1 Problem

I want to know whether the mean speed of vehicles on Triphammer Road exceeds the posted speed limit of 30 mph. I have a sample of 23 car speeds on April 11, 2000.

1.1 Null and Alternative Hypotheses

\[ H_0 : \mu = 30 \text{ mph} \]  \hspace{1cm} (1)

\[ H_A : \mu > 30 \text{ mph} \]  \hspace{1cm} (2)

1.2 Checking Conditions

I. Independence Assumption: These cars are a convenience sample, but they were selected so no two cars were driving near each other, so I am justified in believing that their speeds are independent.

II. Randomization Condition: Although I have a convenience sample, I have reason to believe that it is a representative sample.

III. Nearly Normal Condition: Based on the graphs shown in Figure 1, normality seems plausible since the density of the speeds is unimodal and reasonably symmetric, and the quantile-quantile plot is reasonably linear.

Code to create the graphs shown in Figure 1 follows.

```r
> speeds <- c(29, 29, 24, 34, 34, 34, 34, 32, 36, 28, 31, 31, 30, 27, 34, 29, 37, 36, 38, 29, 21, 31, 26)
> par(mfrow = c(2, 1))  # splitting screen into 2*1 regions
> plot(density(speeds), lwd = 2, col = "blue", main = "Density of Car Speeds")
> qqnorm(speeds, col = "red")
> qqline(speeds, col = "blue", lwd = 2)
> par(mfrow=c(1, 1))
```
1.3 Mechanics

```r
> t.test(speeds, mu = 30, alternative = "greater")

One Sample t-test

data:  speeds
t = 1.1781, df = 22, p-value = 0.1257
alternative hypothesis: true mean is greater than 30
95 percent confidence interval:
 29.52257   Inf
sample estimates:
mean of x
31.04348
```
1.4 Statistical Conclusion
Based on a p-value of 0.1257, we fail to reject the null hypothesis in (1) that the mean speed of cars is 30 mph.

1.5 English Conclusion
There is insufficient evidence to support the alternative hypothesis in (2) that the average speed of cars on Triphammer road is greater than 30 mph.