CENTRAL LIMIT THEOREM

1. $\mu = 10$ $n = 100$ Sample mean of 100 observations is less than 9?

$\sigma = 4$

$$z = \frac{x - \mu_{samp}}{\sigma_{samp}} = \frac{9-10}{\frac{4}{\sqrt{100}}} \Rightarrow (-2.5)$$

Z-score of $-2.5 \Rightarrow 0.00621$

2. $\mu = 50$ $n = 10$

$\sigma = 15$

Max lift capacity $\Rightarrow$ 550 kgs

Since 10 would use the lift $\Rightarrow 550/10 = 55$

$$z = \frac{x - \mu_{samp}}{\sigma_{samp}} = \frac{55-50}{\frac{15}{\sqrt{10}}} \Rightarrow 1.05$$

z-score of $1.05 \Rightarrow 0.8531 \Rightarrow 85.31\%$

3. $\mu = 2.4$ $n = 100$

$\sigma = 2.0$

Max No. tickets $= 250$

Since 100 passengers probability we have to calculate $\Rightarrow \frac{250}{100} \Rightarrow 2.5$

$$z = \frac{x - \mu_{samp}}{\sigma_{samp}} = \frac{2.5-2.4}{\frac{2.0}{\sqrt{100}}} = 0.5$$

z-score for $(0.5) \Rightarrow 0.6915 \Rightarrow 69.15\%$

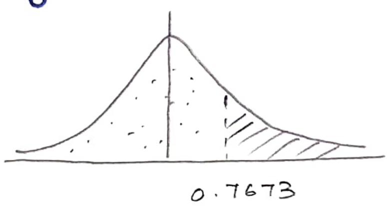
4. $\mu = 96$ $\quad n = 35$

$\sigma = 16$ Get people with IQ greater than 98?

$$z = \frac{98 - 96}{\frac{16}{\sqrt{35}}} = \frac{2}{2.704} = \cancel{0.76}\ 0.73$$

z-score for 0.73 => 0.7673

∴ Since greater than 98. we have identified dotted region, but we need the line region.



Hence $1 - 0.7673 \Rightarrow 0.23 \Rightarrow 23\%$ only has IQ greater than 98.

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5. $\mu = 6$

$\sigma = 1$

a) One person selected from sample;

$$z = \frac{x - \mu}{\sigma} = \frac{6.2 - 6.0}{1} = 0.2$$

z-score of 0.2 => 0.5793

b) Out of 100 samples.

$$z = \frac{x - \mu}{\sigma_{samp}} = \frac{6.2 - 6.0}{1/\sqrt{100}} = 2$$

z-score of 2 => 0.9772

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6. From the results it is clear that the sample is biased as it says only 1% of population has head size greater than 6.2 inch. Hence the manager should take a new sample and test the same.

7. $\mu = 268$ $n = 25$

$\sigma = 15$

$$z = \frac{260 - 268}{15/\sqrt{25}} = \frac{-8}{\frac{15}{5}} = -2.66$$

z-score of $-2.66 \Rightarrow 0.0039$

8. From the previous example/solution it is clear that pbly of having child birth with less than 260 days is less than 1%, hence it is not a normal event.

But when the women are subjected to diet plan, it is observed they give birth with less than 260 days. Hence the diet does have an effect.

9. $\mu = 172$

$\sigma = 29$

a) $x > 190$ pounds.

$$z = \frac{190 - 172}{29} = 0.62 \Rightarrow 0.7324$$

Since greater $\Rightarrow 1 - 0.7324 \Rightarrow 0.2676$

b) $n = 25$ and $x > 190$

$$z = \frac{190 - 172}{\frac{29}{\sqrt{25}}} = \frac{18}{5.8} = 3.10 \Rightarrow 0.9990$$

Since greater; $1 - 0.9990 \Rightarrow 0.001$

c) Max weight lift can handle $\Rightarrow$ 4750 pounds.

$n = 25$

$$\therefore \frac{4750}{25} \Rightarrow 190$$

Hence consider $x > 190$ and $n = 25$ determine the z-score would give the pbty. which is 0.001 //

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10. $\mu = 4$ $n = 50$

$\sigma = 1.5$

$$z_1 = \frac{3.5 - 4}{\frac{1.5}{\sqrt{50}}} = -2.35 \overset{z}{\Rightarrow} 0.0094$$

$$z_2 = \frac{3.8 - 4}{\frac{1.5}{\sqrt{50}}} = -0.94 \overset{z}{\Rightarrow} 0.1736$$

$\therefore$ Between 3.5 and 3.8 $\Rightarrow$ 0.1642

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11. $\mu = 23.1$ $\quad n = 6$

$\sigma = 3.1$

$x > 27$

$$z = \frac{27 - 23.1}{\frac{3.1}{\sqrt{6}}} = \frac{3.9}{1.265} = 3.08 \xrightarrow{z} 0.9990$$

greater than 27 years $\Rightarrow 1 - 0.9990$

$\Rightarrow 0.001$

12. $\mu = 21.50$ $\quad n = 8$

$\sigma = 2.22$

$$z_1 = \frac{20 - 21.50}{\frac{2.22}{\sqrt{8}}} = -1.91 \xrightarrow{z} 0.0281$$

$$z_2 = \frac{23 - 21.50}{\frac{2.22}{\sqrt{8}}} = 1.91 \xrightarrow{z} 0.9719$$

$z_2 - z_1 \Rightarrow 0.9719 - 0.0281 \Rightarrow 0.9438$

13. $\mu = 75$

$\sigma = 5$

a) $x = 83$

$$z = \frac{83 - 75}{5} = 1.6 \xrightarrow{z} 0.9452$$

b) $n = 5$ and $x = 83$

$$z = \frac{83 - 75}{\frac{5}{\sqrt{5}}} = 3.57 \xrightarrow{z} 0.99$$

14. $\mu = 28.3$ $n = 10$

$\sigma = 2.3$

$$z = \frac{27 - 28.3}{\frac{2.3}{\sqrt{10}}} = \frac{-1.3}{0.727} = -1.788$$

$\overset{z}{\Rightarrow}$ 0.0375