

# Procedures for calculating Overall Positions (OPs) and Field Positions (FPs)

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# Overview

This paper provides technical information on the way Overall Positions (OPs) and Field Positions (FPs) are calculated by the Queensland Studies Authority (QCAA). It covers the inputs, the calculations and the quality assurance processes. The information is aimed at an informed audience, with complex discussions of scaling and anomaly detection.

## School-based assessment

A system of externally moderated school-based assessment has operated in Queensland secondary schools in various forms since 1972. The QCAA is responsible for issuing the senior education profiles, which provide information about students' demonstrated achievements when they leave school.

An Authority subject is one based on a QCAA-approved syllabus from which a school develops an accreditable work program that is subject to the full moderation procedures of the QCAA. Results in Authority subjects are reported on the Senior Statement and are included in the calculations for the OPs and FPs that Queensland uses to determine tertiary entrance.

## Cross-curriculum testing

A close examination of all syllabuses in Authority subjects identified 49 testable common curriculum elements that underpin the senior curriculum. The Queensland Core Skills (QCS) Test assesses students' achievements in these elements, and is not subject-specific. The QCS Test has two functions:

- to scale students' school results for tertiary entrance calculations
- to provide an individual grade (A to E), which is reported on the Senior Statement.

## Tertiary Entrance Statement

The Tertiary Entrance Statement is issued to students who are eligible for an OP, and information appearing on it may be used to make tertiary entrance decisions. To be eligible for an OP, a student must sit the QCS Test and complete 20 semester units of credit in Authority subjects, including at least three subjects that have been studied for four semesters. The Tertiary Entrance Statement reports overall achievement on a statewide ranking from OP1 (highest) to OP25 (lowest), as well as achievements in a maximum of five fields ranked from FP1 (highest) to FP10 (lowest).

An FP indicates a student's rank order position based on their overall achievements in Authority subjects in one of five fields. A field is an area of study that emphasises particular knowledge and skills. FPs are calculated for OP-eligible students only. The calculation of FPs involves the use of field-specific weights for each subject, referred to as subject weights. These weights reflect the emphasis of the skills within the definition of each field in the particular subject syllabus.

# Calculating OPs and FPs

## Scaling QCS Test scores

The QCS Test is one of the two major inputs used to calculate OPs and FPs. As the highest possible mark for the QCS Test varies from year to year, QCS Test scores are transformed to a consistent scale for the purposes of consistency. Students' raw test scores are converted to a rank and these are mapped to a Gaussian distribution. The resulting Gaussian scores are transformed to have a mean of 175 and a mean difference of 25 for OP-eligible students who sat the test. These QCS scaling scores, as they are known, are used to provide information about the parameters of school-groups and subject-groups within a school. Note that while OP-ineligible students may sit the QCS Test, their results are not included in the group data used for scaling purposes.

## Subject achievement indicators (SAIs)

SAIs are the other major input used to calculate OPs and FPs. In subject groups where there are 14 or more OP-eligible students, the subject teachers assign SAIs. The procedures differ for small and intermediate groups (see page 7). An SAI represents a student's achievement in an Authority subject relative to all other students in the subject-group at that school. An SAI is assigned by teachers to each OP-eligible student in each Authority subject on a scale from 400 (for the student who has the highest achievement in that subject in that school regardless of the level of achievement) to 200 (for the student who has the lowest achievement in that subject in that school regardless of the level of achievement).

Because students have a right to know their final positions on SAI scales, all schools are required to make SAI decisions available to students at a suitable time and in a suitable form. This is an important part of the accountability process and helps to ensure the integrity of the OP calculations.

## Scaling

The aim of scaling is to remove bias that may be caused by differences in the strength of the competition in different subject-groups and school-groups. There are two stages of scaling:

- the within-school stage
- the between-school stage.

### First-stage scaling: The within-school stage

The within-school stage uses QCS Test results for OP-eligible students in all Authority subject-groups within the school to compare the relative achievement of each subject-group. To do this, SAIs for each subject-group are scaled to the mean and mean-difference (a measure of spread) of the QCS scaling scores for that subject-group. The relativities of SAIs within a subject are not changed. This allows a scaled SAI in one subject to be compared with a scaled SAI in another subject in the same school. For each student, these SAIs are combined by averaging the best 20 semester units of credit in Authority subjects, including at least three subjects studied for four semesters. This average is called an overall achievement indicator (OAI) and reflects the relative placement of a student within a school-group.

A similar process is used to calculate FPs in each of the five fields. When scaled SAIs for each field are combined, however, the results are weighted according to the subject weight for that subject in that field. The QCS Test scaling scores used for scaling FPs reflect performance on aspects of the QCS Test relevant to each field. The combined scaled SAIs are known as a field achievement indicator (FAI). Only a student who has studied a combination of subjects with sufficient total subject weights in a particular field will receive an FP for that field.

Subjects are weighted equally in the OP calculations. That is, no assumptions are made about the difficulty of subjects or overall achievements of students who complete particular subjects or combinations of subjects. However, this does not mean that the same SAI or the same level of achievement in different subjects is taken to indicate the same achievement.

## Second-stage scaling: The between-school stage

The between-school stage uses QCS Test results for school-groups to compare the relative achievement of students in different schools. OAls for each school are scaled to the mean and mean-difference of QCS scaling scores for the school, while preserving the relativities of OAls within the school. The resulting scaled OAls are banded into 25 bands that are reported as OPs (from 1 to 25). Twenty-five bands is a degree of precision to which the outcomes can be justifiably reported and upon which tertiary institutions can make appropriate entrance selection decisions (given that they can also use FPs).

There are, then, five important steps in the calculation of OPs:

1. SAIs are assigned to OP-eligible students by their teachers.
2. SAIs are scaled using QCS Test information for OP-eligible students to allow comparisons of the achievement of groups within the school.
3. Scaled SAIs are combined to form OAls.
4. OAls are scaled using QCS Test information to allow comparisons of the achievements of students in different schools.
5. Scaled OAls are banded to produce OPs.

The FPs are based on only ten bands and are more course-grained than the OPs. There is no second stage of scaling for FPs.

# Comparability

Originally, each OP band represented a certain percentage of the student population. Since 1994, three years after OPs were introduced, procedures have been in place to make each OP represent an equivalent achievement from one year to the next. Three methods are used to compare the achievement of statewide groups of senior students from year to year:

- *Performing a multiple regression on levels of achievement as dummy variables:* Moderation processes aim to assign levels of achievement that reflect performance relative to criteria in the syllabus for the subject. These levels of achievement, then, should represent the same achievement in different years. A multiple regression using levels of achievement as dummy variables can be used to map OAls from one year to another.
- *Using the QCS Test:* Information about QCS Test items from test-equating allows the use of item response theory to compare the relative achievement of students from one cohort to another.

- *Matching similar students in the two cohorts:* By looking at students who achieve approximately the same levels of achievement in the same subjects, we can compare the OALs that the two students who completed senior in different years received. A multiple regression of the two sets of OALs, weighted by a similarity measure, gives another mapping of OALs from one year to another.

A combination of the information from these procedures informs the decision about the cut-offs that will be used to band scaled OALs into OPs for the new cohort based on those used in previous cohorts.

## Quality control

The quality of the outcomes for students from the entire process is based on the quality of the input data. In addition, while the method outlined reflects the overall philosophy behind the system, there are several cases in which applying it routinely would be inappropriate for the available data and might result in inequitable outcomes for students. To avoid this, quality-control and special procedures are in place.

## QCS Test quality control

Quality control of the development, administration and marking of the QCS Test is critically important in achieving equitable outcomes for students. Items used on the test are extensively trialled and reviewed before use. Marking operations for the Short Response and Writing Task components of the test are carefully structured, with emphasis on marker monitoring. Post-test analyses provide feedback to inform ongoing quality control procedures.

## SAI data surveillance

SAI data also undergoes rigorous quality control. SAI distributions submitted by a school are compared with information obtained from the school as part of moderation procedures to check for face-value consistency. The QCAA uses the in-house computer tool BonSAI to examine every SAI distribution to see how it compares to moderation data. Extensive negotiation is carried out with schools regarding possible face-value inconsistencies.

## Weighting inconsistent QCS Test results

Some students' performance on the QCS Test is not consistent with their in-school performance. For example, a student may seemingly underperform on the QCS Test or a student may achieve QCS Test results that are much higher than would have been expected from their results on school-based assessment. Where there is a significant mismatch between performance on the QCS Test and performance at school, the contribution of that student's achievements to scaling parameters for groups is down-weighted in group calculations. Students at the top of the school cohort who achieve exceptionally well on the QCS Test are not down-weighted because the measures of relative achievement within the school might not reflect how far they are ahead of the school-group.

## Small subject-groups

The standard scaling process is inappropriate for small subject-groups as there is insufficient data and the results would be unstable. Therefore, for subject-groups with fewer than ten OP-eligible students, scaled SAIs are estimated using other information. On the Senior Statement, students receive one of five levels of achievement in each subject. Teachers place students' achievements on one of ten 'rungs' within each level of achievement. Moderation procedures normally provide advice to schools about students' placements to within a third of a level of achievement — top, middle or bottom — not the rung. In the case of small groups, however, rung placements are carefully scrutinised because the teachers' rung placements are used to estimate scaled SAIs from large-group data from other schools. This estimation is performed only when there is insufficient information available about the group, and another method must be used to determine scaled SAIs.

## Intermediate subject-groups

Scaling for subject-groups of 10–13 students uses a weighted combination of the scaling parameters obtained using the small-group method and the standard method. The weighting depends on the size of the group. For example, a group with ten students would have a scaling score mean representing 20% of the large group method and 80% of the small group method.

## Small school-groups

For a school with a very small number of students, second-stage scaling parameters would be very unstable, so no second stage of scaling is carried out. This means that scaled OAI for students at small schools are the same as their OAI. Small schools are defined as schools with fewer than 16 OP-eligible students.

## Intermediate school-groups

Scaling for schools with 16–19 OP-eligible students uses a weighted average of the raw OAI and scaled OAI, weighted according to how many OP-eligible students are at the school. For example, at a school with 19 students, the scaled OAI for a student would be 20% of the raw OAI and 80% of the scaled OAI.

## Visa groups and schools

Visa students are students who attend a school in Queensland but who are not Australian citizens or permanent residents of Australia. Visa students' data generally does not contribute to the calculation of the scaling parameters used to calculate the OPs of domestic students. Visa students receive an equivalent OP based on scaling parameters derived from the QCS Test scores of the non-visa students in their groups. This procedure cannot be used in the case of a school- or subject-group that consists solely of visa students. For subject-groups and schools that have a high number of visa students (greater than 20% of the number of OP-eligible students), special procedures are used to determine parameters. Parameters for the entire group, OP-eligible and equivalent-eligible, are estimated using QCS Test information from OP-eligible students and other achievement information for equivalent-eligible students.

## Group anomaly detection

Although quality control on the inputs used to calculate OPs and FPs is essential, quality control on the outputs is equally important. For each group, scaling parameters are examined and compared with other information about the group. This other information may be levels of achievement or rankings of students within the school. Using this information, unusual or unexpected group scaling parameters can be found and adjusted if necessary. Each year the Scaling Anomalies Committee, which includes people from outside the QCAA, considers cases that arise from the QCAA's internal checking and also considers concerns raised by individual schools. As a result, some adjustments may be made to the scaling parameters for school-groups or subject-groups within a school.

## Individual anomaly detection

The outcomes of the tertiary-entrance calculations for individual students also undergo quality control processes. Before Tertiary Entrance Statements are issued, data for all students is examined for anomalies in their OPs. Each student's OP is compared with those of students who studied a similar combination of subjects across the state. For any student whose OP seems anomalously low, a summary report and graphs illustrating the student's relative achievement are produced and the cases are brought to the attention of an in-house committee chaired by the Deputy Director of the QCAA's Assessment and Reporting Division. This report consists of information about achievement in subjects, comments made by moderation panels about the school's application of assessment standards in subjects that the student studied, QCS performance and other information. The committee then makes a decision about the case for intervention on the student's OP. Such intervention, typically, will change a student's OP by only one position. Students may also apply for a review of their OP after the Tertiary Entrance Statement is issued and similar checking processes take place.