2020/11/06(五), 109 學年第一學期 資料科學應用 R 作業(2)

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(請依照規定)貼上執行程式碼及執行結果。
詳見: R 程式作業繳交方式
http://www.hmwu.idv.tw/web/teaching/doc/R-how-homework.pdf

```
> #2020/11/06  作業
>
> #ex1.13(a)
> lm.obj <- lm(airquality$Wind ~ airquality$Temp)
> lm.anova <- anova(lm.obj)
> lm.summary <- summary(lm.obj)
>
> lm.obj

Call:
lm(formula = airquality$Wind ~ airquality$Temp)

Coefficients:
    (Intercept)    airquality$Temp
        23.2337           -0.1705

> lm.anova
Analysis of Variance Table

Response: airquality$Wind
                 Df    Sum Sq Mean Sq F value     Pr(>F)
airquality$Temp    1    395.71   395.71    40.08 2.642e-09 ***
Residuals        151 1490.84      9.87
---
Signif. codes:   0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> lm.summary

Call:
lm(formula = airquality$Wind ~ airquality$Temp)
```

Residuals:

Min	1Q	Median	3Q	Max
-8.5784	-2.4489	-0.2261	1.9853	9.7398

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	23.23369	2.11239	10.999	< 2e-16	***
airquality$Temp	-0.17046	0.02693	-6.331	2.64e-09	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.142 on 151 degrees of freedom

Multiple R-squared: 0.2098,   Adjusted R-squared: 0.2045

F-statistic: 40.08 on 1 and 151 DF,   p-value: 2.642e-09

```
>
> #用 class 去判斷物件類別
> class(lm.anova)
[1] "anova"          "data.frame"
> #用 str 去判斷資料結構
> str(lm.anova)
Classes 'anova' and 'data.frame':   2 obs. of   5 variables:
 $ Df      : int   1 151
 $ Sum Sq : num    396 1491
 $ Mean Sq: num    395.71 9.87
 $ F value: num    40.1 NA
 $ Pr(>F) : num    2.64e-09 NA
 - attr(*, "heading")= chr [1:2] "Analysis of Variance Table\n" "Response:
airquality$Wind"
>
> #ex1.13(b)
> #用 attributes 去判斷資料屬性
> attributes(lm.summary)
$names
 [1] "call"             "terms"            "residuals"        "coefficients"
 [5] "aliased"          "sigma"            "df"               "r.squared"
 [9] "adj.r.squared" "fstatistic"       "cov.unscaled"
```

$class
[1] "summary.lm"

> #加入$取出 R2
> lm.summary$r.squared
[1] 0.2097529
>
>
> #ex1.20(a)
> #用 table 讀檔並用 "\t" 分隔
> data_statlog_vehicle_846x18 <- read.table("data/statlog_vehicle_846x18.txt", sep="\t")
> data_statlog_vehicle_846x18

	V1	V2	V3	V4	V5	V6	V7
1	no	class	compactness	circularity	distance	radiusratio	pr.axis
2	1	0	96	55	103	201	65
3	2	0	101	56	100	215	69
4	3	0	93	35	66	154	59
5	4	0	101	48	107	222	68
6	5	0	87	38	85	177	61
7	6	0	95	48	104	214	67
8	7	0	98	55	101	228	70
9	8	0	107	53	103	221	66
10	9	0	103	50	98	212	63
11	10	0	77	38	63	135	59
12	11	0	89	41	75	143	56
13	12	0	98	55	101	219	69
14	13	0	96	55	98	161	54
15	14	0	97	59	108	227	70
16	15	0	92	39	91	191	62
17	16	0	73	37	53	111	54
18	17	0	101	53	103	203	63
19	18	0	79	40	80	133	55
20	19	0	80	37	57	116	55
21	20	0	94	38	84	158	55
22	21	0	97	50	108	211	65
23	22	0	95	46	105	219	68

24 23	0	99	46	105	209	64
25 24	0	85	39	77	151	59
26 25	0	77	38	75	144	59
27 26	0	88	35	50	121	58
28 27	0	100	45	100	209	65
29 28	0	102	54	100	163	53
30 29	0	106	49	107	194	57
31 30	0	95	45	80	186	62
32 31	0	103	54	107	218	64
33 32	0	93	35	72	172	62
34 33	0	85	36	78	149	55
35 34	0	91	45	75	154	57
36 35	0	82	38	53	125	59
37 36	0	107	52	101	218	64
38 37	0	98	54	104	186	59
39 38	0	103	54	91	179	57
40 39	0	108	51	103	197	60
41 40	0	84	39	90	180	60
42 41	0	78	36	60	116	56
43 42	0	98	45	76	166	60
44 43	0	101	51	105	212	68
45 44	0	90	36	78	179	64
46 45	0	97	48	94	198	63
47 46	0	111	54	103	171	50
48 47	0	103	55	100	194	62
49 48	0	92	46	79	176	64
50 49	0	101	56	100	168	55

	V8	V9	V10	V11	V12	V13
1	max.length	scatterratio	elongatedness	pr.axis max.length	scaledvmi	
2	9	204	32	23	166	227
3	10	208	32	24	169	227
4	6	142	46	18	128	162
5	10	208	32	24	154	232
6	8	164	40	20	129	186
7	9	205	32	23	151	227

8	9	210	31	24	168	236
9	11	209	32	24	163	222
10	9	193	34	22	161	214
11	5	130	52	18	130	145
12	7	146	46	19	137	170
13	11	225	30	25	178	231
14	10	215	31	24	175	226
15	11	224	30	25	186	225
16	8	176	37	21	137	196
17	6	126	55	18	128	135
18	9	195	34	22	162	210
19	7	147	47	19	135	172
20	6	125	54	18	125	142
21	9	169	39	20	130	196
22	10	214	31	24	156	232
23	9	201	33	23	148	223
24	11	197	34	23	152	212
25	8	150	45	19	134	176
26	6	147	46	19	132	167
27	5	114	59	17	122	

						132
28	8	201	32	23	147	231
29	10	213	31	24	173	219
30	11	214	31	24	161	224
31	7	164	40	20	145	188
32	12	222	30	25	174	221
33	7	149	44	19	124	169
34	7	147	45	19	128	168
35	6	150	44	19	146	170
36	5	133	51	18	128	152
37	11	202	33	23	164	219
38	10	213	32	24	172	223
39	11	220	31	25	170	220
40	11	211	31	24	160	222
41	7	177	37	21	131	209
42	6	123	55	17	124	141
43	7	157	42	20	148	184
44	10	209	32	24	162	222
45	8	157	42	19	126	182
46	9	181	36	21	155	

	V14	V15	V16	V17	V18	V19	V20
							200
47	11	221		30	25	172	227
48	11	212		31	24	175	217
49	8	162		41	20	149	183
50	11	214		31	24	175	219

	V14	V15	V16	V17	V18	V19	V20
1	scaledvma	scaledradius	skewness	skewness	kurtosis	kurtosis	hollows
2	624	246	74	6	2	186	194
3	651	223	74	6	5	186	193
4	304	120	64	5	13	197	202
5	641	204	70	5	38	190	202
6	402	130	63	1	25	198	205
7	628	202	74	5	9	186	193
8	661	245	72	1	6	188	197
9	653	212	66	0	1	191	201
10	567	185	64	5	5	198	204
11	247	139	79	13	21	183	187
12	317	156	76	18	5	184	188
13	748	216	74	6	14	187	195
14	683	221	76	3	6	185	193

15	732	218	70	10	25	186	198
16	466	151	67	3	23	192	200
17	227	147	82	1	15	176	184
18	571	210	68	5	5	191	198
19	311	144	76	8	30	181	193
20	229	132	81	8	5	178	184
21	430	155	69	9	15	190	195
22	683	218	72	7	29	188	197
23	602	201	69	5	38	191	202
24	575	159	65	0	33	194	205
25	331	133	73	0	16	184	193
26	315	136	80	16	20	181	187
27	192	138	74	21	4	182	187
28	611	189	72	5	5	189	195
29	669	201	76	12	27	187	195
30	670	172	67	0	39	192	206
31	406	178	65	11	18	199	204
32	728	199	67	0	18	189	200
33	334	125	62	5	30	203	210

34	321	134	64	10	24	197
203						
35	335	180	66	16	2	193
198						
36	259	146	87	0	0	177
183						
37	610	192	65	17	2	197
206						
38	665	217	73	1	26	186
195						
39	707	198	72	1	32	186
198						
40	661	187	67	7	3	190
200						
41	469	145	71	4	38	190
198						
42	221	121	78	3	16	178
185						
43	371	186	69	13	10	190
196						
44	653	224	73	5	23	186
195						
45	367	142	66	1	20	192
198						
46	494	189	64	20	11	199
203						
47	727	201	69	15	6	190
198						
48	666	219	73	10	14	187
194						
49	396	178	67	2	10	191
198						
50	681	224	74	2	3	185
192						

```
 [ reached 'max' / getOption("max.print") -- omitted 797 rows ]
>
> #列出陣列維度
> dim(data_statlog_vehicle_846x18)
```

[1] 847   20

>

> #列出前後五筆資料

> #前五筆

> head(data_statlog_vehicle_846x18)

	V1	V2	V3	V4	V5	V6	V7
1	no	class	compactness	circularity	distance	radiusratio	pr.axis
2	1	0	96	55	103	201	65
3	2	0	101	56	100	215	69
4	3	0	93	35	66	154	59
5	4	0	101	48	107	222	68
6	5	0	87	38	85	177	61

	V8	V9	V10	V11	V12	V13
1	max.length	scatterratio	elongatedness	pr.axis	max.length	scaledvmi
2	9	204	32	23	166	227
3	10	208	32	24	169	227
4	6	142	46	18	128	162
5	10	208	32	24	154	232
6	8	164	40	20	129	186

	V14	V15	V16	V17	V18	V19	V20
1	scaledvma	scaledradius	skewness	skewness	kurtosis	kurtosis	hollows
2	624	246	74	6	2	186	194
3	651	223	74	6	5	186	193
4	304	120	64	5	13	197	202
5	641	204	70	5	38	190	202
6	402	130	63	1	25	198	205

> #後五筆

> tail(data_statlog_vehicle_846x18)

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18
842	841	3	95	49	82	139	56	11	159	43	20	162	173	365	185	75	7	10
843	842	3	87	45	66	139	58	8	140	47	18	148	168	294	175	73	3	12
844	843	3	95	43	76	142	57	10	151	44	19	149	173	339	159	71	2	23
845	844	3	90	44	72	157	64	8	137	48	18	144	159	283	171	65	9	4
846	845	3	89	46	84	163	66	11	159	43	20	159	173	368	176	72	1	20
847	846	3	85	36	66	123	55	5	120	56	17	128	140	212	131	73	1	18

	V19	V20
842	182	191
843	188	196

```
844 187 200
845 196 203
846 186 197
847 186 190
>
> #看記憶體站比
> object.size(data_statlog_vehicle_846x18)
267448 bytes
>
>
> #ex1.28(a)
> #讀檔 skip 第一列
> data_stock_data.txt <- read.table("data/stock-data.txt",    header = TRUE, sep="\t",
skip = 1)
> data_stock_data.txt
```

	半導體公司	年度	月份	最高價	最低價	加權平均價	成交筆數
1	台積電	100	1	78.30	69.60	74.30	263,999
2	台積電	100	2	77.00	69.90	72.54	235,159
3	台積電	100	3	72.20	65.70	69.74	276,434
4	台積電	100	4	73.90	68.00	71.37	211,611
5	台積電	100	5	76.90	73.00	74.96	213,185
6	台積電	100	6	78.20	70.40	74.70	260,507
7	台積電	100	7	73.90	68.50	71.59	238,386
8	台積電	100	8	72.80	62.20	66.61	305,409
9	台積電	100	9	72.10	65.90	69.11	266,720
10	台積電	100	10	74.00	68.10	70.70	181,361
11	台積電	100	11	76.00	71.30	74.03	197,579
12	台積電	100	12	76.80	72.00	75.00	179,107
13	威盛	100	1	33.40	29.30	30.97	55,107
14	威盛	100	2	32.65	28.35	30.54	26,901
15	威盛	100	3	35.45	28.50	32.01	55,802
16	威盛	100	4	32.80	27.55	30.35	27,568
17	威盛	100	5	32.60	25.95	29.40	37,516
18	威盛	100	6	37.25	31.20	34.68	89,247
19	威盛	100	7	38.15	32.45	35.47	67,463
20	威盛	100	8	35.40	26.60	30.13	45,393
21	威盛	100	9	29.00	23.10	26.17	24,781
22	威盛	100	10	25.15	20.40	23.39	25,791

23	威盛	100	11	25.70	18.70	22.74	29,099
24	威盛	100	12	20.20	14.80	16.96	21,092
25	聯發科	100	1	424.00	378.00	403.55	106,530
26	聯發科	100	2	380.00	325.50	348.98	97,339
27	聯發科	100	3	355.00	312.50	339.96	117,960
28	聯發科	100	4	354.00	301.00	328.65	87,638
29	聯發科	100	5	362.50	305.50	335.42	128,717
30	聯發科	100	6	331.00	295.00	311.57	110,521
31	聯發科	100	7	316.50	244.00	274.39	161,471
32	聯發科	100	8	298.00	221.00	262.09	249,066
33	聯發科	100	9	348.00	268.00	309.66	240,792
34	聯發科	100	10	345.00	310.50	329.66	185,407
35	聯發科	100	11	326.00	268.00	302.52	160,330
36	聯發科	100	12	292.00	243.00	268.01	135,509
37	聯電	100	1	18.20	15.50	17.19	258,572
38	聯電	100	2	18.30	15.30	16.38	150,872
39	聯電	100	3	16.10	13.90	14.92	209,011
40	聯電	100	4	15.65	14.55	15.21	125,663
41	聯電	100	5	15.30	14.25	14.76	116,087
42	聯電	100	6	15.15	13.85	14.51	125,348
43	聯電	100	7	14.50	12.95	13.89	122,812
44	聯電	100	8	13.15	10.15	11.13	169,781
45	聯電	100	9	12.05	10.65	11.25	127,617
46	聯電	100	10	13.70	11.05	12.39	113,378
47	聯電	100	11	13.30	11.60	12.68	107,400
48	聯電	100	12	13.60	11.70	12.51	99,760
49	旺宏	100	1	23.75	20.20	22.19	241,726
50	旺宏	100	2	22.95	20.30	21.49	113,440
51	旺宏	100	3	22.40	17.65	19.48	208,006
52	旺宏	100	4	19.65	18.05	18.88	107,292
53	旺宏	100	5	18.90	17.40	18.25	103,567
54	旺宏	100	6	18.15	16.90	17.60	72,617
55	旺宏	100	7	18.50	14.40	17.09	125,851
56	旺宏	100	8	14.50	10.25	11.84	152,177
57	旺宏	100	9	12.65	10.40	11.55	108,879
58	旺宏	100	10	12.00	10.25	11.31	68,571
59	旺宏	100	11	13.65	10.85	12.54	167,018
60	旺宏	100	12	12.85	11.15	12.17	115,192

	成交金額	成交股數	週轉率百分比
1	100,578,274,926	1,353,616,348	5.22
2	74,985,055,548	1,033,654,452	3.98
3	88,459,924,495	1,268,289,393	4.89
4	70,177,023,098	983,177,475	3.79
5	74,005,599,560	987,256,484	3.80
6	96,761,306,205	1,295,262,736	4.99
7	73,569,965,426	1,027,567,656	3.96
8	84,617,942,159	1,270,302,342	4.90
9	74,225,030,814	1,073,997,108	4.14
10	59,947,670,693	847,821,278	3.27
11	65,432,526,407	883,753,804	3.41
12	53,687,756,290	715,808,271	2.76
13	4,580,913,795	147,912,893	21.54
14	2,060,809,696	67,459,942	9.82
15	4,355,434,679	136,059,651	19.81
16	1,815,454,798	59,799,382	8.70
17	2,758,375,085	93,810,158	13.66
18	7,828,188,732	225,687,324	32.86
19	5,968,464,729	168,228,930	24.50
20	3,364,616,892	111,649,410	16.26
21	1,477,865,479	56,460,496	8.22
22	1,528,259,415	65,336,840	9.51
23	1,687,413,881	74,175,097	10.80
24	856,362,397	50,464,211	7.34
25	57,621,649,341	142,786,216	12.98
26	46,409,931,806	132,985,689	12.08
27	52,887,228,668	155,567,203	14.14
28	39,442,097,346	120,011,172	10.91
29	60,665,847,316	180,862,384	16.44
30	50,190,673,665	161,084,547	14.64
31	67,807,228,929	247,119,699	22.46
32	99,279,007,797	378,794,148	34.43
33	110,850,615,666	357,971,048	30.97
34	86,245,899,331	261,616,653	22.64
35	66,694,256,195	220,461,694	19.21
36	50,261,172,442	187,529,947	16.34
37	31,112,735,815	1,809,650,075	13.93

38	14,737,456,282	899,524,191	6.92
39	19,678,194,951	1,318,563,860	10.15
40	11,339,720,871	745,385,215	5.73
41	10,613,932,085	718,857,838	5.53
42	11,651,143,825	802,571,097	6.17
43	11,900,583,208	856,247,283	6.55
44	13,165,667,283	1,182,650,262	9.04
45	9,214,851,731	818,390,302	6.25
46	7,702,645,861	621,343,297	4.74
47	7,641,319,053	602,169,179	4.60
48	6,317,139,669	504,611,921	3.85
49	24,488,010,731	1,103,457,390	32.81
50	10,237,820,122	476,337,345	14.13
51	16,814,336,067	863,074,087	25.58
52	7,081,789,345	374,989,300	11.10
53	7,221,174,001	395,658,986	11.70
54	4,294,383,140	243,965,636	7.22
55	8,571,233,298	501,422,845	14.82
56	8,137,500,167	687,167,610	20.31
57	5,542,998,380	479,779,350	14.18
58	3,041,525,834	268,710,697	7.94
59	9,538,526,797	760,264,306	22.47
60	5,070,210,532	416,455,073	12.31

```
> #印出前五筆資料
> head(data_stock_data.txt)
```

	半導體公司	年度	月份	最高價	最低價	加權平均價	成交筆數
1	台積電	100	1	78.3	69.6	74.30	263,999
2	台積電	100	2	77.0	69.9	72.54	235,159
3	台積電	100	3	72.2	65.7	69.74	276,434
4	台積電	100	4	73.9	68.0	71.37	211,611
5	台積電	100	5	76.9	73.0	74.96	213,185
6	台積電	100	6	78.2	70.4	74.70	260,507

	成交金額	成交股數	週轉率百分比
1	100,578,274,926	1,353,616,348	5.22
2	74,985,055,548	1,033,654,452	3.98
3	88,459,924,495	1,268,289,393	4.89
4	70,177,023,098	983,177,475	3.79
5	74,005,599,560	987,256,484	3.80

```
6   96,761,306,205 1,295,262,736                4.99
> #印出後五筆資料
> tail(data_stock_data.txt)
     半導體公司 年度 月份 最高價 最低價 加權平均價 成交筆數       成交金
額
55         旺宏  100    7  18.50  14.40      17.09   125,851 8,571,233,298
56         旺宏  100    8  14.50  10.25      11.84   152,177 8,137,500,167
57         旺宏  100    9  12.65  10.40      11.55   108,879 5,542,998,380
58         旺宏  100   10  12.00  10.25      11.31    68,571 3,041,525,834
59         旺宏  100   11  13.65  10.85      12.54   167,018 9,538,526,797
60         旺宏  100   12  12.85  11.15      12.17   115,192 5,070,210,532
              成交股數 週轉率百分比
55 501,422,845              14.82
56 687,167,610              20.31
57 479,779,350              14.18
58 268,710,697               7.94
59 760,264,306              22.47
60 416,455,073              12.31
> #檢查資料類別物件
> class(data_stock_data.txt)
[1] "data.frame"
> str(data_stock_data.txt)
'data.frame':   60 obs. of    10 variables:
 $ 半導體公司    : chr   "台積電" "台積電" "台積電" "台積電" ...
 $ 年度        : int    100 100 100 100 100 100 100 100 100 100 ...
 $ 月份        : int    1 2 3 4 5 6 7 8 9 10 ...
 $ 最高價       : num    78.3 77 72.2 73.9 76.9 78.2 73.9 72.8 72.1 74 ...
 $ 最低價       : num    69.6 69.9 65.7 68 73 70.4 68.5 62.2 65.9 68.1 ...
 $ 加權平均價    : num    74.3 72.5 69.7 71.4 75 ...
 $ 成交筆數     : chr   "263,999" "235,159" "276,434" "211,611" ...
 $ 成交金額     : chr   "100,578,274,926" "74,985,055,548" "88,459,924,495"
"70,177,023,098" ...
 $ 成交股數     : chr   "1,353,616,348" "1,033,654,452" "1,268,289,393"
"983,177,475" ...
 $ 週轉率百分比: num    5.22 3.98 4.89 3.79 3.8 4.99 3.96 4.9 4.14 3.27 ...
> attributes(data_stock_data.txt)
$names
 [1] "半導體公司"     "年度"          "月份"          "最高價"
```

[5] "最低價"   "加權平均價"   "成交筆數"   "成交金額"
 [9] "成交股數"   "週轉率百分比"

$class
[1] "data.frame"

$row.names
 [1]   1   2   3   4   5   6   7   8   9 10 11 12 13 14 15 16 17 18 19 20 21 22
[23] 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44
[45] 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

> #轉換 成交筆數 成交金額 成交股數 為數字
> lapply(data_stock_data.txt, class)
$半導體公司
[1] "character"

$年度
[1] "integer"

$月份
[1] "integer"

$最高價
[1] "numeric"

$最低價
[1] "numeric"

$加權平均價
[1] "numeric"

$成交筆數
[1] "character"

$成交金額
[1] "character"

$成交股數

[1] "character"

$週轉率百分比
[1] "numeric"

```
> data_stock_data.txt$成交筆數  <- as.numeric(data_stock_data.txt$成交筆數)
Warning message:
強制變更過程中產生了  NA
> data_stock_data.txt$成交金額  <- as.numeric(data_stock_data.txt$成交金額)
Warning message:
強制變更過程中產生了  NA
> data_stock_data.txt$成交股數  <- as.numeric(data_stock_data.txt$成交股數)
Warning message:
強制變更過程中產生了  NA
> #確認轉換過去的資料型態
> lapply(data_stock_data.txt, class)
```
$半導體公司
[1] "character"

$年度
[1] "integer"

$月份
[1] "integer"

$最高價
[1] "numeric"

$最低價
[1] "numeric"

$加權平均價
[1] "numeric"

$成交筆數
[1] "numeric"

$成交金額

[1] "numeric"

$成交股數
[1] "numeric"

$週轉率百分比
[1] "numeric"

>
>
> #ex1.33(a)
> Dates <- c("0924", "1112", "1231", "1105", "0604", "0219", "0416", "0611", "0813", "1029")
> Time <- c("01:00", "04:00", "16:00", "23:00", "08:00", "09:00", "07:00", "17:00", "03:00", "14:00")
> Items <- c("shirt", "shirt", "pants", "jacket", "jacket", "shirt", "jacket", "jacket", "shoes", "shirt")
> Volume <- c(7951, 159, 1958, 6848, 3762, 3678, 8696, 9045, 6208, 1425)
> DateTime <- paste(Dates, Time)
> DateTime
  [1] "0924 01:00" "1112 04:00" "1231 16:00" "1105 23:00" "0604 08:00"
  [6] "0219 09:00" "0416 07:00" "0611 17:00" "0813 03:00" "1029 14:00"
> mySale <- data.frame(DateTime, Items, Volume)
> mySale
        DateTime   Items Volume
1   0924 01:00   shirt   7951
2   1112 04:00   shirt   159
3   1231 16:00   pants   1958
4   1105 23:00 jacket   6848
5   0604 08:00 jacket   3762
6   0219 09:00   shirt   3678
7   0416 07:00 jacket   8696
8   0611 17:00 jacket   9045
9   0813 03:00   shoes   6208
10 1029 14:00   shirt   1425
> str(mySale)
'data.frame':   10 obs. of   3 variables:
  $ DateTime: chr   "0924 01:00" "1112 04:00" "1231 16:00" "1105 23:00" ...

```
  $ Items    : chr   "shirt" "shirt" "pants" "jacket" ...
  $ Volume   : num   7951 159 1958 6848 3762 ...
>
> #lapply 列出類別
> lapply(mySale,class)
$DateTime
[1] "character"

$Items
[1] "character"

$Volume
[1] "numeric"

> #用 strptime()更改
> mySale$DateTime <- strptime(mySale$DateTime,"%m%d %H:%M")
> #檢查是否轉換成功
> class(mySale$DateTime)
[1] "POSIXlt" "POSIXt"
> #轉換以下類別
> mySale$DateTime <- as.POSIXct(mySale$DateTime)
> mySale$Items <- as.factor(mySale$Items)
> mySale$Volume <- as.numeric(mySale$Volume)
> #用 lapply()去確認所有類別
> lapply(mySale,class)
$DateTime
[1] "POSIXct" "POSIXt"

$Items
[1] "factor"

$Volume
[1] "numeric"

> str(mySale)
'data.frame':   10 obs. of   3 variables:
  $ DateTime: POSIXct, format: "2020-09-24 01:00:00" ...
  $ Items   : Factor w/ 4 levels "jacket","pants",..: 3 3 2 1 1 3 1 1 4 3
```

```
  $ Volume    : num    7951 159 1958 6848 3762 ...
>
> #ex1.33(b)
> #用 mySale$Items 擷取出 mySale 中 Items 的 DateTime >="0700 00:00"商品  並存
成 after_july
> after_july <- mySale$Items[DateTime >="0700 00:00"]
> after_july
[1] shirt   shirt   pants   jacket shoes   shirt
Levels: jacket pants shirt shoes
> #用 mySale$Volume 擷取出 mySale 中 Volume 的 DateTime >="0700 00:00"銷售量
並計算 mean 存成 after_july_meanVolume
> after_july_meanVolume <- mean(mySale$Volume[DateTime >="0700 00:00"])
> after_july_meanVolume
[1] 4091.5
>
```