Large Sample test

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \sim N(0,1)$$

Then the null hypothesis of the lower tail test is to be rejected if $z < -z_\alpha$, where z_α is the $100(1-\alpha)$ percentile of the standard normal distribution

Problems:

1. Manufacturer claims that mean life time of a bulb is more than 10,000 hours. Sample of 30 bulbs, 9900 hours on average. Assume the population standard deviation is 120 hours. At 0.5 significance level, can we reject the claim?

ans

```
> xbar = 9900
> mu0 = 10000
> s = 120
> n = 30
> z = (xbar - mu0)/(s/sqrt(n))
> z
[1] -4.564355                # Test statistic

> alpha = 0.5
> z.alpha = qnorm (1-alpha)
> -z.alpha
[1] -1.644854                # Critical value
```

Interpretation:

Test statistic < critical value

∴ Claim rejected

Problems:

2. Food label on a cookie, states at most 2g of satuated fat in a single cookie. Sample of 35 cookies, average was found to be 2.1g and population standard deviation is 0.25g.
At .05 significance level, can we reject the claim?

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ans

```
> xbar = 2.1
> mu0 = 2
> s = 0.25
> n = 35
> z = (xbar-mu0)/(s/sqrt(n))
> z
[1] 2.366432          # Test statistic

> a = 0.05
> z.alpha = qnorm(1-a)
> z.alpha
[1] 1.644854          # Critical value
```

Interpretation:

Test statistic > critical value

∴ Claim rejected

- Two tail test of population mean with known variance: $\mu = \mu_0$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \sim N(0,1)$$

Then the null hypothesis of the two-tailed test is to be rejected if $z_{\alpha/2} \leq z \leq -z_{\alpha/2}$, where $z_{\alpha/2}$ is the $100(1-\alpha/2)$ percentile of the standard normal distribution