1. $H_0: p_1 = p_2 = p_3 = p_4 = p_5 = p_6 = \frac{1}{6}$
   $H_1$: The die is not balanced
   Reject $H_0$ if $T > \chi^2_{0.95, 5} = 11.07$.
   $N = 600 \Rightarrow E_j = 100$ for each category
   $T = 8.58 \neq 11.07$, so fail to reject $H_0$. P-value $\approx 0.127$

2. [Grad problem] $H_0$: Data come from $N(12, 3)$
   $H_1$: $N(12, 3)$ is a poor fit
   Note $E_j = (26)(\frac{1}{4}) = 6.5$ for each category under $H_0$.
   Reject $H_0$ if $T > \chi^2_{0.95, 3} = 7.815$
   $T = 11.54 > 7.815$, so reject $H_0$.
   P-value $\approx 0.0091$

3. $H_0: p_1 \geq p_2$, $H_1: p_1 < p_2$
   Reject $H_0$ if $T < Z_{0.05} = -1.645$
   $T = \sqrt{60 \left[ (23)(3) - (27)(7) \right]} = -1.39 \neq -1.645$.
   Fail to reject $H_0$. P-value $\approx 0.0829$

4. $H_0: p_1 \leq p_2$, $H_1: p_1 > p_2$
   $\frac{Hired}{Not hired}$
   Male 10 11 $\Rightarrow T_2 = 10$. From R,
   Female 14 49
   Fisher's Exact Test, p-value $= .028 < .05$
   $\Rightarrow$ Reject $H_0$, conclude males have a greater probability of being hired.
5) \( H_0: \) Post position and finishing position are independent
\( H_1: \) Post position and finishing position are dependent (associated)
-We use the \( \chi^2 \) test for independence here.

Reject \( H_0 \) if \( T > \chi^2_{.95,4} = 9.488 \)
\( T = 6.053 \neq 9.488, \) so fail to reject \( H_0. \)
We conclude finishing position may be independent of post position. \( P\)-value \( \approx .1091. \)

6) \( H_0: \) The 4 drill sergeants have the same median
\( H_1: \) The 4 drill sergeants do not all have the same median

Reject \( H_0 \) if \( T > \chi^2_{.95,3} = 7.81 \)
\( T = \frac{84^2}{(42)(42)} \left[ \frac{14^2}{20} + \frac{8^2}{22} + \frac{8^2}{20} + \frac{15^2}{22} \right] - \frac{84}{(42)(42)} \)
\( = 5.55 \neq 7.81 \Rightarrow \) fail to reject \( H_0. \)
\( P\)-value \( \approx .1357 \)