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Project 3.1

**9.9** Regular consumption of presweetened cereals contributes to tooth decay, heart disease, and other degenerative diseases, according to studies conducted by Dr. W. H. Bowen of the National Institute of Health and Dr. J. Yudben, Professor of Nutrition and Dietetics at the University of London. In a random sample consisting of 20 similar single servings of Alpha-Bits, the average sugar content was 11.3 grams with a standard deviation of 2.45 grams. Assuming that the sugar contents are normally distributed, construct a 95% confidence interval for the mean sugar content for single servings of Alpha-Bits.

```
> n <- 20
> a <- 11.3
> s <- 2.45
> error <- qnorm(0.975) * s/sqrt(n)
> a - error
[1] 10.22626
> a + error
[1] 12.37374
```

So, [10.23, 12.37]

**10.14** A manufacturer has developed a new fishing line, which the company claims has a mean breaking strength of 15 kilograms with a standard deviation of 0.5 kilogram. To test the hypothesis that $\mu = 15$ kilograms against the alternative that $\mu < 15$ kilograms, a random sample of 50 lines will be tested. The critical region is defined to be $\bar{x} < 14.9$.

(a) Find the probability of committing a type I error when $H_0$ is true.

```
> pnorm((14.9-15)/sqrt(0.005))
[1] 0.0786496
```

**10.29** Past experience indicates that the time required for high school seniors to complete a standardized test is a normal random variable with a mean of 35 minutes. If a random sample of 20 high school seniors took an average of 33.1 minutes to complete this test with a standard deviation of 4.3 minutes, test the hypothesis, at the 0.05 level of significance, that $\mu = 35$ minutes against the alternative that $\mu < 35$ minutes.

```
> pnorm((33.1-35)/(4.3/sqrt(20)))
[1] 0.02407399
```

**9.51** In a random sample of 1000 homes in a certain city, it is found that 228 are heated by oil. Find 99% confidence intervals for the proportion of homes in this city that are heated by oil using both methods presented on page 297.

```
> n <- 1000
> a <- 228/1000
> error <- qnorm(1-0.005) * sqrt((a * (1 - a)) / 1000)
> a + error
[1] 0.2621738
> a - error
[1] 0.1938262
```

So, [0.194, 0.262]

**10.57** A new radar device is being considered for a certain missile defense system. The system is checked by experimenting with aircraft in which a kill or a no kill is simulated. If, in 300 trials, 250 kills occur, accept or reject, at the 0.04 level of significance, the claim that the probability of a kill with the new system does not exceed the 0.8 probability of the existing device.

```
> (250-300*0.8)/sqrt(300*0.8*0.2)
[1] 1.443376
> qnorm(0.96)
[1] 1.750686
```

Since 1.44 is not > 1.75, fail to reject $H_0$.