



## Analysis of variant items

In this example, responses to 50 items are read from those of 100 items in the data file using the format statement

```
(10A1, T38, 25A1, 1X, 25A1) .
```

The first few lines of the data file are shown below. In contrast to previous examples, each position in the item response fields for each examinee corresponds to the same item. In the earlier examples, the association between response and item depended on the group/form membership of an examinee.

The answer key (KFNAME keyword on the INPUT command) is given first, and is given in the first two lines of the raw data file in the same format as the item responses.

```
KEY          000000000000000000000000000000000000000000000000000000000000000000000000000000...
0102111900  00000401020100002001101002024030005001000000000233004002014062000012000100...
0104112200  10101200210100000100010230110030013000000100103021014000002042001012001000...
0105121900  11012041110200000010002230131010122101000000013123000002001042101012001300...
```

From the 50, 20 are selected as Main Test items and 4 as Variant Test items. This is indicated by setting NITEMS to 24 and NVARIANT to 4 on the LENGTH command. Items for the main test are selected by name in the TESTM command; items for the variant test are selected by name in the TESTV command. The item names correspond to the sequence numbers in the original set of 100 items. Here the short form of naming and numbering is used – the set of items forms an arithmetic progression of integer or decimal numbers allowing use of the short form (*first (increment) last*). A similar abbreviation may be used for consecutive item names (INAMES keyword on the ITEMS command).

The analysis is performed on a sample of 200 students randomly drawn from the original sample of 660 (SAMPLE=200 on the INPUT command). The EAP scale scores of Phase 3 are computed from the responses to items in the main test.

```
EXAMPL07.BLM - ANALYSIS OF VARIANT ITEMS IN A SPELLING TEST OF RANDOMLY
                SELECTED WORDS; SUBJECTS: 660 UNDERGRADUATE STUDENTS; 2PL MODEL.
>GLOBAL  DFNAME='EXAMPL07.DAT', NTEST=1, NVTEST=1, NPARAM=2, SAVE;
>SAVE    PARM='EXAMPL07.PAR', SCORE='EXAMPL07.SCO';
>LENGTH  NITEM=24, NVARIANT=4;
>INPUT   NTOTAL=50, KFNAME='EXAMPL07.DAT', SAMPLE=200, NIDCHAR=10;
>ITEMS   INUMBERS=(1(1)50), INAME=(I26(1)I75);
>TESTM   TNAME=MAINTEST, INAMES=(I26, I27, I28, I29, I31, I33, I34,
I35, I36, I38, I39, I47, I48, I49, I50, I54, I60, I64, I68, I72);
>TESTV   TNAME=VARIANT, INAMES=(I53, I59, I69, I73);
(10A1, T38, 25A1, 1X, 25A1)
>CALIB   NQPT=31, CRIT=.005, CYCLES=10, NEWTON=2, FLOAT, ACCEL=0.5;
>SCORE   METHOD=2, NOPRINT;
```

## Phase 1 output

Phase 1 lists the test specifications and the assignment of items to the main test and the variants.

```
>ITEMS INUMBERS=(1(1)50), INAME=(I26(1)I75);
```

```
TEST SPECIFICATIONS
=====
```

```
>TESTM TNAME=MAINTEST,
INAMES=(I26,I27,I28,I29,I31,I33,I34,
I35,I36,I38,I39,I47,I48,I49,I50,I54,I60,I64,I68,I72);
```

```
TEST NUMBER: 1 TEST NAME: MAINTEST
NUMBER OF ITEMS: 20
```

ITEM NUMBER	ITEM NAME						
1	I26	9	I34	23	I48	43	I68
2	I27	10	I35	24	I49	47	I72
3	I28	11	I36	25	I50		
4	I29	13	I38	29	I54		
6	I31	14	I39	35	I60		
8	I33	22	I47	39	I64		

```
>TESTV TNAME=VARIANT,
INAMES=(I53,I59,I69,I73);
```

```
TEST NUMBER: 2 TEST NAME: VARIANT
NUMBER OF ITEMS: 4
```

ITEM NUMBER	ITEM NAME						
28	I53	34	I59	44	I69	48	I73

Responses of 660 examinees are read from the data records, but only 200 randomly sampled cases are included in the Phase 1 and Phase 2 analysis. The classical item statistics are shown separately for main and variant items. The test scores for the item-test correlations are based on the test scores from the main test items only.

```
660 OBSERVATIONS READ FROM FILE: EXAMPL07.DAT
660 OBSERVATIONS WRITTEN TO FILE: MF.DAT
```

```
REPORT ON SUBJECT SAMPLING:
LEVEL OF SAMPLING = 0.3030
660 SUBJECTS READ FROM FILE: MF.DAT
200 SUBJECTS WRITTEN TO FILE: CF.DAT
```

```
ITEM STATISTICS FOR SUBTEST MAINTEST
```

ITEM	NAME	#TRIED	#RIGHT	PCT	ITEM*TEST CORRELATION		
					LOGIT/1.7	PEARSON	BISERIAL
1	I26	200.0	134.0	67.0	-0.42	0.188	0.244
2	I27	200.0	102.0	51.0	-0.02	0.421	0.527
3	I28	200.0	78.0	39.0	0.26	0.294	0.374
4	I29	200.0	147.0	73.5	-0.60	0.444	0.598

```
...
```

## ITEM STATISTICS FOR SUBTEST VARIANT

ITEM	NAME	#TRIED	#RIGHT	PCT	ITEM*TEST CORRELATION		
					LOGIT/1.7	PEARSON	BISERIAL
1	I53	200.0	139.0	69.5	-0.48	0.454	0.596
2	I59	200.0	135.0	67.5	-0.43	0.456	0.594
3	I69	200.0	53.0	26.5	0.60	0.379	0.510
4	I73	200.0	50.0	25.0	0.65	0.069	0.094

**Phase 2 output**

Calibration of the main test items is computed as in the other examples. Without altering the item parameter estimates of those items, parameter estimates for the variants are computed with respect to the latent dimension determined by the main items.

SUBTEST MAINTEST; ITEM PARAMETERS AFTER CYCLE 6

ITEM	INTERCEPT S.E.	SLOPE S.E.	THRESHOLD S.E.	LOADING S.E.	ASYMPTOTE S.E.	CHISQ (PROB)	DF
I26	0.451 0.648*	0.360 0.088*	-1.254 1.775*	0.339 0.083*	0.000 0.000*	8.6 (0.3784)	8.0
I27	0.028 0.691*	0.753 0.152*	-0.037 0.918*	0.602 0.121*	0.000 0.000*	3.2 (0.7857)	6.0
(Similar output omitted)							
I72	-0.018 0.684*	0.726 0.149*	0.025 0.942*	0.587 0.121*	0.000 0.000*	13.6 (0.0347)	6.0

\* STANDARD ERROR

LARGEST CHANGE = 0.002542 106.4 131.0  
(0.9439)

PARAMETER	MEAN	STN DEV
SLOPE	0.616	0.220
LOG(SLOPE)	-0.548	0.368
THRESHOLD	0.143	1.256

\*\*\*\*\*  
CALIBRATION OF VARIANT ITEMS  
VARIANT  
\*\*\*\*\*

-2 LOG LIKELIHOOD = 4545.542

ITEM	INTERCEPT S.E.	SLOPE S.E.	THRESHOLD S.E.	LOADING S.E.	ASYMPTOTE S.E.	CHISQ (PROB)	DF
I53	0.587 0.104*	0.613 0.111*	-0.957 0.202*	0.523 0.094*	0.000 0.000*	0.0 (1.0000)	0.0
I59	0.519 0.101*	0.603 0.109*	-0.860 0.195*	0.517 0.093*	0.000 0.000*	0.0 (1.0000)	0.0
I69	-0.702 0.107*	0.549 0.109*	1.280 0.263*	0.481 0.095*	0.000 0.000*	0.0 (1.0000)	0.0
I73	-0.668 0.098*	0.231 0.064*	2.886 0.857*	0.225 0.062*	0.000 0.000*	0.0 (1.0000)	0.0

### Phase 3 output

In Phase 3, scores for all 660 examinees are computed from the main test item response and saved to an external file. Printing of the scores is suppressed, except for the first three cases. The latent distribution estimated from all 660 cases is computed and printed. Scores are based on the unrescaled Phase 2 parameters, which are then saved to an external file.

```
>SCORE METHOD=2, NOPRINT;
```

```
SCORES WILL NOT BE COMPUTED FOR VARIANT ITEM SUBTESTS  
PARAMETERS FOR SCORING, RESCALING, AND TEST AND ITEM INFORMATION
```

```
METHOD OF SCORING SUBJECTS:          EXPECTATION A POSTERIORI  
                                       (EAP; BAYES ESTIMATION)  
TYPE OF PRIOR:                          NORMAL  
SCORES WRITTEN TO FILE                   EXAMPL07.SCO
```

GROUP WEIGHT	SUBJECT IDENTIFICATION TEST	TRIED	RIGHT	PERCENT	ABILITY	S.E.	MARGINAL PROB
1	0102111900						
1.00	MAINTEST	20	8	40.00	-0.4065	0.3645	0.000000
1	0104112200						
1.00	MAINTEST	20	8	40.00	-0.4091	0.3641	0.000000
1	0105121900						
1.00	MAINTEST	20	3	15.00	-1.2316	0.4637	0.000000

```
SUMMARY STATISTICS FOR SCORE ESTIMATES  
=====
```

```
CORRELATIONS AMONG TEST SCORES
```

```
                MAINTEST  
MAINTEST        1.0000
```

```
MEANS, STANDARD DEVIATIONS, AND VARIANCES OF SCORE ESTIMATES
```

```
TEST:                MAINTEST  
MEAN:                0.0915  
S.D.:                0.8940  
VARIANCE:            0.7992
```

```
ROOT-MEAN-SQUARE POSTERIOR STANDARD DEVIATIONS
```

```
TEST:                MAINTEST  
RMS:                0.4493  
VARIANCE:            0.2019
```

```
EMPIRICAL RELIABILITY:    0.7984
```

```
MARGINAL LATENT DISTRIBUTION(S)  
=====
```

```
MARGINAL LATENT DISTRIBUTION FOR TEST MAINTEST
```

```
MEAN    =    0.092  
S.D.    =    0.974
```