1a) Mean $\bar{x} = \frac{2260}{28} \approx \boxed{80.71}$ Median = middle value $\boxed{=84.5}$

$\sigma = \sqrt{\left(\frac{\Sigma(x_i - \bar{x})^2}{N}\right)} = \boxed{12.60}$ Left skewed, higher concentration of scores in upper range.

b) Q1 = ~~[illegible]~~ Data$\left(\frac{1}{4} \times (N+1)\right) = \boxed{70.5}$

Q3 = $\downarrow \left(\frac{3}{4} \times (N+1)\right) = \boxed{90.25}$

IQR = Q3 - Q1 = 19.75

c) No outliers in the data, based on IQR

2a) P(Under 25 | Male) = $\frac{P(\text{Under 25 and Male})}{P(\text{Male})} = \frac{\text{\# of Males under 25}}{\text{\# of Males}}$

$= 0.375 = \boxed{37.5\%}$

b) $\frac{\text{\# of Females + \# over 40}}{\text{\# of Females above 40}} = 0.72 = 72\%$

c) Probability of a shopper being a male under 25 doesn't align with the product of probabilities of being male and under 25.

Not independant

3a) ~~[illegible]~~

$Z = 1.28$

$IQ = \mu + 1.28 \times \sigma$

$= 400 + 1.28 \times 80 = \boxed{502.4}$

b) $Z(20th) = -0.84$

$Z(80th) = 0.84$

$= 400 - 0.84 \times 80 = 332.8 \rightarrow$ lower bound

$= 400 + 0.84 \times 80 = 467.2 \rightarrow$ upper bound

c) $Z = \frac{375 - 400}{80} \rightarrow P(x > 375) = 1 - P(Z < -0.3125)$

$\boxed{= 62.3\%}$

m

4 a) $n = 160$
$k = 0$ to 155 (number of passengers showing up)
$p = 0.95$

$P(X=k) = \binom{n}{k} p^k (1-p)^{n-k}$

$P(x=155) = \frac{160!}{155!5!} \cdot 0.95^{155} \cdot (0.05)^5 = \boxed{\cancel{90.61\%}}$ $\boxed{= 90.61\%}$

b) $E = 0.09$
$z = 0.90$
$\sigma = \sqrt{p(1-p)}$
$n = \left(\frac{z \times \sigma}{E}\right)^2 = \boxed{84 \text{ observations}}$

5 a) Mean of $\hat{p}$: $\mu_{\hat{p}} = p = \boxed{0.85}$
Standard Deviation (SE) of $\hat{p}$: $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \boxed{0.016}$

b) Satisfied because both np and $n(1-p)$ are greater than 10
$500(0.85)$ and $500(1-0.85) > 10$

c) $P(\hat{p}$ lying between 83% and 88%)
= 86.47%

d) Lower limit → 80.89%
Upper limit → 89,11%

6a)

The samples are not independant as they are paired measurements from the same adults before and after medication, establishing a dependency in the data.

b)

H0: Medication has no effect on glucose levels

H1: Medication decreases blood glucose levels.

Significance level $(a) = 0.05$

Mean Difference $\overline{D}$ = mean of (Before - After) ≈ 1.84

$S_0 = \sigma$ of $(B - A) \approx 0.257$

t-statistic $t = \frac{\overline{D}}{S_D/\sqrt{n}} \approx 7.16$

Critical Value $t_{0.05, 9} \approx 2.26$

Since t-statistic is greater than the critical value, we reject H0. The data provides sufficient evidence that medication decreases blood glucose levels.

7a

$H0: \sigma_1^2 = \sigma_2^2$

$H1: \sigma_1^2 \neq \sigma_2^2$

$a = 0.05$

$F = \frac{S_1^2}{S_2^2} = 4.74$ p-value ≈ 0.00053

b) $t = 2.22$

p-value ≈ 0.0266

we can reject the null hypothesis.

4 (10 a)

$H0: \sigma^2$ is less than or equal to $0.64 \, mmol^2/L$

$H1: \sigma^2 > 0.64$

$a = 0.05$

$$X^2 = \frac{(n-1)s^2}{\sigma_0^2} \approx 2.26$$

Critical value ≈ 12.59

b) p-value ≈ 0.894

$0.894 > 0.05$ ∴ we reject the null hypothesis.
There is Not enough evidence.

c) 90% confidence interval

$$CI = \left(\frac{(n-1)s^2}{X^2_{a/2}} , \frac{(n-1)s^2}{X^2_{1-a/2}} \right)$$

$\approx (0.115, 0.886) \, mmol^2/L$