1. normal & variances are equal

(a) independent

(b) H_0: CBF rate and weights are unrelated to smoking

   H_1: CBF rate or weights is related to smoking

(c) either

	weights	CBF
G1	91.53 (16.86)	59.97 (20.02)
G2	94.24 (15.78)	78.64 (29.59)

$\overline{X_{G1}} = \dfrac{23 \times 91.53 + 23 \times 59.97}{46} = 75.75$

$SS_{group} = 46(75.75 - 81.72)^2 + 74(86.44 - 81.72)^2$
$= 3288.83$ df = 1

$\overline{X_{G2}} = \dfrac{37 \times 94.24 + 37 \times 78.64}{74} = 86.44$

$SS_{w.c} = 60(93.2 - 81.72)^2 + 60(71.48 - 81.72)^2$
$= 1419.89$ df = 1

$\overline{X_w} = \dfrac{23 \times 91.53 + 37 \times 94.24}{60} = 93.2$

$SS_{group \times w.c} = 23(91.53 - 81.72)^2 + 23(59.97 - 81.72)^2$
$+ 37(94.24 - 81.72)^2 + 37(78.64 - 81.72)^2$

$\overline{X_c} = \dfrac{23 \times 59.97 + 37 \times 78.64}{60} = 71.48$

$= 1924.46$ df = 1

$\overline{X_{all}} = \dfrac{75.75 + 86.44 + 93.2 + 71.48}{4} = 81.72$

$SS_{residual} = 16.86^2 \times 22 + 20.02^2 \times 22 +$
$15.78^2 \times 36 + 29.59^2 \times 36 = 55556.07$
df = 116

	SS	df	MS	F		
w.c	1419.89	1	1419.89	$F_{1,116} = 2.96$	$p > 0.05$	
group	3288.83	1	3288.83	$F_{1,116} = 6.87$	$p < 0.05$	reject
w.c × group	1924.46	1	1924.46	$F_{1,116} = 4.02$	$p < 0.05$	reject
residual	55556.07	116	478.93			

1.

Weights /

Group	#	mean	std
1	23	91.53	16.86
2	37	94.24	15.78

$$\bar{X} = \frac{23 \times 91.53 + 37 \times 94.24}{60} = 93.2$$

$SS_B = 23(91.53 - 93.2)^2 + 37(94.24 - 93.2)^2 = 104.16$ $df = 1$

$SS_W = 16.86^2 \times 22 + 15.78^2 \times 36 = 15218.01$ $df = 58$

$MS_B = 104.16$ $MS_W = 262.4$ $F_{1.58} = 0.397$ $P \gg 0.05$ can't reject

Weights is unrelated to smoking

CBF /

Group	#	m	sd
1	23	59.97	20.02
2	37	78.64	29.59

$\bar{X} = 71.48$

$SS_B = 4943.87$ $SS_W = 40338.1$ $MS_W = 695.48$ $F_{1.58} = 7.1$

$P \approx 0.01$

reject H_0

CBF is unrelated to smoking.

2.

group	#	mean	SD
A	10	2.44	1
B	10	5.88	2.21
C	10	8.17	2.33

H_0: 和照什麼光無關

H_1: 和照什麼光有關

$$\bar{X} = (24.4 + 58.8 + 81.7) / 30 = 5.5$$

$$SS_B = 10(2.44 - 5.5)^2 + 10(5.88 - 5.5)^2 + 10(8.17 - 5.5)^2 = 166.37$$

$$df = 2 \qquad MS_B = 166.37/2 = 83.19$$

$$SS_W = 1 \times 9 + 2.21^2 \times 9 + 2.33^2 \times 9 = 101.82$$

$$df = 27 \qquad MS_W = 101.82/27 = 3.77$$

$$F_{2,27} = 22.07$$

$p \ll 0.01$

reject H_0

3.

(a) $t = \dfrac{25 - \mu}{2.7/\sqrt{58}} = \dfrac{25 - \mu}{0.355} = 2 \Rightarrow \mu = 24.29$

$$CI = 25 \pm 2 \times 0.355$$
$$= (25.71, 24.29)$$

(b) $t = \dfrac{25 - 24}{0.355} = 2.82 \qquad 0.0005 < p < 0.05$

(c) reject H_0 BMI 和 糖尿病有關.

(d) CI 很小, 應該要拒絕 H_0. 兩者應有關聯.

4.

(50)

	ketchup	mustard
male	10	20
female	5	15

H_0: They are similar.

$$\chi^2 = \frac{(10-5-1)^2}{15} = \frac{16}{15} = 1.067 \quad P >> 0.1$$

can't reject H_0 => Yes

5. H_0: 攝取量和有沒有暴食症無關.

1	8.5	22	11	30.5
2	10	23	14	33
3	12	25	16	34
4	13	27	18	35
5	15	28	20.5	36
6	17	29	24	37
7	19	32	26	38
8.5	20.5		30.5	

337.5   373.5

$$\mu_w = 23(23+15+1)/2 = 448.5$$

$$\sigma_{\tilde{w}} = \sqrt{\frac{23 \cdot 15(23+15+1)}{12}} = 33.485$$

$$Z_w = \frac{337.5 - 448.5}{33.485} = -3.315 \quad p = 0$$

reject H_0, Adolescents with bulima need to reduce their daily caloric intake.