your coins are bent.
- ● contact the supplier.
- ○ press the redress button.

"At some places, such as at major shopping malls or swimming pools, we do provide the management with a 'float' of five to ten dollars. This means they can reimburse people who've lost money in our machines on the spot."

The article says that, at some shopping malls and swimming pools, you can get a refund of money that has been 'eaten' by a vending machine if

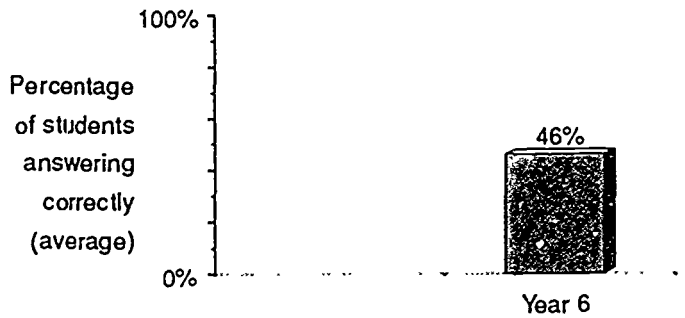
- ○ the management likes the look of you.
- ● the management has been given some money.
- ○ you have kept your cool.
- ○ you have not damaged the machine.

Critical reading requires a sensitivity to the general tenor of a piece of writing and an ability to use this sensitivity to interpret what is happening in text. It also requires an appreciation of the human dimensions of a piece of writing. These are the most advanced skills assessed in the 1989 Reading tests.

Superficially, the use of the words *stupid, nonsense, ruin your back* and *pain in the neck* could disguise the fact that the first passage is a lighthearted conversation between members of a family on holiday. Mr Carpenter's offer to carry his wife is made in fun. This was not understood by the majority of Year 3 students who concluded that it must have been difficult for Mrs Carpenter to walk.

The second question is made difficult by the use of the uncommon terms *right of redress sticker* and *refund.* Students must 'read around' these terms to work out what they could mean from the surrounding text. Their success in doing this depends on their understanding of the entire passage. They need to understand, for example, that the advice in this passage is being given by a supplier of vending machines. Some 36 percent of Year 6 students answered *press the redress button.*

The percentage of Year 6 students correctly answering questions like those on the facing page ranged between 41 and 54 percent. Only one question from this skill level (the Carpenters question) was included on the Year 3 test. That question was answered correctly by 23 percent of Year 3 students.



Awareness of standard forms grows as students continue to read and write.[1]

[1] *Writing K-12* , NSW Department of Education, p.52.

Language

Much public discussion of literacy standards in schools focuses on students' mastery of spelling, punctuation and grammar. This is not surprising: these conventions of written language are more easily observed in writing than other aspects of writing skill such as the use of appropriate language, the choice of relevant content, and the structuring and expression of ideas. The ability to write with minimal errors in spelling, syntax, punctuation, and usage is highly valued in particular kinds of writing and is widely regarded as an indicator of literacy skill. For these reasons, a goal of literacy teaching in schools is to develop students' knowledge of the conventions of written language and to encourage the use of these conventions in student writing.

Students' abilities to use accepted conventions can be assessed most directly by inspecting samples of their own writing. In the BSTP Language test, knowledge of conventions is assessed by asking students to identify errors in other students' writing. This task of 'editing' the writing of other students is a familiar classroom activity for Year 6 students. (Only Year 6 students took the Language test.) In the 1989 test, students were given samples of writing and asked to underline up to one error in each line. The writing samples were constructed by adult test developers from actual student scripts. The errors were taken directly from these scripts.

Analysis of performances on the 1989 test has provided four levels of increasingly sophisticated knowledge of the conventions of written language. These four levels are shown on page 25.

The skill levels for Reading (page 11) and Language (page 25) were constructed by combining the Reading and Language questions into a single *Aspects of Literacy* test. Five skill levels were then defined for this combined test. There are no Level 1 Language questions because the Language test was designed for Year 6 students only.

On the 1989 test, Level 2 Language skills are characterised by an ability to identify only the most obvious errors in text. These include errors of usage that have a jarring effect when text is read aloud and that are unlikely to occur in speech (for example, *Would you like to took my pet to school?*). They also include spelling errors in simple words that students will have seen many times, and errors in

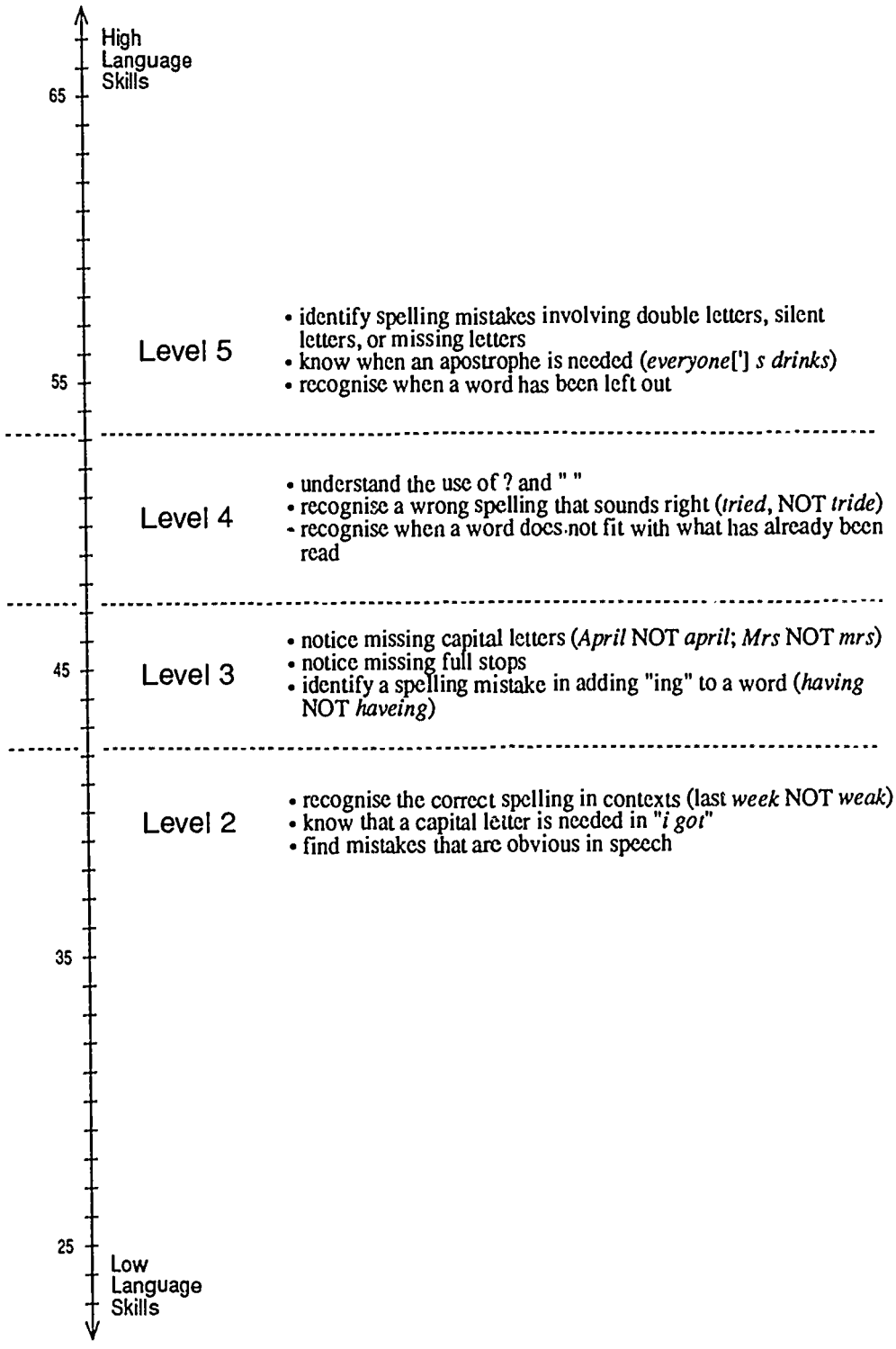
elementary punctuation and capitalisation (for example, *The next day i got Archie ready.*).

At higher skill levels on the 1989 test, students demonstrate a familiarity with standard practices such as ending a sentence with a full stop and beginning a name with a capital letter. They also show some understanding of spelling rules such as dropping the letter *e* from the verb *have* when adding *ing*.

As students' understandings of conventions of written language develop further, they are able to detect errors in the use of more advanced punctuation such as question marks and inverted commas for direct speech. They are also able to identify non-standard usage that occurs in everyday speech (for example, *a space creature come and smashed through a window*).

At the highest level of skill on the facing page students are able to identify errors that may be undetectable in spoken language. For example, *I should've* can sound like *I should of*, making it less likely that this incorrect form will be detected in writing. At this sophisticated level of language knowledge, students are able to identify spelling errors that are not simply violations of rules but that involve silent, double and missing letters. Students at this level are also able to identify errors in the use of apostrophes with common nouns to indicate possession.

In this section of the test, students recorded their answers by underlining up to one error in each line of text.



Level 5

- identify spelling mistakes involving double letters, silent letters, or missing letters
- know when an apostrophe is needed (*everyone*['] *s drinks*)
- recognise when a word has been left out

Level 4

- understand the use of ? and " "
- recognise a wrong spelling that sounds right (*tried*, NOT *tride*)
- recognise when a word does not fit with what has already been read

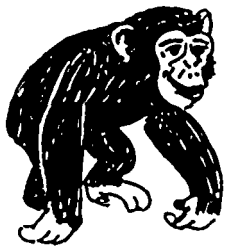
Level 3

- notice missing capital letters (*April* NOT *april*; *Mrs* NOT *mrs*)
- notice missing full stops
- identify a spelling mistake in adding "ing" to a word (*having* NOT *haveing*)

Level 2

- recognise the correct spelling in contexts (last *week* NOT *weak*)
- know that a capital letter is needed in "*i got*"
- find mistakes that are obvious in speech

"Would you like to took my chimpanzee to school to show to your class"



On the third day of april a most amazing thing happenings

They couldn't see it because it was invisible, but it came and sits next to me.

Last weak when some people were

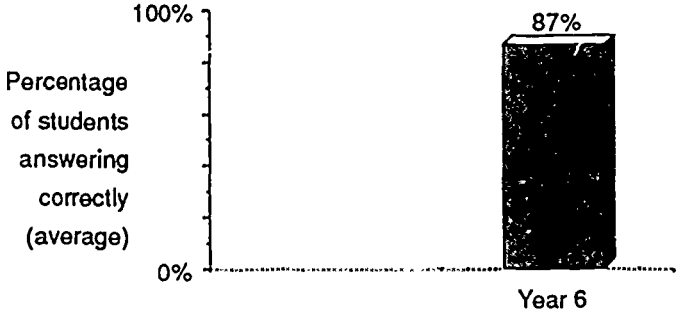
The next day i got Archie ready.

Before children begin to learn conventions of written English, they are already aware of many conventions of spoken English and are able to recognise violations of those conventions. For this reason, the errors that students find easiest to identify in writing are those that are also easily identified in speech. The three sentences at the top of the facing page, for example, contain errors that are obvious when the sentences are read aloud. These errors are not likely to occur in spoken language and almost certainly would have been detected by the students who made them had they re-read what they had written.

As students learn to read and write, they begin to learn other conventions specific to written English. Among the earliest conventions of written English that students learn are the accepted spellings of common words.

At this level, skills on the 1989 BSTP test include identifying errors that are obvious in speech and spelling errors in short, familiar words. The word *week*, for example, is a word that is likely to be familiar to Year 6 students.

The percentage of Year 6 students correctly identifying errors of the kind illustrated on the facing page ranged from 84 to 93 percent.



but

he knocked down mrs Chimp and

On the third day of april a most amazing

Last weak when some people were
having dinner a space creature
come and smashed through a
window of their house It tipped
over everyones drinks and then

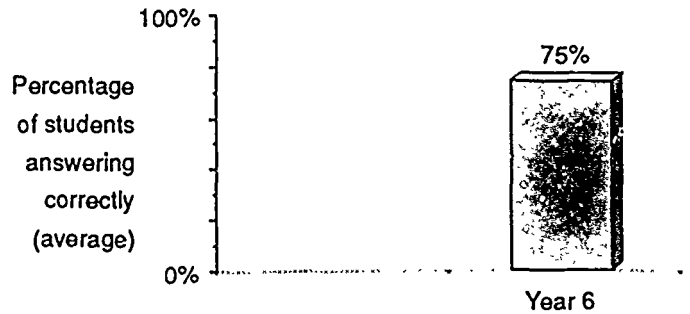
Last weak when some people were
having dinner a space creature

At a higher level of language skill than being able to identify sentences that 'sound wrong' when read aloud and commonly encountered words that 'look wrong', students develop an understanding of elementary general rules of written English. These basic rules include the conventions of commencing names with capital letters, beginning sentences with capital letters and ending sentences with full stops. These rules often have no parallels in spoken language.

In the examples on the facing page, students demonstrate their understanding of these general rules of written English by applying them in previously unseen contexts. The two examples at the top of the page assess students' abilities to identify violations of the convention of commencing names with capital letters. Other illustrations of this level of skill may be the identification of the need for capital letters in words like *david, sunday* and *paris.*

The third example assesses understanding of the convention of ending a sentence with a full stop. As students' language skills develop, they also learn general conventions for spelling. The word *having* is a common word. But so is the word *have,* making the misspelling *haveing* more difficult to identify. At this skill level it is likely that students have a beginning understanding of elementary spelling rules such as dropping the *e* when adding *ing.*

The graph below shows that, on average, 75 percent of Year 6 students can identify errors like those shown opposite. The actual percentages for this skill level ranged from 71 to 80 percent.



When we got there he pull down a tent

a space creature come and smashed through a window of their house.

We were on our way quick, but

things again. That was too bad," I said.

"Would you like to took my chimpanzee to school to show to your class"

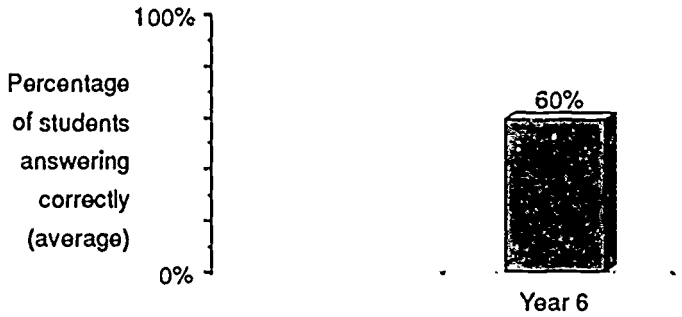
tride a trick and then I could see it.

Errors of usage that are obvious when text is read aloud are relatively easy to recognise (see page 26). More difficult are errors that are not easily identified in spoken language or are common forms of non-standard usage.

Students may find the error *pull down* at the top of the page opposite relatively difficult because it can sound like *pulled down* and may occur in non-standard spoken English. In the following two examples, the errors *come* and *quick* are difficult for students because they both occur in non-standard English and are often heard and sometimes used by Year 6 students.

This level of language skill includes a more sophisticated knowledge of rules for punctuating written English. Students are able to identify not only errors in the use of basic devices such as full stops and capital letters, but also errors in the use of more advanced devices such as question marks and inverted commas for direct speech. At this skill level on the 1989 test, students are able to recognise spelling errors in less common words that, although incorrect, are nevertheless phonetic (the spellings *ride* and *pride* are correct; *tride* is incorrect).

Errors of the kind illustrated on the facing page were identified correctly by between 50 and 65 percent of Year 6 students.



I should of left Archie at home!"

and bit a teachers nose.

It tipped over everyones drinks and then

he knocked down mrs Chimp and recived all Alec's roses.

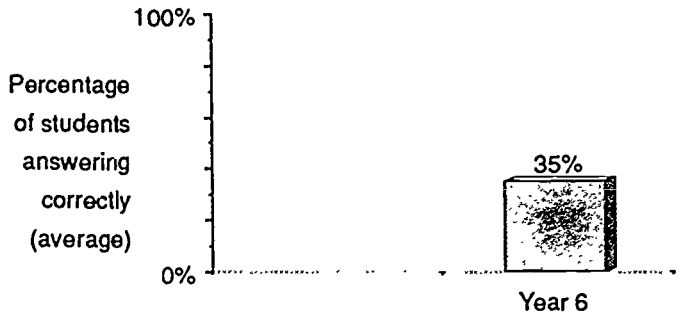
over everyones drinks and then disapeared.

It's hard to belive, but next day the

At the highest level of skill defined by the 1989 BSTP Language test, students are able to identify errors that are often undetectable when text is read aloud. The common use of the contraction *should've* in spoken English, for example, is misinterpreted by many students as *should of*. Because *should've* and *should of* can be indistinguishable in spoken English, a relatively high level of familiarity with written English is required before students are able to identify this error.

Beyond the mastery of simple punctuation such as full stops and capital letters, and more advanced punctuation such as question marks and inverted commas, students master the more complex rules associated with the use of the apostrophe to indicate possession. This is illustrated by the identification of the missing apostrophes in *teachers nose* and *everyones drinks* in the examples opposite.

At this relatively sophisticated level of language skill students are able to identify an increasing number of spelling errors in words with silent letters (*recked*), double letters (*disapeared*) and missing letters (*belive*). The percentage of Year 6 students identifying errors of the kind illustrated on the facing page ranged from 16 to 47 percent.



Using interesting materials can stimulate curiosity and encourage students to think mathematically.[1]

[1] *Mathematics K-6*, NSW Department of Education, p.31.

Number

Number is one of the three strands of the NSW mathematics syllabus. It includes a knowledge of numbers (face value, place value, base 10 system); skills in addition, subtraction, multiplication and division; an understanding of percentages, fractions and decimals; and a facility with problems involving money.

An important skill running through the Number strand is the ability to estimate and approximate. Students at all levels are encouraged to think about what a reasonable answer would be and to anticipate answers to questions.

Beginning understandings of Number are achieved in the first year or two of school by giving students opportunities to sort, match, classify, compare and count objects. Activities involving combining, removing, grouping and sharing provide the foundations for students' skills in adding, subtracting, multiplying and dividing. Practical activities with money in which students share amounts, make 'purchases' and calculate change provide valuable opportunities for students to apply basic arithmetic processes.

The earliest Number skills assessed by BSTP tests include the ability to add and subtract numbers using the language developed through classroom activities with real objects. Easier BSTP tasks provide word clues to appropriate operations by asking questions such as *How much altogether?* and *How many left?*.

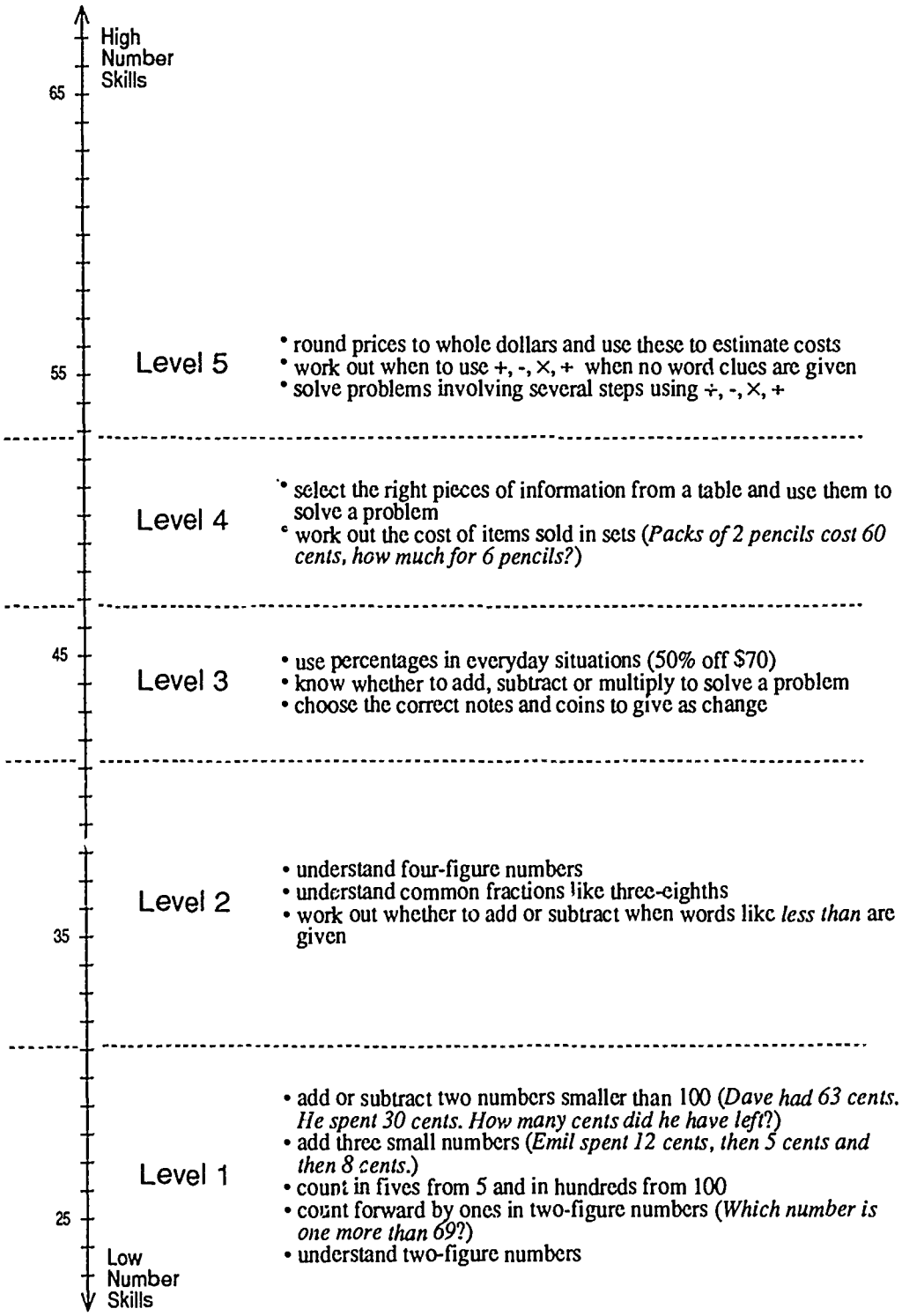
As students' skills in Number develop, they are able to choose and apply appropriate operations to solve everyday problems even when word clues are not given. In these problems, the process for solution is 'hidden' within the problem and students must extract sufficient information to decide on an appropriate approach. Students also develop an ability to add and subtract with and without 'trading' (borrowing and carrying), and display a developing understanding of fractions and percentages.

The 1989 tests suggest that at a still higher level of skill, students are able to use information provided in tabular form to solve problems. Tables may be as simple as lists of prices or as complex as bus and train timetables. Extracting and using information provided in

tables requires an understanding of how variables are related in a table and an ability to ignore irrelevant information.

At the highest level of skill assessed by the 1989 tests, students are able to solve relatively difficult everyday problems requiring multiple applications of basic arithmetic processes and an ability to round numbers and approximate.

On the basis of students' performances on the 1989 tests, five levels of Number skill have been defined. These are shown on the facing page. Examples of skills characterising each level are provided. Level 1 questions were given to Year 3 students only. Level 4 and 5 questions were given to Year 6 students only. These five levels of Number skill are described and illustrated in the pages that follow.


High Number Skills
65
55
45
35
25
Low Number Skills
Level 5
• round prices to whole dollars and use these to estimate costs
• work out when to use +, -, ×, + when no word clues are given
• solve problems involving several steps using ÷, -, ×, +
Level 4
• select the right pieces of information from a table and use them to solve a problem
• work out the cost of items sold in sets (*Packs of 2 pencils cost 60 cents, how much for 6 pencils?*)
Level 3
• use percentages in everyday situations (50% off $70)
• know whether to add, subtract or multiply to solve a problem
• choose the correct notes and coins to give as change
Level 2
• understand four-figure numbers
• understand common fractions like three-eighths
• work out whether to add or subtract when words like *less than* are given
Level 1
• add or subtract two numbers smaller than 100 (*Dave had 63 cents. He spent 30 cents. How many cents did he have left?*)
• add three small numbers (*Emil spent 12 cents, then 5 cents and then 8 cents.*)
• count in fives from 5 and in hundreds from 100
• count forward by ones in two-figure numbers (*Which number is one more than 69?*)
• understand two-figure numbers

Emil spent 12 cents. After that he spent 5 cents and then 8 cents.
How much did he spend altogether?

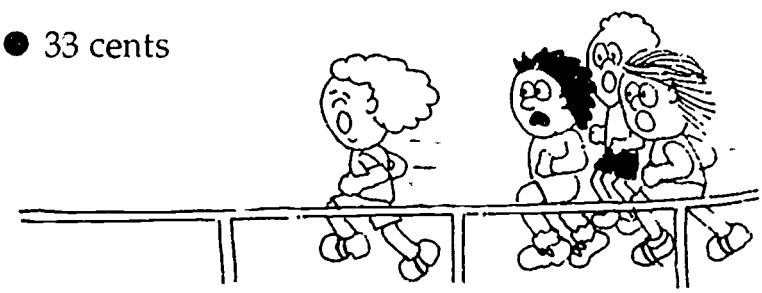
○ 15 cents ○ 20 cents

○ 17 cents ● 25 cents

Dave had 63 cents.
He spent 30 cents.
How many cents did he have left?

○ 20 cents ○ 30 cents

○ 23 cents ● 33 cents



For sports day, there are 100 children in each team. There are 4 teams.
How many children are there?

○ 25 children ● 400 children

○ 40 children ○ 4000 children

Which number is one more than 69?

○ 59 ○ 60 ● 70 ○ 79

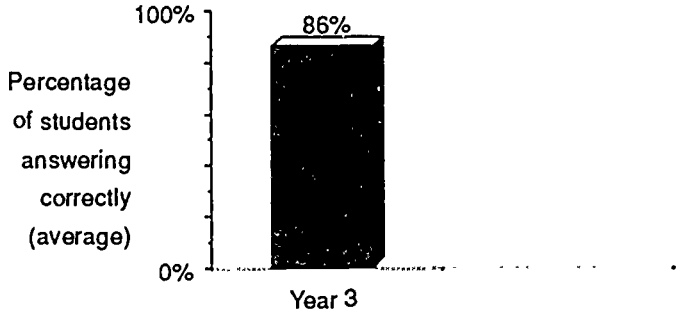
The easiest Number skills assessed by the 1989 BSTP tests include the ability to count in fives (5, 10, 15, 20) and hundreds (100, 200, 300, 400) and to add and subtract numbers smaller than one hundred without trading. Mastery of these skills is part of the foundation on which other number skills are built[1].

The four questions on the facing page illustrate this relatively low level of Number skill. In the 'Emil' question the word *altogether* suggests addition. In any case, because three numbers are given, many students will see adding as the best response. Students giving incorrect answers most often chose 15 or 20 cents, suggesting that they added only two of the three numbers.

In the 'Dave' question, the clue *How many...left?* suggests subtraction. Students can work out the answer using simple subtraction, or perhaps counting by tens either forwards (33, 43, 53) or backwards (53, 43, 33). The 'Sports Day' question can also be answered by counting (100, 200, 300, 400).

Year 6 students were not given questions from this skill level. The percentage of Year 3 students succeeding on Level 1 Number questions ranged from 82 to 89 percent.

[1] Carpenter, T.P. and Moser, J.M. (1984). The acquisition of addition and subtraction concepts in grades one through three. *Journal for Research in Mathematics Education*, 15, pp 179-202.



Sam bought 5 packs of stickers.
Each pack cost 25 cents.
Which of these would give
how much Sam paid?

● 5 x 25 = 125 cents

○ 5 + 25 = 30 cents

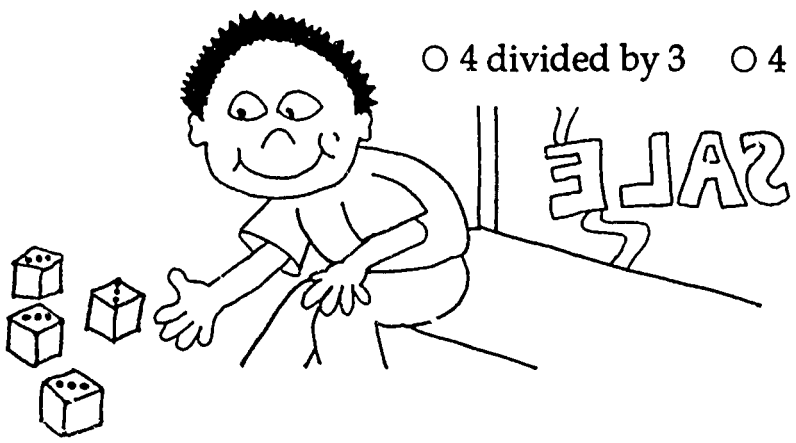
○ 25 – 5 = 20 cents

○ 25 ÷ 5 = 5 cents

Teng threw four dice.
Each one came up a '3'.
Which one of these gives his total?

● 4 times 3 ○ 4 add 3

○ 4 divided by 3 ○ 4 take away 3



629.7 people visited the shop during the sale.
In this number, what does the '2' stand for?

○ 2 ones ● 2 hundreds

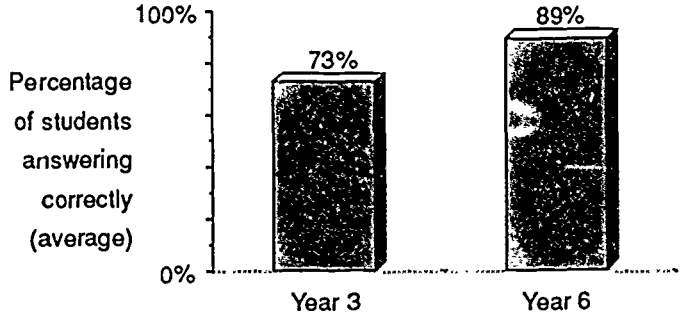
○ 2 tens ○ 2 thousands

The second level of Number skill in the BSTP tests includes knowing when to use addition, subtraction or multiplication to solve practical problems and knowing what is meant by a number such as 8294 (eight thousands, two hundreds, nine tens, four ones).

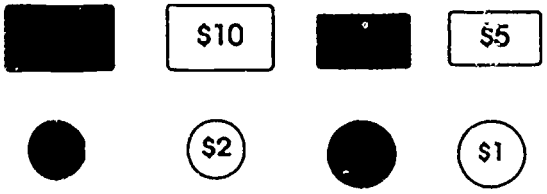
The 'Packs of Stickers' and 'Dice' questions illustrate this level of skill. The ability to do the arithmetic is not important here: what is being assessed is students' understanding of the four operations. In the 'Stickers' question, the total cost of the five packs gives a clue to the answer. The most common incorrect response to these two questions (given by 15 percent and 12 percent of Year 3 students) was to choose addition.

Skills at this level also include understanding the conventions for writing whole numbers. For the 'Sale' question, the most common incorrect answer (given by 14 percent of Year 3 students and 5 percent of Year 6 students) was 2 *thousands*, probably because four-figure numbers have 'thousands' in them.

The percentage of Year 3 students correctly answering questions from this level ranged from 62 to 80 percent, and for Year 6 students, from 85 to 92 percent.



Mike chose some soccer boots at the sale.
His mother paid for them with a $50 note.
Colour in the notes and coins that would make up the change they got.



(or any other combination adding to $18)

Susan bought a pair of netball shoes at the sale. How much did she pay?

○ $20 ● $35 ○ $50 ○ $105

Alex is doing some French Knitting.
Each centimetre of knitting has five rows of stitches.
How many rows of stitches are there in 10 centimetres of knitting?

○ 2 rows of stitches

○ 5 rows of stitches

○ 15 rows of stitches

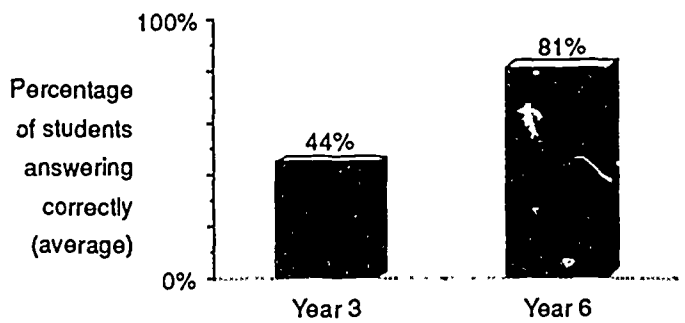
● 50 rows of stitches

At this level, students are able to solve everyday problems by choosing to add, subtract or multiply when no word clues (such as *altogether* and *less than*) are given. The key to success at this level is being able to extract sufficient information from the problem to decide on an appropriate strategy. Students can also solve problems involving percentages.

One question illustrating this skill level is the 'Soccer Boots' question. This question does not provide obvious word clues and involves several steps: find the cost ($32), calculate change ($50 – $32 = $18), find notes and coins that sum to $18 (e.g., $10 + $5 + $2 + $1). These skills of manipulating several pieces of data and correctly choosing and applying arithmetic processes are characteristic of this level of proficiency.

To answer the 'Netball Shoes' question students must understand the expression *50% off* and be able to interpret that expression mathematically. Again, the problem involves several steps: find the usual cost ($70), calculate 50% of $70 ($35), subtract this from the usual cost ($70 – $35 = $35).

The percentage of Year 3 students correctly answering questions like those on the facing page ranged from 33 to 53 percent, and for Year 6 students, from 78 to 84 percent.



HB Pencils Pack of 2	60c
Correction Fluid	$1.98
Paste Jar	98c
Pencil Sharpener	40c

Joe buys six HB pencils.
Which one of these calculations would give the total cost (in cents)?

- ● 3 x 60 cents
- ○ 6 x 60 cents
- ○ 60 ÷ 3 cents
- ○ 60 ÷ 6 cents

Sofia lives 83 km from the store.
How much will it cost her to have a 3 kg Moulding Set delivered?

○ Free ● $2 ○ $8
○ $5 ○ $10 ○ $15

Delivery charges

	Up to 50 km	50 to 100 km	Over 100 km
Under 10 kg	free	$2.00	$8.00
Over 10 kg	$5.00	$10.00	$15.00

The prices of extra packs of clay are given in the table in the catalogue. How much would 1.5 kg cost?

- ○ $1.20
- ○ $2.00
- ● $2.40
- ○ $3.20

Moulding Set
$9.50

Packs of Clay: (for use with moulding set)

SIZE	250 g	500 g	1 kg	2 kg
PRICE	40c	80c	$1.60	$3.20

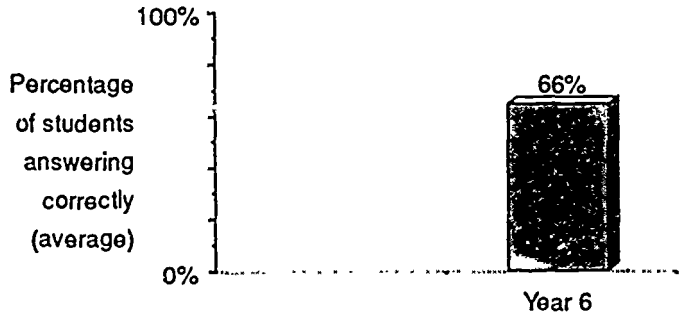
Level 4 Number skills include analysing and using relationships among pieces of information given in a problem. Sometimes this means identifying and extracting relevant facts from a list or table.

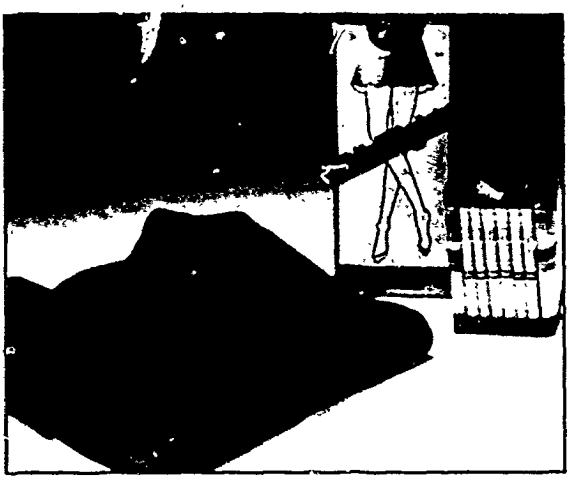
The 'HB Pencils' question is an example of an easier task of this kind. This question gives the cost of a pack of two pencils and asks for the cost of six pencils. To answer the question correctly, students must understand the relationship between the price and the number of pencils.

The 'Delivery Charges' question also requires an understanding of relationships among provided information. Students must first identify the appropriate categories (below 10 kg; 50 to 100 km) and then use the table to relate these two pieces of information to the delivery charge.

In the 'Moulding Set' question, size and price are related through a table. The weight of the clay must first be converted from 1.5 kg to 1500 g, and packs must be found in the table to provide this amount. The appropriate operation (addition or multiplication) must then be applied to find the total cost.

Year 3 students were not given questions from this skill level. The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 63 to 69 percent.





Handkerchiefs
Pack of 8 **$7.95**

Tops **$9.90** ea. .

Tights **$3.89** a pai

Toni bought a top and a pair of tights.
She paid for them with a $20 note.
Which of these is the best guess for the change she got?

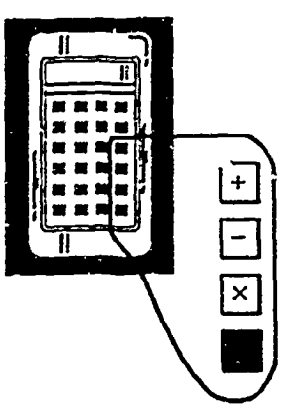
○ $4 ● $6 ○ $8 ○ $10

Gino bought a pack of 8 handkerchiefs at the sale.
Which of these is the best guess
for the cost of one handkerchief?

○ about 80 cents
○ about 50 cents
○ about $1.50
● about $1.00

Alex is doing some French Knitting.
Each centimetre of knitting has five rows of stitches.

Alex does 350 rows of stitches.
Colour in the calculator button you would best use to find out how long the knitting is.

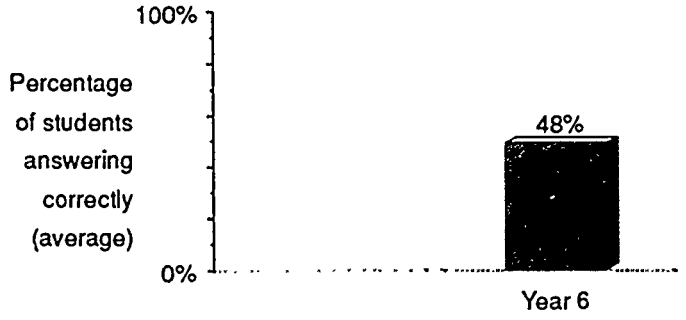


At this level on the 1989 BSTP tests, students make and use approximations and apply addition, subtraction, multiplication and division to solve everyday problems with a number of steps.

The ability to approximate costs by rounding prices to whole dollars is an important skill. This skill is assessed in the 'Tops and Tights' question which involves several steps as well as rounding: for example, rounding $9.90 to $10, rounding $3.89 to $4, adding $10 and $4, and then subtracting $14 from $20. The 'Handkerchief' question also requires rounding ($7.95 to $8.00) and then the choice of division ($8.00 divided by 8). More than 30 percent of Year 6 students gave *about 80 cents* as their best guess for the cost of one handkerchief.

Working out whether to add, subtract, multiply or divide without clues and guidance is a skill commonly required in everyday living, but depends on a sound understanding of the basic principles of arithmetic. The 'French Knitting' question illustrates a situation in which a decision must be made about the appropriate operation without obvious hints. The solution requires an ability to visualise the relationship between rows of stitches and centimetres.

Year 3 students were not given questions from this skill level. The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 35 to 59 percent.



Estimation and approximation skills play an important role in the ability to measure with understanding.[1]

[1] *Mathematics K-6* , NSW Department of Education, p.10.

Measurement

The Measurement strand of the New South Wales mathematics curriculum develops students' awareness of attributes such as length, area, volume, mass, temperature and time. Through this strand students are helped to appreciate the need for standard units of measurement and are given experience in using common instruments for measuring (stopwatches, digital and analogue clocks, calendars, thermometers, balances, compression scales, measuring cylinders, rulers, tape measures). An important goal of the Measurement strand is to provide students with an understanding of the approximate magnitudes of various units and of the situations in which different units are appropriate.

Early learning activities in Measurement are usually designed to provide students with experience in describing, comparing and ordering objects according to their length, mass and temperature. As students' awareness of these attributes develops, they are made aware of the need for devices to measure these attributes and are introduced to standard units of measurement.

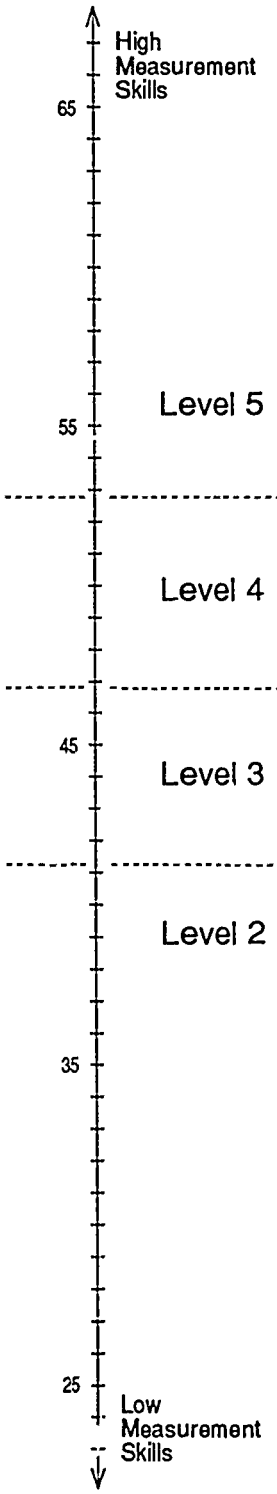
By Year 6 most students have a sound knowledge of the most common measuring instruments (watches, clocks, rulers, thermometers) and are at least able to read off values of time, length and temperature. They also have a good feel for the magnitudes of common measuring units such as hours, minutes and centimetres.

Analysis of the 1989 BSTP test shows that as students' skills in Measurement develop further, they become increasingly familiar with measurement as the counting of units and are able to generalise this process to a variety of contexts using non-standard units (e.g., comparing volumes by counting blocks). At the same time, students develop a feel for less familiar units such as metres and degrees Celsius.

By the end of primary school many students are able to carry out calculations using a variety of different measures. These may involve calculating differences between times (8:45 a.m. to 5:45 p.m.), working out sizes of objects from scale drawings, converting one unit into another (kilograms to grams), or applying basic formulae such as the formula for calculating the area of a square from the length of the sides. Students with high levels of under-

standing of the measurement process have sufficient confidence to invent their own units to measure and compare objects.

On the basis of students' performances on the 1989 BSTP tests, four levels of Measurement skill have been defined. These four levels are shown on the facing page with examples of skills characterising each level. To construct these levels, the Number, Measurement and Space questions on the BSTP tests were combined to form an overall *Aspects of Numeracy* test and five levels of performance were defined for this combined test. There are no Level 1 Measurement questions because the Measurement test was designed only for Year 6 students. The four levels of Measurement skill are described and illustrated in the pages that follow.



Level 5

- invent ways to estimate or compare lengths, areas or volumes
- solve problems involving mixed measurements (kilograms/grams, centimetres/metres)
- find and compare areas

Level 4

- solve problems involving everyday measurements (*How many hours between 8:45 a.m. and 5:45 p.m.?*)
- work out sizes of objects on scale drawings

Level 3

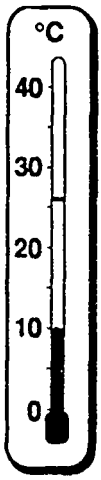
- estimate measurements in everyday use (*How high is this swing in metres? How hot is this day in degrees Celsius?*)
- compare volumes of several objects made from sets of blocks

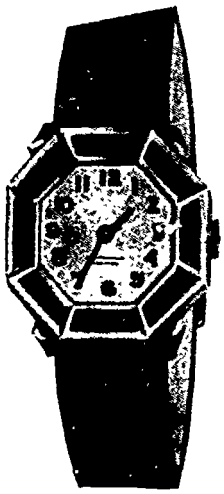
Level 2

- read everyday instruments such as thermometers and watches with hands

The thermometer shows 10 °C.

Draw a line
across it
to show 26 °C.





What time is shown on the watch?

- ○ 1 : 07
- ● 1 : 35
- ○ 1 : 45
- ○ 7 : 07

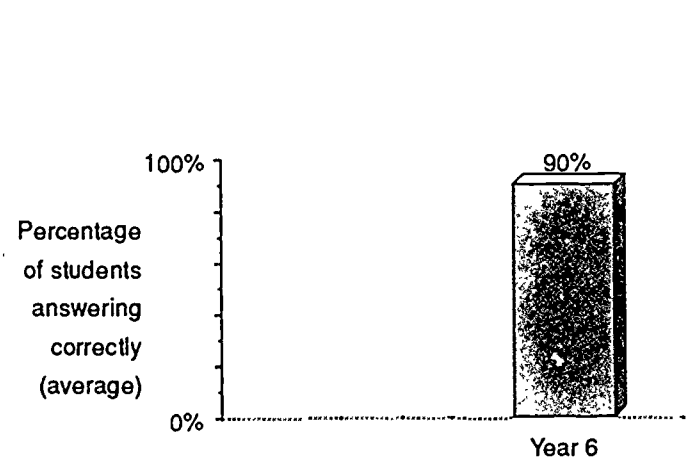
The easiest skills in Measurement assessed by the 1989 BSTP tests require a familiarity with everyday measuring instruments such as thermometers, watches with hands, and rulers. At this level of skill students have an understanding of conventions for indicating amounts on simple linear scales and watches.

To answer the 'Thermometer' question students must be familiar with linear scales and, in particular, with the convention for indicating half-way points on the scale (5, 15, 25, 35). This question can be expected to be slightly more difficult than one that does not assess knowledge of this convention and associates a number with each scale mark.

The 'Watch' question assesses students' knowledge of the conventions associated with an analogue clock. There is evidence from the 1988 Victorian Achievement Study[1] that students' abilities to read analogue clocks and watches have declined with the advent of digital instruments. The difficulty in reading an analogue watch arises from the use of two measurement scales (hours and minutes) on the same dial. More than 8 percent of Year 6 students confused the roles of the two hands and gave the answer 7:07.

The percentage of Year 6 students correctly answering questions from this skill level ranged from 86 to 95 percent.

[1] McGaw, B., Long, M., Morgan, G. and Rosier, M. (1989). *Literacy and Numeracy in Victorian Schools, ACER Monograph No. 34,* ACER, Melbourne.



Measurement

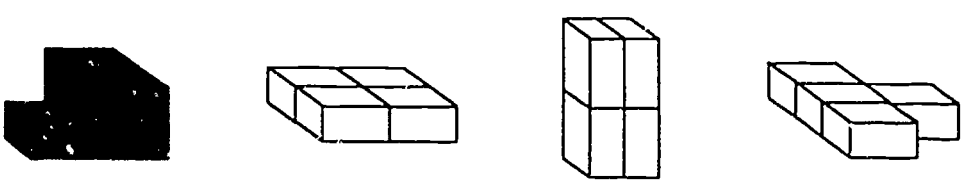
The catalogue shows a picture of a swing. Guess how high the top bar of the real swing is. Which of these is the best guess?

- ○ about 30 cm
- ○ about 3 cm
- ○ about 30 m
- ● about 3 m

In the picture below, what is the temperature most likely to be?

- ○ 50 °C
- ● 30 °C
- ○ 15 °C
- ○ 5 °C

Jimmy built these models with some blocks. Colour in the model that does not have the same volume as the others.

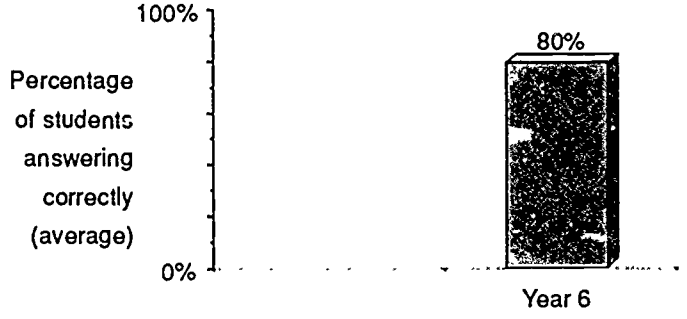


Level 3 skills include the ability to apply the idea of a measuring unit in real-world contexts. At this level students have a feel for the sizes of some common units and so are able to estimate and compare magnitudes in real settings.

The 'Swing' question requires a feel for the approximate size of a metre and an ability to use this to estimate the height of an object. The fact that 16 percent of Year 6 students gave other answers (most commonly *30 metres*) suggests that many students have not yet developed an intuitive feel for the length of a metre.

The 'Beach' question is similar in that it assesses students' abilities to relate the Celsius scale to a real-world setting. The great majority of students were able to answer this question correctly. The most common incorrect response, given by about 15 percent of students, was *50°C*. This is an improbable temperature given the height of the sun from the horizon and would be too hot for someone to be lying out in the sun.

The 'Blocks' question assesses students' abilities to identify and use a non-standard unit to compare objects. Some 12 percent of students chose the upright model. The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 78 to 82 percent.

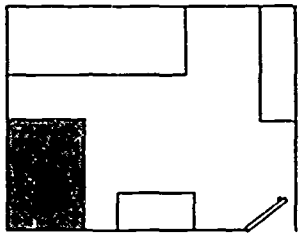


JULY						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

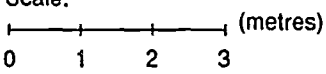
It was Sofia's birthday on the fourth Tuesday in July. What date is this?

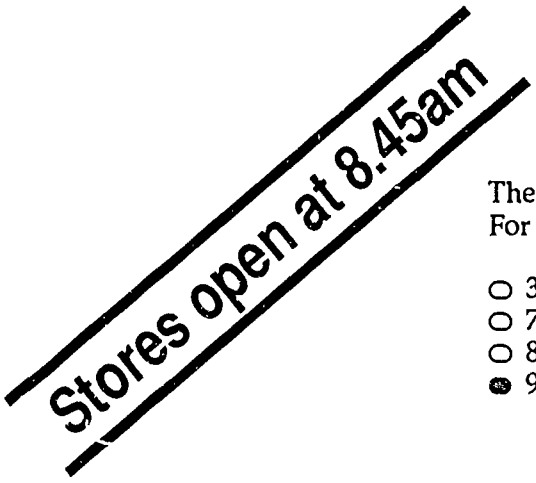
- ○ 4 July
- ○ 18 July
- ● 25 July
- ○ 27 July

Here is a plan of a room.
Colour in the piece of furniture that is 150 cm long and 100 cm wide.



Scale:





The store closes at 5.45 pm.
For how many hours is it open?

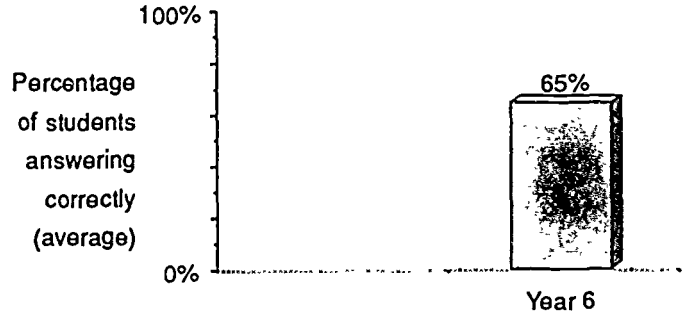
- ○ 3 hours
- ○ 7 hours
- ○ 8 hours
- ● 9 hours

Skills at this level include the ability to solve problems in which several pieces of information are related through pictures or tables. To answer these questions correctly, students must analyse and understand relationships.

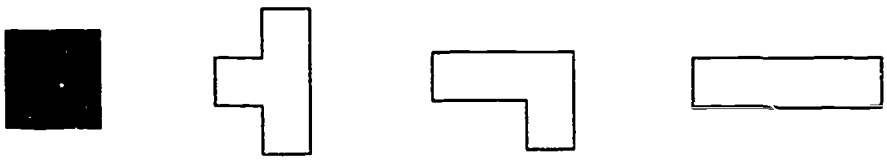
The 'Calendar' question requires an understanding of this convention for relating days of the week and weeks of the month. The *fourth* can refer either to the fourth day of the month or to the fourth occurrence of a particular day of the week. One quarter of all students gave the answer *4 July*.

The 'Furniture' question depends on an ability to relate the provided scale to the plan of the room. It also depends on an understanding of the relationship between centimetres and metres. Some thirty-five percent of students attempting this question were unable to relate the scale to the picture.

The 'Store' question illustrates a slightly different skill with a similar level of difficulty. To answer this question correctly, students must relate the numbers 8 and 5 in a 12-based system. The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 61 to 68 percent.

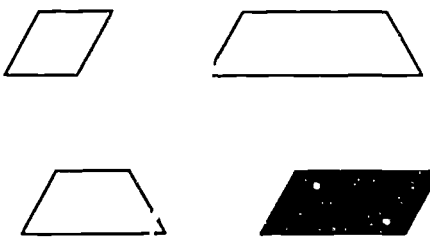


Karl used his Drawing Set to draw these shapes.
One shape has a smaller distance around its edge than the others. Colour it in.



Which shape has the same area as four triangles this size  ?

Colour it in.



The Moulding Set contains 0.5 kg of clay. Each model uses about 150 g of clay. How many models can be made before extra clay is needed?

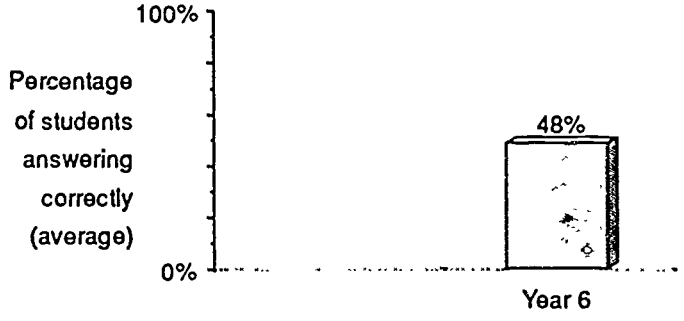
- ○ two models
- ● three models
- ○ four models
- ○ five models

The most advanced Measurement skills assessed in the 1989 BSTP tests include the ability to invent units to compare lengths, areas and volumes of irregular shapes. At this level students are also able to solve problems involving a mixture of units and several steps.

The correct answer to the 'Drawing Set' question can be obtained by inventing a unit of length (for example, half the length of the square) and stepping this around the four perimeters. Many Year 6 students were unable to answer this question: 56 percent chose a shape other than the square.

The 'Four Triangles' question provides students with a unit to measure the area of the four shapes. The fact that more than half of the Year 6 students were unable to answer this question illustrates the difficulty that students have in making precise measures with non-standard units.

In the 'Moulding Set' question students must relate grams and kilograms and carry out several steps to solve this problem. The fact that some clay is left over adds to the difficulty of the question. The percentage of Year 6 students correctly answering questions from this skill level ranged from 41 to 57 percent.



In all facets of mathematics, the manipulation of materials helps the development of understanding.[1]

[1] *Resource Materials for Basic Learning: K-6 Mathematics,* NSW Department of Education, p.xi.

Space

The third strand of the New South Wales mathematics syllabus is Space. The Space strand develops students' understanding of position, including the use of grids and coordinates to describe positions on a map. It provides a developing understanding of two- and three-dimensional shapes, including their properties and lines of symmetry. It also introduces a range of methods for displaying data graphically.

The skills developed through this strand are important to everyday activities such as map reading, reading graphs in newspapers, and using space in the home. They also provide an essential base for further mathematics learning in secondary schools. Early development in Space is achieved by providing students with opportunities to manipulate everyday shapes and objects in space.

The 1989 BSTP tests assess students' spatial skills using two-dimensional representations of three-dimensional shapes. Students are required to visualise the outlines of three-dimensional objects; to picture what objects would look like from different viewpoints, rotated about an axis, or reflected in a mirror; and to visualise stacks of blocks from two-dimensional drawings.

The easiest Space questions on the 1989 BSTP tests were designed to assess students' abilities to compare the lengths of lines and sizes of shapes. These questions were constructed to match classroom activities such as drawing around blocks to make two-dimensional shapes and cutting and pasting paper shapes.

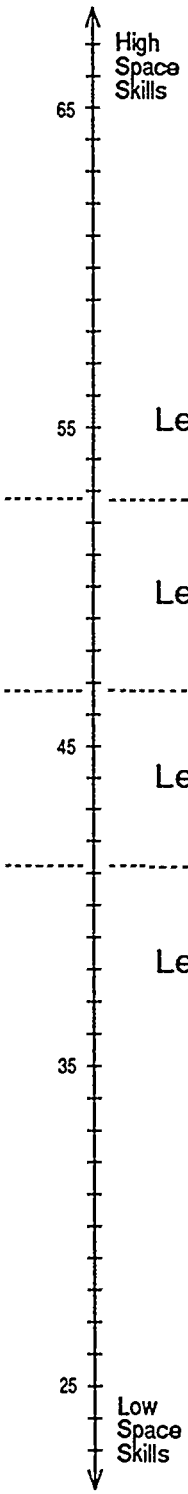
More difficult questions were designed to assess students' abilities to visualise objects from a variety of viewpoints. At this higher level of ability students are able to picture simple three-dimensional objects such as prisms, cylinders, pyramids, cones and spheres from two-dimensional drawings and are able to picture how these objects would appear from different perspectives. Students are more likely to be able to visualise objects in this way if they have had opportunities to manipulate and study real objects.

As students' abilities in Space develop, they are able to visualise the rotation of objects in space, identify lines of symmetry, and predict the appearance of objects reflected in a mirror. They also become

increasingly able to manipulate two variables simultaneously—an essential skill for reading values from line graphs and following complex directions on a map.

At an advanced level of skill on the 1989 tests, students are able to use the packing properties of three-dimensional objects to visualise objects that are hidden from view and to picture how objects might be packed to fill a space. These are important practical skills. Advanced skills also include the ability to interpret more complex graphs such as pie graphs and bar graphs.

The four levels of skill constructed from Year 6 students' performances on the 1989 Space test are shown on the facing page. There are no Level 1 Space questions because, in 1989, Space questions were constructed for Year 6 students only. Examples of the skills characteristic of each level are shown. The four skill levels are described in more detail and illustrated in the pages that follow.



Level 5

- picture a complicated object from a drawing in which parts of the object are hidden
- use pie graphs

Level 4

- picture how shapes would appear when reflected in a mirror or turned over
- follow instructions using distances and directions
- use line graphs

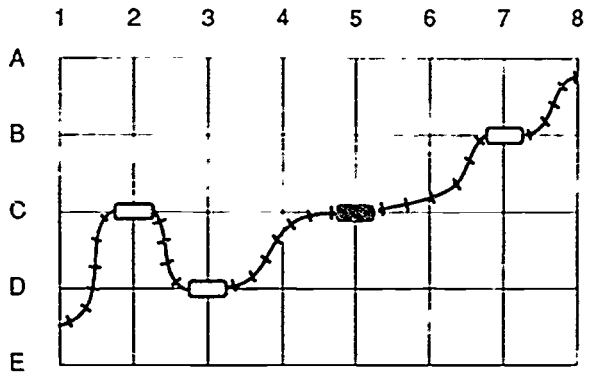
Level 3

- identify an object using drawings showing different views (from top or side)
- use compass directions to follow a simple map

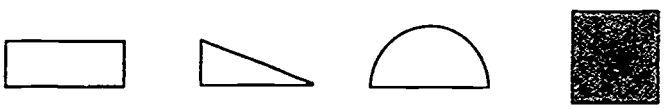
Level 2

- compare the lengths of paths on maps
- compare the sizes of shapes
- find places on simple maps (*Which railway station is at map location C-5?*)

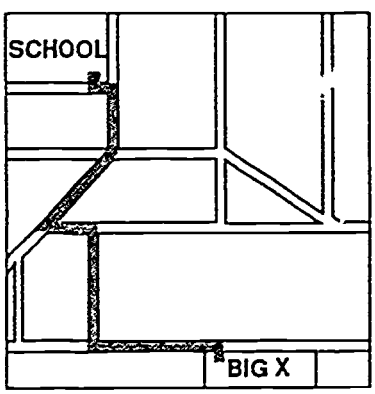
The map shows four railway stations.
Sofia's station is at C-5. Colour it in.



Lisa joined four shapes together. She traced around them to make this picture. Colour in the shape she did not use.



You want to walk from the school to the BIG X store. Colour in the shortest path on the map.

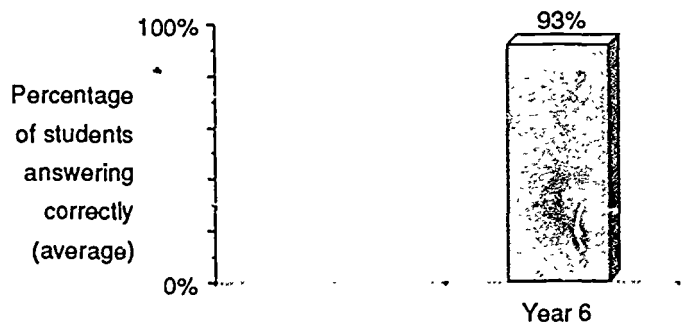


The easiest Space questions on the 1989 tests assess students' skills in making basic comparisons of size, shape and position. The ability to judge and order lengths of lines and sizes of shapes is an important skill for later problem solving.

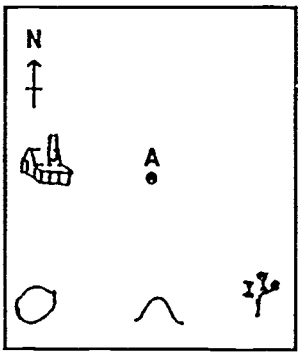
The 'Railway Station' question illustrates elementary skill in locating the position of an object. In this example, students must understand conventions for using a simple grid.

The second question on the facing page is an example of a task requiring the comparison of the sizes of shapes. Each of the four basic shapes must be compared in size with the irregular shape and a judgement made as to whether or not that shape would fit inside the larger shape. In the third example students must compare the lengths of several alternative paths, none of which is identified for them. Students found this task slightly more difficult than the other two.

The percentage of Year 6 students correctly answering questions from this skill level ranged from 89 to 97 percent.



Suppose you are at point A on the map below.

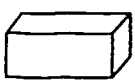
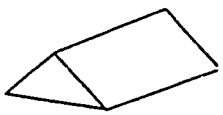
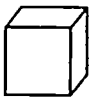


You turn to face SW. What do you see?

- ● dam
- ○ hill
- ○ tree
- ○ farm house

Tran drew this top view  of one of the Building Blocks. Which block is it?

Colour it in.

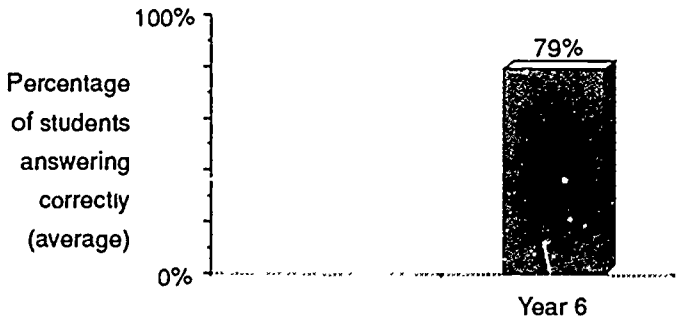





At a higher level of skill than making elementary comparisons of size, shape and position is the ability to visualise objects from alternative viewpoints. To complete tasks at this level of skill, students must be able to put themselves 'in the picture' and to imagine how objects would appear from specified perspectives.

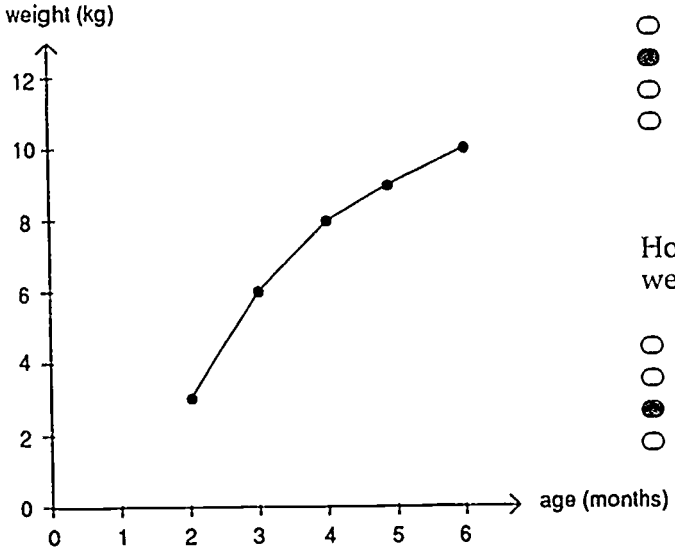
The first question on the facing page requires students to imagine they are at point *A* and facing south-west. This general ability is important in reading maps and graphs. Approximately one student in six incorrectly identified the tree as the answer.

The second question requires students to visualise four three-dimensional objects and to reorient them mentally to determine how they appear from above. About one student in eight was unable to visualise the square base of the pyramid and chose the cube.

The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 74 to 84 percent.



Tula was given a two-month-old puppy. She used bathroom scales to weigh it each month, and drew this graph.



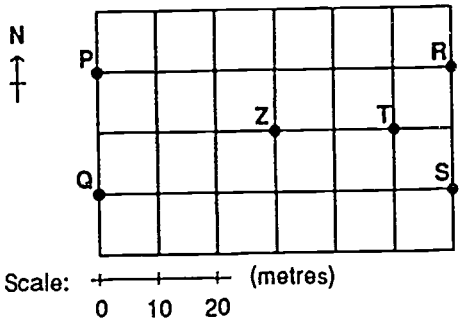
How much did the puppy weigh when it was five months old?

- ○ 8 kg
- ● 9 kg
- ○ 10 kg
- ○ 11 kg

How old was the puppy when it weighed 7 kg?

- ○ about 5.5 months
- ○ about 4.5 months
- ● about 3.5 months
- ○ about 2.5 months

Start at point Z on the map below.

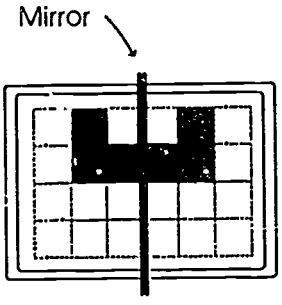


Go 10 metres E, then 20 metres S, then 10 metres N, and then 20 metres E.

Which point will you be at?

○ P ○ Q ○ R ● S ○ T

A shape is shaded on the Magic Screen below. Colour in the squares that show its mirror image.

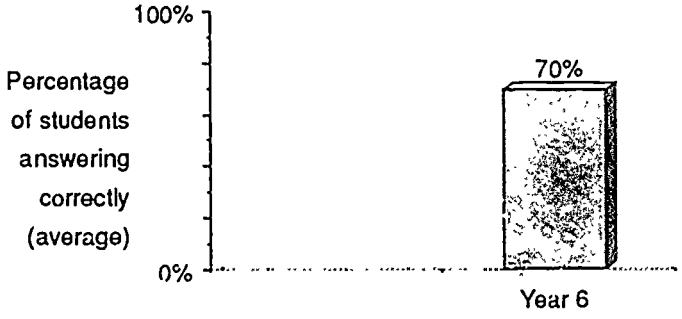


Level 4 Space skills on the 1989 tests include the ability to manipulate two variables simultaneously. At this level, students have some understanding of ways of depicting and using relationships between variables and are able to hold one variable constant while changing the other.

The first two questions on the facing page assess students' understanding of a line graph as a way of depicting the relationship between two variables and test their ability to read off a value on one dimension for a fixed value of the other. The map question requires students to manipulate two variables (direction and distance) simultaneously. It also assesses their ability to relate the provided scale to the map.

In the 'Mirror' question the *L* shape is reflected in two-dimensional space. To answer this question students must understand that each part of the *L* shape will maintain its position on the vertical axis while changing its position on the horizontal axis.

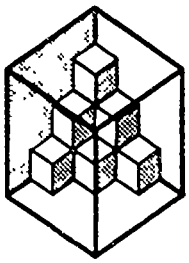
The percentage of Year 6 students correctly performing tasks of the kind shown on the facing page ranged from 65 to 73 percent.



Lee has stacked some building cubes like this  in the corner of a box.

How many cubes are in the stack?

- ○ 18
- ● 10
- ○ 9
- ○ 6

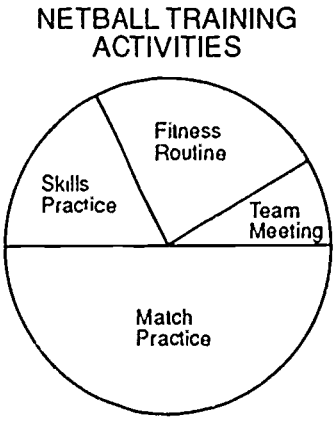


How many cubes **altogether** would be needed to fill the box?

- ○ 27
- ○ 37
- ● o4
- ○ 125

Susan trains for 90 minutes each Thursday night. The pie graph shows how she uses the time. How long is her match practice?

- ○ 30 minutes
- ● 45 minutes
- ○ 60 minutes
- ○ 180 minutes

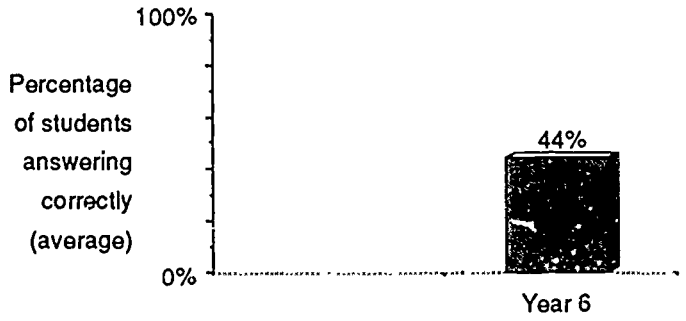


At this level of skill students are able to use relatively advanced visual representations of mathematical ideas and to picture complicated three-dimensional objects. In general, this level is characterised by the ability to interpret more complex pictorial representations and to apply several operations in solving a problem.

The 'Cubes in a Box' questions require a knowledge of the packing properties of cubes and an ability to picture the cubes that are not visible, either because they are hidden or must still be provided to fill the box. The most common answer to the first question was *6*, obtained by counting the visible cubes.

To answer the 'Pie Graph' question students must first be familiar with this pictorial representation of parts of a whole. From the graph, students arrive at a fraction or percentage and then apply that to the total training time. In other words, the question requires some proficiency with converting given information into fractions as well as with this form of representation.

The percentage of Year 6 students correctly answering questions like those on the facing page ranged from 29 percent (for the question at the top of the page) to 53 percent.



PART II

HOW WELL ARE STUDENTS PERFORMING?

The five aspects of basic skills assessed by BSTP tests were introduced in Part I. This section summarises students' performances in these five areas of learning. Year 3 results in Reading and Number are reported for the random sample of 2300 students who took BSTP tests in 1989. Year 6 results are based on all 53 800 Year 6 students. Both year groups were tested in August 1989.

Each Year 6 student taking BSTP tests receives results in Reading, Language, Number, Measurement and Space. Each Year 3 student receives results in Reading and Number. These results are expressed on the scales introduced on pages 11, 25, 37, 51 and 63 and take values from around 25 to around 65. The pages that follow show the distributions of students' results on these five scales for all students tested and for various subgroups of students.

For each aspect of the BSTP tests, results are shown for all students, girls, boys, students from non-English-speaking backgrounds, Aboriginal/Torres Strait Islander students, and for separate age groupings. Assignments of students to these groups are based on information provided at the time of testing. Students are assigned to the non-English-speaking background category if, in response to the question *How often do you speak English at home?*, they respond *Sometimes but not usually* or *Never or almost never* and if they have lived in Australia for four years or less. (Students who have lived in Australia for one year or less generally do not take BSTP tests.)

On the following pages, results for subgroups of students are displayed graphically. Before studying the graphs, it is important that the method used to display BSTP results is understood.

On each aspect of the tests, students' results are expressed as scores on a scale that runs from around 25 to around 65. This score scale is shown in the picture opposite. Most students have scores near the middle of the scale, a few have high scores near 65, and a few have low scores near 25.

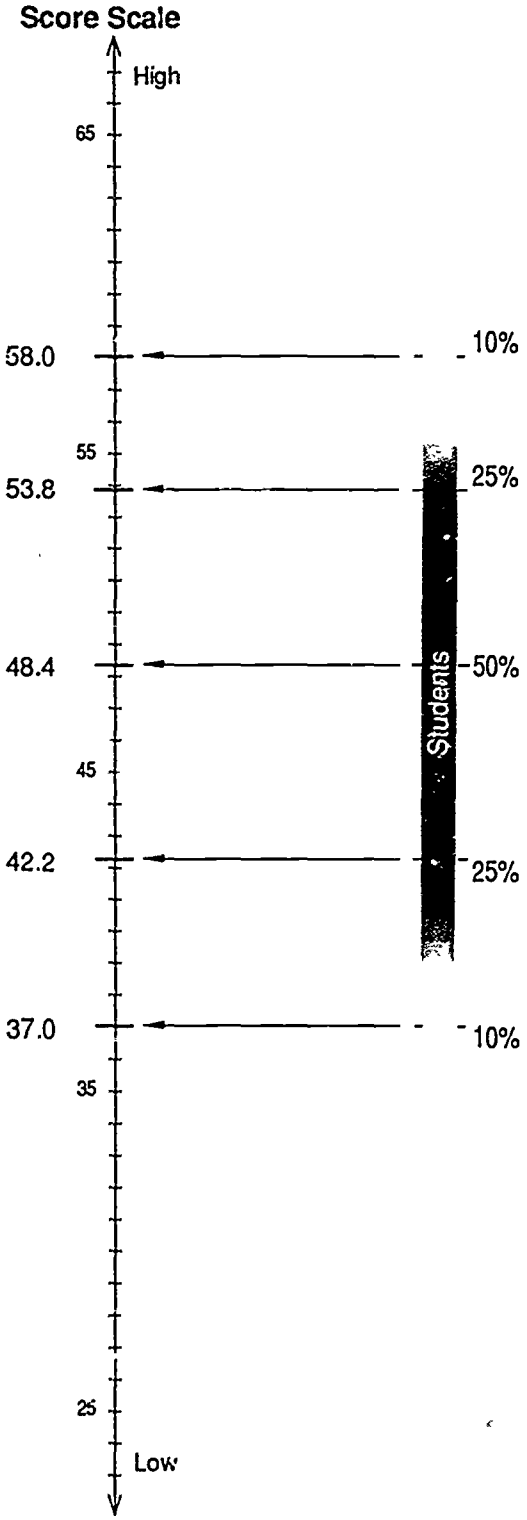
The shaded column in the graph provides information about the distribution of students' scores. In this illustration, 10 percent of students have scores above 58.0, and 25 percent have scores above 53.8. Some of those high-scoring students may have results above 65. At the other extreme, 10 percent of students have scores below 37.0, and 25 percent have scores below 42.2. Half the students have scores greater than 48.4 and half have scores less than 48.4. The column is shaded as a reminder that most students have scores near the middle of the column and there are relatively few students with very high or very low scores.

The percentages have been left off the graphs on the pages following the example to make them less cluttered. The numbers of students in the various subgroups identified in this section are shown below.

NUMBERS OF STUDENTS IN SUBGROUPS

	Year 3	Year 6
All Students	2331	53 794
Girls	1098	26 305
Boys	1231	27 428
Non-English-Speaking Bkgd	64	1398
Aboriginal/Torres St Is	53	1288
8-year olds	1599	
9-year olds	722	
10-year olds		66
11-year olds		35 236
12-year olds		18 289

Example


Score Scale
High
65
58.0
10%
55
53.8
25%
48.4
50%
Students
45
42.2
25%
37.0
10%
35
25
Low

Reading

Results for Year 3 students on the Reading test are displayed on the facing page. Each Year 3 student has a Reading score on the scale shown here[1].

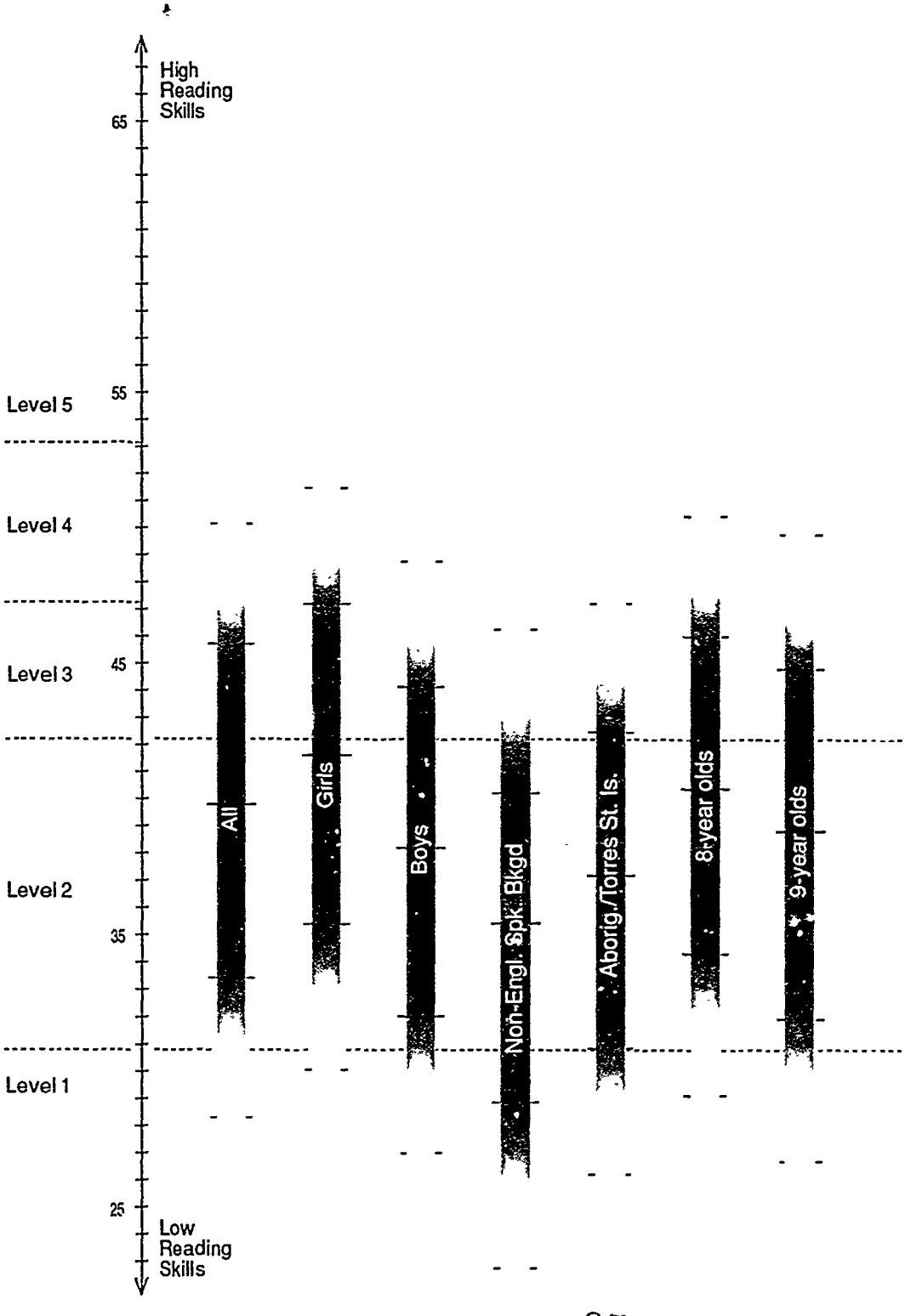
An advantage of expressing students' Reading results in this way is that performances can be interpreted in terms of the Reading skill levels described and illustrated on pages 12 to 21. A student with a result of, say, 45 will typically be highly proficient in Level 1 and Level 2 skills (early independent reading and extracting literal information from text) and will have a high level of mastery of Level 3 skills such as integrating multiple clues in text. Typically, students scoring 45 are able to answer about 70 percent of Level 3 questions correctly, but have a lower success rate on Level 4 questions.

Reading across the graph shows that girls have performed markedly better than boys. This is a consistent finding in studies of this kind: on average, girls are better readers than boys in primary school. However, there is a large overlap in these score distributions with a third of boys outperforming half the girls.

Not surprisingly, the 64 students with recent non-English-speaking backgrounds (NESB) have performed less well in Reading than other students. Despite their relatively recent arrival in Australia and the fact that they do not speak English at home, the top 10 percent of NESB students have achieved high scores and are performing at relatively advanced reading levels.

The reversed results for 8- and 9-year olds are explained by the fact that these are not samples of all 8-year olds and all 9-year olds, but of students of those ages *in Year 3*. Many advanced 9-year olds will have been in Year 4 at the time of testing; many less advanced 8-year olds will have been in Year 2.

[1] See Technical note 1 on page 121.


High Reading Skills
65
55
Level 5
Level 4
45
Level 3
Level 2
35
Level 1
25
Low Reading Skills
All
Girls
Boys
Non-Engl. Spk. Bkgd
Aborig./Torres St. Is.
8-year olds
9-year olds

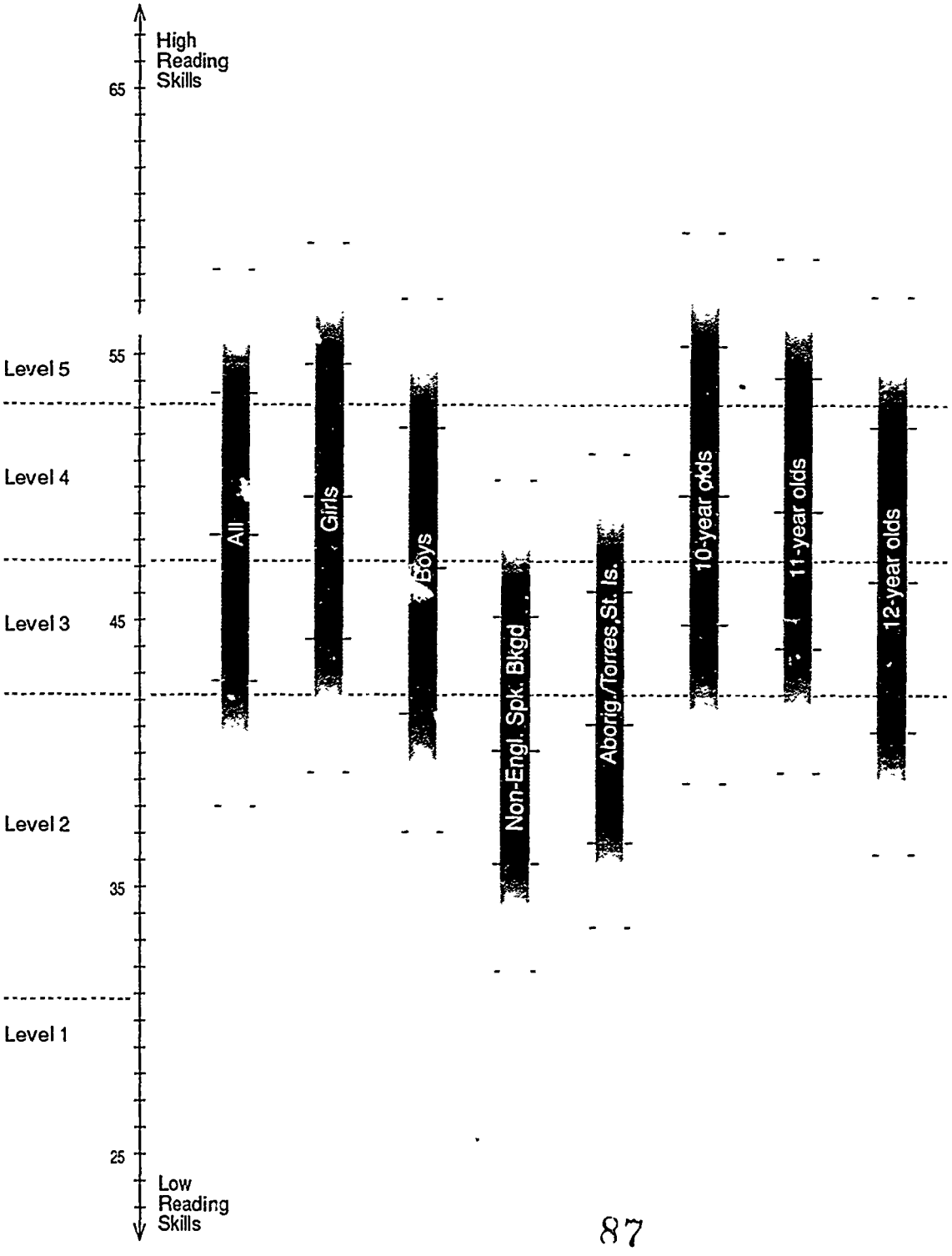
Reading results for Year 6 students are shown on the facing page. A comparison of the graphs on pages [illegible] and 79 indicates the amount of growth that occurs in Reading between Year 3 and Year 6. The graphs here suggest that, on average, students' growth in Reading between August of Year 3 and August of Year 6 is of the order of eight or nine score points.

The pattern of results is very similar to that observed at Year 3. There appears to be somewhat less variation in Reading scores at Year 6, and the gap between girls' and boys' results appears to have closed slightly.

Students from non-English-speaking backgrounds are further behind in their reading in Year 6 than in Year 3. This is probably not surprising. In general, students in Year 6 will have been older when they began learning English and, unlike students in Year 3, will have started school and begun learning to read in a language other than English.

A comparison of the Year 3 and Year 6 graphs shows that while Aboriginal/Torres Strait Islander students have generally achieved lower Reading results than other students in Year 3, this gap has widened by Year 6. There are no longer large numbers of students in this group with very low (Level 1) reading skills by Year 6 but, in general, Aboriginal/Torres Strait Islander students appear not to have progressed at the same rate as the majority of students.

Year 6 score distributions



Language

In the 1989 BSTP tests, only Year 6 students took a Language test. Their Language scores are expressed on the scale introduced on page 25 and take values generally in the range 25 to 65. The graph on the page opposite shows score distributions on this scale for various subgroups of Year 6 students.

The Language skill levels, which are explained in detail on pages 25 to 33, provide a guide to the kinds of knowledge that students have. From the first column in the graph it can be seen that about 20 percent of all students have scores in Language Level 2. These students will typically be able to recognise the most obvious errors in text (see pages 26 and 27), but will typically not have mastered Level 3, 4 or 5 Language skills[1].

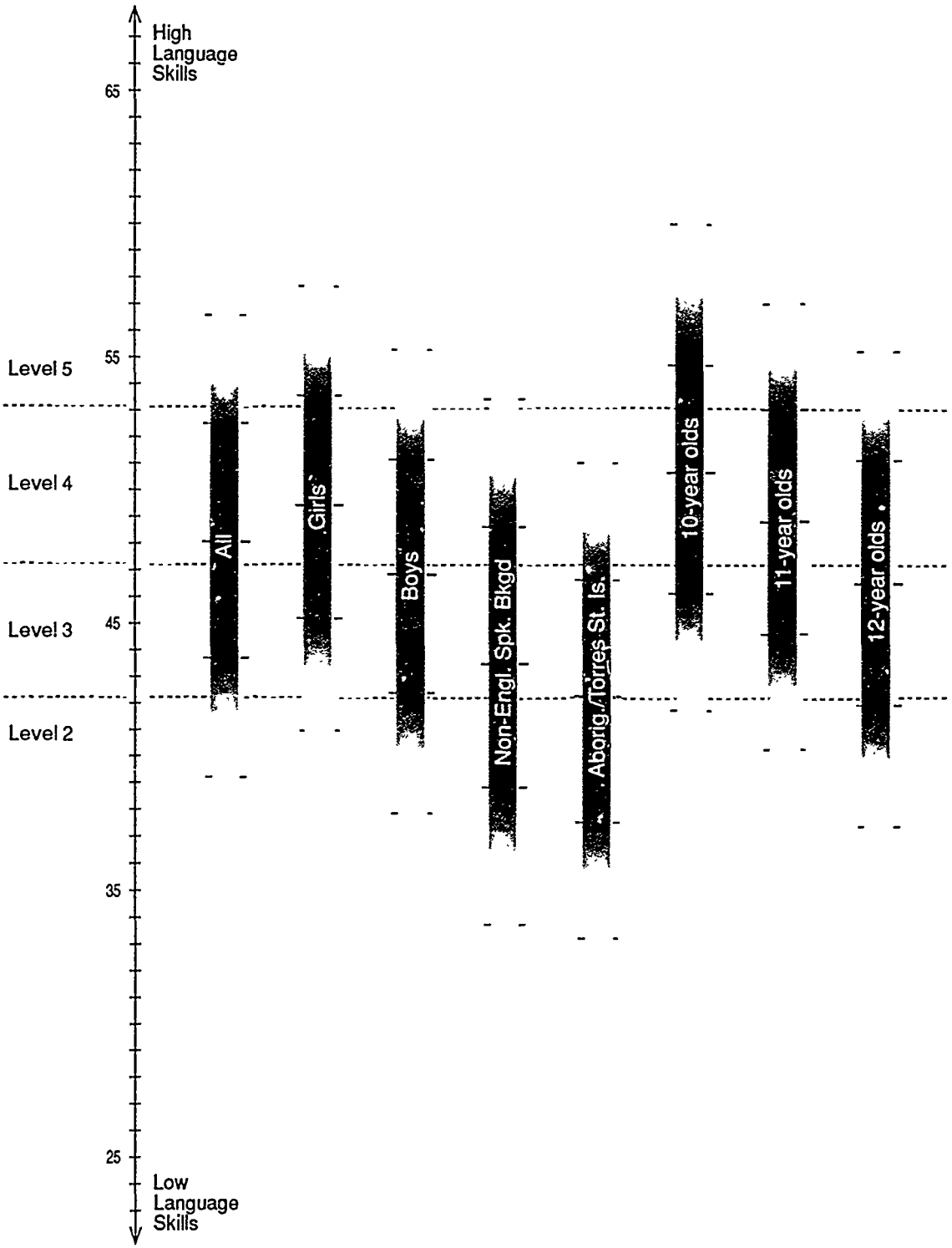
From the graph it can be seen that the pattern of results in Language is very similar to the pattern of results in Reading. On average, girls have achieved markedly higher scores than boys. But there is substantial overlap in the two distributions.

Students with recent non-English-speaking backgrounds generally have lower scores than other students, but the difference is not as great as for Reading. Some 10 percent of NESB students have scores in Language Level 5 and are among the top 20 percent of Year 6 students in their knowledge of the conventions of written English.

As for Reading, the tiny group of 10-year olds has performed somewhat better than 11-year olds, who in turn have scored higher than 12-year olds in Year 6.

[1] In the sense that they are unlikely to succeed on as many as 70 percent of questions from these higher skill levels.

Year 6 score distributions



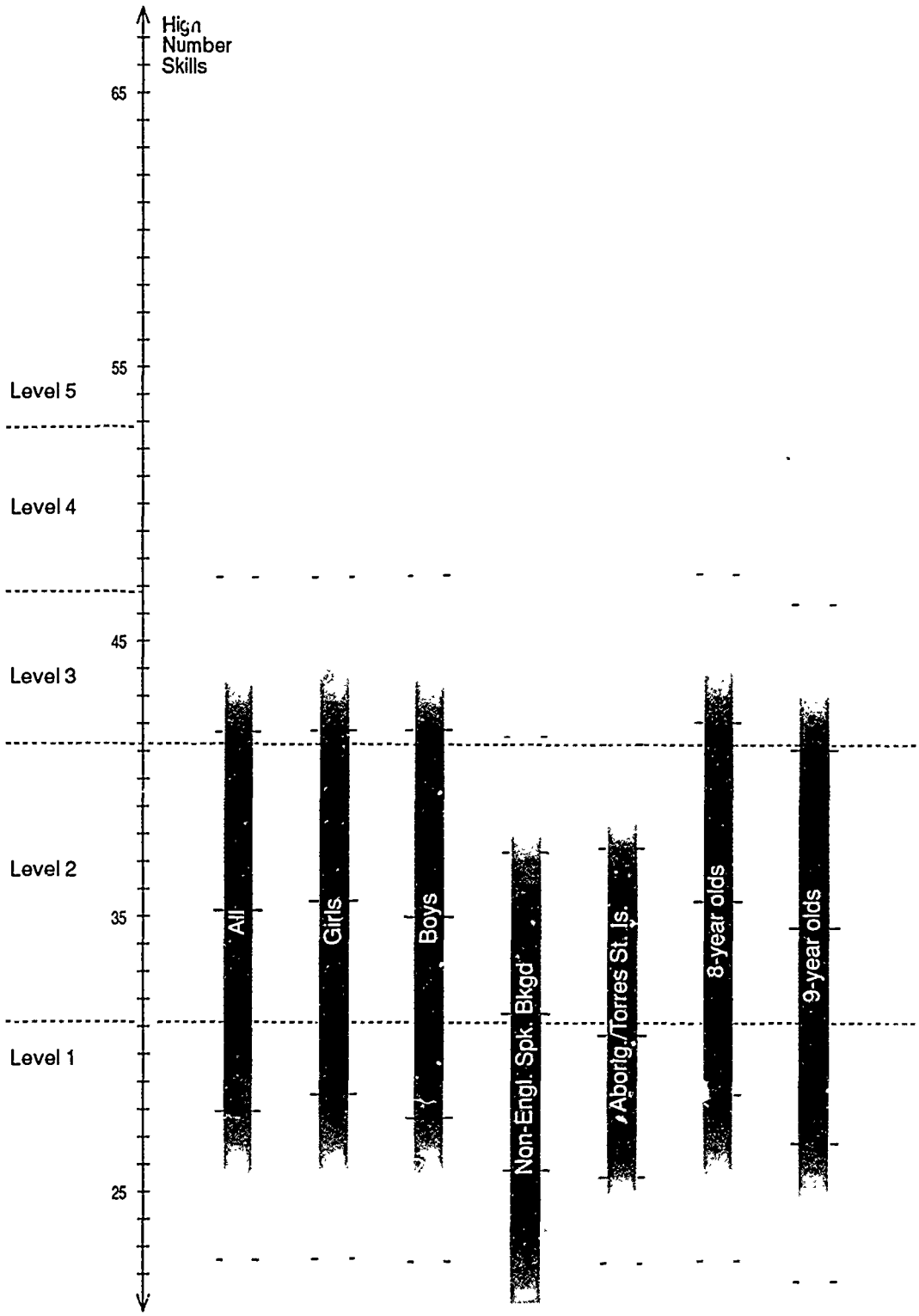
Number

Year 3 and Year 6 students' results on the Number strand of the BSTP tests are expressed as scores on the scale described on page 37 and take values from around 25 to around 65[1].

From the graph opposite it can be seen that Year 3 students' scores are widely dispersed. The lowest-scoring 10 percent of students have scores below 23 on the Numeracy Scale; the highest-scoring 10 percent have scores above 47. This represents a wide variation in skills: from a mastery of very basic Level 1 skills through to the more advanced skills described on pages 42 and 43. Most of the items on the Year 3 test were developed to assess Level 1 and Level 2 skills. While these were appropriate for many students, they were too easy for the more advanced Year 3 students. The top 25 percent of students were not really challenged by the items on the Year 3 test and, if they missed any items at all, missed no more than two or three of the twenty-four questions on this test.

In contrast to the picture for Reading, there is no marked difference between girls' and boys' results in Number. Students from non-English-speaking backgrounds have generally achieved lower scores than other students, probably reflecting the dependence of the Number test on skills in standard written English (a dependence which is consistent with the current emphasis in the New South Wales mathematics curriculum on tasks set in realistic contexts and not based solely on the manipulation of numbers). The lowest-scoring 10 percent of NESB students had scores below the lower limit of this picture.

[1] See Technical note 2 on page 121.


High Number Skills
65
55
45
35
25
Level 5
Level 4
Level 3
Level 2
Level 1
All
Girls
Boys
Non-Engl. Spk. Bkgd
Aborig./Torres St. Is.
8-year olds
9-year olds

The score distributions of Year 6 students in Number are shown on the page opposite. A comparison of these distributions with the Year 3 distributions on the preceding page indicates the progress that students make in Number between Year 3 and Year 6. The graphs here suggest that, on average, students' growth in Number between August of Year 3 and August of Year 6 is of the order of twelve to thirteen score points[1]. At Year 3, more than 50 percent of students had scores in Levels 1 and 2, and had not yet mastered Level 3 skills in Number. By Year 6, the majority of students are functioning at Levels 4 and 5.

A comparison of girls' and boys' results shows little difference between these two groups, although girls appear to have performed slightly better than boys overall.

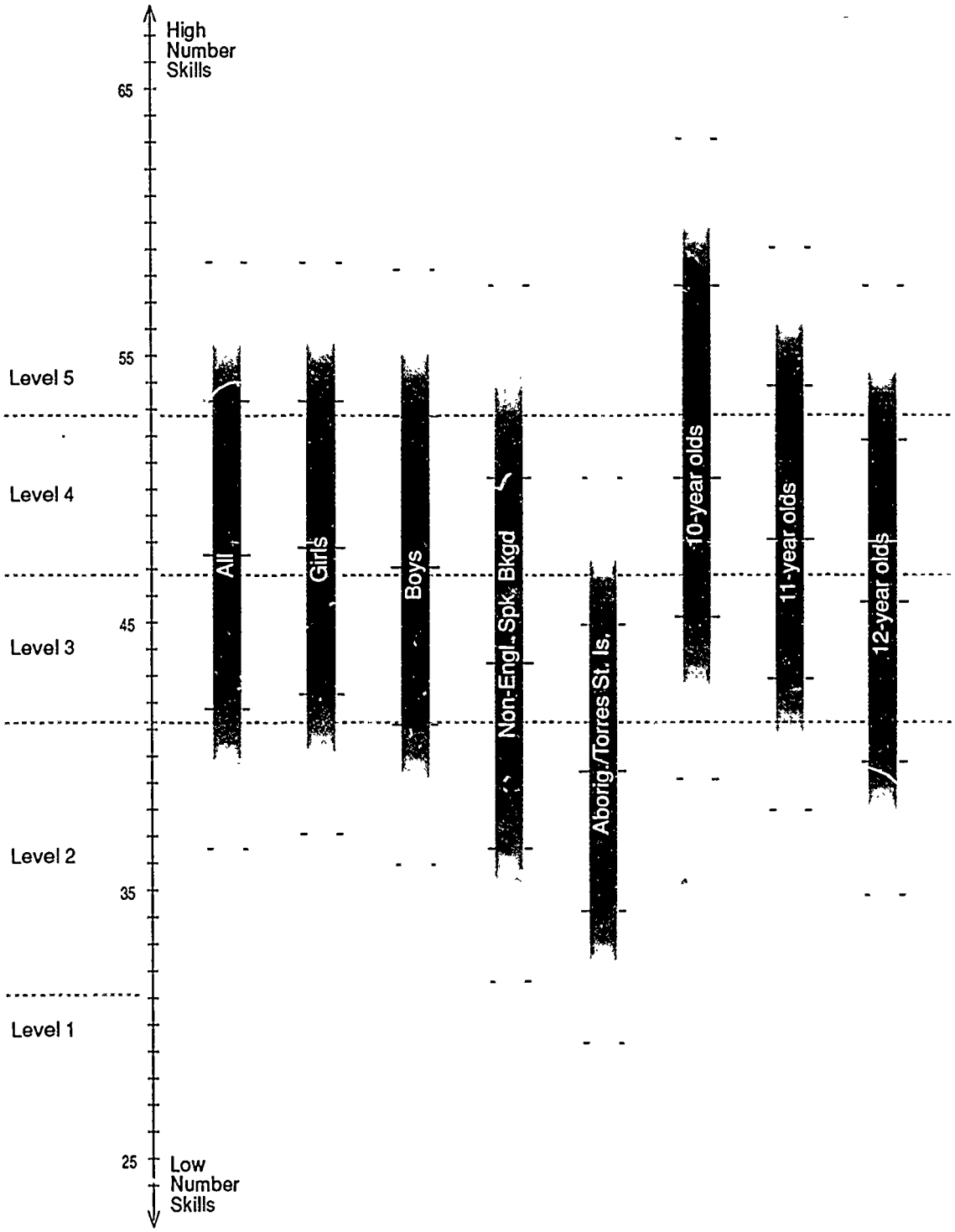
Non-English-speaking background students scored somewhat lower than other students. However, the top 10 percent of NESB students have performed about as well as the top 10 percent of all other students, suggesting that their non-English-speaking background is not preventing them from reaching high levels of achievement in this aspect of mathematics learning.

An important feature of the graph opposite is the relatively low performance of Aboriginal/Torres Strait Islander students. As was observed earlier for Reading, the score gap that exists between this subgroup of students and other students in Year 3 has widened by Year 6.

The small group of 10-year olds has outperformed 11- and 12-year olds in Year 6 in Number as well as in Reading and Language.

[1] No direct comparison with growth in Reading is possible.

Year 6 score distributions



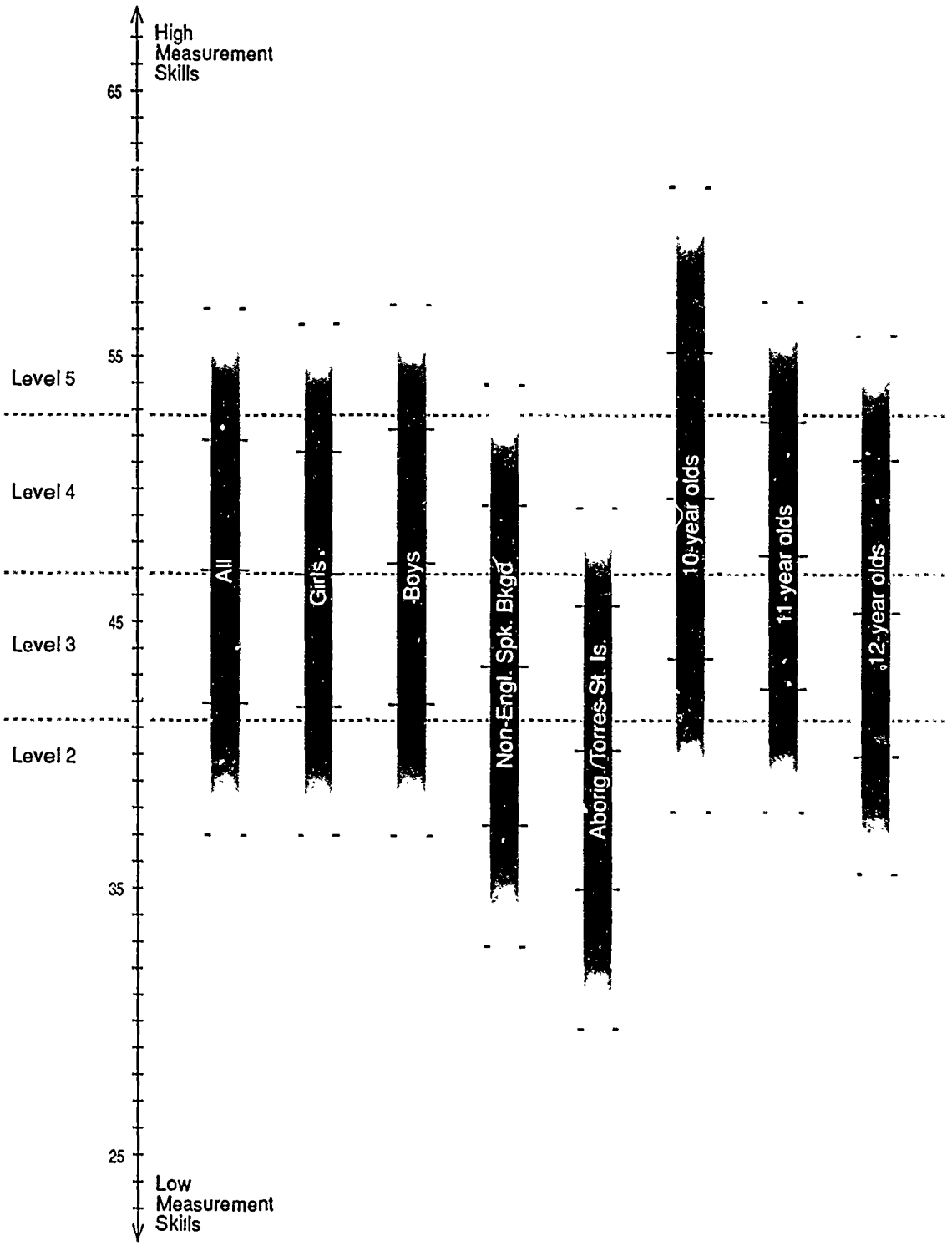
Measurement

In 1989, only Year 6 students took a test in Measurement. Their Measurement results are expressed as scores on the scale introduced on page 51. Because these scores have been equated with the scores for Number and Space (see explanation on pages 116 to 119), it is possible to make direct comparisons of subgroups' performances across these three strands. For example, while the top 10 percent of NESB students were performing at much the same level as the top 10 percent of all students in Number, this is not the case in Measurement: the top 10 percent of NESB students do not score quite as well in Measurement.

Once again, there is very little difference between boys' and girls' performance levels. Boys score slightly higher than girls overall.

Aboriginal/Torres Strait Islander students are performing in Measurement at much the same levels as in Number, significantly lower than other students. When their scores are interpreted in terms of the Measurement skill levels on page 51, the significance of their low levels of achievement becomes apparent. More than half the students in this group have scores in Level 2. While these students can be expected to read thermometers and analogue watches and clocks, they generally have a low mastery of higher level Measurement skills such as estimating heights in metres and temperatures in degrees Celsius.

The results for 10-, 11- and 12-year olds follow the pattern established in the preceding pages for other aspects of the BSTP tests.


High
Measurement
Skills
65
55
45
35
25
Low
Measurement
Skills
Level 5
Level 4
Level 3
Level 2
All
Girls
Boys
Non-Engl. Spk. Bkgd
Aborig./Torres St. Is.
10-year olds
11-year olds
12-year olds

Space

Only Year 6 students took a Space test in 1989. Their scores are expressed on the scale introduced on page 63 and are directly comparable with their scores in Number and Measurement.

Subgroup performances in Space are almost identical to results for Measurement. Boys have scored slightly higher than girls on average. The boy-girl comparisons made for Number, Measurement and Space show an interesting parallel with results of other studies. The 1988 report of the American National Assessment of Educational Progress (NAEP) survey of mathematics achievement, for example, observes that:

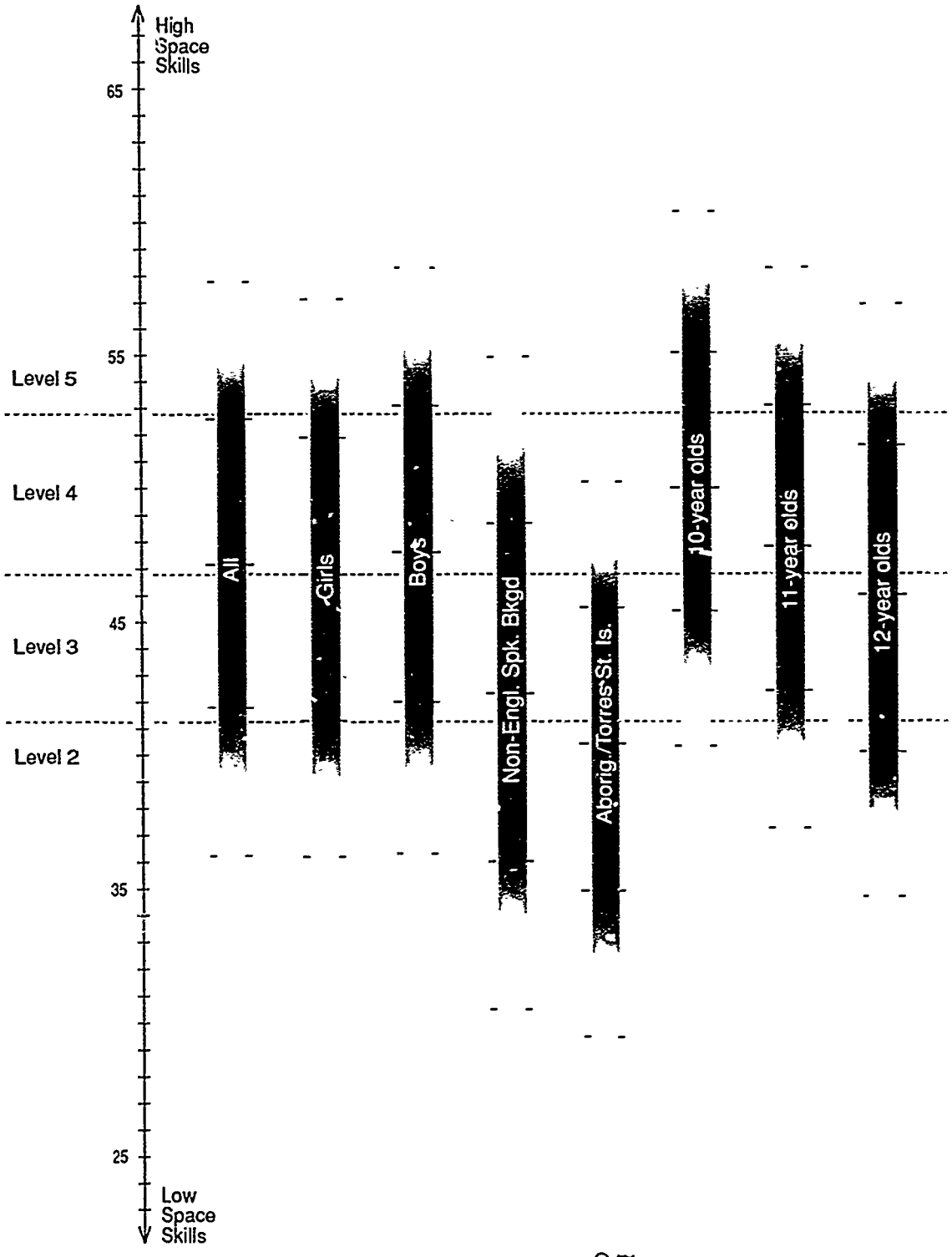
> *Results for gender served to reinforce existing research findings about differences in spatial abilities by showing that females are comparatively weak in measurement and geometry... In the domain of numbers and operations, females showed superior performance to males.*[1]

The small boy-girl differences in Number, Measurement and Space at Year 6 in the 1989 BSTP tests do not justify descriptions of 'weaknesses' and 'superior performance', but the trends in the BSTP scores are consistent with the trends in the American observations.

Results for NESB students almost certainly reflect the dependence of the BSTP tests on students' skills in standard written English. This is no doubt also a factor in the relatively low performance of Aboriginal and Torres Strait Islander students.

[1] Educational Testing Service (1988). *The Mathematics Report Card: Are we Measuring Up?*, ETS, Princeton, p.61.

Year 6 score distributions



PART III

Producing an effective piece of writing can enhance a student's confidence, self-esteem and sense of achievement.[1]

[1] *Writing K-12* , NSW Department of Education, p.7.

REPORTING BSTP RESULTS

The methods used to report BSTP results capitalise on modern measurement theory to provide more informative reports to parents, teachers and schools than are possible with more traditional test analysis methods. This section describes how BSTP results are reported and provides sample report forms. The 'Item Response Theory' techniques used to construct report forms are described in Part IV.

Central to reports generated for parents, teachers and schools are the skill levels developed for each aspect of the tests. These are described in Part I. As students learn, they progress from lower level skills and understandings to more advanced levels. Students progress at different rates and learn best when provided with learning activities and experiences appropriate to their current levels of achievement. A goal of BSTP tests is to map student achievement with respect to a set of defined skill levels and to provide feedback to parents and teachers in a form that will be useful in helping students to build upon their current achievements.

The report forms constructed for BSTP tests make extensive use of pictures and words to describe students' test results and relatively little use of numbers. Where numbers are used, they are used to help mark out and refer to positions on reporting scales. This approach has been adopted to reduce the likelihood of inappropriate interpretations—such as interpreting 50 as a 'pass mark'—and to make reports as informative as possible to parents and teachers.

Reports for Parents

Parents of students who take BSTP tests receive a one-page report of their child's results. This computer-generated report is mailed from the student's school.

An example of the *Report for Parents* is shown on the facing page. This report is for one of the students tested in 1989 and referred to here as 'Kim'. On the report mailed to parents, each student's full name, the name of his or her school, and the student's year level are printed in the long box at the top of the page.

Immediately below this box is a pictorial display of the student's results in the two *Aspects of Literacy* (Reading and Language) and three *Aspects of Numeracy* (Number, Measurement and Space). The student's achievement levels in these five aspects of the tests are indicated by rectangles made up of horizontal lines. It can be seen at a glance that Kim has performed at a slightly lower level in Reading than in Language, and at a much lower level in Number than in either Measurement or Space.

Students' achievement levels are indicated by rectangles (rather than by single lines) to reflect the uncertainty that always surrounds a student's test results. While it is usual to report a student's achievement level as a precise score, it is unlikely that exactly the same score would be obtained by that student on a second occasion. BSTP tests provide a 'best' estimate of a student's level of achievement on each aspect of the tests (indicated by the horizontal line in the middle of each rectangle), but they also provide an indication of the uncertainty surrounding that estimate.

The rectangles that indicate a student's levels of Reading and Language skill are shorter than the rectangles for Number, Measurement and Space because the Reading and Language tests contain more questions and so provide more information about a student's achievement levels. The Measurement strand of the BSTP tests contains fewest test questions, so students' levels of Measurement skill are estimated with least precision.

On the right of the *Aspects of Literacy* and *Aspects of Numeracy* graphs are a Literacy Scale and a Numeracy Scale each of which runs from around 25 to around 65. These scales make it easier to describe stud-

Basic Skills Testing Programme

REPORT FOR [illegible]

Name: Kim

6

Band 1*	• follow simple written instructions. • get information from a TV guide, newspaper index, or weather forecast. • find one or two pieces of simple information in a short piece of writing
Band 2*	• notice missing capital letters *(April* NOT *april*, *Mrs* NOT *mrs)*. • notice missing full stops; • identify a spelling mistake in adding 'ing' to a word *(having* NOT *haveing)*
Band 1*	• understand four-figure numbers; • understand common fractions like three-eighths. • work out whether to add or subtract when words like less than are given
Band 3*	• solve problems involving everyday measurements *(How many hours between 8 45 am and 5 45 pm?)*. • work out sizes of objects on scale drawings.
Band 2*	• identify an object using drawings showing different views *(from top or side)*. • use compass directions to follow a simple map

ents' achievement levels on the five aspects of the tests. In the report to Kim's school (see page 103), her BSTP results would be listed as Reading 42, Language 46, Number 33, Measurement 53, and Space 46. All results on BSTP tests are reported in terms of the Literacy and Numeracy Scales shown here. The numbers on these scales are not test scores in the usual sense; they are simply convenient place markers on a reporting scale.

A parent receiving Kim's report is able to see at a glance that she performed at similar levels in Reading and Language, but at a lower level in Number than in either Measurement or Space. These performances can be interpreted in terms of the four 'skill bands' which correspond to Skill Levels 2, 3, 4 and 5 described in Part I (see table on opposite page). On the *Aspects of Literacy* test, Kim's performance in Reading places her near the boundary of Bands 1 and 2; her performance in Language places her slightly higher, in Band 2. On the *Aspects of Numeracy* test, her test performances place her in Band 1 for Number, near the boundary of Bands 3 and 4 for Measurement, and near the boundary of Bands 2 and 3 for Space.

The lower section of the report, headed 'Your Child's Skill Levels', interprets Kim's test results in terms of the kinds of knowledge and skill typical of students with her profile of achievements. In Number, for example, Kim's test performance places her in Band 1. A brief description of the skills typical of students performing in Band 1 for Number is provided. Students at this level of skill can typically understand four-figure numbers and common fractions like three-eighths, and work out whether to add or subtract when words like *less than* are given as clues (see pages 38 to 41).

The fact that Kim's test result in Number places her in Band 1 does not mean that she will always answer questions about common fractions correctly, or that she will not sometimes make mistakes when choosing an appropriate operation. Nor does it mean that she will not be able to perform some of the skills associated with Band 2 or even Band 3. In fact, most students at her level of achievement in Number can perform some skills from higher bands. Kim's Band 1 result for Number means that she can be expected to succeed on fewer than seven out of ten Band 2 questions and on still fewer Band 3 and 4 questions in Number.

Kim's result in Reading places her near the boundary between Bands 1 and 2. Her numerical result is slightly below the boundary and so her test performance is automatically assigned to Band 1 and her performance is described in terms of Band 1 skills. The pictorial display of Kim's result in Reading reminds her parents that this is an estimate of Kim's reading ability and that she probably also has a reasonable mastery of Band 2 Reading skills.

In Measurement, Kim can be expected to have mastered the skills listed for Band 3, and probably has a good grasp of some Band 4 skills as well. Students performing at her level in Measurement rarely have any difficulty with the lower level Measurement skills listed for Bands 1 and 2.

In 1989, the Year 3 *Report for Parents* differed from the Year 6 report in that results were reported in Reading and Number only. For the reporting of Year 3 results, three 'skill bands' corresponding to Skill Levels 1, 2 and 3 were used (see table below).

On the back of the *Report for Parents*, a complete set of skill band descriptions is printed. This enables parents to interpret their child's results in terms of the set of skill bands constructed for each aspect of the tests. The percentages of Year 3 and Year 6 students with results in each band are given on page 109.

SKILL BANDS USED IN 1989 REPORTS TO PARENTS AND SCHOOLS

Skill Level	*Year 3 Skill Band*	*Year 6 Skill Band*
5		*4*
4		*3*
3	*3*	*2*
2	*2*	*1*
1	*1*	

Reports for Teachers

Teachers of students taking BSTP tests receive copies of reports prepared for parents (page 93) and a question-by-question record of students' results showing the questions each student answered correctly and those answered incorrectly. This more detailed report allows teachers to identify specific areas in which students have performed unexpectedly poorly or well. In many cases, this detail will confirm a teacher's understanding of a student's strengths and weaknesses; in other cases it may lead to new insights into a student's learning.

An example of the report for teachers is shown on pages 98 and 99. This two-page report shows detailed results for Kim whose parent report appears on page 93. The way in which Kim's teacher might use the additional detail on these two pages can be illustrated using her *Aspects of Numeracy* report on page 99.

Kim's overall result on the *Aspects of Numeracy* test is indicated by the rectangle of horizontal lines on the scale that runs up the middle of page 99. Kim's overall numeracy result can be thought of as the average of her results in Number (33), Measurement (53) and Space (46)[1]. Once again, the horizontal lines indicate a region of uncertainty about Kim's exact position on the scale.

The forty-three questions on the *Aspects of Numeracy* test are divided into two groups. The questions Kim answered correctly are on the left of the page; the questions she answered incorrectly are on the right. Each question has an identification number that shows its position in the test and whether it assesses Number (*N*), Measurement (*M*) or Space (*S*). Questions are shown at their estimated difficulty levels on the scale. The hardest questions on the test (*S36* and *N9*) are positioned towards the top of the scale. The easiest questions (*M7*, *S43*, *N5*) are positioned towards the bottom.

The advantage of displaying results in this way is that it facilitates the study of students' correct and incorrect answers[2]. In general,

[1] See Technical note 3 on page 121.

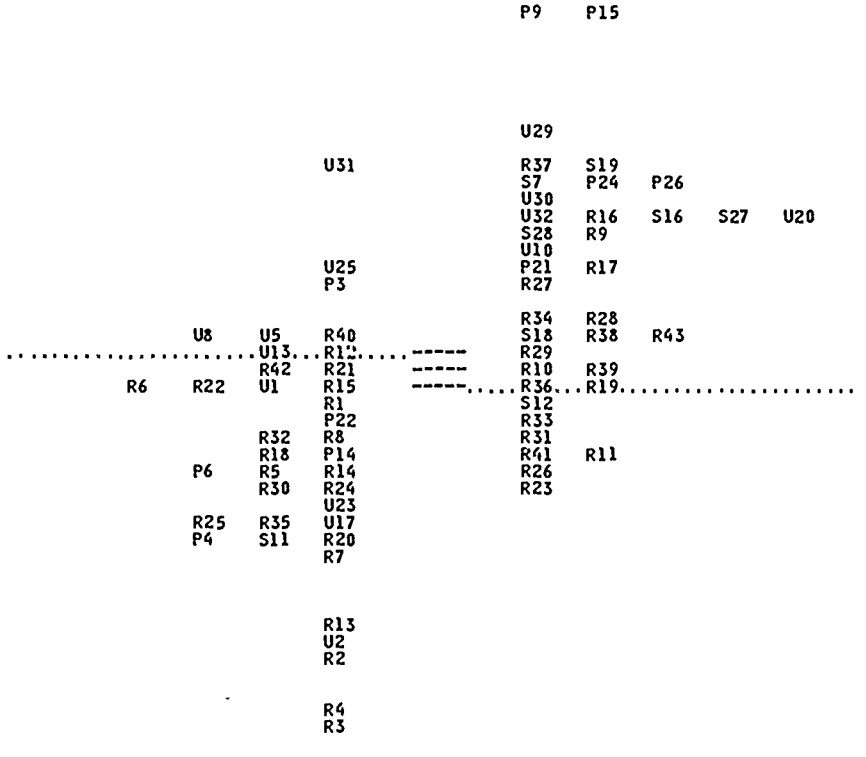
[2] See Technical note 4 on page 121.

results of most interest will be those at the bottom right of a student's report. These will be questions that most students found easy but that this student either did not answer or answered incorrectly. Questions in this corner of Kim's report include *N5*, *N31*, *N8* and *N3*. These are all from the Number strand and assess relatively low levels of Number skill (see pages 40 to 43). Given Kim's overall numeracy result, and particularly her results in Space and Measurement, her lack of success on these relatively easy Number questions is surprising. In attempting to understand why Kim performed relatively poorly in Number, her teacher may wish to begin with these four questions.

At the top left of Kim's *Student Profile* are difficult questions that she answered correctly (*S36*, *M14*, *M4*, *S37*). These questions are all from the Measurement and Space strands and assess relatively high levels of skill. They may indicate skills (such as visualising the packing of three-dimensional shapes: *S36*, *S37*) in which Kim has special strengths.

To mark out four corners of this page, a dotted line is drawn across the left of the page at the top of the region of uncertainty about Kim's overall numeracy achievement and across the right of the page at the bottom of this region. The four corners defined in this way ensure that questions in the top left corner are significantly above Kim's estimated achievement level and those in the bottom right corner are significantly below her estimated achievement level.

Students make progress in different aspects of mathematics at different rates. The fact that Kim has significantly better results in Measurement and Space than in Number may be of no great concern. On the other hand, most students with Kim's understanding of Measurement and Space concepts have made better progress in Number. Is there an explanation for her relatively slow progress in Number? By drawing attention to her most surprising results (*N5*, *N31*, *N8*, *N3*), the *Individual Student Profile* provides Kim's teacher with a starting point for investigating possible areas of misunderstanding.


P9 P15
U29
U31 R37 S19
S7 P24 P26
U30
U32 R16 S16 S27 U20
S28 R9
U10
U25 P21 R17
P3 R27
R34 R28
U8 U5 R40 S18 R38 R43
U13 R29
R42 R21 R10 R39
R6 R22 U1 R15 R36 R19
R1 S12
P22 R33
R32 R8 R31
R18 P14 R41 R11
P6 R5 R14 R26
R30 R24 R23
U23
R25 R35 U17
P4 S11 R20
R7
R13
U2
R2
R4
R3

INDIVIDUAL STUDENT PROFILE

ASPECTS OF NUMERACY

Student Kim Year 6

School.

Harder Correct | Harder Incorrect

S36

N9

M14 M32

M4

S37 N29

S27

M22 M13

N30

M41 N42

M21 -----

----- S28 S2 N23

M39 -----

----- S12 N6

S17 -----

S19 S16

S20 N26

M35

M40 N25

N3

M15 N8

S34

M11 N31

N10 N38

S18

S33 N1

N24 N5

S43

M7

Easier Correct | Easier Incorrect

KEY

S ... Space

M ... Measurement

N ... Number

EXAMPLE

M15 indicates that the question tests Measurement and that it is Question 15 in the test

Reports for Schools

As well as reporting on the performances of individual students (through the *Reports for Parents* and *Individual Student Profiles*), the Basic Skills Testing Program provides schools with summaries of their students' results. Each NSW government primary school receives a folder containing four tables.

Table 1: Means and standard deviations for school subgroups
Table 2: Alphabetical list of students' results
Table 3: School and state means, with skill band descriptions
Table 4: Analysis of students' answers (school and state)

These four tables provide the principal and teachers at each school with an overview of the performances of students at that school in relation to a set of defined skill levels for each aspect of the tests and in relation to statewide performance levels.

Table 1, provided directly to school principals, displays the mean (i.e., average) and standard deviation (i.e., spread) of scores for various groups of students in their school and the state. An example of *Table 1* is shown on the page opposite. Results here are for Year 3 students in a fictitious school.

Table 1 shows means and standard deviations of overall literacy and overall numeracy results expressed on the Literacy and Numeracy Scales[1]. The number of students in each group is reported. With the exception of the group of students seven years or younger, means and standard deviations are calculated only for groups with five or more students.

Results in *Table 1* enable principals to compare results for their schools with statewide performance levels[2]. Principals are not provided with results for any other school or group of schools, and are able to compare their school's results with statewide results only.

[1] See the section 'How results are analysed' on pages 116 to 120.

[2] See Technical notes 1 and 2 on page 121.

Table 1: Subgroup results

School: ..... Year 3

Student Group		No. in Group	Literacy mean	Literacy s.d.	Numeracy mean	Numeracy s.d.
All students	State	2334	40.4	9.1	35.7	10.2
	School	50	44.1	9.4	37.5	9.7
Boys	State	1232	38.8	8.9	35.6	10.3
	School	28	42.9	9.5	36.6	9.7
Girls	State	1099	42.2	9.0	35.9	9.9
	School	22	45.8	9.3	38.7	9.7
7 years or younger	State	2	30.5	0.7	25.5	4.9
	School	0				
8 years	State	1600	41.0	9.0	36.1	10.1
	School	35	45.5	8.8	38.5	9.7
9 years or older	State	723	39.2	9.3	34.8	10.2
	School	15	42.2	0.3	36.2	9.8
Non-Eng-spkg bkgd	State	64	34.9	8.5	31.9	10.0
	School	2				
Aborig./Torres St	State	53	37.7	8.3	31.9	8.3
	School	0				

The second table in the *Report for Schools* is an alphabetical list of students showing their results on each aspect of the tests, their overall literacy result, and overall numeracy result. Students are not asked to give the names of their teachers or classes, and are identified only as coming from a particular school. *Table* 2 of the school report lists all students from a particular year level in alphabetical order. The names on the facing page are fictitious.

Students' names appear in this list exactly as they are provided by the students. Where a name is too long to be read entirely by machine, it is entered by hand.

Results in Reading, Language, Number, Measurement and Space in *Table* 2 are displayed graphically in the upper section of the *Report for Parents* (page 93). A teacher who, after inspecting the graphical display, wishes to know a student's numerical results in the five aspects of the BSTP tests can obtain them from *Table* 2.

Students' overall literacy and overall numeracy results (which can be thought of as their average results in Reading and Language, and in Number, Measurement and Space) are displayed graphically in the *Individual Student Profiles* (pages 98 and 99). A teacher wishing to know the numerical values of a student's overall literacy and overall numeracy results can obtain them from *Table* 2.

In 1989, a few students obtained results below 25 or above 65. For those students, the BSTP tests were inappropriately difficult or too easy. To obtain more exact estimates of their achievement levels on the Literacy and Numeracy Scales, an easier test is required for students scoring below 25, and a harder test is required for students scoring above 65. In *Table* 2, their results appear as 25# and 65* to indicate that they are outside the 25 to 65 range.

Table 2: Alphabetical list of students' results

School:..... Year 6

Student Name		Results Expressed on Literacy Scale			Results Expressed on Numeracy Scale			
		Readg	Lang	Overall	Num	Meas	Space	Overall
Michelle	BASSETT	38	44	40	51	47	44	47
Jim	DU	34	36	34	39	37	31	36
Tony	DUNSTAN	39	46	42	41	40	31	38
Ming	HO	35	42	38	35	34	34	34
Anita	HUGHES	40	43	41	55	42	51	49
Nick	KOVACEVIC	31	37	33	28	34	25#	27
Xuan	LIU	39	48	43	37	44	44	42
Sandra	MILLER	30	37	33	37	47	44	42
Adam	MURPHY	37	48	41	48	47	46	47
Tran	NGUYEN	47	52	50	46	44	41	44
Maria	TOMMASINI	34	37	35	25	37	31	30
Sophie	WILSON	40	48	43	37	40	44	40

This student's skill level is below this point on the scale.

Table 3 of each school's report shows the school means in Reading, Language, Number, Measurement and Space, and the corresponding state means. It also gives the percentages of students with results in each skill band for the school and for the state. The Reading and Language sections of one school's version of *Table 3* are shown on the facing page.

School means are indicated by black arrows on the right of each scale, state means by light-coloured arrows on the left. In the example opposite, the school means are below the state means in both Reading and Language.

As well as showing how students in a school have performed in relation to the rest of the state, *Table 3* provides a way of interpreting these average performance levels. In the example opposite, the school means are in Band 2, indicating that Year 6 students in this school have, on average, mastered most Band 2 skills in Reading and Language. The state means are in Band 3, indicating that Year 6 students in New South Wales schools have, on average, mastered Band 2 skills and some Band 3 skills. The band descriptions in *Table 3* provide schools with a way of interpreting these average performance levels.

At the bottom of *Table 3* the percentages of students with results in each skill band are shown. In can be seen that, in this school, at least 60 percent of students have results in the bottom two bands in Reading and Language. From the state percentages it can be seen that more Year 6 students have results in the upper two bands than in the lower two bands.

Table 3: School and state means

Reading

Skill Band	STUDENTS IN THESE BANDS ARE TYPICALLY ABLE TO:
4	read carefully and sort out competing information; work out the meanings of words from clues in the passage; detect feelings when they are not stated directly (*humour*).
3	understand less common expressions and meanings; understand meaning when it is not stated directly; detect feelings in a piece of writing (*tiredness, annoyance*).
2	select the correct piece of information when several are given; choose a word or words to sum up a piece of writing; find and put together several pieces of information to reach a conclusion.
1	follow simple written instructions; get information from a TV guide, newspaper index, or weather forecast; find one or two pieces of simple information in a short piece of writing.

High 65 — 55 — 45 — 35 — 25 Low

Band	1	2	3	4
School %	30	30	25	15
State %	22	22	27	29

Language

STUDENTS IN THESE BANDS ARE TYPICALLY ABLE TO:
identify spelling mistakes involving double letters, silent letters, or missing letters; know when an apostrophe is needed (*everyone['] s d-inks*); recognise when a word has been left out.
understand the use of ? and " "; recognise a wrong spelling that sounds right (*tried*, NOT *tride*); recognise when a word does not fit with what has already been read.
notice missing capital letters (*April* NOT *april*; *Mrs* NOT *mrs*); notice missing full stops; identify a spelling mistake in adding "ing" to a word (*having* NOT *haveing*).
recognise the correct spelling in contexts (*last week* NOT *weak*); know that a capital letter is needed in "*i got*"; find mistakes that are obvious in speech.

65 — 55 — 45 — 35 — 25

Band	1	2	3	4
School %	33	29	24	14
State %	18	23	37	22

KEY: School mean: ⬅ State mean: ⇨

Finally, *Table 4* of the *Report for Schools* provides a record of the percentages of students selecting each of the alternative answers to BSTP test questions. Schools are provided with two versions of *Table 4:* one showing percentages for the school, the other showing percentages for the state. The table on the facing page shows some of the state percentages for the 1989 Year 6 test.

On the left of the table, the alternative answers to each question are listed under the headings *i, ii, iii, iv* and *v.* Some items have four alternatives, others have five. The correct alternative is marked with a star. On the right of the table are the percentages of students choosing each of the alternatives. The percentage choosing the correct alternative is marked with a star. On the far right of the table, under the heading 'omit', is the percentage of students who did not select any of the available alternatives.

Table 4 provides teachers with information about the percentages of students making different kinds of errors—both in the population as a whole and in their schools. Teachers can make best use of this information by identifying the kinds of misunderstandings that lead to incorrect answers. Item 9, for example, refers to a piece of text that describes preparations for a hot air balloon ride: *The day began with high expectations. At 3 am, photographer Mike and I enjoyed a candlelit pancake breakfast with Roger....* Item 9 asks students for the meaning of *high expectations.* Forty percent of Year 6 students chose *a big breakfast* over *great promise.* The misunderstanding revealed by this item is common among Year 6 students and is a pointer to the kinds of classroom discussions that are likely to be fruitful in almost all Year 6 classes.

Teachers can compare the school and state versions of *Table 4* to identify items or topics on which their school performed differently from the rest of the state.

Table 4: Analysis of students' answers

STATE TOTAL — Year 6

Aspects of Literacy—Reading — No. of students: 53811

Item	Alternative					Percentage of students					
	i	ii	iii	iv	v	i	ii	iii	iv	v	omit
1	dinosaurs	world	computer	holiday*		22	3	1	*73		1
2	Adelaide*	Brisbane	Canberra	Melbourne	Sydney	*93	1	1	1	2	2
3	'25'	'27'	'59'*	'69'		1	1	*96	1		1
4	Amusement	Comics*	Crosswords	Personal		3	*95	1	1		0
5	Racer*	Royal	Sporty	Status	Wonder	*80	3	4	2	7	4
6	Racer	Royal	Sporty	Status*	Wonder	5	1	24	*67	1	2
7	none	two	three	four*		2	2	8	*88		0
8	Horizons	World*	Guineas	Desert		4	*77	15	2		2
9	explosion	breakfast	promise*	rain		10	40	*45	4		1
10	attacked	bit*	not active	ignored		10	*66	9	13		2

The following three tables summarise information provided to schools about statewide performances on the 1989 BSTP tests. Results in these tables are for all 2330 Year 3 students and all 53 800 Year 6 students.

The first table shows the state means and standard deviations on the five aspects of the tests, overall literacy, and overall numeracy. The Year 3 means are expressed on the Year 6 reporting scale enabling them to be compared directly with the Year 6 means[1].

STATE MEANS AND STANDARD DEVIATIONS

	Year 3		Year 6	
	mean	s. d.	mean	s. d.
Reading	40.4	9.1	49.0	8.3
Language			48.5	7.0
Overall Literacy			48.5	7.1
Number	35.7	10.2	49.0	9.4
Measurement			48.3	8.3
Space			48.5	9.1
Overall Numeracy			48.8	8.3

The second table shows the percentages of Year 3 students with results in each skill band. The three skill bands used in Year 3 reports to parents, teachers and schools correspond to Skill Levels 1, 2 and 3 described in Part I.

[1] See Technical notes 1 and 2 on page 121.

PERCENTAGES OF YEAR 3 STUDENTS IN SKILL BANDS

Aspects of Literacy			Aspects of Numeracy		
Skill Band	Skill Level	Reading	*Skill Band*	Skill Level	Number[1]
	5			5	
	4			4	
3	3	41	*3*	3	35
2	2	45	*2*	2	33
1	1	14	*1*	1	30

The third table shows the percentages of Year 6 students with results in each skill band. The four skill bands used in Year 6 reports to parents, teachers and schools correspond to Skill Levels 2, 3, 4 and 5 described in Part I.

PERCENTAGES OF YEAR 6 STUDENTS IN SKILL BANDS

Aspects of Literacy				Aspects of Numeracy				
Skill Band	Skill Level	Reading	Language	*Skill Band*	Skill Level	Number	Measurement	Space
4	5	29	22	*4*	5	34	23	29
3	4	27	37	*3*	4	24	26	27
2	3	22	23	*2*	3	25	33	27
1	2	22	18	*1*	2	16	17	16
	1				1			

[1] See Technical note 5 on page 121.

PART IV

In Mathematics, as in other curriculum areas, students learn from each other.[1]

[1] *Mathematics K-6* , NSW Depar'ment of Education, p.18.

PROCEDURES

This section describes the procedures used to develop BSTP tests and to analyse students' results in preparation for reporting. The purpose of this section is to provide an overview of procedures for readers interested in learning more about how BSTP operates. This section does not provide a detailed explanation of the statistical methods used or detailed tables of results. That level of detail is provided in the BSTP technical manual available from ACER.

The pages that follow describe the procedures used to develop test specifications, assemble an initial pool of materials, review questions, pilot test materials, and select questions for the final tests. A special effort is made during test development to ensure that BSTP tests are fair to students from different language, cultural, geographical and gender groups.

A brief explanation is also given of the statistical and qualitative analyses of BSTP results. The methods used to 'calibrate' Year 3 and Year 6 questions, to establish comparability between Years 3 and 6, and to construct skill bands are described and illustrated. Readers interested in learning more about the statistical methods used to analyse BSTP test results are referred to some of the relevant literature.

How Tests are constructed

The skills assessed in the *Aspects of Literacy* and *Aspects of Numeracy* tests are taken from primary school curriculum documents in New South Wales. The construction of BSTP tests begins with consultations between test development staff and personnel of the NSW Department of School Education who have responsibility for curriculum matters. The aim of these consultations is to specify aspects of the curriculum to be represented in the tests, to identify topics that should be covered within each aspect, and to determine relative emphases to be placed on those topics.

For 1989, the aspects of the Mathematics curriculum represented in the Year 6 test were Number, Measurement and Space, with approximately equal numbers of questions from each aspect. The *Aspects of Literacy* test was made up of a Reading Comprehension section and a Language section (knowledge of written English), with about 25 percent more Reading questions than Language questions. At Year 3, only Number and Reading were tested in 1989. A finer breakdown of topics to be covered within each strand (e.g., spelling, vocabulary, addition, subtraction, measurement of length, two-dimensional space) is determined before the writing of test questions begins.

Throughout the process of developing BSTP tests, close consultation with curriculum staff ensures that the tests assess literacy and numeracy skills fundamental to NSW school curricula. Staff developing the tests make constant reference to appropriate syllabus statements where these exist. Senior staff of the NSW Department of School Education review questions proposed for inclusion in the final version of each test prior to publication. The goal of this extensive consultative process is to ensure that BSTP tests are relevant to the content and processes that students are being exposed to during their schooling, appropriate for students' grade levels, and as fair as possible to all subgroups of students.

Because of the numbers of students involved in the Basic Skills Testing Program, computer processing of students' answers is necessary to ensure that results are returned to schools soon after the testing date. An important consideration in the development of BSTP tests is that students' responses be able to be scanned accurately by optical mark readers. This requirement places signifi-

cant constraints on the types of test questions that can be used: open-ended or essay questions cannot be used, for example.

Traditional machine-scored tests provide students with multiple-choice questions in a test booklet and a separate answer sheet on which they record their answers. Although many Year 6 students have some experience with answer sheets for machine-scored tests, some have not. To make the task as similar as possible to day-to-day classroom activities, BSTP tests provide places for students to record their answers either immediately next to or integrated into test questions. To introduce variety and reduce the artificiality of the task, BSTP tests use a range of answering methods within the constraints of machine-scoring. In 1989 students recorded their answers by colouring in pictures of three-dimensional objects, animals and calculator buttons; drawing paths on a map; and underlining errors in samples of student writing.

In keeping with NSW syllabus statements, BSTP tests emphasise the relevance of language and mathematics learning both in daily life and as preparation for further learning. Test questions place language and mathematics skills in contexts which have meaning and relevance to students. This does not mean that all students will have first-hand experience with all of the contexts used—that would be unlikely in a testing program designed for all students in a given year group—but it does mean that the situations described in BSTP questions are ones with which all students can be expected to have some familiarity and to which they should be able to relate from their own experiences.

The process of writing BSTP test questions includes selecting appropriate 'stimulus material' as contexts for test questions. One or two test developers have responsibility for this initial phase of test development, but confer regularly with colleagues. Once a set of possible stimulus materials has been identified and a pool of test questions drafted, these materials are subjected to a formal review process known as 'panelling'. Review panels consist of test developers, other subject matter specialists, and other staff with educational measurement expertise. Draft questions are often amended during panelling and some may be rejected altogether.

A special concern in the development of BSTP tests is to ensure that all test questions are fair to students who are going to take them. Care is taken to minimise the chances of an item being unfair to a particular subgroup of students (girls, Aboriginal students, students from non-English-speaking backgrounds, and so on). This is not to say that an attempt is made to ensure that all subgroups of students score equally well. If girls have higher average reading scores than boys, that is not interpreted as an indication that the Reading test is unfair to (or 'biased' against) boys. It is simply interpreted as an indication that, on average, girls in primary schools tend to be better readers than boys.

To minimise the possibility of unfair disadvantage, care is taken to include in the tests a balance of topics in terms of interest and familiarity, without featuring any material that depends on knowledge likely to be peculiar to a particular subgroup of students. Care is also taken to ensure that males and females feature in a variety of roles, not just stereotyped ones[1]. In the 1989 tests, for example, care was taken to portray girls and boys about equally in active and passive roles. Personal names used in the tests are balanced for gender and ethnic origin.

BSTP tests are, by intention, tests of standard written English. Every attempt is made to make them fair tests of standard written English. Students from non-English-speaking backgrounds are not expected to perform as well on BSTP tests as students who speak English as their first or only language. The language backgrounds of students must be taken into account by parents, teachers and schools in interpreting individuals' results. This is equally true of Aboriginal/Torres Strait Islander students who may speak a non-standard variant of English.

The *Aspects of Numeracy* test assesses students' numeracy skills as applied to realistic, everyday problems. These problems are couched in standard written English. This means that the *Aspects of Numeracy* test is not simply a test of skills in manipulating numbers but, consistent with emphases in the New South Wales mathematics syllabus, assesses students' skills in applying mathematics

[1] see Mosley, F. (1985). *Everyone Counts: Looking for Bias and Insensitivity in Primary Mathematics Materials*. Inner London Education Authority, London.

to problems described in English. This fact must also be taken into account when interpreting the test results of students from non-English-speaking backgrounds.

At least three times as many questions are written for BSTP tests as are required for the final test forms. Following panel sessions, amended questions are assembled into several trial forms which are then administered to students at the appropriate grade level in a number of schools outside the NSW public school system. Schools for trial testing are chosen to ensure that students from a range of socioeconomic and geographical areas are included. A few questions from each trial form are included in at least one other test form so that the relative difficulties of the questions in different trial forms can be compared directly. As part of the trial testing of BSTP test materials, students are interviewed, usually on a group basis, after doing the tests. During the interviews, information is collected on the sections of the tests that students found most interesting, least interesting, easiest, and hardest. Feedback is also obtained on any difficulties that students encountered with the test instructions or procedures.

Following the analysis of results from the trial testing and the collation of information from interviews, the internal review panel is reconvened to study the evidence on each of the test questions. Statistical analyses of how individual questions have functioned are combined with feedback from students on what they found interesting and enjoyable, and professional judgements are made to select questions for inclusion in the final test. This process ensures that the items in the final test cover a range of skill levels for each of the important content areas. It is a goal of BSTP tests to provide tasks that students will enjoy. Feedback from schools suggests that the tests were successful in achieving this goal in 1989.

How Results are analysed

The traditional way to report results on a test is to count the questions answered correctly by each student and to report this count as the student's 'mark' or 'score'. Sometimes number-right scores are converted to percentages. BSTP results are not reported in this way for a number of reasons.

Scores and percentages invariably lead to pass-fail interpretations. It is common practice to interpret 50 percent as a 'pass': on a 40-item test, students with scores of 20 or better are commonly considered to have 'passed', students with scores below 20 are considered to have 'failed'. The purpose of BSTP tests is not to label some students as successful learners and others as failures, but to encourage successful learning for all students. BSTP tests do this by providing feedback on individuals' current levels of achievement so that students can be helped to build on to those achievements.

The practice of treating 50 percent as a 'pass' leads to an arbitrary definition of success. If a few questions on a test are replaced with a few easier questions, then the level of achievement required to 'pass' is lowered. If they are replaced with a few harder questions, then the level of achievement required to 'pass' is raised. Under this definition of adequate performance, test developers can control the percentage of students likely to be judged successful through the inclusion of easier or harder test questions.

Another reason for not using number-right scores or percentages in the reporting of BSTP results is that scores of this kind cannot be compared directly from test to test. It is not possible, from scores alone, to say whether an average score of 25.4 questions correct on this year's test is better or worse than an average score of 22.8 questions correct on last year's test. Perhaps last year's test was harder. Furthermore, equal score differences do not always represent equal differences in achievement. On a 45-item test, the difference between scores of 39 and 44 is not usually equivalent to the difference between scores of 20 and 25. Ordinary number-right scores and percentages do not provide a useful basis for measuring student growth over time or for monitoring educational standards from year to year. The method used to analyse BSTP results overcomes these serious shortcomings of more traditional test analysis methods.

Central to the method used to analyse results on BSTP tests is the concept of a skill continuum extending from low-level, beginning skills to high-level, advanced skills. Within each aspect of literacy and numeracy skill, development is seen as a continuous process through which students progress from relatively low levels of understanding and skill to more advanced skills. Students' test results are used to map their progress along this continuum.

The first step in the construction of a BSTP skill continuum is to 'calibrate' test items according to their difficulty. The result of calibrating the forty-three items on the 1989 Year 6 *Aspects of Numeracy* test is shown on page 119. Items are identified by code number and are shown grouped into the three aspects Number, Measurement and Space.

The forty-three items are positioned at levels on the Numeracy Scale reflecting their difficulties. The position of each item has been obtained from a computer analysis of the responses of a sample of 5570 Year 6 students[1]. Item *S36* towards the top of the scale is estimated to be the most difficult item on the test: it is the item least often answered correctly by the sample of students. Item *M7* is estimated to be the easiest item on the test: it is the item most often answered correctly. More information about the statistics of item calibration can be found in the book *Best Test Design*[2].

The second step is to place the twenty-four Number items from the Year 3 test on the Numeracy Scale. These items are calibrated using the responses of 2330 Year 3 students. An adjustment is required to make the difficulties of Year 3 items directly comparable to the difficulties of Year 6 items. This adjustment is achieved with the help of seven 'anchor' items included in both the Year 3 and Year 6 Number tests. The set of twenty-four Year 3 items is positioned on the Numeracy Scale so that the average scale position of the seven anchor items is the same as their average scale position when calibrated as part of the Year 6 test. The result is shown on page 119.

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[1] See Technical note 6 on page 121.

[2] Wright, B.D. and Stone. M.H. (1979). *Best Test Design*, MESA Press, Chicago. See also Wright, B.D. and Masters, G.N. (1982). *Rating Scale Analysis*, MESA Press, Chicago.

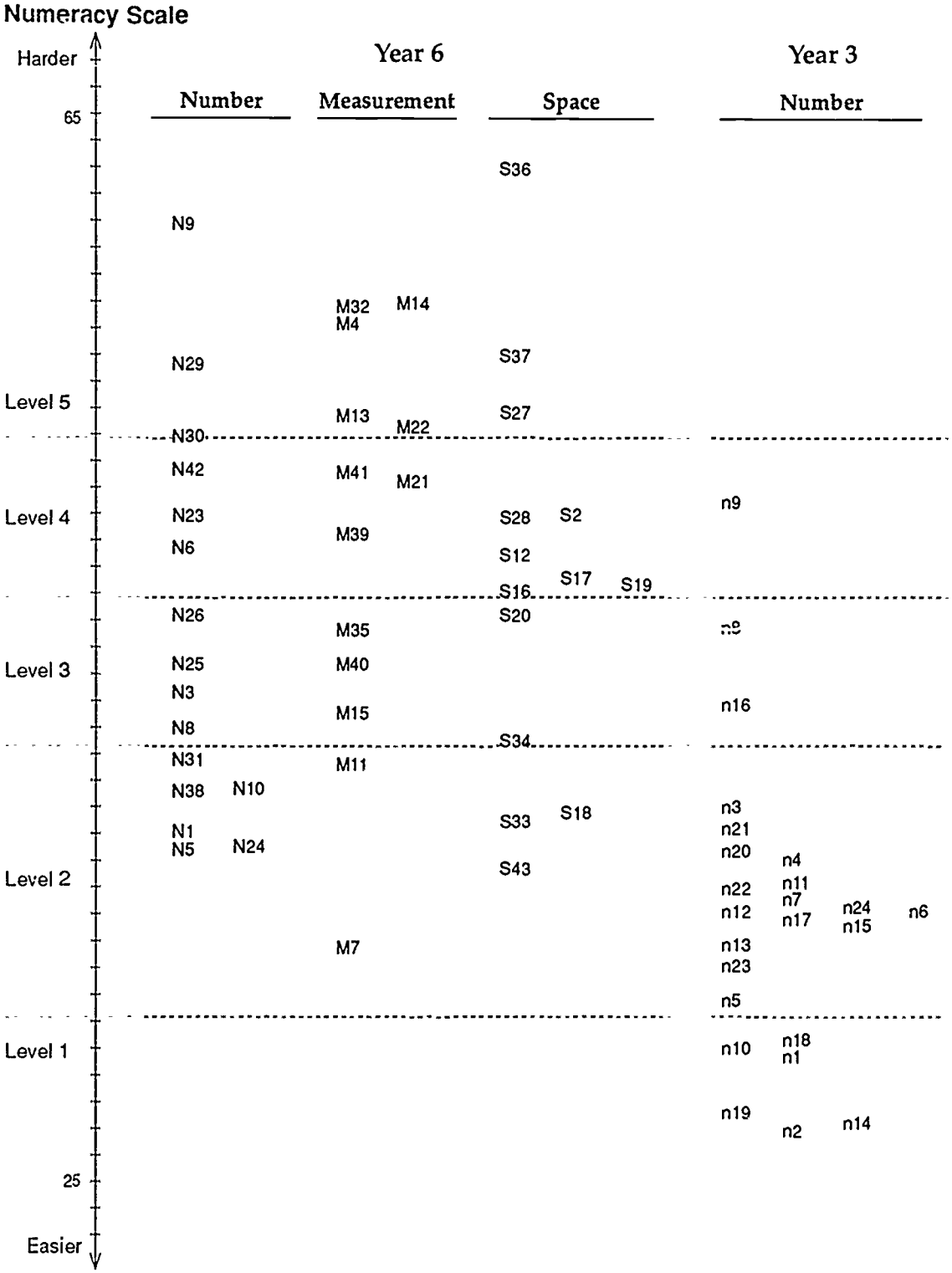
With all items positioned at their estimated difficulty levels on the Numeracy Scale, it is now possible to inspect questions with similar levels of difficulty. What, for example, do Year 3 items *n2*, *n14* and *n19* have in common that makes them so easy? Can we find words to describe this very low level of Number skill? Items *S43*, *S33* and *S18* are the easiest Space questions—what skills do they assess? What skill does *S36* require that makes it so difficult? The third step in the process is a detailed study of all sixty items in an attempt to understand and describe levels of skill in Number, Measurement and Space. Through a qualitative analysis of the items and the grouping of items assessing similar skills, five skill levels have been constructed. These are shown on the facing page and described in detail on pages 37, 51 and 63.

Having calibrated all sixty numeracy items, the next step is to use students' responses to these items to measure their achievement levels. Item Response Theory enables any subset of the sixty items to be used to obtain a measure of achievement on the Numeracy Scale. A student's performances on the sixteen Year 6 Number items, for example, provide a score in the range 25 to 65. Performances on the thirteen Measurement items and fourteen Space items also lead to scores on the Numeracy Scale enabling direct comparisons of a student's performances in these aspects of numeracy. By considering a student's performances on all forty-three Year 6 numeracy items simultaneously, a score on the Numeracy Scale is obtained which can be interpreted as a measure of the student's 'overall' numeracy achievement. The performances of Year 3 students on the twenty-four Year 3 items also provide scores on the Numeracy Scale that can be compared directly with Year 6 scores.

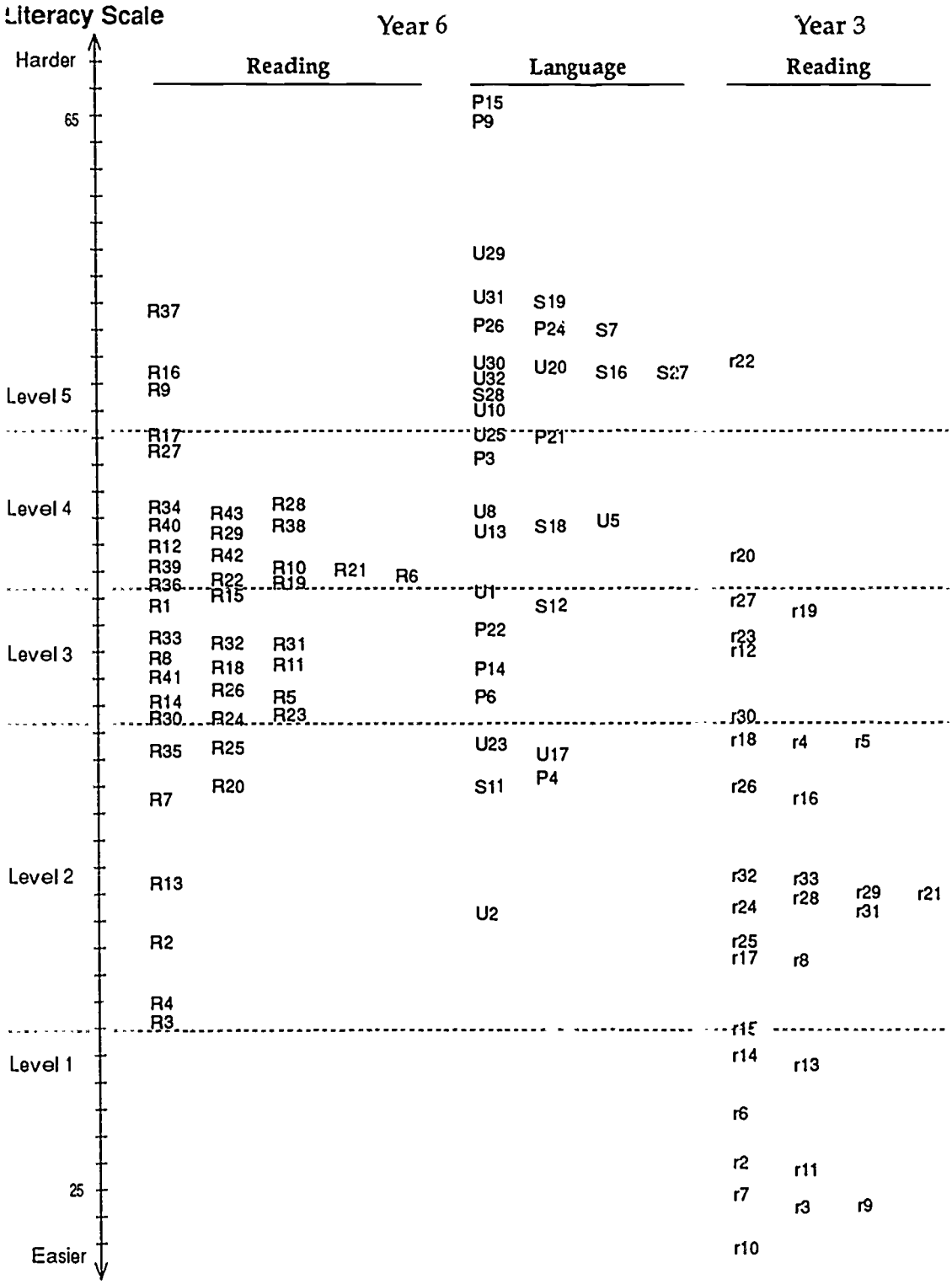
Because all items are calibrated and all students are measured on the same Numeracy Scale, it is now possible to interpret students' scores in terms of the kinds of skills that typify those achievement levels. Each student's performances on the BSTP tests place them in one of the five skill levels for each of Number, Measurement and Space. The skill level descriptions provide an indication of the skills that students in those levels can typically be expected to have mastered[1]. The literacy skill levels obtained by calibrating and studying Year 3 and Year 6 Reading questions and Year 6 Language questions are shown on page 120.

[1] See Technical note 7 on page 121.

Numeracy items and skill levels



Literacy items and skill levels



Technical notes

1. Year 3 students' Reading scores are shown here on the Year 6 reporting scale. This has been done to enable the comparison of Year 3 and Year 6 Reading results. To convert back to the scale used to report Year 3 Reading results to parents and schools, add 10 to these scores.

2. Year 3 students' Number scores are shown here on the Year 6 reporting scale. To convert back to the scale used to report Year 3 Number results to parents and schools, add 13 to these scores.

3. The overall numeracy result is similar in value to an arithmetic mean of the Number, Measurement and Space results weighted by the numbers of questions in the three strands. It is actually a rescaled Item Response Theory estimate based on the student's responses to all forty-three numeracy questions.

4. The *Individual Student Profiles* are based on the 'Kidmap' report developed by Wright, Mead and Ludlow. (See also Martois, J.S. (1985). Kidmap. *The International Encyclopedia of Education*, Pergamon Press, Oxford, pp 2810-12.)

5. For Year 3 Number only, a more lenient criterion based on 50 percent rather than 70 percent mastery was used in reporting to parents and schools. The percentages assigned to skill bands under this more lenient criterion were: Band 1: 16%; Band 2: 30%; Band 3: 53%.

6. BSTP items are calibrated using Item Response Theory. The Rasch model for tests (or one-parameter logistic model) was used to calibrate the questions on the *Aspects of Literacy* and *Aspects of Numeracy* tests on a sample of 5570 students drawn from all ten regions of New South Wales.

7. 'Mastery' here refers to 70 percent mastery. Items are shown on pages 119 and 120 at their $p = 0.7$ level (rather than $p = 0.5$). After calibration, all item difficulty estimates were adjusted to their $p = 0.7$ level and these adjusted difficulties are used throughout the report. The exception occurs in the *Individual Student Profiles* where items are shown at their $p = 0.5$ levels.

Sources

Sources of published material used in the 1989 tests

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Kangaroos	'The first kangaroo', in *The Dreamtime*, C. P. Mountford, Adelaide: Rigby, 1965, p. 18.
The Carpenters' Christmas Holidays	*Jodie's Journey*, Colin Thiele Glebe, NSW: Walter McVitty Books, 1988, pp 66-67.
The Snore Machine	'Anti-snore machine', in *Ratbags & Rascals* Robin Klein, Melbourne: J. M. Dent, 1984, pp 76-77.
School of the Air	'School of the Air', *Comet*, No. 3, 1983, pp 10-11 Education Department of Victoria.
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