STATS ??
Course name
Assignment ?

Jono Tuke

Semester 1 20??

CHECKLIST

- ☐: Have you shown all of your working, including probability notation where necessary?
- ☐: Have you given all numbers to 3 decimal places unless otherwise stated?
- ☐: Have you included all R output and plots to support your answers where necessary?
- ☐: Have you included all of your R code?
- ☐: Have you made sure that all plots and tables each have a caption?
- ☐: If before the deadline, have you submitted your assignment via the online submission on MyUni?
- ☐: Is your submission a single pdf file - correctly orientated, easy to read? If not, penalties apply.
- ☐: Penalties for more than one document - 10% of final mark for each extra document. Note that you may resubmit and your final version is marked, but the final document should be a single file.
- ☐: Penalties for late submission - within 24 hours 40% of final mark. After 24 hours, assignment is not marked and you get zero.
- ☐: Assignments emailed instead of submitted by the online submission on MyUni will not be marked and will receive zero.
- ☐: Have you checked that the assignment submitted is the correct one, as we cannot accept other submissions after the due date?

Due date: Friday 22nd March 2019 (Week 3), 5pm.

---

1. Consider a random variable X with

$$\mathrm{E}[X] = \mu \text{ and } \mathrm{var}(X) = \sigma^2,$$

and let

$$Y = a + bX$$

   a. Calculate $\mathrm{E}[Y]$.

[1 mark]

Solutions:

$$\begin{aligned}
\mathrm{E}[Y] &= \mathrm{E}[a + bX] \\
&= a + b\,\mathrm{E}[X] \\
&= a + b\mu.
\end{aligned}$$

---

b. Calculate var(Y).

[1 mark]

Solutions:

$$\mathrm{var}[Y] = \mathrm{var}[a + bX]$$
$$= b^2 \mathrm{var}[X]$$
$$= b^2 \sigma^2.$$

[Question total: 2]

2. The following analysis is performed in R

```
pacman::p_load(tidyverse)
data(mpg)
mpg_lm  <- lm(cty ~ displ, data = mpg)
summary(mpg_lm)
```

```
##
## Call:
## lm(formula = cty ~ displ, data = mpg)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -6.3109 -1.4695 -0.2566  1.1087 14.0064
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  25.9915     0.4821   53.91   <2e-16 ***
## displ        -2.6305     0.1302  -20.20   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.567 on 232 degrees of freedom
## Multiple R-squared:  0.6376, Adjusted R-squared:  0.6361
## F-statistic: 408.2 on 1 and 232 DF,  p-value: < 2.2e-16
```

a. Write the line of least squares.

[1 mark]

Solutions:
cty = 25.9915 - 2.6305 displ

b. What is the command to obtain the 95% prediction interval for city fuel efficiency for a displacement of 3 litres?

[1 mark]

Solutions:

```
predict(mpg_lm, newdata = tibble(displ = 3), interval = "prediction")

##        fit      lwr      upr
## 1 18.10002 13.02931 23.17074
```

Marking:
complete command needed.

[Question total: 2]

[[Assignment total: 4]]