

## Chapter Six

# Patterns and Trends in Achievement: Mathematics 2015

## 6.1 Introduction

This chapter presents the patterns and trends in achievement of the students in mathematics.

The patterns of achievement in 2015 will be presented in part I and the trends will be presented in part II.

### Part I – Patterns in achievement in mathematics

First, national level student achievement would be discussed in relation to student performance pertaining to mathematics.

## 6.2 Patterns of achievement at national level

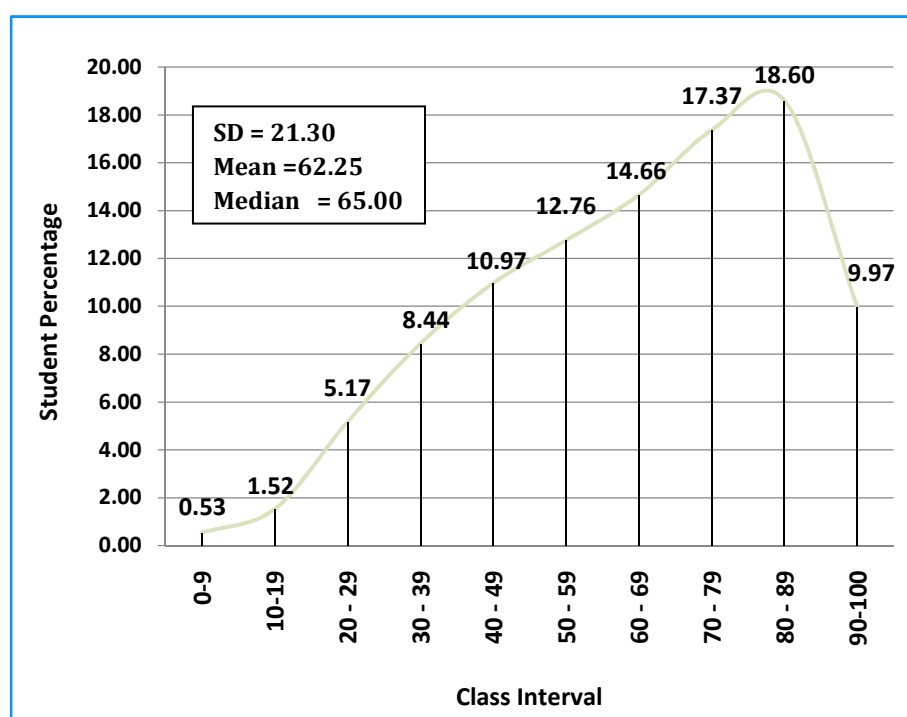


Fig. 6.1: All island achievement in mathematics 2015 – dispersion of marks

The frequency polygon shown in Fig. 6.1 outlines the total picture of the distribution of marks of grade 04 students in mathematics.

Fig. 6.1 depicts a negatively skewed distribution of marks displaying that majority of the students has scored high marks in mathematics. The distribution of marks is further clarified in Table 6.2.

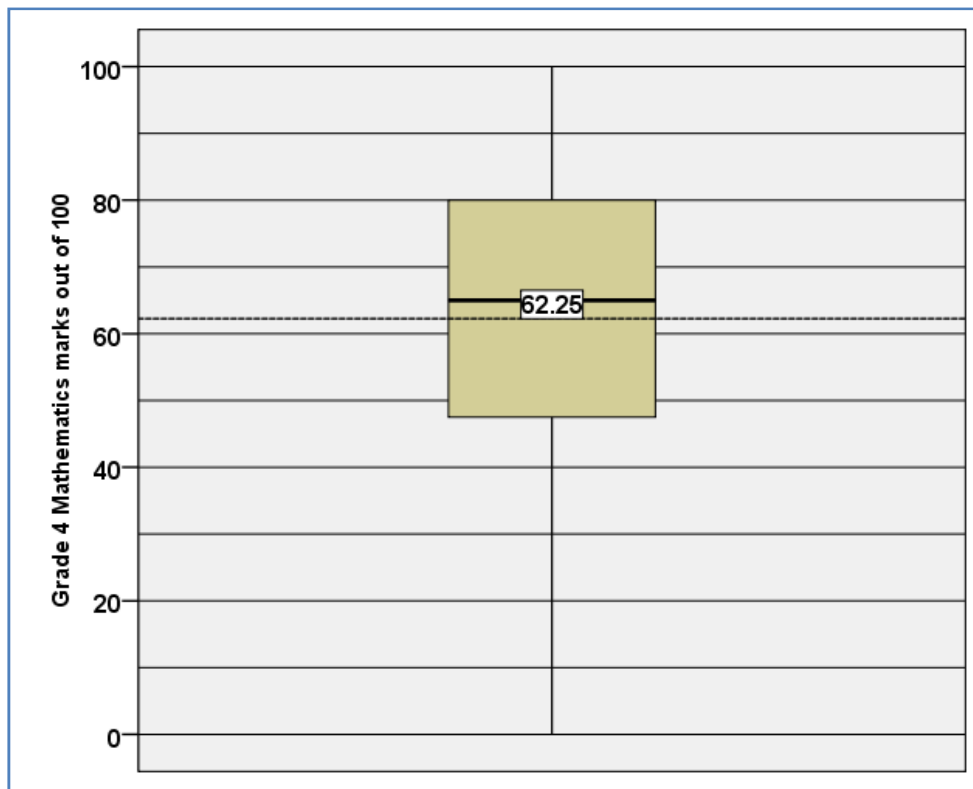
**Table 6.1: All island achievement in mathematics 2015- cumulative percentages**

Class Interval	Student %	Cumulative %
0 -9	0.53	0.53
10 - 19	1.52	2.05
20 - 29	5.17	7.22
30 - 39	8.44	15.67
40 - 49	10.97	26.64
50 - 59	12.76	39.40
60 - 69	14.66	54.06
70 - 79	17.37	71.43
80 - 89	18.60	90.03
90 - 100	9.97	100.00
Total	100.00	

According to this table the highest percent of students (19%) has scored between 80-89 marks and another 10% has scored between 90-100. On the other hand, 15.67% of students has scored below 40 marks. This shows the disparity in achievement in mathematics. However, the percentage of students who has scored above 50 is high indicating that majority of the students are high achievers and that is the reason for the negatively skewed curve in Fig. 6.1.

Fig. 6.2 illustrates student achievement patterns further.

As Fig.6.2, the box plot displays more than 50% of students has scored 62.25 or above. Further 75% of students has scored 42.50 or above for the mathematics achievement. It also reveals that 50% of the marks lie between 42.5 and 80. For the mathematics achievement there are no outliers which means that there are no students who have scored exceptionally high or low marks.



*Fig. 6.2: Box plot and whisker chart representing all island mathematics achievement*

### Summary of national level achievement

- National level mean is 62.25, while the median is 65.00.
- Disparity in achievement prevails with approximately 15.67% of students scoring below 40% and 29% of students scoring above 80%. However, the highest number of students falls within the marks range of 81-90.

Provincial wise student achievement will be discussed next.

### 6.3 Provincial wise student achievement

The nature of the distribution of scores provincial wise reveals certain patterns. These patterns are discussed based on Table 6.2.

**Table 6.2: Provincial achievement in mathematics 2015 – Summary statistics**

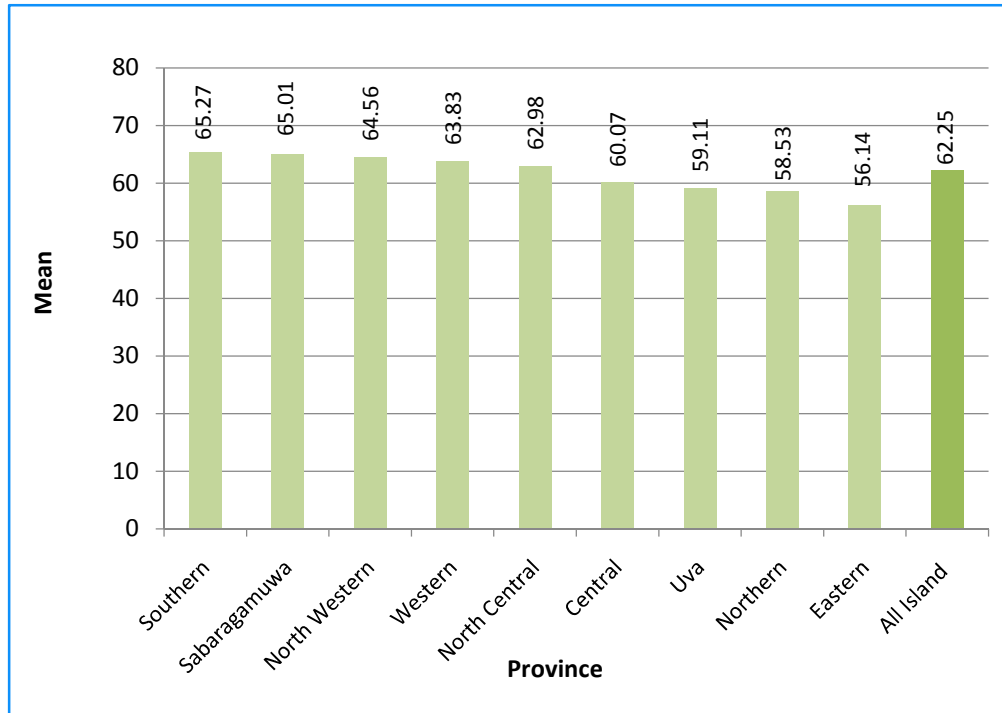
Province	Mean	Rank	Standard Error of Mean	Standard Deviation	skewness	Percentile (p25)	Median (p50)	Percentile (p75)
Southern	65.27	1	0.10	21.25	-0.65	50.0	70.0	82.5
Sabaragamuwa	65.01	2	0.11	19.97	-0.54	50.0	67.5	82.5
North Western	64.56	3	0.10	20.56	-0.49	50.0	67.5	82.5
Western	63.83	4	0.08	21.34	-0.48	47.5	67.5	82.5
North Central	62.98	5	0.13	19.72	-0.42	47.5	65.0	77.5
Central	60.07	6	0.10	20.79	-0.33	45.0	62.5	77.5
Uva	59.11	7	0.14	21.61	-0.23	42.5	60.0	77.5
Northern	58.53	8	0.16	21.82	-0.25	42.5	60.0	77.5
Eastern	56.14	9	0.12	22.38	-0.21	40.0	57.5	75.0
<b>All Island</b>	62.25		0.036	21.30	-0.43	45.0	65.0	80.0

As Table 6.2 indicates based on provincial wise mean achievements Southern Province ranks first. However, Sabaragamuwa Province is ranked second with only a slightly lower mean value.

Western province is in the fourth place with North Western coming third with a slightly higher mean value.

Achievement wise the provinces fall into three categories. Southern, Sabaragamuwa, North Western, Western and North Central with mean scores above the national mean, fall into the higher category. Central, Uva and Northern Provinces cluster in the middle while Eastern fall into the lowest category. Between the Southern and Eastern Provinces there is almost nine point difference in mean values indicating the disparity in achievement among the provinces.

These disparities are further highlighted through the bar chart given in Fig. 6.3.



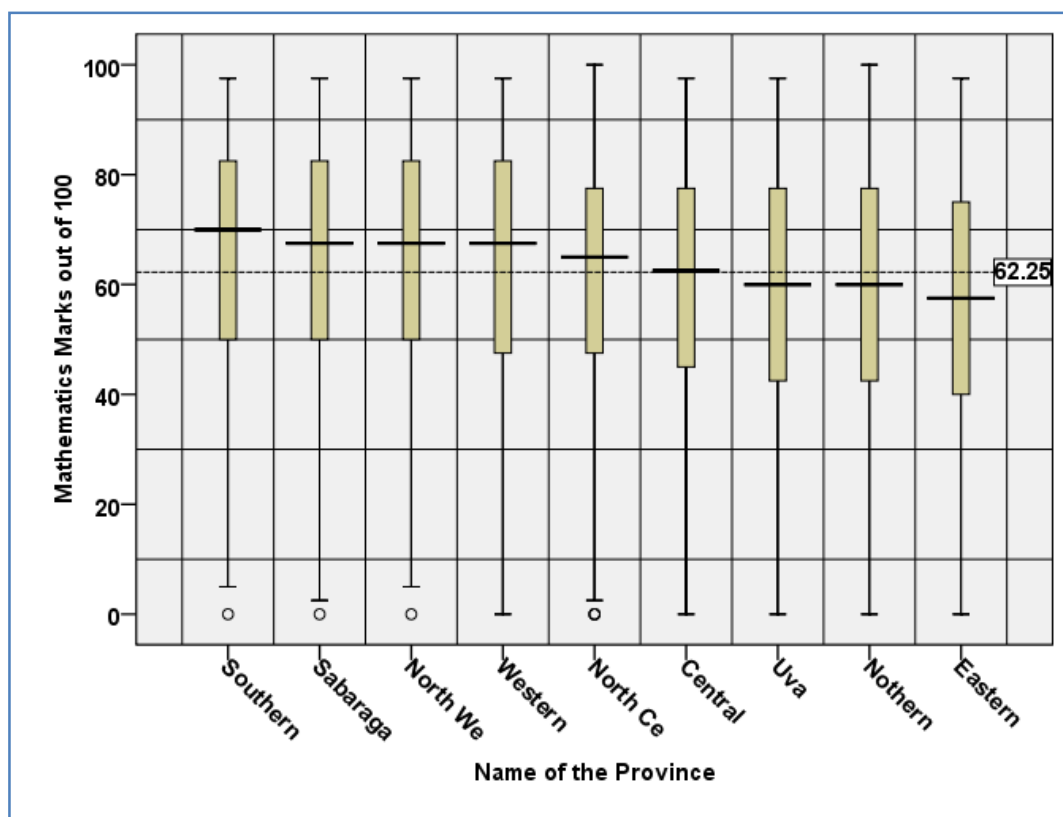
**Fig. 6.3: Bar chart to represent mean among the provinces- Mathematics**

### Disparity in achievement among provinces

According to Table 6.2, Southern Province has the highest mean value but its SD is higher than Sabaragamuwa Province which has the next highest mean value. This means that student performance is more homogeneous in the Sabaragamuwa Province. There are five provinces that have SD values lower than the all island SD. Eastern province has the highest SD value indicating that the variation of students' marks is the highest in this province. The SD values of Western, Uva, Central and Eastern Provinces are higher than the all island SD value indicating that there is variation in achievement in these provinces.

All the provinces have obtained negative skewed values. It is a positive sign that four provinces have achieved higher values (near to the mean or above). Uva, Northern and Eastern Provinces have obtained lower skewed values. This indicates that their performances are not good compared to other provinces.

Patterns of achievement in the different provinces is further elaborated through the box plot chart.



**Fig. 6.4: Box plot and whisker chart representing provincial wise mathematics achievement**

According to the above chart there are three provinces (Southern, Sabaragamuwa, North Western) which show similar characteristics. In the Western Province even though the 75<sup>th</sup> percentile is similar, its 25<sup>th</sup> percentile is lower. Therefore there is greater disparity of marks in the Western Province. While Central, North Central, Northern and Uva Provinces show similarities at the upper limit their performance at the 25<sup>th</sup> percentile differs slightly. On the other hand, the Eastern Province performance is quite different to other provinces at all levels.

However, there are no outliers in the Eastern Province but there are in Southern, Sabaragamuwa, North Western and North Central Provinces.

**Table 6.3: Percentage of students scoring 50 or above, and below 50**

Province	Above or equal to 50	Below 50
Southern	78.74%	21.26%
Sabaragamuwa	78.56%	21.44%
North Western	77.93%	22.07%
Western	75.87%	24.13%
North Central	76.70%	23.30%
Central	72.09%	27.91%
Uva	67.99%	32.01%
Northern	67.49%	32.51%
Eastern	61.88%	38.12%
<b>All Island</b>	<b>73.36%</b>	<b>26.64%</b>

### Summary of provincial level analysis

- Achievement wise the provinces fall into three categories.  
 Category 1 – Southern, Sabaragamuwa, North Western, Western and North Central with mean scores above the national mean (62.25)  
 Category 2 –Uva, Central and Northern Provinces cluster in the middle.  
 Category 3 –Eastern Province

## 6.4 Achievement levels by type of school

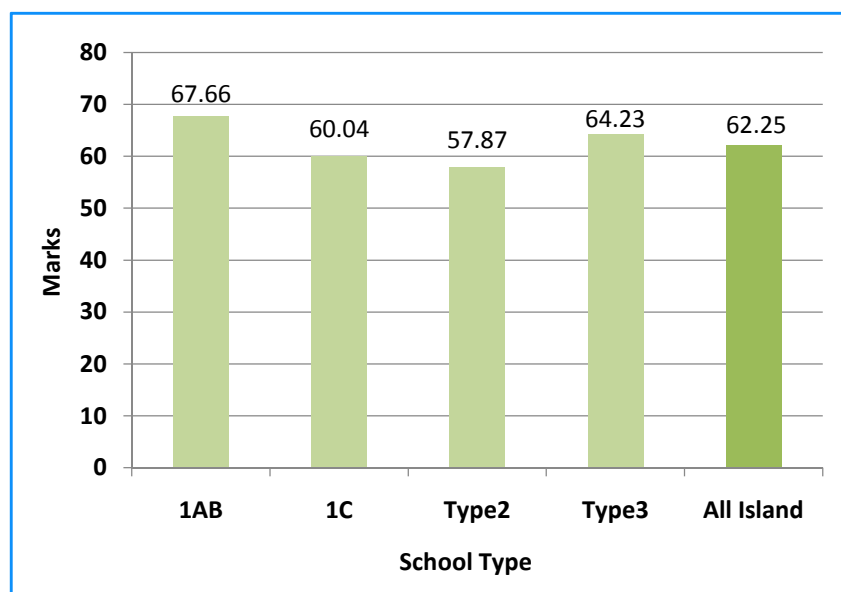
**Table 6.4: Mathematics achievement according to school type**

School Type	Mean	Standard Error of Mean	Standard Deviation	Skewness	Percentile (p25)	Median (p50)	Percentile (p75)
1AB	67.66	0.08	19.31	-0.69	55.0	72.5	82.5
1C	60.04	0.07	20.89	-0.29	45.0	62.5	77.5
Type 2	57.87	0.07	22.00	-0.22	40.0	60.0	77.5
Type 3	64.23	0.06	21.17	-0.54	47.5	67.5	82.5
<b>All Island</b>	<b>62.25</b>	<b>0.04</b>	<b>21.30</b>	<b>-0.43</b>	<b>45.0</b>	<b>65.0</b>	<b>80.0</b>

As Table 6.4 indicates there is a considerable gap between the mean scores of different school types. However, 1AB schools' mean score is above that of the other types and also above the national mean. Type 3 schools mean score is also above the national

mean. On the other hand, the mean scores of Type 2 and 1C schools, are below the national mean. Therefore, the gap between school types exists.

The difference in mean scores is graphically shown in Fig. 6.5.



*Fig.6.5: Bar chart representing the mean among the school types- Mathematics*

The performance of the school types is further highlighted when the median scores are considered in Table 5.4. All school types have achieved a high median value for the mathematics achievement. Fifty percent of students in all school types have obtained scores above the mean value. However, 1AB and Type 3 schools median value is even higher (72.5 and 67.00).

### **Variation among students**

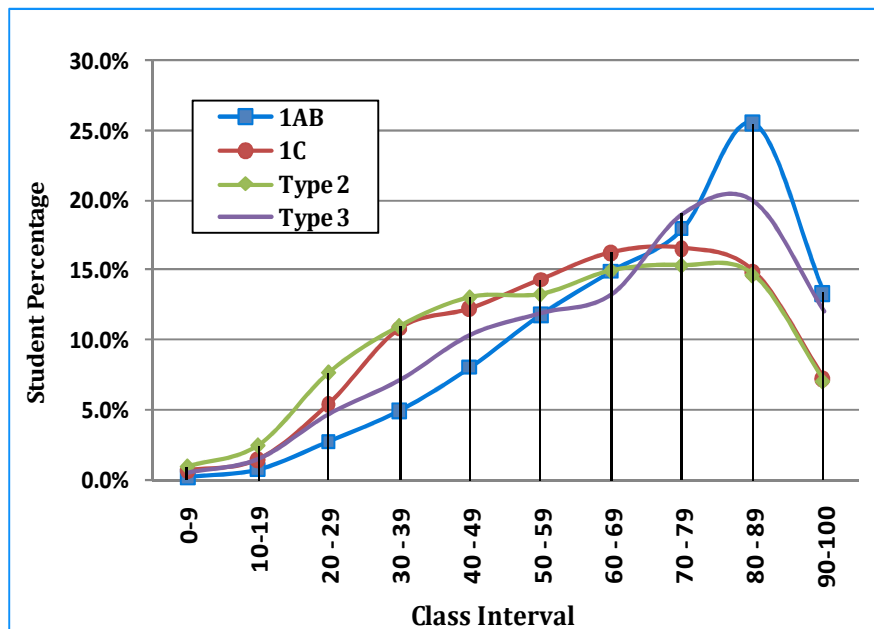
Variation in student achievement in 1AB and 1C school types is low. Lower standard deviation values are shown by 1AB schools and 1C schools. Those values are lower than the all island SD value as well. It reveals that higher number of student achievement lies closer to the mean value. The dispersion from the mean value is very low. Type 2 schools standard deviation value is the highest among the school types. This indicates that student achievement deviation from the mean is very high. Type 1AB and 1C schools have SD values lower than the all island SD value, but Type 2 and Type 3 schools have SD values above the all island value.



## Disparity in achievement

All school types have obtained negative skewed values. It reveals that in all school types higher number of students has achieved high marks while lower marks are obtained by a lower number of students. Highest skewed value has been obtained by 1AB schools. Next higher value has been obtained by Type 3 schools. Both values are above the all island skewness value. Type 2 and 1C schools' skewness value is lower than the all island value, indicating that there is greater variation in achievement in these schools.

The variation in student performance in different types of schools is further highlighted through the frequency distribution graphs.



*Fig. 6.6: Dispersion of marks by school type - Mathematics*

Fig. 6.6 displays that 1AB and Type 3 school curves peaked at the 80-89 class interval. While in Type 2 and 1C schools the peak spreads over three mark intervals.

The spread of marks at different mark intervals is further illustrated in the cumulative percentage Table 6.5.

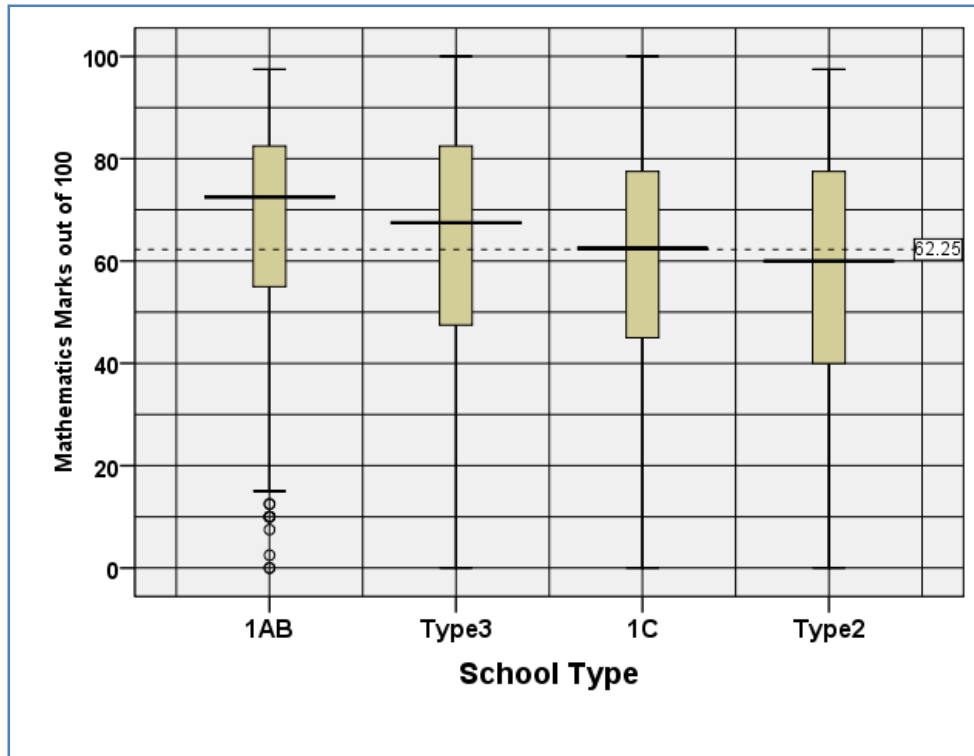
**Table 6.5: Cumulative student percentages according to school type- Mathematics**

Class Interval	1AB		1C		Type 2		Type 3	
	Student %	Cumulative %	Student %	Cumulative %	Student %	Cumulative %	Student %	Cumulative %
0 - 9	0.14	0.14	0.64	0.64	0.89	0.89	0.41	0.41
10 - 19	0.69	0.83	1.47	2.11	2.41	3.30	1.40	1.81
20 - 29	2.71	3.54	5.46	7.57	7.63	10.92	4.64	6.45
30 - 39	4.91	8.45	10.82	18.39	10.95	21.88	7.08	13.52
40 - 49	8.02	16.47	12.26	30.65	13.02	34.89	10.33	23.85
50 - 59	11.81	28.28	14.34	44.99	13.25	48.14	11.90	35.75
60 - 69	14.92	43.19	16.27	61.26	14.94	63.07	13.26	49.00
70 - 79	17.95	61.14	16.58	77.84	15.31	78.38	19.03	68.04
80 - 89	<b>25.53</b>	<b>86.67</b>	<b>14.92</b>	<b>92.77</b>	<b>14.62</b>	<b>93.00</b>	<b>19.95</b>	<b>87.98</b>
90 - 100	13.33	100.00	7.23	100.00	7.00	100.00	12.02	100.00
Total	100.00		100.00		100.00		100.00	

In the 1AB school types high percentage of students has scored between 80-89. In Type 3 schools there is almost equal percent of students in the class intervals 80-89 and 70-79 (19.95 and 19.03). In other school types majority of the students do not belong to these class intervals. When considering student marks below 40 points, 1AB schools cumulative percentage is 10.82, but in other school types this percentage varies from 18.39 in 1C Type to 21.88 in Type 2 schools.

The analysis of data pertaining to the school types indicates disparity in achievement.

This is further illustrated through the box plot.



*Fig. 6.7: Mathematics marks according to school types using box plot and whisker plot*

1AB schools and Type 3 show a similarity at the 75<sup>th</sup> percentile. However, in Type 3 schools the 25<sup>th</sup> percentile is lower. On the other hand in the other two school types also the 75<sup>th</sup> percentile is quite high. However, the 25<sup>th</sup> percentile is low indicating low achievers. Yet only 1AB schools have outliers.

## Summary

- The achievement in mathematics in 1AB and Type 3 schools are relatively similar
- At the same time the performance of Type 2 and 1C schools are also similar
- The gap in achievement between school types appears to be narrowing in 1AB and Type 3 schools but widening between these schools and in Type 2 and 1C schools.

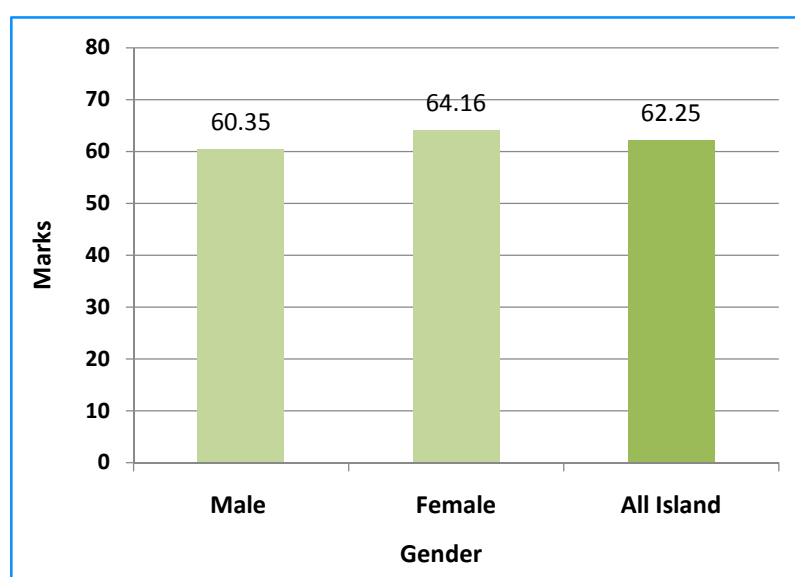
## 6.5 Achievement levels by gender

**Table 6.6: Mathematics achievement according to gender**

Student Gender	Mean	Standard Error of Mean	Standard Deviation	Skewness	Percentile (p25)	Median (p50)	Percentile (p75)
Male	60.35	0.05	21.93	-0.32	42.5	62.5	80.0
Female	64.16	0.05	20.47	-0.53	50.0	67.5	80.0
<b>All Island</b>	62.25	0.04	21.30	-0.43	45.0	65.0	80.0

There is a difference in the achievement of females over males. As Table 6.6 indicates, male performance is also lower than the all island mean score, while female performance is above the all island mean.

These differences could also be seen in Fig. 6.8

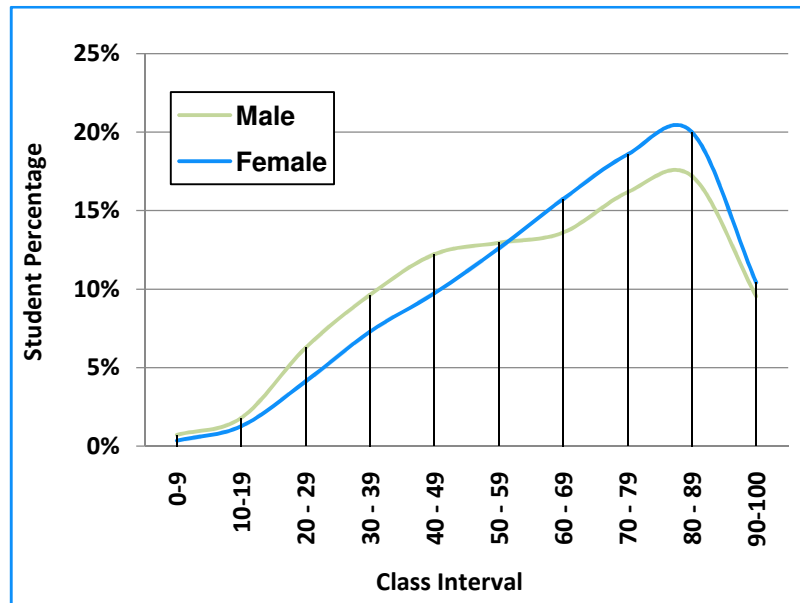


**Fig. 6.8: Bar chart representing mean values according to gender - Mathematics**

### Variation among students

Variation in achievement among males is higher than that of the female students. This is indicated by the male students obtaining a higher SD value than the female students as well as the all island SD (Table 6.6). On the other hand, the female students SD is below the all island SD. Further, the female skewness value is higher than the all island as well as the male value. This indicates that there are more high achievers among the females.

Fig. 6.9 graphically illustrates the dispersion of marks according to gender.



**Fig. 6.9: Dispersion of marks by gender – Mathematics**

Fig. 6.9 displays two curves which are both negatively skewed. As can be seen there are more high achievers than low achievers among both males and females. However the pattern of the two curves are slightly different. At the beginning the curves are similar, then the curves become different and at the 50-59 class interval they cut across. But the female curve then rises above the male curve and finally, both curves become similar again.

The disparity in the male students' achievement can be elaborated better through the cumulative percentages.

**Table 6.7: Cumulative student percentages according to the gender –Mathematics**

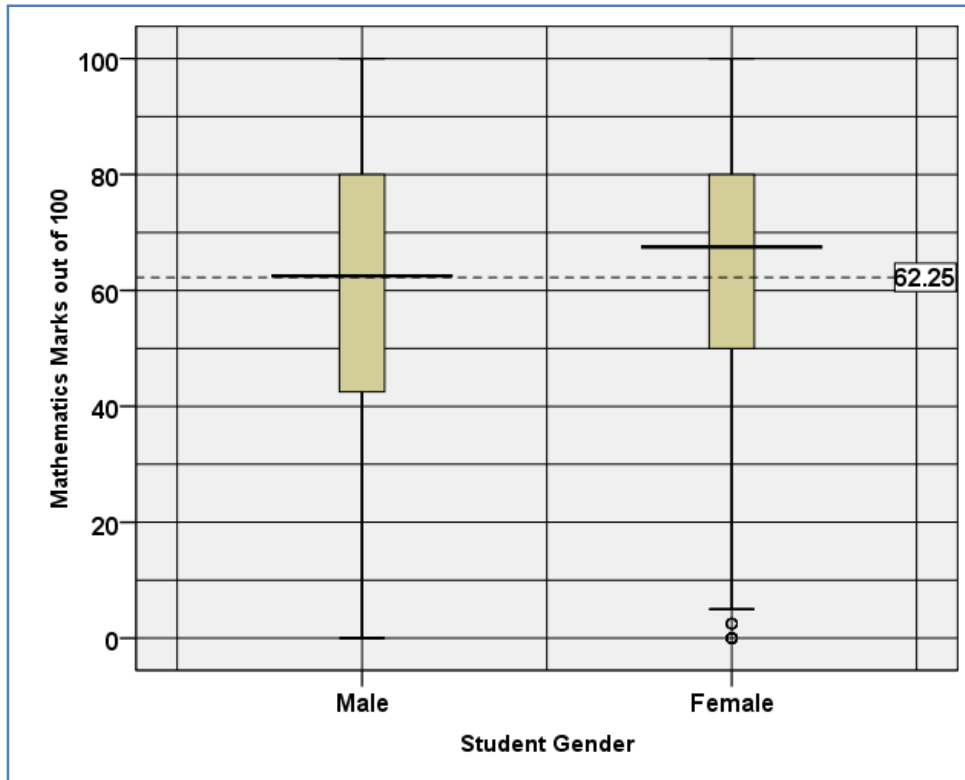
Class Interval	Male		Female	
	Student %	Cumulative %	Student %	Cumulative %
0 - 9	0.71	0.71	0.35	0.35
10 - 19	1.79	2.49	1.26	1.61
20 - 29	6.24	8.74	4.10	5.71
<b>30 - 39</b>	9.61	18.35	7.28	12.99
40 - 49	12.21	30.56	9.73	22.71
50 - 59	12.95	43.51	12.57	35.28
<b>60 - 69</b>	13.60	57.10	15.73	51.01
70 - 79	16.17	73.28	18.57	69.58
<b>80 - 89</b>	17.20	90.47	20.00	89.58
90 - 100	9.53	100.00	10.42	100.00
Total	100.00		100.00	

According to Table 6.7 and Fig. 6.9 it could be concluded that among both females and males, there are high performing students. The highest percentage (20.00%) of female students' marks fall into the class interval 80-89. The highest percentage of male students' marks, even though, a lesser percentage (17.20%) falls into the same class interval. This indicates that the high performing boys achievement is higher than that of the high performing girls.

At the 50-59 class interval percentage of male and female students is almost similar (12.95% and 12.57%).

Even though there are only 12.99 cumulative percent of female students who has scored below 40 marks, there are 18.35% of male students who has scored less than 40 marks. Therefore, the heterogeneity in achievement in mathematics of the boys is greater than the girls.

Box plot and whisker for gender wise mathematics achievement shows similarities that has been discussed already.



**Fig. 6.10: Box plot and whisker plot representing gender wise mathematics marks**

Box plot and whisker chart show that male students' 25<sup>th</sup> and 50<sup>th</sup> percentile is lower than the female mark range as well as the all island range. Therefore fifty percent of male students' achievement lie below the female students' achievement. This means that while 50% of male students has scored 62.50, fifty percent of female students has scored above 62.50. On the other hand, both male and female as well as all island marks at the 75<sup>th</sup> percentile are same (80).

Eventhough the female students performance is better than the male students, there are outliers among the females.

## Summary

- Female performance is better than all island and male performance.
- While 12.99% of girls has scored below 40, the male percentage is 18.35.
- Highest percentage of females, 20.00% as well as 18.35% of males fall into the mark range 80-89.

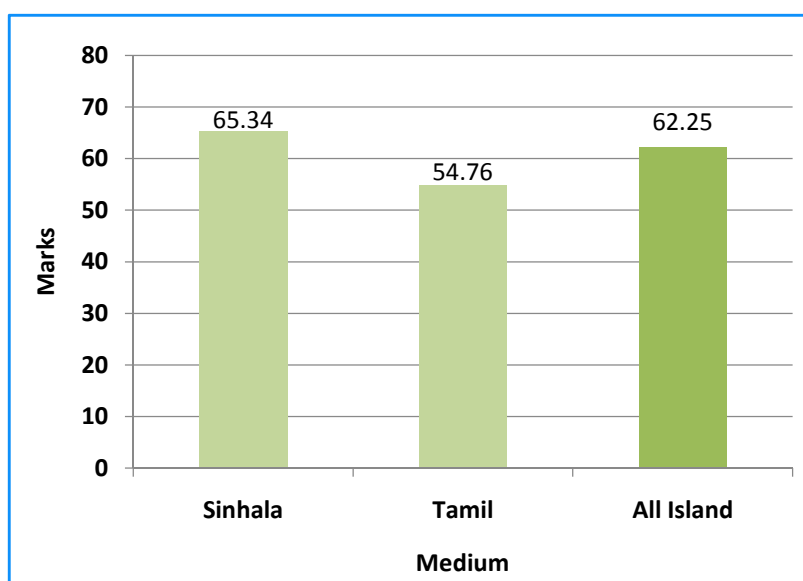
## 6.6 Achievement levels by medium of instruction

**Table 6.8: Mathematics achievement according to medium of instruction**

Location	Mean	Std. Error of Mean	Standard Deviation	Skewness	Percentile 25	Median 50	Percentile 75
Sinhala	65.34	0.04	20.43	-0.58	50.00	70.00	82.50
Tamil	54.76	0.07	21.49	-0.07	37.50	55.00	72.50
All Island	62.25	0.04	21.30	-0.43	45.00	65.00	80.00

There is disparity between the students belonging to the different medium of instruction. While the Sinhala medium students' mean achievement is above the all island mean value, the Tamil medium students' mean achievement is below the national mean average.

These disparities are further highlighted through the bar chart given in Fig. 6.11.



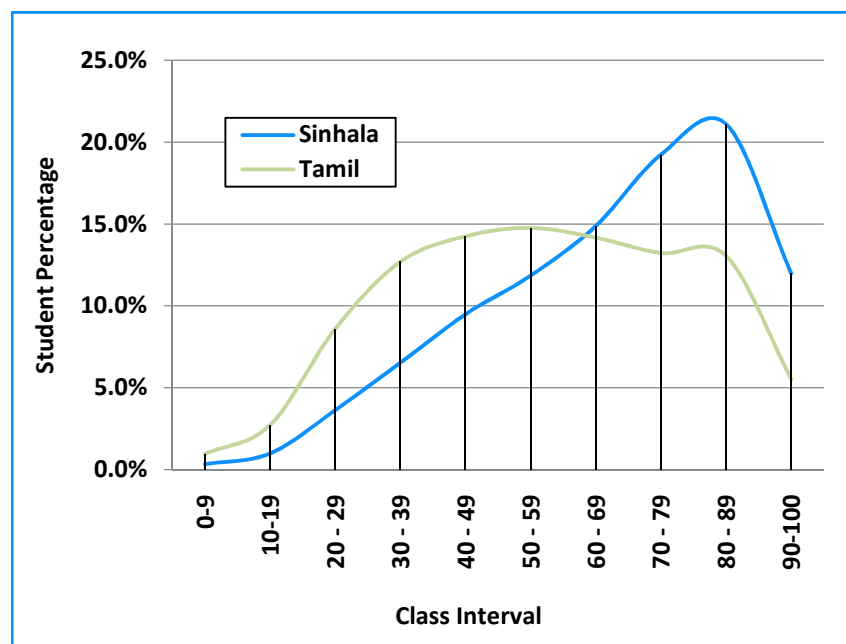
**Fig. 6.11: Bar chart representing mean values according to medium of instruction - Mathematics**

As Table 5.8 indicates Tamil medium students SD is higher than the Sinhala medium students and is higher than the national SD. Thus there is greater variation in their performance.



Sinhala medium students' achievement curve shows negative skewness value. This means that majority of the students has scored high marks. On the other hand, the Tamil medium students' achievement curve though negative shows that it has skewed more towards the positive direction. This denotes that majority of the students is low achievers. Sinhala medium students' achievement has greatly impacted on the all island achievement.

The diversity in achievement scores among the students taught through the different medium of instruction, is further highlighted through the frequency distribution graphs.



**Fig. 6.12: Dispersion of marks by medium of instruction – Mathematics**

The two curves on Fig. 6.12 shows two different patterns. While the Sinhala medium curve is negatively skewed with more students scoring high marks the Tamil medium students marks are spread. There are low achievers as well as high achievers. However, the high achievers are slightly more. This pattern can be explained through Table 6.9.

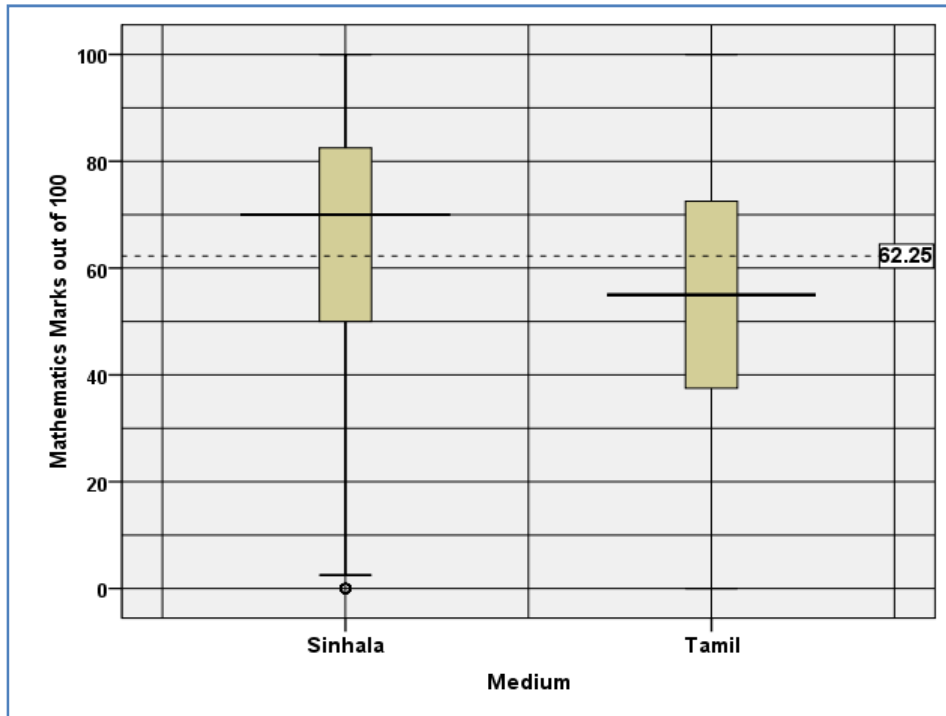
**Table 6.9: Cumulative student percentages according to medium of instruction - Mathematics**

Class Interval	Sinhala		Tamil	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.33	0.33	0.96	0.96
10-19	0.98	1.32	2.72	3.68
20 - 29	3.63	4.94	8.60	12.28
30 - 39	6.52	11.47	12.70	24.98
40 - 49	9.49	20.95	14.26	39.24
50 - 59	11.85	32.80	14.77	54.01
60 - 69	14.88	47.69	14.17	68.18
70 - 79	19.24	66.92	13.24	81.42
80 - 89	21.10	88.02	13.06	94.47
90-100	11.98	100.00	5.53	100.00
Total	100.00		100.00	

As Table 6.9 indicates the highest percentage of the Sinhala medium students' marks is in the range of 70-100. This amounts to more than 50%. On the other hand, the highest percentage of Tamil medium students marks concentrate between 40-70.

Considering the pass mark as 40, only 11.47% of Sinhala medium students has scored below the pass mark. On the other hand 24.98% of Tamil medium students has scored below the pass mark.

Box plot for medium wise achievement graphically shows the differences that have been discussed already.



**Fig. 6.13: Mathematics marks according to medium of instruction using box plot and whisker plot**

Box plot and whisker plot chart shows high differences among both media. However, Sinhala medium dispersion of marks in the box plot is less than the Tamil medium students' dispersion of marks.

Sinhala medium student's 25<sup>th</sup>, 50<sup>th</sup> and 75<sup>th</sup> percentile values are higher than that of the Tamil medium students. Therefore, this confirms that there is disparity between the performance in mathematics of Tamil and Sinhala medium students.

### Summary

- There is wide disparity among students belonging to different medium of instruction.
- The Sinhala medium students' mean score is above the national mean while the Tamil medium students' mean is lower.

Students achievement in relation to the location of the school would be discussed next.

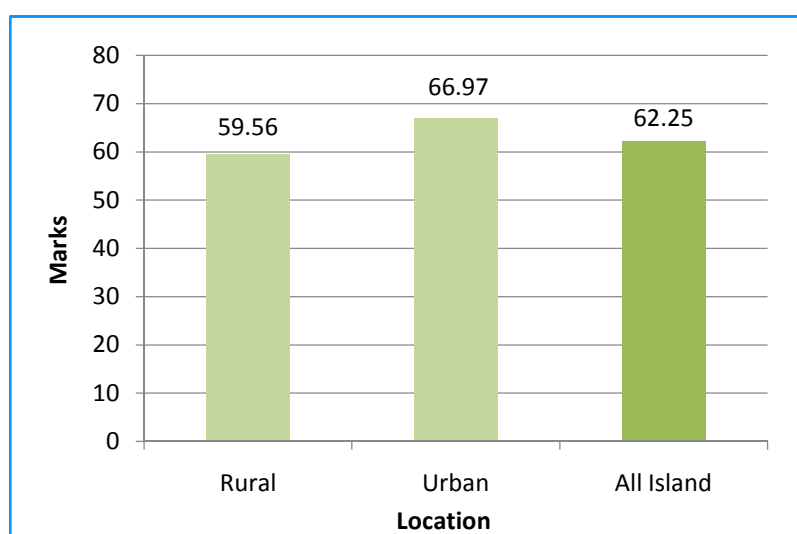
## 6.7 Achievement levels by location

**Table 6.10: Mathematics achievement according to location**

Location	Mean	Std. Error of Mean	Standard Deviation	Skewness	Percentile 25	Median 50	Percentile 75
Rural	59.56	0.05	21.43	-0.30	42.5	62.5	77.5
Urban	66.97	0.06	20.21	-0.66	52.5	70.0	85.0
<b>All Island</b>	62.25	0.04	21.30	-0.43	45.0	65.0	80.0

As Table 6.10 indicates, there is variation in achievement among the schools in the different localities. The Urban Council area schools have performed better than the rural area schools. Rural area schools have performed below the national mean while the urban schools have performed above the national mean.

The difference in mean values is graphically shown in Fig. 6.14



**Fig. 6.14: Bar chart representing mean values according to location– Mathematics**

As Fig. 6.14 indicates the mean values in the rural area schools are lower than urban council areas.

According to Table 6.10 the SD also differs in the two localities even though not to a great extent. However, while the SD of the rural schools is closer to the all island SD, the urban schools SD is lower than the all island SD denoting less variation.

Students' achievement is further elaborated through the frequency distribution graphs in Fig. 6.15.

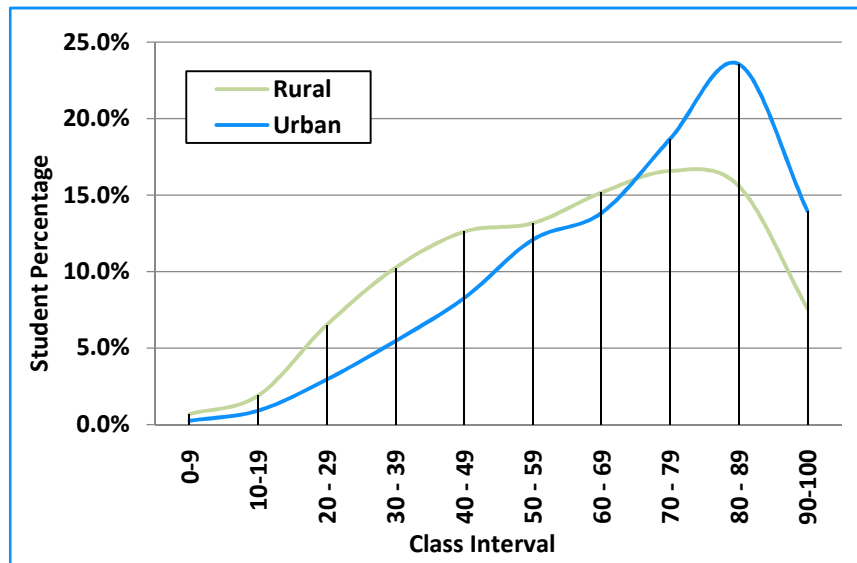


Fig. 6.15: Dispersion of marks by location - Mathematics

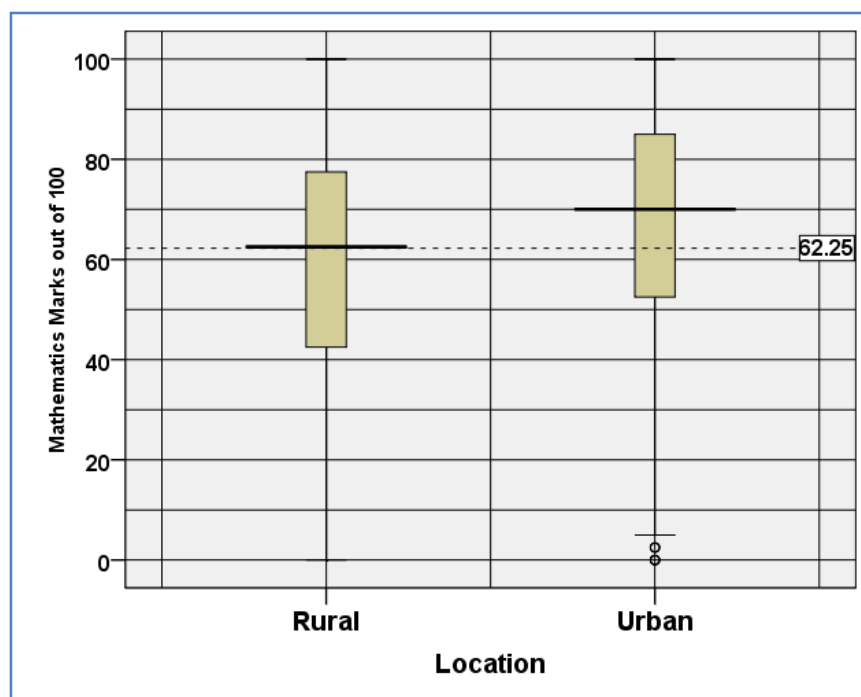
Fig. 6.15 displays two negatively skewed graphs. This means that in both localities the high achievers are greater than the low achievers. While the curve representing the rural areas is smooth, the shape of the curve representing the performance of urban schools is different. This difference can be explained using the cumulative percentage Table 6.11.

Table 6.11: Cumulative student percentages according to the location -Mathematics

Class Interval	Rural		Urban	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.69	0.69	0.26	0.26
10-19	1.89	2.58	0.92	1.17
20 - 29	6.52	9.10	2.95	4.13
<b>30 - 39</b>	10.25	19.35	5.47	9.60
40 - 49	12.60	31.95	8.28	17.87
50 - 59	13.16	45.11	12.09	29.97
60 - 69	15.16	60.27	13.84	43.81
70 - 79	16.58	76.85	18.68	62.49
<b>80 - 89</b>	15.59	92.44	23.56	86.05
90-100	7.56	100.00	13.95	100.00
Total	100.00		100.00	

According to Table 6.11 the highest percentage of students in urban area schools (23.56%) fall into the class interval 80-89. This is peak of the urban area school curve. On the other hand, in the rural area schools the highest percentage of students falls in to the class interval 70-79 and the percentage is only 16.58. Further, the number of students who has scored less than 40 marks is only 9.6% in the urban schools while it is 19.35% in the rural areas schools.

The spread of marks is further illustrated through the box plot graph.



**Fig. 6.16: Box plot and whisker plot representing location wise mathematics marks**

According to the box plot the urban area schools' performance differ from the rural area schools at the 25<sup>th</sup>, 50<sup>th</sup> and 75<sup>th</sup> percentile. Further their performance is above the all island performance. However, there are some outliers in the urban area schools while there are none in the rural area schools. The box plot confirms the variation that exists between the performance of the two localities.

### Summary

- The performance of the students in the urban council areas is better than in the rural areas.
- The deviation of marks is less in the urban area schools.

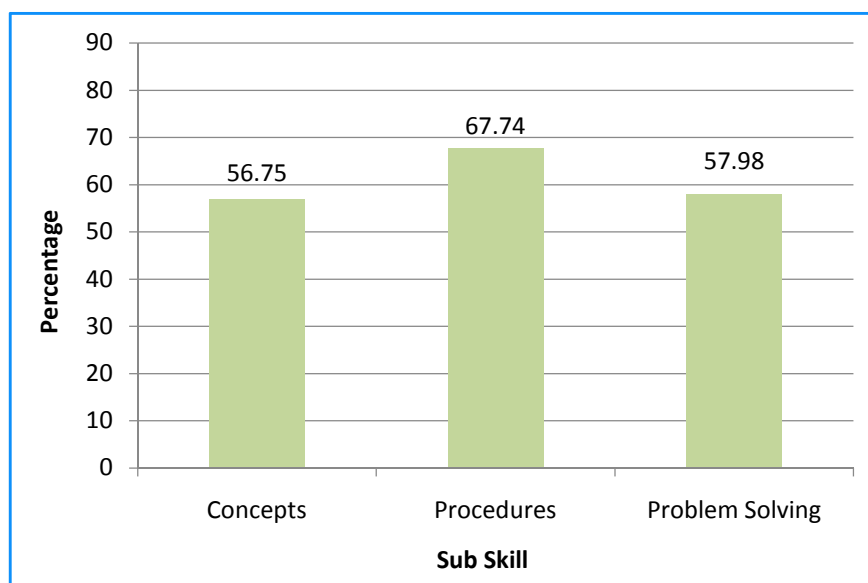
Achievement patterns observed in relation to the achievement in mathematics, revealed that there were variations among provinces, school type, gender and medium wise.

Students' achievement in relation to subject content will be discussed next.

## 6.8 Analysis of achievement by sub skills

In constructing the achievement tests, the test items were designed in relation to the sub skills concepts, procedures and problem solving,

Students' performance according to the sub skills is given in Fig. 6.17



*Fig. 6.17: Achievement in sub skills in mathematics*

Fig. 6.17 displays the mean values for the different sub skills in mathematics. Accordingly the lowest mean value is for concepts.

### Student achievement in relation to Essential Learning Competencies (ELCs)

As discussed in chapter 2, in constructing the paper the Essential Learning Competencies identified for Key Stage 2 were also considered.

Table 6.12 indicates student performance in relation to the ELCs.

**Table 6.12: Students performance in relation to ELCs**

ELC/ DLC	Description	Q. No	2015 correct response %
ELC 9	Correctly measures a length given using standard units	20	65.00%
10	Calculate the balance of a 100 rupees note after spending to buy a product valued less than that	17	68.90%
		34	<b>32.50%</b>
11	Reads a number with three digits	2	84.60%
		4	82.30%
12	Deduct a number from a number with 3 digits with one carrying forward	5	76.80%
		14	64.80%
13	Names the shapes of solid objects using its faces	23	76.00%
14	Measures a given quantity of liquids using appropriate units	33	59.00%
15	write the next of a patterns of numbers with common difference of 3	9	76.60%
16	Names objects situated both at left and right sides of one's own position	16	64.60%
		39	<b>28.60%</b>
17	Read the information presented in a histogram	40	78.60%
18	Read the time by 5 minutes intervals on 12 hours clock	8	78.00%
19	Multiplies a number with 2 digits by 2 and 3 without carrying forward	10	79.20%
20	Divides a number less than 3 digits by 2 without carrying forward	18	59.50%
21	Adds two numbers with three digits without carrying forward	01	86.60%
22	Solves simple problems with only one mathematical operation	6	76.30%
		7	75.20%
		11	77.70%
		12	32.80%
		13	62.00%
		15	78.40%
		19	75.20%
		21	78.20%
		22	67.50%
		25	60.20%
		26	66.20%
		30	52.10%
32	40.50%		
36	39.90%		
DLC1	Place numbers of not higher than 4 digits in descending order	24	43.90%



ELC/ DLC	Description	Q. No	2015 correct response %
4	Identifies 'half' and 'quarter' as a portion of a complete unit	38	<b>29.80%</b>
5	Use Roman numbers from -10	3	78.60%
22	Measures a given quantity in Kg	35	<b>22.30%</b>
23	Converts Kg into g	28	57.40%
26	Measures area of a given surface using desired units	31	50.40%
34	Create geometrical shapes	29	56.40%
35	Draw rectangular shapes	27	63.10%
38	Separates the symmetrical figures	37	44.30%

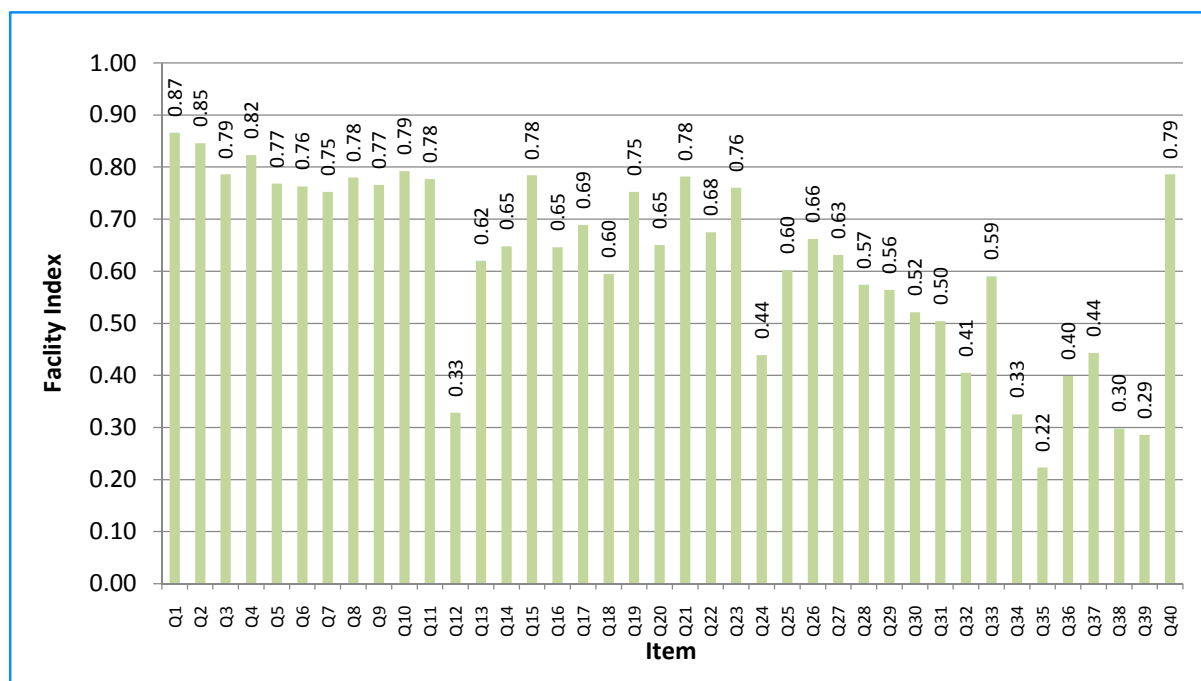
As Table 6.12 indicates, student performance in relation to each ELC is 60% or above except in the competency 16. That is “Names objects situated both at left and right sides of one's own position”. The percentage of correct responses to the question pertaining to this competency is 28.6%.

### Facility index values for the mathematics paper

The mathematics paper consisted of forty supply type questions.

Fig. 6.18 displays the facility values for questions 1-40.

According to this Figure, the most difficult items had been questions 35, 39, and 38. Therefore, it confirms that students' achievement of the competency related to this question, as discussed above is not satisfactory.



**Fig. 6.18: Facility values for the different test items –Mathematics**

According to Fig. 6.18 the facility values ranges from 0.22 to 0.87

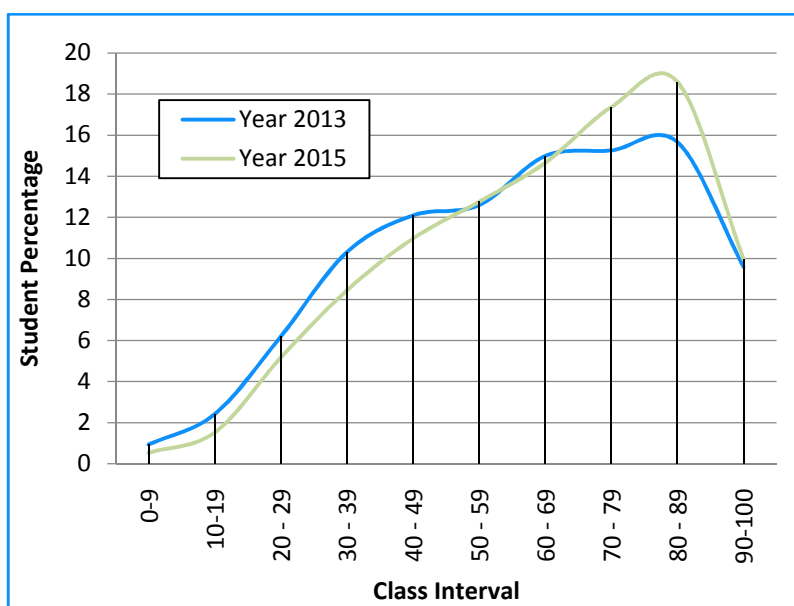
Part I of this chapter discussed students’ performance in mathematics both at national and provincial level, according to school type, gender, medium of instruction and location.

Further, test items used to assess students’ performance were analyzed to assess how far they have been successful in achieving the sub skills of mathematics in grade 4 students.

## **Part II - Comparison of achievement level of students in 2013 with that of 2015**

Trends in achievement over the period 2013-2015 will first be discussed at national level.

## 6.9 Trends in achievement at national level



**Fig. 6.19: All island achievement in mathematics comparison 2013 -2015 – dispersion of marks**

As Fig 6.19 indicates there is an improvement in students' achievement in the year 2015. The line curve for 2015 shows that the percentage of low achievers has decreased and the percentage of high achievers has increased. This has resulted in an increase in the mean value from 60.32 to 62.25.

This change is further elaborated through the cumulative percentage table.

**Table 6.13: Comparison of all island achievement in mathematics - cumulative percentages**

Class Interval	Year 2013		Year 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.94	0.94	0.53	0.53
10-19	2.42	3.36	1.52	2.05
20 - 29	6.20	9.56	5.17	7.22
30 - 39	10.30	19.86	8.44	15.67
40 - 49	12.09	31.95	10.97	26.64
50 - 59	12.59	44.54	12.76	39.40
60 - 69	14.98	59.52	14.66	54.06
70 - 79	15.25	74.77	17.37	71.43
80 - 89	15.65	90.42	18.60	90.03
90-100	9.58	100.00	9.97	100.00
Total	100.00		100.00	

The percentage of low achievers, those who have scored below 40% has decreased from 19.86 % to 15.67%. On the other hand the percentage of students who has scored between 50-100 has risen from 80.14 to 84.33.

provincial level performance has contributed to the national level achievement. The trend in provincial level achievement will be discussed next.

### 6.10 Provincial wise comparison of student achievement

As Fig 6.20 displays that all provinces have recorded an improvement in achievement. Therefore, they have all contributed to the increase in the all island mean value. It is significant to note that the increase is more in the low performing provinces than in the high performing provinces. Central, Northern and Eastern Provinces performance has increased by nearly 4 points while in the other provinces the increase is by 1- 3 points.

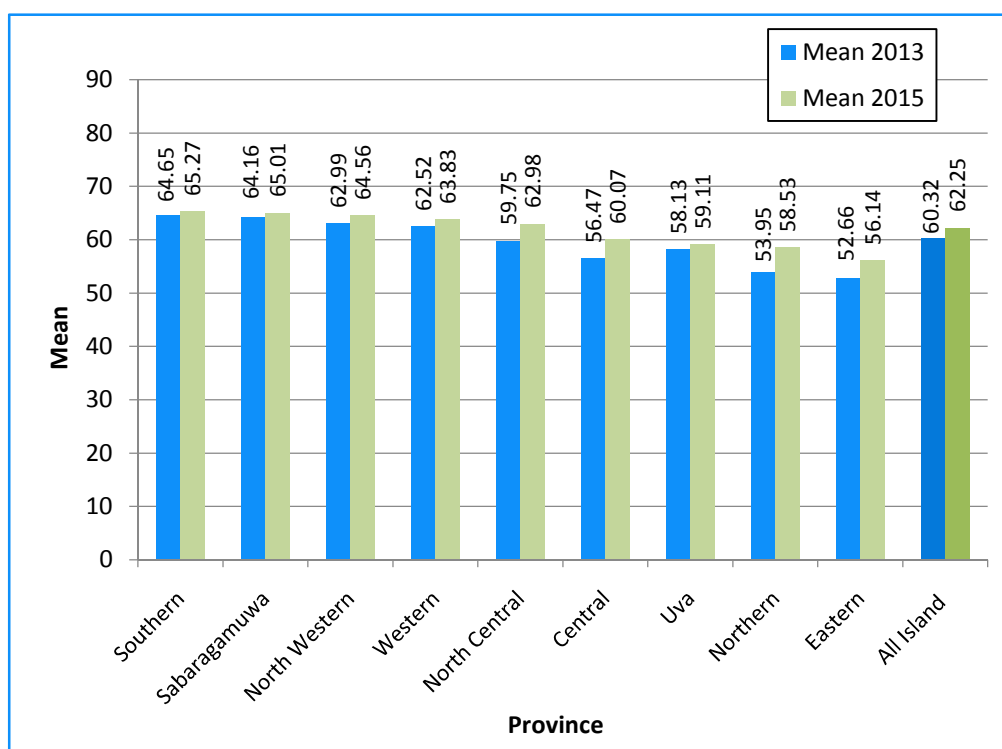


Fig. 6.20: Provincial wise comparison of student achievement - 2013 & 2015

**Table 6.14: Provincial wise comparison of student achievement – 2013 & 2015**

Province	Year 2013		Year 2015		Z
	Mean	Standard Deviation	Mean	Standard Deviation	
Central	56.47	22.39	60.07	20.79	4.79*
Eastern	52.66	23.30	56.14	22.38	4.02*
North Central	59.75	21.40	62.98	19.71	4.35*
North Western	62.99	22.29	64.56	20.56	2.09*
Northern	53.95	21.76	58.53	21.82	5.33*
Sabaragamuwa	64.16	21.56	65.01	19.97	1.23
Southern	64.65	21.38	65.27	21.25	0.87
Uva	58.13	22.54	59.11	21.61	1.19
Western	62.52	21.47	63.83	21.34	1.80
<b>All Island</b>	60.32	22.31	62.25	21.30	7.47*

\* Values are significant at 95%

As the line curve for the Central Province illustrates the percentage of high achievers in the range of 50-90 has increased.

Similarly, the Northern and Eastern Provinces curves also show an increase in high performances. These increase have positively impacted on the mean values of these provinces. As Table 6.14 indicates these changes are significant.

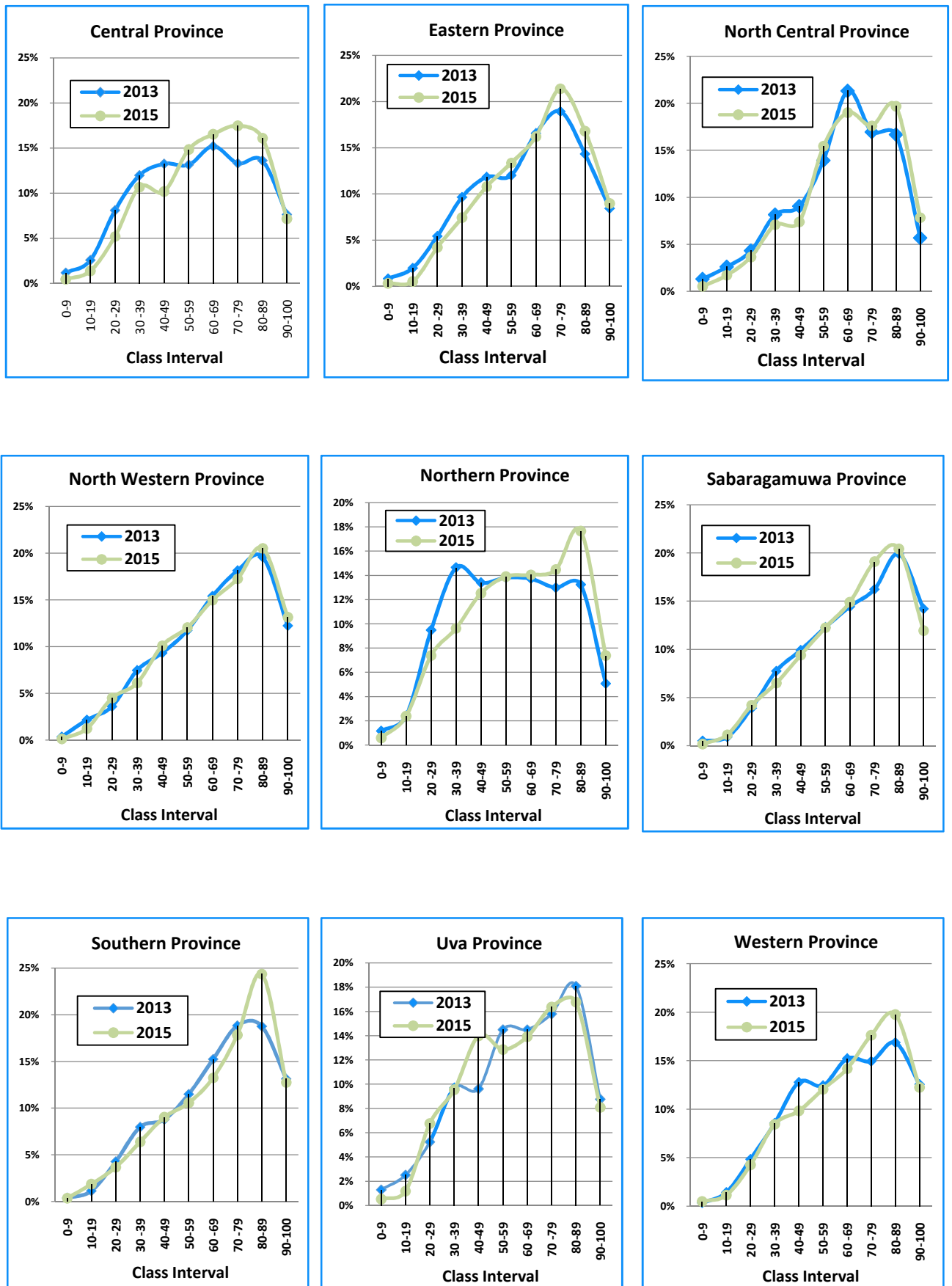


Fig. 6.21: Comparison of provincial wise distribution of marks – Mathematics

### 6.11 Comparison of marks according to school type

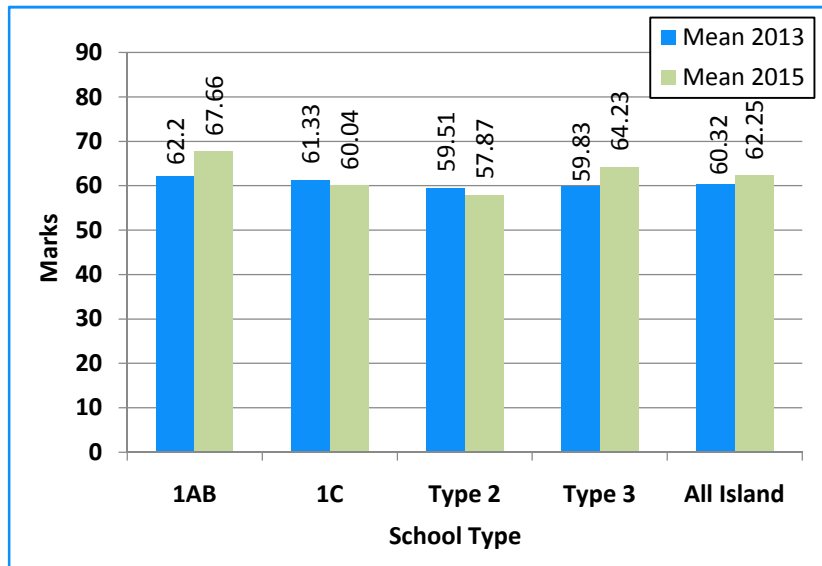


Fig. 6.22: All island comparison of mean values according to school type

As the bar graphs indicate there is an improvement in achievement in 1AB schools as well as in Type 3 schools. This increase is almost similar and the performance of these two school types has contributed to the increase in all island mathematics performance in the year 2015. On the other hand, there is a decrease in performance in 1C and Type 2 schools. The downward trend in these two school types is also identical. Therefore, action needs to be taken to improve the performance of Type 2 and 1C schools as otherwise the gap between the performances in different school types will increase.

Table 6.15: Comparison of achievement of 1AB schools

Class Interval	1AB-Year 2013		1AB-Year 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.47	0.47	0.14	0.14
10-19	1.13	1.60	0.69	0.83
20 - 29	5.39	6.99	2.71	3.54
30 - 39	10.98	17.96	4.91	8.45
40 - 49	10.91	28.88	8.02	16.47
50 - 59	12.38	41.25	11.81	28.28
60 - 69	15.83	57.09	14.92	43.19
70 - 79	15.17	72.26	17.95	61.14
80 - 89	18.36	90.62	25.53	86.67
90-100	9.38	100.00	13.33	100.00
Total	100		100	

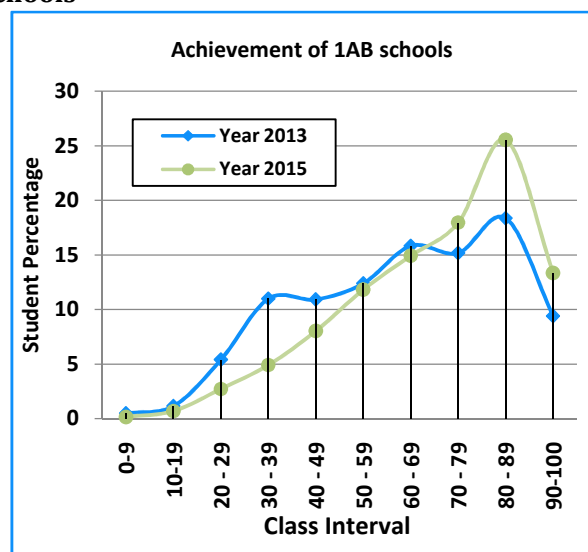
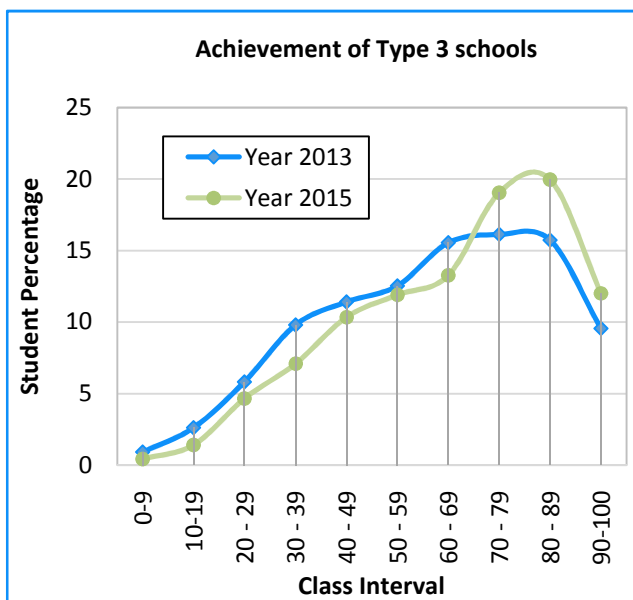


Fig 6.23: Comparison of achievement of 1AB schools - 2013 & 2015

As the Table 6.15 and Fig. 6.23 illustrates the mean value has increased as the percentage of students that fall into the class intervals 70-79, 80-89 and 90-100 has increased.

**Table 6.16: Comparison of achievement of Type 3 schools**

Class Interval	Type 3 - 2013		Type 3 - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.91	0.91	0.41	0.41
10-19	2.60	3.51	1.40	1.81
20 - 29	5.82	9.33	4.64	6.45
30 - 39	9.79	19.12	7.08	13.52
40 - 49	11.40	30.53	10.33	23.85
50 - 59	12.53	43.06	11.90	35.75
60 - 69	15.54	58.60	13.26	49.00
70 - 79	16.12	74.72	19.03	68.04
80 - 89	15.73	90.45	19.95	87.98
90-100	9.55	100.00	12.02	100.00
Total	100		100	

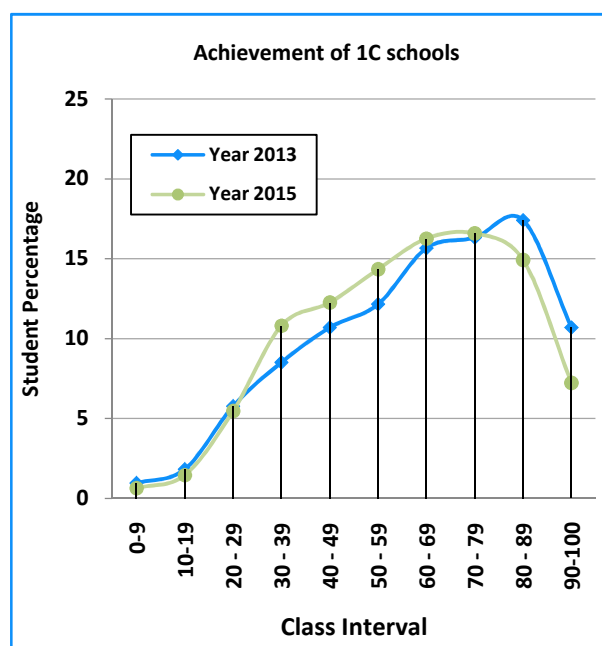


**Fig 6.24: Comparison of achievement of Type 3 schools – 2013 & 2015**

In Type 3 schools also a similar trend can be observed.

**Table 6.17: Comparison of achievement of 1C schools**

Class Interval	1C - 2013		1C - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.96	0.96	0.64	0.64
10-19	1.82	2.78	1.47	2.11
20 - 29	5.77	8.54	5.46	7.57
30 - 39	8.51	17.06	10.82	18.39
40 - 49	10.70	27.76	12.26	30.65
50 - 59	12.15	39.91	14.34	44.99
60 - 69	15.67	55.58	16.27	61.26
70 - 79	16.32	71.90	16.58	77.84
80 - 89	17.40	89.30	14.92	92.77
90-100	10.70	100.00	7.23	100.00
Total	100		100	



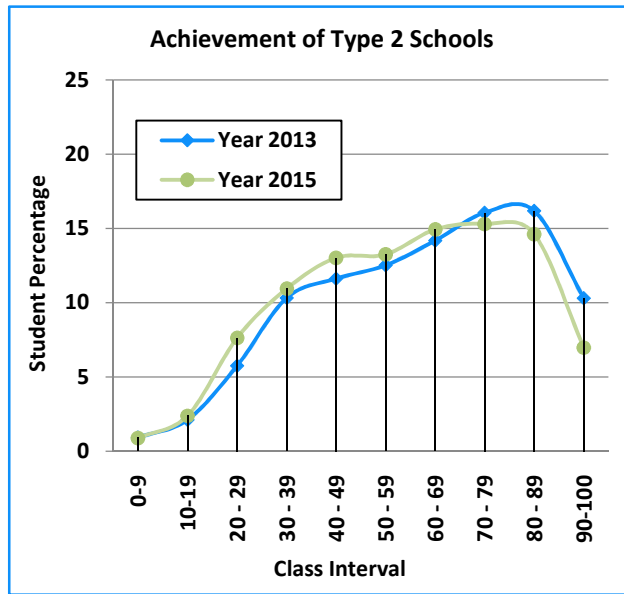
**Fig 6.25: Comparison of achievement of 1C schools – 2013 & 2015**



On the other hand, in 1C schools the percentage of students who has scored marks between 80-100 had declined.

**Table 6.18: Comparison of achievement of Type 2 schools**

Class Interval	Type 2 - 2013		Type 2 - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.93	0.93	0.89	0.89
10-19	2.12	3.05	2.41	3.30
20 - 29	5.76	8.81	7.63	10.92
30 - 39	10.33	19.13	10.95	21.88
40 - 49	11.63	30.76	13.02	34.89
50 - 59	12.52	43.28	13.25	48.14
60 - 69	14.18	57.46	14.94	63.07
70 - 79	16.05	73.51	15.31	78.38
80 - 89	16.18	89.69	14.62	93.00
90-100	10.31	100.00	7.00	100.00
Total	100		100	

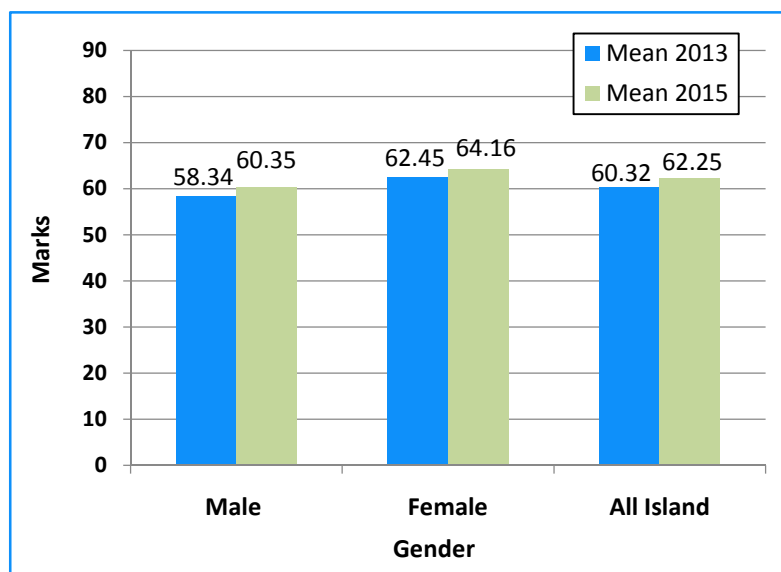


**Fig 6.26: Comparison of achievement of Type 2 schools - 2013 & 2015**

A similar trend in the percentage of high achievers (70-100) declining can be seen.

The trend in achievement gender wise will be discussed next.

### 6.12 Comparison of marks according to gender

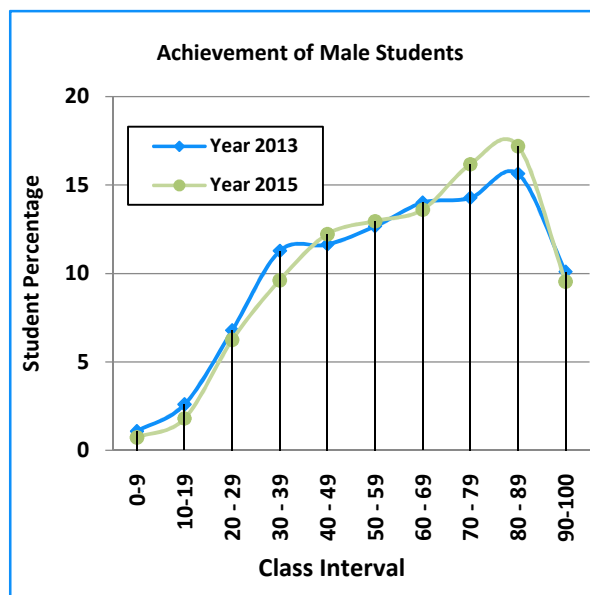


**Fig. 6.27: All island comparison of mean values according to gender**

There is an increase in both male female performance.

**Table 6.19: Comparison of achievement of male students**

Class Interval	Male - 2013		Male - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	1.08	1.08	0.71	0.71
10-19	2.59	3.67	1.79	2.49
20 - 29	6.78	10.45	6.24	8.74
30 - 39	11.27	21.72	9.61	18.35
40 - 49	11.63	33.35	12.21	30.56
50 - 59	12.66	46.01	12.95	43.51
60 - 69	14.00	60.01	13.60	57.10
70 - 79	14.27	74.28	16.17	73.28
80 - 89	15.63	89.91	17.20	90.47
90-100	10.09	100.00	9.53	100.00
Total	100		100	

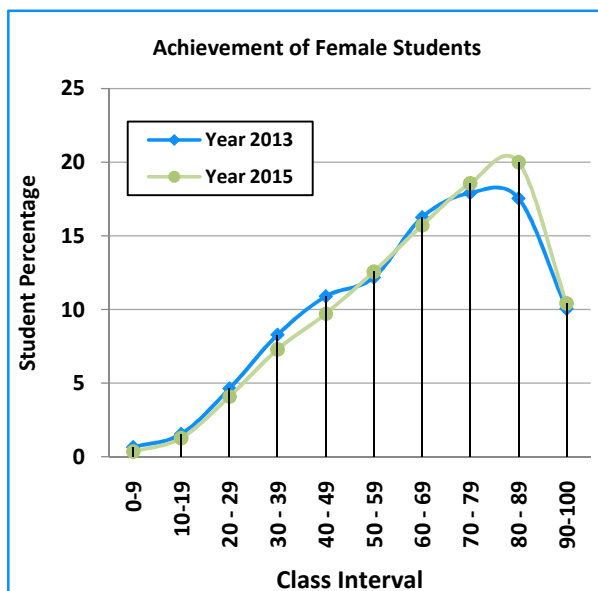


**Fig.6.28: Comparison of achievement of male students – 2013 & 2015**

As Fig. 6.28 illustrates the percentage of high achievers scoring between 70-100 has increased.

**Table 6.20: Comparison of achievement of female students**

Marks range	Female - 2013		Female - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.67	0.67	0.35	0.35
10-19	1.55	2.22	1.26	1.61
20 - 29	4.63	6.85	4.10	5.71
30 - 39	8.28	15.13	7.28	12.99
40 - 49	10.89	26.02	9.73	22.71
50 - 59	12.18	38.20	12.57	35.28
60 - 69	16.27	54.47	15.73	51.01
70 - 79	17.92	72.39	18.57	69.58
80 - 89	17.55	89.94	20.00	89.58
90-100	10.06	100.00	10.42	100.00
Total	100		100	



**Fig.6.29: Comparison of achievement of female students – 2013 & 2015**

A similar trend is observed in female performance as well. The percentage of high achievers scoring between 70-100 has increased.

The trend in performance medium wise will be discussed next.

### 6.13 Comparison of marks according to medium of instruction

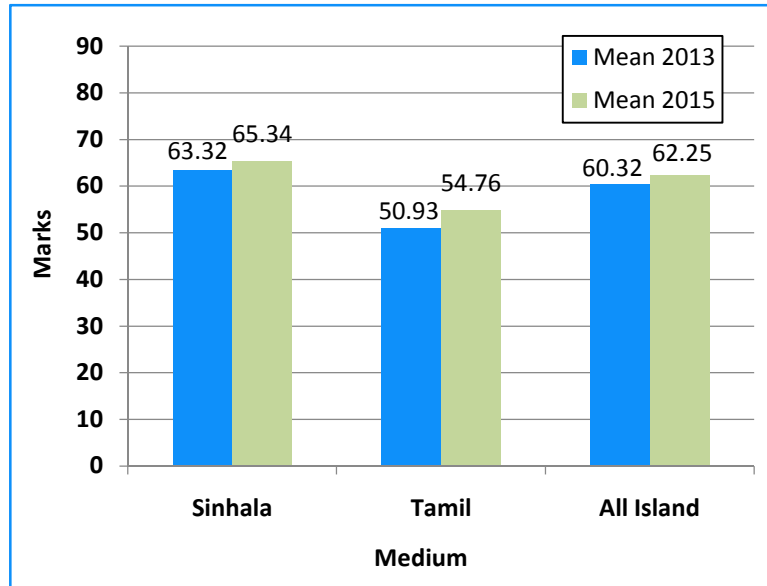


Fig. 6.30: All island comparison of mean values according medium of instruction

There is an improvement in the performance of both Sinhala medium as well as Tamil medium students' performance (Fig. 6.30). However, whereas the Sinhala medium students' performance has been increased by 2 points, the Tamil medium students' performance has increased by nearly 4 points.

Table 6.21: Comparison of achievement of Sinhala medium students

Class Interval	Sinhala - 2013		Sinhala - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.55	0.55	0.33	0.33
10-19	1.48	2.03	0.98	1.32
20 - 29	4.09	6.12	3.63	4.94
30 - 39	7.83	13.96	6.52	11.47
40 - 49	10.29	24.24	9.49	20.95
50 - 59	12.54	36.78	11.85	32.80
60 - 69	15.56	52.35	14.88	47.69
70 - 79	17.24	69.59	19.24	66.92
80 - 89	18.31	87.90	21.10	88.02
90-100	12.10	100.00	11.98	100.00
Total	100		100	

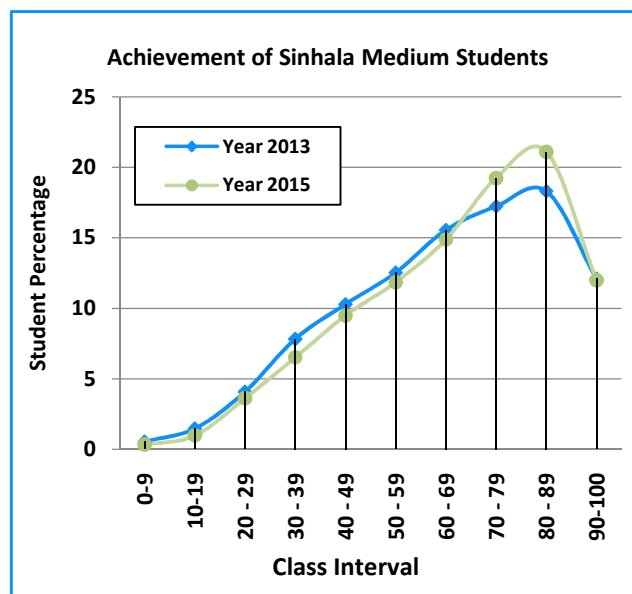
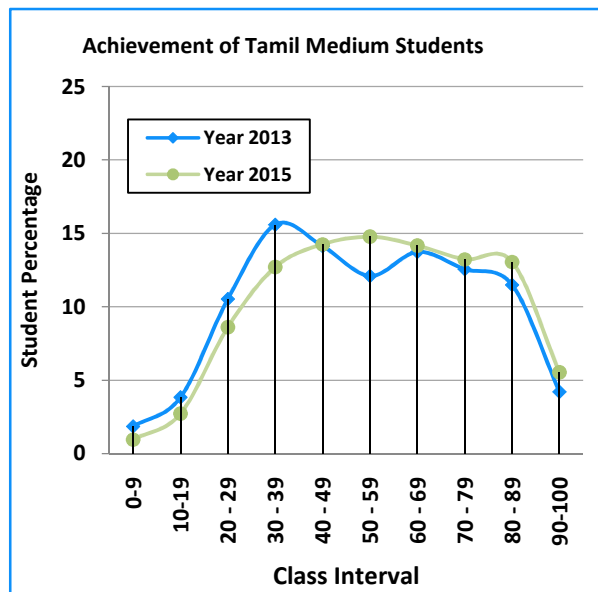


Fig. 6.31: Comparison of achievement of Sinhala medium students - 2013 & 2015

The Sinhala medium students performance has increased between 70-89 class intervals.

**Table 6.22: Comparison of achievement of Tamil medium students**

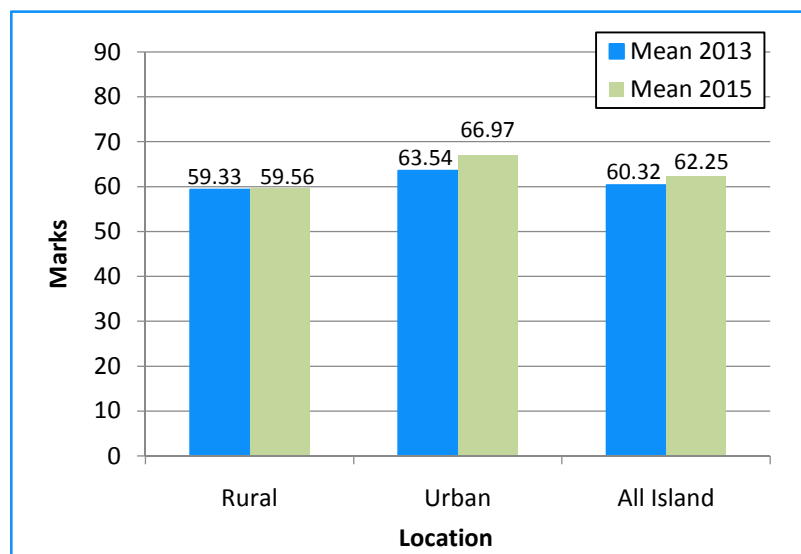
Class Interval	Tamil - 2013		Tamil - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	1.85	1.85	0.96	0.96
10-19	3.83	5.67	2.72	3.68
20 - 29	10.52	16.19	8.60	12.28
30 - 39	15.59	31.78	12.70	24.98
40 - 49	14.13	45.91	14.26	39.24
50 - 59	12.09	58.00	14.77	54.01
60 - 69	13.74	71.74	14.17	68.18
70 - 79	12.56	84.30	13.24	81.42
80 - 89	11.48	95.79	13.06	94.47
90-100	4.21	100.00	5.53	100.00
Total	100		100	



**Fig.6.32: Comparison of achievement of Tamil medium students – 2013 & 2015**

On the other hand, in the Tamil medium performance the increase can be seen between 70-100. Thus the percentage of high achievers is greater.

### 6.14 Comparison of marks according to location

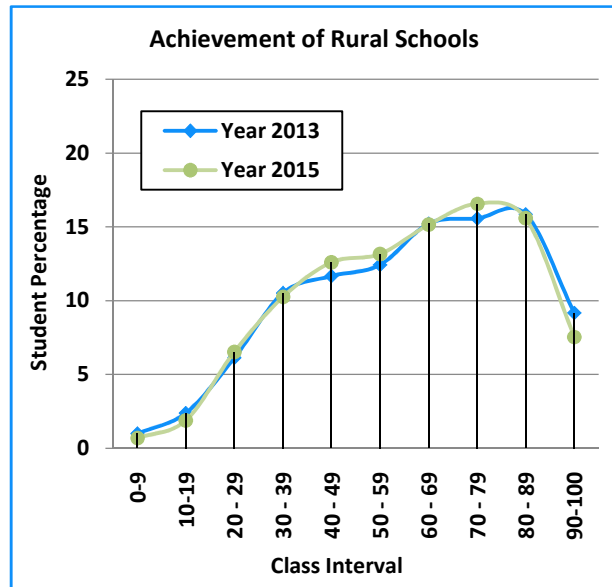


**Fig. 6.33: All island comparison of mean values according to location**

The urban students' performance has increased by three points. on the other hand, the rural students' performance has increased only by .33. Hence this increase is very minimal. Action needs to be taken to improve the rural students achievement levels as otherwise the gap between the rural and urban achievement widens.

**Table 6.23: Comparison of achievement of rural schools**

Class Interval	Rural - 2013		Rural - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.99	0.99	0.69	0.69
10-19	2.39	3.38	1.89	2.58
20 - 29	6.13	9.52	6.52	9.10
30 - 39	10.52	20.03	10.25	19.35
40 - 49	11.68	31.71	12.60	31.95
50 - 59	12.44	44.16	13.16	45.11
60 - 69	15.23	59.38	15.16	60.27
70 - 79	15.58	74.96	16.58	76.85
80 - 89	15.86	90.82	15.59	92.44
90-100	9.18	100.00	7.56	100.00
Total				

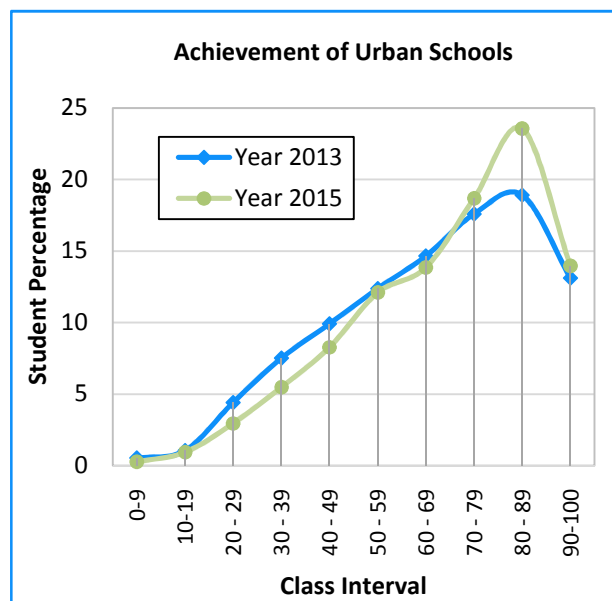


**Fig.6.34: Comparison of achievement of rural schools – 2013 & 2015**

The increase in performance related to those who scored between 70-79 only.

**Table 6.24: Comparison of achievement of urban schools**

Class Interval	Urban - 2013		Urban - 2015	
	Student %	Cumulative %	Student %	Cumulative %
0-9	0.52	0.52	0.26	0.26
10-19	1.05	1.57	0.92	1.17
20 - 29	4.41	5.98	2.95	4.13
30 - 39	7.50	13.48	5.47	9.60
40 - 49	9.90	23.38	8.28	17.87
50 - 59	12.37	35.75	12.09	29.97
60 - 69	14.65	50.40	13.84	43.81
70 - 79	17.58	67.98	18.68	62.49
80 - 89	18.91	86.89	23.56	86.05
90-100	13.11	100.00	13.95	100.00
Total	100		100	

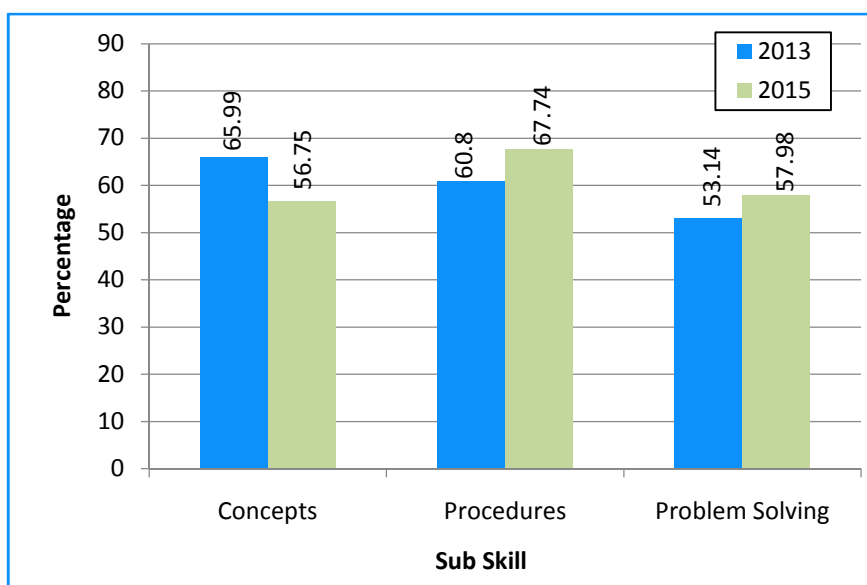


**Fig.6.35: Comparison of achievement of urban schools – 2013 & 2015**

In comparison in urban schools the increase in achievement relates to those who scored between 70-100.

Trends in performance according to the sub skills in mathematics will be discussed next.

### 6.15 Skill analysis comparison



*Fig. 6.36: Comparison of achievement of sub skills in mathematics*

According to Fig. 6.36 students performance in relation to the sub skills of procedures and problem solving has increased. This is a positive trend. On the other hand the knowledge of concepts has declined. This is a trend that needs to be paid attention to as lack of conceptual knowledge will affect the other skills if this trend continues.

**Table 6.25: Comparison of students' achievement in relation to ELCs**

ELC/ DLC	Description	Q. No	2013 correct responses %	2015 correct response %	Change
ELC 9	Correctly measures a length given using standard units	20	60.70%	65.00%	+
10	Calculate the balance of a 100 rupees note after spending to buy a product valued less than that	17	66.50%	68.90%	+
		34	<b>29.50%</b>	<b>32.50%</b>	+
11	Reads a number with three digits	2	84.10%	84.60%	+
		4	82.00%	82.30%	+
12	Deduct a number from a number with 3 digits with one carrying forward	5	74.50%	76.80%	+
		14	62.80%	64.80%	+
13	Names the shapes of solid objects using its faces	23	75.00%	76.00%	+
14	Measures a given quantity of liquids using appropriate units	33	56.70%	59.00%	+
15	write the next of a patterns of numbers with common difference of 3	9	73.20%	76.60%	+
16	Names objects situated both at left and right sides of one's own position	16	61.30%	64.60%	+
		39	<b>33.00%</b>	<b>28.60%</b>	-
17	Read the information presented in a histogram	40	73.30%	78.60%	+
18	Read the time by 5 minutes intervals on 12 hours clock	8	73.60%	78.00%	+
19	Multiplies a number with 2 digits by 2 and 3 without carrying forward	10	78.80%	79.20%	+
20	Divides a number less than 3 digits by 2 without carrying forward	18	56.90%	59.50%	+
21	Adds two numbers with three digits without carrying forward	01	84.90%	86.60%	+
22	Solves simple problems with only one mathematical operation	6	72.60%	76.30%	+
		7	75.20%	75.20%	Not
		11	23.30%	77.70%	+
		12	28.40%	32.80%	+
		13	59.60%	62.00%	+
		15	76.10%	78.40%	+
		19	73.10%	75.20%	+
		21	76.00%	78.20%	+
		22	68.00%	67.50%	-
		25	57.90%	60.20%	+
		26	66.10%	66.20%	+
		30	50.30%	52.10%	+
32	37.50%	40.50%	+		

ELC/ DLC	Description	Q. No	2013 correct responses %	2015 correct response %	Change
		36	37.60%	39.90%	+
DLC1	Place numbers of not higher than 4 digits in descending order	24	40.80%	43.90%	+
4	Identifies 'half' and 'quarter' as a portion of a complete unit	38	<b>23.50%</b>	<b>29.80%</b>	+
5	Use Roman numbers from -10	3	84.90%	78.60%	-
22	Measures a given quantity in Kg	35	<b>43.10%</b>	<b>22.30%</b>	-
23	Converts Kg into g	28	54.80%	57.40%	+
26	Measures area of a given surface using desired units	31	41.20%	50.40%	+
34	Create geometrical shapes	29	53.30%	56.40%	+
35	Draw rectangular shapes	27	60.20%	63.10%	+
38	Separates the symmetrical figures	37	38.90%	44.30%	+

## 6.16 Summary

Part I of this chapter described student performance in relation to the achievement of learning outcomes in the mathematics. The discussion pertained to both national and provincial level. Further, achievement was analyzed according to school type, gender, medium of instruction and location.

Test items used to assess students' performance were analyzed to assess how far they have been successful in achieving sub skills of the language expected to be achieved by grade 4 pupils.

Part II described the trends in achievement between 2013-2015.

It could be concluded that even though overall the achievement of learning outcomes in the mathematics is satisfactory there is still disparity in achievement provincial wise as well as location and gender wise.