One sample hypothesis tests

1. For $X \sim N(\mu, \sigma^2)$, σ^2 *known; random sample evidence* $\bar{x}$ *and* n. Null hypothesis, $H_0 : \mu = \mu_0$; 2-sided alternative $H_1 : \mu \neq \mu_0$. Test statistic $z_{\text{calc}} = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} \sim N(0, 1)$. Reject H_0 (at the α level) if $|z_{\text{calc}}| \geq z_{\alpha/2}$, the critical value of z.

2. For $X \sim N(\mu, \sigma^2)$, σ^2 *unknown; random sample evidence* $\bar{x}$, s *and* n. Null hypothesis, $H_0 : \mu = \mu_0$; 2-sided alternative $H_1 : \mu \neq \mu_0$. Test statistic $t_{\text{calc}} = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim t_{(n-1)}$, the t distribution with $(n - 1)$ df. For $n > 30$ and if X has *any* distribution, $t \sim N(0, 1)$. Reject H_0 if $|t_{\text{calc}}| \geq t_{\alpha/2}$, the critical value of t with $(n - 1)$ df.

3. For $X \sim N(\mu, \sigma^2)$, σ^2 *unknown; random sample evidence* s *and* n. Null hypothesis, $H_0 : \sigma^2 = \sigma_0^2$; alternative $H_1 : \sigma^2 > \sigma_0^2$. Test statistic $\chi^2_{\text{calc}} = (n - 1)s^2/\sigma_0^2 \sim \chi^2_{n-1}$. Reject H_0 if $\chi^2_{\text{calc}} > \chi^2_{\alpha}$, the critical value of χ^2 with $(n - 1)$ df.
In each case the p-value is the tail area outside the calculated statistic.