IRT in BILOG-MG3

What is BILOG-MG3?

- Analysis of binary items (multiple choice or short-answer items scored right, wrong, omitted, or not presented).
- Perform item analysis and scoring of any number of subtests or subscales in a single program run.

Phase of Analysis

Phase 1: INPUT

Reads formatted data records. For omits and attempts, they may be scored "wrong," partially correct, or omitted from calculation.

Classical item statistics are accumulated:

1.Item facilities (% correct)

2.Item-subscore correlations

3.# respondents attempting each item.

Phase 2: INPUT

Fits the logistic item-response function (1PL, 2PL, or 3PL) to each item of each subscale and estimates parameters.

1.Marginal MLE of item parameters: respondents are randomly drawn from a distribution.

2.Maximum marginal a posteriori estimation of item parameters: specify priors.

3.Fit statistics

Phase 3: SCORE

Uses the master response file from Phase 1 and the item parameter estimates from Phase 2 to compute rescaled scores for respondents.

Methods for scale score calculation:

1.Maximum Likelihood

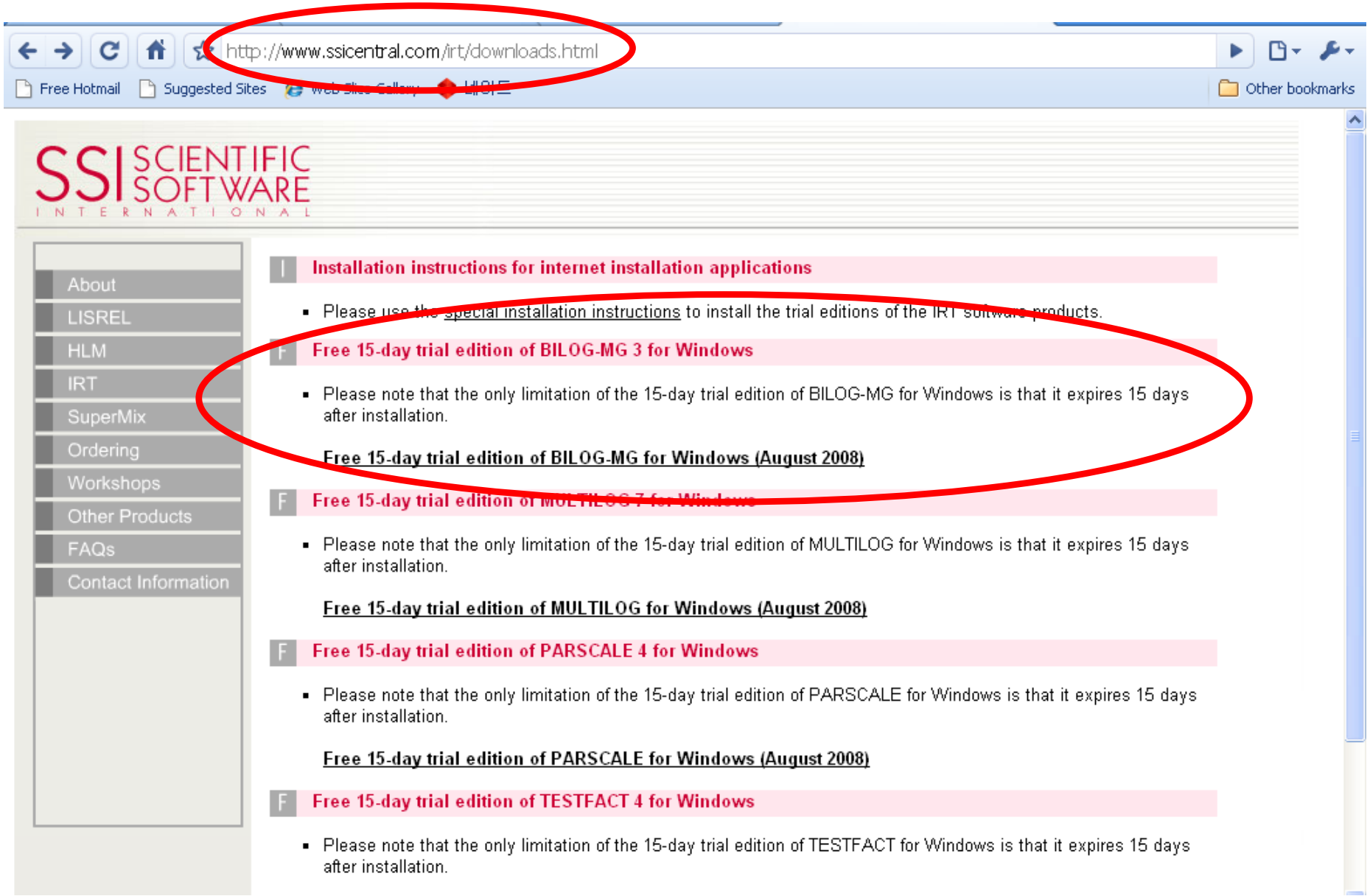
2.Bayes or Expected a posteriori

3.Bayes or maximum a posteriori

Output Files

- Phase 1 (*.ph1): includes test and item identification and classical item statistics
- Phase 2 (*.ph2): includes assumed prior distributions, estimated item parameters, standard errors, and goodness of fit, etc.
- Phase 3 (*.ph3): includes assumed prior distributions of the scale scores for MAP and EAP estimation, scale score of subjects, etc.

Installing a Trial Version of BILOG



Example 1: Fitting a 3PL Model

- Taken from Example 1 of BILOG
- 15 item test
- 1000 test takers
- Need to score data or enter raw data to be scored using key file
- Fit the 3PL IRT Model

Data file

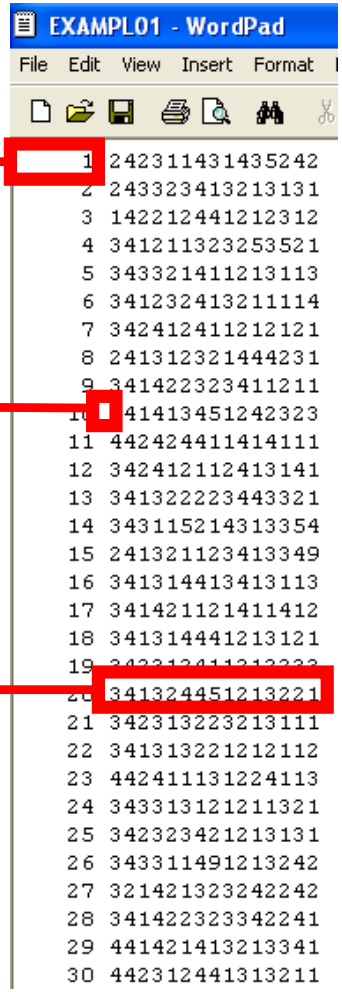
Examinee ID

(4 characters, including space)

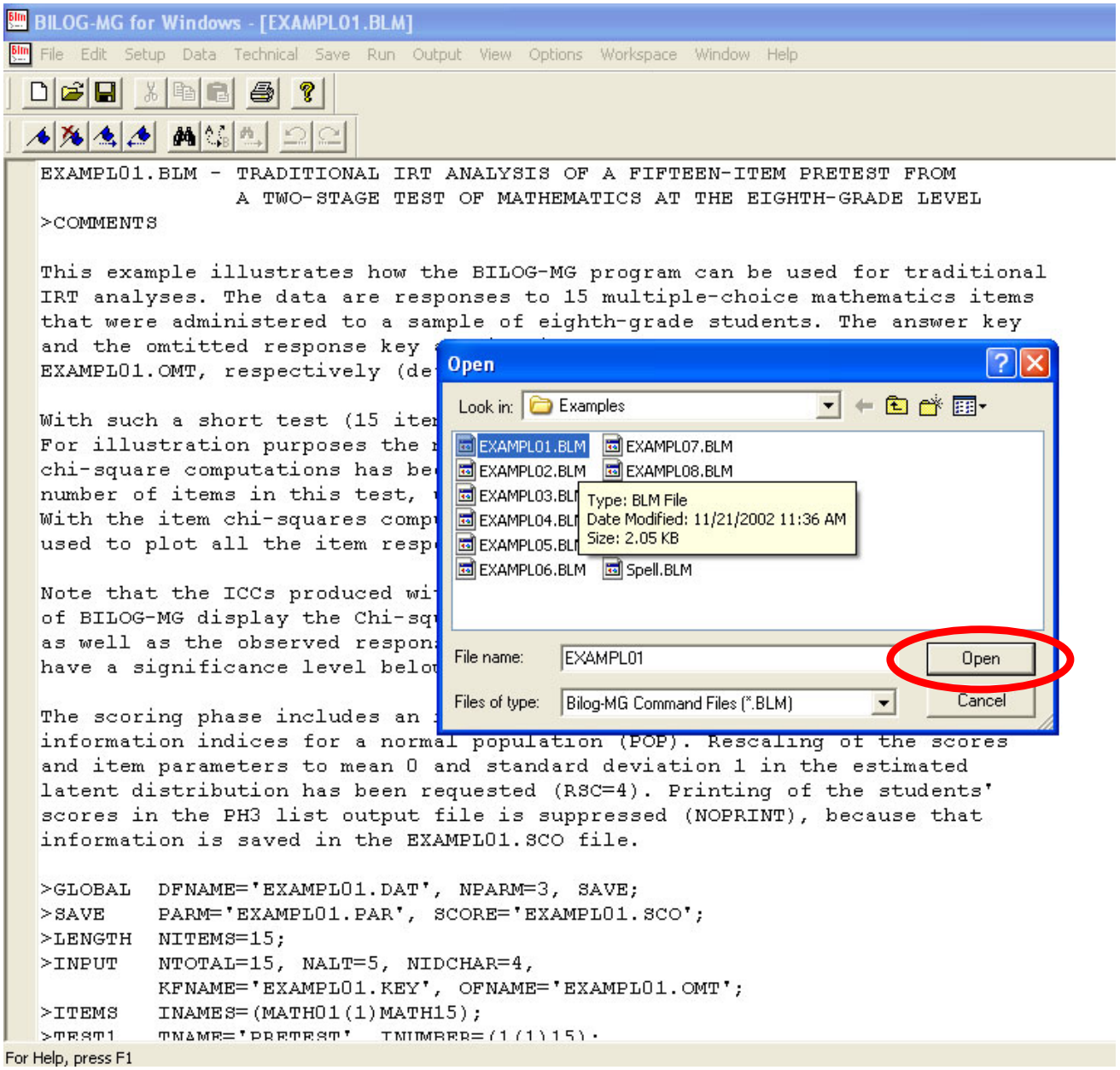
Space between examinee ID and the response

Dichotomous response pattern

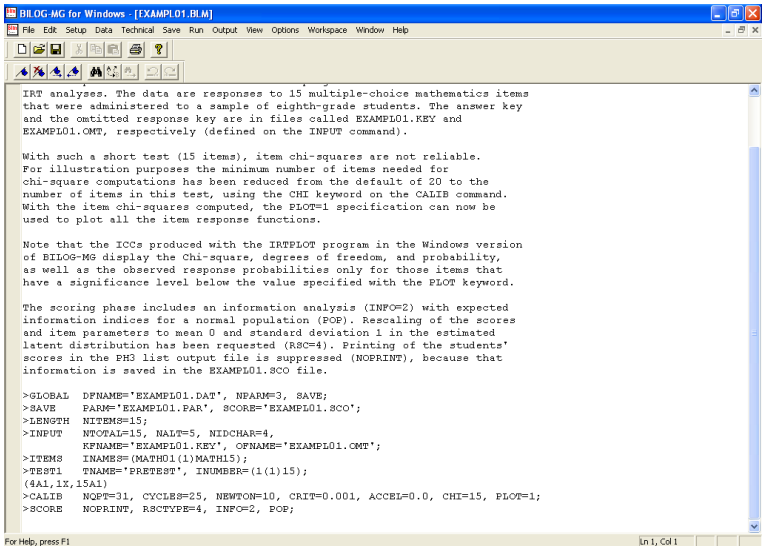
(4A1,1X,15A1)



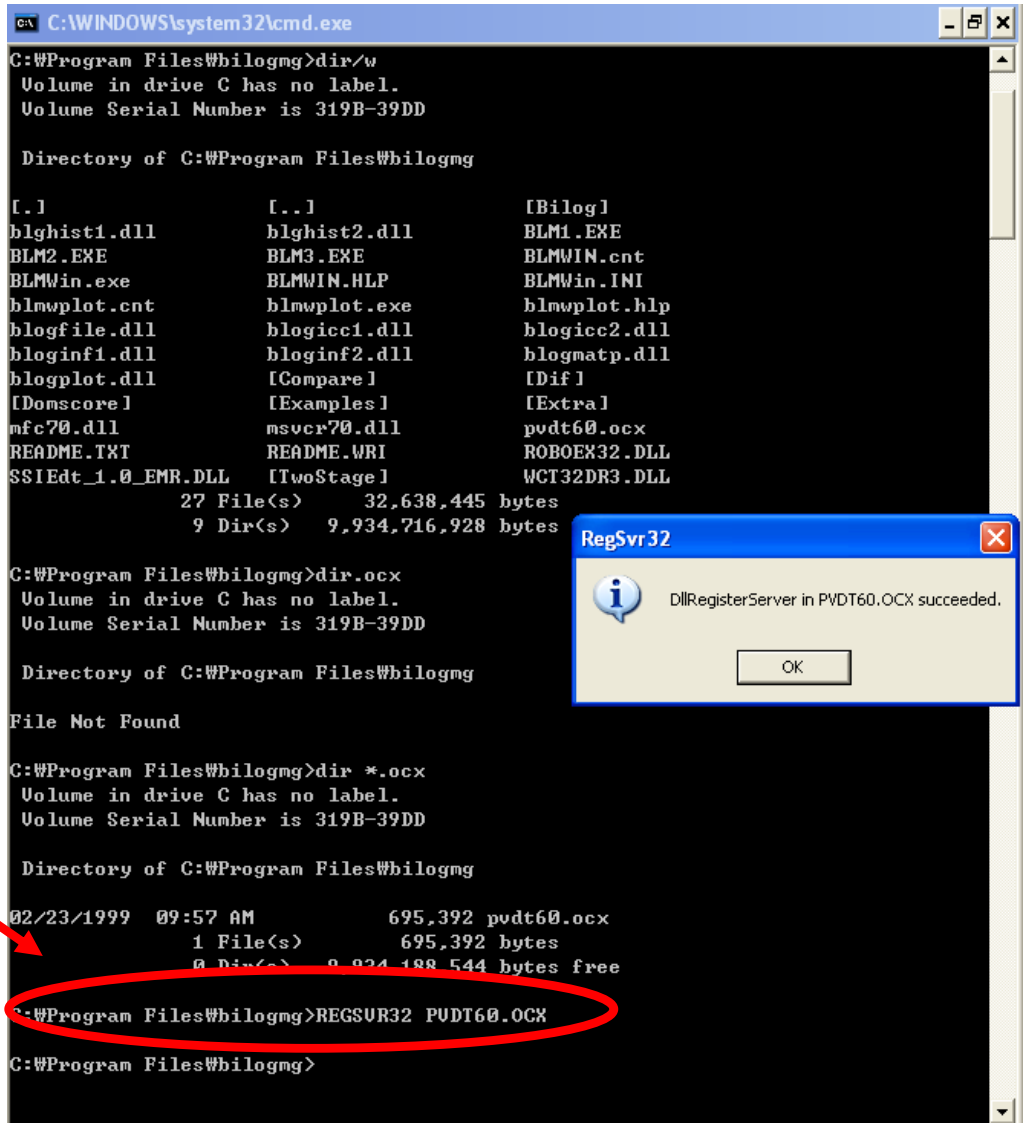
Loading a BILOG-MG Example



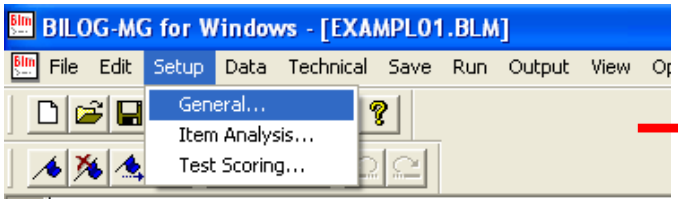
Problems with Building Syntax



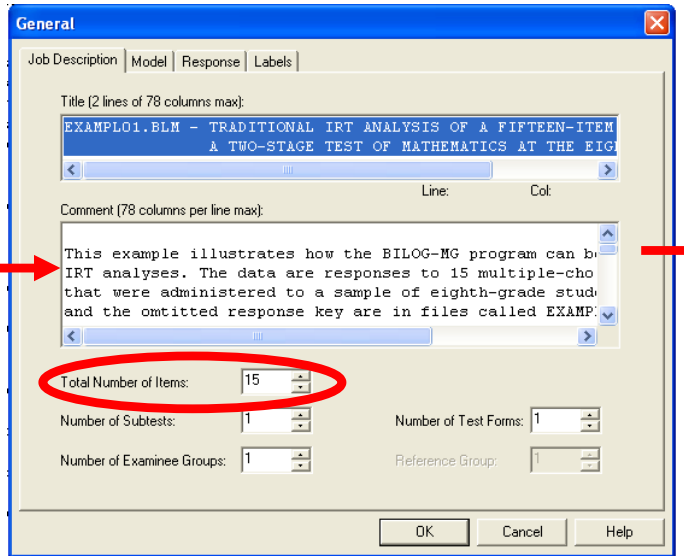
If you experience problems building syntax, you may need to reactivate the PVDT60.OCX file in the directory where BILOG is installed.

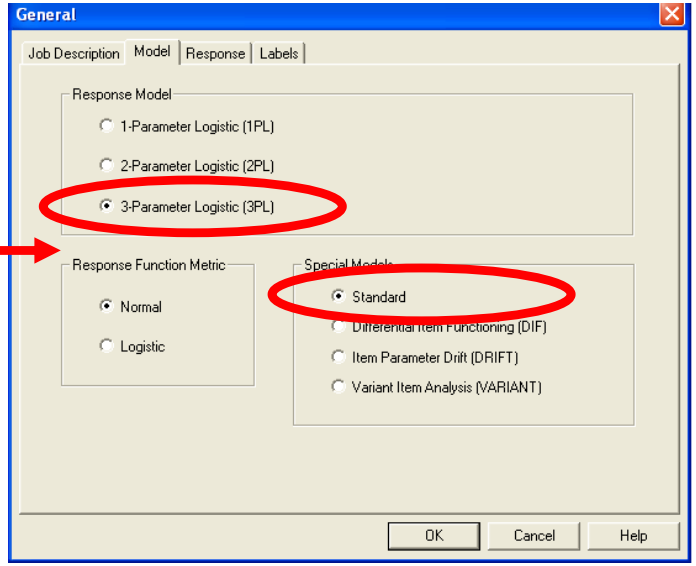


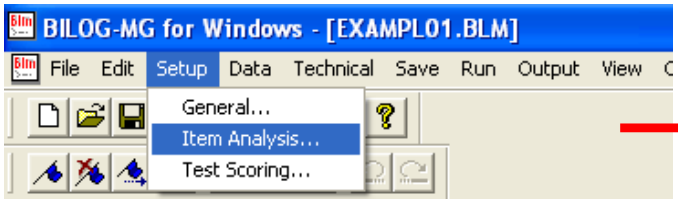
Building Syntax (1)



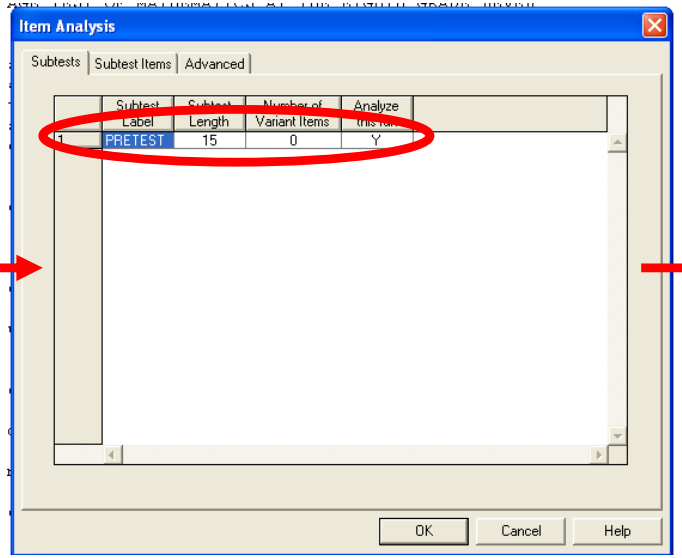
STEP 1

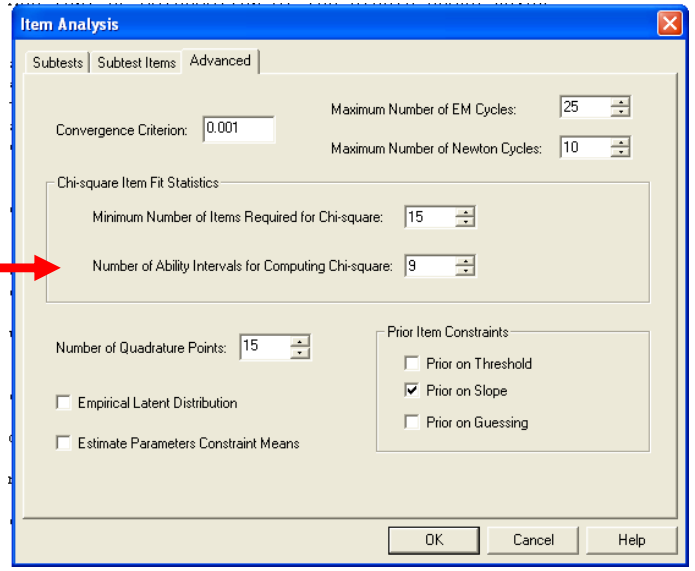




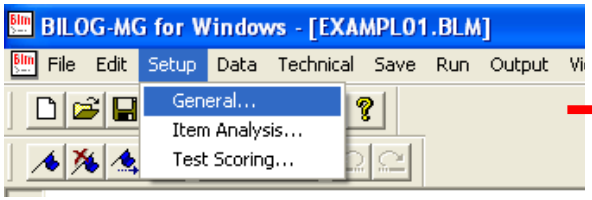


STEP 2

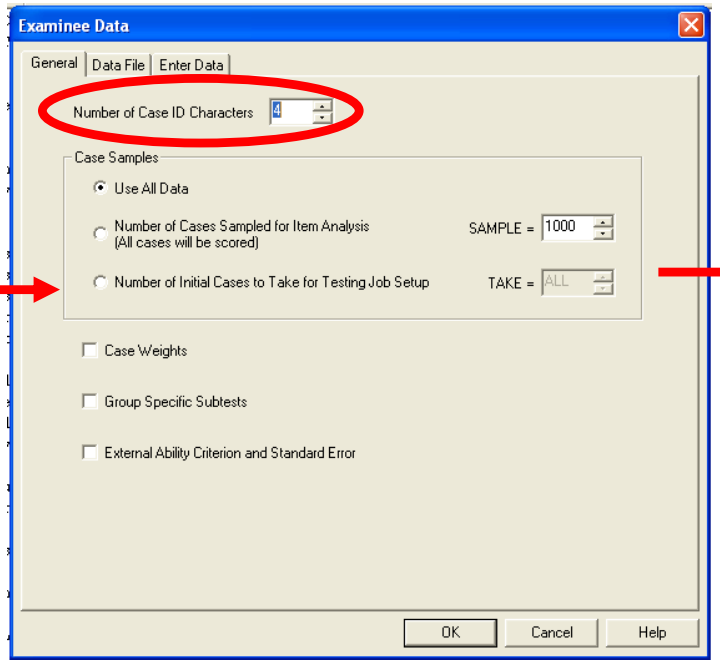


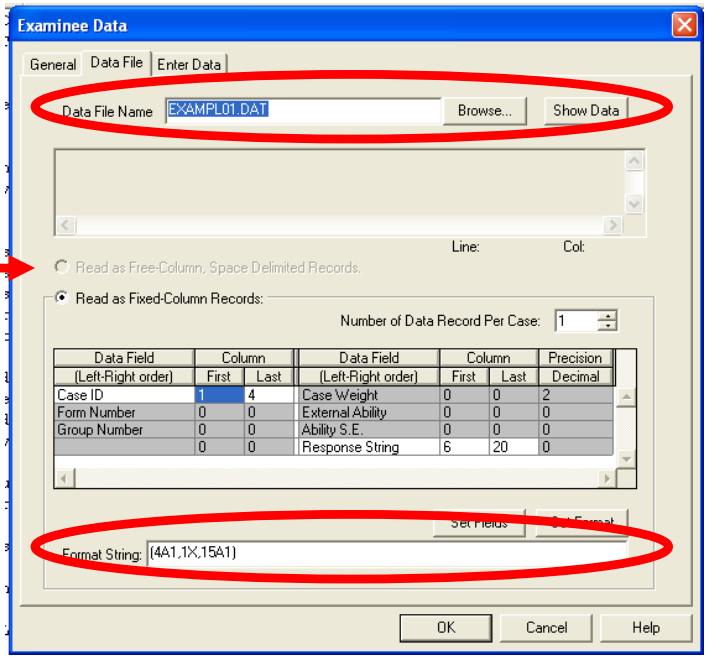


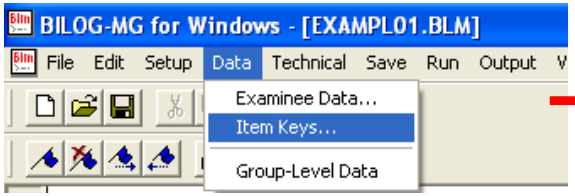
Building Syntax (2)



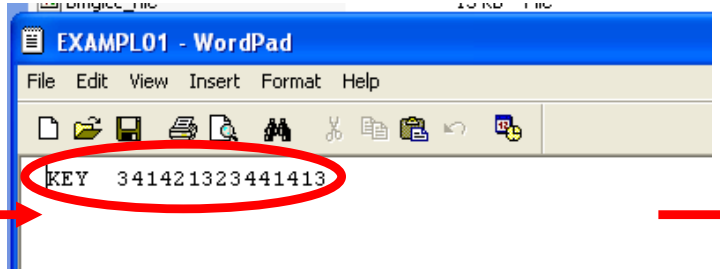
STEP 3

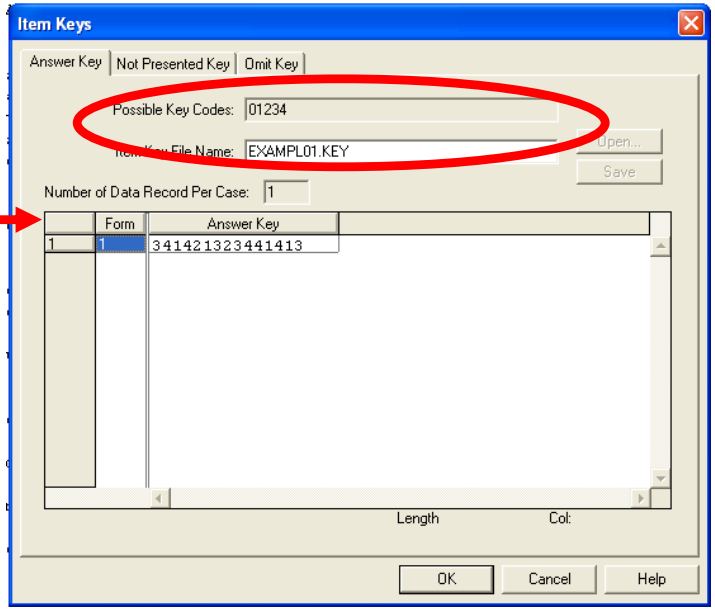




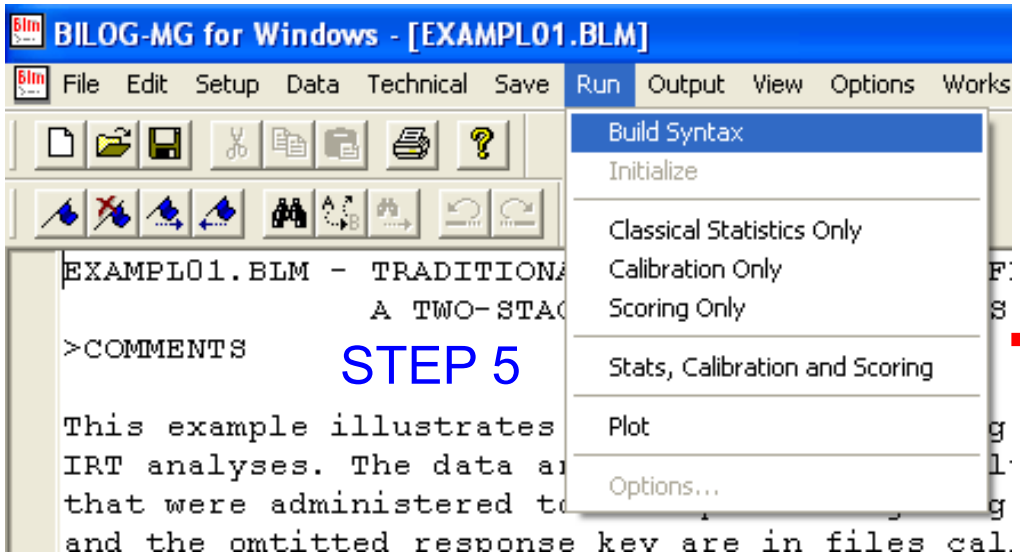


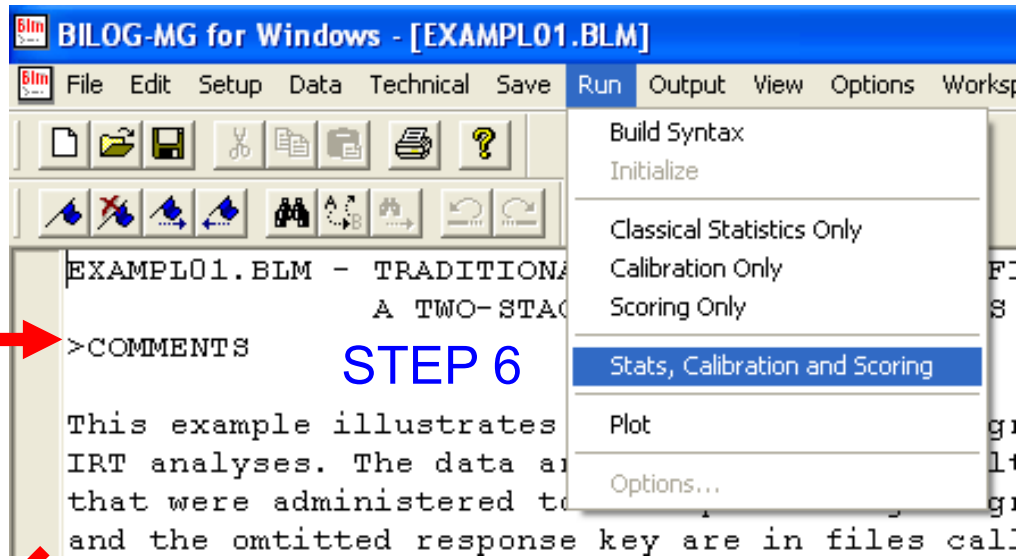
STEP 4

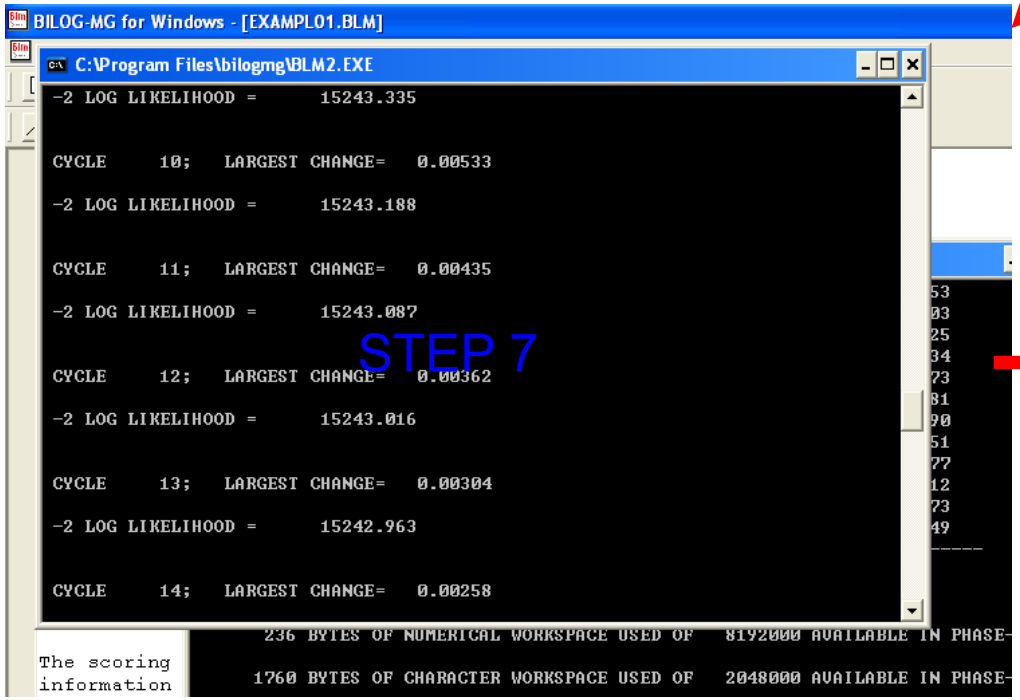


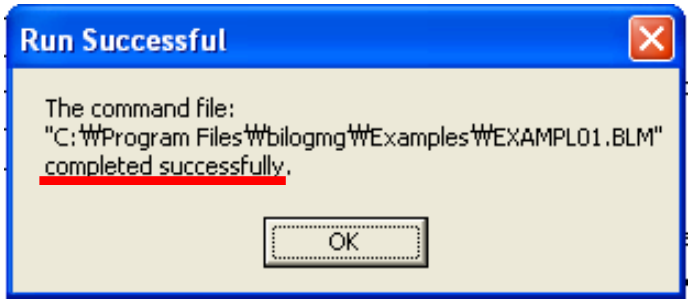


Building Syntax (3)



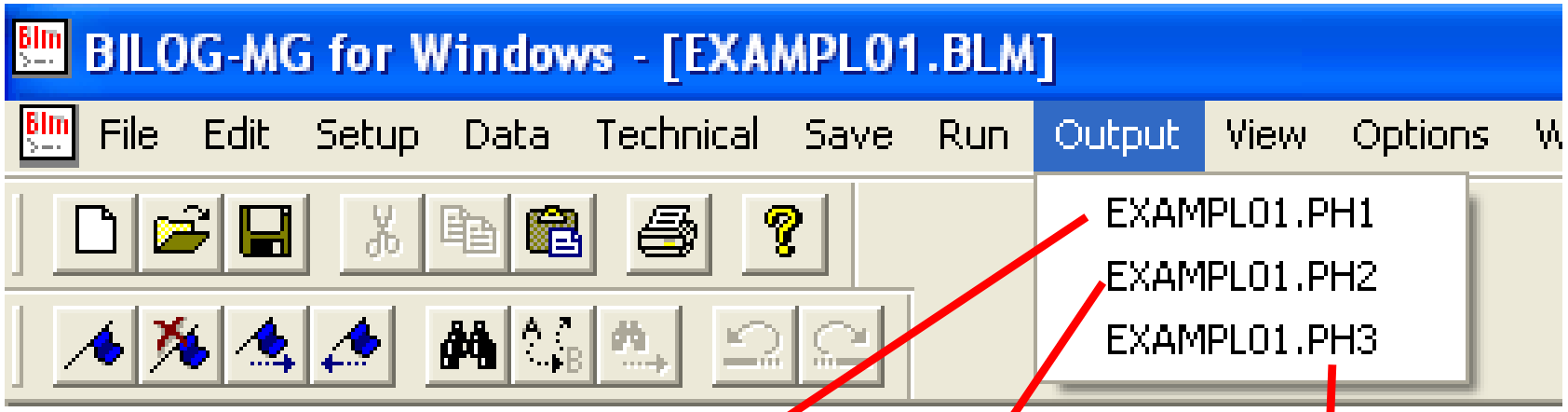






STEP 8: FINISHED RUNNING!

BILOG OUTPUT (1)



PHASE 1 OUTPUT:

BASIC INFORMATION AND CLASSICAL ITEM ANALYSIS STATISTICS

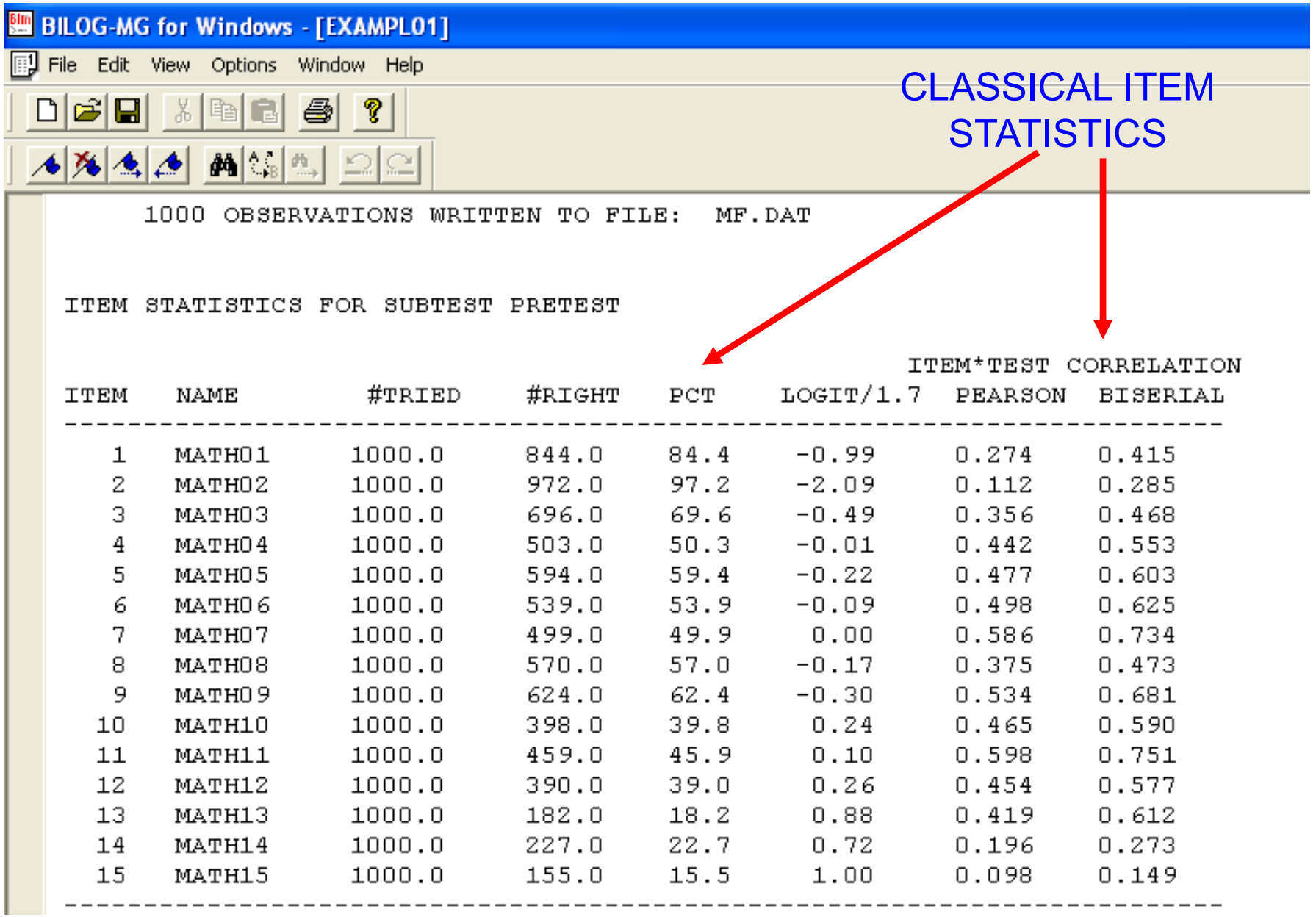
PHASE 2 OUTPUT:

ITEM PARAMETERS, ITEM FIT STATISTICS, ICC

PHASE 3 OUTPUT:

ABILITY ESTIMATES AND FITSTATISTICS

BILOG OUTPUT (2): PHASE 1



1000 OBSERVATIONS WRITTEN TO FILE: MF.DAT

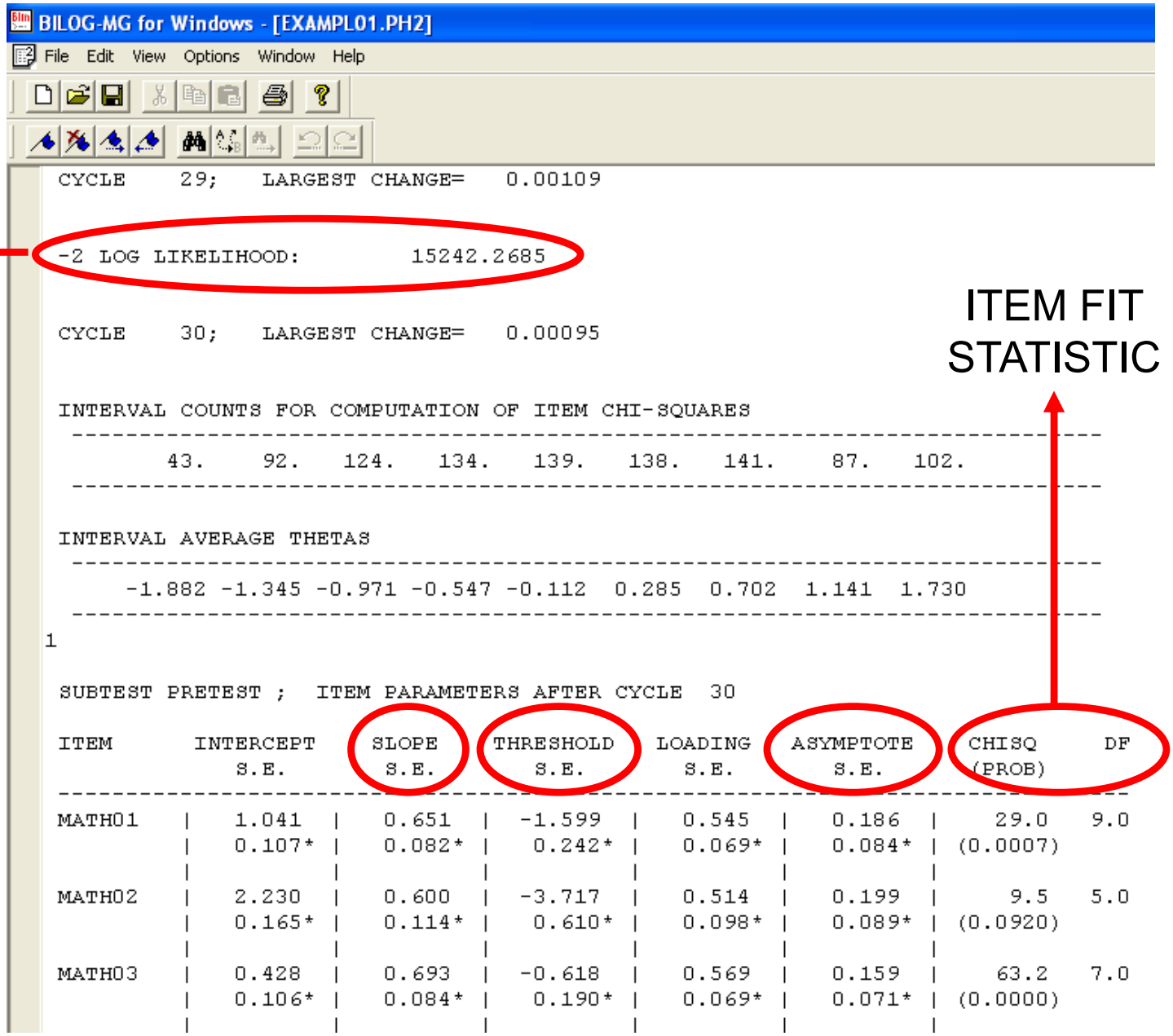
ITEM STATISTICS FOR SUBTEST PRETEST

ITEM	NAME	#TRIED	#RIGHT	PCT	LOGIT/1.7	ITEM*TEST CORRELATION PEARSON	BISERIAL
1	MATH01	1000.0	844.0	84.4	-0.99	0.274	0.415
2	MATH02	1000.0	972.0	97.2	-2.09	0.112	0.285
3	MATH03	1000.0	696.0	69.6	-0.49	0.356	0.468
4	MATH04	1000.0	503.0	50.3	-0.01	0.442	0.553
5	MATH05	1000.0	594.0	59.4	-0.22	0.477	0.603
6	MATH06	1000.0	539.0	53.9	-0.09	0.498	0.625
7	MATH07	1000.0	499.0	49.9	0.00	0.586	0.734
8	MATH08	1000.0	570.0	57.0	-0.17	0.375	0.473
9	MATH09	1000.0	624.0	62.4	-0.30	0.534	0.681
10	MATH10	1000.0	398.0	39.8	0.24	0.465	0.590
11	MATH11	1000.0	459.0	45.9	0.10	0.598	0.751
12	MATH12	1000.0	390.0	39.0	0.26	0.454	0.577
13	MATH13	1000.0	182.0	18.2	0.88	0.419	0.612
14	MATH14	1000.0	227.0	22.7	0.72	0.196	0.273
15	MATH15	1000.0	155.0	15.5	1.00	0.098	0.149

BILOG OUTPUT (3): PHASE 2

DEVIANCE:
USED FOR
LIKELIHOOD
RATIO TESTS

ITEM FIT
STATISTIC

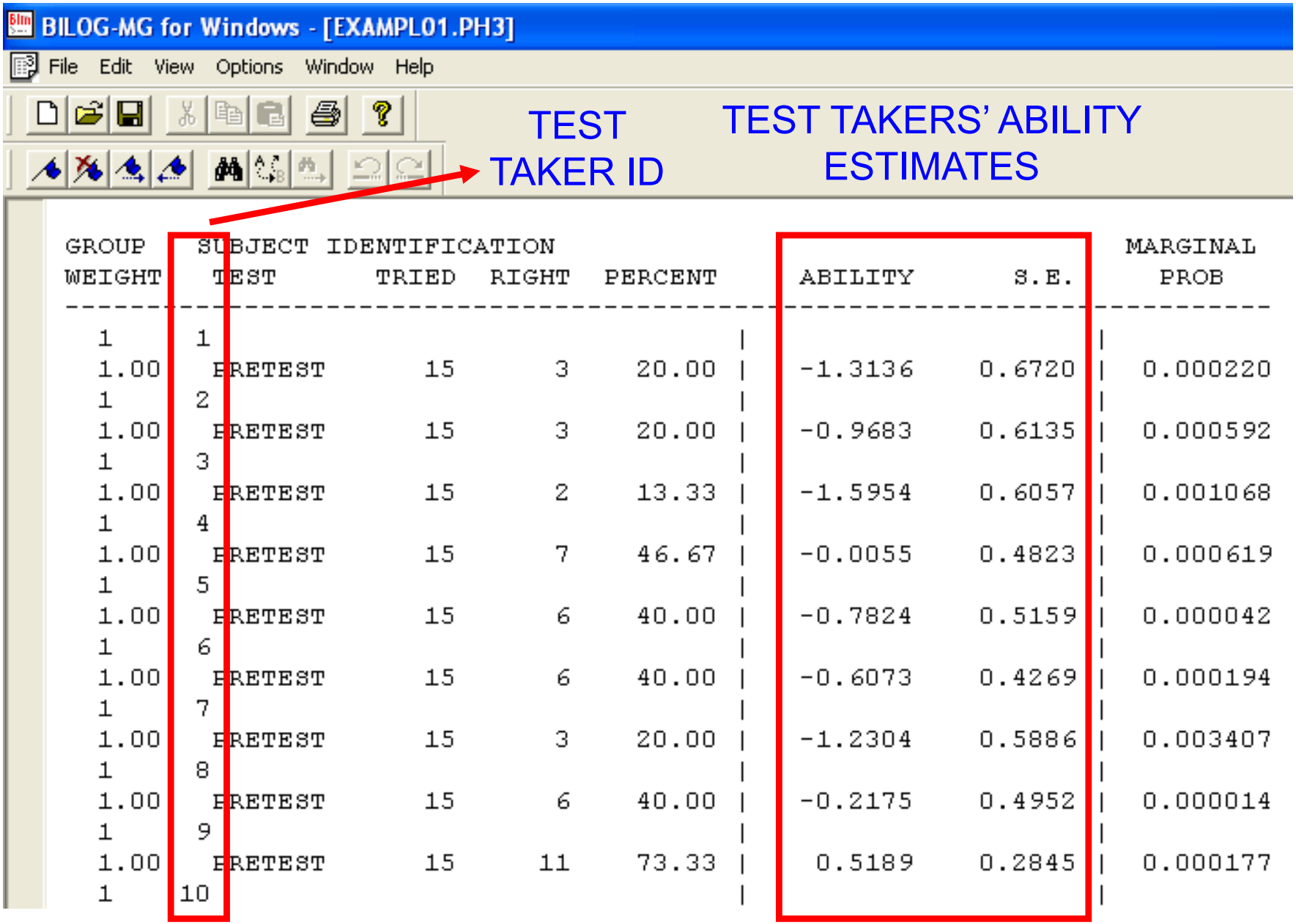


BILOG-MG for Windows - [EXAMPL01.PH2]

File Edit View Options Window Help

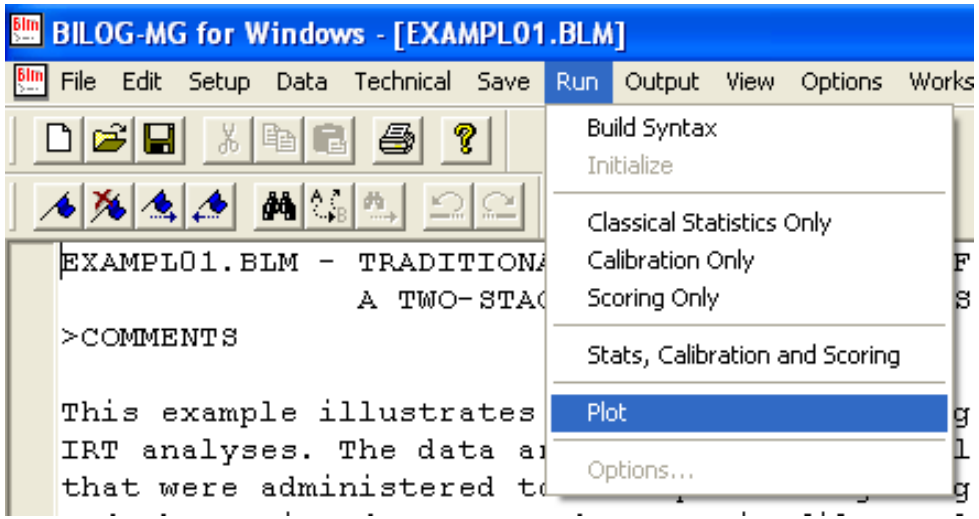
```
 CYCLE    29;    LARGEST CHANGE=    0.00109

 -2 LOG LIKELIHOOD:          15242.2685

 CYCLE    30;    LARGEST CHANGE=    0.00095

 INTERVAL COUNTS FOR COMPUTATION OF ITEM CHI-SQUARES
 ---------------------------------------------------------------------------
        43.    92.   124.   134.   139.   138.   141.    87.   102.
 ---------------------------------------------------------------------------

 INTERVAL AVERAGE THETAS
 ---------------------------------------------------------------------------
     -1.882 -1.345 -0.971 -0.547 -0.112  0.285  0.702  1.141  1.730
 ---------------------------------------------------------------------------
1

 SUBTEST PRETEST ;  ITEM PARAMETERS AFTER CYCLE  30

 ITEM      INTERCEPT     SLOPE     THRESHOLD    LOADING    ASYMPTOTE    CHISQ     DF
              S.E.        S.E.        S.E.       S.E.        S.E.      (PROB)
 ---------------------------------------------------------------------------------
 MATH01    |   1.041   |   0.651   |  -1.599   |   0.545   |   0.186   |    29.0   9.0
           |   0.107*  |   0.082*  |   0.242*  |   0.069*  |   0.084*  | (0.0007)
           |           |           |           |           |           |
 MATH02    |   2.230   |   0.600   |  -3.717   |   0.514   |   0.199   |     9.5   5.0
           |   0.165*  |   0.114*  |   0.610*  |   0.098*  |   0.089*  | (0.0920)
           |           |           |           |           |           |
 MATH03    |   0.428   |   0.693   |  -0.618   |   0.569   |   0.159   |    63.2   7.0
           |   0.106*  |   0.084*  |   0.190*  |   0.069*  |   0.071*  | (0.0000)
           |           |           |           |           |           |
```

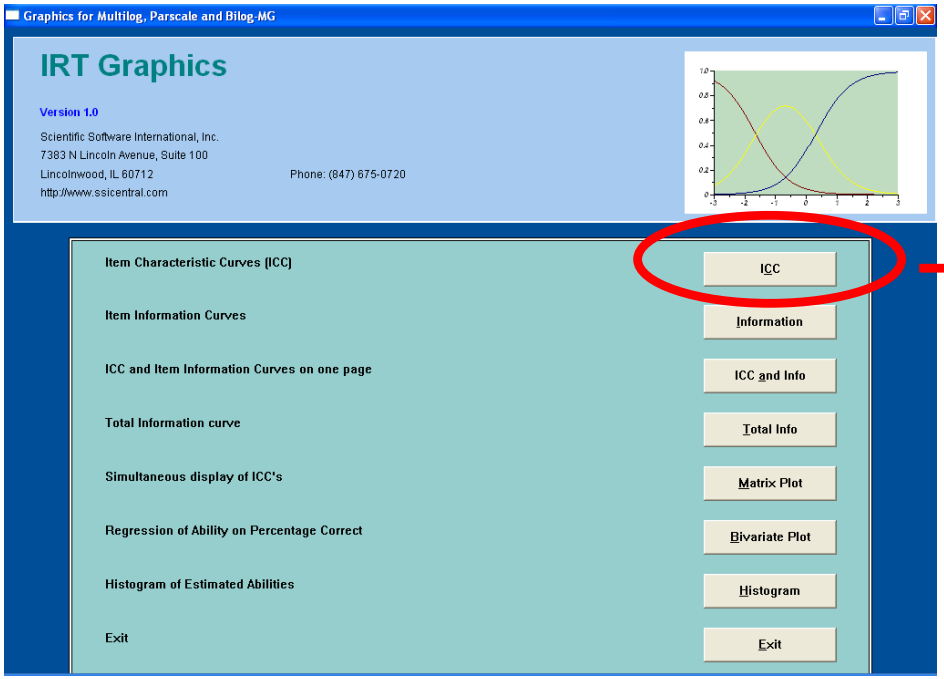
BILOG OUTPUT (4): PHASE 3

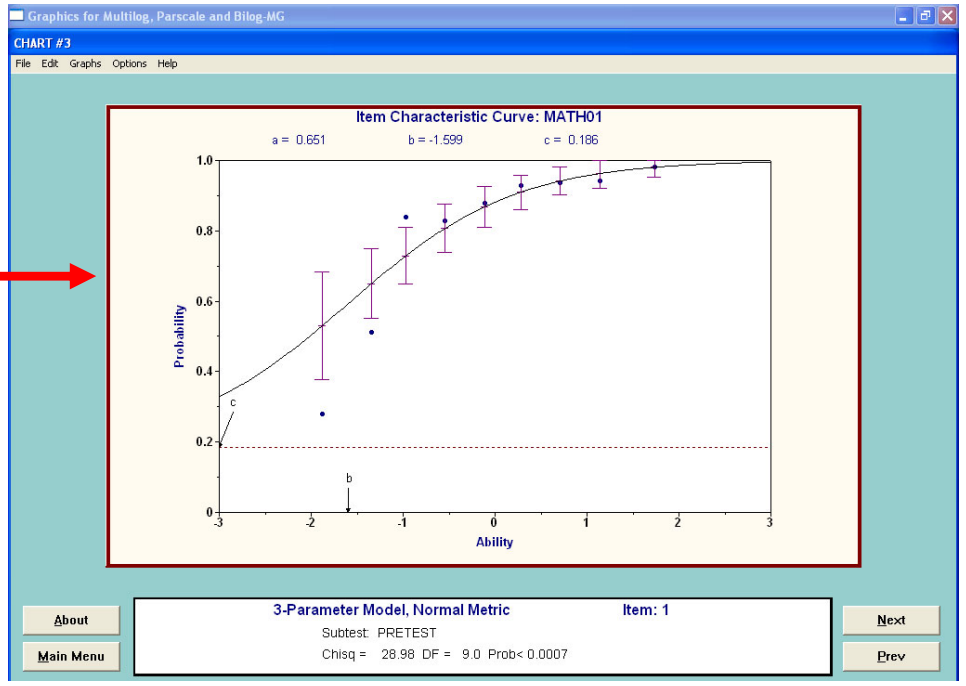


GROUP WEIGHT	SUBJECT IDENTIFICATION TEST	TRIED	RIGHT	PERCENT	ABILITY	S.E.	MARGINAL PROB
1 1.00	1 PRETEST	15	3	20.00	-1.3136	0.6720	0.000220
1 1.00	2 PRETEST	15	3	20.00	-0.9683	0.6135	0.000592
1 1.00	3 PRETEST	15	2	13.33	-1.5954	0.6057	0.001068
1 1.00	4 PRETEST	15	7	46.67	-0.0055	0.4823	0.000619
1 1.00	5 PRETEST	15	6	40.00	-0.7824	0.5159	0.000042
1 1.00	6 PRETEST	15	6	40.00	-0.6073	0.4269	0.000194
1 1.00	7 PRETEST	15	3	20.00	-1.2304	0.5886	0.003407
1 1.00	8 PRETEST	15	6	40.00	-0.2175	0.4952	0.000014
1 1.00	9 PRETEST	15	11	73.33	0.5189	0.2845	0.000177
1	10						

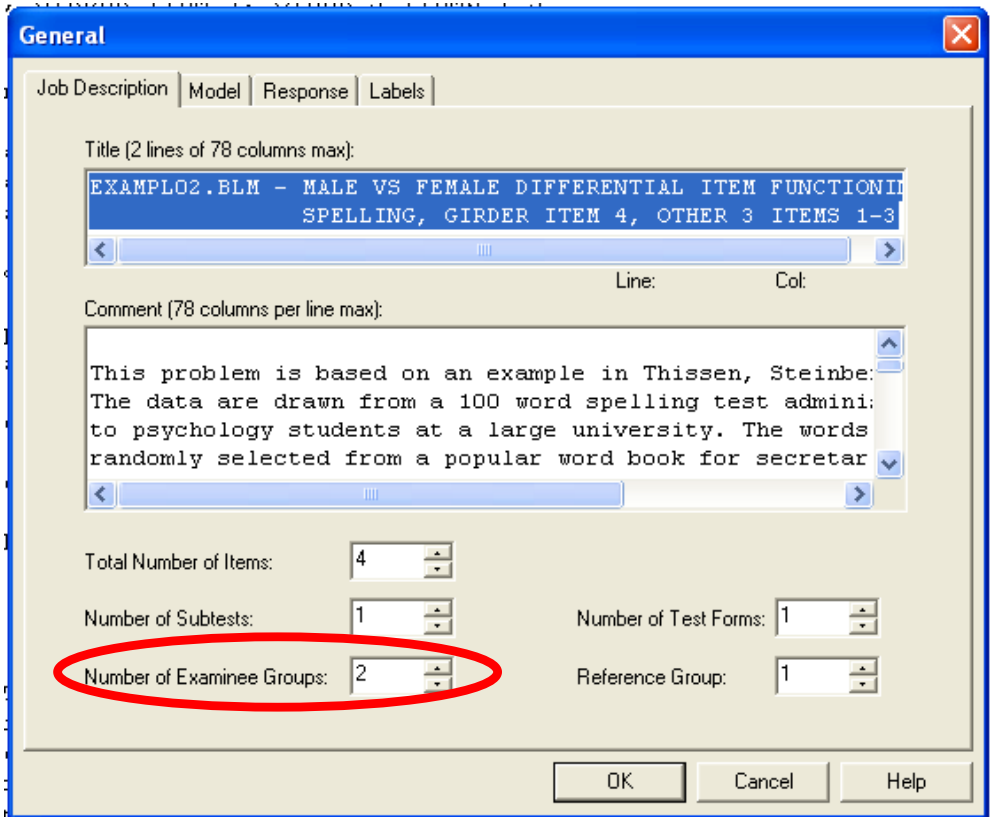
BILOG Graphics Interface

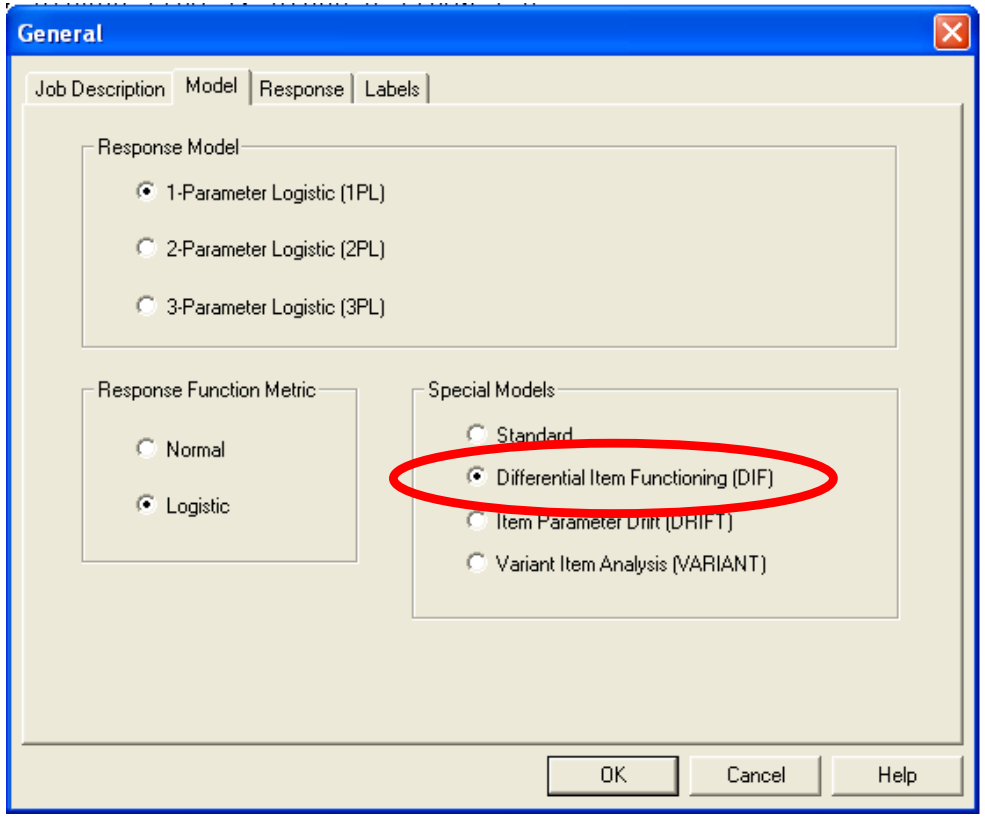






Example 2: DIF





Differences in specification of syntax

BILOG Sample Output

BILOG-MG for Windows - [EXAMPL02 *]

File Edit View Options Window Help

```
SUBTEST    1    SPELL
  GROUP    1    MALES          16 OBSERVATIONS
  GROUP    2    FEMALES        15 OBSERVATIONS


SUBTEST    1    SPELL


ITEM STATISTICS FOR GROUP:  1    MALES

                                                          ITEM*TEST CORRELATION
ITEM   NAME        #TRIED    #RIGHT     PCT     LOGIT     PEARSON   BISERIAL
-------------------------------------------------------------------------------
   1   SP1         285.0     215.0    0.754    -1.12      0.243     0.332
   2   SP2         285.0     181.0    0.635    -0.55      0.351     0.450
   3   SP3         285.0      91.0    0.319     0.76      0.364     0.474
   4   SP4         285.0     179.0    0.628    -0.52      0.360     0.461
-------------------------------------------------------------------------------


ITEM STATISTICS FOR GROUP:  2    FEMALES

                                                          ITEM*TEST CORRELATION
ITEM   NAME        #TRIED    #RIGHT     PCT     LOGIT     PEARSON   BISERIAL
-------------------------------------------------------------------------------
   1   SP1         374.0     305.0    0.816    -1.49      0.254     0.370
   2   SP2         374.0     230.0    0.615    -0.47      0.295     0.376
   3   SP3         374.0     109.0    0.291     0.89      0.231     0.307
   4   SP4         374.0     171.0    0.457     0.17      0.306     0.385
-------------------------------------------------------------------------------
```

PHASE 1

BILOG-MG for Windows - [EXAMPL02.PH2 *]

File Edit View Options Window Help

```
MODEL FOR GROUP DIFFERENTIAL ITEM FUNCTIONING:
ADJUSTED THRESHOLD VALUES

    ITEM              GROUP
                   1          2
-----------------------------------
   SP1       |  -1.159  |  -1.615
             |   0.130* |   0.131*
             |          |
   SP2       |  -0.583  |  -0.627
             |   0.119* |   0.106*
             |          |
   SP3       |   0.785  |   0.720
             |   0.085* |   0.112*
             |          |
   SP4       |  -0.552  |   0.012
             |   0.117* |   0.104*
-----------------------------------
*STANDARD ERROR

MODEL FOR GROUP DIFFERENTIAL ITEM FUNCTIONING:
GROUP THRESHOLD DIFFERENCES

   ITEM        GROUP
                2 - 1
----------------------
   SP1       |  -0.456
             |   0.185*
             |
   SP2       |  -0.043
             |   0.159*
             |
   SP3       |  -0.064
             |   0.141*
             |
   SP4       |   0.564
             |   0.156*
----------------------
*STANDARD ERROR
```

PHASE 2