

1a) Solution

first part

Backup Theory

Nominal scales are mere codes assigned to objects as labels, they are not measurements

Now to work out the solution

Variable 1: Number of new customers is quantifiable and countable $\rightarrow$ so it is quantitative discrete

Variable 2: Amount of new revenue is quantifiable and measurable. So it is quantitative continuous

Variable 3 $\rightarrow$ number of orders per customer is quantifiable and countable. Quantitative discrete

Variable 4 $\rightarrow$ Location the new customer is just a label so vide (1) $\rightarrow$ qualitative nominal scale

Q4 163 48

46 96 24

3rd part

No of new order

Location	< 2	2-5	5 >	
	24	168	48	240
	40	96	24	160
	64	264	72	400

1) $P(X \leq 5)$ = probability of new order from USA and other orders less than 2 + new order from USA and other 2-5

$$P(X \leq 5) = \frac{64}{400} + \frac{264}{400} = \frac{328}{400} = 0.82$$

the probability represents that the new customer from USA and outside USA will order 2 up to 5 is 82%.

$$Q2) P(X \geq 5) = \frac{48}{400} = 0.12$$

Probability represents that the new customer from USA order more than 5 times is 12%.

$$Q3) P(X < 2) = \frac{40}{400} = 0.10$$

Probability that new customer is outside USA and orders less than 2 orders is 10%.

$$Q4) P(X \geq 2) = \frac{336}{400} = 0.84$$

Probability represents if a new customer is outside USA and orders greater than 2 is 84%.

5) New small fry marketing director will obviously try to market its product to new customers as the demand among the new customer both USA and outside USA are liking the new product with probability of ordering more than 2 times is very high about 84%.

2. a)

0	0.10
1	0.40
2	0.50

$$\begin{aligned}P(X=1) &= 1 - [P(X=0) + P(X=2)] \\&= 1 - [0.10 + 0.50] \\&= 0.40\end{aligned}$$

$$\begin{aligned}\text{b) } P(X \geq 1) &= P(X=1) + P(X=2) \\&= 0.40 + 0.50 \\&= \underline{0.90}\end{aligned}$$

$$\begin{aligned}\text{(ii) } P(X < 2) &= P(X=0) + P(X=1) \\&= 0.10 + 0.40 \\&= 0.50\end{aligned}$$

$$\begin{aligned}\text{(iii) } P(2 < X < 4) &= P(X < 4) - P(X < 2) \\&= 1 - 0.50 \\&= \underline{\underline{0.50}}\end{aligned}$$

$$\begin{aligned}\text{(iv) } P(X > 4) &= 0 \\&= 1 - P(X < 4) \\&= 1 - 1 \\&= \underline{\underline{0}}\end{aligned}$$

4. $n = 120$
 $sd = 10$
Mean = 125

120 trans Step 1. $H_0 \Rightarrow \mu = 120$

$n =$ Step 2. $H_1 \Rightarrow \mu \neq 120$

This corresponds to a two tailed test for which a t test for one mean with unknown population standard deviation

Step 3: $t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{125 - 120}{10/\sqrt{120}} = 1.732$

Step 4 Decision about the null hypothesis
 the p value for this fraction $t = 1.732$
 will be 0.11172

P value = 0.1117

Step 5. Since the p value is greater than significance levels of 0.10 and 0.05 we fail to reject.

Step 6. Conclusion $\rightarrow$ Hence we conclude that the sample of weekly transactions is not significantly different from the assumed average of 120 transactions.

for $\alpha = 0.05$ our decision and conclusion remain the same since even for 0.05 significance level the p value is greater than the significance level

for $\alpha = 0.10$ our decision and conclusion remain same

Hence we conclude that the sample of weekly transactions is not significantly different from the assumed average of 120 at 0.05 significance level and 0.10 significance level.

2 b) Second part

$$P(X > 68) = P\left(\frac{X - \mu}{\sigma} = \frac{68 - 60}{5}\right) = P(Z > 1.6)$$

$$P(X > 68) = 1 - P(Z < 1.6)$$

$$= 1 - 0.9452$$

$$= \underline{0.0548}$$

$$(ii) P(X > 52) = P\left(\frac{X - \mu}{\sigma} > \frac{52 - 60}{5}\right) = P(Z > -1.6)$$

$$= P(1 - P(Z < -1.6))$$

$$= 1 - 0.0542$$

$$= \underline{0.9452}$$

(iii)

$$P(57 < X < 63) = P\left(\frac{57 - 60}{5} < \frac{X - \mu}{\sigma} < \frac{63 - 60}{5}\right)$$

$$= P(-0.6 < Z < 0.6)$$

$$= 0.7257 - 0.2743$$

$$= \underline{0.4514}$$

$$(iv) P(62 < X < 72) = P\left(\frac{62 - 60}{5} < \frac{X - \mu}{\sigma} < \frac{72 - 60}{5}\right)$$

$$= P(0.4 < Z < 2.4)$$

$$= P(Z < 2.4) - P(Z < 0.4)$$

$$= 0.9918 - 0.6554$$

$$= \underline{0.3364}$$

4b) $H_0: \mu = 120 \rightarrow \text{step 1}$
 $H_1: \mu \neq 120 \rightarrow \text{step 2}$ $\alpha = 0.10$

Step 3 test statistic under H_0 0.05

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{125 - 120}{10/\sqrt{48}} = 3.46410$$

Hence t statistic is 3.46410

step 4) the p value for $t = 3.46410$
 is
0.001454

Step 5: Since p value is lower than significance levels of 0.05 and 0.10 we reject H_0

Step 6: Hence we conclude that the sample of weekly transactions are significantly different from the assumed weekly transactions of 120

for $\alpha = 0.05$ - our conclusion and decision remains the same since the p value is also lower than the significance level of 0.05

Hence we conclude that the sample of weekly transactions are significantly different from the assumed weekly transactions for both α levels of 0.05 and 0.10.

For the hypothesis test based on past 12 transactions we find that the sample weekly transactions are not significantly different from the assumed weekly transactions for both 0.10 and 0.05

for the hypothesis test based on 43 past transactions, we find that transactions are significantly different for 0.10 and 0.05

So based on 43 past transactions, we see there is need to buy a new communication equipment.

$$b) 43 = n$$

$$\text{Average} = 250,000$$

$$sd = 30000$$

$$85\%, 90\%, 95\%$$

i) At 85% C.I

$$\alpha = 1 - 0.85 = 0.15$$

$$\frac{\alpha}{2} = \frac{0.15}{2} = 0.075$$

$$t_{\alpha/2, df} = t_{0.075, 42} = 1.463$$

$$t_{\alpha/2, df} = 1.463$$

$$85\% \text{ C.I} = 250000 \pm 1.463 \left(\frac{30000}{\sqrt{43}} \right)$$

$$= 250000 \pm 6,334.98$$

$$= (243665, 256335)$$

(ii) at 90% C.I

$$\alpha = 1 - 0.9 = 0.10 \quad \frac{\alpha}{2} = 0.05$$

$$t_{0.05, 42} = 1.68$$

$$\text{At } 90 \text{ C.I} = 250,000 \pm 1.68 \times \frac{30000}{\sqrt{43}}$$

$$= 250000 \pm 7265.64$$

$$(242735, 257266)$$

(iii) At 95% C.I

$\pm$

$$= 250000 \pm 2.01 \left(\frac{30000}{\sqrt{43}} \right)$$

$$= 250000 \pm 8711.09$$

$$= (241289, 258711)$$

5 b

6(b) $n=12$ $df=11$

(i) $t_{\alpha/2, df} = t_{0.10, 11} = 1.36$
 $t_{\alpha/2, df} = 1.36$

at 80% C-I = $250000 \pm 1.36 * (30000/\sqrt{12})$
 $= 250000 \pm 11807.65$
 $= \underline{238192, 261808}$

(ii) $t_{\alpha/2, df} = t_{0.05, 11} = 1.80$
 $t_{\alpha/2, df} = 1.80$

90% C-I = $250000 \pm 1.80 (30000/\sqrt{12})$
 $= 250000 \pm 15552.82$
 $= \underline{(234447, 265553)}$
 $= \underline{(234447, 265553)}$

(iii) $t_{\alpha/2, df} = t_{0.005, 11} = 3.11$
 $t_{\alpha/2, df} = 3.11$

99% C-I = $250,000 \pm 3.11 * (30000/\sqrt{12})$
 $= 250,000 \pm 26897.07$
 $= \underline{(223103, 276897)}$