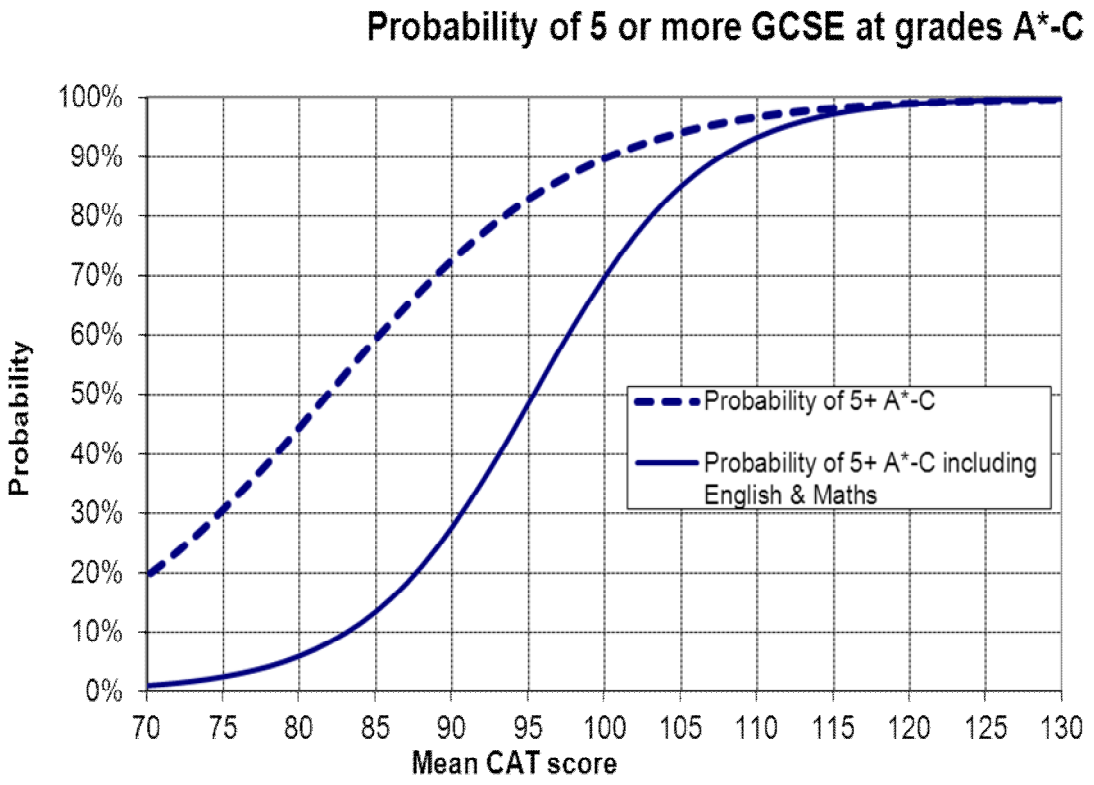
COGNITIVE ABILITIES TEST AND GCSE INDICATORS

There has always been a significant and positive correlation between student's scores in reasoning tests and their school performance, as measured by national tests or public examinations. The link may be assumed to exist because much school activity is concerned with the application of reasoning abilities in the initial learning of curriculum content, and then building on and recombining existing knowledge as learning progresses.

The indicators are derived by tracking the progress of large and representative samples of students over time. Through this process, we can determine the actual relationship between CAT scores and students' subsequent attainment in national tests and examinations. Through statistical analysis of the matched datasets, we are able to provide indicated or typical outcomes for each student based on the students' CAT scores. These indicators can also be aggregated to provide indicated outcomes for the cohort and school or college as a whole. The proportions of students achieving GCSE grades A*-C has increased significantly in most years over the past decade and therefore these indicators are updated regularly to keep in-line with national trends of performance in national tests and examinations.

There is a strong relationship between CAT scores and GCSE outcomes. The chart below shows the proportion of students 2011 achieving 5+ GCSE grades A*-C including English and maths for each mean *CAT* score. We can see that the higher the mean *CAT* score the greater the proportion of students who achieve five or more A* to C grades. For example only 13% of students with a mean *CAT* score of 85 obtain 5+ A*-C grades; in contrast about 97% of students with a mean *CAT* score of 115 achieve 5+ A*-C grades.



CORRELATIONS BETWEEN CAT AND GCSE OUTCOMES

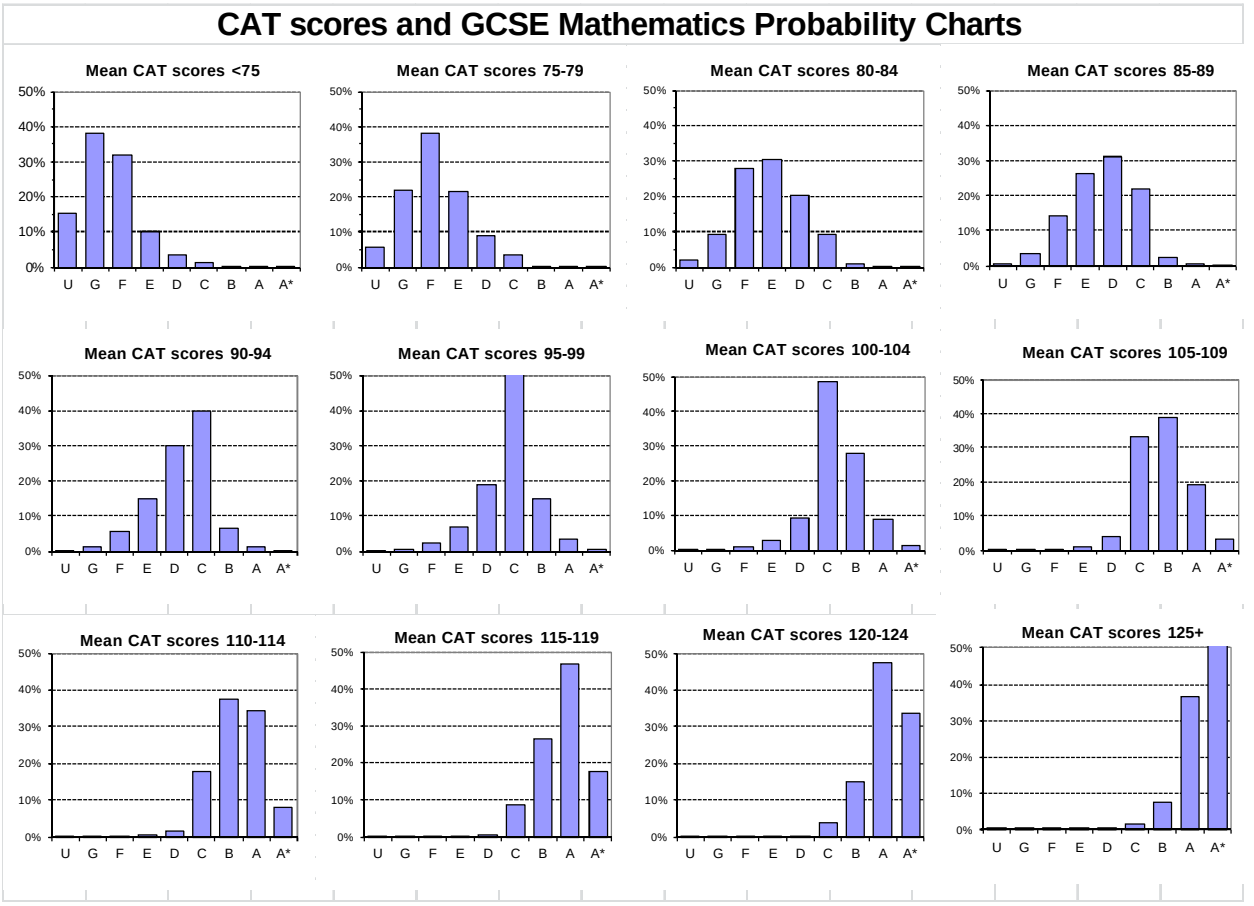
The strength of the relationship between two variables can be measured by a statistic called the correlation coefficient. A value of zero indicates no relationship between the two measures whereas a value of one indicates a perfect positive relationship. Table below shows the correlation coefficients between CAT standard age scores and students' subsequent GCSE outcomes. The GCSE Capped Points score is based on points for the eight subjects the students recorded their highest grades (including English and Maths). The points for each GCSE subject are defined by the Department for Education using the convention A*=58, A=52, B=46 etc.

	Correlation			
	Mean CAT SAS	Verbal Reasoning SAS	Quantitative Reasoning SAS	Non-verbal Reasoning SAS
GCSE Capped Points Score	0.65	0.62	0.58	0.55
5+ GCSE A*-C Inc. English & Maths	0.65	0.60	0.59	0.55
Art & Design	0.49	0.47	0.41	0.44
Business Studies	0.61	0.59	0.54	0.47
DT - Electronic Products	0.58	0.55	0.50	0.50
DT - Food Technology	0.55	0.55	0.48	0.46
DT - Graphic Products	0.53	0.48	0.45	0.46
DT - Resistant Materials	0.54	0.51	0.45	0.49
DT - Systems Control	0.58	0.46	0.53	0.52
DT - Textiles Technology	0.58	0.56	0.50	0.51
Drama and Theatre Studies	0.45	0.45	0.37	0.37
English Language	0.69	0.70	0.59	0.56
English Literature	0.59	0.61	0.50	0.47
French	0.56	0.55	0.47	0.45
Geography	0.64	0.64	0.54	0.53
German	0.56	0.53	0.49	0.45
History	0.61	0.61	0.53	0.49
ICT	0.52	0.44	0.50	0.43
Mathematics	0.80	0.70	0.76	0.71
Media, Film and TV Studies	0.48	0.47	0.42	0.37
Music	0.57	0.55	0.50	0.48
Office Technology	0.60	0.59	0.51	0.51
Religious Studies	0.58	0.58	0.49	0.46
Science - Core	0.70	0.68	0.60	0.58
Science - Additional	0.60	0.56	0.50	0.49
Science - Biology	0.54	0.53	0.40	0.41
Science - Chemistry	0.50	0.45	0.41	0.38
Science - Physics	0.55	0.50	0.44	0.43
Sociology	0.55	0.53	0.49	0.42
Spanish	0.49	0.46	0.43	0.39
Physical Education/Sports Studies	0.51	0.49	0.45	0.41
Statistics	0.61	0.52	0.55	0.51

The correlations are all highly significant. Most GCSE outcomes tend to have their highest correlation with mean CAT score. The exceptions are English Language and English Literature where CAT Verbal Reasoning score alone gives a slightly higher correlation than mean CAT score.

ACCURACY OF GCSE INDICATORS

The probability charts for maths below illustrates the chances of getting a GCSE maths grade for students in various CAT score bands.



The indicators are not precise: they indicate the outcomes expected for students with a particular *CAT* score making average progress in a typical secondary school. They come with a margin of error which reflects the differences in progress that may be made by different students.

The table below shows the proportions of students with a mean CAT score of 75 obtaining the various GCSE grades in maths.

Mean CAT Score	Mathematics GCSE Grades – probabilities									Most likely maths grade achieved	'If challenged' maths grade achieved
	U	G	F	E	D	C	B	A	A*		
75	8%	29%	38%	17%	6%	2%	0%	0%	0%	F	E

In the national sample, 37% of students with this score obtained lower grades G or U, 37% obtained grade F and 25% obtained grades higher than F. The 'most likely' outcome in this example is grade F and the 'if challenged' outcome is grade E. For most of the GCSE subjects indicators, around 50% of

students with a given CAT score will meet the 'most likely' grade target and around 25% of students will meet the 'if challenged' grade target.

CALCULATION OF GCSE GRADE ESTIMATES FOR GROUPS OF STUDENTS

The table below shows how the group/class indicators have been calculated for this fictitious class with five students and shows the probability of obtaining 5+ grades A* to Cs, and the probabilities associated with getting different mathematics grades.

Calculating group indicators for Maths for a fictitious class of five pupils

Pupil	Mean CAT Score	Probability of 5+ A*-C including English & maths	Mathematics GCSE Grades – probabilities									Most likely maths grade achieved
			U	G	F	E	D	C	B	A	A*	
1	75	3%	8%	29%	38%	17%	6%	2%	0%	0%	0%	F
2	85	10%	1%	5%	19%	29%	27%	16%	2%	0%	0%	D/E
3	100	52%	0%	0%	1%	4%	13%	52%	22%	6%	1%	C
4	115	92%	0%	0%	0%	0%	1%	11%	31%	43%	13%	A/B
5	120	97%	0%	0%	0%	0%	0%	5%	19%	49%	27%	A
Group indicator		**51%**	**2%**	**7%**	**12%**	**10%**	**10%**	**17%**	**15%**	**20%**	**8%**	

The individual student indicators do not show any of these five students likely to obtain a A* grade. However, Student 5 has high (27%) chance of obtaining a A* grade. As a group there is a 8% chance for one of these students to obtain a A* grade. As an illustration, if your group has 10 students all with mean CAT scores of 120, the most likely outcome for each of these 10 students individually is grade A. However, it is likely that 27% of these ten students (i.e. 3 students) will achieve grade A*.

Using individual student grade estimates to provide information about the overall class or group grade outcomes will in most cases lead to underestimating the number of students likely to get both the higher and lower GCSE grades.

The group level indicators are the average of the probabilities for all students in the group. Our research has shown that this method provides the most accurate set of group level indicators. However group indicators are extremely sensitive to variations in the number of students in the group, and may be very unstable for groups of less than 30 students. Group indicators should only ever be taken as a rough guide to the possible future performance of a class.

SETTING TARGETS

The above confirm the need for suitably cautious interpretation when using the indicators with staff, parents and, particularly, if sharing them with individual students. In the latter context, we would advise that school staff follow the established best practice of schools using the results for mentoring and target setting purposes by:

- stressing to students that the indicators are a statistical prediction, not a prophecy of their actual GCSE results;
- emphasise to students the range of outcomes that could be achieved;
- emphasising the importance of the students' motivation and effort in determining the grade they obtain, identifying any areas in which the student requires greater support from the teacher;
- not using the indicators to label students as actual or potential 'failures';
- setting the indicators in the context of all other known relevant factors and other assessment information, thus making sure targets are reasonable.