Some Basic Item Analyses for Ability and Knowledge Tests

Item Difficulty
Once your variables are scored 0 for incorrect and 1 for correct, find the mean of each of the items to obtain the item difficulty. Below, all of the examples use menus and syntax to do the same thing. You do not need to do both. For more complex tasks and for keeping records, syntax can be a better approach. Note that I use capital letters for the syntax commands, but SPSS is not case sensitive.

Menus
Analyze -> Descriptive Statistics-> Descriptives…

Then drag over all of the items.

Syntax[1]
(Before running a syntax file, find your downloaded data file and drag it over to the desktop)
```
GET FILE=' C:\Users\newsomj\Desktop\examdata.sav'.

DESCRIPTIVES VARIABLES=q1 TO q10.
```

When variables are coded 0 and 1, the mean is equal to the difficulty (easiness) index, P.

Item Discrimination Index
Computation of the item discrimination index requires a total score on the test, which I have already computed for the exam data. For your project you will first need to create a new variable which is a composite summed score, using the Transform menu or COMPUTE command in syntax. I used the upper and low third of scores (the 33rd and 66th percentiles) for my low and high scoring groups, but other cutoffs could be used.

Compute Total Score (not needed now, I did this earlier)
Menus
Transform -> Compute Variable… Then type a new name for the scale into the *Target Variable* box. At the right, under the *Function* group: box, click on *Statistical*. Then, in the *Functions and Special Variables*: box, double click on Sum. Then move over or type Q1 in place of the first question mark in the parentheses expression (?,?), then replace the comma in the parentheses with "to" and move over or type Q25 in place of t he second question mark. Click Ok.

Syntax
```
COMPUTE mctotal=SUM(q1 TO q25).
```

Find the Percentiles for the Total Score
Menus
Analyze -> Descriptive Statistics -> Frequencies…

Highlight the scale total score (*mctotal*) on the left and move it over to the box on the right hand side using the arrow button in the middle.

Click on *Statistics* button. Under *Percentile Values*, check the box next to *Percentile(s)*. Then enter values, such as 33 (click add) and 67 (click add), which is the Kelly (1939) method. [note: percentiles need to be in whole numbers not decimals].

Syntax
(Before running a syntax file, find your downloaded data file and drag it over to the desktop)

---

[1] If the lab SPSS on the computer will not access the data file, the following syntax may work instead:
```
CD ' C:\Users\newsomj\Desktop'.
GET FILE='examdata.sav'.
```

```
GET FILE=' C:\Users\newsomj\Desktop\examdata.sav'.

FREQUENCIES VARIABLES=mctotal
   /percentiles=33 67.
```

Obtain the Proportion Correct for Top and Bottom Scorers[2]
In the interest of time, I just use the first 10 items for our example.

Menus
Data -> Select Cases
Choose *If condition is satisfied* click on *if…* and then enter the condition to select the bottom scorers, such as mctotal <= 14. Check *Continue* and then *OK*.

Data -> Select Cases
Choose *All Cases*

Data -> Select Cases
Choose *If condition is satisfied* click on *if…* and then enter the condition to select the top scorers, such as mctotal > 20.39. Check *Continue* and then *OK*

Data -> Select Cases
Choose *All Cases*

Analyze -> Descriptive Statistics-> Descriptives…
Move over the desired variables (e.g. Q1 through Q10)
Click OK

Syntax
```
TEMPORARY.
SELECT IF mctotal LE 14.
DESCRIPTIVES VARIABLES=q1 TO q10.

TEMPORARY.
SELECT IF mctotal GT 20.39.
DESCRIPTIVES VARIABLES=q1 TO q10.
```

Compute Discrimination Index
Download the MS Excel sheet item discrimination index.xlsx from the data page:
http://web.pdx.edu/~newsomj/data.htm and enter values from the output.

---

[2] Another somewhat simpler method is to use to split the file at the top and bottom percentile cutoffs and generate the descriptive once, and SPSS will print the statistics separately for each of the groups.

R

Item Difficulty

```
library(lessR)
#you will need to change your location
d = Read("C:/Jason/SPSSWIN/pmclass/examdata.sav", quiet=TRUE)

pivot(d, c(mean,sd), c(Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10,Q11,Q12,Q13,Q14,
                       Q15,Q16,Q17,Q18,Q19,Q20,Q21,Q22,Q23,Q24,Q25))
```

Item Discrimination Index
In the interest of time, I just use the first 10 items for our example.

To compute a summed scale score (not needed because already in data set)
```
d$mctotal<-rowSums(d[, c("Q1","Q2","Q3","Q4","Q5","Q6","Q7","Q8","Q9","Q10",
"Q11","Q12","Q13","Q14","Q15","Q16","Q17","Q18","Q19","Q20","Q21","Q22","Q23","Q24",
"Q25")],na.rm=F)
```

Find the Percentiles for the Total Score

The option q_num=3 divides the distribution into three parts to obtain the 33rd and 66th percentiles.
```
pivot(d, quantile, c(mctotal),q_num=3)
```

Obtain the Proportion Correct for Top and Bottom Scorers
This creates two new data frames (lessR functions), one for the lower third and one for the upper third.
Then lessR pivot function is used.
```
lower <- d[.(mctotal<=14), .(Q1:Q10)]
pivot(lower, c(mean,sd), c(Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10))

upper <- d[.(mctotal>=20), .(Q1:Q10)]
pivot(upper, c(mean,sd), c(Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8,Q9,Q10))
```

Compute Discrimination Index
Download the MS Excel sheet item discrimination index.xlsx from the data page:
http://web.pdx.edu/~newsomj/data.htm and enter values from the output.