```
/* x7_3.sas */
/* Purpose:  */

title1 'Example 7.3.';

data a (type=cov);
  length _type_ $ 8 _name_ $ 8;
  input pop$ _type_ @;
  if _type_='COV' or _type_='CORR'
    then input _name_ x1 x2;
    else input        x1 x2;
  cards;
pop1 COV  X1       1       1
pop1 COV  X2       1       2
pop1 MEAN          4       2
pop1 N       1000000 1000000
pop2 COV  X1       1       0
pop2 COV  X2       0       1
pop2 MEAN          1       1
pop2 N       1000000 1000000
;

proc print data=a;
title2 'List of data. NB special SAS-dataset (type=cov). Nobs set "high".';

data b;
  input x1 x2;
  cards;
9 0
1 0
2 0
3 0
4 0
5 0
6 0
7 0
8 0
;

proc print data=b;
title2 'List of testdata.';

proc discrim data=a testdata=b testlist pool=no
    bcov pcov tcov wcov bcorr pcorr tcorr wcorr simple;
  class pop;
  var x1 x2;
title2 'Quadratic discriminant analysis - equal prior probabilities.';

run;
```

Example 7.3. 1

List of data. NB special SAS-dataset (type=cov). Nobs set "high".

Obs	_type_	_name_	pop	x1	x2
1	COV	X1	pop1	1	1
2	COV	X2	pop1	1	2
3	MEAN		pop1	4	2
4	N		pop1	1000000	1000000
5	COV	X1	pop2	1	0
6	COV	X2	pop2	0	1
7	MEAN		pop2	1	1
8	N		pop2	1000000	1000000

/><><>

Example 7.3. 6
Quadratic discriminant analysis - equal prior probabilities.

The DISCRIM Procedure
Within-Class Correlation Coefficients / Pr > |r|

pop = pop1

Variable	x1	x2
x1	1.00000	0.70711 <.0001
x2	0.70711 <.0001	1.00000

---

pop = pop2

Variable	x1	x2
x1	1.00000	0.00000 1.0000
x2	0.00000 1.0000	1.00000

Example 7.3. 7
Quadratic discriminant analysis - equal prior probabilities.

The DISCRIM Procedure

Pooled Within-Class Correlation Coefficients / Pr > |r|

Variable	x1	x2
x1	1.00000	0.40825 <.0001
x2	0.40825 <.0001	1.00000

Between-Class Correlation Coefficients / Pr > |r|

Variable	x1	x2
x1	1.00000 .	1.00000 .
x2	1.00000 .	1.00000 .

Total-Sample Correlation Coefficients / Pr > |r|

Variable	x1	x2
x1	1.00000	0.52414 <.0001
x2	0.52414 <.0001	1.00000

Example 7.3. 8
Quadratic discriminant analysis - equal prior probabilities.

The DISCRIM Procedure
Simple Statistics

Total-Sample

Variable	N	Sum	Mean	Variance	Standard Deviation
x1	2E6	5000000	2.50000	3.25000	1.8028
x2	2E6	3000000	1.50000	1.75000	1.3229

---

pop = pop1

Variable	N	Sum	Mean	Variance	Standard Deviation
x1	1E6	4000000	4.00000	1.00000	1.0000
x2	1E6	2000000	2.00000	2.00000	1.4142

---

pop = pop2

Variable	N	Sum	Mean	Variance	Standard Deviation
x1	1E6	1000000	1.00000	1.00000	1.0000
x2	1E6	1000000	1.00000	1.00000	1.0000

Within Covariance Matrix Information

pop	Covariance Matrix Rank	Natural Log of the Determinant of the Covariance Matrix
pop1	2	-3.331E-16
pop2	2	-2.22E-16

Example 7.3. 9
Quadratic discriminant analysis - equal prior probabilities.

The DISCRIM Procedure

Pairwise Generalized Squared Distances Between Groups

$$D^2(i|j) = (\bar{X}_i - \bar{X}_j)' \, COV_j^{-1} \, (\bar{X}_i - \bar{X}_j) + \ln |COV_j|$$

Generalized Squared Distance to pop

From pop	pop1	pop2
pop1	-3.331E-16	10.00000
pop2	13.00000	-2.22E-16

/><<><><>

Example 7.3. 11

Quadratic discriminant analysis - equal prior probabilities.

The DISCRIM Procedure

Classification Summary for Test Data: WORK.B

Classification Summary using Quadratic Discriminant Function

Generalized Squared Distance Function

$$D_j^2(X) = (X-\bar{X}_j)' \, COV_j^{-1} \, (X-\bar{X}_j) + \ln |COV_j|$$

Posterior Probability of Membership in Each pop

$$Pr(j|X) = \exp(-.5\, D_j^2(X)) \,/\, SUM_k \exp(-.5\, D_k^2(X))$$

Number of Observations and Percent Classified into pop

	pop1	pop2	Total
Total	5	4	9
	55.56	44.44	100.00
Priors	0.5	0.5	