Mathematics Chief Examiner's Report

Mathematics Examinations

Junior Lyceum Entrance Examination into Form I - 2002

General Comments about the examination paper

The questions focused on assessing the mathematical knowledge, skills and understanding acquired by the candidates on completion of their Mathematics Primary Education.

To ensure construct validity a specification grid was employed. This helped to make sure that all the set questions were within the syllabus, that these were pitched at appropriate levels to cater for a wide range of abilities, that all the different areas of the syllabus were tested and that the established weighting for the different areas of the syllabus was maintained.

The candidates had to answer 20 questions carrying a total of 100 marks; the first ten questions carried 4 marks each and the remaining ten carried 6 marks each. These questions were presented on a 16-page booklet, with ample space for allowing the candidates to display the necessary working. Clear diagrams and pictures contributed further to make the paper child-friendly. Particular attention was given to the language used in the questions to ensure that the language was accessible to all candidates, even to those with special assessment needs.

General comments about the performance of the candidates

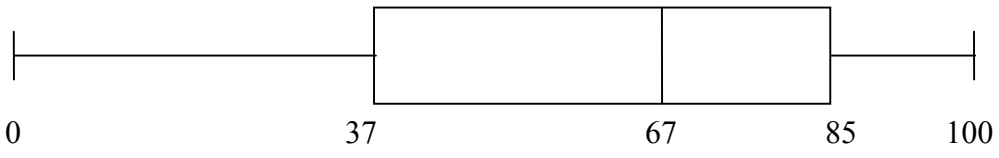
The average mark for the paper was 62, the median mark was 67 whilst the standard deviation was 25.

70% of those who sat the examination scored over 50.
58% scored above the average mark of 62.

The marks were distributed as follows:

the bottom 25% scored in the range 0 to 37;
the next 25% scored in the range 38 to 67;
the next 25 % scored in the range 68 to 85;
the top 25% scored in the range 86 to 100.

The following box-plot summarises this information.



A good number of candidates performed very well in most of the questions except, up to a certain extent, in those which tested the candidates' understanding of particular mathematical concepts (such as percentages, volume and time) and the candidates' ability to reason and apply mathematics in problem solving situations.

A case in point is question 19 in which a good number of candidates resorted to a formal method which gave rise to large numbers that made the computation more difficult; had they resorted to applying understanding and reasoning the solution could have been found in a shorter and easier way, perhaps even by being carried out mentally!

It was also surprising to note the difficulty experienced by a good number of candidates in question 20 which required them to work out a time interval (the number of hours of sleep) in a context that all children experience every day. It is evident that for a good number of children the formal method is beyond their understanding; the recommendation in the syllabus to use the time-line needs to be taken more seriously by both teachers and candidates. It needs to be remarked here that very often the candidates' anxiety to solve the problem and "get it right" leads them to use straight away what they feel is a secure formal method rather than apply a method related to the nature of the situation presented in the problem. In view of this phenomenon, before introducing formal methods, teachers should help pupils develop a variety of other methods and strategies to solve word problems, including mental and pictorial approaches.

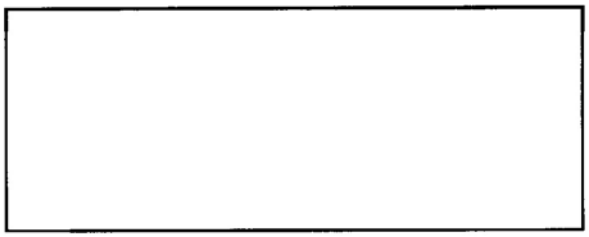
It was also noted that a good number of candidates found difficulty in articulating their reasoning in simple English and in making use of the appropriate mathematical language. This was evident in question 11 b (ii) which required them to explain why the triangle was scalene. Teachers therefore need to give children more opportunities to communicate mathematically and give due importance to the section in the syllabus which recommends that "emphasis should be given to both oral and written modes of communication".

As in previous years some candidates lost precious marks for not showing their working. In those cases where the answer was wrong and no working was shown both method marks and accuracy marks were lost. In most instances, however, candidates displayed their working in a satisfactory way. There were some candidates though who in multi-step problems displayed all their working in one continuous line. Candidates should appreciate that the working associated with each step has to be written separately so as to preserve mathematical logic and preciseness.

The samples shown on the next page, taken from the candidates' scripts, highlight some other strengths and weaknesses in the pupils' performance.

Incorrect alignment of the units and tenths digits

5. i) **Measure** the **length** and **breadth** of this rectangle with your ruler.
(***Write down*** *your measurements in the space provided.*)



Breadth: 3 **c**

Length: 7.5 **cm**

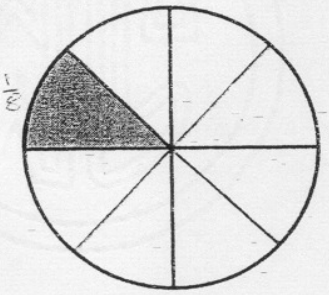
ii) **Work out** the **perimeter** of the rectangle.

7.5 cm
7.5 cm
3 cm
3 cm
15.6 cm

Perimeter: 15.6 **cm**

Sound understanding of the concept of fractions

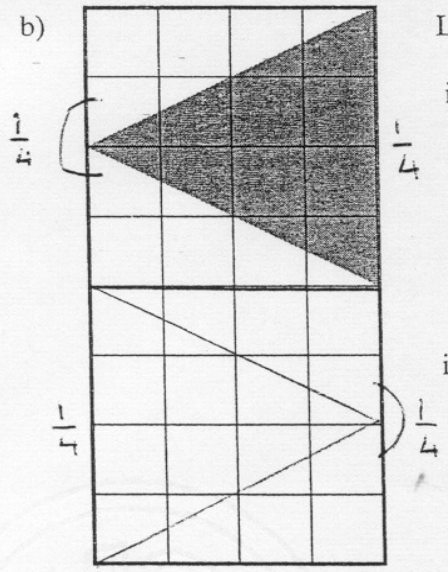
8. a)



Look at this circle.
What **fraction** of the circle is **shaded**?

1/8

b)



Look at this rectangle.

i) What **fraction** of the rectangle is **shaded**?

1/4

ii) What **percentage** of the rectangle is **not shaded**?

4/4 - 1/4 = 3/4
100% - 25% = 75%

75%

Good understanding and mastery of the long division process
Step by step presentation of working

7. **17 bottles** of Orange Juice cost **Lm6·29**.
John wants to find out the cost, **in cents**, of **1 bottle** of Orange Juice.
This is how he starts his working. **Complete his working**.

17 bottles 629c
-340c
left 289c-
170c
left 119c
85c
left 34c-
~~tef~~ 34c
left 0c

20c × 17
10c × 17
5c × 17
2c × 17
37c

17
5
85

17
2
34

1 bottle costs 37 **cents**

Incorrect calculation of time interval and reasonableness of result not checked

20. **Yesterday** Nathan went to bed at **21:45**.
He woke up **today** at **06:30**.
He left home for school **1¾ hours later**.

i) How much sleep did he get?

21:45 -
06:30
15:15

21:45 +
06:
27:

75 -
60
15

15 h 15 min

ii) At what **time** did he leave home for school?

~~60~~
~~6~~:30 -
1¾ = 1:45
4:45

60 +
30
90

90 -
45
45

~~6:45~~ a.m
4:45

Markers' Comments

These were submitted by the markers and refer to the strengths and weaknesses demonstrated by the candidates in each question.

Question 1
The first three parts were generally answered correctly. The last part was however answered wrongly by many, the most common mistake being multiplying by 60 instead of dividing.

Question 2
On the whole this was generally answered correctly. Some however still lack a clear understanding of the place value concept.

Question 3
In the first part some candidates submitted the wrong answer, indicating that they were not able to write correctly a decimal number from its description in words.

In the second part many found difficulty in working out the unknown number.

Question 4
Most candidates performed well in this question. Only a few committed arithmetical mistakes.

Question 5
This was a straightforward question for many candidates. A few did not measure the sides of the rectangle accurately enough. A good number who had the correct measurements failed to work out correctly the perimeter due to incorrect alignment of the units and the tenths digits.

Question 6
The main difficulty of most candidates was the conversion from one unit of measurement to another.

Question 7
Some candidates managed to complete the long division by the repeated subtraction method. Others who tried the traditional approach failed to obtain the correct answer.

Question 8
Most candidates answered part (a) correctly.
A good number of candidates, however, failed to answer correctly b(ii), indicating that they lack the basic understanding of the concept of percentages.

Question 9
In general most candidates answered the first part correctly. However a good number of them failed to interpret and use the answer to the first part appropriately to solve the second part of the question.

Question 10
Some candidates failed to apply their knowledge about the units of capacity to solve this real life problem. Lack of reasoning led to absurd answers; most divided 200ml by 2litres!

Question 11
There are still some who do not estimate the angle before measuring the angle with the protractor, with the consequence of supplying the wrong value of the size of the angle.

A good number applied their knowledge of the angle sum property of a triangle and solved the problem successfully.

It was surprising to note the great difficulty most candidates encountered in expressing themselves in simple English when asked to explain why the triangle was scalene.

Question 12
Most candidates found part (i) straightforward.
Only a few realized that in part (ii) they could have obtained the answer by multiplying Lm2.40 by 3. This shows that most of them rush to work out mechanically without taking time to look at and examine carefully the numbers involved to see if they are related.

Question 13
The first two parts were generally answered correctly. The last part however offered some difficulty, indicating once again the candidates' lack of ability to convert a fraction into a percentage. This was due to a lack of understanding of the concept of the equivalence of these two apparently different forms of representations.

Question 14
Most candidates answered this question correctly, except for the last part where some found it difficult to express themselves precisely using the appropriate mathematical language.

Question 15
A good number of candidates fared well in this question. It must be remarked that only a few used a shorter and more elegant method to work out the solution.

Question 16
It was amazing to note the high number of good responses to this question about data handling. The associated concepts are understood and mastered by most candidates.

Question 17
A few candidates failed to read the temperature scale correctly.

A good number gave 91 as a prime number.

A good number still confuse the distinction between factors and multiples.

Some candidates worked out the four options instead of applying their reasoning in understanding the different representations.

Question 18
Most candidates were successful in constructing both the square and the circle. Some however drew the circle inside the square, showing that they failed to understand what was requested of them in the problem.

Question 19
This turned out to be, as expected, the most difficult to solve. Most candidates applied the formula for the volume of the cuboid and the cube blindly, ending up with extremely large numbers and wrong answers. The problem could have been easily solved (perhaps even mentally!) by working out, through reasoning, the number of cubes needed to make one layer and subsequent layers. Children need to think of efficient calculation strategies before embarking on a mechanical calculation.

Question 20
A good number of candidates performed badly on this question, in spite of the fact that children go through the experience presented in the problem every day! Very few made use of the time-line to facilitate the working out of the number of hours of sleep.

Implications for Teaching and Learning

1. As emphasised in previous reports, teachers and parents should continue to encourage children to make more use of the methods and approaches described in the Year 4, 5 and 6 Syllabus. These methods are based on understanding and therefore enable the children to learn Mathematics in a more meaningful way.

2. Once more children should be encouraged to justify their answer to a problem by checking the reasonableness of the result. They should appreciate that checking is an essential part of the problem solving process.

3. Teachers and parents need to help pupils acquire a range of strategies to solve word problems, particularly in problems involving two or more steps.

4. Misconceptions and errors in children's work need to be tackled with the whole class as well as on an individual basis as these offer an excellent opportunity to clear difficulties encountered by many children.

5. Due to being anxious to solve a problem and get it right, children often tend to adopt what they feel is a standard written method rather than a range of strategies related to the nature of the problem. Children therefore need to be more engaged in problem solving approaches that make them think. Children need to be given more opportunities to talk about the way they reach a solution to a problem. They need to appreciate that there is often more than one way of solving a problem. Moreover during discussions they should be encouraged to use the appropriate mathematical language to verbalise their thoughts and reasoning.

6. The teaching of place value needs to be strengthened and the importance of accuracy when setting out work in calculations involving decimal fractions should be emphasised.

7. Teachers should provide opportunities for children to develop their early algebraic skills; for example, to generalise from patterns or to solve "missing number" problems.

8. Before children use the protractor to measure an angle, they should first give an estimate for the size of the angle and use this estimation to decide on the appropriate scale they should choose. Children should therefore be given ample opportunities to develop the skill of estimation of angles before they embark on measuring the angles with a protractor.

9. Accuracy in measuring the lengths of lines and the sizes of angles needs to be emphasised.

10. Children need to be given more opportunities to read and use scales (temperature, weighing, measuring, graphs, . . .) in a variety of contexts and relate them to the divisions on a number line.

11. Teachers should provide pupils with more opportunities to develop familiarity with the units of measurement.

12. Teachers should provide pupils with more practice in solving a variety of problems involving percentages, aiming to consolidate their understanding of percentage as number of parts per 100.

13. More use of the time line is recommended. The low performance shown by the candidates in answering the question involving time intervals indicates that teachers need to reflect on the way this topic is being presented and should give alternative approaches a try.
