

Difficulty of the Questions

You can see, in the [Australian students' performance per question table](#), the distribution of the number of correct responses given for Australian students in each school year. We continue to carefully monitor the difficulty level of papers to ensure reasonable access to earlier questions for most students, whilst retaining a high level of challenge towards the end of the papers. We have struck a benchmark to aim for, that the average student score in the upper year of each division should be approximately 15 questions correct out of 30. As you can see from the table, we have got extremely close to this benchmark in the Upper Primary Division and the Junior Division is also within acceptable parameters. The Middle Primary paper was a little harder this year and the Senior paper proved significantly more challenging than the 2015 paper. This information will be taken into account in developing future papers.

This year there were just 14 perfect scores. Six of these were in Upper Primary, two in Junior, four in Intermediate and two in Senior.

The aim of the paper is to make the earliest questions very accessible to students of all standards, hopefully having over 90% success rates, with the questions gradually getting more challenging until the last five, where questions should challenge even the most able students.

As a result, the aim is that students of all standards will find a challenge somewhere in the paper. The following is a commentary on the response rate in each of the 5 divisions:

Middle Primary – Questions 1 and 2 each had a correct response rate of well over 90% for both Year 3 and Year 4. Questions 3 to 8 also had very healthy response rates, though question 9 (about chairs arranged in a circle) proved much more difficult than expected. All multiple choice questions had correct response rates over 20%, except question 22, which had a response rate of 18% for Year 3 students. Questions 13 to 15 were also below the expected level of response for this stage of the paper. In general questions 21 to 25 proved more demanding, as would be expected.

The last 5 questions, which require an integer answer from 0 to 999 proved quite difficult (as intended) though Question 26 drew correct response rates of 6% for Year 3 and 11% for Year 4.

Overall, the score distribution in this paper was a little below that intended, with the paper becoming more difficult a little too quickly. There were no perfect scores.

Upper Primary – From a statistical view, this was almost the perfect paper, with overall performance very close to the model of 15 correct questions for the upper year of the division. Questions 1 and 2 had response rates over 95% and most of the early questions scored very well, with the exception of question 6, which was the chairs in a circle question which also caught out the Middle Primary students and question 8, which required estimation of volume. There was still strong scoring through the middle of the paper, though two questions proved quite challenging. These were question 17, which was about splitting a geometric shape (with answer A proved too tempting a distractor) and question 20, which was a logic problem in which distractor D proved to be considerably more attractive than the correct answer C. These were also the only two question in which the percentage of correct responses fell below 20 (in Year 5 only), both scoring 19%.

The first of the numeric question proved quite accessible with a correct response rate of 12% in Year 5 and 20% in Year 6. Questions 27 and 28 also attracted reasonable response rates, though, as intended, the last two questions were somewhat harder.

Junior – This year there were two questions in the Junior division with a successful response rate of over 90%, this being questions 1 and 4. However, the first nine questions had healthy correct response rates with question 10 (on fraction estimation) proving a little more demanding. Response rates through the middle of the paper were largely as expected, though only 15% answered question 19 correctly, with many falling for distractor C, rather than the correct answer B. This question involved some careful logical thinking. The only other question with a response rate below 20% was question 25, with 17% for Year 7 and 18% for Year 8, whilst distractor C drew over 50% of the answers. This was an enumeration question.

The last 5 questions, with numerical responses, proved increasingly challenging, with 3% (Year 7) and 5% (Year 8) answering question 26 correctly and between 2% and 3% for questions 27 and 28. Overall, score distributions were fairly satisfactory and there was enough challenge at the end of the paper to avoid the large number of perfect scores obtained last year.

Intermediate – In the Intermediate division there was just one question with a successful response rate of 90%, being Question 1 (97%). Question 3 had a response rate in the high 80s (86%/89%) but the other early questions proved to be too difficult, achieving little more than 50% correct response rates. Questions 6 to 10 performed as expected, apart from question 9 (angles on a clock face), which achieved a success rate of just over 30%. The rest of the multiple choice questions scored according to expectations, except for questions 22 and 23 which were the only questions to have a correct response rate less than 20%.

The last five questions proved quite difficult, though questions 26 and 28 achieved correct response rates of 2% or greater. Overall, the paper was a little more difficult than intended and this was primarily due to not enough very easy questions in the first five.

Senior – The first five questions performed well, each with a correct response rate of 75% or more, though only question 2 was above 90%. Questions 6 to 10 were also in accord with expectations, but things became too difficult at questions 12 to 14 and several of the later multiple choice questions had correct response rates below 20% (questions 17, 18, 21, 22, 24 and 25). This led to overall scores on the paper being too low. We need to make the middle 10 questions more accessible in future.

The last 5 questions proved quite difficult, with none achieving correct response rates over 1%, though this has relatively little impact on overall average score.

Discriminatory Power of the Questions

The biserial discrimination index was used to determine the discriminatory power of each question. The index ranges from -1 to +1, with a positive value indicating that the correct response was chosen by more students in the top 27% of students (with regard to the total set of questions) than in the bottom 27% of students. A question with an index of about 0.45 or greater was considered to have discriminated effectively between the top 27% and bottom 27% of students. In general, indices tend to be lower towards the beginning and end of a paper as students are either nearly all getting them right or nearly all getting them wrong.

A table of the discrimination index for each question in this year's papers can be viewed on page 4. None of the indices were negative. Only the most challenging, or simplest, were close to zero. The highest discrimination index in the secondary papers was 0.79 for Question 11 in Senior (Year 12). In primary, question 2 in the Upper Primary paper had a discrimination index of 0.68 for Year 6.

The topics which yielded an index of 0.45 or greater covered a wide field, although most involved familiar classroom topics with a problem-solving component. These questions were:

PRIMARY DIVISION		SECONDARY DIVISION	
QUESTION	SKILLS TESTED	QUESTION	SKILLS TESTED
MP5	Geometry (symmetry) (Year 4 only)	J6	Geometry (folding & cutting)
MP10	Measurement (money)	J8	Number (decimals)
MP11	Number (place value)	J10	Number (fractions)
MP12	Geometry (folding & cutting)	J11	Geometry (area) (Year 8 only)
MP16	Statistics (bar charts)	J12	Algebra
UP8	Problem solving (enumeration)	J14	Problem Solving
UP12	Geometry (area) (Year 6 only)	J15	Problem solving
UP13	Number (ratio)	J16	Algebra
UP14	Number (properties) (Year 5 only)	J17	Geometry (tessellation)
UP15	Measurement (perimeter) (Year 6 only)	J20	Problem solving (prime factors) (Year 8 only)
UP17	Geometry (shape recognition))	J21	Problem solving

PRIMARY DIVISION		SECONDARY DIVISION	
QUESTION	SKILLS TESTED	QUESTION	SKILLS TESTED
UP19	Problem solving (algebra) (Year 6 only)	I2	Number (fractions)
UP22	Algebra	I4	Number (fractions)
UP23	Problem solving	I5	Number (order of operations)
		I6	Number (percentages)
		I7	Algebra (Year 9 only)
		I8	Geometry (perimeter)
		I10	Problem solving
		I11	Geometry (angles)
		I12	Geometry (Pythagoras) (Year 9 only)
		I13	Geometry (circle area)
		I14	Algebra (indices)
		I15	Problem solving
		I16	Problem solving (prime factors) (Year 10 only)
		S6	Geometry (angles)
		S7	Geometry (Pythagoras)
		S8	Algebra
		S9	Probability
		S10	Number (properties)
		S11	Number (indices)
		S13	Geometry (co-ordinates) (Year 12 only)
		S15	Problem solving (averages)

NB In Upper Primary, Year 7 has not been included as the numbers are too small for statistical purposes.

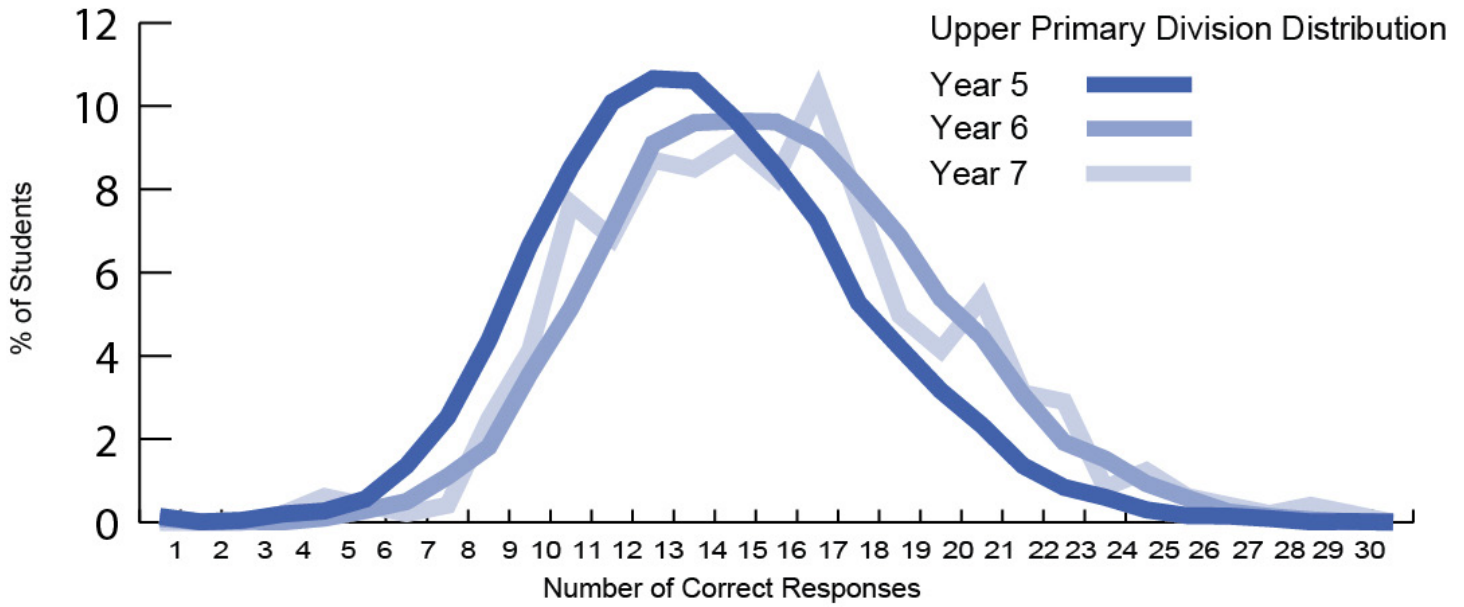
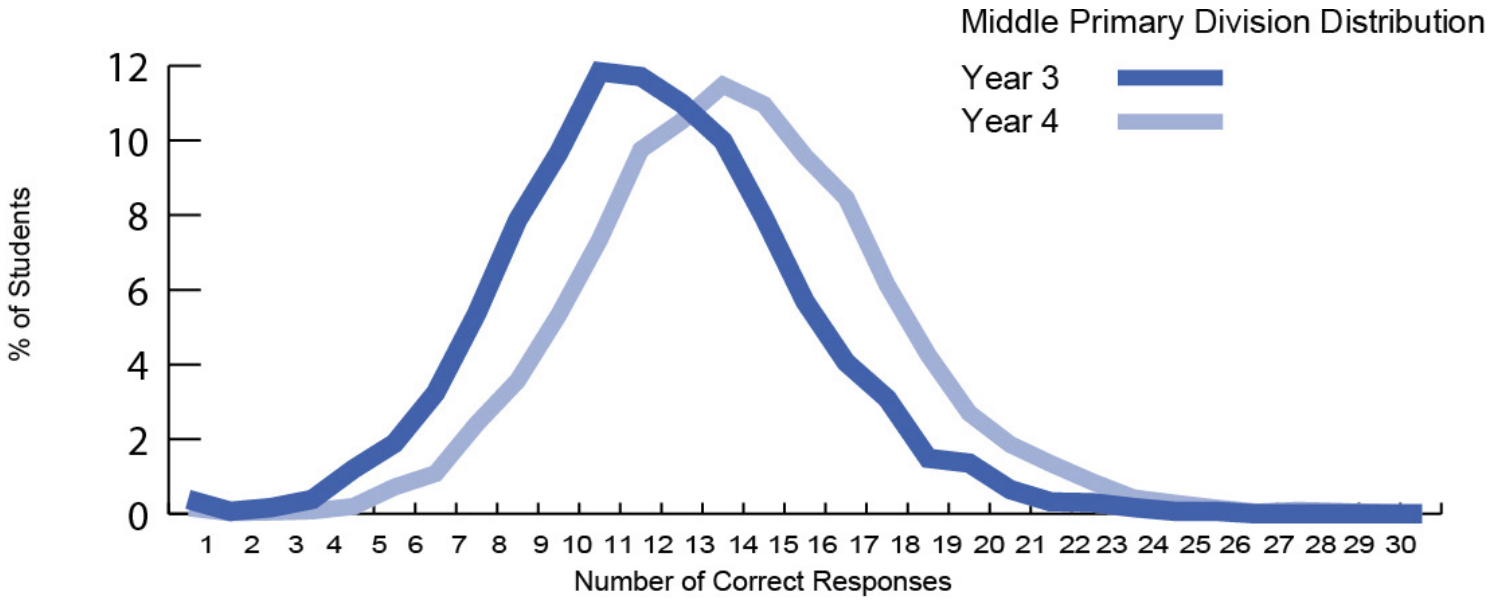
Discrimination Biserial Index

QUESTION	DIVISION				
	MIDDLE PRIMARY		UPPER PRIMARY		
	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
1	0.06	0.07	0.03	0.02	-0.05
2	0.02	0.01	0.13	0.06	-0.02
3	0.39	0.26	0.28	0.18	0.21
4	0.36	0.23	0.2	0.13	0.09
5	0.45	0.41	0.42	0.31	0.28
6	0.29	0.18	0.33	0.36	0.41
7	0.4	0.23	0.17	0.09	0.15
8	0.38	0.22	0.49	0.5	0.5
9	0.26	0.3	0.18	0.12	0.14
10	0.52	0.51	0.29	0.28	0.21
11	0.54	0.63	0.37	0.44	0.38
12	0.48	0.49	0.43	0.47	0.43
13	0.28	0.43	0.64	0.52	0.52
14	0.22	0.26	0.45	0.34	0.38
15	0.24	0.28	0.41	0.5	0.65
16	0.55	0.61	0.5	0.49	0.58
17	0.24	0.26	0.25	0.38	0.37
18	0.23	0.32	0.41	0.46	0.39
19	0.2	0.21	0.32	0.42	0.42
20	0.34	0.37	0.25	0.29	0.3
21	0.28	0.31	0.42	0.44	0.38
22	0.24	0.31	0.66	0.68	0.71
23	0.28	0.32	0.45	0.57	0.58
24	0.3	0.43	0.29	0.29	0.31
25	0.24	0.19	0.28	0.3	0.21
26	0.02	0.08	0.33	0.51	0.5
27	0.15	0.26	0.06	0.13	0.21
28	0.13	0.21	0.13	0.24	0.34
29	0.02	0.05	0.02	0.03	0.05
30	0.08	0.21	0.01	0.02	0.03

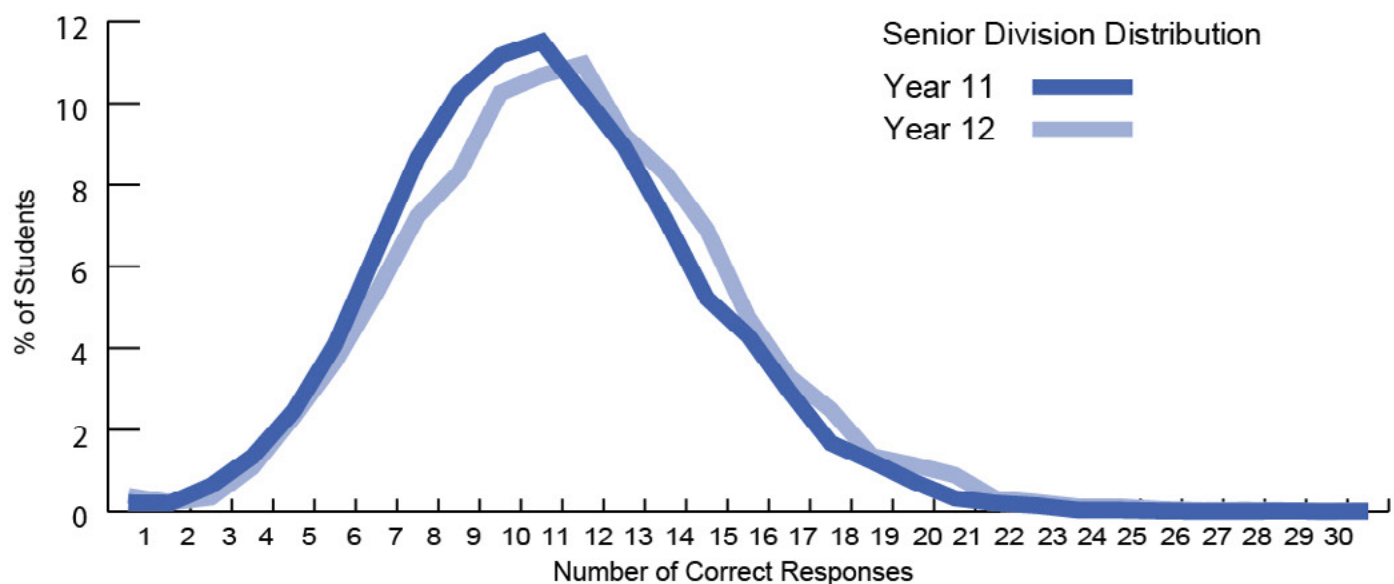
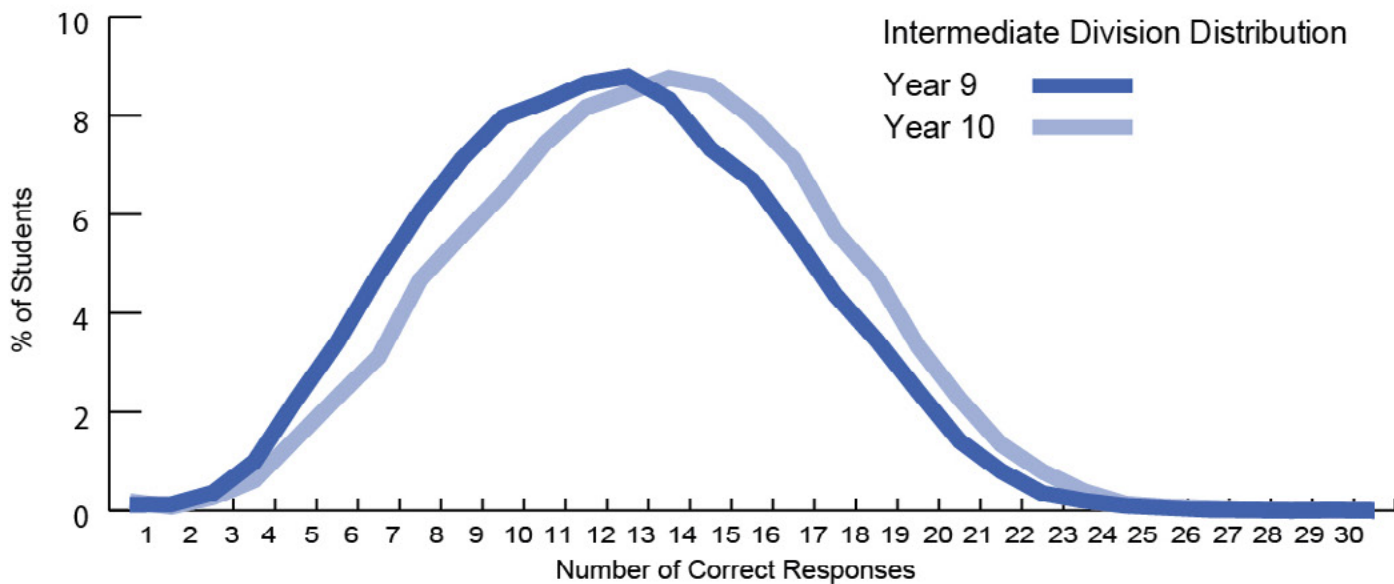
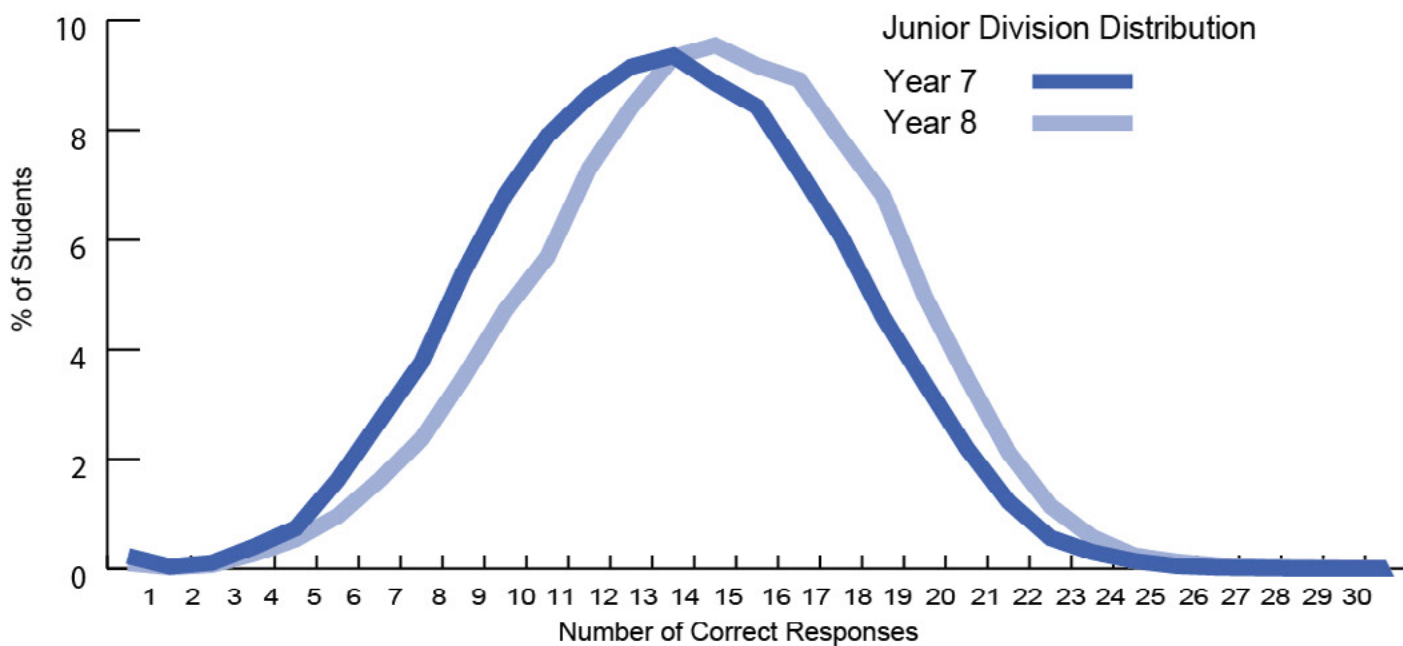
Discrimination Biserial Index

QUESTION	DIVISION					
	JUNIOR		INTERMEDIATE		SENIOR	
	7	8	9	10	11	12
1	0.12	0.1	0.08	0.07	0.36	0.38
2	0.5	0.36	0.67	0.63	0.18	0.19
3	0.3	0.28	0.33	0.25	0.39	0.33
4	0.23	0.17	0.48	0.49	0.4	0.37
5	0.5	0.41	0.54	0.49	0.33	0.3
6	0.47	0.45	0.61	0.56	0.56	0.64
7	0.33	0.29	0.49	0.44	0.56	0.59
8	0.64	0.6	0.52	0.48	0.61	0.6
9	0.29	0.21	0.21	0.26	0.45	0.48
10	0.45	0.47	0.51	0.5	0.47	0.45
11	0.4	0.5	0.69	0.67	0.74	0.79
12	0.55	0.55	0.36	0.48	0.26	0.26
13	0.34	0.4	0.67	0.76	0.42	0.49
14	0.57	0.55	0.56	0.47	0.24	0.29
15	0.59	0.61	0.56	0.52	0.53	0.58
16	0.64	0.6	0.44	0.5	0.3	0.31
17	0.45	0.45	0.44	0.43	0.21	0.23
18	0.28	0.33	0.31	0.41	0.29	0.42
19	0.02	0.03	0.36	0.44	0.16	0.18
20	0.44	0.49	0.29	0.33	0.25	0.28
21	0.49	0.53	0.29	0.24	0.26	0.3
22	0.25	0.24	0.13	0.15	0.1	0.11
23	0.25	0.24	0.18	0.23	0.27	0.29
24	0.35	0.41	0.39	0.39	0.16	0.16
25	0.11	0.12	0.11	0.1	0.07	0.05
26	0.09	0.13	0.05	0.08	0	0
27	0.04	0.06	0.02	0.02	0	0
28	0.05	0.09	0.05	0.06	0.03	0.04
29	0.04	0.08	0	0	0.01	0.02
30	0	0.01	0.01	0.01	0	0.01

Distribution of Numbers of Correct Responses for Australian Primary Students



Distribution of Numbers of Correct Responses for Australian Secondary Students



Mean and Standard Deviation of Correct Responses

MIDDLE AND UPPER PRIMARY DIVISIONS					
	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
MEAN	11.3	13.4	13.2	14.9	14.8
S.D.	3.5	3.7	3.8	4.0	4.3

JUNIOR, INTERMEDIATE AND SENIOR DIVISIONS						
	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
Mean	12.8	13.9	11.6	12.6	10.1	10.7
S.D.	4.0	4.2	4.2	4.3	3.6	3.8