$$1-\alpha = Pr\left[-q \le \frac{\bar{X}_n - \mu}{S/\sqrt{n}} \le q\right]$$

$$= Pr\left[-q \times S/\sqrt{n} \le \bar{X}_n - \mu \le q \times S/\sqrt{n}\right]$$

$$= Pr\left[-\bar{X}_n - q \times S/\sqrt{n} \le -\mu \le -\bar{X}_n + q\, S/\sqrt{n}\right]$$

$$= Pr\left[\bar{X}_n - q \times S/\sqrt{n} \le \mu \le \bar{X}_n + q\, S/\sqrt{n}\right]$$

$$C = \left[\bar{X}_n \pm q_{1-\alpha/2}\, S/\sqrt{n}\right]$$

is a $1-\alpha$ CI.