

Evaluation of Grading Systems of Some Tertiary Institutions in Nigeria

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Abstract

Since the advent of *course system* of education in tertiary institutions world-over, Cumulative Point Average (CGPA) has been in use as an Assessment Instrument instead of Cumulative Weighted Average Mark (CWAM). Consequently, mapping of percentage marks into an n-grade points system which is required to generate the much needed CGPA has become necessary. Countless methods of mapping have been witnessed across different tertiary institutions. In addition, the number of grade point, 'n' varies from institutions to institutions. While it is a universal fact that 'n' can take any value less than 100, it is nevertheless important to know that the value of 'n' has never been greater than 12. In Nigerian tertiary institutions, the value of 'n' varies between 4 and 7 while 5 is the most common. However, simply equating 'n' to 100 is not sufficient to convert the percentile system to an n-grade points system in order to generate the required CGPA. It is discovered that there is no sound mathematical method employed to relate the CGPA ranges normally used to classify degree to the percentage scores earned by individual students. This paper (paper 2) is primarily written to establish the required parameters and the most suitable format of an n-grade points system which is referred to as a Non-Graded Fail Grading System with a fail grade, 'F' assigned a zero value (NGF/$GS_{F=0}$) while another paper (paper 3) presents the development of the required mathematical relationship between CGPA and percentage scores ranges.

1. Introduction

There are many opinions about grading systems. As a matter of facts, there are as many as there are users of grading systems. Every training institution that is required to assess its trainees has its own format of grading system since a grading system is a platform for the application of Assessment Instruments. There are also many different Assessment Instruments that are also used by different training institutions. All these grading systems do not address the same objectives and purposes. Because of these different shades of opinions and freedom to use whichever is considered suitable for a given situation, much study has not been done on the subject. It is discovered that people copy one format or the other without knowing fully the original purpose for which what is copied is intended. This consequently leads to many assumptions, one of which is to think that there is nothing to teach anybody about grading systems. The study carried out on grading system is presented in four different papers, namely, Paper 1: Assessment of Student Performance: Grading Systems, Paper 2: Parameters of Grading Systems, Paper 3: Mathematical Relationship Between Percentile & Grade Point Numbers, ***Paper 4: Evaluation of Grading Systems of Some Tertiary Institutions in Nigeria***. The Assessment Instrument considered in this paper is the Cumulative Grade Point Average, CGPA which is the one adopted in most tertiary institutions around the world because of its unique features. Therefore, the grading system suitable for such an instrument is the subject of this paper. There are still many types of this kind depending on such factors as objectives of assessment, understanding of the CGPA and other demands for graduates being assessed. However, there are basically two types of Grading Systems being considered for CGPA. These are **Non-Graded Fail** (where only one class is allowed in a Failure Zone) and **Graded Fail** (where there are more than one class in a Fail Zone).

2. Typical Grading Systems in Nigerian Universities

The grading systems of a few universities in Nigerian are analysed in this section to see how much they comply with the principles and theory presented in papers 2 & 3. The National Universities Commission (NUC)'s directives of Minimum Academic Standard (MAS) are also considered along.

2.1 University 'A' (UA) Grading System

The grading system being used by University 'A', UA (Table 1) is examined and compared with the principles articulated in papers 2 & 3. Their basic parameters (m, n, $[M_H + 1]$, M_L) are used to calculate the expected CGPA ranges (when F = 0 & d = 1 and F = d =1). This is presented in Tables 2 and 3

respectively. Comparing the calculated CGPA ranges with what UA is using to classify their degree fall short of what it should be. Their CGPA ranges accommodate average students into higher classes while weak students are disadvantaged. That is, their grading system is biased in favour of a class of students. This is obvious even from the distribution of their pass scores with unequal intervals shown in Table 1.

The Excel Calculator developed in Paper 3 is employed to calculate the corresponding CGPA ranges from a given score ranges. This is presented in Table 2.

OBSERVATIONS ABOUT TABLE 2:
Comparing the calculated CGPA ranges (Table 2) with the allotted ones by UA, the following analysis is hereby presented:

UA Data		**Calculated Data, CD (Table 2): Error% = [100(CD-UA)/CD]**
1st Class	(4.50 to 5.00)	4.50 to 5.00 considering lower limit, Error% = 0.00
2nd Class U	(3.50 to 4.49)	3.88 to 4.49 considering lower limit, Error% = +9.72
2nd Class L	(2.50 to 3.49)	3.25 to 3.87 considering lower limit, Error% = +23.17
3rd Class	(1.50 to 2.49)	2.98 to 3.24 considering lower limit, Error% = +49.61
Low Pass	(1.00 to 1.49)	2.70 to 2.97 considering lower limit, Error% = +62.96

UA Data		**Calculated Data, CD (Table 2): Error% = [100(CD-UA)/CD]**
1st Class	(4.50 to 5.00)	4.50 to 5.00 considering upper limit, Error% = 0.00
2nd Class U	(3.50 to 4.49)	3.88 to 4.49 considering upper limit, Error% = 0.00
2nd Class L	(2.50 to 3.49)	3.25 to 3.87 considering upper limit, Error% = +9.74
3rd Class	(1.50 to 2.49)	2.98 to 3.24 considering upper limit, Error% = +23.24
Low Pass	(1.00 to 1.49)	2.70 to 2.97 considering upper limit, Error% = +49.78

The error is most significant at lower Classes. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected because it is a Graded Fail Grading System; consequently it compromises the Separation Property of CGPA. In addition, the score ranges are biased and the validity test is violated. That is, m (4) ≠ n (5). However, UA grading format satisfies all other basic principles of a grading system such as appropriately applying Arithmetical Progression of a Common Difference of 1.

On the other hand, if the score intervals are equal, even when a Graded Fail Grading System is adopted, the result would be as presented in Table 3.

OBSERVATIONS ABOUT TABLE 3:
Comparing the calculated CGPA ranges (Table 3) with the allotted ones by UA, the following analysis is hereby presented:

UA Data		**Calculated Data, CD (Table 3): Error% = [100(CD-UA)/CD]**
1st Class	(4.50 to 5.00)	4.50 to 5.00 considering lower limit, Error% = 0.00
2nd Class U	(3.50 to 4.49)	3.99 to 4.49 considering lower limit, Error% = +12.33
2nd Class L	(2.50 to 3.49)	3.48 to 3.98 considering lower limit, Error% = +28.25
3rd Class	(1.50 to 2.49)	2.98 to 3.47 considering lower limit, Error% = +49.61
Low Pass	(1.00 to 1.49)	1.52 to 2.97 considering lower limit, Error% = +34.34

UA Data		**Calculated Data, CD (Table 3): Error% = [100(CD-UA)/CD]**
1st Class	(4.50 to 5.00)	4.50 to 5.00 considering upper limit, Error% = 0.00
2nd Class U	(3.50 to 4.49)	3.99 to 4.49 considering upper limit, Error% = 0.00
2nd Class L	(2.50 to 3.49)	3.48 to 3.98 considering upper limit, Error% = +12.36
3rd Class	(1.50 to 2.49)	2.98 to 3.47 considering upper limit, Error% = +28.34
Low Pass	(1.00 to 1.49)	1.52 to 2.97 considering upper limit, Error% = +49.78

Because of the imperfect integers (Integer + Fraction) used for score ranges in this format, the format of Table 2 may be preferred should it be necessary to adopt Graded Fail Grading System.

2.2 University 'B' (UB) Grading System

The grading system of University 'B' is presented in Table 4 with the observations of the author at a glance. Using the Triangle Model that has been developed (paper 3) to obtain a mathematical relationship between the score and CGPA ranges on the scores ranges presented in Table 4, the resulting CGPA ranges are as shown in Table 5.

OBSERVATIONS ABOUT TABLE 5:

The score and CGPA ranges have to be recombined appropriately to obtain the required five degree classes as shown. There are more than one way of recombination which is capable of creating differences in the final outcome. That is, a grading system of this type is not unique. A well-designed and unique grading system where it is required to make the score range equal to the CGPA range from the first principle, recombination will not be necessary. Such a grading system is presented in Table 6.

Comparing the calculated CGPA ranges (Table 5) with the allotted ones by UB, the following analysis is hereby presented:

UB Data		**Calculated Data, CD (Table 5): Error% = [100(CD-UB)/CD]**
1st Class	(6.0 to 7.0)	6.30 to 7.00 considering lower limit, Error% = +4.76
2nd Class U	(4.6 to 5.9)	4.53 to 219 considering lower limit, Error% = –1.47
2nd Class L	(2.6 to 4.5)	2.77 to 4.52 considering lower limit, Error% = +6.02
3rd Class	(1.6 to 2.5)	1.88 to 2.76 considering lower limit, Error% = +15.04
Pass	(1.0 to 1.5)	1.00 to 1.87 considering lower limit, Error% = 0.0

UB Data		**Calculated Data, CD (Table 5): Error% = [100(CD-UB)/CD]**
1st Class	(70 to 100)	6.30 to 7.00 considering upper limit, Error% = 0.0
2nd Class U	(60 to 79)	4.53 to 6.29 considering upper limit, Error% = –9.13
2nd Class L	(50 to 59)	2.77 to 4.52 considering upper limit, Error% = –23.63
3rd Class	(45 to 49)	1.88 to 2.76 considering upper limit, Error% = +9.31
Pass	(40 to 44)	1.00 to 1.87 considering upper limit, Error% = +19.93

The error is most significant at Pass & 2nd Class Lower. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected because the format violates the Validity Test of grading systems; that is $m \neq n$. However, UB grading format satisfies all other basic principles of a grading system such as appropriately applying Arithmetical Progression of a Common Difference of 1.

OBSERVATIONS ABOUT TABLE 6:

This grading system produces/generates the correct set of CGPA ranges that are mathematically related to the given score ranges. However, the given score ranges are biased in favour of 2nd class division of degree classification, thereby not giving equal chances to all students as a well-designed and unique grading system is expected to provide. When this is done, a balanced and unbiased result is attained. This is presented in Table 8.

Comparing the calculated CGPA ranges (Table 6) with the allotted ones by UB, the following analysis is hereby presented:

UB Data		**Calculated Data, CD (Table 6)**	**UB Data (Table 4)**	**UB Data (Table 5)**
1st Class	(70 to 100)	[4.50 to 5.00] × [7/5] = [6.30 to 7.00]	[6.0 to 7.0]	[6.30 to 7.00]
2nd Class U	(60 to 79)	[3.29 to 4.49] × [7/5] = [4.61 to 6.29]	[4.6 to 5.9]	[4.53 to 6.29]
2nd Class L	(50 to 59)	[2.08 to 3.28] × [7/5] = [2.91 to 4.60]	[2.6 to 4.5]	[2.77 to 4.52]
3rd Class	(45 to 49)	[1.54 to 2.07] × [7/5] = [2.15 to 2.90]	[1.6 to 2.5]	[1.88 to 2.76]
Pass	(40 to 44)	[1.00 to 1.53] × [7/5] = [1.40 to 2.14]	[1.0 to 1.5]	[1.00 to 1.87]

Multiplying the CGPA in Table 6 by a factor of 7/5 = 1.4 gives another set of CGPA that are comparable with the figures in Table 5. The same can be achieved if an Extended Grading System format, (ExGS) is

employed with a Common Difference of 1.4 which is a factor of factorization of the grading system (see Table 7).

OBSERVATIONS ABOUT TABLE 7:
This is another valid grading system that is referred to as an Extended Grading System (ExGS) with a factorisation constant of 1.4. That is, if the CGPA ranges in Table 7 are divided by 1.4, the same CGPA ranges of Table 6 will be obtained. That is,

$$CGPA\ of\ Table\ 6 = \frac{[CGPA\ of\ Table\ 7]}{1.4} \dots\dots\dots\dots\dots (1)$$

or

$$CGPA\ of\ Table\ 7 = 1.4[CGPA\ of\ Table\ 6] \dots\dots\dots\dots\dots (2)$$

UB Data		Calculated Data, CB (Table 6)	Table 7	Table 4
1st Class	(70 to 100)	[4.50 to 5.00] × [7/5] = [6.30 to 7.00]	[6.30 to 7.00]	[6.0 to 7.0]
2nd Class U	(60 to 79)	[3.29 to 4.49] × [7/5] = [4.61 to 6.29]	[4.60 to 6.29]	[4.6 to 5.9]
2nd Class L	(50 to 59)	[2.08 to 3.28] × [7/5] = [2.91 to 4.60]	[2.91 to 4.59]	[2.6 to 4.5]
3rd Class	(45 to 49)	[1.54 to 2.07] × [7/5] = [2.15 to 2.90]	[2.15 to 2.90]	[1.6 to 2.5]
Pass	(40 to 44)	[1.00 to 1.53] × [7/5] = [1.40 to 2.14]	[1.40 to 2.14]	[1.0 to 1.5]

From the above analysis, Table 6 is the preferred format since Table 7 is a multiple of Table 6 by a factor of 1.4. More multiples of this factor (say 2.8, 4.2, etc) can be used for the same purpose. Hence, it is best to stay with the fundamental format rather than using multiples factors. However, a better format is presented in Table 8 where score intervals are made equal as earlier mentioned.

OBSERVATIONS ABOUT TABLE 8:
This is the best grading system format to suit UB fundamental objective of assessing and evaluating students with absolute fairness, equity and justice. Note the change in score ranges (given to the nearest one decimal place) which becomes necessary in order to give equal opportunities to all categories of students (academically weak and strong alike). It is the CGPA earned by the individual students that will separate the weak from the strong. This is why the fail grade is always assigned zero grade point in a well-designed and unique grading system. From the analysis, UB classifications are totally inferior to the Minimum Academic Standard (MAS) of National Universities Commission (NUC).

2.3 University 'C' (UC) Grading System

Similarly, the grading system of University 'C' is presented in Table 9 with the observations of the author at a glance. This grading system is patterned around the American Grading Systems. Using the Triangle Model that has been developed (paper 3) to obtain a mathematical relationship between the score and CGPA ranges on the scores ranges presented in Table 9, the resulting CGPA ranges are as shown in Table 10.

NOTE: Because of the reason given in the 'Class' column of Table 10, the intermediate values of the grade points indicated cannot be used to compute students' CGPAs; otherwise, the values obtained will not fall in the appropriate ranges as calculated/expected. Because of this arbitrariness of assigning the intermediate grade points, many other series are available that have been used by other institutions (see Table 11). Hence, only equal division between 0 & 4 may be used to obtain uniformity and consistence with equal score distributions as shown in Table 12.

Note: Table 12 is in a form of Elongated Grading System (ElGS) and it is more valid than Table 10.

A close study of Table 11, reveals that the assignment of grade points (GPs) against each score range fails to follow any known mathematical series. Comparing the two (9-point) scales, the intervals between any two successive GPs are not constant and it is different from one scale to another. Hence, it is not an Arithmetical Progression. There is no logical reason for the assignment of GPs to be different in both cases. That is, the assignment of GPs is not unique to the score ranges. Upon the application of Table 12 into Table 9, Table 13 is obtained.

If the maximum and minimum marks/scores are maintained and the principles of grading systems are applied, Table 14 is obtained. If the marks/scores that represent the grade points (3.0), (2.7), (2.0), and (1.0) are maintained and the principles of grading systems are applied, Table 15 is obtained.

Comparing the CGPA ranges of Table 14 with the given value being used by UC, the observation is presented in Table 16. Comparing the CGPA ranges of Table 15 with the given value being used by UC, the observation is presented in Table 17.

From the above analysis, it is obvious that the grading system of UC fails to meet the Minimum Academic Standard (MAS) of NUC and it is totally out of tune with all principles of assessment instruments that is just and fair for degree classification. American degrees do not have the equivalent of First, Second and Third classes. All they have are the Summa, Magna and Cum Laude which are within the First Class division. The rest are ordinary Passes. UC has tried to find the equivalent but failed to apply the appropriate mathematical theory to obtain such equivalents.

For UC to meet the MAS of NUC, the minimum limit of the maximum pass mark/score range must be 70% to achieve their quoted (3.60 to 4.00). The proof is presented in Table 18. Comparing the CGPA ranges of Table 18 with the given value being used by UC, the observation is presented in Table 19.

3. NUC Minimum Academic Standard (Table 20) & "No Pass degree is to be awarded"

The National Universities Commission (NUC) gave a directive as stated above with other details presented in Table 20, with commends of the author included, as a Minimum Academic Standard (MAS). This directive presupposes that a (5-point) grading system is to be replaced by a (4-point) grading system.

3.1 National Universities Commission(NUC) Grading System

In the same way, the corresponding CGPA ranges from given score ranges (Table 20) are calculated using the Triangle Model of paper 3 for the different possibilities as indicated. This is presented in Table 21 through Table 23.

OBSERVATIONS ABOUT TABLE 21:

Comparing the calculated CGPA ranges (Table 21) with the allotted ones by NUC, the following analysis is hereby presented:

NUC Data	**Calculated Data, CD (Table 21): Error% = [100(CD-NUC)/CD]**
1st Class (4.50 to 5.00)	4.50 to 5.00 considering lower limit, Error% = 0.0
2nd Class U (3.50 to 4.49)	3.48 to 4.49 considering lower limit, Error% = –0.51
2nd Class L (2.40 to 3.49)	2.45 to 3.47 considering lower limit, Error% = +1.57
3rd Class (1.50 to 2.39)	2.00 to 2.44 considering lower limit, Error% = +20.45

NUC Data	**Calculated Data, CD (Table 21): Error% = [100(CD-NUC)/CD]**
1st Class (70 to 100)	4.50 to 5.00 considering upper limit, Error% = 0.0
2nd Class U (60 to 79)	3.48 to 4.49 considering upper limit, Error% = 0.0
2nd Class L (50 to 59)	2.45 to 3.47 considering upper limit, Error% = –0.66
3rd Class (45 to 49)	2.00 to 2.44 considering upper limit, Error% = +2.23

The error is most significant at the lower level. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected because the format destroys the Separation Property of CGPA and m (4) ≠ n (5).

OBSERVATIONS ABOUT TABLE 22:

Table 22 is essentially the same as Table 21 since the least pass score still has a grade point of 2. Hence, the same comments for Table 21 are still applicable. Note also that the least grade point (2) is not the same as the Common Difference (1) of the required Arithmetical Progression ($d \neq n_x$) and m (4) ≠ n (5). These two conditions violate the fundamental principles of grading systems. Hence, this format is inappropriate.

OBSERVATIONS ABOUT TABLE 23:

Comparing the calculated CGPA ranges (Table 23) with the allotted ones by NUC, the following analysis is hereby presented:

NUC Data		**Calculated Data, CD (Table 23): Error% = [100(CD-NUC)/CD]**
1st Class	(4.50 to 5.00)	3.60 to 4.00 considering lower limit, Error% = –22.50
2nd Class U	(3.50 to 4.49)	2.54 to 3.59 considering lower limit, Error% = +26.84
2nd Class L	(2.40 to 3.49)	1.47 to 2.53 considering lower limit, Error% = +36.71
3rd Class	(1.50 to 2.39)	1.00 to 1.46 considering lower limit, Error% = +34.18

NUC Data		**Calculated Data, CD (Table 23): Error% = [100(CD-NUC)/CD]**
1st Class	(70 to 100)	3.60 to 4.00 considering upper limit, Error% = –25.00
2nd Class U	(60 to 79)	2.54 to 3.59 considering upper limit, Error% = –25.07
2nd Class L	(50 to 59)	1.47 to 2.53 considering upper limit, Error% = –38.15
3rd Class	(45 to 49)	1.00 to 1.46 considering upper limit, Error% = –63.40

The error is significant at all levels. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected because of the unequal distribution of the score ranges which interprets to mean that the distribution is biased in favour of 2nd Class divisions thereby not given equal opportunities to all students.

On the other hand, if the same score classification are used to develop an appropriate grading system, the result would be as presented in Table 24.

OBSERVATIONS ABOUT TABLE 24:

This is the best grading system format to suit NUC fundamental score parameters of assessing and evaluating students with absolute fairness, equity and justice. Note the change in score ranges which becomes necessary in order to give equal opportunities to all categories of students (academically weak and strong alike). It is the CGPA earned by the individual students that will separate the weak from the strong. This is why the fail grade is always assigned zero grade point in a well-designed and unique grading system.

Two similar formats are possible as shown in Table 25 & 26

However, using a minimum grade point of 1.5 assigned to the least pass mark/score of 45%, the resulting grading systems are shown in Tables 27 & 28 below. These are Non-Graded Fail (Extended) Grading Systems of the form,

$$[\boldsymbol{ExGS}]_{\boldsymbol{F=0}} = \mathbf{1.5}\{[(\mathbf{4} - \boldsymbol{point})\mathbf{0}, \mathbf{1}], [\boldsymbol{P}(\mathbf{0}, \mathbf{1}, \mathbf{4})]\}, [\mathbf{45}, \mathbf{70}] = \mathbf{1.5}[\boldsymbol{NGF/GS}]_{\boldsymbol{F=0}}$$

Where,

$$[\boldsymbol{NGF/GS}]_{\boldsymbol{F=0}} = \{[(\mathbf{4} - \boldsymbol{point})\mathbf{0}, \mathbf{1}], [\boldsymbol{P}(\mathbf{0}, \mathbf{1}, \mathbf{4})]\}, [\mathbf{45}, \mathbf{70}]$$

OBSERVATIONS ABOUT TABLE 27:

Comparing the calculated CGPA ranges (Table 27) with the allotted ones by NUC, the following analysis is hereby presented:

NUC Data		**Calculated Data, CD (Table 27): Error% = [100(CD-NUC)/CD]**
1st Class	(4.50 to 5.00)	5.40 to 6.00 considering lower limit, Error% = +15.00
2nd Class U	(3.50 to 4.49)	3.80 to 5.39 considering lower limit, Error% = +5.65
2nd Class L	(2.40 to 3.49)	2.21 to 3.79 considering lower limit, Error% = –5.65
3rd Class	(1.50 to 2.39)	1.50 to 2.20 considering lower limit, Error% = 0.0

NUC Data		**Calculated Data, CD (Table 27): Error% = [100(CD-NUC)/CD]**
1st Class	(70 to 100)	5.40 to 6.00 considering upper limit, Error% = +16.67
2nd Class U	(60 to 79)	3.80 to 5.39 considering upper limit, Error% = +16.70
2nd Class L	(50 to 59)	2.21 to 3.79 considering upper limit, Error% = +8.02
3rd Class	(45 to 49)	1.50 to 2.20 considering upper limit, Error% = –8.68

The error is significant at all levels. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected because of the unequal distribution of the score ranges which interprets to mean that the distribution is biased in favour of 2nd Class divisions thereby not given equal opportunities to all students. In addition, this is an ExGS with a Common Difference of 1.5. That is, Table 27 = 1.5×(Table 23).

OBSERVATIONS ABOUT TABLE 28:
Comparing the calculated CGPA ranges (Table 28) with the allotted ones by NUC, the following analysis is hereby presented:

NUC Data		**Calculated Data, CD (Table 28): Error% = [100(CD-NUC)/CD]**
1st Class	(4.50 to 5.00)	5.40 to 6.00 considering lower limit, Error% = +15.00
2nd Class U	(3.50 to 4.49)	4.10 to 5.39 considering lower limit, Error% = +11.13
2nd Class L	(2.40 to 3.49)	2.80 to 4.09 considering lower limit, Error% = +9.78
3rd Class	(1.50 to 2.39)	1.50 to 2.79 considering lower limit, Error% = 0.0

NUC Data		**Calculated Data, CD (Table 28): Error% = [100(CD-NUC)/CD]**
1st Class	(70 to 100)	5.40 to 6.00 considering upper limit, Error% = +16.67
2nd Class U	(60 to 79)	4.10 to 5.39 considering upper limit, Error% = +16.70
2nd Class L	(50 to 59)	2.80 to 4.09 considering upper limit, Error% = +14.68
3rd Class	(45 to 49)	1.50 to 2.79 considering upper limit, Error% = +14.34

The error is significant at all levels. The errors are due to arbitrariness of allocation of CGPA ranges against score/mark ranges. Apart from these errors, this format is rejected for the same reasons given for Table 27.

The contradiction in the directive is the stipulated minimum CGPA of 1.50 that is associated with the least pass class of degree in an (n-point) grading system. This directive violates the theory, hypothesis, axiom and assumptions upon which grading systems are hinged. From the theory presented in papers 2 & 3, it is clear that the lower limit of CGPA range for the last pass in the degree classification is the value of the Common Difference of the Arithmetical Progression used to distribute the grade points, irrespective of the minimum pass mark/score, even if it is 90%. This is clearly demonstrated in all the tables of calculation of CGPA ranges presented in papers 2 & 3.

Given the parameters presented in Table 20, another interpretation that can suit these parameters is a Graded Fail Grading System (one and/or two levels of fail grade) and a Non-Graded Grading System whose fail grade is assigned a unit instead of zero shown in Tables 29, 30 & 31.

From Table 21 through 31, it becomes clear that it is not the lower limit of the CGPA range assigned to the least pass degree that determines the **quality** of degree but the number of degree classification which in turns depends on the percentage scores approved for pass grades. That is, for an (n-point) grading system, the least class of degree does not have the same nomenclature as that found in any other grading system even when both have the same grading parameters but different value of 'n'. This is why it is necessary to have a ***National Grading System*** that will serve as a **common datum** to measure the **quality** of degrees awarded by different Nigerian universities.

3.2 Rationale for a Pass Degree In a (5-point) Grading System

a) 'Pass' is a class in a (5-point) grading system. It is the last pass class to which the least pass grade point/CGPA of one (1) is automatically assigned by virtue of being the last pass class. Similarly, in a (4-point) grading system, the last pass class to which the least pass grade point/CGPA of one (1) is automatically assigned by virtue of being the last pass class is a 3rd Class if the same nomenclatures are used in both cases [see Table 3 through Table 6 of (4-point) and (5-point) grading systems to convince you]. For a (6-point) grading system, the last pass class to which the least pass grade point/CGPA of one (1) is automatically assigned by virtue of being the last pass class will probably be called a 'Low Pass' if the same nomenclatures are used in both cases (see Table 32 below).

In the above table (Table 32), 'Pass', as a class, is assigned automatically a grade point of 2 resulting in a CGPA greater than one (1), while 'Low Pass' is automatically assigned a grade point/CGPA of 1. Note also that Pass in a (5-point) scale is not the same in a (6-point) grading system. That is, (45 to 53) Pass in (5-point) ≠ (52 to 58) Pass in (6-point) for the same basic parameters. It is important to note here that there is ***no direct conversion*** from an (n_1-point) grading system to (n_2-point) grading system. That is, $CGPA_1$ of (say 2.33) in an (n_1-point) usually written as $2.33/n_1$ is not equal to or the same as $CGPA_2$ of (say 1.82) in an (n_2-point) grading system. In other words, $CGPA_1/n_1 \neq CGPA_2/n_2$, except where n_1 is a multiple of n_2, in which case, one of the two grading systems is an Extended fashion of the other. ***This is a common mistake***. Just as $/cent ≠ ₦/kobo, so also $CGPA_1/n_1 \neq CGPA_2/n_2$. Each $CGPA_1$ and $CGPA_2$ MUST be worked out separately from first principles (see section 4). Therefore, 'Pass' as a class of degree cannot be condemned simply because the least grade point/CGPA of one (1) is assigned to it. It is only a 'name'. What is important is the score ranges attached to each class.

b) Examining Table 33, it can be observed that only few students are likely to fall into the lower limit of Pass Class (scoring below 50% in this case) while majority are almost as good as some other students in 3rd Class (scoring 50% and above). It will be unfair to throw away such majority of students because of the few weak ones by simply abolishing Pass division. For every class of people, there exists the ***least*** by nature no matter how much ***high*** the class is rated. That is, in a group of First-Class graduates, some graduates will be found at the lowest/least grade if adequately subjected to appropriate Assessment Instrument and uniquely designed grading systems.

c) The implications of the last pass in any given grading system can be explained as follows: Though students falling into this category are university materials but they cannot proceed to higher university degrees without remedying the cause of such level of performance. However, they are qualified to be admitted into corporate membership class of their respective disciplines/professional bodies like any other graduates of higher classes because they have sufficient knowledge to deal with real-life situations. As a matter of facts, this class of graduates are preferred to be employed in production industries because they are much more likely to stay on the job longer than the high-flying graduates who are likely to move into academics, consulting and design firms. The high-flying graduates (1st and 2nd Classes) are much more mobile than 3rd and Pass class graduates, an attribute that does not guarantee stability of labour in the industries which is primarily what is needed. Unfortunately, because of high unemployment rating/index in Nigeria, this scenario has changed, leaving many graduates (including First Class) unemployed. Cancelling Pass division in degree classification is certainly not the solution to unemployment anywhere in the world. It has never been! Pass degrees are still being awarded in many advanced countries till date. Many UK institutions still award ordinary Pass degrees which are still lower than Pass (Honours) degrees that are being condemned in Nigeria today.

d) If Nigerian employers can employ graduates with American Bachelor degrees which are essentially unclassified (see Table 9 through 19) as Nigerian universities do, then, it does not make sense to disadvantage graduates from Nigerian universities by simply cancelling Pass (Honours) degree.

e) There are many professionals whose basic academic qualification is WAEC, yet, they are admitted into employment market at the same level if not even higher than degree holders by some employers of labour in Nigeria. Why then will a holder of Bachelors degree be denied simply because she/he has a Pass (Honours) degree?

f) If Pass (Honours) degree is abolished, 3rd Class will also be abolished when unemployment index gets higher; Second Class will be abolished when unemployment index gets still higher and so on. What will happen when unemployment continues to grow? Will First Class degrees be abolished as well?

4. CONVERSION FROM ONE GRADING SYSTEM TO ANOTHER GRADING SYSTEM

Because of the different grading systems being used by different institutions from one country to another, there is the need to convert the CGPA earned in one grading system to another grading system. This requirement is particularly necessary when graduates from different institutions are seeking admission into other institutions whose grading systems are different from the graduates' Alma-Ata.

This is approached from the fact that for every earned CGPA, there is an equivalent CWAM. Therefore, given a CGPA of any graduate, the equivalent CWAM can be calculated as follows:

4.1 Conversion from 'CGPA' to 'CWAM'

In order to establish a formula to perform this conversion, the parameters required are defined and indicated in Figure 1.

Calculating the value of $CWAM_e$ from the lower end of the range, we have

$$CWAM_e = M_L + \left[\frac{CGPA_e - CGPA_L}{CGPA_U - CGPA_L}\right][M_U - M_L] \ldots\ldots\ldots\ldots (1)$$

Calculating the value of $CWAM_e$ from the upper end of the range, we have

$$CWAM_e = M_U - \left[\frac{CGPA_U - CGPA_e}{CGPA_U - CGPA_L}\right][M_U - M_L] \ldots\ldots\ldots\ldots (2)$$

Cumulative Weighted Average Mark (CWAM) is fully defined by equation (6) in Chapter 1.

NOTE: From equations (1) & (2), it is obvious that the grading system of the graduate MUST be specified from where the values of the parameters in these equations can be derived. This is why all certificates MUST contain the details of the grading system of the institution that awards the degree for which the certificate is issued.

Example: Find the equivalent score/mark for an earned CGPA of 4.05 and of 1.50 by a graduate of institution 'A', having a grading system given in Table 34 and consequently establish the equivalent CGPA the graduate would have earned in Institutions 'B', 'C' & 'D' whose grading systems are given in Tables 37a, 37b & 3.7c respectively.

Table 34: Grading System of Institution A.

CGPA		Interval		Score/Marks		Interval
4.44	**5.00**	0.56		**80**	**100**	20.00
2.63	**4.43**	1.80		**60**	**79**	19.00
1.77	**2.62**	0.85		**50**	**69**	9.00
1.38	**1.76**	0.38		**45**	**49**	4.00
1.00	**1.37**	0.37		**40**	**44**	4.00

From the Table 34, the following parameters are obtainable:
$M_L = 60$, $M_U = 79$, $CGPA_L = 2.63$, $CGPA_U = 4.43$ and $CGPA_e = 4.05$
$M_L = 45$, $M_U = 49$, $CGPA_L = 1.38$, $CGPA_U = 1.76$ and $CGPA_e = 1.50$

For $CGPA_e = 4.05$

Substituting the appropriate parameters into equation (1), we have,

$$CWAM_e = 60 + \left[\frac{4.05 - 2.63}{4.43 - 2.63}\right][79 - 60] = 60 + 14.99 = \mathbf{74.99}$$

Substituting the appropriate parameters into equation (2), we have,

$$CWAM_e = 79 - \left[\frac{4.43 - 4.05}{4.43 - 2.63}\right][79 - 60] = 79 - 4.01 = \mathbf{74.99}$$

The value of $CWAM_e$ obtained, 75 lies within the range (60 to 79) and CGPA (2.63 to 4.43) in both cases. This agrees with the given $CGPA_e$ of 4.05.

For $CGPA_e$ = 1.50

Substituting the appropriate parameters into equation (1), we have,

$$CWAM_e = 45 + \left[\frac{1.50 - 1.38}{1.76 - 1.38}\right][49 - 45] = 45 + 1.26 = \mathbf{46.26}$$

Substituting the appropriate parameters into equation (2), we have,

$$CWAM_e = 49 - \left[\frac{1.76 - 1.50}{1.76 - 1.38}\right][49 - 45] = 49 - 2.74 = \mathbf{46.26}$$

The value of $CWAM_e$ obtained, 46 lies within the range (45 to 49) and CGPA (1.38 to 1.76) in both cases. This is in conformity with the given $CGPA_e$ of 1.50.

NOTE: The value of $CWAM_e$ obtained from this analysis will only be equal to that calculated from the raw scores of the graduate if and when all failed scores are considered as having zero values; otherwise, this value will be lower than that which is computed from the raw scores when the scores earned in failed grades have finite values. This is illustrated in Tables 35a, 35b, 36a & 36b. In addition, the following reasons are responsible for the lower value of $CWAM_e$ calculated from the corresponding $CGPA_e$:

- For CWAM calculated from raw scores [CWAM(S)], the intermediate values between the limits of a range contribute to the value of CWAM(S). That is, if someone scores 85% to earn a letter grade 'A' where 'A' = (80 to 100), 5% contributes to the calculation of CWAM(S) whereas, on 80% contributes to the calculation of CWAM calculated from the corresponding CGPA, [CWAM(GP)].
- The same is true for all ranges. Hence, it is valid to say CWAM(S) > CWAM(GP) at all time.

The difference can be reduced if fail scores are assigned zero values and if the score intervals are reduced to the minimum. This is probably why some institutions prefer to have as many ranges as possible leading to Elongated Grading Systems (that is, m > n). That is,

$$\lim_{Int \to 1} CWAM(GP)_{Int} = CWAM(S) \ldots\ldots\ldots\ldots (3)$$

Where,
Int = score/mark range equal interval

For this reason, Elongated Grading Systems (ElGS) may be justified and from equation (3), it is most suitable for Assessment Instrument referred to as CWAM and not CGPA. Otherwise, the required steps to recombine the many groupings to fit into the degree classification may worth the trouble if CGPA is employed as the Assessment Instrument.

From Tables 35a, 35b, 36a & 36b, we have,

Note: $CWAM_e$ (F = Finite) = 81.18	Note: $CWAM_e$ (F = Finite) = 80.16
Note: $CWAM_e$ (F = 0) = 80.51	Note: $CWAM_e$ (F = 0) = 78.16
Difference = 0.67	Difference = 2.00

The possible errors caused by these two different methods of calculating CWAM(S) and CWAM(GP) is much less if the failed courses are of lower credits; otherwise, it could be significant.

Table 35a: STUDENT 1: Class 'A' Student (Minor) (Major)

With Fail Grade = Finite

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	76	228
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	76	228
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	70	140
18	R	1	60	60
19	S	1	30	30
20	T	2	94	188
∑		**45**		**3653**
$CWAM_e$	**81.18**			

Table 35b: STUDENT 2: Class 'A' Student

With Fail Grade = Finite

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	80	240
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	30	90
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	80	160
18	R	1	60	60
19	S	1	90	90
20	T	2	94	188
∑		**45**		**3607**
$CWAM_e$	**80.16**			

Table 36a: STUDENT 1: Class 'A' Student (Minor) (Major)
With Fail Grade = 0

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	76	228
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	76	228
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	70	140
18	R	1	60	60
19	S	1	30	
20	T	2	94	188
∑		45		3623
$CWAM_e$	80.51			

Table 36b: STUDENT 2: Class 'A' Student
With Fail Grade = 0

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	80	240
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3		0
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	80	160
18	R	1	60	60
19	S	1	90	90
20	T	2	94	188
∑		45		3517
$CWAM_e$	78.16			

The values of $CWAM_e$ obtained are now plotted into the grading system of the institution admitting the graduate. For instance, let the grading system of the institution be as given in Tables 37a & 37b

Table 37a: Grading System of Institution 'B'

CGPA RANGES			MARK RANGES	
4.70	5.00	1st Class	80	100
2.75	4.69	2nd Class U	60	79
1.82	2.74	2nd Class L	50	59
1.41	1.81	3rd Class	45	49
1.00	1.40	Pass Class	40	44

Since $CWAM_e \approx 75$, the graduate's CGPA lies between 2.75 and 4.69 on Table 37a.

Table 37b: Grading System of Institution 'C'

CGPA RANGES			MARK RANGES	
4.50	5.00	1st Class	80	100
3.50	4.49	2nd Class U	60	79
2.50	3.49	2nd Class L	50	59
2.00	2.49	3rd Class	45	49
1.00	1.99	Pass Class	40	44

Table 37c: Grading System of Institution 'D'

CGPA RANGES			MARK RANGES	
4.50	5.00	1st Class	70	100
3.50	4.49	2nd Class U	60	69
2.40	3.49	2nd Class L	50	59
1.50	2.39	3rd Class	45	49
1.00	1.49	Pass Class	40	44

Since $CWAM_e \approx 75$, the graduate's CGPA lies between 3.50 and 4.69 on Table 37b. The equivalent $CGPA_e$ will be calculated in a similar manner in section 3.2.

4.2 Conversion from 'CWAM' to 'CGPA'

Similarly, equation (3) & (4) are derived as follows:

Calculating the value of $CWAM_e$ from the lower end of the range, we have

$$CGPA_e = GP_L + \left[\frac{CWAM_e - CWAM_L}{CWAM_U - CWAM_L}\right][GP_U - GP_L] \ldots\ldots\ldots\ldots (3)$$

Calculating the value of $CWAM_e$ from the upper end of the range, we have

$$CGPA_e = GP_U - \left[\frac{CWAM_U - CWAM_e}{CWAM_U - CWAM_L}\right][GP_U - GP_L] \ldots\ldots\ldots\ldots (4)$$

For $CWAM_e$ = 75

Considering Table 37a, $CWAM_U$ = 79, $CWAM_L$ = 60, $CWAM_e$ = 75, GP_U = 4.69, GP_L = 2.75. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 2.75 + \left[\frac{75 - 60}{79 - 60}\right][4.69 - 2.75] = 2.75 + 1.53 = \mathbf{4.28}$$

$$CGPA_e = 4.69 - \left[\frac{79 - 75}{79 - 60}\right][4.69 - 2.75] = 4.69 - 0.41 = \mathbf{4.28}$$

For $CWAM_e$ = 46

Considering Table 37a, $CWAM_U$ = 49, $CWAM_L$ = 45, $CWAM_e$ = 46, GP_U = 1.81, GP_L = 1.41. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 1.41 + \left[\frac{46 - 45}{49 - 45}\right][1.81 - 1.41] = 1.41 + 0.10 = \mathbf{1.51}$$

$$CGPA_e = 1.81 - \left[\frac{49 - 46}{49 - 45}\right][1.81 - 1.41] = 1.81 - 0.30 = \mathbf{1.51}$$

For $CWAM_e$ = 75

Considering Table 37b, $CWAM_U$ = 79, $CWAM_L$ = 60, $CWAM_e$ = 75, GP_U = 4.49, GP_L = 3.50. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 3.50 + \left[\frac{75 - 60}{79 - 60}\right][4.49 - 3.50] = 3.50 + 0.86 = \mathbf{4.36}$$

$$CGPA_e = 4.49 - \left[\frac{79 - 75}{79 - 60}\right][4.49 - 3.50] = 4.49 - 0.23 = \mathbf{4.36}$$

For $CWAM_e$ = 46

Considering Table 37b, $CWAM_U$ = 49, $CWAM_L$ = 45, $CWAM_e$ = 46, GP_U = 2.49, GP_L = 2.00. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 2.00 + \left[\frac{46-45}{49-45}\right][2.49 - 2.00] = 2.00 + 0.12 = \mathbf{2.12}$$

$$CGPA_e = 2.49 - \left[\frac{49-46}{49-45}\right][2.49 - 2.00] = 2.49 - 0.37 = \mathbf{2.12}$$

For $CWAM_e$ = 75

Considering Table 37c, $CWAM_U$ = 69, $CWAM_L$ = 60, $CWAM_e$ = 75, GP_U = 4.49, GP_L = 3.50. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 3.50 + \left[\frac{75-60}{69-60}\right][4.49 - 3.50] = 3.50 + 1.65 = \mathbf{5.15}$$

$$CGPA_e = 4.49 - \left[\frac{69-75}{69-60}\right][4.49 - 3.50] = 4.49 + 0.66 = \mathbf{5.15}$$

NOTE: The value of $CGPA_e$ obtained, 5.15 is more than the maximum grade point of 5 available to the grading system of Institution 'B'. Hence, the two grading systems are totally incompatible. This is obvious from the fact that the highest pass marks to which the same maximum grade point of 5 is assigned are not the equal.

For $CWAM_e$ = 46

Considering Table 37c, $CWAM_U$ = 49, $CWAM_L$ = 45, $CWAM_e$ = 46, GP_U = 2.39, GP_L = 1.50. Substituting these values into equations (3) & (4), we have

$$CGPA_e = 2.50 + \left[\frac{46-45}{49-45}\right][2.49 - 1.50] = 1.50 + 0.22 = \mathbf{1.72}$$

$$CGPA_e = 2.39 - \left[\frac{49-46}{49-45}\right][2.39 - 1.50] = 2.49 - 0.67 = \mathbf{1.72}$$

NOTE: The situation revealed for the case of $CWAM_e$ = 75% analysed above is not evident in this case of $CWAM_e$ = 46%; thereby given a false impression of valid conversion because the calculated value of $CGPA_e$ of 1.72 lies within the same class as the grading system of Institution 'A'. For the same reason and from the analysis above, it can be concluded as follows:

- The CGPA earned in a grading system with a higher pass mark will result to a higher CGPA when it is mapped into grading systems with a lower score that carries the same highest grade point.
- The CGPA earned in a grading system with a lower pass mark will result to a lower CGPA when it is mapped into grading systems with a higher score that carries the same highest grade point.

Table 38: Comparison of the Conversion Values

Common	Institution 'A'	Institution 'B'	Institution 'C'	Institution 'D'	
		Table 37a	Table 37b	Table 37c	
CWAM $CWAM_e$ = 75 $CWAM_e$ = 46	CGPA $CGPA_e$ = 4.05 $CGPA_e$ = 1.50	CGPA $CGPA_e$ = 4.28 $CGPA_e$ = 1.51	CGPA $CGPA_e$ = 4.36 $CGPA_e$ = 2.12	CGPA $CGPA_e$ = 5.15 $CGPA_e$ = 1.72	CWAM $CWAM_e$ = 75 $CWAM_e$ = 46
80-100	4.44-5.00	4.70-5.00	4.50-5.00	4.50-5.00	70-100
60-79	2.63-4.44	2.75-4.69	3.50-3.49	3.50-3.49	60-79
50-59	1.77-2.62	1.82-2.74	2.50-3.49	2.40-3.49	50-59
45-59	1.38-1.76	1.41-1.81	2.00-2.49	1.50-2.39	45-59
40-44	1.00-1,37	1.00-1.40	1.00-199	1.00-199	40-44

From the above analysis, it is clear that the CGPA earned by graduates from a different grading system does not have the same value even when

- the earned CGPAs fall in the same class for obvious reason given by the two limits of the range (Table 38).
- the classification number, (m = n) is of the same value, 5. That is, same (n-point) grading system, where n = 5. One would have thought that the CGPA earned by the graduate from Institution 'A' would have been rated the same with that of Institutions 'B', 'C' & 'D' since they all have (5-point) grading systems. This analysis has proved that it is not the case because of the variations in the allocation of CGPA ranges to score/mark ranges. This would have been eliminated if the values of CGPA ranges are calculated from the score/mark ranges.

Therefore, the accuracy of a grading system dictates the accuracy of the degree classification and the degree of fairness to the students being assessed. Hence, the importance of using an analytically proven grading system cannot be over-emphasized.

5. Conclusion

In general, the quality of a product that undergoes certain processes fundamentally depends on two factors one of which is more crucial than the other. These are; the quality of raw materials and the processes of manufacturing as depicted in Figure 1. Quality of products is fully determined by ALL stages of processes before the final products are made available for the use of society. In Figure 1, assessment and evaluation are aided by adequate grading systems and proper application of the same after thorough training that is based on sound curriculum.

The quality of degree classification is undoubtedly affected by wrong application of grading systems resulting from lack of understanding of the totality of this evaluation instrument called CGPA and its required platform, the grading system.

It is therefore, inappropriate to accept/condemn a degree by mere nomenclature and/or CGPA ranges which has not been measured against an established standard or which is being measured against a standard that is non-existent, the ***National Grading System*** as a common datum. The current assumption that Nigerian universities use a (5-point) grading system is no long valid with the advent of private universities that have introduced all kinds of variations to what was, upon a time, assumed to be uniform among Nigerian universities; thereby creating different understanding and misapplications of the (5-point) grading system. In order to establish the correct interpretation of any degree classification, the score ranges with their associated grade points and the CGPA ranges MUST be provided. That is, a legend of the full grading system MUST be stated at the back of the certificate carrying the class of degree for proper and adequate interpretation.

IMPORTANT

Any of the grading systems presented in Paper 2 can be adopted by any institution as a matter of choice. However, in order to conform to the world standards and the meaning of (n-point) grading system where

the number of degree classification (m) is expected to be equal to the grade point (n), the Non-Graded Fail Grading System (NGF/GS), is the only one that satisfies this criterion. Hence, it is recommended to be adopted for all Nigerian tertiary institutions where CGPA is the Assessment Instrument employed to evaluate the performances of their students.

However, in order to respect the academic freedom of individual universities, any variation that must be allowed should be guided by the principles presented in paper 2. That is,

- Non-Grade Fail Grading System MUST be adopted.
- Triangle Model MUST be used to obtain the required mathematical relationship between the scores and CGPAs.
- Arithmetical Progression MUST be employed to distribute the grade points among the score ranges.
- Score ranges MUST be as equally spaced as possible even if fractional scores are required to be used. However, when equal score intervals do not give perfect integers, the nearest perfect integers (whole numbers) could be used allowing the higher numbers at the lower classes in order to take full advantage of the Separation Property of CGPA.
- Fail grade/score range MUST be assigned a zero grade point, also in order to take full advantage of the Separation Property of CGPA.

Consequently upon the above criteria, the parameters allowable to be varied by individual universities are,

- The maximum number of grade points (n) which of course MUST be equal to the number of degree classifications (m) desired. That is, varying (m) automatically varies (n) or vice versa.
- The lower limit of the minimum pass mark/score range, ($M_H + 1$) and
- The lower limit of the maximum pass mark/score range, (M_L).

Nevertheless, NUC may set a minimum values for these parameters above which any Nigerian university may choose to use higher values. No minimum value of grade point is to be regulated because the assignment of the required Arithmetical Progression (AP) automatically takes care of the minimum grade point to be assigned to the minimum score range which is the Common Difference of the AP. The author would also want to recommend that CWAM(S) should be calculated along with the CGPA of every student. The values of CWAM(S) will serve as a guide to fully recognize and appreciate the totality of the instrument being used.

Abolition of Pass Hons Degrees is not the answer to higher standard of education either is the answer to unemployment. What is required by any government and/or its agencies is to strengthen the tertiary institutions through ***appropriate curricula*** that are self-employed-biased, through ***adequate training*** which is industry-oriented and through ***proper assessment and evaluation of students' performance*** that is goal-directed. This paper deals only with the last in the series and has shown why it is important to use non-subjective instruments that can be interpreted scientifically, logically and numerically to classify our degrees. A mathematically developed grading system is paramount, essential and necessary to monitor with genuine intentions with a view to improving the falling standards of education, most especially at our tertiary institutions.

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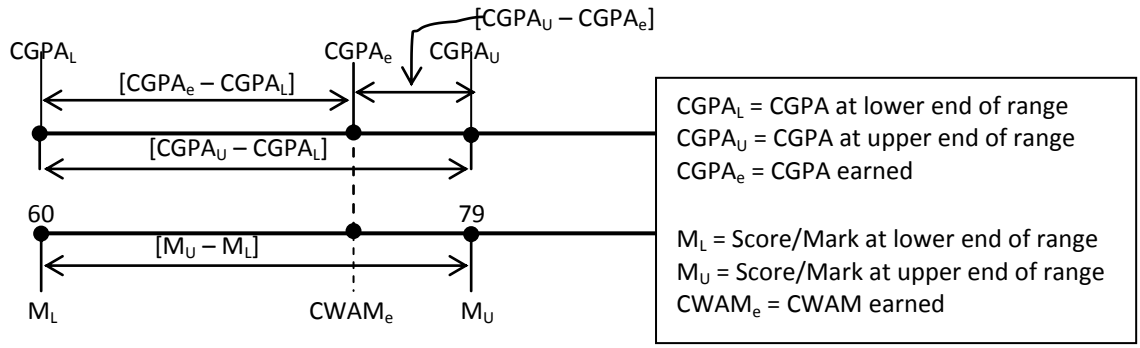


Figure 1: Line Diagram Relating Mark with CGPA Ranges

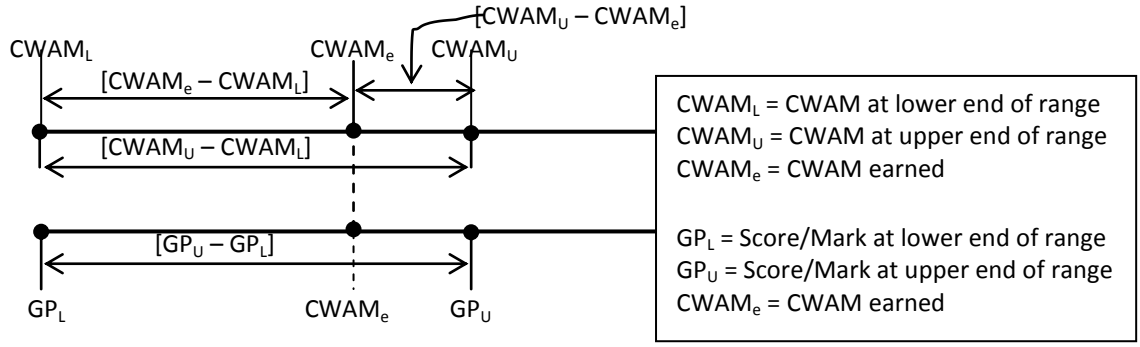


Figure 2: Line Diagram Relating Mark with CWAM Ranges

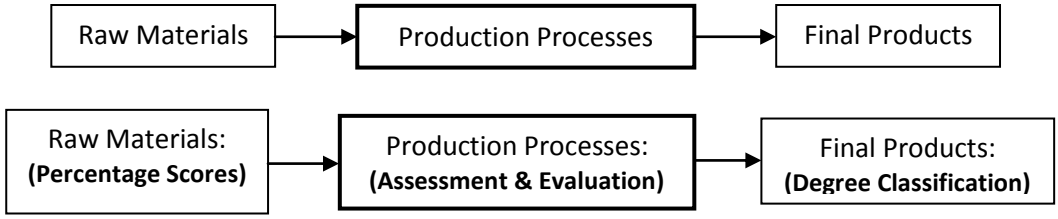


Figure 3: Process of a Product & Its Quality Determination

Table 1: Operating Grading System of University 'A' (UA)

Letter Grade (GP)	SCORE RANGES				CGPA RANGES			Class of Degree
	ML	MH	Intervals INT-M		Intervals INT-G	GPL	GPH	
A (5)	70	100	30	There is no direct link between the score and CGPA ranges	0.50	4.50	5.00	1st
B (4)	60	69	9		0.49	3.00	3.49	2nd U
C (3)	50	59	9		0.49	2.50	2.99	2nd L
D (2)	45	49	4		0.99	1.50	2.49	3rd
E (1)	40	44	4		0.49	1.00	1.49	Low Pass
F (0)	0	39	39					

OBSERVATIONS

1. The score range (40 – 44) is regarded as failure since Pass degree is outlawed, resulting into Graded Fail Grading System instead of Non-Graded Grading System originally adopted before now. It is technically a (4-point) grading system.
2. As a result of item (1) above, the Separation Property of CGPA is compromised.
3. The score intervals have no bearing with that of CGPA.

It is the directive of National Universities Commission (NUC) that University 'A' is probably trying to comply with that has resulted into the degree classification stated above with their attending errors.

Table 2: Graded Fail Grading System (70,45,5,2) University 'A' (UA) – Unequal Intervals

$$[GF/GS]_{F1,E} = \{[(4-point)0,1,1],P(0,1,5)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		4.50	1st	5
B	2	60	69		9	3.88	4.49	0.6230591		2nd U	4
C	3	50	59		9	3.25	3.87	0.6230591	(d)	2nd L	3
D	4	45	49		4	2.98	3.24	0.2769152	1	Pass	2
E	5	40	44		4	2.70	2.97	0.2769152		Fail	1
F1	6	0	39		39.000	0.00	2.69	2.699923		Fail	0
		∑CI (Pass/Fail)			65.000						

Table 3: Graded Fail Grading System (70,45,5,2) University 'A' (UA) – Equal Intervals

$$[GF/GS]_{F1,E} = \{[(4-point)0,1,1],P(0,1,5)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	**70**	**100**	77.78	30	**4.50**	**5.00**		4.50	1st	5
B	2	**61.7**	**69**		7.3333	**3.99**	**4.49**	0.5076778		2nd U	4
C	3	**53.3**	**60.7**		7.3333	**3.48**	**3.98**	0.5076778	**(d)**	2nd L	3
D	4	**45.0**	**52.3**		7.3333	**2.98**	**3.47**	0.5076778	1	Pass	2
E	5	**23**	**44**		21.0	**1.52**	**2.97**	1.4538046		Fail	1
F1	6	**0**	**22**		22.0	**0.00**	**1.51**	1.523033		Fail	0
		∑CI (Pass/Fail)			65.0						

Table 4: Grading System of University 'B' (UB)

Letter Grade (GP)	SCORE RANGES				CGPA RANGES			Class of Degree
	ML	MH	Intervals INT-M		Intervals INT-G	GPL	GPH	
A(7)	70	100	20	There is no direct link between the score and CGPA ranges	1.0	6.0	7.0	1st
B (6)	65	79	4		1.3	4.6	5.9	2nd U
C (5)	60	64	4		1.9	2.6	4.5	2nd L
D (4)	55	59	4		0.9	1.6	2.5	3rd
E (3)	50	54	4		0.5	1.0	1.5	Pass
G (2)	45	49	4					
H (1)	40	44	4					
F (0)	0	39	39					Fail

OBSERVATIONS:

1. The degree classification (5) is less than the score classification (7). That is, m < n, a condition that violates grading system principles.
2. Consequent upon item 1 above, the corresponding CGPA appropriately generated will have to be combined in order to classify the degree into 5.
3. The score intervals have no mathematical relationship with that of CGPA intervals which are biased in favour of 2nd Class Lower division.
4. Consequent upon item 3 above, a different set of CGPA ranges will be generated by using a developed mathematical relationship between the CGPA and score ranges (Table 5).

Table 5: Non-Graded Fail Grading System (70,40,7,1) of University 'B' (UB) – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(5 - point)0, 1], [P(0, 1, 7)]\}, [40, 70]$$

POLICY PARAMETERS: Max Grade Point = 7 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 40

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	6.30	7.00		5.30	1st	7.0
B	2	65	69		4	5.42	6.29	0.8833033	(d)		6.0
C	3	60	64		4	4.53	5.41	0.8833033	1.0	2.1	5.0
D	4	55	59		4	3.65	4.52	0.8833033			4.0
E	5	50	54		4	2.77	3.64	0.8833033		2.2	3.0
G	6	45	49		4	1.88	2.76	0.8833033		3rd	2.0
H	7	40	44		4	1.00	1.87	0.8833033		Pass	1.0
F	5	0	39							Fail	0
		∑CI (Pass Only)			24						

Table 6: Non-Graded Fail Grading System (70,40,5,1) of University 'B' (UB) – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(5 - point)0, 1], [P(0, 1, 5)]\}, [40, 70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 40

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		3.50	1st	5
B	2	60	69		9	3.29	4.49	1.211494	(d)	2nd U	4
C	3	50	59		9	2.08	3.28	1.211494	1	2nd L	3
D	4	45	49		4	1.54	2.07	0.5384418		3rd	2
E	5	40	44		4	1.00	1.53	0.5384418		Pass	1
F	5	0	39							Fail	0
		∑CI (Pass Only)			26						

Table 7: Non-Graded Fail Grading System (70,40,7,1.4) of University 'B' (UB) – Unequal Intervals

$$[ExGS]_{F=0} = \{[(7 - point)0, 1.4], [P(0, 1, 7)]\}, [40, 70]$$
$$[ExGS]_{F=0} = \{1.4[(5 - point)0, 1], [P(0, 1, 5)]\}, [40, 70]$$

POLICY PARAMETERS: Max Grade Point = 7 and the Least Pass Grade Point = 1.4, M_L = 70, M_H+1 = 40

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	6.30	7.00		4.90	1st	7.0
B	2	60	69		9	4.60	6.29	1.6960915	(d)	2nd U	5.6
C	3	50	59		9	2.91	4.59	1.6960915	1.4	2nd L	4.2
D	4	45	49		4	2.15	2.90	0.7538185		3rd	2.8
E	5	40	44		4	1.40	2.14	0.7538185		Pass	1.4
F	5	0	39							Fail	0
		∑CI (Pass Only)			26						

Table 8: Non-Graded Fail Grading System (70,40,5,1) of University 'B' (UB) – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(5 - point)0, 1], [P(0, 1, 5)]\}, [40, 70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 40

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		3.50	1st	5
B	2	62.5	69.0		6.5	3.62	4.49	0.8749679	(d)	2nd U	4
C	3	55.0	61.5		6.5	2.75	3.61	0.8749679	1	2nd L	3
D	4	47.5	54.0		6.5	1.87	2.74	0.8749679		3rd	2
E	5	40	46.5		6.5	1.00	1.86	0.8749679		Pass	1
F	5	0	39							Fail	0
		∑CI (Pass Only)			26						

Table 9: Grading System of University 'C' (UC)

INT GP	Letter Grade (GP)	SCORE RANGES ML	MH	Intervals INT-M		CGPA RANGES Intervals INT-G	GPL	GPH	Class of Degree
	A (4.0)	95	100	5	There is no direct link between the score and CGPA ranges	0.40	3.60	4.00	1st
0.3	A-(3.7)	90	94	4		0.79	2.80	3.59	2nd U
0.4	B+(3.3)	85	89	4		0.79	2.00	2.79	2nd L
0.3	B (3.0)	80	84	4		Not graduated			3rd
0.3	B-(2.7)	75	79	4		0.10	3.90	4.000	Summa Cum Laude
0.4	C+ (2.3)	70	74	4		0.99	3.80	3.899	Magna Cum Laude
0.3	C (2.0)	65	69	4		0.99	3.70	3.799	Cum Laude
0.3	C- (1.7)	60	64	4		0.99	3.50	3.699	University Honours
0.7	D (1.0)	50	59	9					
1.0	F (0.0)	0	49	49					

OBSERVATIONS:

1. The mathematical series used to distribute the grade points fails to conform to any known mathematical series such as Arithmetical Progression series that is recommended. It is arbitrary and does not agree with the equal interval of the scores. That is, it is biased randomly. It violates all principles and theories of grading system.
2. The degree classification does not seem to have any logical bearing with the scores earned by the students.
3. The grading system seems to be a (4-point) scale which is expected to produce four degree classifications but instead, there are four classifications within the 1st class and two others named 2nd Class Upper and Lower, making a total of six classes. Thus, the score distributions must be recombined to produce these six classes.

Table 10: Non-Graded Fail Grading System (95,50,4,?) of University 'C' (UC) – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,?],[\mathbb{P}(0,?,4)]\},[50,95]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 95, M_H+1 = 50

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	95	100	96.30	5	3.95	4.00		2.95		4.0
A-	2	90.0	94		4	3.63	3.94	0.3185015		The intermediate values of Grade Points are not made use of in the calculation of CGPA Ranges	3.7
B+	3	85.0	89		4	3.31	3.62	0.3185015			3.3
B	4	80.0	84		4	2.99	3.30	0.3185015			3.3
B-	5	75.0	79		4	2.67	2.98	0.3185015			3.0
C+	6	70.0	74		4	2.35	2.66	0.3185015			2.7
C	7	65.0	69		4	2.03	2.34	0.3185015			2.0
C-	8	60.0	64		4	1.72	2.03	0.3185015			1.7
D	9	50	59		9	1.00	1.71	0.7166283		Pass	1.0
F	5	0	49							Fail	0
		∑CI (Pass Only)			37						

Table 11: Alternative Grade Points Distribution Mostly Used by American Institutions

Serial No	SCORE RANGES	Letter Grade (GP)	SCORE RANGES	Letter Grade (GP)	SCORE RANGES	Letter Grade (GP)	SCORE RANGES	Letter Grade (GP)	Serial No
1	95 – 100	A (4.0)	95 – 100	A (4.0)	95 – 100	A (4.0)	94 – 100	A (4.0)	1
2	90 – 94	A-(3.7)	90 – 94	A-(3.67)	90 – 94	A-(3.7)	86 – 94	A-(3.7)	2
3	85 – 89	B+(3.3)	85 – 89	B+(3.33)	85 – 89	B+(3.5)	80 – 89	B+(3.1)	3
4	80 – 84	B (3.0)	80 – 84	B (3.0)	80 – 84	B (3.0)	75 – 84	B (2.8)	4
5	75 – 79	B-(2.7)	75 – 79	B-(2.67)	75 – 79	B-(2.7)	70 – 79	B-(2.5)	5
6	70 – 74	C+ (2.3)	70 – 74	C+ (2.33)	70 – 74	C+ (2.5)	65 – 74	C+ (2.2)	6
7	65 – 69	C (2.0)	65 – 69	C (2.00)	65 – 69	C (2.0)	60 – 69	C (1.9)	7
8	60 – 64	C- (1.7)	60 – 64	C- (1.67)	60 – 64	C- (1.7)	55 – 64	C- (1.6)	8
9	50 – 59	D (1.0)	55 – 59	D+ (1.33)	55 – 59	D+ (1.5)	50 – 59	D (1.0)	9
10			50 – 54	D (1.00)	50 – 54	D (1.0)			10
11			45 – 49	D- (0.67)					11
	0 – 49	F (0.0)	0 – 44	F (0.0)	0 – 49	F (0.0)	0 – 49	F (0.0)	
	(9-point) Scale		**(11-point) Scale**		**(10-point) Scale**		**(9-point) Scale**		

Table 12: Non-Graded Fail Grading System (95,50,4,0.444) OF University 'C' (UC) – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0, 0.444], [P(0, 0.444, 4)]\}, [50, 95]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 95, M_H+1 = 50

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	**95**	**100**	96.30	5	**3.95**	**4.00**		3.50	1st	4.00
A-	2	**90.0**	**94**		4	**3.57**	**3.94**	0.3785615	**(d)**		3.56
B+	3	**85.0**	**89**		4	**3.19**	**3.56**	0.3785615	0.444		3.11
B	4	**80.0**	**84**		4	**2.81**	**3.18**	0.3785615			2.67
B-	5	**75.0**	**79**		4	**2.43**	**2.80**	0.3785615			2.22
C+	6	**70.0**	**74**		4	**2.05**	**2.42**	0.3785615			1.78
C	7	**65.0**	**69**		4	**1.67**	**2.04**	0.3785615			1.33
C-	8	**60.0**	**64**		4	**1.30**	**1.66**	0.3785615			0.89
D	9	**50**	**59**		9	**0.44**	**1.29**	0.8517635		Pass	0.44
F	5	**0**	**49**							Fail	0
		∑CI (Pass Only)			37						

Table 13: Comparison of Table 12 with the Given CGPA Ranges

INT GP	Letter Grade (GP)	CGPA RANGES CALCULATED				CGPA RANGES GIVEN				Class of Degree
		GPL	GPH	Intervals INT-G			Intervals INT-G	GPL	GPH	
	A (4.00)	**3.95**	**4.00**	0.05	Summa, Mag	First Class 3.60 - 4.00	0.10	**3.90**	**4.00**	Summa Cum Laude
0.44	A-(3.56)	**3.57**	**3.94**	0.37	Magna, Cum		0.99	**3.80**	**3.899**	Magna Cum Laude
0.44	B+(3.11)	**3.19**	**3.56**	0.37	Univ Hons		0.99	**3.70**	**3.799**	Cum Laude
0.44	B (2.67)	**2.81**	**3.18**	0.37	2nd U		0.199	**3.50**	**3.699**	University Honours
0.45	B-(2.22)	**2.43**	**2.80**	0.37	2nd L					
0.44	C+(1.78)	**2.05**	**2.42**	0.37			0.40	**3.60**	**4.00**	1st Class
0.45	C (1.33)	**1.67**	**2.04**	0.37	3rd		0.79	**2.80**	**3.59**	2nd U
0.44	C- (0.89)	**1.30**	**1.66**	0.36			0.79	**2.00**	**2.79**	2nd L
0.45	D (0.44)	**0.44**	**1.29**	0.85	Pass		Not graduated			3rd
0.44	F (0.0)	0	49	49	Fail					

OBSERVATIONS:

1. The calculated CGPA is much more in agreement with the score distribution (equal intervals) than the given CGPA.
2. The best and logical classification is what is indicated on the calculated CGPA side to conform with the desired policy of the university to sub classify First Class division, bringing the total classes to seven (7).

Table 14: Non-Graded Fail Grading System (95,50,4,1) of University 'C' (UC) – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[50,95]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 95, M_H+1 = 50

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	**95**	**100**	96.30	5	**3.95**	**4.00**		2.95	1st	4.0
B-	2	**80.0**	**94**		14	**2.96**	**3.94**	0.9820462	**(d)**	2nd U	3.0
C	3	**65.0**	**79**		14	**1.98**	**2.95**	0.9820462	1	2nd L	2.0
D	4	**50**	**64**		14	**1.00**	**1.97**	0.9820462		3rd	1.0
F	5	**0**	**49**							Fail	0
		∑CI (Pass Only)			42						

Table 15: Non-Graded Fail Grading System (80,50,4,1) of University 'C' (UC) – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[50,80]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 80, M_H+1 = 50

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	**80**	**100**	85.19	20	**3.76**	**4.00**		2.76	1st	4.0
B-	5	**75**	**79**		4	**3.35**	**3.75**	0.4083639	**(d)**	2nd U	3.0
C+	6	**65**	**74**		9	**2.43**	**3.34**	0.9188188	1	2nd L	2.0
D	9	**50**	**64**		14	**1.00**	**2.42**	1.4292737		3rd	1.0
F	5	**0**	**49**							Fail	0
		∑CI (Pass Only)			27						

Table 16: Comparison of Table 14 with the Given CGPA Ranges

INT GP	Letter Grade (GP)	CGPA RANGES CALCULATED				CGPA RANGES GIVEN				Class of Degree
		GPL	GPH	Intervals INT-G			Intervals INT-G	GPL	GPH	
	A (4.0)	**3.95**	**4.00**	0.05	1st	First Class 3.60 - 4.00	0.10	**3.90**	**4.00**	Summa Cum Laude
1	B (3.0)	**2.96**	**3.94**	0.98	2nd U		0.99	**3.80**	**3.899**	Magna Cum Laude
1	C (2.0)	**1.98**	**2.95**	0.97	2nd L		0.99	**3.70**	**3.799**	Cum Laude
1	D (1.0)	**1.00**	**1.97**	0.97	3rd		0.199	**3.50**	**3.699**	University Honours
1	F (0.0)				Fail					
							0.40	**3.60**	**4.00**	1st Class
							0.79	**2.80**	**3.59**	2nd U
							0.79	**2.00**	**2.79**	2nd L
							Not graduated			3rd

Table 17: Comparison of Table 15 with the Given CGPA Ranges

INT GP	Letter Grade (GP)	CGPA RANGES CALCULATED				CGPA RANGES GIVEN				Class of Degree
		GPL	GPH	Intervals INT-G			Intervals INT-G	GPL	GPH	
	A (4.0)	**3.76**	**4.00**	0.24	1st	First Class 3.60 - 4.00	0.10	**3.90**	**4.00**	Summa Cum Laude
1	B (3.0)	**3.35**	**3.75**	0.40	2nd U		0.99	**3.80**	**3.899**	Magna Cum Laude
1	C (2.0)	**2.43**	**3.34**	0.91	2nd L		0.99	**3.70**	**3.799**	Cum Laude
1	D (1.0)	**1.00**	**2.42**	1.42	3rd		0.199	**3.50**	**3.699**	University Honours
1	F (0.0)				Fail					
							0.40	**3.60**	**4.00**	1st Class
							0.79	**2.80**	**3.59**	2nd U
							0.79	**2.00**	**2.79**	2nd L
							Not graduated			3rd

Table 18: Non-Graded Fail Grading System (70,50,4,1) University 'C' (UC) – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[50,70]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 80, M_H+1 = 50

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	**70**	**100**	77.78	30	**3.60**	**4.00**		2.60	1st	4.0
B-	5	**66.7**	**69**		2.3333	**3.24**	**3.59**	0.3568486	**(d)**	2nd U	3.0
C+	6	**63.3**	**66**		2.3333	**2.89**	**3.23**	0.3568486	1	2nd L	2.0
D	9	**50**	**62**		12	**1.00**	**2.88**	1.8861999		3rd	1.0
F	5	**0**	**49**							Fail	0
		∑CI (Pass Only)			17						

Table 19: Comparison of Table 18 with the Given CGPA Ranges

INT GP	Letter Grade (GP)	CGPA RANGES CALCULATED				CGPA RANGES GIVEN				Class of Degree
		GPL	GPH	Intervals INT-G			Intervals INT-G	GPL	GPH	
	A (4.0)	**3.60**	**4.00**	0.40	1st	First Class 3.60 - 4.00	0.10	3.90	4.00	Summa Cum Laude
1	B (3.0)	**3.24**	**3.59**	0.35	2nd U		0.99	**3.80**	**3.899**	Magna Cum Laude
1	C (2.0)	**2.89**	**3.23**	0.34	2nd L		0.99	**3.70**	**3.799**	Cum Laude
1	D (1.0)	**1.00**	**2.88**	1.88	3rd		0.199	**3.50**	**3.699**	University Honours
1	F (0.0)				Fail					
							0.40	**3.60**	**4.00**	1st Class
							0.79	**2.80**	**3.59**	2nd U
							0.79	**2.00**	**2.79**	2nd L
							Not graduated			3rd

OBSERVATIONS:

1. From the comparison, MAS is violated.
2. Summa, Magna, Cum Laude & University Honours are all within the First Class division.
3. The grading system presented in Table 9 is very intimidation and scaring but after the analysis, it is discovered that students are actually assessed by the grading system worse than the one presented in Table 18 when compared the given CGPA ranges with those calculated.
4. Consequently from item (3) above, lots of efforts and computer resources are expended in the calculation of the CGPAs earned by individual students (nine groups per student instead of four) to fix into the given CGPA ranges which by themselves are not correct because they are not calculated from their raw scores.

Table 20: Grading System of National Universities Commission (NUC)

Letter Grade	SCORE RANGES				CGPA RANGES			Class of Degree
	ML	MH	Intervals INT-M		Intervals INT-G	GPL	GPH	
A	70	100	20	There is no direct link between the score and CGPA ranges	0.50	4.50	5.00	1st
B	60	79	9		0.99	3.50	4.49	2nd U
C	50	59	9		1.09	2.40	3.49	2nd L
D	45	49	4		0.89	1.50	2.39	3rd
F	0	44	44			0		Fail

OBSERVATIONS:

1. The CGPA ranges suggest that the maximum grade point assigned to the highest pass mark/score is 5. This situation is capable of given rise to different versions of grading systems as follows (see Table 21 through 23):
   i) A(5), B(4), C(3), D(2), F(1) – This format destroys the major feature, Separation Property of CGPA. Thus, favouring the academically weak students against the strong ones – (Table 21).
   ii) A(5), B(4), C(3), D(2), F(0) – This format fails to obey Arithmetical Progression (AP) required to distribute the grade points among the score ranges including the fail range. Note, AP of a Common Difference of '1' is applied for pass score ranges only which makes it identical to Table 21 – (Table 22).
   iii) A(4), B(3), C(2), D(1), F(0) – This format satisfies the required condition of a well-designed and unique grading system but the given CGPA ranges are out of tune with this format. This is a clear evidence that the given CGPA ranges are arbitrarily allocated without a mathematical linkage – Table 23.
2. The score intervals have no mathematical relationship with that of CGPA intervals which are biased in favour of 2nd Class Lower division.
3. Consequent upon item 1 &2 above, a different set of CGPA ranges will be generated by using a developed mathematical relationship between the CGPA and score ranges.

Table 21: Non-Graded Fail Grading System (70,45,5,2) of NUC – Unequal Intervals

$$[NGF/GS]_{F=1} = \{[(4-point)1,1],[P(1,1,5)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		2.50	1st	5
B	2	60	69		9	3.48	4.49	1.0226747	(d)	2nd U	4
C	3	50	59		9	2.45	3.47	1.0226747	1	2nd L	3
D	4	45	49		4	2.00	2.44	0.4545221		3rd	2
F	5	0	44							Fail	1
		∑CI (Pass Only)			22						

Table 22: Non-Graded Fail Grading System (70,45,5,2) of NUC – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,2],[P(0,1,5)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		2.50	1st	5
B	2	60	69		9	3.48	4.49	1.0226747	(d)	2nd U	4
C	3	50	59		9	2.45	3.47	1.0226747	1	2nd L	3
D	4	45	49		4	2.00	2.44	0.4545221		Pass	2
F	5	0	44							Fail	0
		∑CI (Pass Only)			22						

Table 23: Non-Graded Fail Grading System (70,45,4,1) of NUC – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	3.60	4.00		2.60	1st	4
B	2	60	69		9	2.54	3.59	0.8666324	(d)	2nd U	3
C	3	50	59		9	1.47	2.53	0.8666324	1	2nd L	2
D	4	45	49		4	1.00	1.46	0.8666324		Pass	1
F	5	0	44							Fail	0
		∑CI (Pass Only)			22						

Table 24: Non-Graded Fail Grading System (70,45,4,1) of NUC – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	3.60	4.00		2.60	1st	4
B	2	62	69		7	2.77	3.59	0.8666324	(d)	2nd U	3
C	3	53	61		8	1.83	2.76	0.8666324	1	2nd L	2
D	4	45	52		7	1.00	1.82	0.8666324		Pass	1
F	5	0	44							Fail	0
		∑CI (Pass Only)			22						

Table 25: Non-Graded Fail Grading System (70,45,4,1) of NUC – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	3.60	4.00		2.60	1st	4
B	2	62	69		7	2.77	3.59	0.82724	(d)	2nd U	3
C	3	53	61		8	1.83	2.76	0.9454171	1	2nd L	2
D	4	45	52		7	1.00	1.82	0.82724		Pass	1
F	5	0	44							Fail	0
		∑CI (Pass Only)			22						

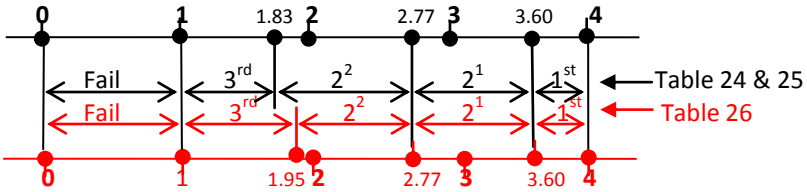
Table 26: Non-Graded Fail Grading System (70,45,4,1) of NUC – Unequal Intervals

$$[NGF/GS]_{F=0} = \{[(4-point)0,1],[P(0,1,4)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 4 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	3.60	4.00		2.60	1st	4
B	2	62	69		7	2.77	3.59	0.82724	(d)	2nd U	3
C	3	54	61		7	1.95	2.76	0.82724	1	2nd L	2
D	4	45	53		8	1.00	1.94	0.9454171		Pass	1
F	5	0	44							Fail	0
		∑CI (Pass Only)			22						

This is the best of the three formats (Tables 24, 25 & 26) because the gap between the strong and the weak students is highest and distinct. Only the truly brilliant students can get to the top class.



Note that when equal score intervals do not give perfect integers, the nearest to perfect integers (whole numbers) could be used allowing the higher numbers at the lower classes in order to take the advantage of the above scenario.

Table 27: Non-Graded Fail Grading System (70,45,6,1.5) of NUC – Unequal Intervals

$$[ExGS]_{F=0} = \{[(6-point)0,1.5],[P(0,1.5,6)]\},[45,70]$$

$$[ExGS]_{F=0} = 1.5\{[(4-point)0,1],[P(0,1,4)]\},[45,70] = 1.5[NGF/GS]_{F=0}$$

POLICY PARAMETERS: Max Grade Point = 6 and the Least Pass Grade Point = 1.5, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	5.40	6.00		3.90	1st	6.0
B	2	60	69		9	3.80	5.39	1.5953914	(d)	2nd U	4.5
C	3	50	59		9	2.21	3.79	1.5953914	1.5	2nd L	3.0
D	4	45	49		4	1.50	2.20	0.7090629		Pass	1.5
F	5	0	44							Fail	0.0
		∑CI (Pass Only)			22						

Table 28: Non-Graded Fail Grading System (70,45,6,1.5) of NUC – Equal Intervals

$$[ExGS]_{F=0} = \{[(6-point)0, 1.5], [P(0, 1.5, 6)]\}, [45, 70]$$
$$[ExGS]_{F=0} = 1.5\{[(4-point)0, 1], [P(0, 1, 4)]\}, [45, 70] = 1.5[NGF/GS]_{F=0}$$

POLICY PARAMETERS: Max Grade Point = 6 and the Least Pass Grade Point = 1.5, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	5.40	6.00		3.90	1st	6.0
B	2	61.7	69		7.3333	4.10	5.39	1.2999486	(d)	2nd U	4.5
C	3	53.3	61		7.3333	2.80	4.09	1.2999486	1.5	2nd L	3.0
D	4	45	52		7.3333	1.50	2.79	1.2999486		Pass	1.5
F	5	0	44							Fail	0.0
		∑CI (Pass Only)			22						

Table 29: Non-Graded Fail Grading System (70,45,5,2) of NUC – Equal Intervals

$$[NGF/GF/GS]_{F=1} = \{[(4-point)1, 1], [P(1, 1, 5)]\}, [45, 70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		2.50	1st	5
B	2	62	69		7.3333	3.67	4.49	0.8332905	(d)	2nd U	4
C	3	53	61		7.3333	2.83	3.66	0.8332905	1	2nd L	3
D	4	45	52		7.3333	2.00	2.82	0.8332905		Pass	2
F	5	0	44							Fail	1
		∑CI (Pass Only)			22						

OBSERVATIONS:

1. Since fail grade, 'F' is assigned a finite value (1), the Separation Property of CGPA is lost. Hence, this is not suitable for university assessment instrument.
2. The CGPA ranges generated in this table defer considerably from the NUC quoted figures. This is an evidence that NUC quoted data is arbitrary. That is, no mathematical relationship between the score/mark ranges and that of CGPA ranges quoted by NUC.
3. The score/mark ranges given is biased as against the balance ones produced on this table.
4. The validity condition for an Ideal grading system is violated. That is, m ≠ n

Table 30: Non-Graded Fail Grading System (70,45,5,1) of NUC – Equal Intervals

$$[GF/GS]_{F=1} = \{[(4-point)1, 1], [P(1, 1, 5)]\}, [45, 70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		3.50	1st	5
B	2	62	69		7.3333	4.11	4.49	0.3888746	(d)	2nd U	4
C	3	53	61		7.3333	3.72	4.10	0.3888746	1	2nd L	3
D	4	45	52		7.3333	3.33	3.71	0.3888746		Pass	2
F1	5	0	44		44.000	1.00	3.32	2.333248		Fail	1
		∑CI (Pass/Fail)			66.000						

OBSERVATIONS:

1. Since fail grade, 'F' is assigned a finite value (1), the Separation property of CGPA is lost. Hence, this is not suitable for university assessment instrument.
2. The CGPA ranges defer considerably from the NUC quoted figures.
3. The score/mark ranges given is biased as against the balance ones produced on this table.
4. The validity condition for an Ideal grading system is violated. That is, m ≠ n

Table 31: Graded Fail Grading System (70,45,5,1) of NUC – Equal Intervals

$$[GF/GS]_{F1,F2} = \{[(4-point)0,1,1],[P(0,1,5)]\},[45,70]$$

POLICY PARAMETERS: Max Grade Point = 5 and the Least Pass Grade Point = 2, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	70	100	77.78	30	4.50	5.00		4.50	1st	5
B	2	62	69		7.3333	3.99	4.49	0.5076778	(d)	2nd U	4
C	3	53	61		7.3333	3.48	3.98	0.5076778	1	2nd L	3
D	4	45	52		7.3333	2.98	3.47	0.5076778		Pass	2
F2	5	23	44		21.000	1.52	2.97	1.453805		Fail	1
F1	6	0	22		22.000	0.00	1.51	1.523033		Fail	0
		∑CI (Pass/Fail)			65.000						

OBSERVATIONS:

1. Since fail grade, 'F2' is assigned a finite value (1), the Separation property of CGPA is lost. Hence, this is not suitable for university assessment instrument.
2. The CGPA ranges defer considerably from the NUC quoted figures.
3. The score/mark ranges given is biased as against the balance ones produced on this table.
4. The validity condition for an Ideal grading system is violated. That is, m ≠ n

Table 32: Graded Fail Grading System (80,45,6,1) of NUC – Equal Intervals

$$[NGF/GS]_{F=0} = \{[(6-point)0,1],[P(0,1,6)]\},[45,80]$$

POLICY PARAMETERS: Max Grade Point = 6 and the Least Pass Grade Point = 1, M_L = 70, M_H+1 = 45

L/G	M	ML	MH	Ref 70	INT	GPL	GPH	SH	RR	Class	GP (n)
A	1	80	100	85.19	20	5.63	6.00		4.63	1st U	6
B	2	73.0	79		6	4.71	5.62	0.9269369	(d)	1st L	5
C	3	66.0	72.0		6	3.78	4.70	0.9269369	1	2nd U	4
D	4	59.0	65.0		6	2.85	3.77	0.9269369		2nd L	3
E+	5	52.0	58.0		6	1.93	2.84	0.9269369		Pass	2
E	6	45	51.0		6	1.00	1.92	0.9269369		Low Pass	1
F	7	0	44.0							Fail	0
		∑CI (Pass Only)			30						

Note the perfect equality in score intervals (6s) and CGPA intervals (0.9269369). In such cases like this, rounding errors are minimized and/or totally eliminated.

TABLE 33: Students' Earned Scores Distribution On Given Score Ranges

Position	1st Class		2nd Class Upper		2nd Class Lower		3rd Class		Pass	
	Score (A)	No of Students	Score (B)	No of Students	Score (C)	No of Students	Score (D)	No of Students	Score (E)	No of Students
1	100	0	69	10	64	45	59	52	54	24
2	99	0	68	21	63	34	58	41	53	10
3	98	0	67	23	62	40	57	44	52	12
4	97	0	66	20	61	46	56	30	51	1
5	96	0	65	40	60	50	55	25	50	5
6	95	0							49	3
7	94	0	L/Grade	Range					48	4
8	93	0	A	70 – 100					47	2
9	92	0	B	65 – 75					46	3
10	91	0	C	60 – 64					45	2
11	90	0	D	55 – 59						
12	89	0	E	45 – 54						
13	88	0								
14	87	0								
15	86	1								
16	85	0								
17	84	0								
18	83	0								
19	82	1								
20	81	0								
21	80	1								
22	79	1								
23	78	1								
24	77	0								
25	76	0								
26	75	0								
27	74	2								
28	73	1								
29	72	1								
30	71	2								
31	70	5								
Total		17		114		215		192		66
% of 604		2.18		18.87		35.60		31.79		10.93
% of 100		0-2		15-20		20-40		20-35		5-15
Hand Palm		Thumb		1st Finger		Middle Finger		3rd Finger		Last Finger

This format can be used to generate the distribution pattern of students' performances in each course & prove that they flows a Bell Curve probability distribution similar to the relative positions of the fingers to the thumb.

Table 34: Grading System of Institution A.

CGPA		Interval		Score/Marks		Interval
4.44	**5.00**	0.56		**80**	**100**	20.00
2.63	**4.43**	1.80		**60**	**79**	19.00
1.77	**2.62**	0.85		**50**	**69**	9.00
1.38	**1.76**	0.38		**45**	**49**	4.00
1.00	**1.37**	0.37		**40**	**44**	4.00

Table 35a: STUDENT 1: Class 'A' Student (Minor) (Major)

With Fail Grade = Finite

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	76	228
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	76	228
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	70	140
18	R	1	60	60
19	S	1	30	30
20	T	2	94	188
∑		**45**		**3653**
$CWAM_e$	**81.18**			

Table 35b: STUDENT 2: Class 'A' Student (Major)

With Fail Grade = Finite

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	80	240
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	30	90
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	80	160
18	R	1	60	60
19	S	1	90	90
20	T	2	94	188
∑		**45**		**3607**
$CWAM_e$	**80.16**			

Table 36a: STUDENT 1: Class 'A' Student (Minor) (Major)

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	76	228
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3	76	228
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	70	140
18	R	1	60	60
19	S	1	30	
20	T	2	94	188

Table 36b: STUDENT 2: Class 'A' Student (Major)

S/N	COURSES	CREDIT CR	MARK M	M*CR
1	A	3	80	240
2	B	3	88	264
3	C	3	78	234
4	D	3	80	240
5	E	3	84	252
6	F	2	81	162
7	G	2	80	160
8	H	2	87	174
9	I	1	90	90
10	J	1	93	93
11	K	3		0
12	L	3	77	231
13	M	3	84	252
14	N	2	85	170
15	O	2	92	184
16	P	3	91	273
17	Q	2	80	160
18	R	1	60	60
19	S	1	90	90
20	T	2	94	188

∑		45		3623
$CWAM_e$	80.51			

With Fail Grade = 0

∑		45		3517
$CWAM_e$	78.16			

With Fail Grade = 0

Table 37a: Grading System of Institution 'B'

CGPA RANGES			MARK RANGES	
4.70	5.00	1st Class	80	100
2.75	4.69	2nd Class U	60	79
1.82	2.74	2nd Class L	50	59
1.41	1.81	3rd Class	45	49
1.00	1.40	Pass Class	40	44

Table 37b: Grading System of Institution 'C'

CGPA RANGES			MARK RANGES	
4.50	5.00	1st Class	80	100
3.50	4.49	2nd Class U	60	79
2.50	3.49	2nd Class L	50	59
2.00	2.49	3rd Class	45	49
1.00	1.99	Pass Class	40	44

Table 37c: Grading System of Institution 'D'

CGPA RANGES			MARK RANGES	
4.50	5.00	1st Class	70	100
3.50	4.49	2nd Class U	60	69
2.40	3.49	2nd Class L	50	59
1.50	2.39	3rd Class	45	49
1.00	1.49	Pass Class	40	44

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Table 38: Comparison of the Conversion Values

Common	Institution 'A'	Institution 'B'	Institution 'C'	Institution 'D'	
		Table 37a	Table 37b	Table 37c	
CWAM $CWAM_e$ = 75 $CWAM_e$ = 46	CGPA $CGPA_e$ = 4.05 $CGPA_e$ = 1.50	CGPA $CGPA_e$ = 4.28 $CGPA_e$ = 1.51	CGPA $CGPA_e$ = 4.36 $CGPA_e$ = 2.12	CGPA $CGPA_e$ = 5.15 $CGPA_e$ = 1.72	CWAM $CWAM_e$ = 75 $CWAM_e$ = 46
80-100	4.44-5.00	4.70-5.00	4.50-5.00	4.50-5.00	70-100
60-79	2.63-4.44	2.75-4.69	3.50-3.49	3.50-3.49	60-79
50-59	1.77-2.62	1.82-2.74	2.50-3.49	2.40-3.49	50-59
45-59	1.38-1.76	1.41-1.81	2.00-2.49	1.50-2.39	45-59
40-44	1.00-1,37	1.00-1.40	1.00-199	1.00-199	40-44

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