Junior Lyceum Entrance Examination into Form 1 – May 2005
MATHEMATICS
CHIEF EXAMINER'S REPORT

General Comments about the examination paper

The main objective of the examination was to assess the children's mathematical knowledge, skills and understanding at the end of their Primary Education.

Once again the validity and reliability of the examination were ensured by the adoption of a specification grid to ascertain that all the questions were within the syllabus and that the questions were pitched at appropriate levels to cater for different abilities. It was endeavoured to cover as much as possible of the syllabus content and to stay within the established weighting, namely:-

- Problem Solving 20% ± 1%
- Number 40% ± 3%
- Measurement 15% ± 3%
- Shape 15% ± 3%
- Data 10% ± 1%

For further details regarding the estimation of the difficulty level and strand tested kindly refer to the specification grid at the end of this report. Naturally some divergence is bound to occur between the level in difficulty as estimated by the paper setters and the level determined by the item analysis. This aspect will be treated further in the section "Markers' comments".

The candidates had to answer 20 questions carrying a total of 100 marks. The first ten questions carried 4 marks each and the remaining 10 carried 6 marks each. These questions were presented on a 12-page booklet, with ample space to allow the candidates display the necessary working. Clear diagrams contributed further to make the paper child-friendly. Once again particular attention was paid to the language used to ensure that the language was accessible to all candidates, even to those with special needs.

General comments about the performance of the candidates

Once again, in terms of number of passes and the average mark, the general result of the examination was satisfactory. About 70% of the candidates passed the examination. This shows that the paper catered for the ability of most students. The paper contained some challenging questions, which will be discussed later in this report, but there were quite a number of straightforward questions testing routine mathematical skills. Thus, one can safely state that students with lower ability were given ample opportunities to perform well while those with higher ability could show their advanced knowledge and understanding in the more demanding questions.

With this aim in mind a couple of questions were set to test the candidates' ability in solving problems related to real life situations. This is especially true in the last three questions which were presented in an original way in order to help candidates organise their thinking. Skills were tested and routine questions were set but the more demanding questions required rigorous and organised thinking skills. The problems set were related to children's everyday experiences. This helped in making the examination less stressful and the questions more child friendly. This was often achieved by making use of prompts in the form of bubbles, diagrams, tables and hints. It was a pity that some children missed out on the clues and hints given in the examination paper.
It will be seen from the markers' comments and the facility index of each question that certain aspects of teaching need to be improved. It is pertinent to point out that in teaching problem solving teachers

should expose children to a variety of solutions to the same problem rather than provide a single strategy. This applies for example, to questions number seven and seventeen where perimeter and area of a square and rectangle were involved. These two questions revealed that by a perimeter many children understand adding the side lengths and nothing more. The fact that border lines could have been manipulated and additions shortened, as shown in the first part of question seventeen, was for many children a novelty! The second part of question seventeen was easy going except for errors of addition, whereas the first part of question seventeen was answered wrongly by many children. Question seven was obviously a big hurdle. Many simply left out the first part while others confused the lengths of the parts. In finding the shaded area, only on rare occasions was the method of subtracting the area of the smaller square from the area of the larger square used. The partitioning method was resorted to with the result that many found great difficulty in interpreting the diagram correctly. Further comments are found in the exemplars and the markers' comments.

Other questions which presented considerable difficulty were those which had different possibilities to be considered. Questions number eighteen, nineteen and twenty showed clearly that children are weak at considering different possible solutions. Finding a solution after considering various alternatives is part and parcel of our everyday life and should form part of our everyday mathematical thinking. We must not give the wrong impression that a solution is always possible by following one strategy. Very few considered different possibilities in splitting twelve and eighteen, and most students faltered while working backwards in the second part of question twenty. The first part of question nineteen was worked out by practically all the children. However, children got stuck in applying the concept of more and less. In trying to teach children to memorise the symbols of larger and smaller by using the mnemonic "the big fish eats the small fish" the concept of more and less is trivialised and consequently an opportunity for developing logical thinking is lost. More practical experience is needed to develop a concrete concept of more, less, greater, smaller, bigger, and equal. Comparison of objects needs to go beyond comparing two objects or two quantities only.

Two further remarks are worth mentioning here and will be developed later in the section for markers' comments. The first is related to the problem on time, the second to the questions on equivalent and decimal fractions, and mixed numbers. Although the problem on time involved a relatively short time interval it seems that it is one of the themes that need more emphasis in our teaching. Either the time line or the use of a clock can be used as an aid. Many students worked out the problem by adding or subtracting mechanically, complicating the solution, when a simple following of the minute hand from the two clocks was enough. Where number skills are concerned a great need of improvement is felt when working with mixed numbers, decimals and equivalent fractions. At this early age it is important to emphasise a good grip of these concepts. This is important to make good and efficient use of the calculator in the Secondary years of study.

Needless to say emphasis will continue to be laid on the importance of encouraging children to use good English in expressing mathematical ideas and results. There were some good replies to the few questions where the candidates had to give reasons for their answer in words. But many still find great difficulty in expressing their ideas clearly and coherently. What is expected is a short and simple intelligible answer. Although many students worked out the results of the volumes wrongly they still earned full marks for the reply to the question "why" so long as they were in agreement with their result. In the question on compass directions, the candidates had an example to show them the format of the reply, yet many either forgot the distance, or split the answer into two parts in giving the diagonal distance and the direction.

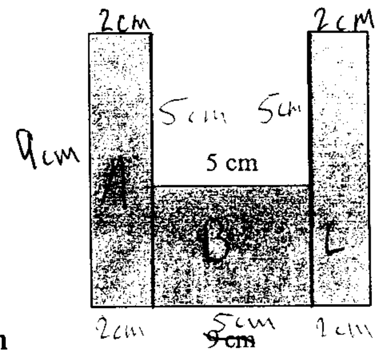
Further details about the paper, item by item, will be found in the exemplars that follow, in the Markers' comments, the Specification grid and the Facility index.

Some exemplars from the paper

Question 7
Method 1
One of the possible short strategies is used for part (i). Two attempts are shown. The candidate attempted the question and made a mistake but corrected this to obtain a final correct answer.
For part (ii) a partition method is used.
Method 2
For part (ii) the shortest and neatest method is used. This method was rarely adopted by the candidates.

Method 1

7. A **square** of side 5 cm is cut from a larger **square** of side 9 cm.
The remaining part is shaded.



Work out:
i) the perimeter of the shaded part.

$5 \times 3 = 15$

$9 - 5 = 4$

127 cm + 15 cm + 4 cm = 46 cm

9 cm × 3 = 27 cm + 5 cm = 32 cm + 4 = 36

~~36~~ 46 cm

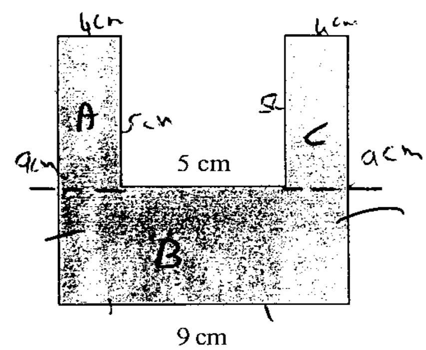
ii) the area of the shaded part.

Area of A = 9 × 2 = 18 cm²
Area of B = 5 × 4 = 20 cm²
Area of C = 9 × 2 = 18 cm²
Area is in all = 56 cm²

56 cm²

Method 2

7. A **square** of side 5 cm is cut from a larger **square** of side 9 cm.
The remaining part is shaded.



Work out:
i) the perimeter of the shaded part.

9 cm + 9 cm + 9 cm = 27 cm

4 + 4 = 8 cm

5 cm + 5 cm + 5 cm = 15 cm

27 cm + 8 cm + 15 cm = 50 cm

50 cm

ii) the area of the shaded part.

(5cm)

9 cm × 9 cm = 81 cm

5 cm × 5 cm = 25 cm

81 − 25 = 56

56 cm²

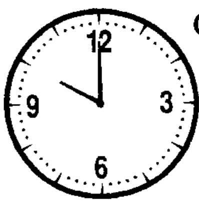
Question 8. Again we show two methods for this question to emphasise the use of the clocks as an aid in working out this time problem.
Method 1: Uses the clocks, or otherwise reasoning it out, to work out the time interval (50 minutes).

Method 2: Shows the correct addition of 30 minutes to 10:45 shown on clock B and subtracting from 12:05, the time the bus arrives at Valletta on its return journey. Both methods are correct, the first method being more risky because it either carries or loses all marks.

Method 1

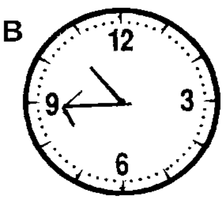
8. i) **Clock A** shows the time a bus leaves Valletta for Mellieħa on Monday morning.
At what time does the bus leave Valletta?

ii) The bus arrives at Mellieħa **45 minutes later**.
Draw the **minute hand** on **clock B** to show the time the bus arrives at Mellieħa.



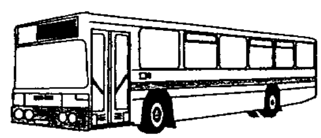
Clock A

Clock B



10·00 / 10 o'clock

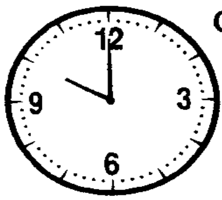
iii) The bus **stops for half an hour** at Mellieħa and returns to Valletta.
It **arrives** at Valletta **at 12:05**.
How long does the journey from Mellieħa to Valletta take?



~~15~~ 50 **minutes**

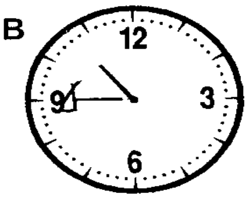
Method 2

8. i) **Clock A** shows the time a bus leaves Valletta for Mellieħa on Monday morning.
At what time does the bus leave Valletta?



10:00

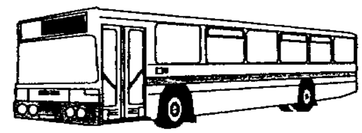
ii) The bus arrives at Mellieħa **45 minutes later**.
Draw the **minute hand** on **clock B** to show the time the bus arrives at Mellieħa.



iii) The bus **stops for half an hour** at Mellieħa and returns to Valletta.
It **arrives** at Valletta **at 12:05**.
How long does the journey from Mellieħa to Valletta take?

10:45 +
30
11:15

12:05 −
11:15
50



50 minutes

Question 11. The main difficulty here was that many candidates did not subtract one for the number of spaces to multiply by 20 metres. This exemplar shows how the candidate arrived at the correct solution by drawing twelve posts and counting the spaces. **Supporting thinking with the help of diagrams is very important** at this age, and is to be recommended as a teaching aid. The picture made it clear that for four poles there are three spaces. It is a pity that many failed to notice this important clue.

11. a) On my bike I cycle 36 km in 3 hours.

i) Find my speed in km/h.

3 hrs 36
1 hr = 12

$\frac{1}{3} \times \frac{36}{1}$

12 km/h

ii) I cycle for 1½ hours at the **same speed**.
What distance do I cycle?

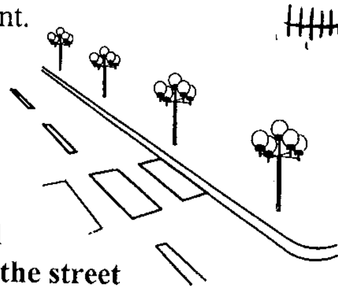
60hrs = 12km
30mr = 20

$\frac{30}{60}$ $\frac{12}{1}$ ~~6½ hr~~

12 km 1h
6 km = ½ h
18 km

18 km

b) A street has 13 lamp posts ~~fixed on the~~ pavement.
The distance between one lamp post and another is **20 metres**.
Work out the **distance** between the **first** and the **last** lamp post on the pavement.



A small part of the street

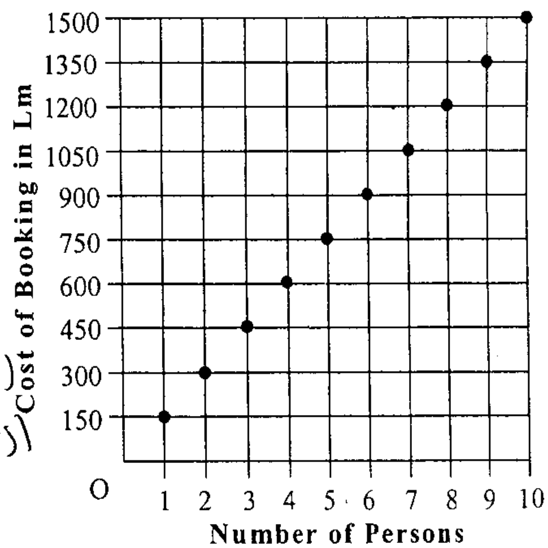
~~20m~~
~~12 distanse~~

12 distance
20 m
140m

240 m

Question 12. Parts (c) and (d) of this question were a challenge to many candidates. Part (c) offered a variety of solutions and many adopted a correct method to solve the problem. Here we show one of them.
In part (d) there were many candidates who made the mistake of writing 3 $^{1}/_{2}$ persons. It is important that children learn to assess how sensible an answer is.

12. The graph shows the cost of booking a holiday for a number of persons.



a) What is the cost of booking a holiday for 1 person?

Lm 150

b) How many persons can book for Lm900?

6 **persons**

c) How much does it cost to book for 15 persons?

1500 + (10 pers)
750 (5 pers)
2250

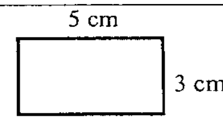
Lm 2250

d) For how many persons can I book if I have Lm517? 3 **persons.**

Question 17. Two exemplars are given to show what was expected of the candidates in this question. Unfortunately, this question and question 7 part (i), revealed that most candidates simply add the lengths round the given shape. They then falter when faced with a non-routine problem based on perimeter. In fact many of the candidates who mixed up the first part, worked part (b) by adding up all the lengths around the shape and got the correct answer. It was also evident that many ignored the small rectangle on which the first part was based. It is necessary to emphasise the importance of these methods since they are good examples of the distributive law in algebra. These examples have another advantage insofar as they bring out the benefits of short cut strategies in calculations.

Method 1

17. Rita, Sue and Ann work out the **perimeter** of this rectangle.



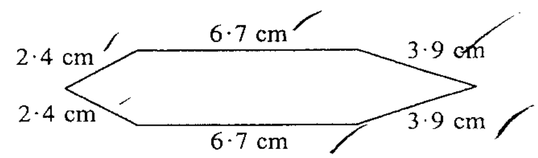
a) Fill in the **circles** with +, −, × or ÷ and write a **number** in **each box** to complete their working.

Rita: 5 cm (+) 3 cm (+) 5cm (+) 3 cm = 16 cm

Sue:
5 cm × 2 = 10 cm
3 cm × 2 = + 6 cm
Ans: 16 cm

Ann: (5 cm + 3 cm) (×) 2 = 16 cm

b) Work out the **perimeter** of this shape.

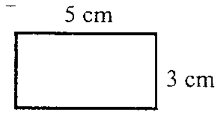


2·4 + 2·4 = 4·8
6·7 + 6·7 = 13·4
3·9 + 3·9 = 7·8
4·8 + 13·4 + 7·8 = 26·0

26 **cm**

Method 2

17. Rita, Sue and Ann work out the **perimeter** of this rectangle.



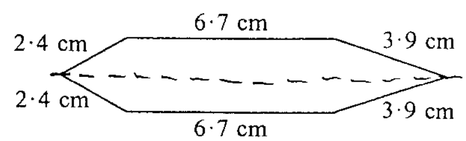
a) Fill in the **circles** with +, −, × or ÷ and write a **number** in **each box** to complete their working.

Rita: 5 cm (+) 3 cm (+) 5cm (+) 3 cm = [16] cm

Sue:
5 cm × [2] = [10] cm
3 cm × [2] = + [6] cm
Ans: [16] cm

Ann: (5 cm + 3 cm) (×) 2 = [16] cm
8×2=16

b) Work out the **perimeter** of this shape.



6·7cm +
2·4
3·9
13·0 ×2 = 26·0

26·0 cm

Question 18. This question required a high level of thinking and was one of the most difficult questions. Nevertheless, there were some good attempts two of which are presented here. Not all were perfect, as is the case with these exemplars.
Method 1
In part (a) there is some doubt as to whether in fact the candidate considered all the options. This is compensated in part (b) where the candidate showed two of the three options, and in part (c) showed the complete method.
Method 2
In part (b) there is one option which is not considered (the one considered by the candidate in method 1). Yet these were very good attempts which showed that both candidates understood the question and adopted a good strategy.

Method 1

18. In a shop window there is this sale advert.
An owner of a Restaurant needs to buy some chairs.
He can buy **in lots** of **4**, **6** and **10** **only**.

a) Find the total cost of the **cheaper** way to buy **12** chairs only.

Lm23
x2
Lm46

Lm 46

b) Find the total cost of the **cheapest** way to buy **18** chairs only.

Lm23
x3
Lm6 96

Lm16
x2
Lm32

Lm35
+Lm32
64

Lm 69

c) He wants to spend **exactly** Lm93.
How many chairs can he buy?

~~Lm35~~
~~x3~~
~~Lm105~~

Lm35
x2 (20)
Lm70
+Lm23 (6)
Lm93

26 **chairs**

Method 2

18. In a shop window there is this sale advert.
An owner of a Restaurant needs to buy some chairs.
He can buy **in lots** of **4**, **6** and **10** **only**.

a) Find the total cost of the **cheaper** way to buy **12** chairs only.

6x2=12
23x2=46.

4x3=12
16x3=48

Lm 46 (6chairs x2)

b) Find the total cost of the **cheapest** way to buy **18** chairs only.

6x3=18
23x3=69

4 16 +
8 4 16
18 10 4 16
6 23
71

Lm 69 (6chairs x3)

c) He wants to spend **exactly** Lm93.
How many chairs can he buy?

10→35 +
10→35
20→70+
6→23
26 93

26 **chairs**

Question 19. The help given under the first and second grid was intended to lead on the students from the first grid and thus make it easier to solve this problem. Some trial and error in finding the numbers is expected and is to be encouraged. Naturally subtracting three, dividing by three and then distributing the difference was also possible and some candidates adopted this strategy. This was a higher order question in 'problem solving'. It cannot be solved by a superficial knowledge of the words 'more' and 'less'; students need to experience these words by making comparisons from real life situations. Again we show two methods adopted by two of the candidates.

Method 1

19. Father wants to share 21 sweets among Glenn, Ruth and Claire. He plans to share the sweets in one of the following three ways. Find out how many each child receives and fill in the tables if:

a) he decides to share the sweets **equally** between them.

3)21
7

	Glenn	Ruth	Claire
Number of sweets	7	7	7

b) he decides to give **both** Glenn and Claire three sweets **less** than Ruth.
(**Help:** *Use your **results in** (a) to answer this question*)

21 -
9
2)12
6

	Glenn	Ruth	Claire
Number of sweets	6	9	6

c) He decides to give Ruth **two sweets more** than Glenn and **one sweet more** than Claire.
(**Help:** *Use your **results in** (a) to answer this question*)

6 +
8
7
21

	Glenn	Ruth	Claire
Number of sweets	6	8	7

Method 2

19. Father wants to share 21 sweets among Glenn, Ruth and Claire.
He plans to share the sweets in one of the following three ways.
Find out how many each child receives and fill in the tables if:

a) he decides to share the sweets **equally** between them.

	Glenn	Ruth	Claire
Number of sweets	7	7	7

b) he decides to give **both** Glenn and Claire three sweets **less** than Ruth.
(**Help:** *Use your* ***results in*** **(a)** *to answer this question*)

	Glenn	Ruth	Claire
Number of sweets	4	13	4

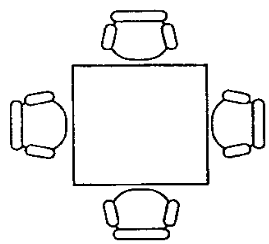
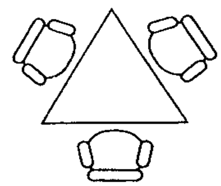
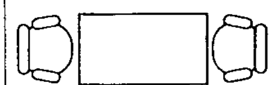
c) He decides to give Ruth **two sweets more** than Glenn and **one sweet more** than Claire.
(**Help:** *Use your* ***results in*** **(a)** *to answer this question*)

13+

	Glenn	Ruth	Claire
Number of sweets	~~4~~ 6	~~4~~ ~~7~~ 8	~~8~~ ~~5~~ 7

Question 20. The first part of this question was within the reach of most candidates and in fact many candidates gained the marks allotted for part (a). Again the diagram was most helpful to visualise the situation presented by the problem. The second part was more challenging and some mistakes were committed, such as writing down the number of persons instead of the number of tables used by those persons.

20. I can use three types of tables for my party.

Table shape	Square	Triangular	Rectangular
Seating plan			
Number of places	4 16	3 15	2 20

a) For my birthday party I use: 5

4 square tables, 5 triangular tables and 10 rectangular ones.

If all **places are taken** and **all guests are seated** how many guests do I have at my party? $4\times4=16$ + $5\times3=15$ + $2\times10=20=51$

51 **guests**

b) At my sister's party there are **30** guests. She uses 5 square tables.
The rest are **triangular** and **rectangular** tables.
Work out the number of **triangular** and **rectangular** tables she uses if **all places are taken** and **all guests are seated.**

$5\times4=20$ $30-20=10$

$3\times2=6$ + $2\times2=4$ $=10$

2 **triangular tables**

2 **rectangular tables**

Markers' Comments

The following remarks were made by the markers and refer to the strengths and weaknesses demonstrated by the candidates in each question.

Question 1

This question presented little difficulty and was a good starter to the examination.

Question 2

Although this was not considered a difficult question the main difficulty encountered by candidates was in working with fractions. Some also found difficulty in completing the shape. It is important that children use their pencils to draw shapes.

Question 3

Counting the steps presented some difficulty and a number of students multiplied by 6 instead of 7. Others missed the word 'more' in (b) part (ii) and ignored the fact that Mary had gone up 3 steps. Nevertheless many candidates managed to earn good marks, if not all the marks.

Question 4

Working with fractions and percentages proved difficult for many candidates. The question was straightforward but still many mistakes that could have been avoided were noted. Some candidates did not bother to check the answer for (c) part (ii), going to absurd lengths to work out the problem.

Question 5

The general impression of the markers was that the double multiplication required in part (i) proved difficult, although a question requiring a two step solution is not beyond the average ability of an eleven year old. It is important to note that many worked out the second part by dividing 20 by 2 to get 10, sometimes even doing this mentally.

Question 6

This was an easy question and many answered it correctly. Markers pointed out the fact that children needed more practice in reading the protractor.

Question 7

This item proved to be one of the most difficult questions. Very rarely was the subtraction method used in finding the area. In finding the perimeter few of the candidates realised that the shape was made up of two squares. They therefore resorted to find the lengths of all the parts individually. This was not necessary and many found it difficult and made mistakes. The evidence from the markers is that the children's ability to apply the concept of perimeter is limited to adding the parts around the shape. This is further confirmed by the feedback from question number 17 (see comments). The concept of perimeter affords a very good case of the important algebraic distributive law, a notion not beyond the primary years. This fact should be emphasised and explored in teaching.

Question 8

Although this was not a difficult question on time, children always find some difficulty in working out the problem part. In fact many wrote correct answers to parts (i) and (ii) but failed to work out correctly part (iii). The problem was related to the clocks, yet few made use of them. The solution could be traced on the face of one clock or worked out mentally as was the case for many. Unfortunately many left out the half hour stop. Others worked it out correctly by adding and subtracting.

Question 9

Part (b) of this question presented difficulties to many candidates. Although the net was recognised as that of a pyramid, the number of vertices and edges was either inverted or just guessing. This shows that either the children confuse the meaning of vertices and edges or that they have no concept of a solid pyramid.

Question 10

Candidates attempted this question by using the repeated subtraction method successfully. This method has gained ground on the old method of long division. The main difficulty was in writing the final answer as 12 tins and in calculating how much more coffee is needed. Many simply wrote the remainder 4.

Question 11

The first two parts of this question were quite straightforward and many candidates worked them out correctly. The main difficulty was in the third part of the question where many multiplied by 13 instead of 12. The diagram made it amply clear that there was one space less in any number of posts.

Question 12

Several candidates managed to tackle the first two parts of the question but parts (c) and (d) presented some difficulty. Many gave the answer to part (d) as 3½, ignoring the fact that persons cannot be divided. In part (c) many resorted to long multiplication when there were easier options from the graph. It is important that children learn to elicit information from the graphs.

Question 13

This question confirmed that greater emphasis is needed on the teaching of concepts. Apart from the persistent confusion in converting units, the main mistakes were committed in parts (b) and (c) where an application of the average found was sought. Many put Susan in the correct position but misplaced Alice and Grace. Others answered (b) and (c) completely wrong.

Question 14

This was a question of average difficulty, and was not presented in the usual format. The jigsaw was intended to help the children place the number in their correct order. However, many did not recognise the square numbers and consequently found difficulty in completing part (d).

Question 15

Markers commented about the growing familiarity of the children with this type of question. Notwithstanding this, many did not apply the scale correctly and committed the mistake of giving the diagonal measurement equal to the vertical and horizontal distance of 12m. Another common mistake was in giving wrong descriptions although the example made it very clear what was expected. Some even wrote one movement split into part (i) and (ii).

Question 16

Though not intended to be a difficult question, some candidates found difficulty in finding the volume of the cube. In answering the last part there was some confusion in deciding which is larger and which is smaller, and in using correct English. The names of the solids were sometimes given as rectangles and squares. Use of the formula length × breadth × height was correctly used or implied and thus part (b) was within the reach of most candidates, although there were multiplication mistakes. Good presentation of the working was seen in many cases.

Question 17

Part (a) of this question was intended to lead on for a shorter method in part (b). Few adopted a short method (Sue's and Ann's methods) to work out part (b). This question, as well as question 7, showed that for most students perimeter equates to adding up the numbers seen. When it comes to applying the concept they falter. From markers' feedback it was evident that many confused part (a), ignoring the rectangle completely, and worked part (b) correctly.

Question 18

According to the markers this was a difficult question. Many candidates ignored the fact that chairs were sold in lots of 4, 6 and 10 and that 12 and 18 could be split in various ways. Accordingly they reduced the problem to a simple proportion problem. In the opinion of some markers this was an unusual question and for this reason few worked it out totally correct. Children are expected to solve problems using various strategies to arrive at a solution by thinking logically and systematically. Bargain shopping is very common nowadays and so the experience is worth exploring in day to day teaching.

Question 19

As expected, a number of candidates found this question rather challenging. This involved the sharing of an amount of sweets among three children. The first part was worked out correctly by practically all candidates. The main difficulties were in using the grids and in concentrating on the words ‘more’ and ‘less’. There were good attempts at juggling with numbers and quite a good number managed to get a correct solution for all three parts. This was a question which required more thinking and careful checking of the solutions obtained. Some answers were obviously wrong because the number of sweets given to Glenn, Ruth and Claire did not add up to 21.

Question 20

This question needed some thinking. It was not a difficult question and the diagrams should have helped the children to visualise the situation. The second part was slightly more difficult although there was a very good number who worked it out correctly or made an effort to do so. Some mistakes could have been avoided such as writing the number of persons for the number of tables. Otherwise the response to it was as anticipated.

Implications for Teaching and Learning

- The use of diagrams in solving out problems is a technique which needs to be encouraged. Children need to learn how to make a good diagram from the description of the problem. They then can adopt a strategy to solve the problem.

- Candidates should ensure that answers are reasonable -- a part of a quantity can never be greater than the whole! These are simple points that can be brought up in teaching.

- Challenging problems should be included in the daily tasks. It is not necessary that demanding problems are broken into smaller parts. Two steps problem at a go are within the average ability of an eleven year old.

- It is important to emphasise that time can be represented by a diagram. Use a time line or a clock to facilitate the acquisition of the concept of time.

- The repeated subtraction method has become very widespread among children. This method should be emphasised further as it is beneficial for children.

- Emphasis on the distributive law should be made in teaching to find the perimeter of a shape which has equal lengths repeated. This fact can also be used when multiplying two numbers by the same quantity; the use of a perimeter facilitates the understanding of such a concept to a child.

- Always explore alternative strategies with the children and never give the impression that only the teacher's method is right. Some methods may be longer but original, and so deserve to be acknowledged.

- Solid space is more difficult to represent and imagine on a flat surface. This constrain on the teacher makes it imperative to use solid objects to show all the aspects and the properties of solids. Recognising the net of a solid should not be enough. Making good use of it is important.

- In graphical interpretation children should learn to discover hidden detail. Marking a point on a graph is not enough. Reading out the graph should include extracting information from the graph.