Annexure II

September 8, 2015

Report of the committee of JAB

To recommend the future course of action for ranking in JEE (Main)

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This report of the committee formed by JEE Apex Board (JAB) aims at making recommendations to the JAB regarding the future course of action for determining All India Ranks for the candidates who appear in JEE (Main) examination. While arriving at the recommendations, the committee has analysed the distribution of marks in each of the board and their effect on JEE ranks over years.

Details about such analysis are available in this report.

Signed and delivered to JAB.

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1. Acronyms used in this report

AIEEE: All India Entrance Examination for Engineering. The entrance examination conducted by CBSE prior to 2013 which ceased to exist after introduction of JEE (Main).

AIR: All India Rank. The rank obtained by a candidate on an all India basis in an examination as clear from the context.

BoG: Board of Governors.

CBSE: Central Board of Secondary Education. CBSE conducts the JEE (Main).

CFTI: Centrally funded technical institutions. The technical institutions which are funded by Government of India.

COBSE: The Council of Boards of School Education in India (COBSE) is an association of the Boards of School Education in India.

CSAB: Central Seat Allocation Board for allocation of seats to CFTIs based on JEE (Main) ranks.

IITs: Indian Institutes of Technology.

IIT-JEE: (same as JEE) but is used by Ramasami Committee to distinguish JEE from other entrance examinations.

JAB: JEE Apex Board. This board is responsible for the conduct of JEE (Main).

JEE: Joint Entrance Examination. This term is used to mean the Joint Entrance Examination to Indian Institutes of Technology (IITs), Institute of Technology BHU (IT-BHU) and Indian School of Mines Dhanbad (ISM) prior to 2013.

JEE (Main): Joint Entrance Examination (Main). This term is used to mean the Joint Entrance Examination (Main) which is being conducted since 2013. This is also used as the first stage examination to identify those eligible to appear in JEE (Advanced).

JEE (Advanced): Joint Entrance Examination (Advanced). This term is used to mean the Joint Entrance Examination (Advanced) which is being conducted since 2013 by various IITs and is used as the criteria for admission to IITs and ISM Dhanbad.

JIG: JEE Interface Group for JEE (Main).

MHRD: Ministry of Human Resource Development, Government of India.

NITs: National Institutes of Technology.

VNIT: Visvesvaraya National Institute of Technology Nagpur.

2. Executive Summary

In year 2013, the then AIEEE examination for admission to various CFTIs was converted to JEE (Main). The then JEE examination was replaced by JEE (Advanced) where approximately top 150000 candidates on the basis of JEE (Main) performance were allowed to appear. The following changes were brought in for admissions to various institutes.

1. A single competitive examination was envisaged for admission to various centrally funded technical institutes (CFTIs) and other state government funded institutes based on adoption by the corresponding states.
2. The examination was carried out in two stages – JEE (Main) and JEE (Advanced).
3. Top 150000 candidates on the basis of their performance in JEE (Main) would qualify for the second stage, i.e. JEE (Advanced).
4. Admission to various IITs and ISM Dhanbad were made on the basis of ranks in JEE (Advanced) only.
5. Admission to various other CFTIs were made on the basis of ranks in JEE (Main). The rank itself was obtained by a mix of performance in JEE (Main) and the board examination in 60:40 ratio. The board performance itself was taken in a complex manner by taking the percentile of the candidate in the board and mapping his/her performance to the marks obtained in JEE (Main) for the same percentile score. The 40% performance in the board was equally divided into two parts – the first part using the target group in JEE (Main) which were taken to be all candidates appearing in JEE (Main); and the second part using the target group in JEE (Main) which were taken to be those candidates only who were from the same board.
6. Admission to IITs and ISM Dhanbad were made subject to the candidate being in top 20 percentile in their corresponding board examination. This criteria was later changed in 2015 to top 20 percentile or an absolute performance of 75 percent or more in board examination.
7. For three years, namely in 2013, 2014 and 2015, the same system had been operational.

While in the JEE Apex Board (JAB) meeting held on 27th July 2015, several deficiencies were pointed out, JAB decided to form a committee to look into this aspect afresh and make suitable recommendations to MHRD. Accordingly a committee was formed by JAB (Annexure A). The committee had three meetings (on 13th August, 2015, September 1, 2015 and September 8, 2015) and has come up with recommendations outlined in this report. Summarily the recommendations are (1.) All India Rank should be based on JEE (Main) performance only after applying tie breaking rules (2.) The Board Performance should be treated as a filtering criteria which should be similar to JEE (Advanced) with thresholds defined by CSAB (3.) The provisional admissions, only in case of non-availability of board results, should be finalized by a cutoff date decided by CSAB.

3. Background

The present system has its roots in the recommendations of the following committees.

1. Committee formed by MHRD under the chairmanship of Professor D Acharya, then Director IIT Kharagpur vide letter F.No.19-2/2010-TS.I dated 8th March 2010.
2. Committee formed by MHRD under the chairmanship of Dr. T. Ramasami, then Secretary DST vide letter F.No. 19-4/2010-TS.I dated 11th November 2010.
3. Committee formed by MHRD under the chairmanship of Dr. S K Joshi, then chairman BoG, VNIT Nagpur vide letter F.33-5/2012-TS.III dated 13th August 2012.
4. Joint Interface Group (JIG) under the chairmanship of Sh Vineet Joshi, then President COBSE and chairman CBSE vide letter CBSE/CM/PS/2013 dated 22.04.2013.

The salient recommendations of the committees are as follows.

Recommendations of Acharya committee[2]

The Acharya Committee presented in its interim report an alternative to the then examination system for admission into engineering colleges, including IITs. While there was unanimity that the then examination system of JEE and AIEEE etc. had to change to reduce the burden on students on account of the multiplicity of entrance examinations, there was emphasis that any new system has to recognize the diversity of learning within the country.

The salient points in the recommendations of Acharya committee are the following.

- Screening based on normalized Board scores at Standard X and/or Standard XII and multiple choice examination to replace the then two-stage JEE.
- Entry barrier is to be raised to 60% in the +2 examinations.
- Factors, other than the standard XII marks and All India Rank (AIR) based on Physics, Chemistry and Maths (PCM) testing, such as raw intelligence, logical reasoning, aptitude, comprehension and general knowledge need to be considered.
- Need to factor in school performance more significantly into the selection process.

Recommendations of Ramasami committee[5]

The report of Ramasami committee was discussed in the 4th meeting of the NIT Council held on July 04, 2012. It was felt that a combination of school and national level test performance will help develop an alternative admission system wherein multiplicity of tests and dependency on coaching would get reduced by incorporating +2 (or its equivalent) results. It was decided by the NIT Council that the NIT System would consider 40% weightage for performance in class XII Board marks normalized on percentile basis and the remainder 60% weightage would be given for performance in JEE (Main) and a combined merit list would be decided accordingly. The system was implemented from year 2013 onwards as was desired by the NIT Council.

The Ramasami committee made the following observations*.

- Decision based on one time test needs to be re-examined. Opportunities to improve must be built in.

* While making these observations, Ramasami committee had interchangeably used JEE as then joint entrance examination for admission to Indian Institutes of Technology and any other competitive entrance examination when it referred to them as multiple JEEs that a student takes.

- Students must be relieved of the pressure of multiple JEEs. Currently a student appears on an average at 5 JEEs all within a few days of the Board Examinations.
- Influence of coaching for JEE needs to be minimised.
- Urban-rural and gender bias has to be eliminated or at least minimised.
- The objective type of examination lends itself to undue influence of coaching. The conventional pen and paper examination with well-designed long and problem solving oriented questions should be revived by keeping numbers in any JEE within reasonable limits.
- JEEs, especially the IIT-JEE, have become a huge money spinning activity for coaching centres with attendant undesirable consequences.

While making these observations, the committee gave a mechanism of an alternate test scheme with the following objectives that the alternate test scheme should meet.

- Evaluate the ability of the learners rather than their preparedness and competitiveness
- Reveal in a transparent (*manner*), the latent potentials of the learners to match the emerging opportunities in engineering education sector and link to the development of National economy
- Aim to provide for more proportional representation of various regions and parent income levels without causing rural-urban divides
- Reduce the burden of education administration on faculty in elite engineering institutions so that their higher participation in research and academic roles could be further facilitated
- Match the rigour and process integration of best global models into the currently employed admission systems in engineering programmes in the country and
- Offer opportunities to retain the "unity in diversity" principle of the country by permitting scientific methods of providing allowance to scholastic performances in various board examinations into deciding admission criteria into engineering programmes in the country.

The committee made the following recommendations.

1. The admission process should factor in the school board marks. It should use normalization of School Board Scores.
2. There should be a national screening test scheme with two sections, one each on aptitude and advanced concepts.

The committee gave six options of combining the performances in board examinations and national screening test schemes – one of which was to be adopted. It opined that such a scheme will result in objectives set forth as listed above.

Recommendations of Joshi committee[6]

Joshi committee recognized the stress on the students for appearing in multiple entrance examinations and attributed it to the multiplicity of such examinations. It felt that in order to boost the prospects of better performance in the entrance examinations, the student often neglects the school education and puts more focus on coaching classes. In order to handle such situation, the committee agreed with the recommendations of Ramasami committee and provided normalization mechanisms of board marks to include the board performance with the JEE (Main) performance in the ratio of 40:60 as was decided by the NIT council in its 4th meeting.

The committee made the following recommendations.

- As the number of subjects differ from one board to another, and sometimes even within a board, there is a need to define the set of subjects for which the marks obtained by students

would be normalized. Committee noted that almost all boards make students choose at least five subjects. It decided that five subject marks would be used for aggregation. These subjects are the following.

1. Physics
2. Mathematics
3. Any one of the subjects – Chemistry, Biology, Biotechnology and Computer Science
4. One language
5. Any subject other than the above four subjects.

In respect of 3, 4 and 5 above, the best mark in the given category were to be chosen. The committee further recommended that in respect of boards/examinations assessing only four subjects, the aggregate marks may be extrapolated to a five-subject aggregate.

- While normalizing the board marks, an accuracy up to eight digits after decimal should be maintained for evaluating percentiles and equivalent marks to help break tie. Composite score/percentile in the final merit list should display up to five places after decimal.
- The procedure for normalization was to compute the percentile score of each student on the basis of aggregate marks in his/her own board, computed from the list of five subjects; determine the JEE (Main) aggregate marks corresponding to that percentile at the All-India level and use those aggregate marks as the normalized board score of the student. The composite score used for drawing the merit list would be 0.6 times the JEE (Main) aggregate added to 0.4 times the normalized board score.

Normalization method adopted by JEE (Main)

The final method adopted by JEE (Main) was discussed in the NIT Council meeting held on April 09, 2013 which debated on whether the board normalization should occur on the basis of JEE (Main) scores on All-India basis or only among those students who appeared in JEE (Main) from the board of the student. Subsequently in the JIG committee meeting held on May 2, 2013, JIG recommended a minor variation in the approach by taking equal weightages to two methods for arriving at the board normalized marks.

The normalization procedure adopted by the JEE (Main) is described as given below.

1. Note down the aggregate marks (A_0) obtained by candidates in JEE (Main).
2. Compute the percentile (P) of each student on the basis of aggregate marks in his/her own board (B_0) computed from the list of five subjects specified (each scaled up or down to be marked out of 100). The percentile is to be computed among all students of the board whose subject combinations meet the eligibility criteria of JEE (Main). The variable B_0 is only a base for calculating percentile (P), which is further used to get corresponding JEE (Main) marks.
3. Determine the JEE (Main) aggregate marks corresponding to the percentile (P) at the All-India level. Regard this as B_1.
4. Also, determine the JEE (Main) aggregate marks corresponding to percentile (P) among the set of aggregate scores obtained in the JEE (Main) by the students of that board. Regard this as B_2.
5. The normalized board score of the candidate is computed as $B_{\text{final}} = 0.5 \times (B_1 + B_2)$.
6. For the purpose of admission to CFTIs where it has been decided to use the JEE (Main) performance and the Normalized Board performance in the 60:40 ratio, the composite score for drawing the merit list is computed as $C = 0.6 \times A_0 + 0.4 \times B_{\text{final}}$.

The JEE (Main) ranks are arrived on the basis of C.

4. Need for re-evaluation

It had been three years since the scheme was introduced for arriving at the JEE (Main) ranks. In the matters pertaining to admission in IITs and NITs, the policy of CBSE to take into account 40% of the Class XII Board Examination marks and 60% of the JEE (Main) Examination while arriving at the JEE (Main) ranks had been under challenge before the Hon'ble Supreme Court of India. The core issue relates to normalization matter of JEE (Main) 2013. The main writ petition is titled Priya Maurya and Ors. v/s UOI is pending before the Hon'ble Supreme Court of India. There were similar matters filed in various High Courts viz., Allahabad High Court, Patna High Court, Kerala High Court, Karnataka High Court, Punjab and Haryana High Court, and Delhi High Court. In addition to this, the policy of 20 percentile for admission in IITs was also under challenge and the transfer petitions had been filed by IITs separately.

It is generally felt that the scheme is too complex to comprehend by students and even by professionals as well as teachers in the educational institutes for whom the scheme was adopted. It is also worthwhile to note that several states adopted the JEE (Main) examination as their own entrance tests for admissions to state educational institutes. However, the scheme of ranking in many states were different than the one adopted by JEE (Main).

This committee set upon itself the tasks for evaluating the basic postulates as were outlined by Ramasami committee and to see if in these three years, those postulates were met or not. It further looked at the logistic difficulties that arose year on year basis due to adoption of dual scheme.

Postulate 1:

Decision based on one time test needs to be re-examined. Opportunities to improve must be built in.

The basic postulate of Ramasami committee was to look at the issues arising due to giving weightage to one-time examination only for the entrance to the technical education and not giving any weightage to the continuous evaluation system of school education.

However it is observed that not all boards are equal. Some boards offer only four courses, while some offer five, six or seven courses in class XII. Even when boards offer five courses, the fifth course may often be a course such as physical education where the evaluation does not provide much insight to the academic capability. The same boards offer courses with different maximum marks. For example, Andhra Pradesh Board of Intermediate Education provides options to students to take English subject paper out of 100 marks or 200 marks, Physics subject out of 90 marks or 150 marks, Mathematics subject out of 100, 150, 200 and 300 marks, Geography subject out of a maximum of 125, 150 or 200 marks, etc. Such examples are widespread over boards and subjects.

It was noted that to handle such disparities across boards and to give fair chance to all students irrespective of their boards, a single and uniform examination system was introduced which compared all students on the same testing ground without any biases. While this may not be the most optimal way of measuring the intelligence, the other alternative has obvious flaws and definitely not fair to the candidates across boards. Most examination systems such as entrance to Delhi University which use the board marks often rely on the fact that students seeking admission come from largely a single board.

While the concern of Ramasami report on dependence on a single examination system is a valid one, there is no other alternative since the evaluation methods and evaluation subjects differ from board to board.

Postulate 2:

Students must be relieved of the pressure of multiple JEEs. Currently a student appears on an average at 5 JEEs all within a few days of the Board Examinations.

By citing multiple JEEs, Ramasami report perhaps meant multiple entrance examinations which were taken by the students for admission to various technical institutes. The committee's observations were accurate as the students do take multiple entrance examinations for admission to various technical institutes.

After introduction of a single JEE (Main) for entrance to various CFTIs and State technical institutes, a few examination systems were replaced by this examination. However the following points are to be noted in this regard.

- Various private colleges, universities and non-CFTIs continued to have their own entrance examination. Notable among them are BITS Pilani, Manipal Institute of Technology, Amity University, Vellore Institute of Technology, Amrita University etc.
- Typically about 15 lakh students appear in various entrance examinations. However the total number of seats in various CFTIs and institutes put together which use JEE (Main) or JEE (Advanced) as the criteria for admission remains at about 35000. Thus the students have no option but to try other avenues for higher education as well which is largely provided by privately funded institutes.
- The numbers of students appearing in various examinations are so large that a meaningful ranking is not possible among all students. The total maximum marks obtainable for any exam remains less than 500 whereas about 15 lakh students are to be ranked in this range. Thus a single examination raises the risk of ranking deviation very highly.
- In our society where the societal pressure is high for selection to the institutes of higher learning, it is inconceivable that the students would like to not take more than one examination. Thus the most of the pressure is rather built because of the societal conditions rather than the structure of examination.

It is therefore observed that after the introduction of the JEE (Main) and its ranking system, the pressure of appearing in many entrance examination continued for the students. Hence it is not clear as to how the newer structure of ranking and examination helped in easing out this pressure.

Postulate 3:

Influence of coaching for JEE needs to be minimised.

Before discussing this aspect, we would like to narrate a conversation between one of the members of the committee with a class XII student who passed out in 2015.

Member: *Beta congratulations on your success in JEE (Main). How do you see the current format of JEE (Main) ranking system with board marks being included in the ranking process?*

Student: *It is OK.*

M: *Do you think students now focus more on school education rather than coaching institute?*

S: *No Uncle. Now most students go for double coaching. JEE as well as for class XII since class XII marks are now important.*

M: *You mean the school education is replaced by coaching altogether?*

S: *The school education is bad. Some coaching institutes offer a single coaching for class XII and IITs while some offer two separate coaching sessions. In fact some coaching institutes offer coaching classes in the school itself.*

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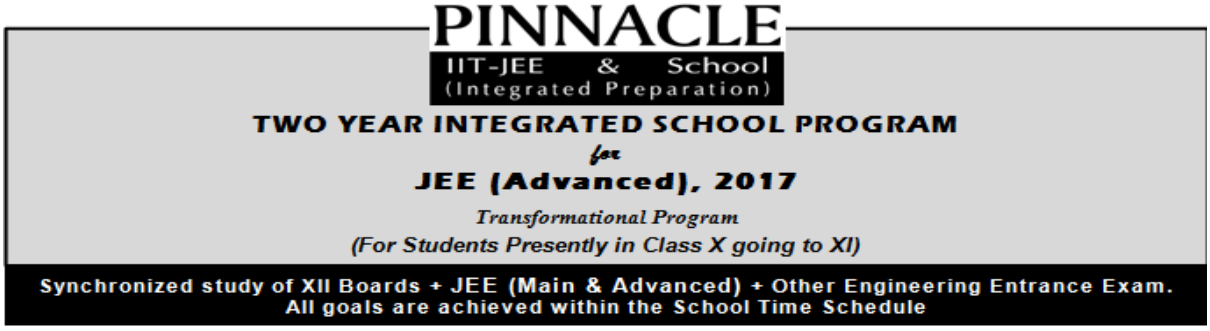
It is also worthwhile to note that many coaching programs have already started school integrated programs. One such example is FIITJEE[10] run programs. The following is taken from the advertisement of the coaching institute web site.

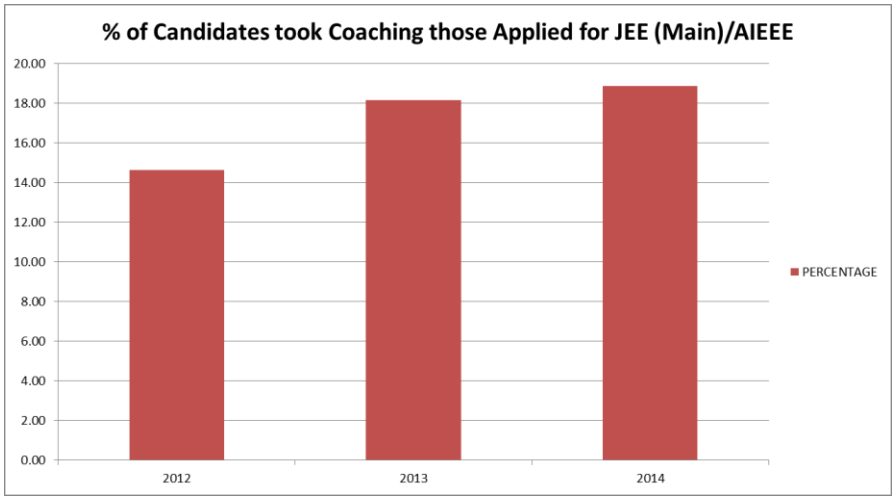


FIITJEE prepares you for JEE (Main & Advanced) in a Pattern Proof Mode*. We are the only institute where students do well not only in JEE (Main & Advanced) but Other Engineering Entrance Exams and XII Boards. With weightage for Boards FIITJEE programs are like an insurance policy to ensure you an optimum result.*

While this is taken from FIITJEE, the similar methods are adopted by other large coaching institutions. This clearly indicates that the coaching institutions adopt to the changes much faster. It is about the fear of unknown and peer pressure under which the students opt for the coaching and that is what is made use of by the coaching institutions as is clear in the web-site promotion of FIITJEE ("insurance policy for an optimal result", "preparation for JEE and class XII boards" etc.). Perhaps a different and sturdy approach must be used by the Government to minimize the influence of coaching on JEE.

The following table summarizes the number of candidates who take coaching for various entrance examinations. This table is based on the candidates giving this information voluntarily in the application forms for JEE (Main)/AIEEE.

Year	Percentage of candidates out of those applying for JEE (Main)/AIEEE	
	with coaching	without coaching
2012	14.63	85.37
2013	18.15	81.85
2014	18.89	81.11



From this table and chart, it is clear that the number as well as the percentage of candidates who take coaching out of those who apply for JEE (Main) or for AIEEE before year 2013 has increased over years and especially since 2013 when the current system of ranking was introduced. The current ranking scheme introduced in year 2013 for JEE (Main) has not made any desired impact. On the contrary, it has only contributed to even higher increase in coaching.

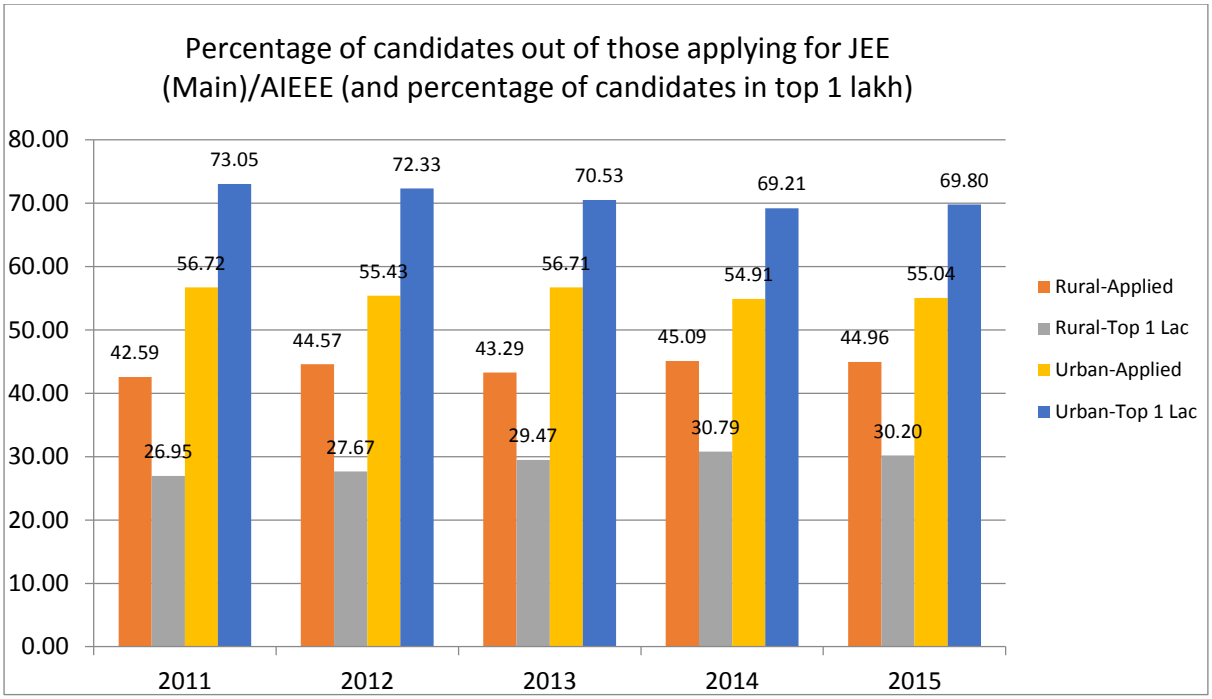
Postulate 4:

Urban-rural and gender bias has to be eliminated or at least minimised.

As per the Census of India 2011 report, out of the Indian population of 121.0 crores, the rural population is 83.3 crore (68.8%) and the urban population is 37.7 crore (31.2%)[3]. In order to be free of urban-rural bias (or to minimize this bias), the number of candidates appearing in the JEE (Main) should be close to the rural-urban ratio of approximately 7:3 whereas this ratio has been close to 9:11 and heavily biased towards the urban population.

The urban-rural division had been a major concern among the educationists and policy makers over years. The new method of ranking was suggested in which board marks were incorporated to encourage this division to be as close to the population ratio as possible. By introduction of this scheme in 2013, and three years into the scheme, no substantial gains are noticed. The table and chart below shows the urban-rural division of students who appear in the JEE (Main) and the same in top 1 lakh students based on their ranks over the past several years.

Year	Percentage of candidates out of those applying for JEE (Main)/AIEEE (and percentage of candidates in top 1 lakh)	
	From rural areas	From urban areas
2011	42.59 (26.95)	56.72 (73.05)
2012	44.57 (27.67)	55.43 (72.33)
2013	43.29 (29.47)	56.71 (70.53)
2014	45.09 (30.79)	54.91 (69.21)
2015	44.96 (30.20)	55.04 (69.80)



The Census of India 2011 report also enumerates the sex ratio of number of females per 1000 males as 933:1000 for overall and child sex ratio as 927:1000. Based on data from data.gov.in[9] and from UNESCO[8] the enrolment ratio of girls to boys in secondary school has been increasing since 2002 (70:100) to 2012 (94:100). It is also an acknowledged fact that the enrolment of girls in technical education is less than that of boys[4]. This had been one of the reasons to introduce the present system of board examination performance in determining ranks in JEE (Main) as was outlined in Ramasami report.

In 2013, JEE (Main) introduced differential fees for examination for girls and boys and subsequently a smaller fee was charged from girl students for appearance in JEE (Main). This is also evident from the fact that in 2013 suddenly there was a surge in girl students appearing for JEE (Main). There is however not much perceivable difference to justify that any gender bias could be helped due to inclusion of board performance in defining the ranks (which should have started moving towards 45 to 50%, if there was indeed any impact of the present method of ranking).

The following table indicates these findings.

Year	Percentage of candidates out of those applying for JEE (Main)/AIEEE (and percentage of candidates in top 1 lakh)	
	Boys	Girls
2011	76.76 (82.58)	23.24 (17.42)
2012	77.66 (81.43)	22.34 (18.57)
2013	74.48 (77.25)	25.52 (22.75)
2014	74.00 (77.45)	26.00 (22.55)
2015	74.20 (77.75)	25.79 (22.25)

Postulate 5:

The objective type of examination lends itself to undue influence of coaching. The conventional pen and paper examination with well-designed long and problem solving oriented questions should be revived by keeping numbers in any JEE within reasonable limits.

This is a well-established fact that the measurement of intelligence is not based on a single factor. Several such studies have been done involving human population in various stages[1]. It is a well-established understanding today that at least three factors affect the overall performance on tests to measure or rank intelligence. These factors include the short-term memory recall, logic and reasoning, and finally verbal recall. Further there are lifestyle factors that affect the performance on tests. For example kids who spend lot of time on computer games are known to perform on tests such as logic and reasoning as well as short-term memory recall.

Any type of tests, and more importantly multiple choice based examinations always have shown a bias towards the specific preparation. However, in the past several years the pen and paper examinations have lost their utility because of several reasons.

1. The number of candidates in any examination in India have grown enormously. Currently these numbers range anywhere between one million to 1.6 million.
2. The regular pen-and-paper examination systems which are evaluated manually will always have an element of subjectivity in evaluation. To minimize the effect of subjectivity, often evaluations are carried out multiple times, especially for those who are likely to get chosen. Thus about 10% exam copies are evaluated two to three times while all copies go through the steps of evaluation and a separate round of scrutiny.
3. Assume that a grader can grade about 100 copies in a day (on an average), this amounts to the number of evaluations to exceed 5 million, or about 50000 grader-days. With a total of about 500 graders available, it would mean 100 days or about 3 months for grading. Thus it is not feasible to carry out pen-paper examination for large population.
4. Due to increased demands of transparency, all subjective evaluations are also required to be made available to the candidates which would increase its overheads.

It is some of these reasons why no examination system has reverted back to pen-paper examination from multiple-choice questions. It is since three years that the new system of ranking has been in place, no examination system has carried out pen-paper based written answers and subjective evaluations.

Postulate 6:

JEEs, especially the IIT-JEE, have become a huge money spinning activity for coaching centres with attendant undesirable consequences.

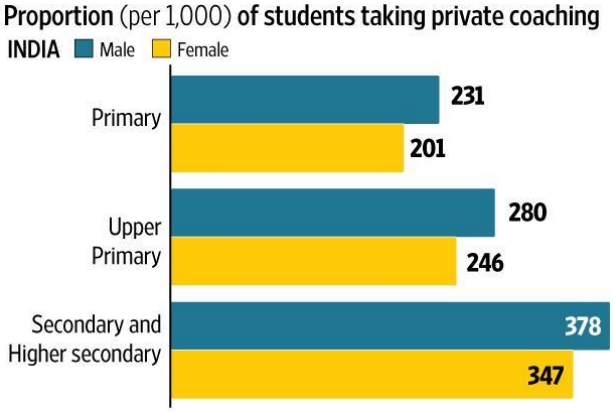
The coaching in the secondary education is a huge phenomenon. Zee News published a story[11] in March 2015 where they quoted several sources to show the phenomenon of coaching.

The Associated Chamber of Commerce and Industry of India's (ASSOCHAM)[7] recent survey of 2013 on "Business of private coaching centers in India" reveals that the private tuitions have become a multi-billion rupee industry which recorded a growth of 35% in the last five years. The current size of private coaching industry in India is about $23.7 billion and likely to touch $40 billion by 2015. The survey further revealed that many of the best teachers of reputed schools and colleges left their jobs to take up private coaching for the simple reason that the monthly income of good tutors is equal to the annual salaries of school teachers.

In a similar 2010-11 study, CRISIL pegged the market size of this parallel education system at Rs. 40,187 crores. This is expected to grow to Rs. 75,629 crores by the turn of the financial year 2014-15.

According to the 'Asian Development Bank Report, 'Shadow Education: Private Supplementary Tutoring and Its Implications for Policy Makers in Asia,' the coaching sector is estimated to be growing at over 15 per cent each year. As per the 2012 report by the Asian Development Bank (ADB), about 83 per cent of India's high school children attend coaching classes.

Another survey[12] by National Sample Survey Office (NSSO) bring huge insight into the coaching in K12 education. For the context of this report, only the coaching for senior secondary education is considered. The survey indicates that in secondary and higher secondary education, about 37.8% boys and 34.7% girls attend coaching. Further in states like West Bengal and Tripura more than 80% students are attending the coaching.



However this issue is not specific to India alone[13]. In countries such as Japan (70%), Korea (88%) and Malaysia (83%) also similar trends of excessive registration in coaching institutes is observed as indicated by Accountability Initiative which is a part of the Centre for Policy Research think tank.

From these reports as well as from the data of candidates appearing in JEE (Main) over years, it is clearly indicated that the issue of coaching has far deeper roots. In India about 1.5 crore students appear in class XII examinations each year across all streams. In comparison, only about 13 lakh students appear in JEE (Main) each year. This number comprises of only about 60% candidates from class XII while others would be making their second or third attempt. This number therefore comes to about 5.5% of total class XII students.

Therefore while it is a common perception that JEE system causes a huge coaching industry to flourish, the statistics only say it differently. If the Government would want to handle the problem of coaching, the localized methods of influencing it through the micro adjustments in JEE systems would not help it as is evident in the last three years of introduction of alternate ranking system. It would be a very naïve approach to handle the issue of education quality in this manner.

5. Other issues related to current method of ranking

1. Change in board results after the first declaration is a major issue. Often the boards withhold the results of a few students for the want of their evaluation data. Such results are then declared on a subsequent date after some time. Further a few students appear for supplementary examinations in several boards. Additionally, many boards permit re-evaluation/re-totalling or scrutiny of exam copies upon requests from students.

   Any time a result of a student is changed, the percentile score of a large number of students would get affected. This therefore has an impact of 40% component of the composite score thereby resulting in shifts of students.

   In order to avoid such shifts, different mechanisms of accounting the normalized scores are adopted by JEE (Main). These include not using the board marks and instead computing the composite marks on pro-rata basis using the JEE (Main) marks only. This is also carried out for those boards where the number of students are small and where the assumption of percentile score use is statistically not valid.

   However, the change in the results from boards cause considerable changes in the ranks. Typically ranks are made to change only for those students whose board marks change. Keeping ranks of other candidates unchanged (since they have been notified already), results in unusual situations. In order to handle such changes, all candidates whose ranks change and they come between two candidates of consecutive ranks are assigned fractional ranks (for example introduction of ranks such as 100.1, 100.2, 100.3 while keeping the ranks of candidates at 100 and 101 unchanged). This makes the actual ranks themselves non-representatives of the real position. Further those candidates whose ranks shift, are accommodated only in the second and subsequent rounds of seat allocation. In order to be fair to all other candidates, supernumerary seats are created if it is not possible to accommodate such students in the seat allocation otherwise. Central Seat Allocation Board (CSAB) has certain defined rules in this regard.

2. Ranking of JEE (Main) is carried out on the basis of computed composite score up to the fifth digit of decimal to break the tie. Thus a score difference of as low as 0.001% may change the rank of a candidate by one or two locations. This number is also consistent with the number of candidates appearing in the examination. Since about 1.3 million students appear, it is evident that the resolution for a tie breaking must take place at 1.3 millionth of the total maximum range of marks obtained by candidates (say about 90% of the total maximum marks).

   A resolution at this level is very sensitive to the marks obtained in the board and the normalization process carried out to add the marks. Since there is no ideal mechanism of the normalization, even the one that is used for normalization makes it sensitive to the ranks of the candidates.

   As per data from JEE (Main) 2015, this is also evident in a different way where candidates with a very low marks in JEE (Main) – even negative – got high ranks due to the contribution of board marks. A few such cases are outlined in the table below. In a similar manner, there are few cases (very few but not insignificant) where candidates did very well in JEE (Main)

but received low ranks due to pull down by normalized board marks. Some of these cases are outlined in the next table which also provides the ranks such candidates could have gotten had it been only on the basis of JEE (Main) marks.

Board	Marks in JEE (Main)	Percent marks in board	JEE (Main) rank
Punjab School Education Board	0	98.22	64423
Madhya Pradesh Board of Secondary Education	0	95.6	82656
U P Board of High School & Intermediate Education	0	95	95453
U P Board of High School & Intermediate Education	0	95.6	84721
U P Board of High School & Intermediate Education	-4	95.8	91028
National Institute of Open Schooling	-2	91	75498

Board	Marks in JEE (Main)	JEE (Main) rank	Percent marks in board	Rank based on JEE (M) marks only
Andhra Pradesh Board of Intermediate Education	164	102679	38.6	17200
Maharastra State Board of Sec. & Higher Sec. Edu.	163	112183	46	17541
Maharastra State Board of Sec. & Higher Sec. Edu.	161	116994	36.8	18318
Central Board of Secondary Education	161	104159	42.6	18568
Central Board of Secondary Education	157	114818	40.4	20366
Council for the Indian School Certificate Exam.	157	113215	52.8	20626
Haryana Board of Education	157	105241	52.8	20508
Maharastra State Board of Sec. & Higher Sec. Edu.	156	101850	55.33	20989
Central Board of Secondary Education	155	108998	48.6	21420

3. Non adherence to deadlines by boards and increasing dependence on the board results is a major concern on the timeliness of the result declaration of JEE (Main) as well as start of the counselling process. In year 2015, inability to meet the deadlines for board results declarations resulted in a massive pressure on timely start of counselling. Since the counselling was a joint one, it affects admissions to all institutes.

4. Often candidates appear in more than one boards taking class XII examinations. Later, such students would like to take the credit for the best performance between these boards so as to maximize their ranks in JEE (Main). These students then ask for a change in their data and to regenerate the ranks. The entire process then becomes ambiguous to generate the ranks.

5. Candidates often commit mistakes in filling the academic information and these are not verifiable at the time of filling the information. This causes a huge effort of data correctness and mapping of board results with the JEE (Main) results at the time when results are declared and provided by boards. This becomes a huge bottleneck since the time is not enough between the declaration of results by boards and start of counselling. This also brings to a non-zero probability of mapping data from two separate candidates if their names match. Further to this, the candidates keep on sending corrections of academic information till the last minute and often even after the board results are announced in spite of adequate opportunity being given for corrections.

6. There are several other related issues of coordinating with boards for collection of data. Often a lot of coordination is required including that for collection of data, collection and correction of formats, merging of partial data in multiple batches (which many a times changes from one submission to another).

7. There are often inconsistencies in data. The following is observed in 2015 data.

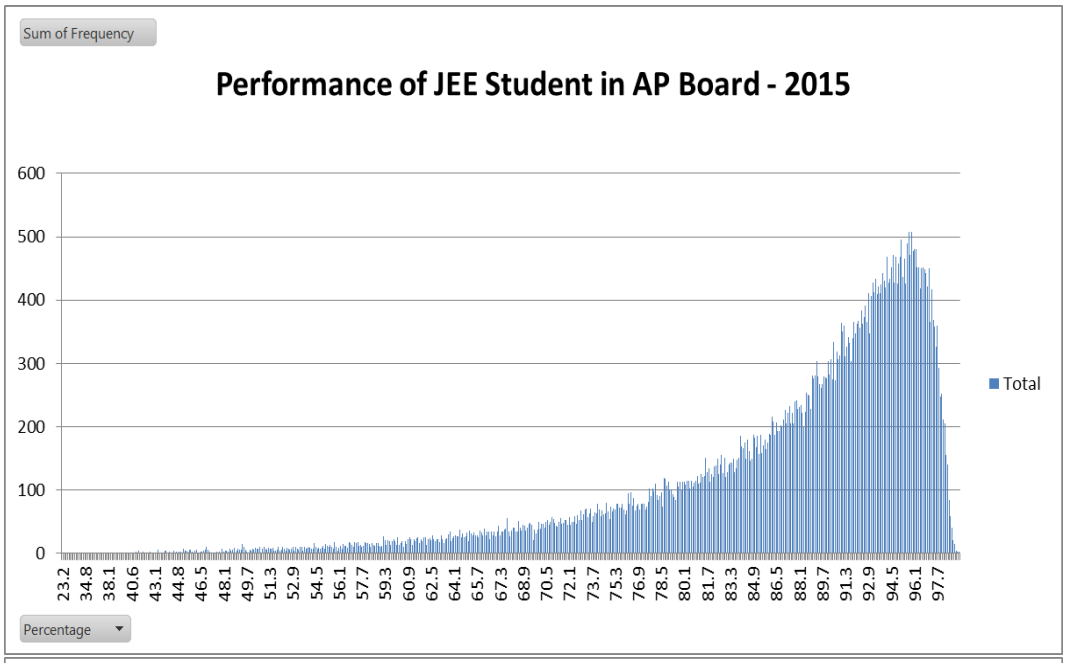
    a. Often marks are sent with duplicity of subjects for the same candidate.
    b. Sometimes duplicate roll numbers with different names are given in result data.
    c. Some boards do not maintain mother name or father name or both in their databases. This makes it difficult to map the results of students as there is no verification method.
    d. Same candidates' data is found in different Boards, for example, a candidate might have given the roll number of Bihar Board but selected board as UP. Based on the Board the candidate's details are found in UP board data and based on roll number it is also available in Bihar board data.

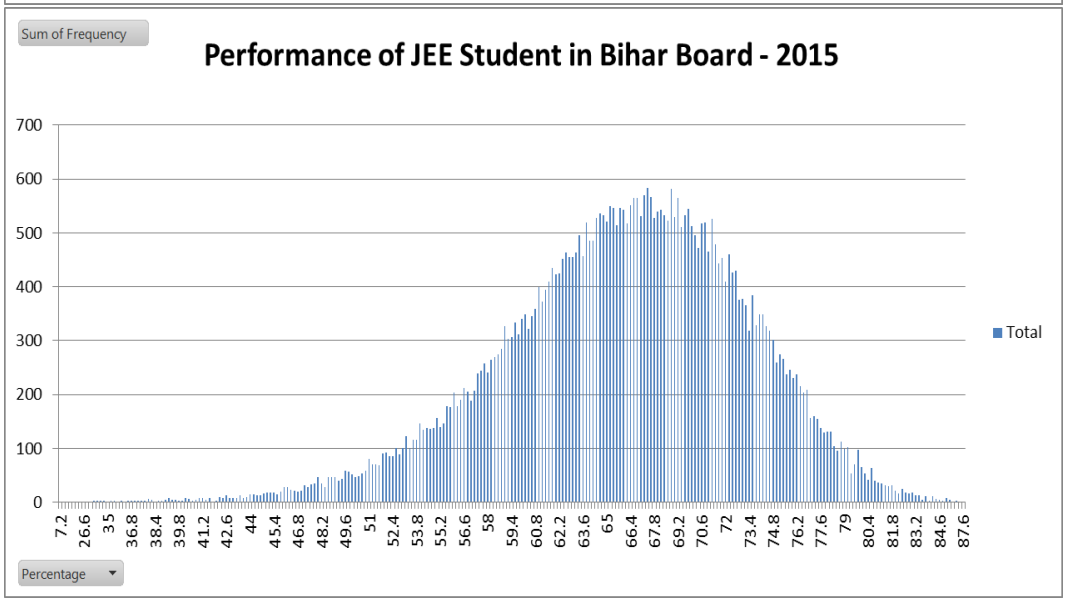
8. At the time of mapping, it was noticed that same candidate appeared (by all other details being the same) with different roll numbers by a little change in particulars. Such candidates are likely to be impersonators as the result is available for all such entries. There is also a small likelihood of these candidates being two different individuals. However at the time of mapping there is no time or means to verify such details.

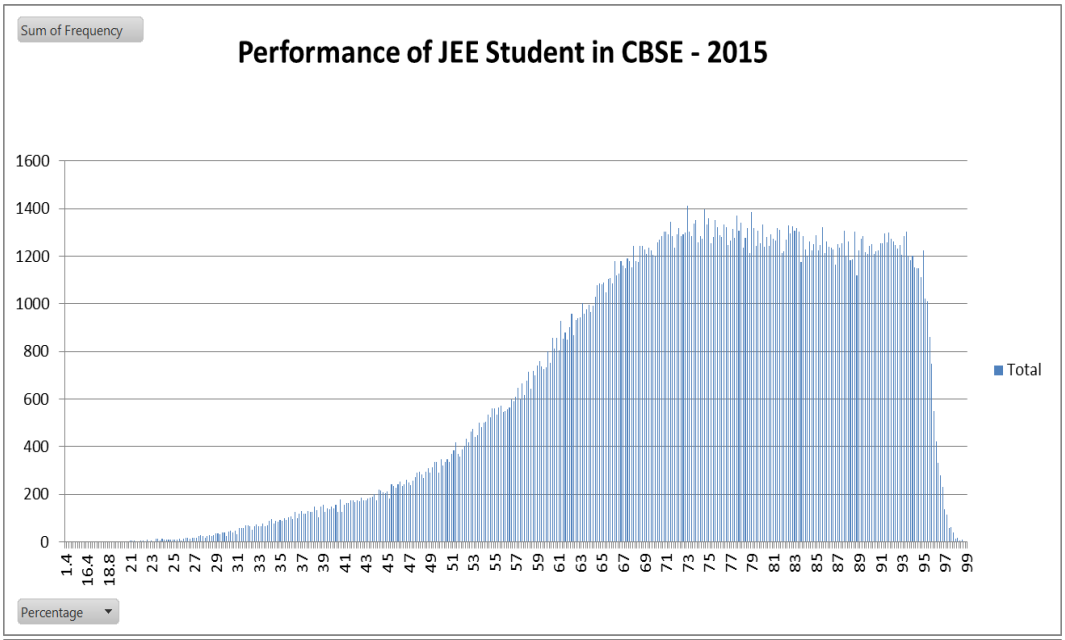
6. Analysis of Board results

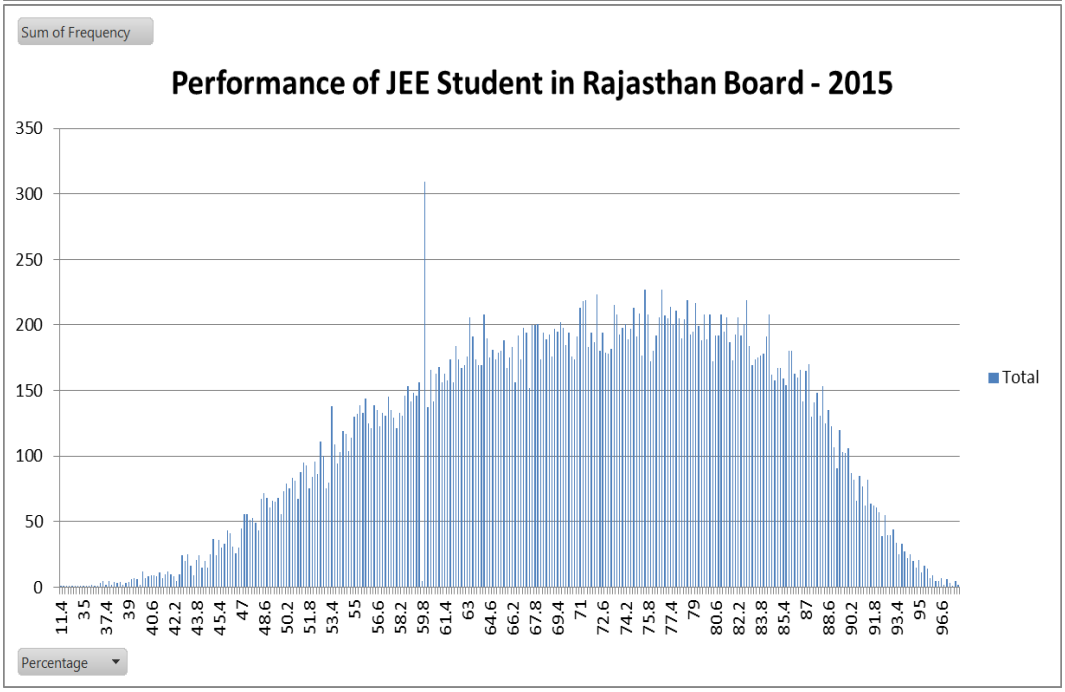
The following analysis is carried out for the board results.

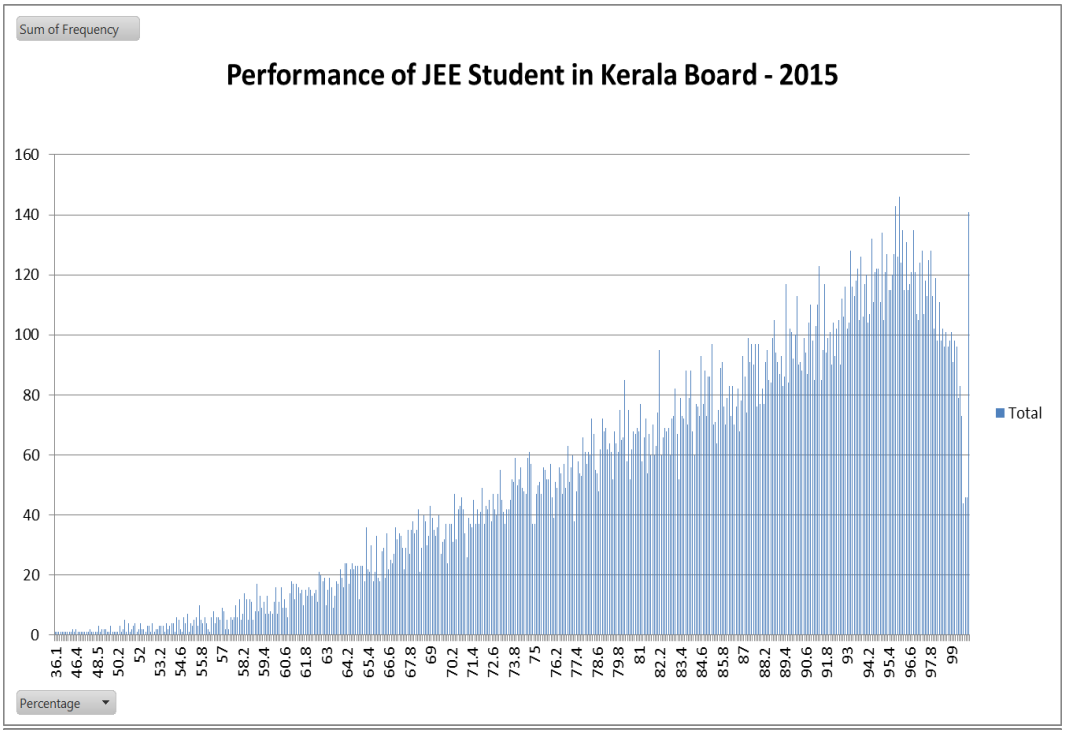
1. Distributions of marks across students. An ideal system of any board exam should provide a reasonable bell shaped curve to identify performers (who must stand apart from the rest) and to not have too many left-behind. An ideal distribution should have a mode value around 50-70%. However as given in the charts below (which provide the board performance of JEE (Main) candidates from various boards), this is not what is indicated by the board results. Further in the case of entrance examinations which are ranking systems, the resolution of performance should be at the top of the ranks. However in many board examinations, the top rankers are all very high marks which results in no resolution of ranks among those candidates.

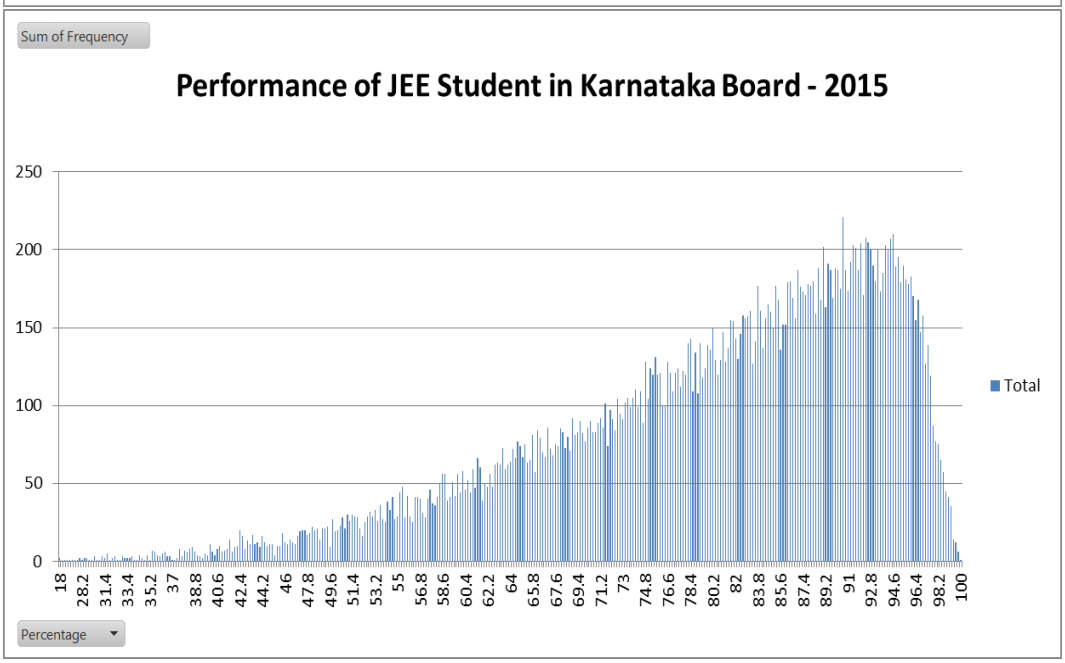


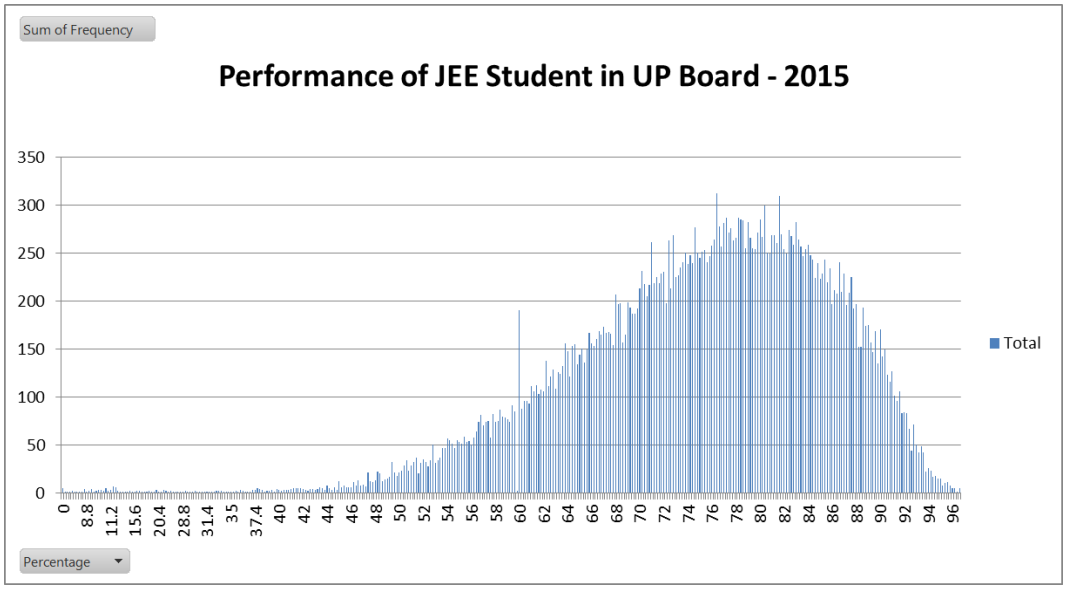



Sum of Frequency
Performance of JEE Student in CBSE - 2015
1600
1400
1200
1000
800
600
400
200
0
1.4 16.4 18.8 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99
Total
Percentage


Sum of Frequency
Performance of JEE Student in Rajasthan Board - 2015
350
300
250
200
150
100
50
0
11.4 35 37.4 39 40.6 42.2 43.8 45.4 47 48.6 50.2 51.8 53.4 55 56.6 58.2 59.8 61.4 63 64.6 66.2 67.8 69.4 71 72.6 74.2 75.8 77.4 79 80.6 82.2 83.8 85.4 87 88.6 90.2 91.8 93.4 95 96.6
Total
Percentage

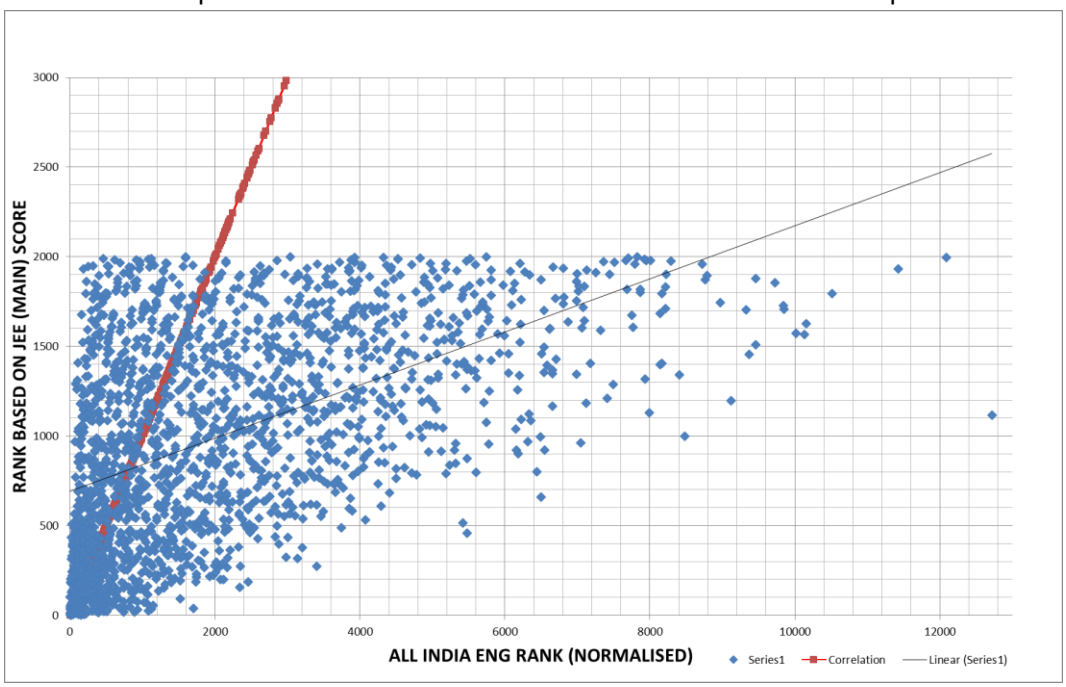

Sum of Frequency
Performance of JEE Student in Kerala Board - 2015
160
140
120
100
80
60
40
20
0
36.1 46.4 48.5 50.2 52 53.2 54.6 55.8 57 58.2 59.4 60.6 61.8 63 64.2 65.4 66.6 67.8 69 70.2 71.4 72.6 73.8 75 76.2 77.4 78.6 79.8 81 82.2 83.4 84.6 85.8 87 88.2 89.4 90.6 91.8 93 94.2 95.4 96.6 97.8 99
Total
Percentage


Sum of Frequency
Performance of JEE Student in Karnataka Board - 2015
250
200
150
100
50
0
18 28.2 31.4 33.4 35.2 37 38.8 40.6 42.4 44.2 46 47.8 49.6 51.4 53.2 55 56.8 58.6 60.4 62.2 64 65.8 67.6 69.4 71.2 73 74.8 76.6 78.4 80.2 82 83.8 85.6 87.4 89.2 91 92.8 94.6 96.4 98.2 100
Total
Percentage



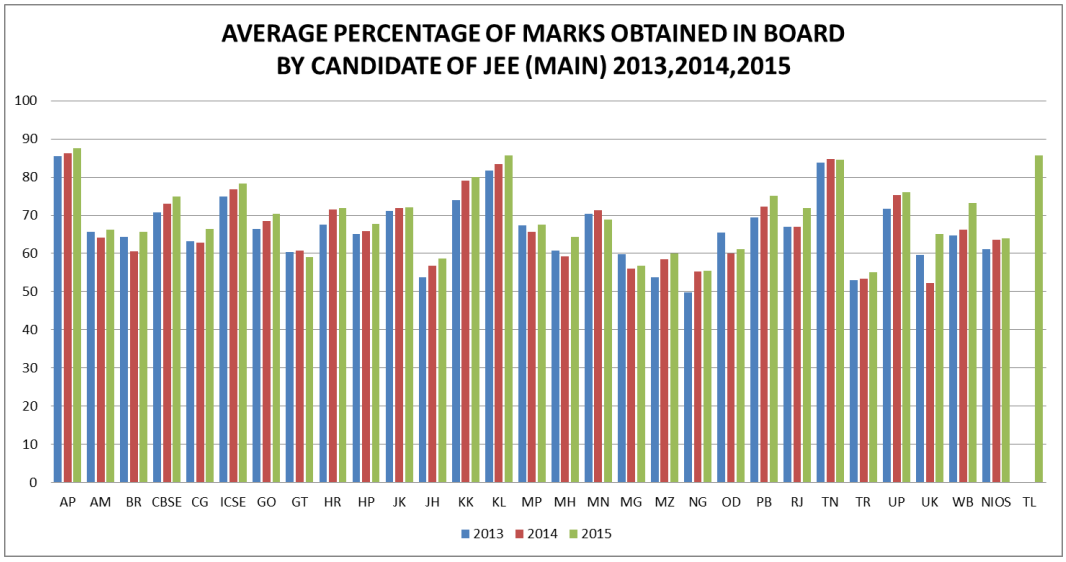
The results of other boards also seem similar in nature.

2. Ranks based on only JEE (Main) score vs. ranks based on composite score (i.e. All India Eng Rank (Normalized) in the chart below). The chart shows only the top 2000 candidates based on their performance in JEE (Main) score only. These ranks, if fully correlated, should show roughly a 45° line passing through origin when plotted on X-Y graph (as shown as red line). With a high degree of correlation, the plot should still be close to 45° line. It is clear that the results are not in correlation with the JEE (Main) marks. Similarly the composite scores are not correlated with the normalized board marks. Hence the composite score is harder to correlate to the performance of the candidates and therefore hard to comprehend.

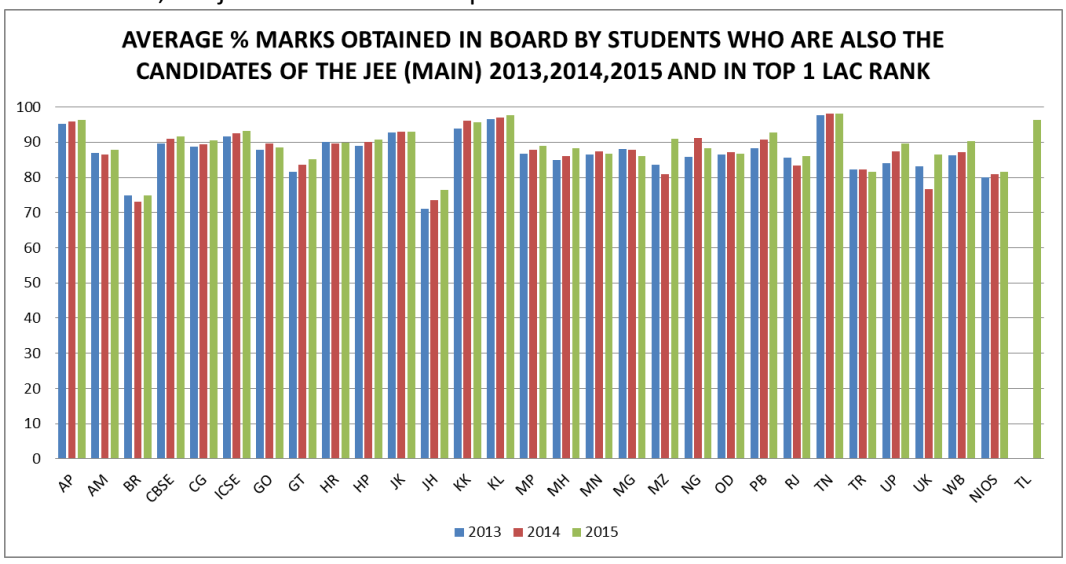


3. The average marks of board students who are also the candidates of the JEE (Main) as shown in the chart below. It is clear that for several boards such as AP, CBSE, ICSE, Goa, Haryana, Karnataka, Kerala, Punjab, West Bengal etc. the averages have increased over years. This might have some students believe that their boards are becoming lenient with

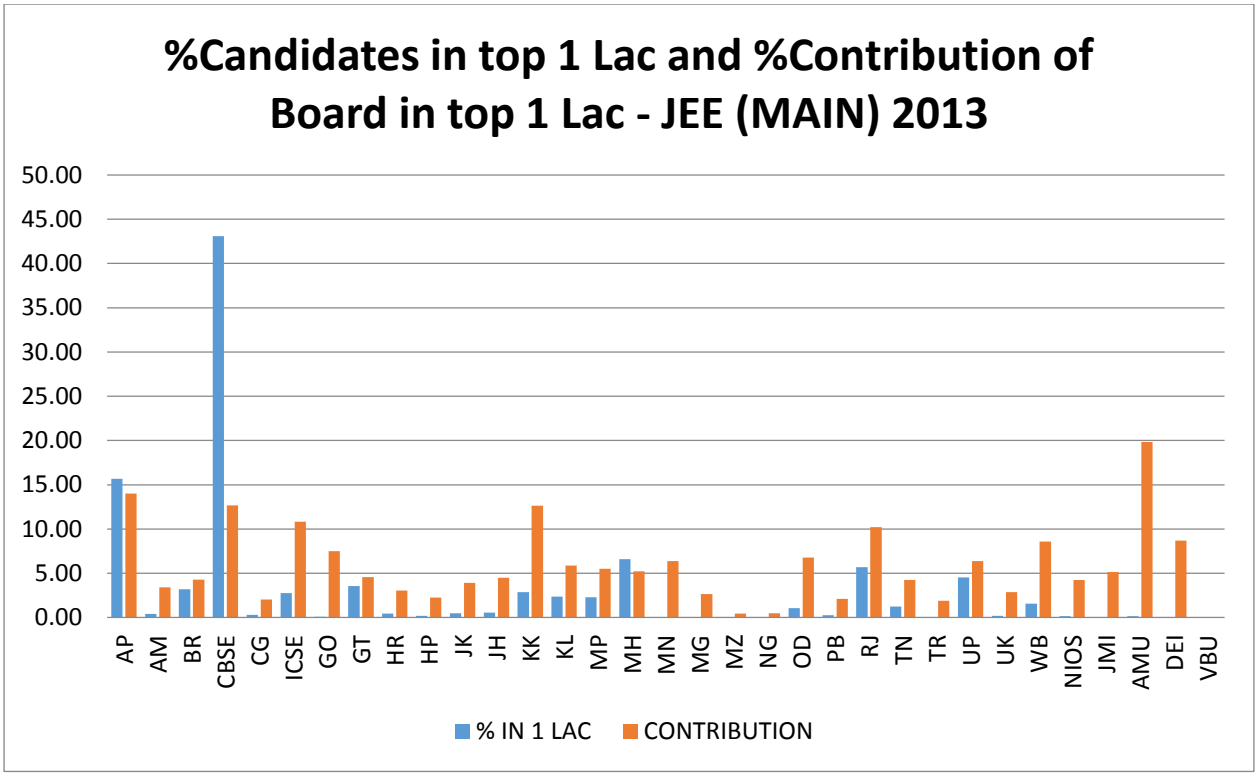
time (with a perception that it might be to help their candidates in the JEE (Main) examinations)

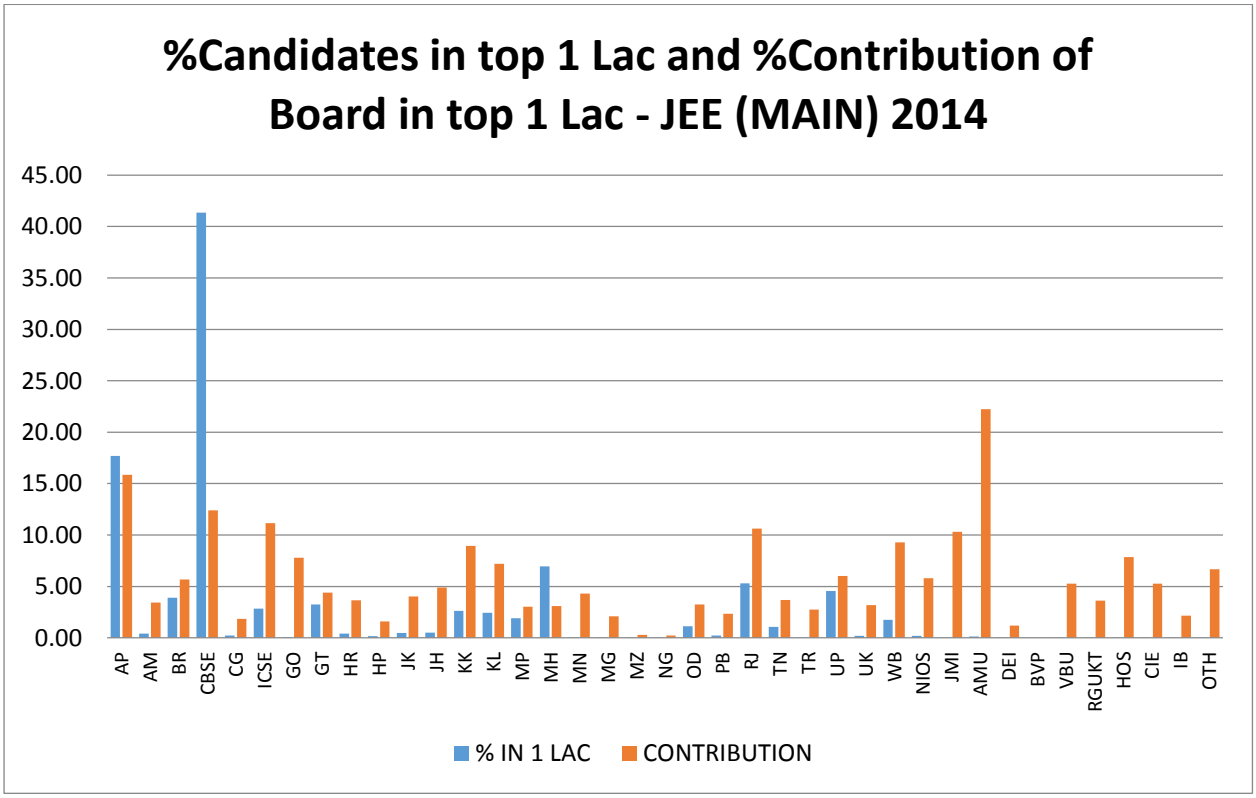


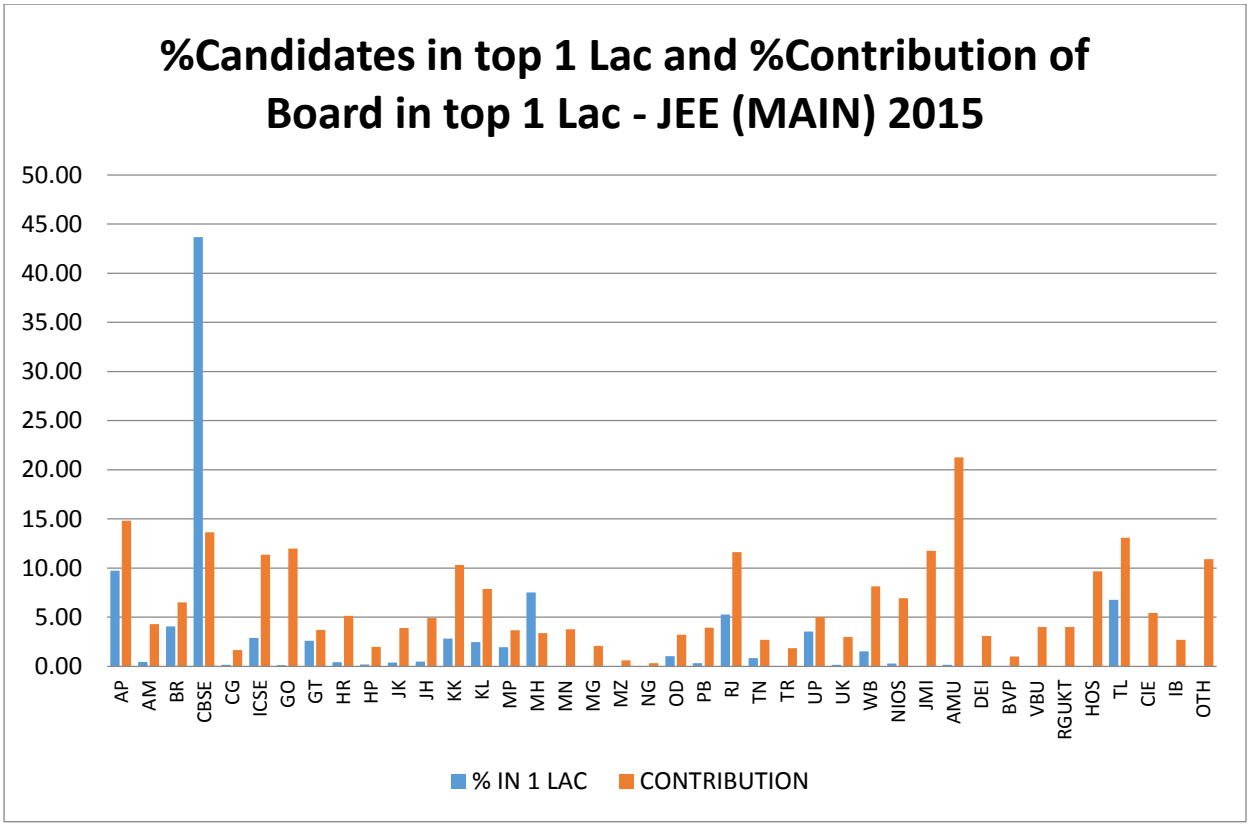
4. The average marks of board students for the top one lakh candidates of the JEE (Main) as shown in the chart below. Since these are candidates who are likely to get the engineering seats in the CFTIs, the change in the board marks averages over years is a likely indicator of the boards becoming lenient over time. Some boards such as AP, CBSE, CG, ICSE, Kerala, Maharashtra, Punjab etc. are the examples.



5. The percent of candidates from boards in top one lakh candidates for the years 2013, 2014 and 2015 is shown in the following three charts. Further the contribution of each board in a normalized manner (i.e. number of candidates in top one lakh from a board / total number of candidates in the board) is also analysed. This number should be more or less equal in an ideal situation but shows a skew in favour of a few boards such as AMU, AP and CBSE.


%Candidates in top 1 Lac and %Contribution of Board in top 1 Lac - JEE (MAIN) 2013
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
AP AM BR CBSE CG ICSE GO GT HR HP JK JH KK KL MP MH MN MG MZ NG OD PB RJ TN TR UP UK WB NIOS JMI AMU DEI VBU
% IN 1 LAC
CONTRIBUTION


%Candidates in top 1 Lac and %Contribution of Board in top 1 Lac - JEE (MAIN) 2014
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
AP AM BR CBSE CG ICSE GO GT HR HP JK JH KK KL MP MH MN MG MZ NG OD PB RJ TN TR UP UK WB NIOS JMI AMU DEI BVP VBU RGUKT HOS CIE IB OTH
% IN 1 LAC
CONTRIBUTION


%Candidates in top 1 Lac and %Contribution of Board in top 1 Lac - JEE (MAIN) 2015
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
AP AM BR CBSE CG ICSE GO GT HR HP JK JH KK KL MP MH MN MG MZ NG OD PB RJ TN TR UP UK WB NIOS JMI AMU DEI BVP VBU RGUKT HOS TL CIE IB OTH
% IN 1 LAC
CONTRIBUTION

7. Recommendations for the ranking system

The following are the recommendations of the committee for arriving at the ranking system.

1. The all India ranks must be given purely on the basis of JEE (Main) performance after applying all tie-breaking rules based on the performance in individual components of JEE (Main).
2. The tie-breaking rules should be based on the performance in JEE (Main) only and should not be dependent upon the demographic data of the candidates.
3. Candidates should be given as many ranks as applicable in various categories.
4. The board performance should be used as a filtering criteria only. Only those students who are above certain minimum performance should be admitted to the technical institutes.
5. The minimum performance may be set by CSAB in consultation with admitting institutes.
6. The minimum performance can be one of the following.
    a. Meeting the minimum marks criteria in Board Examination as set by CSAB.
    b. Meeting the minimum percentile score criteria as set by CSAB
    c. Meeting the minimum marks criteria or the minimum percentile score criteria. That is, a candidate who meets either the minimum marks criteria or the minimum percentile criteria or both is deemed to have the minimum performance criteria.
    d. Any other criteria as set by CSAB.
7. In order to keep the understanding of percentile scores and minimum marks criteria clear to the candidates, it is suggested that the method of evaluation of percentile scores and minimum marks be identical between institutes admitting through JEE (Advanced) and institutes admitting through JEE (Main). The thresholds may be chosen by the CSAB differently than the JEE (Advanced) board.
8. Candidates may be admitted provisionally to the institutes in case their board result is not available at the time of admission subject to the verification at a cut-off date as decided by CSAB.

8. Summary

The system of giving ranks to candidates after combining board performance with JEE (Main) performance has been in operation for three years since 2013. In these three years several practical difficulties were seen in declaring the results in time.

Since 2015, the seat allocation for candidates is being done through a joint counselling process. Under this process, the seats are allocated by CSAB and JEE (Advanced) simultaneously. Therefore the dependence on board results announcements, its correctness and correspondingly the JEE (Main) ranks have become extremely important on the admissions to various technical programs in the country.

It is in this context as well as in the context of timely start of various academic sessions, it is important that the critical factor are made more deterministic in terms of time.

It is also observed that the basic cause of introduction of such a mechanism for ranking are not being met as per the data.

It is the recommendation of the committee to do away with incorporation of board marks in the ranking process. Accordingly the committee has made certain recommendations for smooth operations in future.

9. Acknowledgments

The committee would like to thank the chairman JAB, MHRD and CBSE for giving the opportunity to analyse the circumstances, data and processes to make the recommendations. The committee would also like to thank the members of staff from CBSE, IIT Guwahati, NIT Rourkela and NIT Warangal to provide data for analysis which made it possible to draw conclusions and make recommendations. In particular the committee would like to acknowledge the efforts from certain individuals, namely, Mr. Kamal Khandelwal, Mr. J K Yadav and Ms. Sakshi Ahuja for their support to the committee in preparation of the report, data analysis and preparation of graphs.

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11. Annexure A: Notification of the sub-committee.

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E-mail : rajbir.cbse@nic.in

Tele. 0120-2427342, 344, 350
Fax 0120-2427342

CENTRAL BOARD OF SECONDARY EDUCATION
(An Autonomous Organisation under the Union Ministry of Human Resource Development Govt. of India)
JOINT ENTRANCE EXAMINATION (Main) Unit,
H-149, Sector-63, Noida, District Gautam Budh Nagar – 201 309(UP).

CBSE/JEE/2014-15 **31/07/2015**

NOTIFICATION

The JEE Apex Board (JAB) in its meeting held on 27.07.2015 has constituted a committee consisting of following:-

1. Prof. Rajat Moona, Director General, C-DAC, Pune,
2. Prof. B. N. Jain, Vice Chancellor, BITS, Pilani,
3. Nominee by Director ISI, Kolkatta,
4. Prof. P.V.Balaji, IIT, Mumbai,
5. Prof B.C. Ray, NIT, Rourkela,
6. Nominee by Director NIT, Warangal
7. Mr. V. Daware, Representative of State Govt. of Maharashtra,
8. Dr. Antriksh Johri, Director (IT), CBSE,
9. Sri Rajbir Singh, Executive Director (JAB), CBSE, Noida.

.Terms of reference of the committee are attached.

(a) Analyze the distribution of marks in each of the Board and their effect on giving JEE ranks.
(b) Analyze normalization procedure used for determining marks in different boards.
(c) Mapping of JEE results with the candidates from a particular Board actually giving higher weightage to JEE than the 60% weightage.
(d) Analyse if the system of giving weightage of the board marks has any effect on the students doing better for board examinations.
(e) Analyse if the Boards have changed their respective system of evaluation in view of the normalization process currently being followed during the process of determining the 40 % weightage.
(f) Make recommendations for the future course of action for determining All India Ranks for the candidates appearing in JEE Main Examination. So, it is proposed to constitute a committee to analyze the performance of candidates of various boards in JEE (Main). This committee will make recommendations for changes, if any, in the current system.

The committee shall complete the assignment within a month and submit its report latest by 31.08.2015.

31/7/15

(J K Yadav)
Dy. Secretary