

```

1 *****;
2 *** Finish times in a 10 K race ***;
3 *** Data taken from various sites on the ***;
4 *** internet reporting race results ***;
5 *****;
6 options ps=256 ls=80 nocenter nodate nonumber;
7
8 data one; length hometown $ 23 sex $ 3;
9 infile
9 ! "C:\Geaghan\EXST\EXST7015New\Spring2003\SAS\12q-MReg-Polynomial
9 ! Marathons.DAT" missover;
10 TITLE1 'EXST7015: Marathon Footrace Example';
11 input Marathon $ Age Sex $ TIME HomeTown $ 35-57;
12 if age eq 99 then age = .;
13 *(apparently 99 represents missing for 5 PA race participants);
14 *---+----1-----2-----3-----4-----5-----6;
15 cards;

```

NOTE: The infile

"C:\Geaghan\EXST\EXST7015New\Spring2003\SAS\12q-MReg-Polynomial
Marathons.DAT" is:
File Name=C:\Geaghan\EXST\EXST7015New\Spring2003\SAS\12q-MReg-
Polynomial

Marathons.DAT,
RECFM=V,LRECL=256

NOTE: 6150 records were read from the infile

"C:\Geaghan\EXST\EXST7015New\Spring2003\SAS\12q-MReg-Polynomial
Marathons.DAT".

The minimum record length was 29.

The maximum record length was 57.

NOTE: The data set WORK.ONE has 6150 observations and 5 variables.

NOTE: DATA statement used:

real time 0.19 seconds
cpu time 0.14 seconds

```
15 ! run;
```

```
16 ;
```

```
17
```

```
18 data two; set one; if marathon = 'VT052002';
```

NOTE: There were 6150 observations read from the data set WORK.ONE.

NOTE: The data set WORK.TWO has 1490 observations and 5 variables.

NOTE: DATA statement used:

real time 0.05 seconds
cpu time 0.05 seconds

```
19 proc sort data=two; by sex; RUN;
```

NOTE: There were 1490 observations read from the data set WORK.TWO.

NOTE: The data set WORK.TWO has 1490 observations and 5 variables.

NOTE: PROCEDURE SORT used:

real time 0.07 seconds
cpu time 0.07 seconds

```
20
```

```
21 proc mixed data=two method=typel; BY sex;
```

```
22 TITLE2 'Quartic model - separate by sex';
```

```
23 model time= age age*age age*age*age age*age*age*age
```

```
24 / htype=1 3 DDFM=Satterthwaite solution;
```

```
25 run;
```

NOTE: The PROCEDURE MIXED printed pages 1-2.

NOTE: PROCEDURE MIXED used:

real time 0.13 seconds
cpu time 0.12 seconds

EXST7015: Marathon Footrace Example
Quartic model - separate by sex

sex=F

The Mixed Procedure

Model Information

Data Set WORK.TWO
 Dependent Variable TIME
 Covariance Structure Diagonal
 Estimation Method Type 1
 Residual Variance Method Factor
 Fixed Effects SE Method Model-Based
 Degrees of Freedom Method Residual

Dimensions

Covariance Parameters 1
 Columns in X 5
 Columns in Z 0
 Subjects 1
 Max Obs Per Subject 527
 Observations Used 527
 Observations Not Used 0
 Total Observations 527

Type 1 Analysis of Variance

Source	DF	Sum of Squares	Mean Square	Expected Mean Square	Error Term	Error DF	F Value	Pr > F
Age	1	4869.217307	4869.217307	Var(Residual) + Q(Age, Age*Age, Age*Age* Age, Age*Age*Age*Age)	MS(Residual)	522	8.34	0.0040
Age*Age	1	3535.615012	3535.615012	Var(Residual) + Q(Age*Age, Age*Age*Age, Age*Age*Age*Age)	MS(Residual)	522	6.06	0.0142
Age*Age*Age	1	262.700283	262.700283	Var(Residual) + Q(Age*Age*Age, Age*Age*Age*Age)	MS(Residual)	522	0.45	0.5026
Age*Age*Age*Age	1	1.495088	1.495088	Var(Residual) + Q(Age*Age*Age*Age)	MS(Residual)	522	0.00	0.9597
Residual	522	304684	583.686674	Var(Residual)

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	583.69

Fit Statistics

-2 Res Log Likelihood	4884.3
AIC (smaller is better)	4886.3
AICC (smaller is better)	4886.3
BIC (smaller is better)	4890.5

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > t
Intercept	294.52	128.80	522	2.29	0.0226
Age	-3.6313	14.4413	522	-0.25	0.8016
Age*Age	0.07038	0.5872	522	0.12	0.9046
Age*Age*Age	-0.00010	0.01026	522	-0.01	0.9922
Age*Age*Age*Age	-3.3E-6	0.000065	522	-0.05	0.9597

Type 1 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Age	1	522	8.34	0.0040
Age*Age	1	522	6.06	0.0142
Age*Age*Age	1	522	0.45	0.5026
Age*Age*Age*Age	1	522	0.00	0.9597

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Age	1	522	0.06	0.8016
Age*Age	1	522	0.01	0.9046
Age*Age*Age	1	522	0.00	0.9922
Age*Age*Age*Age	1	522	0.00	0.9597

EXST7015: Marathon Footrace Example
Quartic model - separate by sex

sex=M

The Mixed Procedure

Model Information

Data Set WORK.TWO
 Dependent Variable TIME
 Covariance Structure Diagonal
 Estimation Method Type 1
 Residual Variance Method Factor
 Fixed Effects SE Method Model-Based
 Degrees of Freedom Method Residual

Dimensions

Covariance Parameters 1
 Columns in X 5
 Columns in Z 0
 Subjects 1
 Max Obs Per Subject 963
 Observations Used 963
 Observations Not Used 0
 Total Observations 963

Type 1 Analysis of Variance

Source	DF	Sum of Squares	Mean Square	Expected Mean Square	Error Term	Error DF	F Value	Pr > F
Age	1	18395	18395	Var(Residual) + Q(Age, Age*Age, Age*Age* Age, Age*Age*Age*Age)	MS(Residual)	958	22.06	<.0001
Age*Age	1	13295	13295	Var(Residual) + Q(Age*Age, Age*Age*Age, Age*Age*Age*Age)	MS(Residual)	958	15.95	<.0001
Age*Age*Age	1	170.139126	170.139126	Var(Residual) + Q(Age*Age*Age, Age*Age*Age*Age)	MS(Residual)	958	0.20	0.6516
Age*Age*Age*Age	1	381.349352	381.349352	Var(Residual) + Q(Age*Age*Age*Age)	MS(Residual)	958	0.46	0.4990
Residual	958	798683	833.698204	Var(Residual)

Covariance Parameter Estimates

Cov Parm	Estimate
Residual	833.70

Fit Statistics

-2 Res Log Likelihood	9244.6
AIC (smaller is better)	9246.6
AICC (smaller is better)	9246.6
BIC (smaller is better)	9251.4

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > t
Intercept	163.89	130.38	958	1.26	0.2091
Age	8.0558	13.5596	958	0.59	0.5526
Age*Age	-0.3437	0.5108	958	-0.67	0.5012
Age*Age*Age	0.005870	0.008273	958	0.71	0.4782
Age*Age*Age*Age	-0.00003	0.000049	958	-0.68	0.4990

Type 1 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Age	1	958	22.06	<.0001
Age*Age	1	958	15.95	<.0001
Age*Age*Age	1	958	0.20	0.6516
Age*Age*Age*Age	1	958	0.46	0.4990

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Age	1	958	0.35	0.5526
Age*Age	1	958	0.45	0.5012
Age*Age*Age	1	958	0.50	0.4782
Age*Age*Age*Age	1	958	0.46	0.4990