A retailer sells two brands of 12 oz tuna cans. Random samples of sizes 20 from each brand are opened and weighed with results $\bar{X}_A = 12.04$, $s_A = .05$, $\bar{X}_B = 12.02$, and $s_B = .04$. Assume the weights follow normal distributions with a common population variance.

1. Calculate a 95% confidence interval for the difference in population means of the two brands $\mu_A - \mu_B$.
2. Obtain the p-value for the test $H_0 : \mu_A = \mu_B$ vs. $H_a : \mu_A \neq \mu_B$.

Solution:

1. $s_p^2 = \frac{19(.05)^2+19(.04)^2}{38} = 0.04527693^2$. The 95% CI for $\mu_A - \mu_B$ is $(\bar{x}_A - \bar{x}_B) \pm t_{.025,38} s_p \sqrt{1/n_1 + 1/n_2} = (12.04 - 12.02) \pm 2.024394(0.04527693)\sqrt{2/20} = (-0.008984914, 0.048984914)$.
2. $t = \frac{12.04-12.02}{0.04527693\sqrt{1/10}} = 1.396860$, so $p = P(|t_{38}| > 1.396860) = 0.1705607$ (using R), or approximately $P(|Z| > 1.396860) = 0.1624557$ (using Table A.3). Using Table A.5, the two-sided p-value is in the range $(0.10, 0.20)$.