Q.(2) The null and alternative hypothesis are

$H_0: p_0 = 0.05$

$H_0: p > 0.05$

(b) We use the z test because have more then 30 sample.

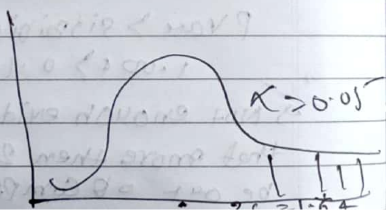
(c) $\hat{p} = 46/384 = 0.12$

$q = 1-p = 1-0.05 = 0.95$

$$z \text{ test} = \frac{\hat{p}-p}{\sqrt{\frac{p \cdot q}{n}}} = \frac{0.12-0.05}{\sqrt{\frac{0.05 \times 0.95}{384}}}$$

$$= \frac{0.07}{0.011} = 6.36$$

$\boxed{z \text{ Score} = 6.36}$



Here z score is grater then z c so we reject the null hypothesis and this test claim that the increase of certain chemicals in the environment has lead to an increase in our firm.

Q(2) Null hypothesis: 20% of the car failed to meet population guidelines

$H_0: P = 0.20$

Alternate hypothesis: more then 20% of the failed to meet population guidelines.

$H_0: P > 0.20$

It is a one tailed test since we are going to check only one end of experiment and here we do Z test.

⇒ set the significance value $= 10\%$

$\alpha = 0.10$

⇒ If Z-critical < Z-score we will reject null hypothesis.

for,

P-value < significance level we will reject our null hypothesis.

Z test for proportion

$$Z = \frac{(\hat{p} - p)}{\sqrt{p(1-p)/n}}$$

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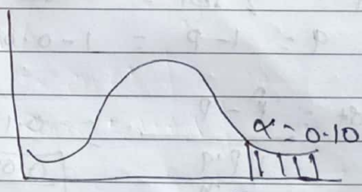
$$\boxed{\hat{p} = 7/22 = 0.318}$$

$$Z = \frac{0.32 - 0.20}{\sqrt{\frac{0.20(1-0.20)}{22}}} = \frac{0.12}{\sqrt{\frac{0.20 \times 0.80}{22}}}$$

$$= \frac{0.12}{\sqrt{0.00727272727}} = \frac{0.12}{0.08528028}$$

$$= 1.4071$$

$$\boxed{Z\text{-score} = 1.4071 = 1.41}$$



As per Z table = $Z_c = 1.3$

Z critical > Z score (we will accept null hypothesis)

P value = 1.004

P value > significance value

1.004 > 0.10 (accept the null hypothesis)

→ Not enough evidence to support the claim that more then 20% of the fleet might be out of compliance.

Q(2) For $\alpha = 5\%$

$\boxed{\alpha = 0.05}$

$\boxed{Z \text{ score} = 1.41}$

$\boxed{Z \text{ critical} = 1.64}$ — Z-table

1.64 > 1.42 We will accept the null hypothesis

if $\alpha = 1\%$

$\boxed{\alpha = 0.01}$

$\boxed{Z \text{ score} = 1.41}$

$\boxed{Z \text{ critical} = 2.33}$

Z critical > Z score

We will accept the null hypothesis

Q(3) → Null hypothesis : 44 % of the adult population had never smoked.

$H_0 : P = 0.44$

→ Alternative hypothesis :- more then 44 % of the adult population have smoked

$H_A : P > 0.44$

→ one taild test because only one end experiment.

we will do Z test.

Confidance level = 98 %

$\alpha = 2\%$

$\alpha = 0.020$

if

Z - critical < Z - test we will reject null hypothesis

for P value

P value < significance value we will reject the null hypothesis

for P value,

P value α significiance value

we will reject null hypothesis

$$Z\ score = \frac{\hat{P} - P}{\sqrt{\frac{Pq}{n}}}$$

$P = 0.44$, $n = 891$

$q = 1 - P = 1 - 0.44 = 0.56$

$$\hat{P} = \frac{463}{891} = 0.519$$

$$Z\ score = \frac{0.519 - 0.44}{\sqrt{\frac{0.44 \times 0.56}{891}}}$$

Z score = 4.75

Z critical = 2.20

Z critical < Z score

2.20 < 4.75

We will reject the null hypothesis

Scanned with CamScanner

Q(3) → According to the test that they State More than 44% of the the adult population never smoked.

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Q.(4)

Null hypothesis → Distance from the lense to the object and distance from the lens to real image is same.

$H_0 : \mu A = \mu B$

Alternate hypothesis → the distance from the lense to the object and distance from the lense to real image is not same

$H_A ; \mu A \neq \mu B$

Here we will do z test.
significance value not given in the problem so we are going to take that

$\alpha = 0.05$

Since this is the two tailed test

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

Decision rule
z - critical < z - score
we will reject the null hypothesis
for p value.
p value < significance value
we will reject the null hypothesis.

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(4) sample mean of the mesurment $(\bar{S}_1) = 26.6$ Cm
" " " " " $(\bar{S}_2) = 13.8$ Cm

standerd deviation of measurmen $S_1 = 0.1$ cm
" " " " $S_2 = 0.5$ cm

=> for distance from the lense to object S_1
$S_1 = 26.6$ Cm
$\sigma_1 = 0.1$ Cm
$n_1 = 25$

=> for distance from lense to real image, S_2,
$S_2 = 13.8$
$\sigma_2 = 0.5$ cm
$n_2 = 25$

$$Z \text{ score} = \frac{\bar{S}_1 - \bar{S}_2}{\sqrt{\frac{(\sigma_1)^2}{n_1} + \frac{(\sigma_2)^2}{n_2}}} = \frac{26.6 - 13.8}{\sqrt{\frac{(0.1)^2}{25} + \frac{(0.5)^2}{25}}}$$

$$= \frac{12.8}{0.102} = Z \text{ Score} = 125.51$$

~~for cri~~

Z critical < Z - Score
$1.96 < 125.51$
we will reject the null hypothesis

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Q(4) As per the test result we state that distance from the lense to the object and distance from the lense to the real image are not same.
i.e

$$\boxed{u_A \neq u_B}$$

Q(5)

Null hypothesis : mean body temp is 98.6

$H_0 : \mu = 98.6$

Alternate hypothesis : mean body temp is not equal to 98.6

$H_0 \; \mu \neq 98.6$

This is two tailed test

$\alpha = \frac{0.02}{2} = 0.01$

Here we are going to T-test.

given, $\alpha = 0.02$

Desicion Rule

t critical < t score

we will reject null hypothesis

for, P value,

if Pvalue < significance level.

we will reject null hypothesis

$n = 52, \quad \bar{x} = 98.2846, \quad s = 0.6824$

$$t \cdot score = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$= \frac{98.2846 - 98.6}{\frac{0.6824}{\sqrt{52}}}$$

Q(5) $\boxed{t\text{-score} = 3.333}$

it is two tailed test

$\alpha = \alpha/2 = \frac{0.02}{2} = 0.01$

$\boxed{\alpha = 0.01}$

DF = n-1 = 52-1 = 51

$\boxed{DF = 51}$

now using t-table

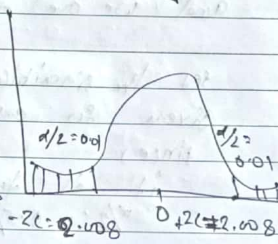
$\boxed{t\ critical = 2.008}$ $\boxed{p\text{-value} = 0.0016}$

As per decision rule for critical value

2.008 < 3.333

t critical < t score

we will reject null hypothesis



0.0016 < 0.02

Pvalue < significance value

reject the null hypothesis

so every time body temp not equal to 98.6 °f

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YOUVA

9(6)

Null hypothesis → There is no difference b/w the premium and Regular gas tanks in term of mileage.

$$H_0;\ \mu_A = \mu_B$$

Alternate hypothesis :- There is a difference b/w the Premium and Regular gas tank in term of mileage.

$$H_0;\ \mu_A \neq \mu_B$$

That is two tailed test and we are going to perform T-test

Set the significance value, significance value not given so assume significance $\boxed{\text{value } \alpha = 0.05}$

since,

it is two tailed test

$\alpha/2 = 0.5/2 = 0.025$

(Decision rule)

t critical < t-test

We will reject the null hypothesis

for p-value

P value < significance value

We will reject null hypothesis

9(6) Given data

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Car	1	2	3	4	5	6	7	8	9	10
Regular	16	20	21	22	23	22	27	25	27	28
Premium	19	22	24	24	25	25	26	26	28	32

Analysis of date { Sample of premium tank $\bar{x}_2 = \mu_B = 25.1$, $n_2 = 10$, $s_2 = 3.44$

t-test for two sample variable, so we required

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

{ Regular tank $\mu_A = \bar{x}_1 = 23.1$, $n_1 = 10$, $S_1 = 3.72$, $\bar{x}_1 = \mu_A = 23.1$

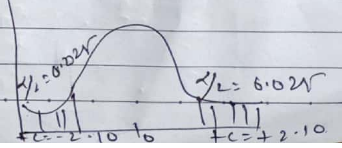
$$\frac{(1.38 + 1.18)^2}{\frac{(1.38)^2}{9} + \frac{(1.18)^2}{9}} = \frac{6.55}{0.36} = 18$$

$$\boxed{DF = 18}$$

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

$$= \frac{23.1 - 25.1}{\sqrt{\frac{(3.72)^2}{10} + \frac{(3.44)^2}{10}}} = 1.24$$

$\boxed{t \text{ critical} = 2.10}$



9(b) $\boxed{p = 0.22}$

As per decision rule for t-critical,
if

t critical < t score
reject null hypothesis.
but here,
t critical > t score
~~0.22~~ 2.10 > 1.24
we will accept the null hypothesis

also for the p value
p value > significance value
0.22 > 0.05
we will accept the null hypothesis

This test shows no difference in mileage of regular and premium tanks of the car.

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9(7.)

Null hypothesis → sugar Contant of brand of cereals for childrens and adult are same

H_0; $\mu A = \mu B$

Alternate hypothesis - Sugar Contant of brand of cereals for children and adult are not same

H_0; $\mu A \neq \mu B$

Here we performed two tailed test

We are comparing the mean of two sample so, we are going to perform t-test.

Set the significance value,
Given Confidance level = 95 %
significance level is 5 %

$\alpha = 5\%$

$\alpha = 0.05$

Science, it is a two tailed test.

$\alpha/2 = 0.05/2 = 0.025$

Decision rule,
t-critical < t-test
we will reject the null hypothesis

P.value < significance leval
we will reject the null hypothesis.

Q(7)

Given,
Sugar Content of several national brand of cereals, here measured as a percentage of weight.

Children	40.3	55.0	45.7	43.3	50.3	45.9	53.5	43.0	44.2
	44.0	33.6	55.1	48.8	60.4	37.8	60.3	46.6	47.4
	44.0								
Adult	20.0	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	10.6
	16.2	14.5	4.1	15.8	4.1	2.4	3.5	8.5	4.7
	18.4								

$\Rightarrow$ For Sample of children,

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

$n_1 = 19$

$S_1 = 6.41$

For Sample of Adult,

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

$n_2 = 29$

$S_2 = 7.47$

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

Q(7)

$$= \frac{(2.16 + 1.92)^2}{\frac{(2.16)^2}{18} + \frac{(1.92)^2}{28}} = \frac{16.64}{0.38}$$

$\boxed{df = 43}$

Now,

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

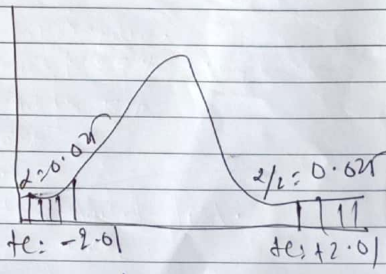
$$\Rightarrow \frac{6.41 - 7.47}{\sqrt{\frac{(6.41)^2}{19} + \frac{(7.47)^2}{29}}} = \frac{36.38}{1.96}$$

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

As per t-table

$\boxed{t_\alpha : 2.01}$

$\boxed{Pvalue = 0.0001}$



Here, t critical < t test
2.01 < 18.10

and,

Pvalue < Significance value.
0.001 < 0.05

So, we will reject the null hypothesis

Q(7)

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So,

The suger content in different brand of cereals for children and Adult are not equal.