HW7 Solution

- (HW7.1) $\hat{p_1} = \frac{65}{374}$. $\hat{p_2} = \frac{43}{193}$. $n_1 = 374$. $n_2 = 193$. $z = 1.96$.
  The 95% C.I. for $p_1 - p_2$ is

$$\hat{p_1} - \hat{p_2} \pm z\sqrt{\frac{\hat{p_1}(1-\hat{p_1})}{n_1} + \frac{\hat{p_2}(1-\hat{p_2})}{n_2}} = [-0.119, 0.021]$$

- (HW7.2)

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Environment	1	2	3	4	5	6	7	8	9	Mean	SD
Brand A	23	17	28	48	10	36	15	22	94	35.56	25.75903
Brand B	36	22	25	60	16	34	28	22	104	38.56	27.66365
Difference	-13	-5	3	-12	-6	2	-13	0	-10	-6	6.44205

2(a) $H_0 : \mu_1 - \mu_2 = 0$ v.s. $H_1 : \mu_1 - \mu_2 \neq 0$

$$t = \frac{\bar{x_1} - \bar{x_2} - 0}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = -0.4762$$

where

$$s_p = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

Can not reject H_0, since $|t_o| = 0.4762$ and P-value$= 2 \times Pr(T > |t_o|) = 2 \times 0.2 = 0.4$. Therefore, we have no evidence of a difference in the mean number of flies landing on board sprayed with brand A or brand B.

Note: One can also use the regular formula for computing the $SE(\bar{x_1} - \bar{x_2}) = \sqrt{\frac{S_A^2}{n_A} + \frac{S_B^2}{n_B}}$, where S_A^2 and S_B^2 are the sample variances, instead the *pooled-variance* formula we used above.

2(b) $H_0 : \mu_d = 0$ v.s. $H_1 : \mu_d \neq 0$

$$t = \frac{\bar{d} - 0}{\frac{s_d}{\sqrt{n}}} = -2.794$$

Reject H_0, since $|t_o| = 2.794$ and P-value$= 2 \times Pr(T > |t_o|) = 2 \times 0.01 = 0.02$. And we have some evidence against H_o.

3. We should treat the data as from a paired experiment since the samples represent measurement on the same environmental conditions (1 - 9). These observations are paired by the inivronmental (unit) condition because the number of flies landing on a board is influenced by the population of flies, which definetely depends on the environmental conditions. Therefore, the second (paired) test, from part (a), is more appropriate for the statistical analysis of these data.