UAC
UNIVERSITIES ADMISSIONS CENTRE

Calculating the Australian Tertiary Admission Rank in New South Wales

A Technical Report – March 2015

Contents

Preface

This report describes the technical details surrounding the calculation of the index employed by NSW universities to assist in the processing of school leaver applicants for tertiary places. From 1998 until 2008 this index was called the Universities Admissions Index (UAI) but the New South Wales Vice-Chancellors' Committee (NSWVCC) agreed that, from the 2009 Higher School Certificate (HSC), it would be known as the Australian Tertiary Admissions Rank (ATAR).

The decision to change the name followed the 2008 decision by the Australasian Conference of Tertiary Admission Centres (ACTAC) to adopt a common name, the Australian Tertiary Admissions Rank (ATAR), which would replace the existing names of the different selection indices used by states and territories. The purpose of the name change was to emphasise that students' ranks were reported on a common scale.

With the new name in 2009 there came two additional changes. Firstly, consistent with the practice in other states and territories, the NSWVCC agreed to truncate students' percentiles so that the maximum rank in NSW would be 99.95. Secondly, NSW students' ranks would be reported against the cohort of students who entered Year 7 with them six years before, including those who did not complete Year 12.

The NSWVCC agreed that these three changes, which would ensure comparability of the distribution of NSW students' ranks with those of other state and territories, would be implemented from the 2009 Higher School Certificate.

Numerical data presented in this report illustrate the processes underpinning the calculation of the ATAR in NSW. The actual results will vary from year to year; details can be found in the annual Report on the Scaling of the NSW Higher School Certificate and other reports.

Documentation and reports are available on the Universities Admissions Centre (UAC) website at www.uac.edu.au.

Common terms and abbreviations

ACTAC

Australasian Conference of Tertiary Admissions Centres

ATAR

Australian Tertiary Admission Rank

ATAR cohort

The *ATAR cohort* refers to students who received an ATAR in a particular year. The students may have accumulated courses over a five-year period.

ATAR courses

ATAR courses are Board Developed courses for which there are examinations conducted by the Board of Studies, Teaching and Educational Standards NSW that yield graded assessments. VET courses for which there are no written examinations, English Studies and Life Skills courses are not ATAR courses.

Board

The *Board* refers to the Board of Studies, Teaching and Educational Standards NSW (BOSTES) and its predecessors.

Board Developed courses

Board Developed courses are HSC courses for which syllabuses have been developed and examined by the Board of Studies, Teaching and Educational Standards NSW.

BOSTES

The Board of Studies, Teaching and Educational Standards NSW

BSS

Board of Secondary Studies

BSSS

Board of Senior Secondary School Studies

Committee of Chairs

The *Committee of Chairs* refers to the Committee of Chairs of Academic Boards and Senates in NSW and the ACT.

HSC

Higher School Certificate

HSC cohort

The *HSC cohort* refers to students who have completed at least one ATAR course in a particular year.

KLA

Key Learning Area

MCEETYA

Ministerial Council for Education, Employment, Training and Youth Affairs

NSWVCC

New South Wales Vice-Chancellors' Committee

SC cohort

The *SC cohort* refers to students who completed the School Certificate tests in a particular year.

SCE

School Certificate Examination

TCOS

Technical Committee on Scaling

TER

Tertiary Entrance Rank

TES

Tertiary Entrance Score

UAC

Universities Admissions Centre

UAI

Universities Admission Index

VET examination courses

The VET Curriculum Frameworks are based on training packages for which the assessment is competency based. As competence-based assessment does not yield a mark that can be used in the ATAR calculations, the Board of Studies, Teaching and Educational Standards introduced, for each VET Curriculum Framework, an additional course that includes an examination. If students wish to have a VET course contribute to their ATAR, they must enrol in the appropriate additional course and complete the examination. These additional courses are termed *VET examination courses*. Students who do not want their VET courses to contribute towards their ATARs are not required to complete these optional examinations.

1. University selection and the ATAR – an overview

1.1 Introduction

Universities receive applications from a broad range of people: school leavers who have just finished their Higher School Certificate, mature age applicants who may or may not have any formal educational qualifications, and applicants from interstate and overseas or with other tertiary qualifications. The current profile of applicants presents universities with the challenge of developing valid procedures to choose applicants who have a good chance of successfully completing their programs.

This document focuses on the Australian Tertiary Admission Rank (ATAR), which is used to rank most school leaver applicants, and how it is calculated in NSW.

This chapter provides a brief historical background to the current procedures.

1.2 The pre-quota era

For over 100 years Australian universities have argued that the best preparation for tertiary study is achievement in a broad range of subjects. Before 1964, when quotas were introduced, as long as students performed 'well enough' in the examination that marked the end of secondary schooling, they were said to have matriculated and could enrol in any university course. The only impediment was whether they could afford the fees.

In NSW, students were required to pass at least five subjects, including English, in the Leaving Certificate in order to matriculate. In most subjects there were just two passing grades, A and B, and one failing grade, F. Students who passed a particular subject were regarded as performing well enough in that discipline to be able to study that subject at university.

Because matriculation was based on passing five or more subjects there was no need to add examination marks together and rank students, except for the purpose of awarding scholarships.

In response to high university failure rates, quotas were introduced, firstly for Medicine at the University of Sydney, and then more widely.

1.3 The post-quota era

The introduction of quotas in 1964 changed the landscape for both universities and applicants.

Universities had to decide whether to set a minimum standard for each of their courses as a way of limiting the number of available places, or to first specify the number of available places and then choose the best applicants to fill those places. Their decision at that time was to choose the second option as it gave them greater control over their course numbers. Under this model applicants for each course were ranked in order of overall academic merit, with the highest considered first. The development of a valid and efficient way of ranking applicants was then required.

Applicants had to specify a set of preferences indicating the courses in which they wanted to enrol and then do well enough to gain a place in at least one of those courses. Their preferences were considered in the order in which they had been listed and if all the places in the course listed as their first preference had been taken by higher ranked applicants, their second preference was considered. The process continued until an offer was made or there were no more preferences. This remains the current practice.

1.4 From TES to TER: 1967–98

The first post-quota aggregate used to rank school leaver applicants was based on the performance in a student's best five HSC courses and calculated by the Board of Senior Secondary Schools Studies (BSSSS). Because of the way subjects were structured at that time, the maximum possible aggregate depended on the particular combination of courses chosen, which led to a skewing in the way students selected their HSC courses. The perception emerged that students were encouraged to attempt the highest levels as a mark-gaining strategy, which resulted in many students attempting levels in courses beyond their abilities.

In response to this concern changes to the structure of the HSC were implemented in 1976 with the introduction of 2-unit and 3-unit courses. The resultant selection aggregate mark, the Tertiary Entrance Score (TES), was based on a student's best 10 units with a possible maximum value of 500 irrespective of the mix of courses. Raw examination marks were scaled before they were aggregated. Scaling was considered necessary as a student's position in a course depended on his/her ability and also the abilities of other students in that course. The purpose of scaling was to estimate a student's position in a course if all courses had the same candidature.

Further changes to the HSC were made during the following decade. A common core for related 2-unit and 3-unit courses was introduced to place the marks for these courses on the same scale. In addition, from 1984 a moderated school assessment mark was included as a formal component of the reported HSC mark. It had the same weight as the examination mark.

In 1984 the Board of Secondary Studies (BSS) made a decision not to continue with the calculation of the TES, arguing that the calculation of a selection aggregate was the responsibility of the university sector. The Board's intention was that HSC marks would provide a profile of achievement and no measure of overall achievement was required. This decision took effect in 1987.

The University of Sydney took initial responsibility for development of an algorithm for calculating the TES. To provide continuity with the past, this scaling algorithm was based on the Board's scaling procedure.

Because the TES was an aggregate of scaled marks, and HSC marks reported by the Board were on a different scale, there was some confusion in the community. Scaled marks used in the aggregate of the TES were reported on a scale with course means clustered around 50; in contrast, HSC marks were reported on a scale with a median of 60 for all 2-unit courses. Consequently, students' aggregates could no longer be calculated directly from their HSC marks and were generally less than the sum of their best 10 units of HSC marks.

In 1990 a decision was taken to replace the TES with a number, the Tertiary Entrance Rank (TER). This rank indicated a student's position in relation to other Year 12 students by rounding students' percentiles (based on their aggregate marks) to the nearest 0.05. Students with percentiles at or above the 99.975th percentile thus received TERs of 100.00.

In 1991 responsibility for scaling was given to an inter-university committee, the Technical Committee on Scaling (TCOS), which reported to the NSWVCC.

1.5 The UAI

The distribution of students' selection ranks depends on the reference population. Before 1998, NSW, in common with other states and territories, reported students' positions with reference to the cohort of Year 12 students who were eligible for a TER. Although the principles underpinning the states' selection indices were similar, because their participation rates differed, their selection indices were not comparable.

In 1994 the Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA) set up a taskforce to devise a methodology for generating a common scale to report students' ranks. The decision was taken to adopt a full weighted age cohort as the reference population. This was done on the assumption that students in different states achieving at the same level in relation to the reference population were likely to perform at university in a similar way.

All states except NSW agreed to use a logistic model to determine the distribution of their Year 12 students' ranks and to report these ranks at intervals of 0.05 by truncating students' percentiles at intervals of 0.05 commencing at 99.95.

NSW agreed to adopt the common scale but elected to use School Certificate (SC) test data rather than the logistic model to determine the distribution of students' ranks. NSW argued that these data provided accurate information about the quality of students who were eligible for a TER relative to their SC cohort. The NSW reference population thus comprised those students who completed the SC two years previously.

The decision to continue rounding percentiles in NSW meant that students above the 99.975th percentile received a TER of 100.00 rather than 99.95.

In 1998 all states adopted a common scale for reporting their TERs. In NSW the change was also accompanied by a change of name: the TER became the Universities Admission Index (UAI).

One consequence of the change in reference cohort in NSW was that the middle Year 12 student who was eligible for a UAI received a UAI of approximately 67.00, which was

higher than the TER of 50.00 previously awarded to the corresponding student. Between 1998 and 2000 there was thus some correspondence between HSC marks reported to students and their UAIs: the middle student in 2-unit courses received an HSC mark of 60 and the middle Year 12 student received a UAI of approximately 67.00.

In 1997 a review was made of the NSW HSC, which led to major changes in curriculum structure and the reporting of student achievement. The changes were to take effect from 2001.

One recommendation was removal of the key learning area coverage requirement for award of the HSC. In order to ensure that the aggregate included a verbal component, the TCOS made a decision to require that from 2001 at least two units of English were included in calculating the aggregate underpinning the UAI.

A further recommendation was that, from 1998, distribution of the UAIs was the responsibility of the Universities Admissions Centre (UAC) and confidentiality provisions prevented the reporting of UAIs to schools, the Board or the press. The major changes in reporting are described in the following section.

In response to the perception that academically able students were being encouraged to study what were seen as very easy courses in order to increase their UAIs, the TCOS decided in 1999 that the maximum marks in courses would be determined on the basis of the academic quality of the course candidatures. This decision was regarded as being consistent with the principles underpinning the calculation of scaled means and standard deviations and took effect from 2001.

1.6 Consequences of the 2001 HSC reforms

Prior to 2001 marks provided by the Board were moderated to satisfy the following conditions:

- Assessments provided by schools were first transformed so that moderated assessments in a course within a school had the same mean and standard deviation of examination marks in that course within that school.
- Examination marks in 2-unit courses were scaled by the Board such that:
  - students who only completed the 2-unit course had their marks scaled by a multi-linear transformation so that their median was 60, the maximum mark was 100, 1–2% of students received marks above 90, 25% received marks above 80, 80% of students received marks above 50, no more than 1% of students received marks less than 20 and a mark of 0 was set at 0
  - students who also completed the corresponding 3-unit course had their 2-unit marks scaled by the same multi-linear transformation.
- The marks of students in 3-unit (additional) courses were determined using common-person equating to put their 3-unit marks on the same scale as their marks in the corresponding 2-unit courses. An equipercentile method was used.
- The marks of students enrolled in 4-unit Mathematics were scaled using common-person equating to put their 4-unit marks on the same scale as their marks in the 3-unit Mathematics course. An equipercentile method was used.

The result of these processes was that the marks provided by the Board were on scales determined by the 2-unit only students in the various courses, and the marks of 3-unit students in the same subject (in both their 2-unit and 3-unit courses) were reported on the same scale.

These marks, reported to students by the Board, were then used as the input for the calculation of the UAIs. The scaled means and standard deviations for the 2-unit courses were first determined as described in Chapter 3. To ensure that the same raw mark, whether a 2-unit or a 3-unit mark, resulted in the same scaled mark, the scaling parameters used by the TCOS for 3-unit courses were the same as those used to scale the corresponding 2-unit courses.

The 2001 HSC, based on a new curriculum structure as recommended in the 1997 HSC Review, changed the reporting of achievement in individual HSC courses. It moved from a norm-referenced model to a standards-referenced model, using predetermined standards specified by six performance band descriptors. As performance band descriptors were not the same for different courses, the distributions of aligned marks reported to students were, and are, not necessarily the same for different courses. The percentages of students in the performance bands may also vary from year to year.

Since 2001 school assessments in a course have been first moderated against the raw examination marks as before, and then aligned against the same standards as the examination marks in that course.

Contrary to previous practice, marks in the extension courses that replaced the previous 3-unit courses were aligned against their own specific standards. No attempt has been made to place them on the scales used to report performance on the corresponding 2-unit courses.

For the 2001 HSC the TCOS had two sets of marks that could be used as input for UAI calculations:

- the raw examination marks and school assessments moderated against the raw examination marks
- the aligned examination marks and aligned school assessments.

The TCOS decided to use the two raw marks as input, rather than the marks reported to students, in order to preserve the discrimination and relative differences between students in a course as determined by the examiners.

In 2001, the marks for the extension courses were not, as previously, on the same scales as the marks for their corresponding 2-unit courses. Therefore, the scaling procedures had to be modified to determine a common scale for the 2-unit and extension course scaled marks.

The Board's decision to have the boundary between Band 1 and Band 2 set at 50 resulted in highly skewed distributions of marks, with most course means lying between 70 and 80. As the scaling algorithm remained the same, from 2001 to 2008 there was a difference between HSC marks reported to students and their UAIs: the middle student in most courses received HSC marks in the range [70, 80] and the middle UAI was in the vicinity of 67.00.

1.7 The ATAR

In 2008 a decision was taken by the Australasian Conference of Tertiary Admission Centres (ACTAC) to adopt a common name, the Australian Tertiary Admission Rank (ATAR), which would replace the existing names of the different selection indices used by states and territories. The name change was not to suggest that there was a common method for calculating the selection indices in the different jurisdictions, but to emphasise that students' ranks from different jurisdictions were reported on a common scale. The NSWVCC agreed to this change of name in 2008.

In 2008 the NSWVCC also agreed to truncate students' percentiles, which is consistent with the practice in other states and territories, so that the maximum rank in NSW would be 99.95. One of the common mistakes people made was to think a score of 100 meant a 'perfect score'. Prior to 2009, students who received a UAI of 100.00 were those who performed better than 99.975% of their peers, and the aggregate marks of this top group had ranged from 480 to 498. There has never, in the past 30 years, been a student with a 'perfect' aggregate of 500. For the ATAR the top group is comprised of students who have performed better than 99.95% of their peers, which means that the number who receive the maximum rank increased from 18–23 to approximately 46.

The minimum school leaving age in NSW in 2009 was 15 years. In 2011 it increased to 17 years. A decision was taken by the NSWVCC in 2009 to pre-empt the change in the nature of the HSC cohort by using the appropriate Year 7 cohort as the reference group for calculating the admission rank. This change came into effect with the move to the ATAR.

Rather than have the changes occur in a piecemeal fashion, the NSWVCC agreed that these three changes would be implemented together for the 2009 Higher School Certificate.

1.8 Implications of the change from UAI to ATAR

The change in reporting student ranks via the ATAR rather than the UAI can be compared to the change in temperature scales, where once we reported a temperature in degrees Farenheit, but now we use degrees Celsius: the actual temperature has not changed, just the name and scale have been changed.

The rules for the ATAR are exactly the same as those for the UAI.

Inclusion of the early leavers in the reference cohort meant that almost all ATARs were greater than the corresponding UAIs. At the very top, because the maximum rank was 99.95 rather than 100.00, some ATARs were less by 0.05, but the actual number changing was very small.

For students the effect had no practical consequences. The scaling process was the same, the rank order of students was the same, and the same applicants were selected for the same courses. Any change in an ATAR compared to a UAI resulted in an equivalent change in the course cut-off.

1.9 The use of a single index

At different times it has been argued that the UAI, or any single index, is a blunt instrument and that different indices should be used for selection for different university courses. Despite the apparent attractiveness of this view there is little empirical evidence in its favour. The choice of a university course, with all other factors being equal, is likely to be determined by a student's knowledge, interests and skills, so that future applicants for a particular course will have their ATARs based on HSC courses that provide the academic background required for that course. Students with ATARs based on different patterns of HSC courses are likely to apply for different university courses.

In recent years there has been an increase in the range of alternative selection methods for school leavers as well as for other applicants.

2. The NSW HSC and the ATAR: An overview of current NSW requirements

2.1 Overview

The base data for reporting student achievement are two sets of marks: assessment marks provided by schools and HSC examination marks. From these two sets of marks the Board produces Records of Achievement for students showing how they have performed against set standards, which are described as Performance Bands, and the Technical Committee on Scaling produces numbers that indicate how students have performed in relation to other students.

To obtain the marks reported by the Board and the scaled marks that contribute to the aggregate on which the ATAR is based, the two sets of marks undergo three transformations to take account of factors that are independent of the students themselves.

1. A student's school assessment mark depends not only on the developed ability of the student but also on the nature of the school assessments and the standards used by the school in the courses the student has completed. Assessments are first moderated by the Board to take account of differences between schools. The moderated marks indicate the achievements of students in their courses as if there were only one school.
2. A student's examination mark depends not only on the developed ability of the student but also on the difficulty of the examination itself and the severity of marking. To take account of these factors and to produce marks that can be compared across time, the Board calibrates or aligns the examination marks in a course against the published standards for that course. The aligned marks indicate the standards students have achieved, rather than the marks gained in a particular examination paper.
3. A student's position in a course depends not only on the student's developed ability but also on the abilities of the students with whom he/she is compared. Scaling, carried out by the Technical Committee on Scaling, takes into account differences in the abilities of course candidatures and produces marks that can be deemed equivalent across courses. A student's scaled mark in a course indicates their position within a common candidature. 'Equivalence' here is defined in a comparable sense: marks in different courses are deemed to be equivalent if the students awarded those marks would have achieved the same position in these different courses if the candidatures of the courses were identical.

Details of the Board's procedures are available on its website at www.boardofstudies.nsw.edu.au.

2.2 The NSW HSC

The Higher School Certificate (HSC) is an exit certificate awarded and issued by the Board. It marks the completion of 13 years of schooling, is the gateway to further study and employment, and presents a profile of student achievement in a set of courses.

2.2.1 Eligibility for an HSC

To qualify for an HSC in NSW, students must complete a pattern of Preliminary and HSC courses containing at least 12-units of Preliminary courses and at least 10 units of HSC courses.

These HSC courses must include at least:

- six units of Board Developed courses
- two units of a Board Developed course in English
- three courses of two unit value or greater (either Board Developed or Board Endorsed courses)
- four subjects.

Further details about HSC eligibility and HSC courses can be found in the *Assessment, Certification and Examination Manual* and in the *Rules and Procedures for Higher School Certificate Candidates* booklet, which are published annually by the Board, and available on its website at www.boardofstudies.nsw.edu.au.

2.2.2 Satisfactory completion of courses

Students are deemed to have satisfactorily completed a course if, in their principal's view, there is sufficient evidence to show that the students have:

- followed the course of study prescribed by the Board
- applied themselves with diligence and sustained effort to the set tasks and experiences provided by the school
- made a genuine attempt at assessment tasks that total more than 50 per cent of the available school assessment marks for that course
- achieved some or all of the course outcomes.

Students also need to make a serious attempt at the examination for the courses. Receiving a mark for a course on a Record of Achievement is an indication that the student has satisfactorily completed that course.

2.2.3 Reporting student achievement in the HSC

For most ATAR courses, the Board reports student achievement against published standards by:

- an examination mark
- a school assessment
- an HSC mark
- a performance band.

These results are shown on a student's Record of Achievement. For most Board Developed courses, a Course Report is also provided. The report describes, using performance bands, the standard achieved in the course and provides a graph indicating the student's position in the course candidature.

2.2.4 Defining standards by performance bands

Standards in a course are described in terms of the content, skills, concepts and principles relevant to the course and represent the range of achievement expected of students completing the course. Performance band descriptors, which describe typical achievement at different standards (bands), have been developed for each course. There are six bands for 2-unit courses and four for extension courses.

The percentage of students in any band depends only on how students enrolled in that course perform at the standard specified by the band descriptor. There are no predetermined percentages of students to be placed in the bands.

It follows that, although the standards described by the bands in a particular course will be the same from year to year, different courses will have different standards because they are based on different criteria. It is likely that the percentage of students in each band will vary across courses, and may vary from year to year.

The range of reported marks for the bands is as follows:

2-unit courses						
Band	1	2	3	4	5	6
Mark range	0–49	50–59	60–69	70–79	80–89	90–100

Extension courses (except Mathematics Extension 2)				
Band	E1	E2	E3	E4
Mark range	0–24	25–34	35–44	45–50

Mathematics Extension 2[1]				
Band	E1	E2	E3	E4
Mark range	0–49	50–69	70–89	90–100

1. *Mathematics Extension 2 students have their achievement reported using four bands but the mark range is out of 100 rather than 50.*

2.2.5 Examination marks

The examination mark reported on a student's Record of Achievement indicates the standard a student has attained in that examination. If, for example, a student's performance in the Society and Culture examination is at the standard described for Band 3, the examination mark reported on their Record of Achievement for that course will lie between 60 and 69.

In general this mark, termed the aligned examination mark, will differ from the mark the student actually gained on the examination (the raw examination mark).

The aligned marks indicate the standards reached by students and their relative positions in a band. For example, a mark of 62 means that, while the student has demonstrated a Band 3 standard, their achievement is closer to Band 2 standard than Band 4 standard.

2.2.6 School assessments

To enable school assessments from different schools to be compared, marks submitted by schools (raw assessments) are first moderated using the raw examination marks gained by their students and then aligned to course standards. The school assessments reported on a student's Record of Achievement are the aligned assessments.

Although school assessments are moderated and then aligned against standards, a school's rank order of students in a course is maintained.

2.2.7 HSC marks

For each course, the Board's aligned examination and school assessment marks, rounded to whole numbers, are released to students together with an HSC mark. This HSC mark is the (rounded) average of the (rounded) aligned examination mark and (rounded) aligned school assessment and determines a student's performance band for the course.

Further details about the Board's processes can be found in Board Bulletins, in *The Media Guide*, which is produced annually, and on the Board's website at www.boardofstudies.nsw.edu.au.

2.3 The ATAR in NSW

2.3.1 Background

The Australian Tertiary Admission Rank (ATAR) is a numerical measure of a student's overall academic achievement in the HSC in relation to that of other students. The ATAR is reported as a number between 0 and 99.95 in increments of 0.05. This measure allows the overall achievement of students who have completed different combinations of HSC courses to be compared.

In NSW, ATARs indicate the positions of students relative to their Year 7 cohorts. That is, students who receive an ATAR of 80.00, for example, have performed better than 80% of their Year 7 cohort, assuming that all these Year 7 students were eligible for an ATAR six years later.

The ATAR is calculated solely for use by tertiary institutions, either on its own or in conjunction with other criteria, to rank and select school leavers for admission. Calculation of the ATAR is the responsibility of the TCOS on behalf of the NSWVCC.

Students who indicate on their HSC entry forms that they wish to be notified of their ATAR will receive an ATAR Advice Notice from UAC. ATARs are also made available to institutions for selection purposes.

2.3.2 Categorising ATAR courses

ATAR courses are assessed by formal examinations conducted by the Board and are deemed by the Committee of Chairs of Academic Boards and Senates in NSW and the ACT to have sufficient academic rigour to be useful as preparation for university study.

ATAR courses are classified as either Category A or Category B courses. The criteria for Category A courses are academic rigour, depth of knowledge, the degree to which the course contributes to assumed knowledge for tertiary studies and the coherence with other courses included in the ATAR calculations. Category B courses are those whose level of cognitive and performance demands are not regarded as satisfactory in themselves, but their contribution to a selection index is regarded as adequate if the other courses included in the aggregate are more academically demanding.

All ATAR courses are reviewed on a regular basis by the Committee of Chairs and the categorisations can change over time. Current details can be found on the UAC's website at www.uac.edu.au.

2.3.3 Eligibility for an ATAR in NSW

To be eligible for an ATAR a student must have satisfactorily completed at least 10 units of ATAR courses, which included at least:

- eight units of Category A courses
- two units of English
- three Board Developed courses of two units or greater
- four subjects.

2.3.4 Calculation of the ATAR in NSW

The ATAR is based on an aggregate of scaled marks in 10 units of ATAR courses comprising:

- the best two units of English
- the best eight units from the remaining units, which can include up to two units of Category B courses.

Marks to be included in the ATAR calculations can be accumulated over a five-year period but if a course is repeated only the last satisfactory attempt is used in the calculation of the ATAR. For students accumulating courses towards their HSC, scaled marks are calculated in the year the courses are completed.

2.3.5 Extension courses

Extension courses do not have to be completed at the same time as the corresponding 2-unit courses; they can be completed in a different year. However, the marks of extension courses will not be counted towards the ATAR calculation unless the corresponding 2-unit course has been satisfactorily completed.

2.3.6 The ATAR Advice Notice

The ATAR Advice Notice includes:

- the student's ATAR
- a list of the ATAR courses which the student studied, the categorisation of each course and the year the course was completed
- the number of units of each ATAR course that were actually included in the calculation of the ATAR.

While ATARs are calculated for all ATAR-eligible students, only those students who indicate on their HSC entry forms that they wish to be notified of their ATAR will receive an ATAR Advice Notice from UAC.

There are two cases where an ATAR will not be shown on the ATAR Advice Notice. The first is when a student receives an ATAR between 0.00 and 30.00, in which case the ATAR will be indicated as '30 or less'. The second is when the student has not met the requirements for an ATAR, in which case the statement 'Not Eligible' will appear.

An example of an ATAR Advice Notice is given below.

An example of an ATAR Advice Notice

ABN 19 070 055 935, ACN 070 055 935
Quad 2, 8 Parkview Drive, Sydney Olympic Park NSW
post: Locked Bag 112, Silverwater NSW 2128
tel: 1300 ASK UAC (1300 275 822) website: www.uac.edu.au

UAC
UNIVERSITIES ADMISSIONS CENTRE

2014 Australian Tertiary Admission Rank Advice

MR FRED CITIZEN
8 PARKVIEW DRIVE
HOMEBUSH BAY NSW 2128

Your Australian Tertiary Admission Rank (ATAR): 73.00 *SEVEN*THREE***ZERO*ZERO

Shown below are the ATAR courses which were available for inclusion in your ATAR, together with the units that were actually included in the calculation. Information about ATAR eligibility and the calculation of the ATAR is shown over the page.

Your NSW Board of Studies Student Number: **12345678**

Course name	Category	Year completed	Unit value	Units included in calculation of ATAR
Economics	A	2014	2	1
English Standard	A	2014	2	2
Legal Studies	A	2014	2	2
Mathematics	A	2014	2	2
Studies of Religion 1	A	2014	1	0
French Continuers	A	2014	2	2
French Extension	A	2014	1	1

Issued by UAC without alteration or erasure (see reverse for details of security features)
18 December 2014

Andrea Goodwin
Acting Managing Director

Common Seal A.C.N. 070 055 935

The ATAR is a rank between 0.00 and 99.95 with increments of 0.05. It is used by UAC participating institutions to rank and select school leavers for admission to most undergraduate courses. Some courses use selection criteria other than, or in addition to, the ATAR. For more information about the ATAR read pages 41–44 of the *UAC 2014-15 Guide* or pages 27–30 of the *UAC 2014-15 International Booklet* or visit UAC's website at www.uac.edu.au/undergraduate/atar/ or www.uac.edu.au/international/atar/

The message 'Not eligible' appears on this advice if you did not satisfactorily complete the requirements for an ATAR as listed over the page.

If you are eligible to have a Limited ATAR calculated it will be sent to you on a separate advice. The Limited ATAR is calculated differently to the ATAR. The calculation of the Limited ATAR is described on page 43 of the *UAC 2014-15 Guide* or page 29 of the *UAC 2014-15 International Booklet* or visit UAC's website at www.uac.edu.au/undergraduate/atar/ or www.uac.edu.au/international/atar/

3. Calculating the ATAR

3.1 Overview

Tertiary institutions are concerned with ranking school leaver applicants. From their perspective, the importance of HSC marks is that they convey information about a student's position in relation to other students.

With the exception of English, which is compulsory, students are free to choose their courses of study. Consequently, individual course candidatures vary in size and nature and there are many different enrolment patterns. For example, in 2014 there were 27,535 different enrolment patterns for ATAR-eligible students; only 202 of these 27,535 combinations were completed by 20 or more students and 20,008 were taken by only one student. Given the choice available, it follows that a student's rank in different courses will not necessarily have the same meaning, as good rankings are more difficult to obtain when the student is competing against students of high academic ability.

Because of the lack of comparability of HSC marks achieved in different courses, marks of individual students are scaled before they are added to give the aggregates from which the ATAR is determined.

The scaling process is designed to encourage students to take the courses for which they are best suited and which best prepare them for their future studies. The underlying principle is that a student should neither be advantaged nor disadvantaged by choosing one HSC course over another. The scaling algorithm estimates what students' marks would have been if all courses had been studied by all students.

The scaling model assumes that a student's position in a course depends on the student's developed ability in that course and the 'strength of the competition'. Since the ATAR is a rank that reflects academic achievement, 'strength of the competition' is defined in terms of the demonstrated overall academic attainment of a course candidature.

Scaling first modifies the mean, the standard deviation and the maximum mark in each course. Adjustments are then made to the marks of individual students to produce scaled marks, which are the marks the students would have received if all courses had the same candidature.

Although scaled marks are generally different from the raw marks from which they are derived, the ranking of students within a course is not changed.

Once the raw marks have been scaled, aggregates are calculated for ATAR-eligible students. Percentiles, which indicate the ranking of students with respect to other ATAR-eligible students, are then determined on the basis of these aggregates. In most cases, the ranking or order of merit based on these aggregates is quite different from the order of merit using aggregates based on HSC marks.

The last step is to translate these percentiles into ranks relative to the weighted age cohort population based on Australian Bureau of Statistics data. This cohort effectively reflects the Year 7 cohort from five years earlier. The population percentiles are truncated at intervals of 0.05 starting at 99.95. These are the ATARs.

Each ATAR corresponds to a range of aggregates and the number of students with each ATAR varies, depending in part on how many candidates tie on the same aggregate.

The scaling process, which does not assume that one course is intrinsically more difficult than another or that the quality of the course candidature is always the same, is carried out afresh each year.

All students who complete at least one ATAR course in a given year are included in the scaling process for that year. Students who are accumulating courses towards their HSC have their scaled marks calculated in the year the courses are completed.

3.2 Marks used in the ATAR calculations

The marks used in the calculation of the ATAR are derived from the following two marks provided by the Board

- a raw examination mark
- a raw moderated school assessment – these are school assessments that have been moderated using the raw examination marks.

All marks are provided on a one-unit basis to one decimal place. A student's raw HSC mark in a course is the average of their raw examination mark and their raw moderated school assessment.

In the description of the scaling process that follows, to cater for both 2-unit and extension courses, marks are described on a one-unit basis.

3.3 Data verification

Before any processing is carried out, an extensive number of data verification checks is completed to ensure the integrity of the marks received from the Board.

Students who have marks for extension courses but no marks for the corresponding 2-unit courses will have their extension course marks ignored. Likewise, students will not have their Mathematics Extension 2 marks included if they have not completed Extension 1, nor will their English Extension 2 marks be included unless they also have English (Advanced) and English Extension 1 marks. These courses may be completed in different years.

Students who have completed Mathematics and Mathematics Extension 1, and subsequently complete Mathematics Extension 2, will have their Extension 1 and Extension 2 marks included but their Mathematics marks will be ignored. The unit value of Mathematics Extension 1 will be changed from 1 to 2.

Students who repeat a course have their last satisfactory attempt included in the calculations.

3.4 Combined courses

The Board places English (Standard) and English (Advanced) raw marks on a common scale using the common Paper 1. For scaling purposes these courses are combined and scaled as a single course. In the Report on Scaling the courses are reported as separate courses in order to be consistent with the Board's reporting practice.

3.5 Initial standardisation

Before the scaling algorithm is implemented, a linear transformation is applied to the raw HSC marks in each course to set the top mark to a common value. The marks in each course are then standardised to a mean of 25 and standard deviation of 12 on a one-unit basis.

3.6 Calculating scaled means and standard deviations

The model underpinning the scaling algorithm specifies that the scaled mean in a course is equal to the average academic achievement of the course candidature where, for individual students, the measure of academic achievement is taken as the average scaled mark in all courses completed. The model specification leads to a set of simultaneous equations from which the scaled means of 2-unit courses are calculated.

The scaled standard deviation for a 2-unit course is the standard deviation of the measure of overall academic achievement of the candidature of that course.

For extension courses the scaled means and standard deviations are determined by the performance of the extension students on the corresponding 2-unit courses. The exceptions are History Extension, which can be completed by both Modern History and Ancient History students, and the second Extension courses in English and Mathematics: English Extension 2 and Mathematics Extension 2.

A scaled mean is determined for the Modern History students in History Extension on the basis of their performance in the 2-unit Modern History course. A scaled mean for the Ancient History students in History Extension is found in a similar manner. The scaled mean for History Extension is then set equal to the weighted average of these two scaled means. The scaled standard deviation is found in a similar manner.

Scaled means and standard deviations for the Extension 1 courses in English and Mathematics are calculated as described above. The scaled mean and standard deviation for the Mathematics Extension 2 course are then determined by the performance of the Extension 2 students in the Mathematics Extension 1 course. For English Extension 2, the scaled mean and standard deviation are determined by the performance of the Extension 2 students in English (Advanced). This option is not available for Mathematics as the Extension 2 students do not complete the Mathematics 2-unit paper.

3.7 Setting maximum scaled marks

The maximum possible scaled mark in a course is determined according to the academic quality of the course candidature in such a way that the maximum possible scaled mark for the combined 2-unit English candidature is 50 on a one-unit basis.

In 2014 the maximum possible scaled mark in a course was given by the smaller of 50 and the scaled mean + 2.48 times the initial scaled standard deviation, where the scaled mean and initial scaled standard deviation of the course are determined using the scaling algorithm.

The number, 2.48, was determined to ensure that the maximum possible scaled mark in the combined 2-unit English course was 50. This number is calculated afresh each year. It has varied from 2.47 to 2.49 over the past six years.

For extension courses with small initial scaled standard deviations a variation exists to replace the initial scaled standard deviation by 6 when calculating the maximum possible scaled mark.

3.8 Scaling individual marks

Once the scaled means and standard deviations are determined, individual raw marks are scaled using a non-linear transformation which preserves the scaled mean and standard deviation of a course and restricts the scaled marks to the range [0, Max]. Max is the maximum possible mark for the course calculated according to the method described in section 3.7.

If the actual maximum scaled mark in a course is less than the maximum possible scaled mark a further linear transformation is applied. The effect of this linear transformation is to increase the standard deviation so that the actual maximum scaled mark in the course is changed to be the same as the maximum possible scaled mark. The transformation does not affect the scaled mean.

For some courses with very small candidatures the non-linear transformation is not always appropriate, in which case alternative transformations, which are consistent with the principles of the scaling algorithm, are used.

3.9 Calculating aggregates

Once the final scaled marks have been calculated for each course, students' marks are brought together and aggregates of scaled marks calculated according to the rule described in section 2.3.4 for each ATAR-eligible student. These aggregates are calculated to one decimal place and will lie in the range [0, 500].

Students who have completed courses in a previous year will have the scaled marks for those courses incorporated with the scaled marks from the current year to determine their aggregate, provided the course has not been repeated in the current year or replaced by an alternative course (for example, replacing Mathematics General 2 with Mathematics).

3.10 Calculating the ATARs

The aggregates of 10 units of scaled marks can be used to rank all ATAR-eligible candidates. The percentiles within the ATAR-eligible group (rounded to the nearest 0.05) are the equivalent of the old TER scores. To calculate the ATARS the percentiles are required relative to the appropriate weighted age cohort determined using Australian Bureau of Statistics data. This reference population is effectively the appropriate Year 7 cohort if all students in this cohort completed Year 12 and were eligible for an ATAR.

Up until 2013 the ATARs were estimated by common-person equating using the School Certificate Examination (SCE) mark as the anchor variable. The common persons were those students in the SC cohort who were eligible for an ATAR two years later; typically, they represented approximately 60% of the total SC cohort. These students had both an aggregate mark gained in Year 12 and an SCE mark gained in Year 10.

The last School Certificate tests were held in 2011 and from 2014 translating ranks based on scaled aggregates into ATARs was completed using a two-parameter logistic function, which is consistent with the technique used in other states without Year 10 data.

The logistic function approach was adopted by other jurisdictions in 1998 based on the patterns observed in NSW data. To illustrate the pattern, Figure 3.1 shows the proportions of the 2010 SC cohort who were eligible for an ATAR two years later in 2012 plotted against the SCE mark. Clearly, almost all of the most able students stayed on to Year 12 and applied for an ATAR and the proportion of ATAR-eligible students decreased as the SCE total decreased. The larger spikes at the extreme SCE marks are due to the proportions being based on very small numbers of candidates.

The specific shape of the logistic function will depend on the proportion of students in the target population who are ATAR-eligible. This figure is the participation rate. In 2014 the participation rate in NSW (determined using ABS data) was 59.6%, up from 58.9% in 2013.

The anchor frequency is the number, N, allocated to the 99.95 category. The top category should contain 1/2000th of the target population as all the most able candidates would study to Year 12 and apply for an ATAR. In 2014 this target frequency was N = 47.

The logistic model is $\log [p_j/(1-p_j)] = a + b\, x_j$, where Np_j is the target frequency of students at ATAR x_j, for x_j less than 99.95. To be consistent with recent NSW ATAR patterns the minimum ATAR awarded is set at 8.00. The target proportions are then rescaled to ensure they sum to 1. The parameters in the logistic model were estimated using historical ATAR and participation rate data for NSW for 2006–13.

Starting with the highest aggregate the candidates are progressively allocated to ATAR categories to achieve the cumulative target frequencies. There is noise in the allocation due to ties in the aggregates. The resulting pattern is shown in Figure 3.2

The relationship between the ATAR and TER in 2014 is shown in Figure 3.3.

Figure 3.1: Proportions of the SC cohort who were eligible for an ATAR in 2012, by SCE mark

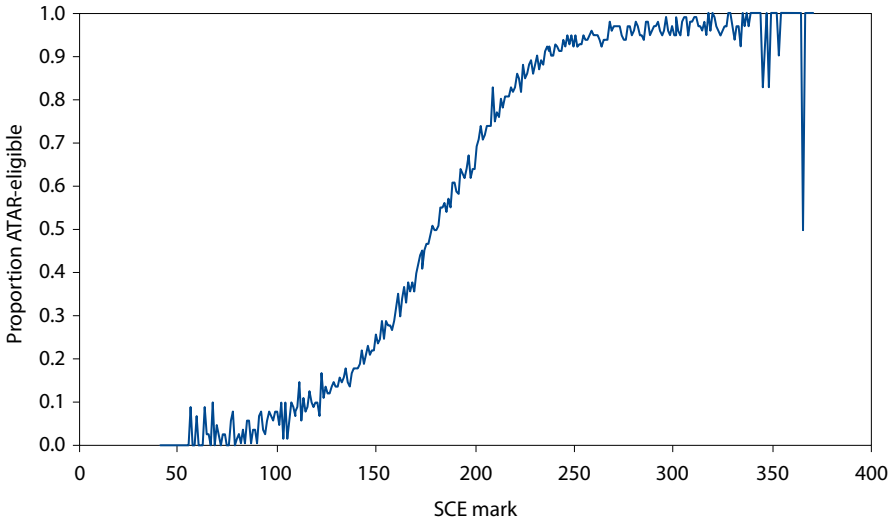


Figure 3.2: Percentage of ATAR-eligible students in each ATAR truncated category, 2014.

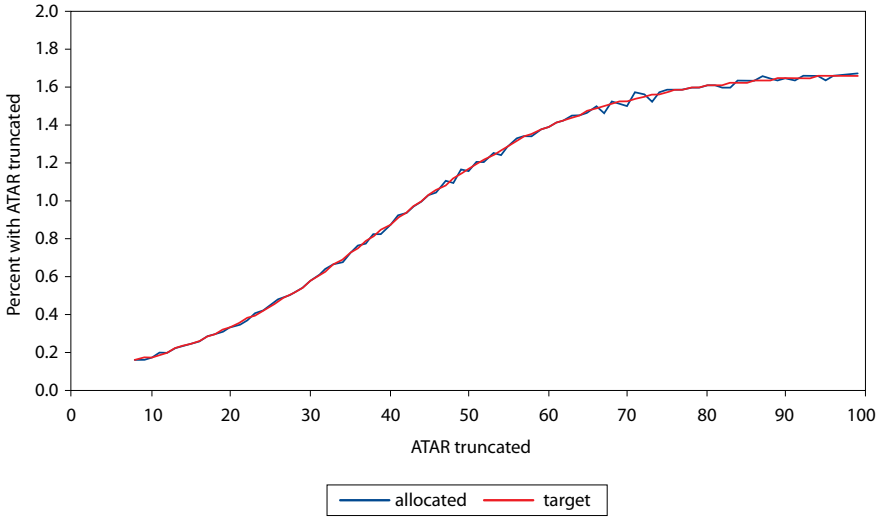
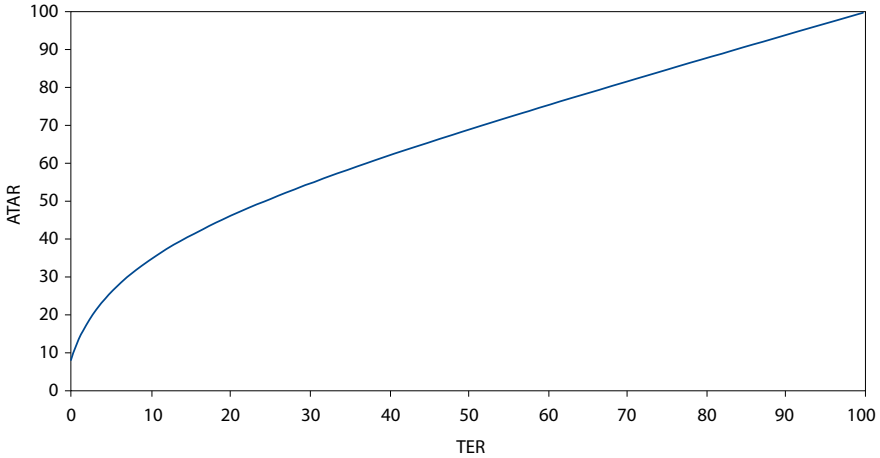


Figure 3.3: The relationship between ATAR and TER, 2014



The relationship between the ATAR and aggregate in 2014 is shown in Figure 3.4.

Each ATAR corresponds to a range of aggregate marks which is greatest in the extremes of the distribution of aggregates and smallest near the middle of the distribution of aggregates.

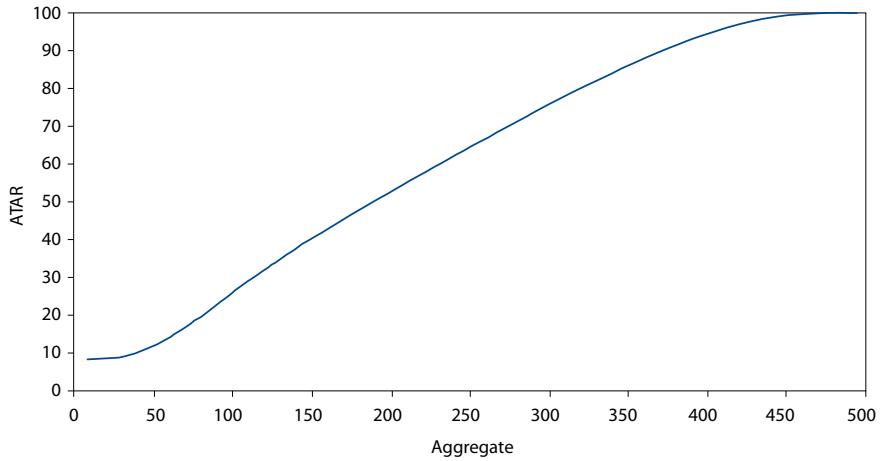
3.11 Verifying ATARs

The final step is to implement a broad range of data verification checks to ensure the accuracy of the calculated ATARs. These include running comparisons of the current results with previous years to identify what might be aberrant values, running consistency checks on individual students and groups of students and checks on the internal consistency of the results when considered as a whole.

3.12 Distributing ATARs

The ATARS of individual students are distributed by UAC and used in the processing of school leaver applicants.

Figure 3.4 Relationship between aggregate and ATAR, 2014



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ACN 070 055 935
ABN 19 070 055 935

Published May 2015

This publication is available on UAC's website at www.uac.edu.au/general/

About this publication

Calculating the Australian Tertiary Admission Rank in New South Wales: A Technical Report describes the technical details surrounding the calculation of the ATAR and provides a brief historical background to the current procedures.

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