1) License Plate Laws:

Step 1: claim:

Passenger car owners violets license plat laws at a higher rate them commercial truck owners. Passenger cars = P_1 $P_1 > P_2$

Commercial trucks = P_2

Step 2: if $P_1 > P_2$ is false, then $P_1 \leq P_2$

Step 3: Hypothesis tests

Null $H_0 = P_1 \leq P_2$

$H_1 = P_1 > P_2$

Step 4: $\alpha = 0.01$

Step 5: $\bar{P} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{239 + 45}{2049 + 334}$

$= \frac{284}{2383} = \boxed{0.1191}$

$\bar{q} = 1 - \bar{P} = 1 - 0.1191$

$= \boxed{0.8808}$

Step 6 :

$$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\bar{p}\,\bar{q}}{n_1} + \frac{\bar{p}\,\bar{q}}{n_2}}}$$

$$= \frac{\left(\frac{239}{2049} - \frac{45}{334}\right) - 0}{\sqrt{\frac{(0.8808)(0.1191)}{2049} + \frac{(0.8808)(0.1191)}{334}}}$$

$$= \frac{0.1166 - 0.1347}{\sqrt{0.00005 + 0.0003}}$$

$$= \boxed{-0.9468}$$

$$P\text{ value} = \boxed{\sim 0.1719}$$

step 7 = A) Because the P-value of $0.17 > \alpha$ (0.1), we fail to reject the null hypothesis. ($P_1 \leq P_2$)

B) Confidence Interval =

$$-0.0670 < P_1 - P_2 < 0.0310$$

2) Accuracy of fast food Drive-Through:

Step 1: claim:

Burger King & MacDonald's have the same accuracy score.

BK = McD

Step 2: Alternative hypothesis

BK ≠ McD

Step 3: Hypothesis tests

H_0 : BK = McD

H_1 : BK ≠ McD

Step 4: $\alpha = 0.01$

Step 5: $\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{264 + 329}{318 + 362}$

$= \boxed{0.8720}$

$\bar{q} = 1 - \bar{p} = \boxed{0.128}$

Step 6 = $Z = \frac{(\hat{p} - \hat{q}) - (p - q)}{\sqrt{\frac{\bar{p}\bar{q}}{n_1} + \frac{\bar{p}\bar{q}}{n_2}}}$

$= \frac{\left(\frac{264}{318} - \frac{329}{362}\right) - 0}{}$

$$\sqrt{\frac{(0.8720)(0.128)}{318} + \frac{(0.8720)(0.128)}{362}}$$

$$= \frac{0.83 - 0.9088}{\sqrt{\frac{0.111616}{318} + \frac{0.111616}{362}}}$$

$$= \frac{-0.0788}{\sqrt{0.00035 + 0.00030}}$$

$$= \frac{-0.0788}{0.0254}$$

$$= -3.091$$

step 7: $\boxed{\text{p-value} = 0.0020}$

step 8: a) Since p-value $< \alpha$,
we reject the null hypothesis.

b) Confidence Interval :-

$-0.1454 < P_1 - P_2 < -0.0120$

Final Conclusion:- There is enough evidence that accuracy of BK doesn't equal to Mac D.

3) Regular Coke and Diet Coke :-

Step 1 : claim :-

the mean weight of Diet coke is less than the mean weight of regular coke.

DC = Diet Coke mean weight

RC = Regular Coke mean weight

Step 2 :- Alternative Claim :-

mean weight of DC is equal or greater than RC.

Step 3 :- Hypothesis testing

H_0 : DC $\geq$ RC

H_1 : DC $<$ RC

Step 4 :- $\alpha = 0.1$

Step 5 :- we are using t-distribution because both are independent variable.

Step 6 :-

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$= \frac{(0.78479 - 0.81682) - 0}{\sqrt{\frac{(0.00439)^2}{36} + \frac{(0.00781)^2}{36}}}$$

$$= \frac{-0.03203}{0.001435}$$

$$= \boxed{-22.32}$$

step - 7 :- $df = Pc + Rc - 2$

$$= \boxed{70}$$

$$\boxed{\text{P- value} = 0.0001}$$

Because P-value is less than 0.1 significam value, we reject the null hypothesis.

6) Confidence - Interval :-

$= -0.034422$ to -0.029638

c) Reason :-

DC weight less than RC because of the use of artificial sweetner.

4) Color and Creativity :-

step 1 :- Claim :-

Blue enhances performance on creative task.

step 2 :- Alternative claim

Blue doesn't enhance performance on creativity tasks.

step 3 :- Hypothesis testing :-

H_0 : μ Blue $\leq$ μ Red (Blue doesn't enhance)

H_1 : μ Blue $>$ μ Red (enhance)

step 4 : $\alpha = 0.01$

step 5 :- t- distribution is being used because of two indipendent variables.

step 6 :-

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$= \frac{(3.97 - 3.39) - 0}{\sqrt{\frac{(0.63)^2}{36} + \frac{(0.97)^2}{35}}}$$

$$= \frac{0.58}{0.1897}$$

$$= \boxed{3.06}$$

Step 7 :- $df = n_{Blue} + n_{Red} - 2$

$$= 36 + 35 - 2$$

$$= \boxed{69}$$

p-value = $\boxed{0.0032}$

Step 8 :- Since p-value $< \alpha$,

we reject the null hypothesis.

b) Confidence Interval :-

(0.2638, 0.8962)