



The National Bank Junior Maths Competition  
c/o Dept of Mathematics and Statistics  
University of Otago  
PO Box 56, Dunedin

Ph: 03 479 7779 Fax: 03 479 8427  
email: [nbjmc@maths.otago.ac.nz](mailto:nbjmc@maths.otago.ac.nz)



*Te Whare Wānanea o Otātec*

## The National Bank Junior Mathematics Competition Report: 2004

### General Comments

On the day of the competition there were almost exactly 9700 students from 207 schools who attempted the questions, once again down from last year. The most noticeable drop has been at Year 11; it is possible that the new assessment regime is having an influence here. Students from 184 schools gained awards of some sort. These ranged from Merit Awards for being in the top 15% of candidates at each level, up to the top three awards at each level.

The 2004 competition was a little easier than the corresponding competition in 2003. In particular, questions 2 and 3 were relatively straight forward, with many students scoring 100% for these two questions. Question 4 was much more difficult, while questions 1 and 5 had difficulties towards the end.

Following a recent trend, several questions were “wordy”, and many candidates did not seem to understand what was being asked. There is a fine line between providing sufficient information so that the questions are not ambiguous (meaning every student has the chance to answer something correctly), and making the questions too “long” to read. We would like to stress that teachers tell candidates to read the questions carefully **before** they begin writing anything down.

As indicated above, two of the questions contained a “difficult” final part. Teachers should note that even though the last part may be tricky, marks for these parts are not disproportionately greater than for the earlier parts. For example, in question 1 this year part (e) was worth 4 marks out of 20, so that a student could “easily” gain 16 without attempting this part. Many good candidates missed out the last part of the question and used the time to score well elsewhere.

Almost certainly a candidate would not gain a “top” mark by missing these last sections, but a Merit Award (or better) would be possible for a candidate who approached the paper this way.

### Cost of Running the Competition

The cost per student for the competition has been \$3 for at least a decade. With increased printing etc. costs, it is almost certain that the entry fee will need to be increased in 2005. The budget is still being worked on, but please do not be surprised if the cost is increased to \$4 or \$5.

### Estimating Competitor Numbers and Payment to Markers

Teachers should note that markers are hired and paid according to the **estimated** number of candidates. This means that if a school “estimates” that 116 candidates will take part, but only 93 actually do so (this happened in 2004), then we still have to pay the marker for the 23 “non-existent” entries. (Marker payment amounts to almost half the running cost of the competition.) If the school subsequently wants to pay only for the 93 final entries, then the competition begins to run at a loss. The poor estimation of candidate numbers by some schools is a contributing reason for the increased charge next year.

A few schools are establishing a particularly poor record for the estimation of their candidate numbers and their entries will **not** be accepted in 2005 **unless they pay at the time of entry**.

## **Minimum Charge**

The minimum charge established in 2004 will continue to apply next year. This will not affect schools entering five or more candidates, and it may even encourage those schools which only enter one candidate to be a little more active in promoting the competition!

## **Competition Deadlines**

Once again this year several schools left it very late to enter. We tried to accommodate late entries, but this continues to be a major problem. With the logistics involved, we warn yet again that we may not be able to be as flexible next year as we have been in the past. Please adhere to the dates more carefully in 2005!

## **Comments on Individual Questions**

### **Question One (Year 9)**

This was generally straight forward, apart from the challenge at the end. Successfully answering the question required the ability to spot the “clues” towards the start which were useful later on. The final part was answered correctly by a small proportion of candidates, but it was certainly not “impossible”. Overall a question requiring the ability to detect patterns.

### **Question Two**

This proved to be very easy – a good start to the competition for many Year 10 candidates.

### **Question Three**

This was also relatively easy.

### **Question Four**

This was very difficult, and hardly anyone scored full marks here.

Traditionally in this competition, many students try the logic question first. It was noticeable this year that most adapted to this particular question and left it well alone! Good test technique!

The break-through for those who did succeed was to notice the odd number of points scored by two of the candidates, and realise that this must come from the “first” votes. Even though this helps, you still have to eliminate one of the possible solutions by checking whether it fits all the information. Virtually nobody scored full marks because of this point, but a few scored fairly well by at least finding the correct solution and verifying that it does indeed work.

Usually the logic question proves to be the hardest to mark. As in 2003, we eliminated much of the difficulty by asking for the answer in part (b), followed by the explanation in part (c). We did not mark part (c) **unless** part (b) was correct. This approach was successful, removing the need to mark the “essays” which “meander nowhere”. It was also noticeable once again that there were not nearly as many “dramatic” mark changes when the top papers were check marked compared to what has happened occasionally in the past. We indeed to continue this approach in future “logic” questions.

It is worth noting that this question was based on an actual voting situation!

### **Question Five**

Most candidates did not have enough time to complete this thoroughly, and very few answered part (d).

The “clue” about external angles in (a) was useful throughout the rest of the question, including part (d) where the first job was to work out that the “middle” shape is just another hexagon.

Part (d) requires knowledge of the Theorem of Pythagoras, but trigonometry is not essential. Nevertheless almost all the correct solutions came from students who used trig (including one or two Year 9 students

who knew the concepts). We cannot recall seeing any answer in surd form; all the students who found the area got their calculator out.

As mentioned in 2003, we will continue to ask geometry questions which may test the Theorem of Pythagoras and/or trigonometry, although they will tend to be placed towards the end of the competition.

### Student Names

A huge thank-you to the numerous teachers and office staff who have sent us student names electronically. The response rate was similar to that of 2003, and hopefully your students will receive Certificates with accurate names. We have made it a priority to try and spell student names correctly on the Certificates, even though this has helped delay (yet again!) the sending out of results.

A reminder that official school lists are much preferable to lists typed up by a teacher. Office staff should be able to send lists without the teachers having to do anything!

Once again delays occurred when we had to search the boxes of scripts for papers belonging to students who had gained an award (e.g. Merit) but whose name was unknown. At least this year only one student missed out on an award because neither the school nor the student provided a name.

We regret to say that from now on we will not even attempt to make an electronic list from a scan. The quality of the font is generally too poor for anything approaching 100% accuracy.

Handwritten lists are not worth mentioning, so we won't.

### Percentiles

The percentiles at each level are given below. (The total possible marks for Year 9 candidates was 100, and for Years 10 and 11 candidates it was 80.):

2004	Year 9	Year 10	Year 11	2003	Year 9	Year 10	Year 11
<b>Top 100</b>	51	48	49	<b>Top 100</b>	44	38	40
<b>Top 200</b>	46	44	44	<b>Top 200</b>	40	34	34
<b>Merit</b>	38	38	41	<b>Merit</b>	33	28	31
<b>80th %ile</b>	35	36	40	<b>80th %ile</b>	30	26	28
<b>70th %ile</b>	31	32	36	<b>70th %ile</b>	27	22	25
<b>60th %ile</b>	27	28	32	<b>60th %ile</b>	24	19	22
<b>50th %ile</b>	24	26	30	<b>50th %ile</b>	22	17	19
<b>25th %ile</b>	17	18	22	<b>25th %ile</b>	14	12	13

A comparison with last year's percentiles (at the right) shows that the 2004 values are higher.

### Check Marking of Top Papers

After the papers are all marked (generally by postgraduate students at Otago University) the top papers at each level are marked again by lecturers in the Mathematics Department. This may result in slight changes to the marks written on the mark sheets. As a worst case scenario, two students from the same school might change positions, and if they are near the borderline between two grades then one student with what seems to be a **lower** mark might receive a "**higher**" certificate than a student who **seems** to have the higher mark.

Usually the question which causes the main fluctuation between markers is the logic question (Question 4 this year), but this does not appear to have been a problem in 2004.

## Explanation of the Symbols on the Mark-Sheets

As usual, each question was marked out of a maximum of 20. The markers will have used the following symbols on the mark-sheets:

(blank)	No work presented
0	Work presented, but ungradeable, or fundamentally incorrect
-	Minimal partial credit (1 - 5 points)
+	Significant partial credit (6 - 13)
✓	Near complete solution (14 - 17)
✓✓	Full, or near full credit (18 - 20)

At the end of each row they will record their estimate of the final score for each student. As noted below, the top papers at each level are then check-marked by a lecturer from the Mathematics Department. The lecturer does not write on the mark-sheet at all.

## Material Enclosed in the Envelope:

The following material is enclosed in the envelope to schools:

- a Participation Certificate for every student
- a booklet of Answers and Comments for every student (plus a few spares)
- one copy of this Competition Report
- the mark list showing each student's mark
- a yellow slip of paper with the names of any students from the school who are to receive Merit Awards, Top 200 Awards, etc.
- the disk of student names if the school sent their names by disk
- miscellaneous items (receipts etc.) if applicable

Teachers should check the list of marks against the percentiles above. If there are any students who seem to be eligible for Merit Awards, but who do not appear on the yellow list, you should immediately contact the organisers of the competition.

The Merit Certificates etc. will be presented by a representative of The National Bank. **The local branch will contact schools to organise the presentation.** Please let us know if you do not hear from the bank. They are very efficient and will sort things out quickly.

Please pass receipts to your bursar and let us know if you have not received a receipt. (Note that many schools received their receipt when the questions were sent out.)

## Final Comments

We hope that teachers continue to find the competition useful. The questions are geared towards problem solving and many students find this difficult. If you have time you should try the questions yourself (!), and then see if you can "tweak" them a little to help students' investigative and problem solving skills. It is amazing what you can develop once you get started. (For example, question 5 this year is based on a single multi-choice question from another competition. There are many potential extensions from this question alone.)

Remember to use the questions throughout the year, and not just in the weeks before the actual competition.

Warren Palmer,  
Competition Manager.