Confidence interval for difference of means

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Here we use the fact that

$$\frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$ is a z distribution.

$(1-\alpha)100\%$
confidence interval would be

$$(\bar{x}_1 - \bar{x}_2) - z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Que :- A study was conducted in which two types of engines, A & B, were compared. Gas mileage in miles per gallon, was measured.

$n_A = 50$ $n_B = 75$

$\bar{X}_A = 36$ $\bar{X}_B = 42$

$\sigma_A = 6$ $\sigma_B = 8$

Find a 96% confidence interval for $\mu_B - \mu_A$.

Sol^n^

$\bar{x}_B - \bar{x}_A = 42 - 36 = 6$

$\alpha = 0.04$

$z_{0.02} = 2.05$ (from table)

Interval is

$$6 - 2.05\sqrt{\frac{64}{75} + \frac{36}{50}} < \mu_B - \mu_A < 6 + 2.05\sqrt{\frac{64}{75} + \frac{36}{50}}$$

$$\boxed{3.43 < \mu_B - \mu_A < 8.57}$$