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Step 1 — State the Hypotheses

H_o (Null Hypotheses): $M <= 8.25$ mm

H_1 (Alternative Hypotheses): $M > 8.25$ mm

Step 2 — Find critical value with significance level

TABLE • V Percentage Points $t_{\alpha,v}$ of the t Distribution

v \ α	.40	.25	.10	.05	.025	.01	.005	.0025	.001	.0005
1	.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	.289	.816	1.886	2.920	4.303	6.965	9.925	14.089	23.326	31.598
3	.277	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.213	12.924
4	.271	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	.267	.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	.265	.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	.263	.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	.262	.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	.261	.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	.260	.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	.260	.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	.259	.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	.259	.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	.258	.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	.258	.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	.258	.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	.257	.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	.257	.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	.257	.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	.257	.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	.257	.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	.256	.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	.256	.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	.256	.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	.256	.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	.256	.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	.256	.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	.256	.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	.256	.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	.256	.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	.255	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	.254	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	.254	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	.253	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291

v = degrees of freedom.

$a = 0.05$

critical value $= 1.65$ //

Step 3 — Compute

```
8.24+8.25+8.20+8.23+8.24
+8.21+8.26+8.26+8.20+8.25
+8.23+8.23+8.19+8.28+8.24
= 123.51

123.51÷15

X̄ = 8.234
```

$M = 8.25$ $n = 15$

2) $t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}}$ when $df = n-1$

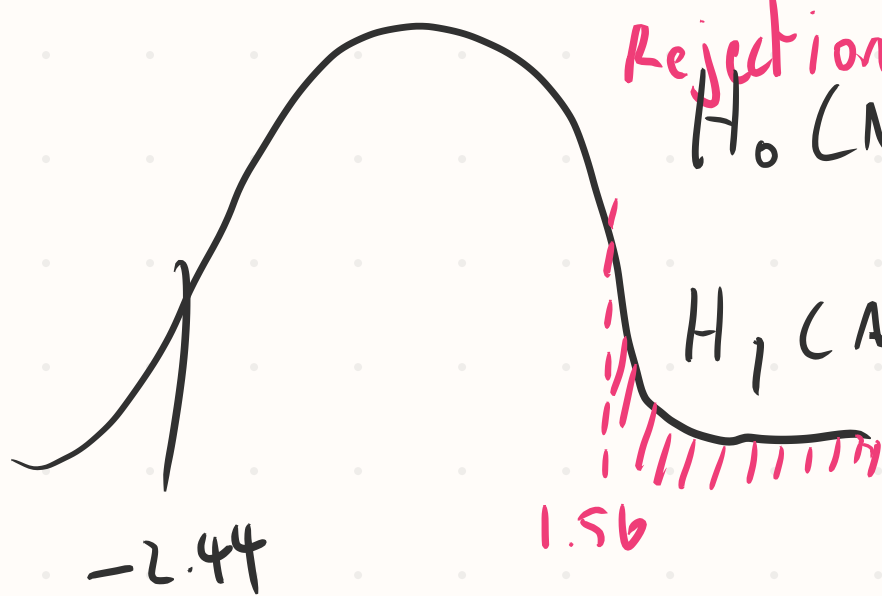$$V = \frac{(x_1 - 8.234)^2 \cdots (x_{15} - 8.234)^2}{15 - 1} = 0.00064$$

$$SD = \sqrt{V} = \sqrt{0.00064} = 0.0253$$

$$t = \frac{8.234 - 8.25}{\dfrac{0.253}{\sqrt{15}}} = -2.44 \; //$$

Step 4 Make decision to reject or not reject Ho

$(-2.49) < (1.65)$

Null Hypotheses is not rejected, since P-value $< a$

Rejection region

H_0 (Null Hypotheses): $M <= 8.25$ mm

- There are three cases

H_1 (Alternative Hypotheses): $M > 8.25$ mm

One-Tailed Test (Left Tail)	Two-Tailed Test	One-Tailed Test (Right Tail)
$H_0 : \mu_x = \mu_0$ $H_1 : \mu_x < \mu_0$	$H_0 : \mu_x = \mu_0$ $H_1 : \mu_x \neq \mu_0$	$H_0 : \mu_x = \mu_0$ $H_1 : \mu_x > \mu_0$
Rejection Region / Acceptance Region	Rejection Region / Acceptance Region \ Rejection Region	Acceptance Region / Rejection Region

1.56

−2.44

```
1   # Step 1: Define the data
2   diameter <- c(8.24, 8.25, 8.20, 8.23, 8.24, 8.21, 8.26, 8.26, 8.20, 8.25, 8.23, 8.23, 8.19, 8.28, 8.24)
3
4   # Step 2: Define the null and alternative hypotheses
5   # HO: μ ≤ 8.25
6   # H1: μ > 8.25
7   |
8   # Step 3: Perform the one-sample t-test
9   result <- t.test(diameter, mu = 8.25, alternative = "greater")
10
11  # Step 4: Make a decision based on the p-value
12  if (result$p.value < 0.05) {
13      cat("Reject the null hypothesis. There is evidence that the mean diameter exceeds 8.25 mm.")
14  } else {
15      cat("Fail to reject the null hypothesis. There is not enough evidence that the mean diameter exceeds 8.25 mm.")
16  }
17
18  # Step 5: Print the t-test results
19  print(result)
Fail to reject the null hypothesis. There is not enough evidence that the mean diameter exceeds 8.25 mm.>
> # Step 5: Print the t-test results
> print(result)

        One Sample t-test

data:  diameter
t = -2.4495, df = 14, p-value = 0.986
alternative hypothesis: true mean is greater than 8.25
95 percent confidence interval:
 8.222495      Inf
sample estimates:
mean of x
    8.234
```

Step 5 Summarize the results

In this assignment, I did the hypotheses test both by hands and rechecking with R code. After doing the hypotheses test with significance level of α = 0.05, we can see from the result that there isn't sufficient evidence to support the claim. The mean diameter of the metal rods does not exceed 8.25 mm. The results does not reject the null hypotheses as the test statistic, t = -2.44, exists in the non-critical region.