SHENANDOAH ™
U N I V E R S I T Y
Center for Teaching, Learning & Technology

Quick Reference Guide to Item Analysis

Considerations
When using the statistics generated by testing software, you should always consider the size of the class. The more students there are, the more accurate the statistics will be. Also, as the instructor, you will be the best judge of a question's validity. Test questions serve different purposes. The statistics should just be used to guide you as you improve your tests.

Terms
Discrimination index (or Point Biserial Index-PBI): A discrimination index is an indicator of whether a question accurately determines student's mastery of a concept. The index is calculated by comparing whether a student got the question right with their total score. The theory is that a question that is a good discriminator will be missed by weaker students, but that better students will get that question right. An index of <.2 generally indicates the question should be revised.

Canvas Guide:
Student groups are generally divided as the top 27%, the middle 46%, and the bottom 27%. Ideally, students who did well on the exam should get the question right. If students do well on the overall exam but not on the question, the question itself may need to be revised.

Lower discrimination scores (in red) are scored +0.24 or lower; good scores (green) are +0.25 or higher. An ideal discrimination index shows students who scored higher on the quiz getting the quiz question right, students who scored lower on the quiz getting the quiz question wrong, and students in the middle range on either side. A discrimination index of zero shows all students getting the quiz question right or wrong.
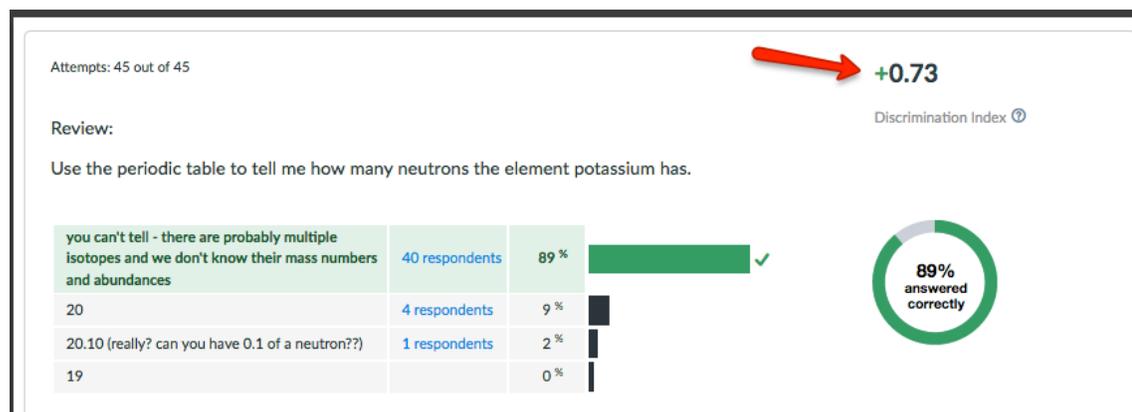
ExamSoft Guide:
Discrimination Index *(-1.00-1.00)*: The discrimination index of a question shows the difference in performance between the upper 27% and the lower 27%. It is determined by subtracting the difficulty index of the lower 27% from the difficulty index of the upper 27%. A score close to 0 indicates that the upper exam takers and the lower exam takers performed similarly on this question. As a discrimination index becomes negative, this indicates that more of the lower

performers got this question correct than the upper performers. As it becomes more positive, more of the upper performers got this question correct.

Discrimination indexes (PBIs) are also generated for distractors. Distractors should have negative numbers and the correct answer should have a positive number.

Standard Deviation: The standard deviation measures how different scores are among students. A low standard deviation indicates that students generally scored close to the mean, while a large standard deviation indicates that scores differed widely. A deviation < 1 is generally low. A deviation >= 1 is generally high.

Difficulty Index: The difficulty index is a number between 0 and 1 that indicates how hard the question is. It is the proportion of students who answered correctly. You generally want a range of .3-.8 (so 30%-80% answered correctly), unless you have a very fundamental question where you want all students to answer correctly.

Cronbach's Alpha and **KR-20**: these are statistical tests for internal reliability. These generate a number between 0-1 and > .5 is ideal. As long as there is no missing data and partial credit is not given, both methods should produce the same result. Cronbach's alpha is the more commonly used method, but is not reliable when data is missing. KR-20 is not appropriate when questions may allow partial credit. Canvas uses Cronbach's Alpha and ExamSoft uses KR-20.
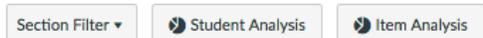
Quiz Statistics in Canvas
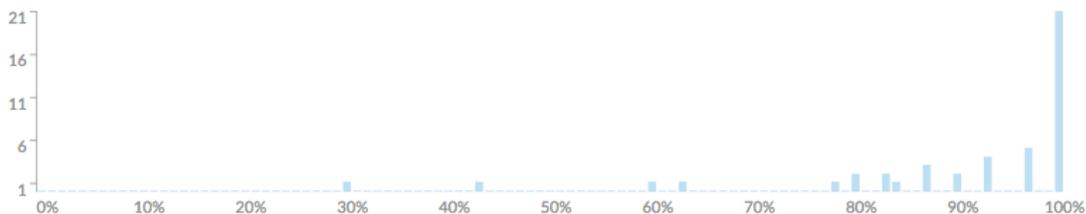First, go into the quiz and choose: Quiz statistics:

The next two graphs illustrate several examples in Canvas. What do these graphs tell you about performance on these two tests?
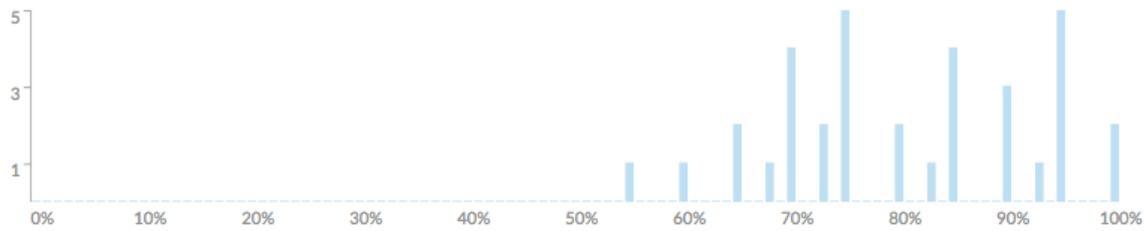
By clicking on Item Analysis, you will get an Excel file with detailed analysis for each question:

Question Title	Answered Student Count	Top Student Count	Middle Student Count	Bottom Student Count	Quiz Question Count
Which is not a charact	16	7	8	1	28

Correct Student Count	Wrong Student Count	Correct Student Ratio	Wrong Student Ratio
12	4	0.75	0.25

Difficulty Index	Alpha
0.75	0.34619478

Point Biserial of Correct	Point Biserial of Distractor 2	Point Biserial of Distractor 3	Point Biserial of Distractor 4	Point Biserial of Distractor 5
0.401291674		0.007802743	-0.44545981	-0.117041147

ExamSoft Example:

The screenshot below shows stastisics for a test and the item analysis for the first question.

- What can you tell about this test?
- Was the first question easy or hard?
- Did the distractors do an equal job?
- Was this question a good discriminator?
- Would you keep this question? (There are arguments both for and against…)

Question Analysis (Multiple Choice)

Exam Takers = 52 **KR20 = 0.78** **Stdev = 7.68** **Mean = 85.40 (85.62%)** **Median = 86.45** **Min = 65.17** **Max = 95.76** **Total Pts = 99.75**

Question #	Correct Responses			Disc. Index	Point Biserial	Correct Answer	Response Frequencies (*Indicates correct answer)											Avg Answer Time
	Diff(p)	Upper	Lower				A	B	C	D	E	F	G	H	I	J	Unanswered	
1	0.96	100.00%	87.50%	0.13	0.46	C	0	1	*50	1	-	-	-	-	-	-	0	03:31

Question ID / Rev: 1384 / 3

			A	B	C	D							Unanswered	
		% Selected	0.00	1.92	96.15	1.92	-	-	-	-	-	-	0.00	-
		Point Biserial (rpb)	0.00	-0.30	0.46	-0.34	-	-	-	-	-	-	-	-
		Disc. Index	0.00	-0.06	0.13	-0.06	-	-	-	-	-	-	-	-
		Upper 27%	0.00	0.00	1.00	0.00	-	-	-	-	-	-	-	-
		Lower 27%	0.00	0.06	0.88	0.06	-	-	-	-	-	-	-	-

Performance History: **# Correct:** 201   **# Incorrect:** 8   **# Not Attempted:** 0   **Difficulty:** 0.96

Q: A patient presents with a chief complaint of positional swelling along the left side of her neck. Physical examination in the supine position was remarkable for a 6-cm, non-tender, diffuse mass at the base of the neck. When seated, there was a noticeable reduction in the size of the swelling. Diagnostic imaging reveals a benign cystic lesion in the anterior mediastinum on the posterior surface of her thymus. Which of the following structures was MOST LIKELY being compressed by the cystic lesion which accounts for the positional swelling?

A: R Internal Thoracic Artery
B: L Subclavian Artery
* C: L Brachiocephalic Vein
D: L Vagus Nerve