7) In this problem, we will examine the sugar content of several national brands of cereals, here measured as percentage of weight.

Children	40.3	55	45.7	43.3	50.3	45.9	53.5
	43	44.2	44	33.6	55.1	48.8	50.4
	37.8	60.3	46.6	47.4	44		
Adult	20	30.2	2.2	7.5	4.4	22.2	16.6
	14.5	21.4	3.3	10.0	1.0	4.4	1.3
	8.1	6.6	7.8	0.6	10.6	16.2	14.5
	4.1	15.8	4.1	2.4	3.5	8.5	4.7

i) Null hypothesis: Sugar content of brand of cerals for children and adult are same.

Alternate hypothesis: Sugar content of brand of cerals for children and adult are not same.

$H_0 : \mu_A = \mu_B$

$H_A : \mu_A \neq \mu_B$

∴ Two tailed test

For comparing the mean of two samples, we are going to perform the t-test.

As confidence level is 95% therefore the significance level is 5%.

$\alpha = 5\%$

$$\boxed{\alpha = 0.05}$$

Since, it is a two tailed test

$$\frac{\alpha}{2} = \frac{0.05}{2} = 0.025$$

Establish the decision rule,

for critical value,

t-critical < t-test

then Null hypothesis is rejected

For p-values,

If P-value < significance level

then null hypothesis is rejected

Analysis of data:-

Since ~~it~~ it is a t-test for two sample random variable

$$dF = \frac{\left[\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right]^2}{\left[\frac{(s_1^2/n_1)^2}{n_1 - 1} + \frac{(s_2^2/n_2)^2}{n_2 - 1}\right]}$$

$$t\text{-test} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

For sample of children,

$$\bar{X}_1 = \mu_A = 46.8$$

$$n_1 = 19$$

$$\bar{S}_1 = 6.41$$

For sample of adult

$$\bar{X}_2 = \mu_B = 10.16$$

$$n_2 = 29$$

$$\bar{S}_2 = 7.4\cancel{7}$$

$$DF = \frac{\left[\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right]^2}{\left[\frac{\left(\frac{S_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{S_2^2}{n_2}\right)^2}{n_2 - 1}\right]}$$

$$= \frac{(2.16 + 1.92)^2}{\frac{(2.16)^2}{18} + \frac{(1.92)^2}{28}}$$

$$= \frac{16.64}{0.38}$$

$\boxed{dF = 43}$

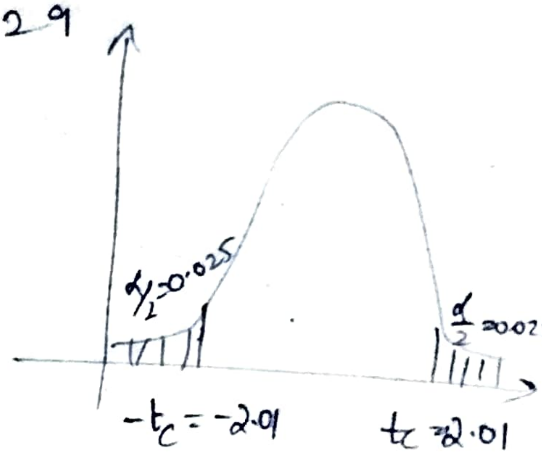
Now,

$$t\text{-test} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$= \frac{6.41 - 7.47}{\sqrt{\frac{(6.41)^2}{19} + \frac{(7.47)^2}{29}}}$$

$$= \frac{36.38}{1.96}$$

$$\boxed{t\text{-test} = 18.10}$$



By using t-table,

$$\boxed{t_c = 2.01}$$

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

Take statistical action, on the basic of decision rule

For critical value $t\text{-critical} < t\text{-test}$

$2.01 < 18.10$

We will reject the null hypothesis

for P-value $P\text{value} < \text{significance value}$

$0.0001 < 0.05$

∴ Null Hypothesis rejected, Alternative hypothesis is accepted.