Problems Sheet 4

Statistics 1

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```
load(url("https://people.maths.bris.ac.uk/~maxca/stats1/stats1.RData"))
```

Part B

Question 1

Assume that the lifetime of each tyre is independent & is distributed $\mathcal{N}(\mu, \sigma^2)$ with μ & σ unknown.
There is no disadvantage to the customer if the mean useful lifetime of the tyre is longer than claimed.
Define $H_0 : \mu = 42 = \mu_0,\ H_1 : \mu < 42 = \mu_0$ & the significance level to be $\alpha = 0.05$. Define the test statistic to be $T(X_1, \ldots, X_{10}) = \sqrt{n}\left(\frac{\bar{X}-\mu_0}{s}\right) \sim t_9$.
So $\mathbb{P}(T < t_{obs} | H_0\ true) = \mathbb{P}(T_9 < t_{obs})$

```
mu0=42
n=length(tyre.lifetimes)
xBar=mean(tyre.lifetimes)
s=sd(tyre.lifetimes)
cat("n=",n," xBar=",xBar," s=",s,sep="")
```

```
## n=10 xBar=41 s=3.59011
```

```
t_obs=sqrt(n)*((xBar-mu0)/s)
t_obs
```

```
## [1] -0.8808303
```

```
p=pt(t_obs,n-1)
p
```

```
## [1] 0.2006597
```

Since this test generates a p-value of $0.2006597 > 0.05 = \alpha$ there is no evidence to reject H_0.
Thus, I conclude that the claims of the manufacture are correct.