

**ALL INDIA INSTITUTE OF MEDICAL SCIENCES
ANSARI NAGAR, NEW DELHI - 110608
EXAMINATION SECTION**

Dated: 20.01.2023

NOTICE NO-35/2023

**NORMALIZATION PROCEDURE FOR PREPARATION OF RESULT OF EXAMINATION CONDUCTED
BY AIIMS NEW DELHI**

1. Process of Normalization

1.1. Percentile Scores

Percentile scores are the relative performance of all those who appear for the examination. The marks obtained are transformed into a scale ranging from 100 to 0 for each group (shift) of examinees.

The Percentile Score indicates the percentage of candidates that have scored EQUAL TO OR BELOW (same or lower raw scores) that particular Percentile in that examination. Therefore, the topper (highest score) of each group (shift) will get the same Percentile of 100, which is desirable. The marks obtained between the highest and lowest scores are converted to appropriate Percentiles.

The Percentile score is the Normalized Score for the examination.

The Percentile Scores will be calculated to 7 decimal places to avoid the bunching effect and reduce ties.

In this method of scoring, the HIGHEST SCORE in each paper (irrespective of the raw scores/percentage obtained) will be the 100 Percentile indicating that 100% of candidates have scored *equal to or lesser than* the highest scorer/ topper for that shift. For example, in Shift 1, if the highest score is 80%; in Shift 2, if the highest score is 82%; in Shift 3, if the highest score is 78%; and in shift 4, if the highest score is 79%, **all the highest scores** would be normalized to 100 Percentile for their respective group/shift.

The lowest score would have a percentile depending on the total number of candidates who have taken the examination. Supposing 100000 students have taken the test in a Shift and the highest Score (A) for that group/shift is 160 / 200 (80%), and the lowest Score (B) is – 3/ 200 (-1.5%). If no other candidate has scores equal to either A or B, then the Percentile Score of A, the top scorer, shall be 100 [because all or 100% of candidates have scored EQUAL TO OR LESS THAN A]. The Percentile Score of B, the lowest scorer, shall be 0.001 since the percentage of candidates with scores EQUAL TO OR BELOW would be 0.001 [(1/100000) *100]. If a candidate (C) had a raw score similar to A, then both A and C would have a Percentile Score of 100. Similarly, if another candidate (D) had a raw score equal to that of B, then both B and D would have a Percentile score of 0.002 [(2/100000) *100]. Ties would therefore have similar Percentiles.

The following further explains the interpretation of the scores in an examination (such as one shift) with **100 candidates**.

- If candidate A's Percentile score is 100, then all who have taken the examination, 100%, have scored either EQUAL TO OR LESS THAN candidate A. It also indicates that no candidate has achieved more than candidate A.
- If candidate B's Percentile score is 90, it indicates that 90% of the candidates who have taken the examination have scored either EQUAL TO OR LESS than candidate B. It also demonstrates that the remaining candidates have achieved more than candidate B.
- If candidate C's Percentile score is 50, it indicates that 50% of the other candidates who have taken the examination have scored either EQUAL TO OR LESS than candidate C. It also shows that the remaining half of those who took the test scored more than candidate C.
- Suppose candidate D's Percentile score is 30. It indicates that 30% of the candidates who have taken the examination have scored either EQUAL TO OR LESS than candidate D. It also shows that the remaining have achieved more than candidate D.
- If candidate E's Percentile score is 1, it indicates that none of the candidates who have taken the examination has scored either EQUAL TO OR LESS than candidate E. It also shows that all remaining candidates who took the test scored more than this candidate.

1.2. Applicability

It may be applicable for entrance, recruitment or any examination as per requirement for preparation of merit results at the discretion of the Dean (Examinations).

It may be applicable in any examination conducted in multiple shifts at the discretion of the Dean (Examinations).

1.3. Process

1.3.1. Examinations consisting of Multiple Subjects in the examination scheme & conducted in Multiple shifts

BRIEF DESCRIPTION OF THE STEP-BY-STEP PROCEDURE FOR NORMALIZATION AND PREPARATION OF MERIT / RANKING

1.3.1.1. Distribution of Examinees in multiple shifts

Applicants would be allotted into different groups(shifts) randomly such that these groups are approximately equal in number. This will ensure that there is no bias in the distribution of candidates who take the examination.

Further, with a large population of examinees spread over the entire country, such a possibility of bias becomes remote.

1.3.1.2. Preparation of Results for each Shift

The examination results for **each shift** will be prepared in the form of

- Raw Scores
- Percentages

Percentiles (**up to 7 decimal places**) **separately** for each of the subjects and the Total.

*The Percentile of the Total shall **not** be an aggregate or average of the Percentile of individual subjects.*

Resolution of ties:

Suppose the examination consists of 'N' subjects, Subject 1, Subject 2,, Subject N, and the Priority of subjects for resolving ties is $S_i > S_{i+1}$ for all i from 1 to N-1, the method adopted for breaking ties (similar Percentiles) shall be:

1. Subject 1: Higher Percentile scores in Subject 1 will result in a higher ranking
2. Subject 2: If Subject 1 Percentiles do not break the tie, higher Percentile scores in Subject 2 will result in a higher ranking
3. Subject N: If Subject 1, Subject 2, and Subject N-1 Percentiles do not break the tie, higher Percentile scores in Subject N will result in a higher ranking
4. Age: If none of the Subjects' Percentiles breaks the tie, the candidate elder by age will be ranked higher

EXAMPLE

Consider an examination consisting of 4 subjects, Biology for ___ Marks, Chemistry for ___ Marks, Physics for ___ Marks and General Knowledge for ___ Marks. As per the scheme of the examination published in the prospectus, tie cases will be resolved in order/sequence of percentile score in Biology, Chemistry & Physics, and if not determined based on mentioned subject percentile score, the elder by age will be higher in rank. General Subject score will not be used for the resolution of tie cases.

Let T, S1, S2, S3, and S4 denote the raw marks obtained in Total, Biology, Chemistry, Physics and General Knowledge.

The following 5 Percentiles will be calculated for each student:

Total Percentile (TP):	$100 \times \frac{\text{No. of candidates from the group with TOTAL MARKS} \leq T}{\text{No. of candidates in the group / shift}}$
Biology Percentile (S1P):	$100 \times \frac{\text{No. of candidates from the group with BIOLOGY} \leq S1}{\text{No. of candidates in the group / shift}}$
Chemistry Percentile (S2P):	$100 \times \frac{\text{No. of candidates from the group with CHEMISTRY} \leq S2}{\text{No. of candidates in the group / shift}}$
Physics Percentile (S3P):	$100 \times \frac{\text{No. of candidates from the group with PHYSICS} \leq S3}{\text{No. of candidates in the group / shift}}$
General Knowledge Percentile (S4P):	$100 \times \frac{\text{No. of candidates from the group with GENERAL KNOWLEDGE} \leq S4}{\text{No. of candidates in the group / shift}}$

1.3.1.3. Resolution of ties Cases

Resolution of ties will be as per the scheme of the examination published in the prospectus/Advertisement.

1.3.1.4. Preparation of Overall Rank / Merit List

As mentioned above, the Percentile scores for the Total Marks for all the shifts would be merged and arranged to derive an overall Merit List / Ranking.

Please Note that the percentile score is not the same as the percentage of marks obtained.

Example of a hypothetical scenario in the preparation of Overall Ranking / Merit

- Assuming the exam is conducted in 4 shifts, and there are 100000 candidates in each shift, the Hypothetical Ranking would be :

PERCENTILE : SHIFT 1					
ROLL NO	TOTAL	Biology	Chemistry	Physics	General Knowledge
A1015	100.0000000	99.9872345	100.0000000	100.0000000	100.0000000
A1020	99.9872385	100.0000000	99.9872345	99.8957721	99.9872365
A1050	99.9872345	100.0000000	99.9872345	99.8956720	99.9872345
↓	↓	↓	↓	↓	↓
↓	↓	↓	↓	↓	↓
A1001	0.0010000	0.0010000	0.0010000	0.0010000	0.0010000

The Percentiles of Shift 1 are calculated separately for the Total marks and the four subjects. The Percentile for the Total is NOT the aggregate nor the average of the Percentiles of each Subject.

2. A similar Table has been prepared for Shift 2, 3 and 4.

PERCENTILES : SHIFT 2					
ROLL NO	TOTAL	Biology	Chemistry	Physics	General Knowledge
B2050	100.0000000	99.9872340	100.0000000	99.9872347	100.0000000
B2035	100.0000000	100.0000000	99.9872345	99.8956721	99.9872345
B2020	99.9872355	100.0000000	99.9872340	99.8956721	99.9872345
↓	↓	↓	↓	↓	↓
↓	↓	↓	↓	↓	↓
B2041	0.0010000	0.0010000	0.0010000	0.0010001	0.0010000

PERCENTILES : SHIFT 3					
ROLL NO	TOTAL	Biology	Chemistry	Physics	General Knowledge
C3105	100.0000000	99.9872340	100.0000000	99.9872345	100.0000000
C3220	99.9972345	100.0000000	99.9898345	99.8956721	99.9872645
C3641	99.9872355	100.0000000	99.9872345	99.8956721	99.9872324
↓	↓	↓	↓	↓	↓
↓	↓	↓	↓	↓	↓
C3044	0.0010000	0.0010000	0.0010000	0.0010001	0.0010000

PERCENTILES : SHIFT 4					
ROLL NO	TOTAL	Biology	Chemistry	Physics	General Knowledge
D4240	100.0000000	99.9872332	100.0000000	99.9972345	100.0000000
D4132	99.9999991	100.0000000	99.9898345	99.8756721	99.9972331
D4332	99.9823156	100.0000000	99.9972045	98.5672107	99.9865840
↓	↓	↓	↓	↓	↓
↓	↓	↓	↓	↓	↓
D4511	0.0010000	0.0010000	0.0010000	0.0010001	0.0010000

3. The next step would be to merge the results of all four shifts using the **Percentiles of Total** for ranking.

ROLL NO	TOTAL
A1015	100.0000000
B2050	100.0000000
B2035	100.0000000
C3105	100.0000000
D4240	100.0000000
D4132	99.9999991
C3220	99.9972345
A1020	99.9872385
B2020	99.9872355
C3641	99.9872355
A1050	99.9872345
D4332	99.9823156
A1001	0.0010000
B2041	0.0010000
C3044	0.0010000
D4511	0.0010000

4. Please note that some candidates have the same Percentile Scores (Ties). In the next step, the ties would be resolved with the sequential application of Percentile Scores of

- Biology
- Chemistry
- Physics
- Date of Birth (age)

Each of the above would be considered in the above sequence until the tie is resolved.

Note: Percentile of General Knowledge and Aptitude is not considered for resolving ties.

The Final Ranking /Merit would be prepared after resolving ties:

ROLL NO	TOTAL	BIOLOGY	CHEMISTRY	PHYSICS	AGE	REMARKS
B2035	100.0000000	100.0000000				Total Percentile equal but Biology Percentile of B2035>A1015>B2050, C3105, D4240
A1015	100.0000000	99.9872345				
B2050	100.0000000	99.9872340	100.0000000	99.9872347		Total, Biology & Chemistry Percentiles equal but Physics Percentile of B2050>C3105
C3105	100.0000000	99.9872340	100.0000000	99.9872345		
D4240	100.0000000	99.9872332				Total Percentiles equal but Biology Percentile of B2035>A1015>B2050, C3105>D4240
D4132	99.9999991					
C3220	99.9972345					Total Percentile D4132>C3220>A1020
A1020	99.9872385					
C3641	99.9872355	100.0000000	99.9872345			Total and Biology percentiles equal. Chemistry Percentile C3641>B2020
B2020	99.9872355	100.0000000	99.9872340			
A1050	99.9872345	100.0000000	99.9872345	99.8956720		Total Percentile A1050>D4332
D4332	99.9823156	100.0000000	99.9972045	98.5672107		
↓	↓	↓		↓	↓	
↓	↓	↓		↓	↓	
A1001	0.0010000	0.0010000	0.0010000	0.0010000	22/01/2000	Since Total, Biology, Chemistry and Physics Percentiles are equal, according to Date of Birth, age of A1001>B2041>C3044 > D4511
B2041	0.0010000	0.0010000	0.0010000	0.0010000	03/02/2000	
C3044	0.0010000	0.0010000	0.0010000	0.0010000	30/10/2001	
D4511	0.0010000	0.0010000	0.0010000	0.0010000	20/11/2001	

4. The Final Ranking / Merit:

RANK	ROLL NO
1	B2035
2	A1015
3	B2050
4	C3105
5	D4240
6	D4132
7	C3220
8	A1020
9	C3641

RANK	ROLL NO
10	B2020
11	A1050
12	D4332
↓	↓
↓	↓
399997	A1001
399998	B2041
399999	C3044
400000	D4511

1.3.2. Examination consisting of Single Subject/Score in the examination scheme & conducted in Multiple Shifts

The overall merit/ranking shall be based on the Percentile score of the Raw score.

The method adopted for breaking ties (similar Percentiles) shall be based on Age, i.e., the candidate older by age will be ranked higher.

1.3.2.1. Distribution of Examinees in multiple shifts

Applicants would be allotted into different groups(shifts) randomly such that these groups are approximately equal in number. This will ensure that there is no bias in the distribution of candidates who take the examination.

Further, with a large population of examinees spread over the entire country, such a possibility of bias becomes remote.

1.3.2.2. Preparation of Results for each Shift

The examination results for **each shift** will be prepared in the form of

- Raw Scores
- Percentages

Percentiles (up to 7 decimal places) for the Total score shall be calculated.

The resolution of ties will be as per the scheme of the examination published in the prospectus. In case the same is not mentioned in the prospectus, older by age will be ranked higher in tie cases.

Consider an exam with Single Subject conducted in Multiple Shifts.

Only 1 Percentile would be calculated for each student

Let T denote the raw marks obtained by a candidate:

$$\text{Total Percentile (TP):} \quad 100 \times \frac{\text{No. of candidates from the group with TOTAL MARKS} \leq T}{\text{No. of candidates in the group / shift}}$$

1.3.2.3. Preparation of Overall Rank / Merit List

The Percentile scores for the Total Marks for all the shifts, as mentioned above, would be merged and arranged so as to derive an overall Merit List / Ranking.

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Example of a hypothetical scenario in the preparation of Overall Ranking / Merit

1. Assuming the exam is conducted in 4 shifts, and there are 100000 candidates in each shift, the Hypothetical Ranking would be:

PERCENTILE : SHIFT 1	
ROLL NO	TOTAL
S1015	100.0000000
S1020	99.9872385
S1050	99.9872345
↓	↓
↓	↓
S1001	0.0010000

PERCENTILE : SHIFT 2	
ROLL NO	TOTAL
S2050	100.0000000
S2035	100.0000000
S2020	99.9872355
↓	↓
↓	↓
S2041	0.0010000

PERCENTILE : SHIFT 3	
ROLL NO	TOTAL
S3105	100.0000000
S3220	99.9972345
S3641	99.9872355
↓	↓
↓	↓
S3044	0.0010000

PERCENTILE : SHIFT 4	
ROLL NO	TOTAL
S4240	100.0000000
S4132	99.9999991
S4332	99.9823156
↓	↓
↓	↓
S4511	0.0010000

The Percentiles of Shift 1,2,3, and 4 are calculated for the Total marks.

2. The next step would be to merge the results of all four shifts using the **Percentiles of Total** for ranking.

ROLL NO	TOTAL
S1015	100.0000000
S2050	100.0000000
S2035	100.0000000
S3105	100.0000000
S4240	100.0000000
S4132	99.9999991
S3220	99.9972345
S1020	99.9872385
S2020	99.9872355
S3641	99.9872355
S1050	99.9872345
S4332	99.9823156
S1001	0.0010000
S2041	0.0010000
S3044	0.0010000
S4511	0.0010000

The diagram illustrates three groups of tied scores. The first group consists of five students (S1015, S2050, S2035, S3105, S4240) all with a total score of 100.0000000. The second group consists of two students (S2020, S3641) both with a total score of 99.9872355. The third group consists of four students (S1001, S2041, S3044, S4511) all with a total score of 0.0010000. Blue arrows point from each of these tied scores to a 'Ties' label on the right side of the table.

3. Please note that some candidates have the same Percentile Scores (Ties). In the next step, the ties would be resolved by considering the "Date of Birth (Age)" or as published in the advertisement.

The Final Ranking /Merit would be prepared after resolving ties:

ROLL NO	TOTAL	AGE	REMARKS
B2035	100.0000000	02/03/1999	Since Total Percentiles are equal, according to Date of Birth, age of B2035 > A1015 > B2050 > C3105 > C3105
A1015	100.0000000	12/05/1999	
B2050	100.0000000	01/02/2000	
C3105	100.0000000	13/08/2000	
D4240	100.0000000	01/10/2001	
D4132	99.9999991		Total Percentile D4132 > C3220 > A1020
C3220	99.9972345		
A1020	99.9872385		
C3641	99.9872355	02/09/2000	Since Total Percentiles are equal, according to Date of Birth, age of C3641 > B2020
B2020	99.9872355	12/05/2001	
A1050	99.9872345		Total Percentile A1050 > D4332
D4332	99.9823156		
↓	↓	↓	↓
▼	▼	▼	▼
A1001	0.0010000	22/01/2000	Since Total Percentiles are equal, according to Date of Birth, age of A1001 > B2041 > C3044 > D4511
B2041	0.0010000	03/02/2000	
C3044	0.0010000	30/10/2001	
D4511	0.0010000	20/11/2001	

4. The Final Ranking / Merit:

RANK	ROLL NO
1	B2035
2	A1015
3	B2050
4	C3105
5	D4240
6	D4132
7	C3220
8	A1020
9	C3641

RANK	ROLL NO
10	B2020
11	A1050
12	D4332
↓	↓
↓	↓
399997	A1001
399998	B2041
399999	C3044
400000	D4511

