441 s24 Makeup test

(1) No problem. It's an experimental study

(2) Yes. Lots of things in addition to the marketing campaign might have happened during that month. For example, the weather. People may consume more cola in warmer weather.

(3) Correlation or simple regression

(4) (a) $E(y|x) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 \pi_1 + \beta_4 \pi_2$

(b)

	π_1	π_2	
B	1	0	$\beta_0 + \beta_3 + \beta_1 x_1 + \beta_2 x_2$
W	0	1	$\beta_0 + \beta_4 + \beta_1 x_1 + \beta_2 x_2$
O	0	0	$\beta_0 + \beta_1 x_1 + \beta_2 x_2$

(c) $H_0: \beta_3 = \beta_4 = 0$

(d) $H_0: \beta_3 = \beta_4$

(e) $H_0: \beta_2 = 0$

(5) (a) $\ln \frac{\pi}{1-\pi} = \beta_0 + \beta_1 x + \beta_2 d_1 + \beta_3 d_2$

(b)

	d_1	d_2	Odds of job
Humanities	0	0	$e^{\beta_0 + \beta_1 x}$
Sciences	1	0	$e^{\beta_0 + \beta_1 x} e^{\beta_2}$
Social Science	0	1	$e^{\beta_0 + \beta_1 x} e^{\beta_3}$

(c) $e^{\beta_2 - \beta_3}$

(d) e^{β_1}

(e) $H_0: \beta_2 = \beta_3 = 0$

(f) $H_0: \beta_1 = 0$

(g) $\pi = \frac{e^{\beta_0 + \beta_2}}{1 + e^{\beta_0 + \beta_2}}$

(h) $e^{\beta_0} = 1 \Rightarrow \beta_0 = 0$

(6) (a) $\mu_{11} + \mu_{21} = \mu_{12} + \mu_{22} = \mu_{13} + \mu_{23}$

(b) $\mu_{11} + \mu_{12} + \mu_{13} = \mu_{21} + \mu_{22} + \mu_{23}$

(c) $\mu_{11} - \mu_{21} = \mu_{12} - \mu_{22} = \mu_{13} - \mu_{23}$

(d) Same as (a)

(e) Same as (c)

(f) $H_0: \mu_{11} = \mu_{12} = \mu_{13}$

(g) Same as (b)

(7) (a) $E(y|\underline{x}) = \beta_0 + \beta_1 x + \beta_2 g + \beta_3 d_1 + \beta_4 d_2$

(b) (i) $H_0: \beta_3 = \beta_4 = 0$

(ii)

Test statistic	p-value	Reject H_0?	Significant?
$F = 4.67$	0.0125	Yes	Yes

(iii) $a = \frac{\Delta F}{n - p + \Delta F} = \frac{2 * 4.67}{71 + 2 * 4.67} = \frac{9.34}{80.34}$

$= 0.116$

(7) (b) iv.

	Test stat	uncorrected p-value	Bonferroni corrected p-value
1 vs 2	$F = 0.02$	0.8807	1
1 vs 3	$t = 2.72$	0.0082	0.0246
2 vs 3	$t = 2.50$	0.0146	0.0438

v. Allowing for gender and weight before the experiment, participants using Diet 3 weighed <u>less</u> than those using Diet 1 or Diet 2.

8 (a)

(i)

Test Statistic	P-value	Reject H_0?	Significant?
$\chi^2 = 7.2006$	0.0073	Yes	Yes

(ii) Allowing for other possible risk factors, participants who smoked more were more likely to get cancer.

(b) $e^{20\beta_4} = e^{20 \times 0.0547} = e^{1.094}$

$= 2.986$

(c) $\dfrac{e^{\beta_0 + 50\beta_3}}{1 + e^{\beta_0 + 50\beta_3}} = \dfrac{e^{-1.5441 + 50 \times (-0.00019)}}{1 + e^{-1.5536}}$

$= \dfrac{0.211485255}{1.211485255}$ $= 0.1746$

Question	Points
1	4
2	4
3	3
4a	2
4b	3
4c	3
4d	3
4e	2
5a	3
5b	3
5c	3
5d	2
5e	2
5f	2
5g	3
5h	4
6a	2
6b	2
6c	2
6d	2
6e	2
6f	2
6g	2
7a	2
7bi.	3
7bii.	3
7biii.	4
7biv.	6
7bv.	5
8ai.	3
8aii.	5
8b	5
8c	4

Sheet1

Question	Points	
1	4	
2	4	
3	3	
4	13	Regression concepts
5	22	Logistic regression concepts
6	14	Factorial H0
7	23	Diet regression
8	17	Bird logisitc regression
Total	100	