

**SUPPLEMENT 1**

**PAT** MATHS

**Progressive Achievement Tests  
in Mathematics**  
THIRD EDITION



## PATMaths Third Edition and I Can Do Maths revised reports

### Introduction

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#### **PATMaths 3rd Edition**

The *Progressive Achievement Tests in Mathematics Third Edition (PATMaths 3rd Edition)* consists of a screening test (Test A) and seven tests of increasing difficulty. The tests cover Years 2 to 10 in Victoria, New South Wales and the Australian Capital Territory, or Years 3 to 11 in Queensland, South Australia, Western Australia and the Northern Territory. Year levels for Queensland, South Australia, Western Australia and the Northern Territory are indicated in brackets ( ). *PATMaths 3rd Edition* can be administered in group settings via a paper-pencil, multiple-choice test.

#### **I Can Do Maths**

*I Can Do Maths (ICDM)* is a test of beginning mathematical ability in the first three years of school. It is orally administered to students individually or in small groups and consists of items that are presented in the form of pictures. It contains open-ended and multiple-choice questions.

#### **Research**

This supplement was prepared in response to schools who wanted to assess mathematics achievement in lower year levels where norms were not available on the *PATMaths 3rd Edition* scale. Norms for Years 1(2) and 2(3) have been obtained with data from the *ICDM* norming study through the calibration of the two *ICDM* tests on the *PATMaths 3rd Edition* scale. Revised reports and tables have been prepared for Test A, Test 1 and the two *ICDM* tests.

The *PATMaths 3rd Edition* scale was extended to lower levels to provide a numeracy continuum in an ACER research project. This was done to show the growth that occurred between March and September 2005 for students in Years 1(2) to 9(10). A total of 14 tests were prepared using items from ACER

and NZCER *PATMaths* that had already been calibrated onto the same scale, a selection of *ICDM* items and new items. These tests were administered on two occasions making sure that no student attempted the same test twice.

Equating of the items that were not already calibrated onto the *PATMaths 3rd Edition* scale was achieved through common items in some tests and through administration of two tests to the same students. Common case equating data were obtained from a sample of 93 Year 1 students, 95 Year 2 students and 120 Year 3 students.

The selected *ICDM* items calibrated on the *PATMaths 3rd Edition* scale provided the link required to calibrate all *ICDM* items on this scale and consequently to obtain a score equivalence table for each of the two *ICDM* tests. A score equivalence table allows each test score to be translated into a scale score in patm units. The achievement of the *ICDM* Year 1 and Year 2 norming samples was then measured on the *PATMaths 3rd Edition* scale providing norms below Year 3 for *PATMaths 3rd Edition* tests.

The relative positions of the selected *ICDM* items on the *PATMaths 3rd Edition* scale and on the *ICDM* scale were very close, validating the equating of the two scales. With this work it is now possible to compare results on the *PATMaths 3rd Edition* tests with results on the *ICDM* tests.

**From this process, we are now able to provide:**

- **Norms for Years 1(2) and 2(3) for *PATMaths 3rd Edition* Test A and Test 1.**
- ***ICDM* test scores scaled onto the *PATMaths 3rd Edition* scale, which allow progressive testing in numeracy from Year 1(2) to Year 10(11).**

#### **List of revised reports and tables**

- 1 Student achievement by year level  
(Revised Figure 12 in *PATMaths 3rd Edition* manual)
- 2 Student reports for *PATMaths 3rd Edition* Test A and Test 1
- 3 Norm tables for *PATMaths 3rd Edition* Test A and Test 1
- 4 Combined reports for *PATMaths 3rd Edition* Test A and Test 1
- 5 Transformation of test scores (%) to scale scores  
(Revised Figure 14 in *PATMaths 3rd Edition* manual)

## Administration Guidelines

When administering the *PATMaths 3rd Edition* Test A and Test 1 to students in Years 1, 2 or 3, the guidelines on pages 10 to 15 of the *PATMaths 3rd Edition* can be used. However, there are some suggestions for testing with this age group:

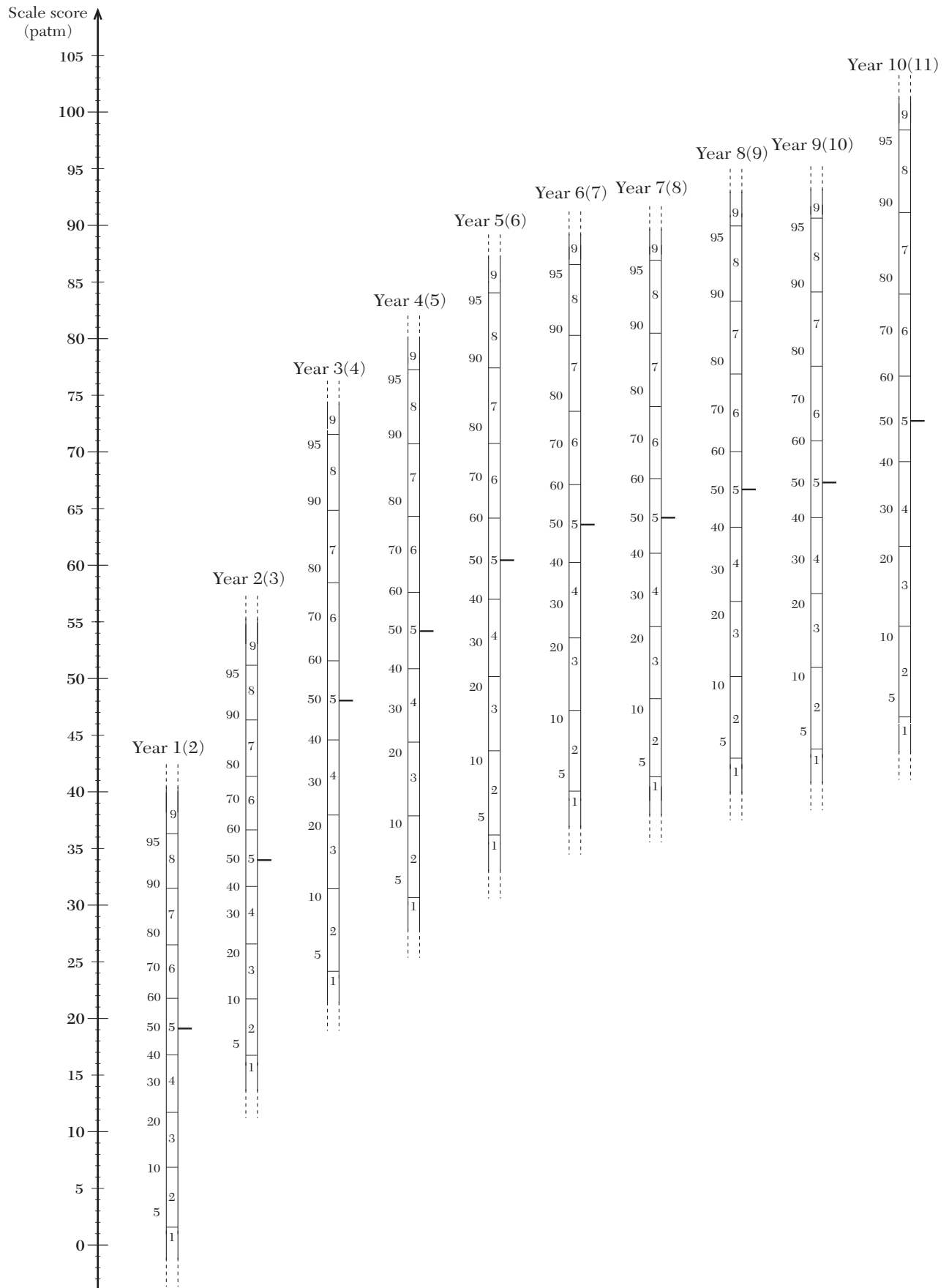
- 1 Use the Non-OMR Answer Sheet, which has larger print and is easier to complete.
- 2 Assessments can be done individually or in pairs. This allows the teacher to provide assistance in:
  - reading the test questions
  - indicating students' answers.
- 3 Allow students to complete the test in two sittings, especially for those who get tired or lose concentration quickly. In this case, do not allow students to review their answers from the previous sitting.
- 4 Work through the practice questions closely with them before they commence.

## 1 Student achievement by year level

The figure on page 6 is a revised version of Figure 12 from the *PATMaths 3rd Edition* manual (p. 53), with the addition of norms for Years 1(2) and 2(3). The revised figure shows the norming data by year level on the *PATMaths* scale. The norming methodology described in the *PATMaths 3rd Edition* manual (p. 50) has been used to obtain distributions of *PATMaths 3rd Edition* scale scores for norming samples in Years 1 and 2.

These results show that a greater rate of growth in mathematics achievement occurs at early year levels.

Student achievement by year level



## 2 Student reports on *PATMaths 3rd Edition Test A and Test 1*

Student reports, as described on pages 18 and 19 and shown on pages 87 – 94 of the *PATMaths 3rd Edition* manual, have been revised to include norms for Years 1(2) and 2(3).

The *PATMaths* scale shown in the manual extends from 5 to 105 patm units. (The calibration of the Years 1(2) and 2(3) students on the same scale requires an extension of this scale below the origin that was selected in 2004. It is necessary to show the scale from -15 to 85 patm units in order to display the location of the *ICDM* items and the transformation of the *ICDM* test scores to scale scores.)

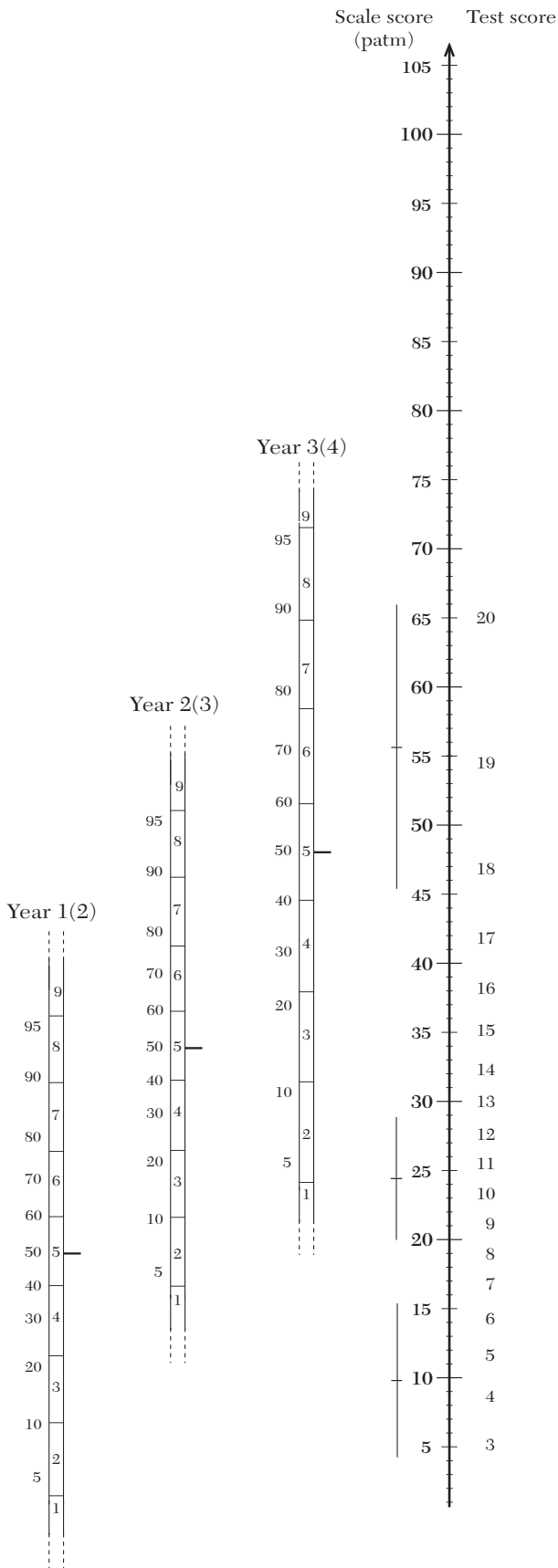
Two revised student reports have, therefore, been prepared for Test A and Test 1, with the scale from 5 to 105 patm. Another two revised student reports have been produced for Test A and Test 1, with the scale from -15 to 85 patm.

Either of these reports can be used, but the versions showing the scale from -15 to 85 patm will allow the performance of lower achieving students to be shown more clearly. The reports showing the scale from 5 to 105 patm are visually more similar to the original reports in the *PATMaths 3rd Edition* manual and can be used for comparison purposes.

The reference year levels for norming Test A are 1(2), 2(3) and 3(4), while those for norming Test 1 are 2(3), 3(4) and 4(5). Year levels for Queensland, South Australia, Western Australia and the Northern Territory are indicated in brackets ( ).

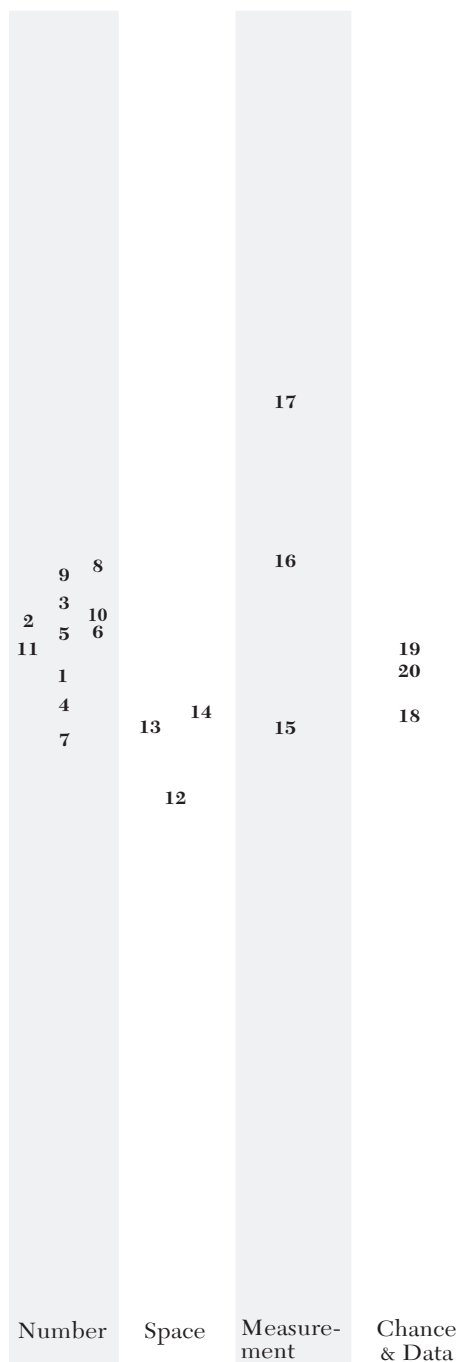
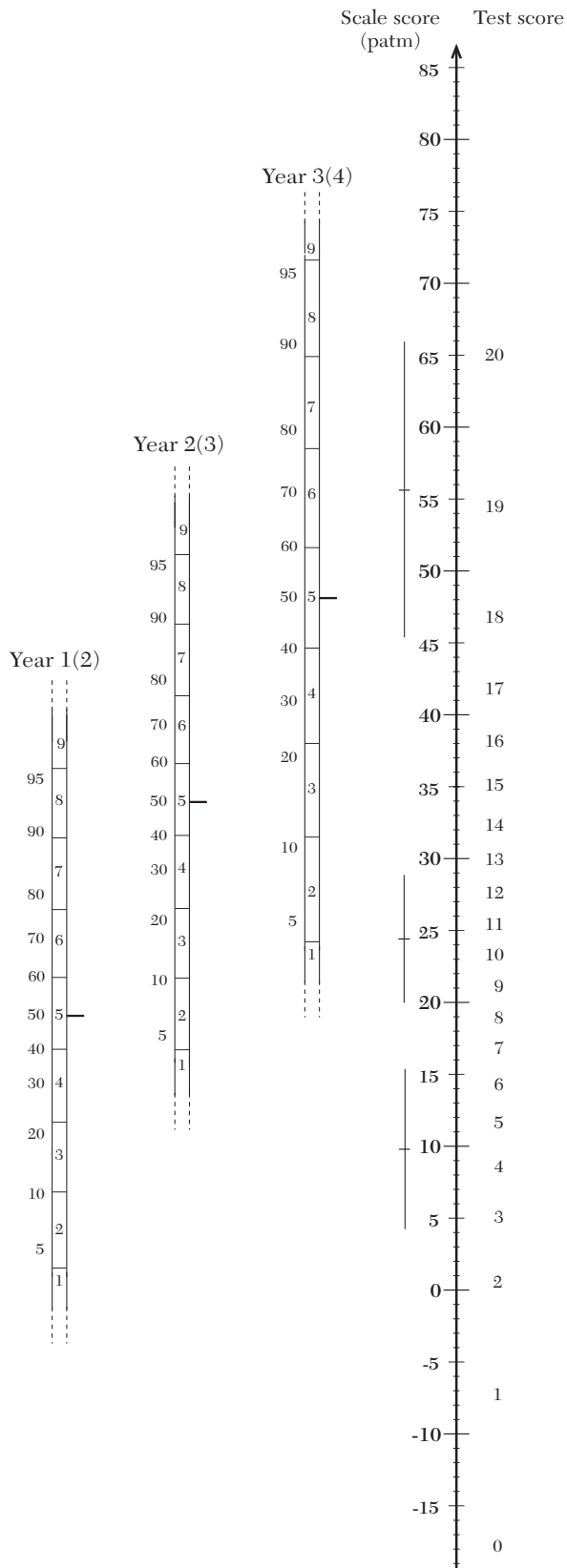
### Test A Student Report

Student name: .....  
 Student year Level: .....  
 Date of testing: .....  
 Test raw score: .....  
 Scale score(patm): ..... ± .....  
 Year level of reference group: .....  
 Percentile rank: ..... Stanine: .....



### Test A Student Report

Student name: .....  
 Student year Level: .....  
 Date of testing: .....  
 Test raw score: .....  
 Scale score(patm): ..... ± .....  
 Year level of reference group: .....  
 Percentile rank: ..... Stanine: .....



### Test 1 Student Report

Student name: .....

Student year Level: .....

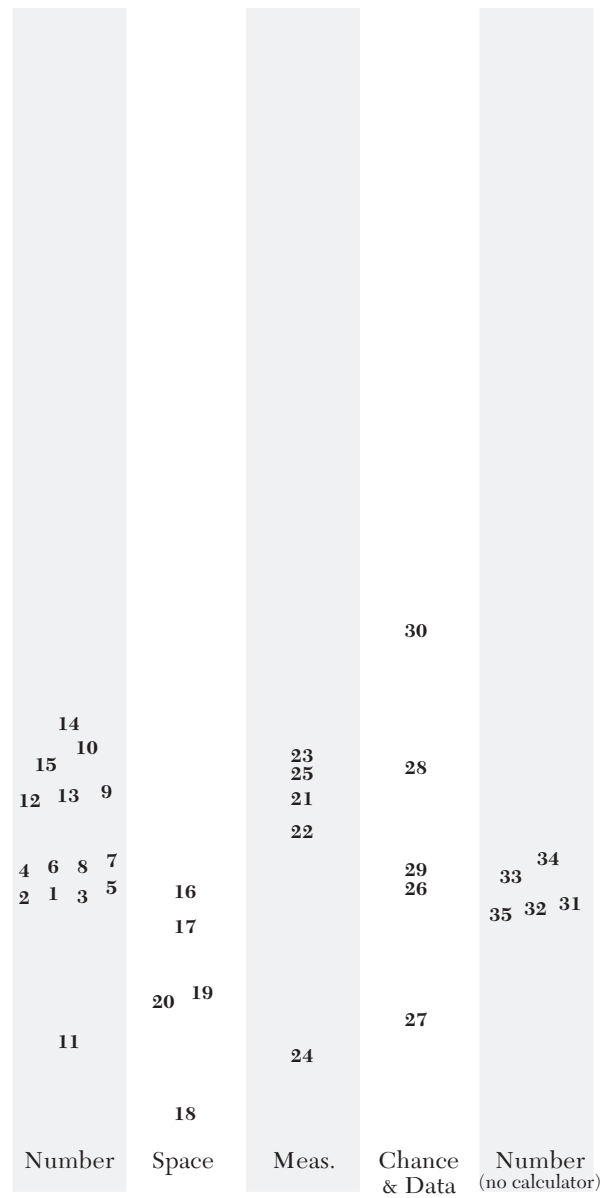
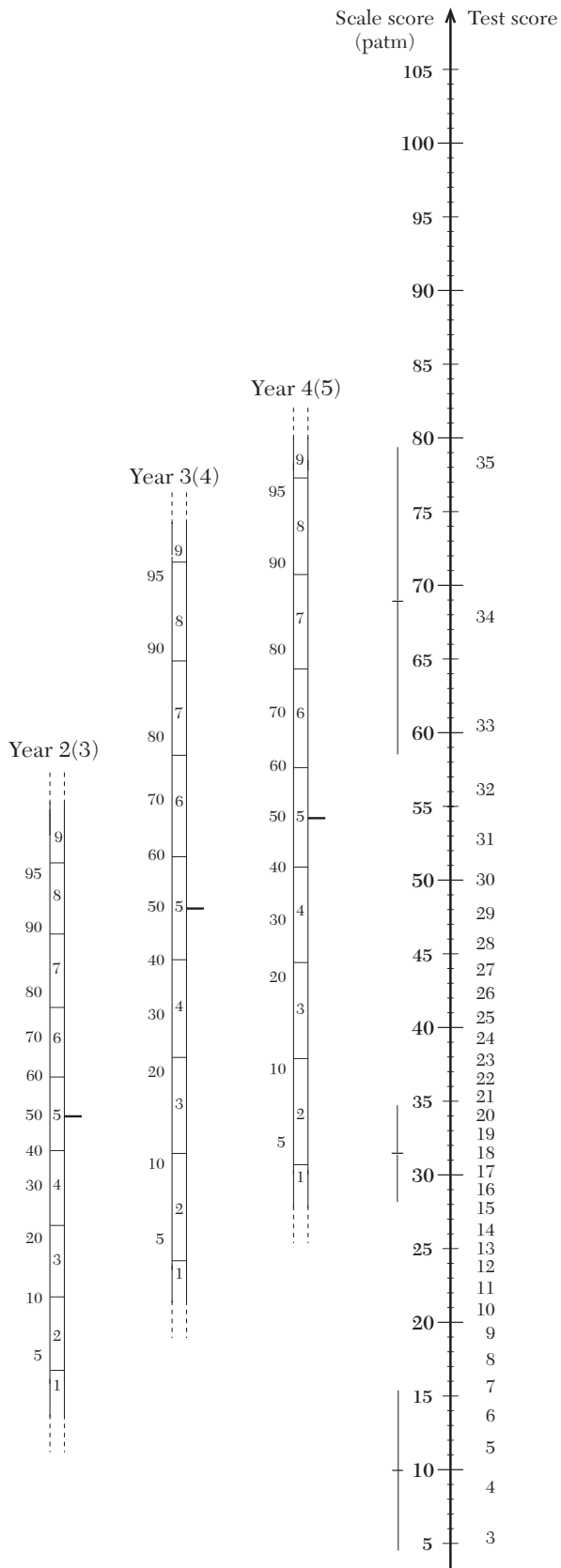
Date of testing: .....

Test raw score: .....

Scale score(patm): ..... ± .....

Year level of reference group: .....

Percentile rank: ..... Stanine: .....



### Test 1 Student Report

Student name: .....

Student year Level: .....

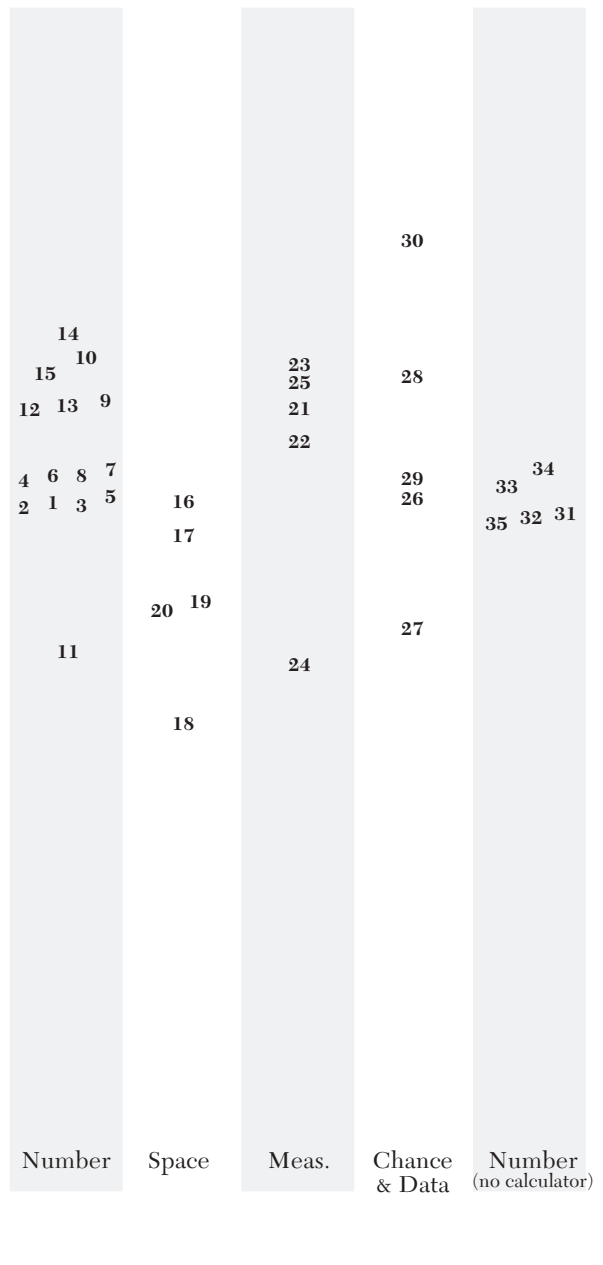
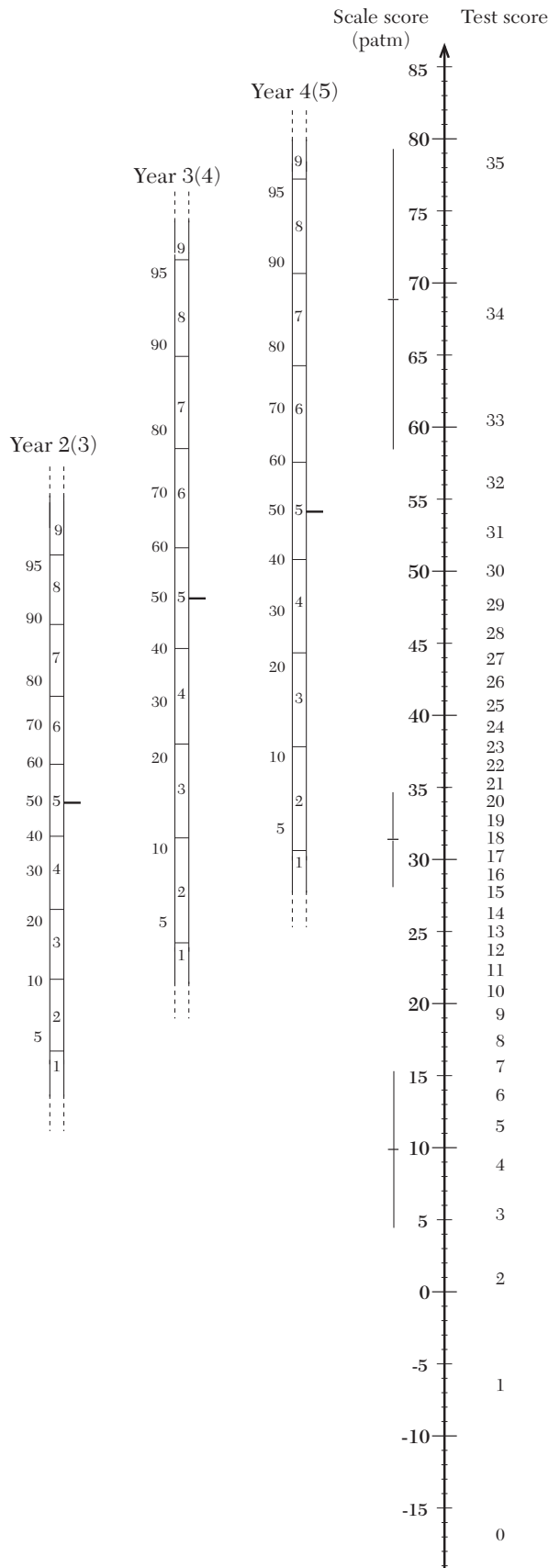
Date of testing: .....

Test raw score: .....

Scale score(patm): ..... ± .....

Year level of reference group: .....

Percentile rank: ..... Stanine: .....



### 3 Norm tables

Norm tables, as shown and described in the *PATMaths 3rd Edition* manual on pages 16, 17 and 63 – 70, have been revised to include norms for Years 1(2) and 2(3) on Test A and Test 1.

The reference years for norming in the revised table for Test A are Years 1(2), 2(3) and 3(4), and Years 2(3), 3(4) and 4(5) for Test 1.

Looking at the tables, there appear to be missing stanines. For example, if you look at a Year 2(3) student who gets a test score of 18 on Test A, she will come out at stanine 7, and one who scores 19 will come out at stanine 9. It follows that stanine 8 is missing from the norm tables. However, a score of 18 means the student will score better than 89% of the reference sample, which corresponds to a stanine of 7. There is also a possibility that the student falls into stanine 8, but we have chosen to include a conservative estimate of their abilities.

Also, test scores, scale scores and percentiles always contain some error and should be viewed as intervals rather than specific points (see the Error column in the table). As the tables show, there tend to be larger errors associated with more extreme scores.

Test A PATMaths Third Edition supplement norm table								
Test score (number correct)	Scale score (patm)	Error (patm)	Percentile rank and stanine					
			Year 1(2)		Year 2(3)		Year 3(4)	
			%ile rank	stanine	%ile rank	stanine	%ile rank	stanine
20	65	>10.4	99	9	99	9	89	7
19	54.5	10.4	99		97		67	6
18	46.8	7.6	99		89	7	45	5
17	41.9	6.4	98		78		32	4
16	38.2	5.8	97		66		6	
15	35.1	5.3	94	8	54	5	16	3
14	32.4	5.0	90		43		12	
13	30.0	4.9	86	7	34	4	9	2
12	27.7	4.7	80		26		6	
11	25.5	4.7	74	6	19	3	4	1
10	23.4	4.6	67		14		3	
9	21.2	4.6	58	5	10	2	2	
8	19.0	4.7	50		6		1	
7	16.8	4.8	41		4	1	1	
6	14.4	5.0	32	4	2		1	
5	11.7	5.3	23		1		1	
4	8.7	5.7	15	3	1		1	
3	5.1	6.4	8	2	1		1	
2	0.4	7.5	3	1	1		1	
1	-7.2	10.3	1		1		1	
0	-17.7	>10.3	1		1		1	

Test 1 PATMaths Third Edition revised norm table									
Test score (number correct)	Scale score (patm)	Error (patm)	Percentile rank and stanine						
			Year 2(3)		Year 3(4)		Year 4(5)		
			%ile rank	stanine	%ile rank	stanine	%ile rank	stanine	
35	78	>10.2	99	9	98	9	96	8	
34	67.8	10.2	99		92	8	84	7	
33	60.4	7.4	99		81	7	67	6	
32	56.0	6.1	98		71	6	55	5	
31	52.7	5.4	96	62	45				
30	50.0	4.9	94	8	55	5	37	4	
29	47.7	4.6	91		48		31		
28	45.7	4.3	87	7	42		26		
27	43.9	4.2	83		37	4	22		3
26	42.2	4.0	79	33	18				
25	40.7	3.9	74	6	29		15		
24	39.2	3.8	69		25	13			
23	37.8	3.7	64	5	4	22	2		
22	36.5	3.6	59			19		9	
21	35.2	3.6	54			3		17	7
20	33.9	3.6	49	14	6				
19	32.6	3.5	44	5	12	5			
18	31.4	3.5	39		4	10	2	1	
17	30.1	3.5	34			9			4
16	28.9	3.5	30			7			3
15	27.6	3.6	26	6		2			
14	26.3	3.6	22	3	5	1			
13	25.0	3.7	18		4	4	1		
12	23.7	3.7	15			3		1	
11	22.2	3.8	11	3	2	1			
10	20.8	3.9	9		2	2		1	
9	19.2	4.0	6	2		1	1		
8	17.5	4.2	4		1	1	1		
7	15.7	4.4	3			1	1		
6	13.7	4.6	2			1	1		
5	11.4	5.0	1	1		1			
4	8.7	5.4	1	1	1	1			
3	5.4	6.2	1		1	1			
2	0.9	7.4	1		1	1			
1	-6.5	10.2	1		1	1			
0	-17	>10.2	1	1	1	1			



### Test A Student Combined Report

At the level of ability shown a student is typically able to

compare sizes of fractions, decimals and percentages; choose the box with dimensions or markings that matches a given net; find area and perimeter of compound shapes; calculate the volume of a cuboid; calculate the side length of a right angle triangle; solve a word problem involving finding an average; interpret data shown in a box and whisker plot; recognise an event with probability closest to 1;

and also

express 7-digit numbers in words; perform single digit division with remainder; add or subtract decimal numbers with regrouping; convert fractions and decimals to percentages; recognise a prism from its description; work out a path using compass directions (NSEW); extend a calendar to the next month; find the perimeter of a rectangle given its area; interpret a line graph; find the mean of a set of numbers; compare outcomes of random selections; read grouped data from a column graph;

and also

put whole numbers and decimals in order; solve one-step word problems using multiplication or division; recognise the mirror image and symmetry of a picture or a 2D shape; follow map directions using 'turn right', 'turn left'; use scale to find distance on a map; estimate capacity of a familiar object; find volumes by counting unit cubes, visible and hidden; interpret data presented in a bar chart; read a line graph; work out the chance of a given random selection;

and also

round large numbers to the nearest million; locate integers on a number line; apply 'tables' facts to division; calculate change from \$1 and \$2; add dollars and cents with regrouping; complete a pattern using symmetry; recognise a 2D shape from a list of its properties; match digital time to clock face time; convert 12 hour time to 24 hour time; read a calendar; compare information given in a pictograph or column graph; recognise possible outcomes from a familiar event;

and also

write 4-digit numbers in words; count by fours from any starting number; add 2-digit and 3-digit numbers; solve simple number problems using +, -, x; reorient 2D shapes so that they will fit together; recognise a model from different viewpoints; find a map location using coordinates; recognise the smallest area on a square grid; match a tally to a column graph; recognise the most likely event; recognise the most frequent score in a set of scores; decide the most likely result of a random selection;

and also

put 2-digit numbers in order; count backwards by tens; recognise a half and a third of a set; recognise percentages shown on a hundreds grid; calculate half of a small number; use place values of 'tens' and 'ones' correctly; use coins to make up a specified amount of money; recognise a cylinder and a cone; draw a line of symmetry on a simple 2D shape; recognise a 2D shape from a description of its sides, corners; recognise the appropriate unit for a quantity of liquid; read a simple pictograph or column graph; recognise the most frequent item in a list;

and also

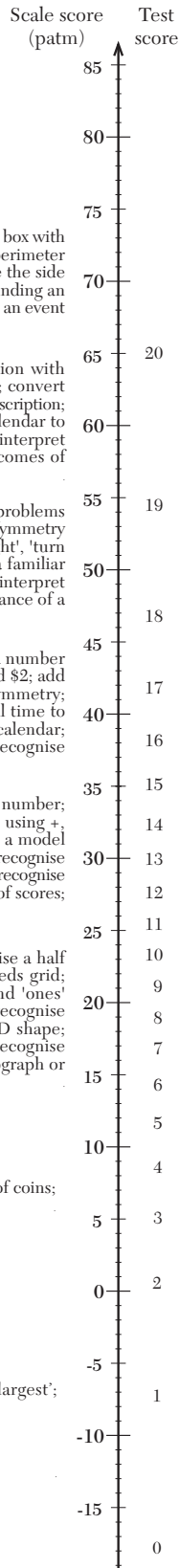
solve problems involving numbers less than 10; recognise value of coins; recognise many simple geometric shapes and solids;

and also

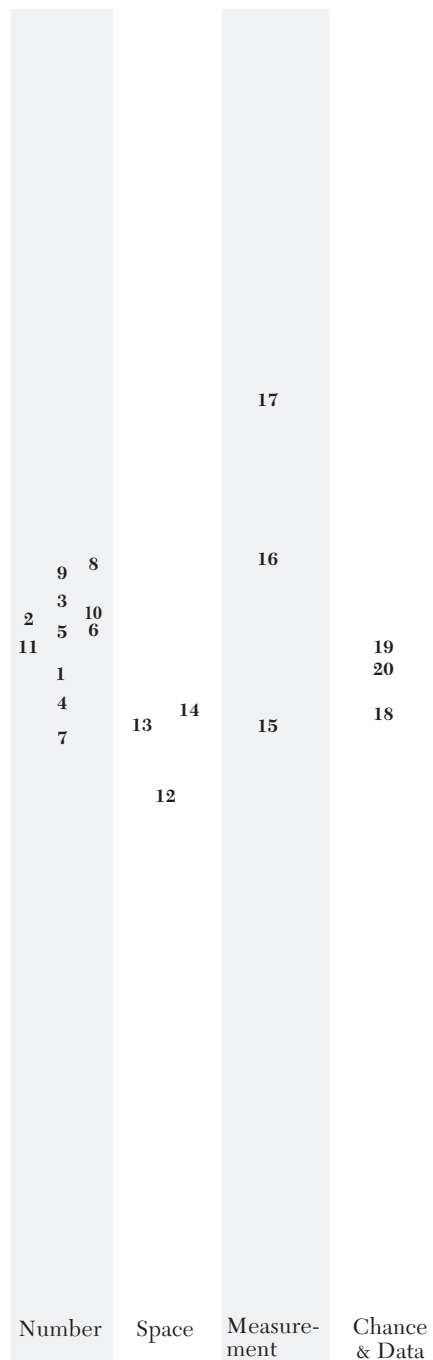
understand comparative terms such as 'shortest', 'smallest', 'largest';

and also

count at least ten objects; understand 'more' and 'less'.



Student name: .....  
 Student year Level: .....  
 Date of testing: .....  
 Test raw score: .....  
 Scale score(patm): ..... ± .....  
 Year level of reference group: .....  
 Percentile rank: ..... Stanine: .....



### Test 1 Student Combined Report

*At the level of ability shown a student is typically able to*  
 compare sizes of fractions, decimals and percentages; choose the box with dimensions or markings that matches a given net; find area and perimeter of compound shapes; calculate the volume of a cuboid; calculate the side length of a right angle triangle; solve a word problem involving finding an average; interpret data shown in a box and whisker plot; recognise an event with probability closest to 1;

*and also*  
 express 7-digit numbers in words; perform single digit division with remainder; add or subtract decimal numbers with regrouping; convert fractions and decimals to percentages; recognise a prism from its description; work out a path using compass directions (NSEW); extend a calendar to the next month; find the perimeter of a rectangle given its area; interpret a line graph; find the mean of a set of numbers; compare outcomes of random selections; read grouped data from a column graph;

*and also*  
 put whole numbers and decimals in order; solve one-step word problems using multiplication or division; recognise the mirror image and symmetry of a picture or a 2D shape; follow map directions using 'turn right', 'turn left'; use scale to find distance on a map; estimate capacity of a familiar object; find volumes by counting unit cubes, visible and hidden; interpret data presented in a bar chart; read a line graph; work out the chance of a given random selection;

*and also*  
 round large numbers to the nearest million; locate integers on a number line; apply 'tables' facts to division; calculate change from \$1 and \$2; add dollars and cents with regrouping; complete a pattern using symmetry; recognise a 2D shape from a list of its properties; match digital time to clock face time; convert 12 hour time to 24 hour time; read a calendar; compare information given in a pictograph or column graph; recognise possible outcomes from a familiar event;

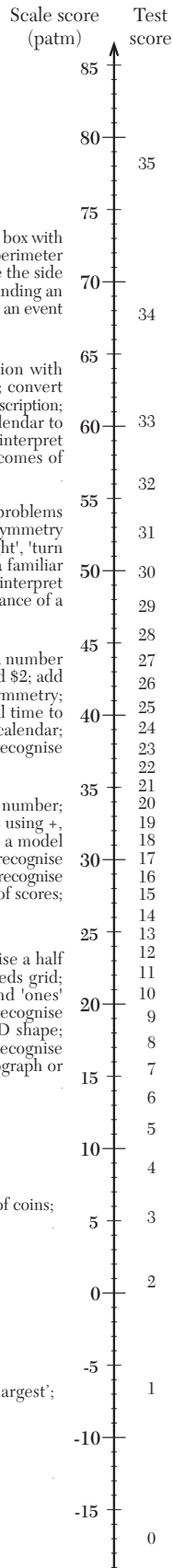
*and also*  
 write 4-digit numbers in words; count by fours from any starting number; add 2-digit and 3-digit numbers; solve simple number problems using +, -, ×; reorient 2D shapes so that they will fit together; recognise a model from different viewpoints; find a map location using coordinates; recognise the smallest area on a square grid; match a tally to a column graph; recognise the most likely event; recognise the most frequent score in a set of scores; decide the most likely result of a random selection;

*and also*  
 put 2-digit numbers in order; count backwards by tens; recognise a half and a third of a set; recognise percentages shown on a hundreds grid; calculate half of a small number; use place values of 'tens' and 'ones' correctly; use coins to make up a specified amount of money; recognise a cylinder and a cone; draw a line of symmetry on a simple 2D shape; recognise a 2D shape from a description of its sides, corners; recognise the appropriate unit for a quantity of liquid; read a simple pictograph or column graph; recognise the most frequent item in a list;

*and also*  
 solve problems involving numbers less than 10; recognise value of coins; recognise many simple geometric shapes and solids;

*and also*  
 understand comparative terms such as 'shortest', 'smallest', 'largest';

*and also*  
 count at least ten objects; understand 'more' and 'less'.



Student name: .....

Student year Level: .....

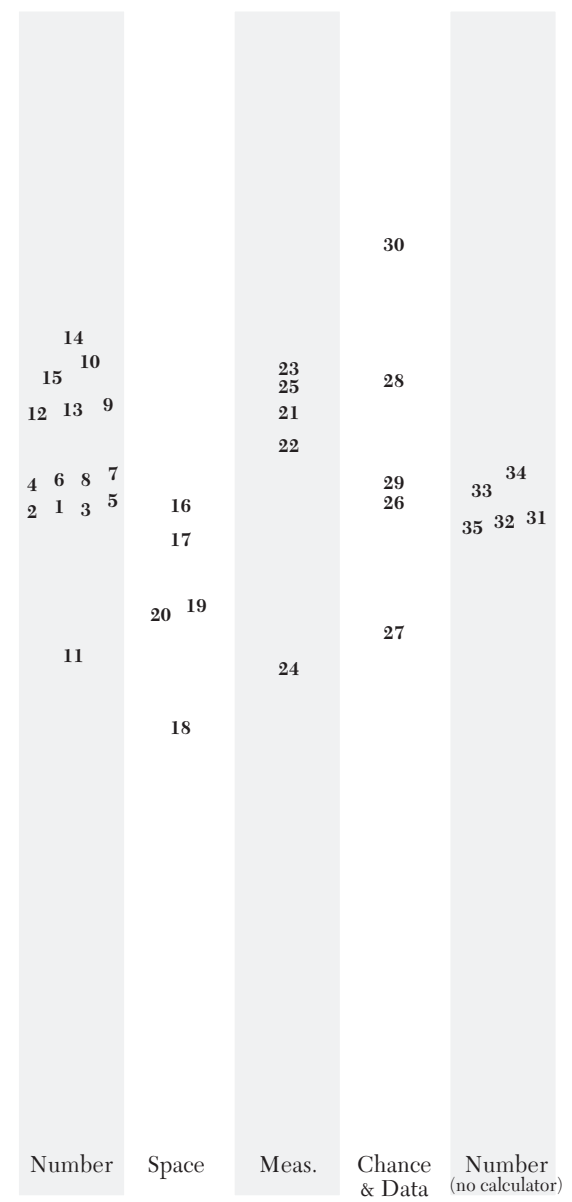
Date of testing: .....

Test raw score: .....

Scale score(patm): ..... ± .....

Year level of reference group: .....

Percentile rank: ..... Stanine: .....

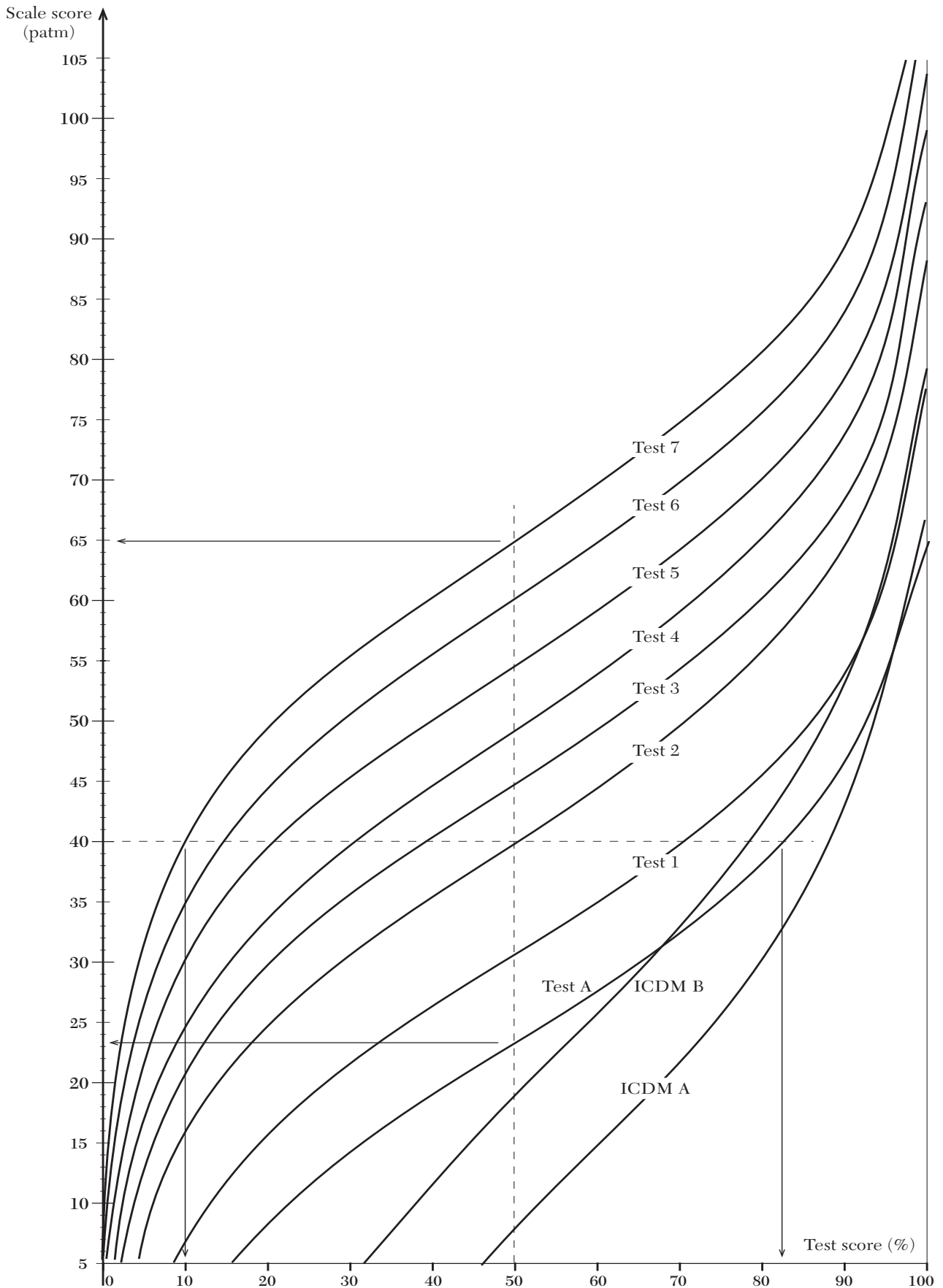


## 5 Transformation of test scores (%) to scale scores

A comparison of the R.difficulty of the eight *PATMaths 3rd Edition* tests (Test A and Tests 1 – 7) is on page 19. The test characteristic curves (TCC) for *ICDMA* and *ICDMB* have been added to those of the eight *PATMaths 3rd Edition* tests. An explanation on how to interpret this figure is given on page 58 of the *PATMaths 3rd Edition* manual.

It can be observed that the TCCs of the *ICDM* tests are not parallel to those of the *PATMaths 3rd Edition* tests. In fact, the slope of a TCC depends on the distribution of the R.difficulties of the items of a test. The student reports show clearly that items in each of the *ICDM* tests are more widely distributed along the scale than items belonging to any given *PATMaths 3rd Edition* test.

Transformation of test scores (%) to scale scores



## References

Doig, B. & De Lemos, M. (2000) *I Can Do Maths Teacher's Guide*, ACER Press, Camberwell.

*Effective Teaching and Learning Practices Initiative for Students with Learning Difficulties*. (2006) Project reports in preparation, ACER.

Lindsey, J., Stephanou, A., Urbach, D. & Sadler, A. (2005) *Progressive Achievement Tests in Mathematics Third Edition Teacher Manual*, ACER Press, Camberwell.