

A manufacturer of sprinkler systems used for fire protection in office buildings claims that the true average system-activation temperature is 130°F; it is known from previous studies that the temperatures are normally distributed. A random sample of n=9 systems was taken. Is there sufficient evidence that the true mean activation temperature is more than what the manufacturer claims? The sample mean is 131.08 degrees and standard deviation of 1.27 degrees.

Claim: temperature is 130; question is the activation temperature more than 130?

1. $H_0: \mu = 130$ and $H_a: \mu > 130$
 - Assumptions: independence (yes because random), Random, normality met
2. Test statistic:

$$t = \frac{\bar{X} - \mu_0}{se} \text{ with } se = \frac{\sigma}{\sqrt{n}} \text{ or } se = \frac{s}{\sqrt{n}}$$

$$se = \frac{1.27}{\sqrt{9}} = 0.423$$

$$t = \frac{131.08 - 130}{0.423} = 2.55$$

3. Pvalue for test statistic: t=2.55, df= 9-1=8, RT

<http://www.statdistributions.com/t?t=2.55&df=8&tail=2>

$$pvalue = 0.017$$

Reject null hypothesis if $pvalue \leq \alpha(0.05)$

$pvalue = 0.017 \leq \alpha(0.05) \therefore$ (therefore) H_0 is rejected.

4. Conclusion: since we rejected the null, the system activation temperature is more than 130 degrees F
5. Error: Since the null was rejected, a Type I error could have been made. We think the system activation temperature is more than 130 when is it not (=130)

Sprinkler output:

One Sample t-test

data: sprinklers

t = 3.3293, df = 8, p-value = 0.005197

alternative hypothesis: true mean is greater than 130

95 percent confidence interval:

130.5965 Inf

sample estimates:

mean of x

131.3512

1. Hypotheses (see above)
2. $t = 3.3293, df = 8, pvalue = 0.00519$
3. Results: reject null if $pvalue \leq \alpha(0.05)$
 $pvalue = 0.00519 \leq \alpha(0.05) \therefore$ (therefore) H_0 is rejected
4. Activation tempera is more than 130 F

5. Error: Since the null was rejected, a Type I error could have been made. We think the system activation temperature is more than 130 when it is not ($\neq 130$)