The level of a particular pollutant, nitrogen dioxide (NO2), in the exhaust of a hypothetical model of car, that when driven in city traffic, has a mean level of 2.1 grams per mile (g/m) and a standard deviation of 0.3 g/m. Suppose a company has a fleet of 35 of these cars.

$$z = \frac{\hat{\tau} - \tau}{se} \; with \; se = \sqrt{n}\sigma = \sigma\sqrt{n}$$

$$\hat{\tau} \sim N(\tau, se)$$

what is the mean and standard deviation of the total amount (sum), in g/m, of NO2 in the exhaust for the fleet?

Mean of total: $\tau = n\mu = 35(2.1) = 73.5$

Standard deviation of sampling distribution (standard error): $se = \sqrt{n}\sigma = (\sqrt{35})(0.3) = 1.77$

Shorthand: $\hat{\tau} \sim N(73.5, 1.77)$ ➔ it should be approximately normal

find the probability that the total amount of NO2 for the fleet is between 70 and 75 g/m

$$P(70 < \hat{\tau} < 75) = P\left(\frac{70 - 73.5}{1.77} < Z < \frac{75 - 73.5}{1.77}\right) = P(-1.98 < Z < 0.85)$$

$$= P(Z < 0.85) - P(-1.98) = 0.802 - 0.024 = 0.778 = 77.8\%$$

stadistributions.com: 1^{st}: z=.85, LT; 2^{nd}: z=-1.98, LT
http://www.statdistributions.com/normal?z=0.85&tail=3
http://www.statdistributions.com/normal?z=-1.98&tail=3

Central Limit Theorem (CLT):

The sampling distribution of the sample statistic (sample mean, sample proportion, sample total) is approximately normal, provided n is sufficiently large.

$\bar{X}$: the mean is μ and standard deviation of sampling distribution of the sample mean (standard error) is $se = \frac{\sigma}{\sqrt{n}}$ and shorthand notation: $\bar{X} \sim N(\mu, se)$

$\hat{\pi}$: the mean is π and the standard error is $se = \sqrt{\frac{\pi(1-\pi)}{n}}$ and shorthand notation: $\hat{\pi} \sim N(\pi, se)$

$\hat{\tau}$: the mean is τ and the standard error is $se = \sigma\sqrt{n} = \sqrt{n}\sigma$

$$z = \frac{argument - mean}{se}$$