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1. Given 1.5, 3, 4, 1.5, 2, 1

Arrange the values in descending or ascending order.

1, 1.5, 1.5, 2, 3, 4

a) Median (m) = $\frac{1.5+2}{2} = 1.75$

Sample median is preferred measure of central tendency as it is statistically robust; i.e., independent of outliers.

b) The parameter of interest is average price (mean). It is denoted by μ.

c) Given $n=6$ $(n<30)$

$1-\alpha = 0.95$

$\alpha = 0.05$

confidence interval is written as $\bar{y} \pm t_{\frac{\alpha}{2},(n-1)} \left(\frac{s}{\sqrt{n}}\right)$

$$\bar{y} = \frac{1+1.5+1.5+2+3+4}{6} = 2.17$$

$$s = \sqrt{\frac{(y_i-\bar{y})^2}{(n-1)}} = 1.13$$

$$CI = 2.17 \pm t_{0.025,5} \left(\frac{1.13}{\sqrt{6}}\right)$$

$CI = 2.17 \pm t_{0.025,5}\ (0.46)$

$CI = 2.17 \pm (2.571)\ (0.46)$

$CI = 2.17 \pm 1.18$

confidence interval = $(0.99, 3.35)$

d) The margin of error would decrease, if the confidence coefficient was decreased and everything else remained the same.

2. a) Y is a discrete random variable.

b) Probability distribution for no. of females selected to delegation is

Y	$P(Y)$
1	$P(Y=1) = 3/10 = 0.3$
2	$P(Y=2) = 6/10 = 0.6$
3	$P(Y=3) = 1/10 = 0.1$

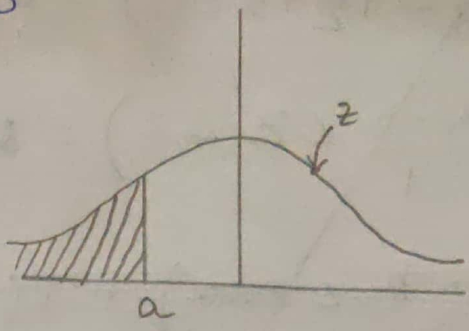
3. Given $P(Z<a) = 0.2$

$P(a<Z<0) = 0.5 - 0.2 = 0.3$

$P(0<Z<-a) = +0.3$

$-a = 0.84$

$a = -0.84$



4. $X \sim N(5, 16)$

~~[illegible]~~ $\mu = 5,\ \sigma^2 = 16 \Rightarrow \sigma = 4$

a) $P(9<X<13)$

$X = Z\sigma + \mu$

$= P(9 < 4Z+5 < 13)$

$= P(4 < 4Z < 8)$

$= P(1 < Z < 2)$

$= 0.97725 - 0.84134$

$= 0.13591$

4. b) $P(x_0 < x < 13) = 0.6328$

$P(x_0 < 4z + 5 < 13) = 0.6328$

$P\left(\frac{x_0 - 5}{4} < z < 2\right) = 0.6328$

$P\left(\frac{x_0 - 5}{4} < z < 0\right) + P(0 < z < 2) = 0.6328$

$P\left(\frac{x_0 - 5}{4} < z < 0\right) + 0.4772 = 0.6328$

$P\left(\frac{x_0 - 5}{4} < z < 0\right) = 0.1556$

$\frac{x_0 - 5}{4} = 0.34$

$x_0 = 6.36$

5. Given $\mu = 100$, $\sigma = 14$

$X \sim N(\mu, \sigma^2)$

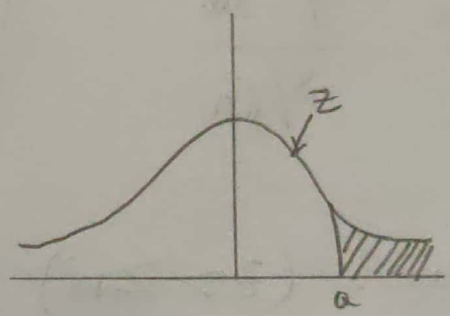
$X \sim N(100, 196)$

a) $P(X > a) = 0.1$

$P(Z\sigma + \mu > a) = 0.1$

$P(14Z + 100 > a) = 0.1$

$P\left(Z > \frac{a-100}{14}\right) = 0.1$



$$\frac{a-100}{14} = 1.28$$

$a = 117.92$

b) $P(X < 86)$

$= P(14Z + 100 < 86)$

$= P(Z < -1)$

$= 0.15866$

5. c) $n = 49$

$\bar{Y} \sim N(\mu_{\bar{Y}}, \sigma^2_{\bar{Y}})$

$\mu_{\bar{Y}} = \mu$; $\sigma^2_{\bar{Y}} = \dfrac{\sigma^2}{n}$

$= \dfrac{(14)^2}{49} = 4$

$\bar{Y} \sim N(100, 4)$

d) $P(\bar{X} < 98) = 0.2$

$$P\left(Z < \frac{98-100}{14/\sqrt{n}}\right) = 0.2$$

$$\frac{98-100}{14/\sqrt{n}} = -0.84$$

$$\frac{98-100}{0.84} = \frac{-14}{\sqrt{n}}$$

$$\frac{14}{\sqrt{n}} = 2.38$$

$$\frac{14}{2.38} = \sqrt{n}$$

$$\sqrt{n} = 5.88$$

$$n = 34.57 \cong 35$$

6. $n = 64$

a) $H_0 : \mu = 40$

$H_a : \mu > 40$

$\alpha = 0.05$, $s = 5$, $n = 64$

b) $$Z_{obs} = \frac{\bar{y} - \mu_0}{s/\sqrt{n}} = \frac{42-40}{5/\sqrt{64}} = 3.2$$

c) P-value $= (Z > Z_{obs}) = (Z > 3.2)$

$= 0.0013$

d) $Z_{\alpha} = Z_{0.05} = 1.64$

$Z_{obs} > Z_{\alpha}$ i.e., $3.2 > 1.64$

As $Z_{obs} > Z_{\alpha}$, we reject null Hypotheses (H_0).

We have sufficient evidence to conclude H_a.

e) $\beta = P\left(Z < Z_\alpha - \frac{|\mu_0 - \mu_a|}{s/\sqrt{n}}\right)$

$= P\left(Z < Z_{0.05} - \frac{|40-42|}{5/\sqrt{64}}\right)$

$= P(Z < 1.64 - 3.2)$

$= P(Z < -1.56)$

$= 0.05938$

f) $n = 25$ $(n < 30)$, $\alpha = 0.05$, $s = 4$, $\bar{y} = 44$

$H_0: \mu = 45$

$H_a: \mu \neq 45$

Test static $t_{obs} = \frac{\bar{y} - \mu_0}{s/\sqrt{n}} = \frac{44-45}{4/\sqrt{25}} = \frac{-5}{4} = -1.25$

P-value $= 2 * P(t_{n-1} > |t_{obs}|)$

$= 2 * P(t_{24} > 1.25)$

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From t-table, we know P-values lies between

$2 * 0.25$ and $2 * 0.1$ (i.e., 0.5 and 0.2)

$\therefore$ P-value ranges from 0.2 and 0.5, which is $> \alpha$.

We fail to reject Null Hypotheses (H_0) as Pvalue $> \alpha$.

$\therefore$ We do not have sufficient evidence to conclude H_a.