

## Explanation of statistics & terms used in Scan 'n' Score reporting

### Rank

**Rank** is a measure of where a score is positioned relative to all other scores in the group, where a rank of "1" indicates the highest score in the group. In cases where there are multiple instances of the same score, the rank is calculated as the average of the range of ranks covering the duplicate scores. For example, here is a partial list of percent scores and their preliminary and adjusted ranks:

Score (%)	Rank	Adj. Rank
95.4	1	1
92	2	2.5
92	3	2.5
89	4	4
88.5	5	5

Because there are two instances of the score of 92%, the ranks for the two are averaged, and a rank of  $(2 + 3)/2 = 2.5$  is assigned to each.

### T-Score

**T-scores** indicate how many standard deviation units an examinee's score is above or below the mean. T-Scores always have a mean of 50 and a standard deviation of 10, so any T-Score is directly interpretable. A T-Score of 50 indicates a raw score equal to the mean. A T-Score of 40 indicates a raw score one standard deviation below the mean, while a T-Score of 65 indicates a raw score 1.5 standard deviations above the mean.

Both rank and T-Scores describe test performance in terms of the examinee's relative position in the distribution of test scores. While rank has the advantage of being easier to understand, it has the serious disadvantage of representing a scale where the percentile units are not equal on all parts of the scale.

A rank difference near the middle of the scale represents a much smaller difference in test performance than the same percentile difference at the ends. T-Scores, on the other hand, provide equal units that can be treated arithmetically. T-Scores from several tests taken during a semester can thus be summed and averaged.

### Z-Score

**Z-Scores** are raw scores expressed in standard deviation units, relative to the mean score. Positive Z-scores indicate a raw score that is above the mean, negative Z-scores indicate a raw score that is below the mean, and a Z-score of zero indicates a raw score that is equal to the mean. In a normally-distributed set of data, the general rule states that 68% of all scores will fall within  $\pm 1$  SD of the mean; 95% of all scores will fall within  $\pm 2$  SD, and 99.7% of all scores within  $\pm 3$  SD. Z-scores between -2.00 and +2.00 are therefore considered relatively ordinary, while values greater than -2.00 and +2.00 are unusual.

## DIF Index

**DIF Index** indicates how many in the entire group answered the question correctly, expressed as a percent.

## DISC Index

**DISC Index**, or index of discrimination, is a measure of how well a particular question is a predictor of success in the test overall. It is simply the difference between the percentage of high achieving students who got an item right and the percentage of low achieving students who got the item right. The high and low achieving students are usually (and is in the Scan 'n' Score reports) defined as the upper and lower twenty-seven percent of the students based on the total examination score.

A useful rule of thumb in interpreting the index of discrimination is to compare it with the maximum possible discrimination for an item. The maximum possible discrimination is a function of item difficulty. When half or less of the sum of the upper group plus the lower group answered the item correctly, the maximum possible discrimination is the sum of the proportions of the upper and lower groups who answered the item correctly. For example, if 30% of the upper group and 10% of the lower group answered the item correctly, the maximum possible discrimination is 30 plus 10, or 40. This maximum possible discrimination would occur when 40% of the upper group and none of the lower group answered the item correctly.

When more than half of the sum of the upper group plus the lower group answers an item correctly, the maximum possible discrimination is 200 minus the sum of the proportions of the upper and lower groups who answered the item correctly. For example, if 96% of the upper group and 84% of the lower group answered the item correctly, the maximum possible discrimination for the item would be 200 minus 180 (96 plus 84), or 20.

Thus, if everyone in the group (high- and low-scorers alike) answers a question correctly, its DISC Index will be zero, meaning it is a poor predictor of overall success. In contrast, if all of the high-scoring group answer the question correctly and all of the low-scoring group get it wrong, the DISC Index will be 100, indicating the question is an excellent predictor of overall success on the test.

## Raw Score

**Raw Score** is defined as the sum of the weighted values of the correct answers. Three examples that will help illustrate this are:

1. The raw score for a fifty question exam all worth 2 points each and a student gets forty correct would be 80.
2. Same test and the first 25 questions are worth 1 point and the last twenty five are worth 3 points. The student gets 23 correct from the group of 1 point answers and 17 correct from the group of 3 point answers so the raw score would be 74.
3. Same test but each question is worth 1 point and forty are correct the raw score would be 40.

## Percent Score

**Percent Score** is defined as the  $(\text{Raw Score}/\text{Total Weight})$ . From the examples above the percent score for each would be 80%, 74%, 80% respectively.