HYPOTHESIS TEST STATISTICS

① One mean $H_0: \mu = \mu_0$, compute $t = \dfrac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$, get p-value

② One proportion $H_0: p = p_0$, compute $z = \dfrac{\hat{p} - p_0}{\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}}$, get p-value

③ Chi-square H_0: percentages for categories, compute $\chi^2 = \sum \dfrac{(\text{observed} - \text{expected})^2}{\text{expected}}$,

get p-value

④ ANOVA $H_0: \mu_1 = \mu_2 = \ldots = \mu_G$, compute $F = \dfrac{\text{variation between groups}}{\text{variation within groups}}$

G = # groups ($G \geq 3$)

$$F = \frac{\text{variation between groups}}{\text{variation within groups}}$$

$$= \frac{\dfrac{n_1(\bar{x}_1 - \bar{x})^2 + n_2(\bar{x}_2 - \bar{x})^2 + n_3(\bar{x}_3 - \bar{x})^2}{2}}{\dfrac{(n_1-1)s_1^2 + (n_2-1)s_2^2 + (n_3-1)s_3^2}{(n_1+n_2+n_3)-3}}$$

$$= \frac{MSG}{MSE} = \frac{\dfrac{8(30.75-38)^2 + 8(34.01-38)^2 + 8(49.25-38)^2}{2}}{\dfrac{(7)(9.25)^2 + 7(14.63)^2 + 7(10.79)^2}{21}}$$

$$= \frac{\dfrac{1560.36}{2}}{2912.1645/21} = 5.626 \Rightarrow \text{p-value} = .011$$