

# Scaling of Examinations in the Physics Department

## Why we scale some exams

Setting exams is a challenging process and it is not surprising that sometimes a lecturer sets an exam that is too hard or too easy. When this happens we scale the results of these exams so that the students taking them are not unfairly advantaged or disadvantaged. We try hard not to scale exam results and only do so when the distribution of marks from an exam is very clearly different from what we would expect the cohort of students who took that particular exam to achieve. When we do scale we do the minimum scaling needed to bring the result back in line with what we would expect. Scaling **never** increases the number of students who fail a particular exam. Our scaling decisions are reviewed and approved by our external examiners.

## When do we decide to scale?

Ultimately it is the Department's Examination Board, made up of all the academic staff members of the Department, that decides whether or not to scale an exam. The Examinations Coordinator and Director of Undergraduate Studies make recommendations to it based on a clear set of criteria. Where possible these criteria are based on the previous results of the individual set of students who took that particular exam. For third and fourth year options we use the students' average marks at the end of their second year. First year averages are used for second year options. The criteria for scaling optional courses are:

- The number of first class marks **AND** the overall average both differ from the expected value by more than two standard errors. If either one of these are within two standard errors we don't scale even if the other is not.
- The number of failures is more than 10% of the cohort who took the exam. This rule is interpreted cautiously where there are limited numbers of students on a particular course. It is definitely possible to fail an exam that was taken by fewer than 10 students.

Resit exams are not scaled as they have insufficient statistics.

Core exams are scaled only if the following criteria are met:

- The average is not within two standard errors of the range 60% to 65% **AND** the number of first class marks is above 40%.
- The number of failures is greater than 10%

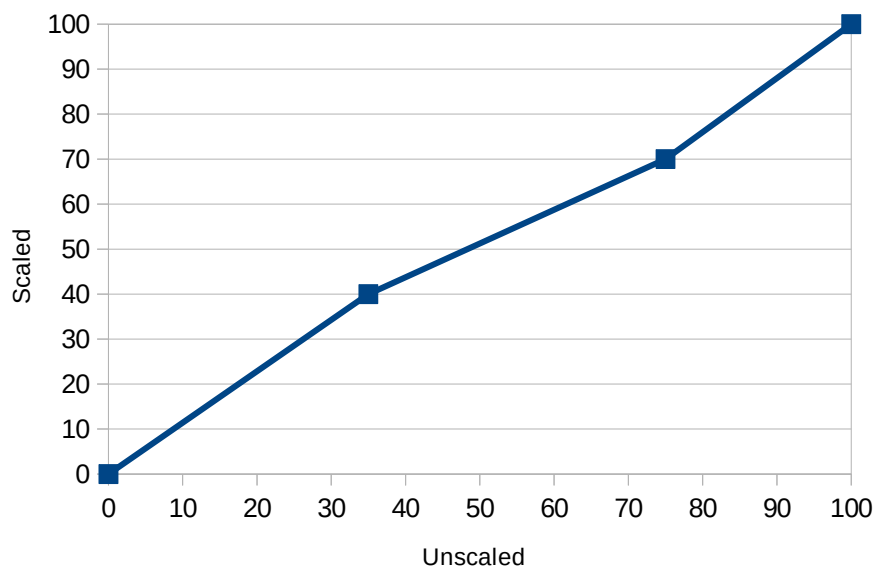
Traditionally some elements of the course are not scaled even if they meet these criteria. These elements include:

- Laboratory and computing (years 1, 2 and 3)
- Projects
- Professional Skills

Whether or not these elements are scaled is reviewed most years but with an inclination not to scale if at all possible.

## Mechanics of Scaling

When we do scale we do so by adjusting the points at 40% and 70% while keeping the points at 0% and 100% fixed. We then interpolate between them. So for example if we scale 35% to 40% and 75% to 70% then we would have the situation shown in Figure 1. These are larger scalings than we normally apply but these values have been chosen so that the effect is clearly visible. This example is also unusual in that it would raise the marks of the weaker students while lowering the marks of the stronger students however it illustrates the principle.



*Figure 1: Graph of scaled marks against unscaled marks where 35% has been rescaled to 40% and 75% to 70%.*

The values which are moved to 40% and 70% are adjusted in integer steps until the criteria for not scaling are met.

## How often do we scale?

In 2017 we scaled just over a third of third and fourth year options and under 30% of first and second year courses. This was unusually high and we try to keep the fractions lower than this by encouraging examination makers to adapt their marking schemes so that their marking distributions reflect those that we would expect. However we feel that the ability to scale is an important part of making sure that our degree programmes give equitable and fair results year upon year. In this way no student is either advantaged or disadvantaged either by their choice of option or, in the case of core courses, by which year they happen to be in.

In 2020 and 2021 the covid pandemic meant that very extreme scaling was required.

Scaling is performed in as transparent a way as possible and you can find out which exams have been scaled by looking at:

<https://www.imperial.ac.uk/physics/dugs/ExamStats/index.php>