SAS
初探

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課程大綱

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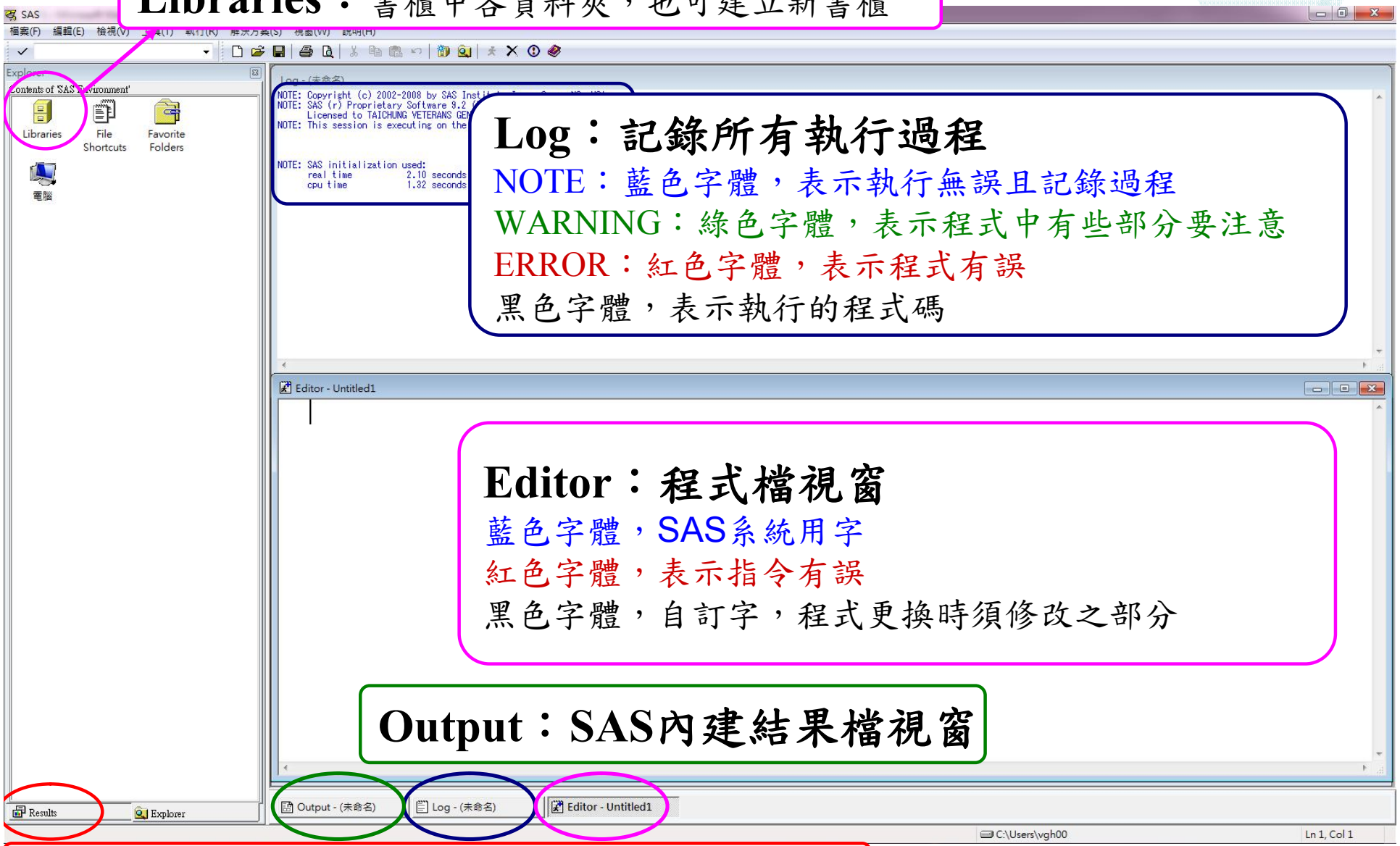
SAS視窗環境介紹

Libraries：書櫃中各資料夾，也可建立新書櫃



Log：記錄所有執行過程

NOTE：藍色字體，表示執行無誤且記錄過程

WARNING：綠色字體，表示程式中有些部分要注意

ERROR：紅色字體，表示程式有誤

黑色字體，表示執行的程式碼

Editor：程式檔視窗

藍色字體，SAS系統用字

紅色字體，表示指令有誤

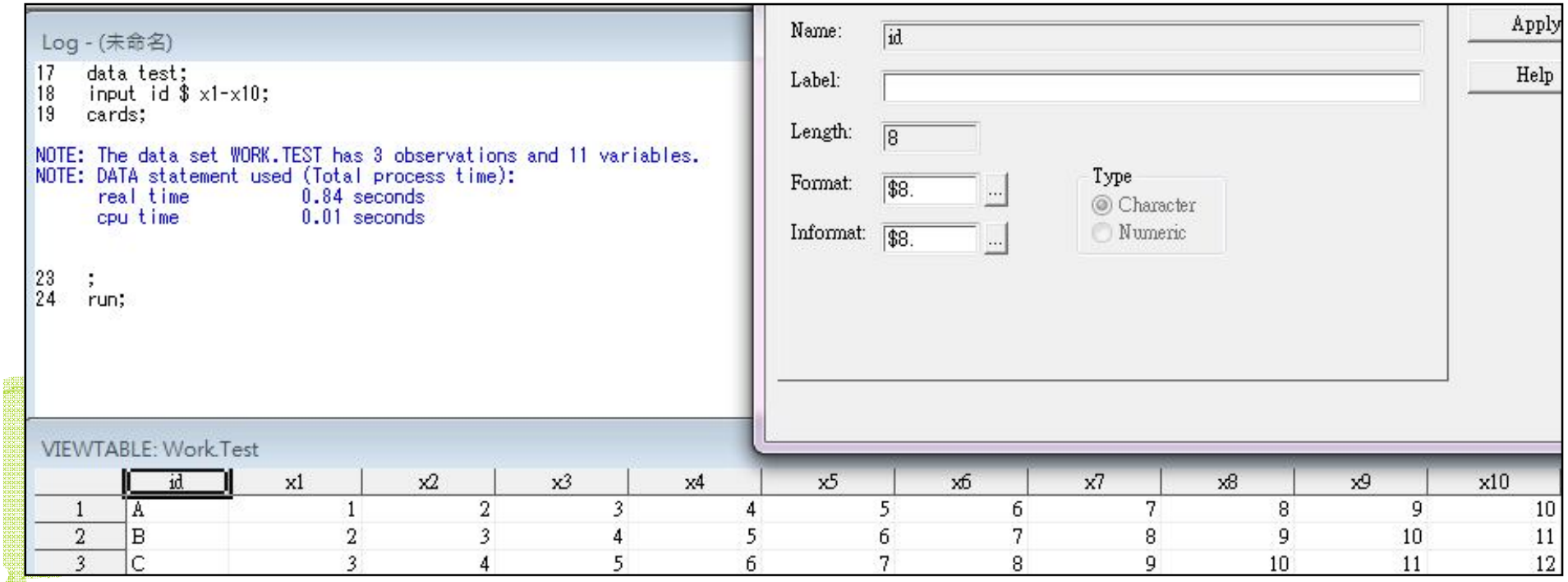
黑色字體，自訂字，程式更換時須修改之部分

Output：SAS內建結果檔視窗

Results：所有分析結果，依分類顯示在此視窗

資料編碼

- Observations(觀測體)
- Variables(變項)
  - SAS命名原則
- Variable Value(變項值)
  - 文字型(Character)
  - 數值型(Numeric)



	id	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10
1	A	1	2	3	4	5	6	7	8	9	10
2	B	2	3	4	5	6	7	8	9	10	11
3	C	3	4	5	6	7	8	9	10	11	12

資料編碼-SAS命名原則-1

- 名稱長度
  - 檔案名稱、變項名稱
    - **32**個字元內
  - 書櫃名稱
    - **8**個字元內
- 書櫃名稱、檔案名稱、變項名稱命名原則
  - 英文字母不分大小寫
  - 必須以『A~Z』或『底線(_)』開頭

資料編碼-SAS命名原則-2

- 範例
  - 合乎規則
    - **age、a1_1、__2、spmsq_1z等等**
  - 不合乎規則
    - **1.age、*6、+az等等**

Log - (未命名)

```
25    data test;
26    input id $ x1-x10 *a;
                        -
                        22
                        200
ERROR 22-322: Syntax error, expecting one of the following: a name, an integer constant,
              arrayname, #, $, &, (, +, /, //, :, ;, =, ?, @, @@, [, {, ~.

ERROR 200-322: The symbol is not recognized and will be ignored.
```

SAS two step -1

- 兩大區塊(two step, 有前後區分)
  - **DATA**
    - **data** management-建立、管理或修改資料之步驟
  - **PROC**
    - data **proc**edure-分析資料之步驟
- 語法不分大小寫
  - 課程範例
    - 大寫-SAS系統用字
    - 小寫-自訂字

SAS two step -2

- 語法注意事項
  - 英文不分大小寫
  - 每句語法，以『;』為結尾
  - 整段語法，以『**RUN**』為結尾，再按 (或F3或F8)執行
- 註解符號『 * 』-執行程式時不會執行

```
*sex, 1=male, 0=female;

/*sex, 1=male, 0=female
  DM, 0=non-DM, 1=DM*/
```

資料檔建立&存檔-1

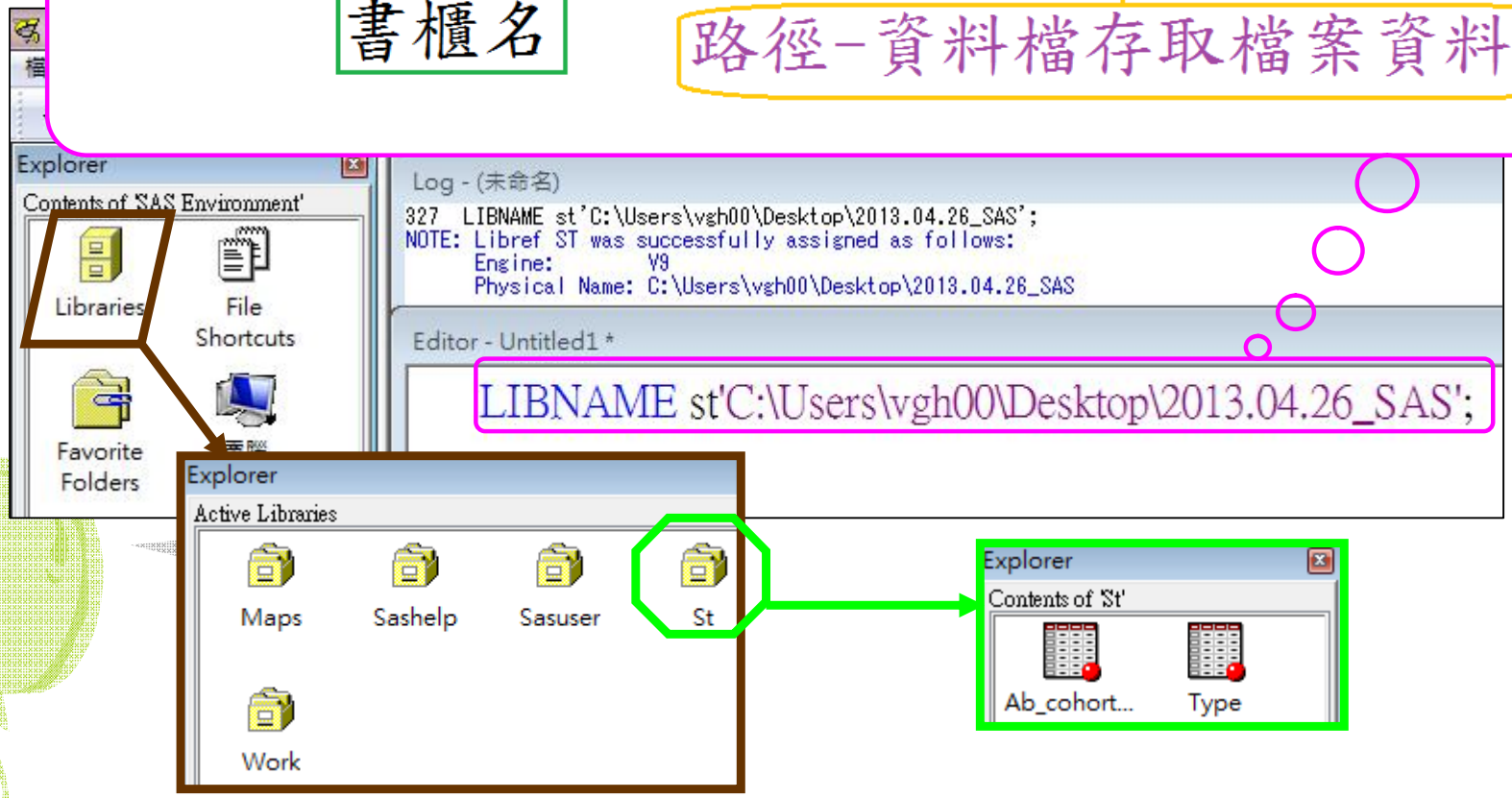
➢LIBNAME指令

☙讀入SAS型式資料檔

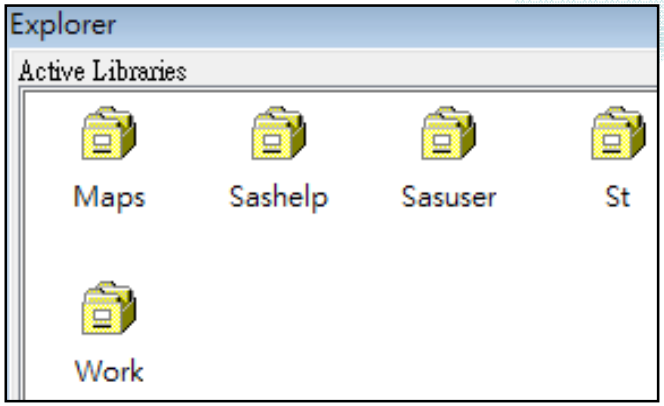
```
LIBNAME st 'C:\Users\vgh00\Desktop\2013.04.26_SAS';
```

書櫃名

路徑-資料檔存取檔案資料夾



資料檔建立&存檔-2



➢ **LIBNAME指令**

- 讀入SAS型式資料檔
- **資料檔存檔**
  - 暫存檔

```
LIBNAME st'C:\Users\vgh00\Desktop\2013.04.26_SAS';
DATA aaa;
SET ST.type;
RUN;
```

  - 永久檔

```
LIBNAME st'C:\Users\vgh00\Desktop\2013.04.26_SAS';
DATA ST.aa;
SET aa;
RUN;
```

資料檔合併-SET

- **SET**
  - 複製資料
  - 垂直合併資料

```
DATA test;
SET test1 test2;
RUN;
```

VIEWTABLE: Work.Test1

	ID	AGE	SEX
1	A	20	1
2	B	22	2
3	C	21	1
4	D	23	2
5	E	20	1

+

VIEWTABLE: Work.Test2

	ID	AGE	SEX
1	F	20	1
2	G	22	2
3	H	21	1

SET

VIEWTABLE: Work.Test

	ID	AGE	SEX
1	A	20	1
2	B	22	2
3	C	21	1
4	D	23	2
5	E	20	1
6	F	20	1
7	G	22	2
8	H	21	1

(未命名)

```
data test;
set test1 test2
run;
```

```
NOTE: There were 5 observations read from the data set WORK.TEST1.
NOTE: There were 3 observations read from the data set WORK.TEST2.
NOTE: The data set WORK.TEST has 8 observations and 3 variables.
NOTE: DATA statement used (Total process time):
      real time           0.02 seconds
      cpu time            0.00 seconds
```

資料檔合併-MERGE

- **MERGE**
  - 水平合併資料
- SET
  - 垂直合併資料
  - 複製資料

VIEWTABLE: Work.Test1

	ID	AGE	SEX
1	A	20	1
2	B	22	2
3	C	21	1
4	D	23	2
5	E	20	1

+

VIEWTABLE: Work.Test4

	ID	DM	HT
1	A	1	1
2	B	0	1
3	C	1	0
4	D	1	1

MERGE

VIEWTABLE: Work.Test5

	ID	AGE	SEX	DM	HT
1	A	20	1	1	1
2	B	22	2	0	1
3	C	21	1	1	0
4	D	23	2	1	1
5	E	20	1	.	.

資料檔合併-MERGE

➢**SORT & BY 指令**

ppt_data

```
PROC SORT DATA=test1; BY id; RUN;
PROC SORT DATA=test4; BY id; RUN;
DATA test5;
MERGE test1 test4;
BY id;
RUN;
```

```
est1; BY id; RUN;

servations read from the data set WORK.TEST1.
RK.TEST1 has 5 observations and 3 variables.
used (Total process time):
      0.16 seconds
      0.01 seconds


est4; BY id; RUN;

servations read from the data set WORK.TEST4.
RK.TEST4 has 4 observations and 3 variables.
used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


33    DATA test5;
34    MERGE test1 test4;
35    BY id;
36    RUN;

NOTE: There were 5 observations read from the data set WORK.TEST1.
NOTE: There were 4 observations read from the data set WORK.TEST4.
NOTE: The data set WORK.TEST5 has 5 observations and 5 variables.
NOTE: DATA statement used (Total process time):
      real time           0.05 seconds
      cpu time            0.00 seconds
```

資料檔合併-MERGE

➢ **SORT & BY 指令**

```
DATA test4;
MERGE test1 test3;
*BY id;
RUN;
```

VIEWTABLE: Work.Test1

	ID	AGE	SEX
1	A	20	1
2	B	22	2
3	C	21	1
4	D	23	2
5	E	20	1

VIEWTABLE: Work.Test3

	ID	DM	HT
1	C	1	1
2	F	0	1
3	G	1	0
4	H	1	1

VIEWTABLE: Work.Test4

	ID	AGE	SEX	DM	HT
1	C	20	1	1	1
2	F	22	2	0	1
3	G	21	1	1	0
4	H	23	2	1	1
5	E	20	1	.	.

常用語法-DATA step-1

➢指派指令

```
DATA newtest;
SET test5;
type2dm=dm;
year=102;
season='spring';
w_year=1911+year;
RUN;
```

VIEWTABLE: Work.Test5

	ID	AGE	SEX	DM	HT
	A	20	1	1	1
	B	22	2	0	1
	C	21	1	1	0
	D	23	2	1	1
	E	20	1	.	.

VIEWTABLE: Work.Newtest

	ID	AGE	SEX	DM	HT	type2dm	year	season	w_year
1	A	20	1	1	1	1	102	spring	2013
2	B	22	2	0	1	0	102	spring	2013
3	C	21	1	1	0	1	102	spring	2013
4	D	23	2	1	1	1	102	spring	2013
5	E	20	1	.	.	.	102	spring	2013

常用語法-DATA step-2

➢四則運算及常用函數

運算種類	SAS語法	數值函數	SAS語法	文字函數	SAS語法
和	**and 、 &**	最小值	y=**MIN**(var)	擷取字串	y=**SUBSTR**(var, 自第幾位起, 取幾位數)
或	**or 、 |**	最大值	y=**MAX**(var)		
非、不是	**not 、 ^**	平均值	y=**MEAN**(var)		
等於	=	標準差	y=**STD**(var)		
不等於	^= 、~=、**ne**	總和	y=**SUM**(var)		
大於等於	>=	絕對值	y=**ABS**(var)		
小於等於	<=	次方項	y=var**(次方數)		
加	+	開根號	y=**SQRT**(var)		
減	-	e為底Log	y=**LOG**(var)		
乘	*	10為底Log	y=**LOG10**(var)		
除	/	取指數	y=**EXP**(var)		

```
x='Dr. Nofuss';
y=SUBSTR(x, 1, 2);
name=SUBSTR(x, 5, 6);
```

x	y	name
Dr. Nofuss	Dr	Nofuss

```
a='204.10';
code=SUBSTR(a, 1, 3);
```

a	code
204.10	204

常用語法-DATA step-3

- 當變項有遺漏值
  - 四則運算及數值函數差異

```
SUM_1=A1+A2+A3+A4+A5;
SUM1=SUM(OF A1-A5);
MEAN1=MEAN(OF A1-A5);
STD1=STD(OF A1-A5);
SUM2=SUM(Z, A1, A2);
```

	z	A1	A2	A3	A4	A5	SUM_1	SUM1	MEAN1	STD1	SUM2
1	1	4	6	.	8	11	.	29	7.25	2.9860788112	11
2	2	5	7	.	9	12	.	33	8.25	2.9860788112	14
3	3	6	8	.	10	13	.	37	9.25	2.9860788112	17
4	4	7	9	.	11	14	.	41	10.25	2.9860788112	20
5	5	8	10	.	12	15	.	45	11.25	2.9860788112	23
6	6	9	11	.	13	16	.	49	12.25	2.9860788112	26
7	7	10	12	6	14	17	59	59	11.8	4.1472882707	29
8	8	11	13	7	15	18	64	64	12.8	4.1472882707	32
9	9	12	14	8	16	19	69	69	13.8	4.1472882707	35
10	10	13	15	9	17	20	74	74	14.8	4.1472882707	38
11	11	14	16	10	18	21	79	79	15.8	4.1472882707	41
12	12	15	17	11	19	.	.	62	15.5	3.4156502553	44
13	13	16	18	12	20	.	.	66	16.5	3.4156502553	47
14	14	17	19	13	21	.	.	70	17.5	3.4156502553	50
15	15	18	20	14	22	.	.	74	18.5	3.4156502553	53

常用語法-DATA step-4

➢ 四則運算

- 計算時間
- 計算年齡

```
DATA time1;
SET time;
day=out_date-in_date;
month=(out_date-in_date)/30;
*month=day/30;
hour=day*24;
RUN;
```

VIEWTABLE: Work.Time1

	ID	in_date	out_date	day	month	hour
1	001551048C	2010-04-17	2010-05-13	26	0.8666666667	624
2	001703646D	2011-08-15	2011-10-07	53	1.7666666667	1272
3	001770973I	2012-06-09	2012-06-11	2	0.0666666667	48
4	001894090E	2012-06-09	2012-06-11	2	0.0666666667	48
5	001908164C	2007-02-18	2007-02-19	1	0.0333333333	24
6	001909199H	2008-09-17	2008-09-22	5	0.1666666667	120
7	001971230C	2007-06-04	2007-06-28	24	0.8	576
8	001987207C	2011-03-30	2011-04-05	6	0.2	144
9	001995046A	2011-07-08	2011-07-17	9	0.3	216
10	002073609I	2010-09-03	2010-09-09	6	0.2	144
11	002090784A	2010-03-09	2010-03-14	5	0.1666666667	120
12	002100581C	2010-03-09	2010-03-14	5	0.1666666667	120
13	002185447H	2011-09-04	2011-09-25	21	0.7	504
14	002202193I	2011-12-31	2012-02-03	34	1.1333333333	816
15	002216691C	2011-06-10	2011-06-28	18	0.6	432
16	002255705H	2011-11-22	2011-11-29	7	0.2333333333	168
17	002275592G	2007-01-14	2007-01-15	1	0.0333333333	24
18	002276512E	2009-01-20	2009-01-25	5	0.1666666667	120
19	002279567B	2011-02-08	2011-02-17	9	0.3	216
20	002284974H	2011-02-08	2011-02-17	9	0.3	216

常用語法-DATA step-5

- 四則運算
  - 計算時間
  - 計算年齡

```
DATA day1;
SET day;
age=(in_date-birthday)/365.25;
RUN;
```

VIEWTABLE: Work.Day1

	ID	birthday	in_date	age
1	001551048C	1968-02-17	2010-04-17	42.162902122
2	001703646D	1952-03-08	2011-08-15	59.436002738
3	001770973I	1956-07-17	2012-06-09	55.89596167
4	001894090E	1980-10-05	2012-06-09	31.676933607
5	001908164C	1938-08-16	2007-02-18	68.509240246
6	001909199H	1939-12-01	2008-09-17	68.796714579
7	001971230C	1962-12-18	2007-06-04	44.459958932
8	001987207C	1950-10-27	2011-03-30	60.421629021
9	001995046A	1950-07-01	2011-07-08	61.018480493
10	002073609I	1959-06-22	2010-09-03	51.20054757
11	002090784A	1934-11-29	2010-03-09	75.274469541
12	002100581C	1953-06-30	2010-03-09	56.689938398
13	002185447H	1944-08-21	2011-09-04	67.036276523
14	002202193I	1940-12-05	2011-12-31	71.069130732
15	002216691C	1953-01-26	2011-06-10	58.368240931
16	002255705H	1983-03-15	2011-11-22	28.689938398
17	002275592G	1954-10-22	2007-01-14	52.229979466
18	002276512E	1962-05-15	2009-01-20	46.685831622
19	002279567B	1955-08-13	2011-02-08	55.490759754
20	002284974H	1934-10-22	2011-02-08	76.298425736

常用語法-DATA step-6

- 保留
  - **KEEP指令**
  - KEEP=
- 刪除
  - **DROP指令**
  - DROP=

VIEWTABLE: Work.Newtest

	ID	AGE	SEX	DM	HT	type2dm	year	season	w_year
1	A	20	1	1	1	1	102	spring	2013
2	B	22	2	0	1	0	102	spring	2013
3	C	21	1	1	0	1	102	spring	2013
4	D	23	2	1	1	1	102	spring	2013
5	E	20	1	.	.	.	102	spring	2013

VIEWTABLE: Work.New

	ID	AGE	SEX	DM
1	A	20	1	1
2	B	22	2	0
3	C	21	1	1
4	D	23	2	1
5	E	20	1	.

```
DATA new;
SET newtest;
KEEP id age sex dm;
RUN;
```

```
DATA new;
SET newtest;
DROP ht type2dm year season w_year;
RUN;
```

常用語法-DATA step-7

- 保留
  - KEEP指令
  - **KEEP=**
- 刪除
  - DROP指令
  - **DROP=**

VIEWTABLE: Work.Newtest

	ID	AGE	SEX	DM	HT	type2dm	year	season	w_year
1	A	20	1	1	1	1	102	spring	2013
2	B	22	2	0	1	0	102	spring	2013
3	C	21	1	1	0	1	102	spring	2013
4	D	23	2	1	1	1	102	spring	2013
5	E	20	1	.	.	.	102	spring	2013

VIEWTABLE: Work.New

	ID	AGE	SEX	DM
1	A	20	1	1

```
DATA new;
SET newtest(KEEP=id age sex dm);
RUN;

DATA new(KEEP=id age sex dm);
SET newtest;
RUN;
```

```
DATA new;
SET newtest(DROP=ht type2dm year season w_year);
RUN;

DATA new(DROP=ht type2dm year season w_year);
SET newtest;
RUN;
```

常用語法-DATA step-8

- 保留
  - KEEP指令
  - **KEEP=**
- 刪除
  - DROP指令
  - **DROP=**

```
PROC PRINT DATA=newtest(KEEP=id age sex dm);
RUN;

PROC PRINT DATA=newtest(DROP=ht type2dm year season w_year);
RUN;
```

The SAS System

Obs	id	age	sex	dm
1	A	20	1	1
2	B	22	2	0
3	C	21	1	1
4	D	23	2	1
5	E	20	1	.

常用語法-DATA step-9

- 條件限制
  - IF…; (只分析某類個案)
    - IF…THEN…; (選擇或刪除某些個案)
    - IF…THEN…; ELSE…; (進行併組、分類)
    - IF…THEN…; ELSE IF…; (每個條件均有**排他性**)
    - IF…THEN **DO**; …; **END**; (同時進行兩個以上之步驟)

常用語法-DATA step-10

➢IF…; (只分析某類個案)

```
DATA dm1;
SET test5;
IF dm=1;
RUN;
```

VIEWTABLE: Work.Test5

	ID	AGE	SEX	DM	HT
1	A	20	1	1	1
2	B	22	2	0	1
3	C	21	1	1	0
4	D	23	2	1	1
5	E	20	1	.	.

VIEWTABLE: Work.Dm1

	ID	AGE	SEX	DM	HT
1	A	20	1	1	1
2	C	21	1	1	0
3	D	23	2	1	1

```
DATA dm2;
SET test5;
IF dm;
RUN;
```

VIEWTABLE: Work.Dm2

	ID	AGE	SEX	DM	HT
1	A	20	1	1	1
2	C	21	1	1	0
3	D	23	2	1	1

常用語法-DATA step-11

➢IF…THEN…; ELSE…; (進行併組、分類)

VIEWTABLE: Work.Test5

	ID	AGE	SEX	DM	HT
1	A	20	1	1	1
2	B	22	2	0	1
3	C	21	1	1	0
4	D	23	2	1	1
5	E	20	1	.	.

```
DATA del;
SET test5;
IF dm=. THEN delete;
IF sex=1 THEN gender=1; ELSE gender=0;
RUN;
```

VIEWTABLE: Work.Del

	ID	AGE	SEX	DM	HT	gender
1	A	20	1	1	1	1
2	B	22	2	0	1	0
3	C	21	1	1	0	1
4	D	23	2	1	1	0

常用語法-DATA step-12

➢IF…THEN…; ELSE IF…; (每個條件均有**排他性**)

```
DATA a2;
 SET a1;
 IF age<75 THEN agegp=0;
    ELSE IF 75<=age<80 THEN agegp=1;
    ELSE agegp=2;
 IF 0<bw<60 THEN bwgp=0;
    ELSE IF 60<=bw<70 THEN bwgp=1;
    ELSE IF 70<=bw<80 THEN bwgp=2;
    ELSE bwgp=3;
 IF bw<60 THEN bwgp1=0;
    ELSE IF 60<=bw<70 THEN bwgp1=1;
    ELSE IF 70<=bw<80 THEN bwgp1=2;
    ELSE bwgp1=3;
 RUN;
```

VIEWTABLE: Work.A2

	sex	age	bw	agegp	bwgp	bwgp1
		72	.	0	3	0
		80	79	2	2	2
		70	56	0	0	0
		68	85	0	3	3
		70	71	0	2	2
		70	.	0	3	0
		72	65	0	1	1
		72	60	0	1	1
		78	75	1	2	2
		81	55	2	0	0
		69	67	0	1	1
		81	62	2	1	1
		68	73	0	2	2
		70	55	0	0	0
		70	67	0	1	1
		76	.	1	3	0
		71	.	0	3	0
		68	.	0	3	0
		86	.	2	3	0
		81	70	2	2	2

常用語法-DATA step-13

➢ IF…THEN **DO**; …; **END**; (同時進行兩個以上之步驟)

```
DATA a3;
SET a1;
IF bw^=. THEN DO;
  IF bw<60 THEN bwgp1=0;
     ELSE IF 60<=bw<70 THEN bwgp1=1;
     ELSE IF 70<=bw<80 THEN bwgp1=2;
     ELSE bwgp1=3;
END;

IF edu=2 THEN DO;
   bmi=bw/((bh/100)**2);
END;
RUN;
```

	sex	age	edu	bh	bw	bwgp1	bmi
1	1	72	2	150	.	.	.
			2	164	79	2	29.372397383
			4	150	56	0	.
			2	174	85	3	28.075042938
			2	169	71	2	24.859073562
			1	142	.	.	.
			2	163	65	1	24.464601603
			2	163	60	1	22.582709172
			4	170	75	2	.
			1	150	55	0	.
			2	167	67	1	24.02380867
			2	165	62	1	22.77318641
			4	169	73	2	.
			3	160	55	0	.
			2	167	67	1	24.02380867
			2	142	.	.	.
			3	165	.	.	.
			1	148	.	.	.
			4	152	.	.	.
20	0	81	1	160	70	2	.

常用語法-DATA step-14

➢ 設**Dummy variable** (虛擬變項、啞變項)

IF…THEN **DO**; …; **END**;

```
DATA a4;
SET a1(KEEP=edu);
IF edu=1 THEN DO; edu1=0; edu2=0; edu3=0; END;
IF edu=2 THEN DO; edu1=1; edu2=0; edu3=0; END;
IF edu=3 THEN DO; edu1=0; edu2=1; edu3=0; END;
IF edu=4 THEN DO; edu1=0; edu2=0; edu3=1; END;
RUN;
```

: Work.A4

	edu	edu1	edu2	edu3
	2	1	0	0
	2	1	0	0
	4	0	0	1
	2	1	0	0
	2	1	0	0
	1	0	0	0
	2	1	0	0
8	2	1	0	0
9	4	0	0	1
10	1	0	0	0
11	2	1	0	0
12	2	1	0	0
13	4	0	0	1
14	3	0	1	0
15	2	1	0	0
16	2	1	0	0
17	3	0	1	0
18	1	0	0	0
19	4	0	0	1
20	1	0	0	0

常用語法-PROC step-1

- **PROC SORT** data=a; **BY** id; **RUN**;
  - 刪除重覆資料
    - **NODUPKEY**
    - **NODUP**

```
PROC SORT DATA=double
                OUT=dupk1 NODUPKEY;
BY id;
RUN;
```

```
PROC SORT DATA=double
                OUT=dup NODUP;
BY id;
RUN;
```

常用語法-PROC step-2

VIEWTABLE: Work.Double

	ID	in_date	out_date	drug_name	dose	no1
1	001930347A	2011-05-31	2011-06-17	MORPHINE INJ 10MG	1	1
2	001930347A	2011-05-31	2011-06-17	FENTANYL TTS 25UG	1	2
3	001930347A	2011-05-31	2011-06-17	FENTANYL TTS 50UG	1	3
4	001930347A	2011-05-31	2011-06-17	MORPHINE INJ 10MG	1	4
5	001946615A	2009-04-18	2009-04-25	MORPHINE INJ 10MG	4	1
6	001946615A	2009-04-18	2009-04-25	FENTANYL TTS 25UG	1	2
7	001946615A	2009-04-18	2009-04-25	FENTANYL TTS 50UG	1	3
8	001946615A	2009-04-18	2009-04-25	MORPHINE INJ 10MG	4	4
9	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 25UG	1	1
10	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 50UG	1	2
11	002004854I	2009-06-10	2009-07-04	PETHIDINE INJ 50MG	1	3
12	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 25UG	1	4
13	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 50UG	1	
14	002009016I	2009-06-17	2009-06-22	MORPHINE TAB 10MG	1	
15	002009016I	2009-06-17	2009-06-22	MORPHINE CONT. TAB	2	
16	002009016I	2009-06-17	2009-06-22	MORPHINE INJ 10MG	4	
17	002009016I	2009-06-17	2009-06-22	MORPHINE TAB 10MG	1	
18	002009016I	2009-06-17	2009-06-22	MORPHINE CONT. TAB	2	
19	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 50UG	1	
20	002010072F	2009-05-14	2009-05-19	MORPHINE INJ 10MG	2	
21	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 25UG	1	
22	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 50UG	1	
23	002010072F	2009-05-14	2009-05-19	MORPHINE INJ 10MG	2	
24	002032284D	2012-12-21	2012-12-23	MORPHINE INJ 10MG	2	
25	002032284D	2012-12-21	2012-12-23	ULTRACET TAB	2	
26	002032284D	2012-12-21	2012-12-23	FENTANYL TTS 50UG	1	
27	002032284D	2012-12-21	2012-12-23	MORPHINE INJ 10MG	2	
28	002040261D	2009-08-24	2009-09-23	MORPHINE TAB 10MG	2	
29	002040261D	2009-08-24	2009-09-23	FENTANYL TTS 50UG	1	
30	002040261D	2009-08-24	2009-09-23	MORPHINE INJ 10MG	2	
31	002040261D	2009-08-24	2009-09-23	MORPHINE TAB 10MG	2	
32	002098121J	2010-11-10	2010-11-13	MORPHINE TAB 10MG	1	
33	002098121J	2010-11-10	2010-11-13	CODEINE TAB 30MG	3	
34	002098121J	2010-11-10	2010-11-13	MORPHINE INJ 10MG	1	
35	002098121J	2010-11-10	2010-11-13	MORPHINE TAB 10MG	1	
36	002165382H	2011-08-26	2011-09-22	MORPHINE CONT. TAB	2	
37	002165382H	2011-08-26	2011-09-22	FENTANYL TTS 50UG	1	
38	002165382H	2011-08-26	2011-09-22	MORPHINE INJ 10MG	1	
39	002165382H	2011-08-26	2011-09-22	MORPHINE CONT. TAB	2	
40	002280625D	2012-12-07	2012-12-21	TRAMAL INJ 100MG	2	
41	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 25UG	1	
42	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 50UG	5	3
43	002280625D	2012-12-07	2012-12-21	MORPHINE INJ 10MG	4	4
44	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 25UG	1	5
45	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 50UG	5	6
46	002280625D	2012-12-07	2012-12-21	MORPHINE INJ 10MG	4	7

```
PROC SORT DATA=double
                OUT=dupk1 NODUPKEY;
 BY id;
 RUN;
```

VIEWTABLE: Work.Dupk1

	ID	in_date	out_date	drug_name	dose	no1
1	001930347A	2011-05-31	2011-06-17	MORPHINE INJ 10MG	1	1
2	001946615A	2009-04-18	2009-04-25	MORPHINE INJ 10MG	4	1
3	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 25UG	1	1
4	002009016I	2009-06-17	2009-06-22	MORPHINE TAB 10MG	1	1
5	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 50UG	1	1
6	002032284D	2012-12-21	2012-12-23	MORPHINE INJ 10MG	2	1
7	002040261D	2009-08-24	2009-09-23	MORPHINE TAB 10MG	2	1
8	002098121J	2010-11-10	2010-11-13	MORPHINE TAB 10MG	1	1
9	002165382H	2011-08-26	2011-09-22	MORPHINE CONT. TAB	2	1
10	002280625D	2012-12-07	2012-12-21	TRAMAL INJ 100MG	2	1

```
61   proc sort data=double
62                   out=dupk1 nodupkey;
63   by id;
64   run;

NOTE: There were 46 observations read from the data set WORK.DOUBLE.
NOTE: 36 observations with duplicate key values were deleted.
NOTE: The data set WORK.DUPK1 has 10 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time           0.09 seconds
      cpu time            0.00 seconds
```

常用語法-PROC step-3

VIEWTABLE: Work.Double

	ID	in_date
1	001930347A	2011-05-31
2	001930347A	2011-05-31
3	001930347A	2011-05-31
4	001930347A	2011-05-31
5	001946615A	2009-04-18
6	001946615A	2009-04-18
7	001946615A	2009-04-18
8	001946615A	2009-04-18
9	002004854I	2009-06-10
10	002004854I	2009-06-10
11	002004854I	2009-06-10
12	002004854I	2009-06-10
13	002004854I	2009-06-10
14	002009016I	2009-06-17
15	002009016I	2009-06-17
16	002009016I	2009-06-17
17	002009016I	2009-06-17
18	002009016I	2009-06-17
19	002010072F	2009-05-14
20	002010072F	2009-05-14
21	002010072F	2009-05-14
22	002010072F	2009-05-14
23	002010072F	2009-05-14
24	002032284D	2012-12-21
25	002032284D	2012-12-21
26	002032284D	2012-12-21
27	002032284D	2012-12-21
28	002040261D	2009-08-24
29	002040261D	2009-08-24
30	002040261D	2009-08-24
31	002040261D	2009-08-24
32	002098121J	2010-11-10
33	002098121J	2010-11-10
34	002098121J	2010-11-10
35	002098121J	2010-11-10
36	002165382H	2011-08-26
37	002165382H	2011-08-26
38	002165382H	2011-08-26
39	002165382H	2011-08-26
40	002280625D	2012-12-07
41	002280625D	2012-12-07
42	002280625D	2012-12-07
43	002280625D	2012-12-07
44	002280625D	2012-12-07
45	002280625D	2012-12-07
46	002280625D	2012-12-07

VIEWTABLE: Work.Dup

	ID	in_date	out_date	drug_name	dose
1	001930347A	2011-05-31	2011-06-17	MORPHINE INJ 10MG	1
2	001930347A	2011-05-31	2011-06-17	FENTANYL TTS 25UG	1
3	001930347A	2011-05-31	2011-06-17	FENTANYL TTS 50UG	1
4	001930347A	2011-05-31	2011-06-17	MORPHINE INJ 10MG	1
5	001946615A	2009-04-18	2009-04-25	MORPHINE INJ 10MG	4
6	001946615A	2009-04-18	2009-04-25	FENTANYL TTS 25UG	1
7	001946615A	2009-04-18	2009-04-25	FENTANYL TTS 50UG	1
8	001946615A	2009-04-18	2009-04-25	MORPHINE INJ 10MG	4
9	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 25UG	1
10	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 50UG	1
11	002004854I	2009-06-10	2009-07-04	PETHIDINE INJ 50MG	1
12	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 25UG	1
13	002004854I	2009-06-10	2009-07-04	FENTANYL TTS 50UG	1
14	002009016I	2009-06-17	2009-06-22	MORPHINE TAB 10MG	
15	002009016I	2009-06-17	2009-06-22	MORPHINE CONT. TAB	
16	002009016I	2009-06-17	2009-06-22	MORPHINE INJ 10MG	
17	002009016I	2009-06-17	2009-06-22	MORPHINE TAB 10MG	
18	002009016I	2009-06-17	2009-06-22	MORPHINE CONT. TAB	
19	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 50UG	
20	002010072F	2009-05-14	2009-05-19	MORPHINE INJ 10MG	
21	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 25UG	
22	002010072F	2009-05-14	2009-05-19	FENTANYL TTS 50UG	
23	002010072F	2009-05-14	2009-05-19	MORPHINE INJ 10MG	
24	002032284D	2012-12-21	2012-12-23	MORPHINE INJ 10MG	
25	002032284D	2012-12-21	2012-12-23	ULTRACET TAB	2
26	002032284D	2012-12-21	2012-12-23	FENTANYL TTS 50UG	1
27	002032284D	2012-12-21	2012-12-23	MORPHINE INJ 10MG	2
28	002040261D	2009-08-24	2009-09-23	MORPHINE TAB 10MG	2
29	002040261D	2009-08-24	2009-09-23	FENTANYL TTS 50UG	1
30	002040261D	2009-08-24	2009-09-23	MORPHINE INJ 10MG	2
31	002040261D	2009-08-24	2009-09-23	MORPHINE TAB 10MG	2
32	002098121J	2010-11-10	2010-11-13	MORPHINE TAB 10MG	1
33	002098121J	2010-11-10	2010-11-13	CODEINE TAB 30MG	3
34	002098121J	2010-11-10	2010-11-13	MORPHINE INJ 10MG	1
35	002098121J	2010-11-10	2010-11-13	MORPHINE TAB 10MG	1
36	002165382H	2011-08-26	2011-09-22	MORPHINE CONT. TAB	2
37	002165382H	2011-08-26	2011-09-22	FENTANYL TTS 50UG	1
38	002165382H	2011-08-26	2011-09-22	MORPHINE INJ 10MG	1
39	002165382H	2011-08-26	2011-09-22	MORPHINE CONT. TAB	2
40	002280625D	2012-12-07	2012-12-21	TRAMAL INJ 100MG	2
41	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 25UG	1
42	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 50UG	5
43	002280625D	2012-12-07	2012-12-21	MORPHINE INJ 10MG	4
44	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 25UG	1
45	002280625D	2012-12-07	2012-12-21	FENTANYL TTS 50UG	5
46	002280625D	2012-12-07	2012-12-21	MORPHINE INJ 10MG	4

```
PROC SORT DATA=double
          OUT=dup NODUP;
BY id;
RUN;
```

```
66    proc sort data=double
67                  out=dup nodup;
68    by id;
69    run;

NOTE: There were 46 observations read from the data set WORK.DOUBLE.
NOTE: 0 duplicate observations were deleted.
NOTE: The data set WORK.DUP has 46 observations and 6 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time           0.02 seconds
      cpu time            0.01 seconds
```

常用語法-PROC step-4

- 單變項分析
  - 等距變項
    - **PROC UNIVARIATE** data=a; **VAR** age s1-s5; **RUN**;
  - 類別、序位變項
    - **PROC FREQ** data=a; **TABLES** sex b1-b5; **RUN**;

常用語法-PROC step-5

```
PROC UNIVARIATE DATA=type;
VAR age bh bw;
RUN;
```

Quantiles (Definition 5)

Quantile	Estimate
100% Max	88.0
99%	88.0
95%	82.0
90%	81.0
75% Q3	75.5
50% Median	72.0
25% Q1	69.5
10%	68.0
5%	67.5
1%	67.0
0% Min	67.0

The UNIVARIATE Procedure
Variable: age

Moments

N	100	Sum Weights	100
Mean	73.11	Sum Observations	7311
Std Deviation	4.98055816	Variance	24.8059596
Skewness	1.05405006	Kurtosis	0.53012719
Uncorrected SS	536963	Corrected SS	2455.79
Coeff Variation	6.81241713	Std Error Mean	0.49805582

Basic Statistical Measures

Location		Variability	
Mean	73.11000	Std Deviation	4.98056
Median	72.00000	Variance	24.80596
Mode	68.00000	Range	21.00000
		Interquartile Range	6.00000

Tests for Location: Mu0=0

Test	-Statistic-		-----p Value------	
Student's t	t	146.7908	Pr > |t|	<.0001
Sign	M	50	Pr >= |M|	<.0001
Signed Rank	S	2525	Pr >= |S|	<.0001

Extreme Observations

----Lowest----		----Highest---	
Value	Obs	Value	Obs
67	82	82	55
67	79	84	44
67	50	86	19
67	42	88	62
67	27	88	78

常用語法-PROC step-6

```
PROC FREQ DATA=type;
TABLES sex smk alc;
RUN;
```

The FREQ Procedure

sex	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	58	58.00	58	58.00
1	42	42.00	100	100.00

smk	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	81	81.00	81	81.00
1	19	19.00	100	100.00

alc	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	75	75.00	75	75.00
1	25	25.00	100	100.00

常用語法-PROC step-7

- 雙變項分析
  - 獨立樣本
    - 等距
      - **PROC TTEST** data=a; **CLASS** sex; **VAR** age s1-s5; **RUN**;
      - **PROC ANOVA** data=a; **CLASS** 類別變項;
        MODEL 等距變項=類別變項; **RUN**;
    - 類別
      - **PROC FREQ** data=a; **TABLES** sex*dis/**CHISQ**; **RUN**;
  - 相依樣本(前後測)
    - 等距
      - **PROC TTEST** data=a; **PAIRED** a*b; **RUN**;

常用語法-PROC step-8

```
PROC TTEST DATA=type;
 CLASS sex;
 VAR age bw;
 RUN;
```

Variable: age

sex	N	Mean	Std Dev	Std Err	Minimum	Maximum
0	58	73.0517	5.0729	0.6661	67.0000	88.0000
1	42	73.1905	4.9101	0.7576	68.0000	88.0000
Diff (1-2)		-0.1388	5.0054	1.0142		

sex	Method	Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0		73.0517	71.7179	74.3856	5.0729	4.2887	6.2108
1		73.1905	71.6604	74.7206	4.9101	4.0401	6.2612
Diff (1-2)	Pooled	-0.1388	-2.1513	1.8738	5.0054	4.3921	5.8195
Diff (1-2)	Satterthwaite	-0.1388	-2.1429	1.8654			

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	98	-0.14	0.8915
Satterthwaite	Unequal	90.14	-0.14	0.8909

Equality of Variances

Method	Num DF	Den DF	F Value	Pr > F
Folded F	57	41	1.07	0.8354

常用語法-PROC step-9

```
PROC FREQ DATA=type;
TABLES sex*smk/CHISQ;
RUN;
```

Statistics for Table of sex by smk

Statistic	DF	Value	Prob
Chi-Square	1	4.2252	0.0398
Likelihood Ratio Chi-Square	1	4.5206	0.0335
Continuity Adj. Chi-Square	1	3.2303	0.0723
Mantel-Haenszel Chi-Square	1	4.1830	0.0408
Phi Coefficient		-0.2056	
Contingency Coefficient		0.2013	
Cramer's V		-0.2056	

Fisher's Exact Test

Cell (1,1) Frequency (F)	43
Left-sided Pr <= F	0.0335
Right-sided Pr >= F	0.9916
Table Probability (P)	0.0252
Two-sided Pr <= P	0.0687

Sample Size = 100

The FREQ Procedure

Table of sex by smk

sex smk

Frequency Percent Row Pct Col Pct	0	1	Total
0	43 43.00 74.14 53.09	15 15.00 25.86 78.95	58 58.00
1	38 38.00 90.48 46.91	4 4.00 9.52 21.05	42 42.00
Total	81 81.00	19 19.00	100 100.00

常用語法-PROC step-10

```
PROC FREQ DATA=type;
 TABLES sex*smk/CHISQ NOPERCENT NOROW;
 RUN;
```

The FREQ Procedure

Table of sex by smk

sex	smk		
Frequency Col Pct	0	1	Total
0	43 53.09	15 78.95	58
1	38 46.91	4 21.05	42
Total	81	19	100

```
PROC FREQ DATA=type;
 TABLES sex*smk/CHISQ NOPERCENT NOCOL;
 RUN;
```

sex	smk		
Frequency Row Pct	0	1	Total
0	43 74.14	15 25.86	58
1	38 90.48	4 9.52	42
Total	81	19	100

```
PROC FREQ DATA=type;
 TABLES sex*smk/CHISQ NOPERCENT NOROW NOCOL;
 RUN;
```

sex	smk		
Frequency	0	1	Total
0	43	15	58
1	38	4	42
Total	81	19	100

常用語法-PROC step-11

```
PROC FREQ DATA=fisher;
 TABLES sex*smk/CHISQ NOPERCENT NOROW EXPECTED;
 RUN;
```

```
                Statistics for Table of sex by smk

Statistic                     DF       Value      Prob
------------------------------------------------------
Chi-Square                     1      0.5000    0.4795
Likelihood Ratio Chi-Square    1      0.5149    0.4730
Continuity Adj. Chi-Square     1      0.1250    0.7237
Mantel-Haenszel Chi-Square     1      0.4917    0.4832
Phi Coefficient                      -0.0913
Contingency Coefficient               0.0909
Cramer's V                           -0.0913

 WARNING: 25% of the cells have expected counts less
          than 5. Chi-Square may not be a valid test.


                Fisher's Exact Test
                ----------------------------------
                Cell (1,1) Frequency (F)        29
                Left-sided Pr <= F          0.3682
                Right-sided Pr >= F         0.8559

                Table Probability (P)       0.2241
                Two-sided Pr <= P           0.7255

                     Sample Size = 60
```

```
                Table of sex by smk

sex          smk

Frequency|
Expected |
Col Pct  |        0|        1|  Total
---------+--------+--------+
       0 |       29|        7|     36
         |       30|        6|
         |    58.00|   70.00|
---------+--------+--------+
       1 |       21|        3|     24
         |       20|        4|
         |    42.00|   30.00|
---------+--------+--------+
Total            50        10       60
```

Thank you

For your

attention!!