lm(mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle + ground\_clearance + AWD,data=MechaCar\_df) #generate multiple linear regression model

Call:

lm(formula = mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle +

ground\_clearance + AWD, data = MechaCar\_df)

Coefficients:

(Intercept) vehicle\_length vehicle\_weight spoiler\_angle ground\_clearance AWD

-1.040e+02 6.267e+00 1.245e-03 6.877e-02 3.546e+00 -3.411e+00

> summary(lm(mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle + ground\_clearance + AWD,data=MechaCar\_df))

Call:

lm(formula = mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle + ground\_clearance + AWD, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-19.4701 -4.4994 -0.0692 5.4433 18.5849

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -1.040e+02 1.585e+01 -6.559 5.08e-08 \*\*\*

vehicle\_length 6.267e+00 6.553e-01 9.563 2.60e-12 \*\*\*

vehicle\_weight 1.245e-03 6.890e-04 1.807 0.0776 .

spoiler\_angle 6.877e-02 6.653e-02 1.034 0.3069

ground\_clearance 3.546e+00 5.412e-01 6.551 5.21e-08 \*\*\*

AWD -3.411e+00 2.535e+00 - 1.346 0.1852

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8.774 on 44 degrees of freedom

Multiple R-squared: 0.7149, Adjusted R-squared: 0.6825

F-statistic: 22.07 on 5 and 44 DF, p-value: 5.35e-11

>

> cor(MechaCar\_df$vehicle\_length, MechaCar\_df$mpg)

[1] 0.6094798

**Moderate**

> cor(MechaCar\_df$vehicle\_weight, MechaCar\_df$mpg)

[1] 0.09068314

**None**

> cor(MechaCar\_df$spoiler\_angle, MechaCar\_df$mpg)

**[1] -0.02083999**

None

> cor(MechaCar\_df$ground\_clearance, MechaCar\_df$mpg)

[1] 0.3287489

**Weak**

> cor(MechaCar\_df$AWD, MechaCar\_df$mpg)

[1] -0.1416698

**None or very weak**

**lm(vehicle\_length ~ mpg,MechaCar\_df)**

Call:

lm(formula = vehicle\_length ~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept) mpg

11.43247 0.07949

Vehicle\_length = 0.08mpg + 11.4

**> summary(lm(vehicle\_length ~ mpg,MechaCar\_df))**

Call:

lm(formula = vehicle\_length ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-2.7607 -1.0762 -0.2082 0.8851 3.2956

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 11.43247 0.71170 16.064 < 2e-16 \*\*\*

mpg 0.07949 0.01492 5.326 2.63e-06 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.627 on 48 degrees of freedom

Multiple R-squared: 0.3715, Adjusted R-squared: 0.3584

F-statistic: 28.37 on 1 and 48 DF, p-value: 2.632e-06

37% of variability of mpg is explained by this regression.

p-value = 0.000002632

**<0.05%; reject Null; slope is not zero**

**> lm(vehicle\_weight ~ mpg,MechaCar\_df)**

Call:

lm(formula = 11.4~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept) mpg

5668.99 10.75

vehicle\_weight = 10.75mpg + 5669

**> summary(lm(vehicle\_weight ~ mpg,MechaCar\_df))**

Call:

lm(formula = vehicle\_weight ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-3942 -1032 -144 1300 3863

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 5668.99 812.66 6.976 8.01e-09 \*\*\*

mpg 10.75 17.04 0.631 0.531

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1858 on 48 degrees of freedom

Multiple R-squared: 0.008223, Adjusted R-squared: -0.01244

F-statistic: 0.398 on 1 and 48 DF, p-value: 0.5311

0.8% of variability of mpg is explained by this regression.

p-value = 0. 5311

**>0.05%; cannot reject Null; slope is zero**

>

**> lm(spoiler\_angle ~ mpg,MechaCar\_df)**

Call:

lm(formula = spoiler\_angle ~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept) mpg

58.29796 -0.02618

spoiler\_angle = 0.03mpg + 58.30

**> summary(lm(spoiler\_angle ~ mpg,MechaCar\_df))**

Call:

lm(formula = spoiler\_angle ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-57.223 -10.326 1.577 11.618 32.665

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 58.29796 8.64480 6.744 1.82e-08 \*\*\*

mpg -0.02618 0.18127 -0.144 0.886

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 19.76 on 48 degrees of freedom

Multiple R-squared: 0.0004343, Adjusted R-squared: -0.02039

F-statistic: 0.02086 on 1 and 48 DF, p-value: 0.8858

0.04% of variability of mpg is explained by this regression.

p-value = 0.8858

**>0.05%; cannot reject Null; slope is zero**

>

**> lm(ground\_clearance ~ mpg,MechaCar\_df)**

Call:

lm(formula = ground\_clearance ~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept) mpg

10.30232 0.05344

ground\_clearance = 0.05mpg + 10.30

**> summary(lm(ground\_clearance ~ mpg,MechaCar\_df))**

Call:

lm(formula = ground\_clearance ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-7.2919 -1.7342 0.2002 1.6385 5.5037

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 10.30232 1.05680 9.749 5.79e-13 \*\*\*

mpg 0.05344 0.02216 2.412 0.0198 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2.416 on 48 degrees of freedom

Multiple R-squared: 0.1081, Adjusted R-squared: 0.08949

F-statistic: 5.816 on 1 and 48 DF, p-value: 0.01975

11% of variability of mpg is explained by this regression.

p-value = 0.02

**<0.05%; reject Null; slope is not zero**

>

**> lm(AWD ~ mpg,MechaCar\_df)**

Call:

lm(formula = AWD ~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept) mpg

0.707365 -0.004595

AWD = 0.005mpg + 0.71

**> summary(lm(AWD ~ mpg,MechaCar\_df))**

Call:

lm(formula = AWD ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-0.58531 -0.48690 -0.00059 0.49021 0.62938

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.707365 0.221005 3.201 0.00243 \*\*

mpg -0.004595 0.004634 -0.992 0.32641

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5052 on 48 degrees of freedom

Multiple R-squared: 0.02007, Adjusted R-squared: -0.0003449

F-statistic: 0.9831 on 1 and 48 DF, p-value: 0.3264

2% of variability of mpg is explained by this regression.

p-value = 0.33

**>0.05%; cannot reject Null; slope is zero**

>

**> lm(mpg ~ mpg,MechaCar\_df)**

Call:

lm(formula = mpg ~ mpg, data = MechaCar\_df)

Coefficients:

(Intercept)

45.13

Warning messages:

1: In model.matrix.default(mt, mf, contrasts) :

the response appeared on the right-hand side and was dropped

2: In model.matrix.default(mt, mf, contrasts) :

problem with term 1 in model.matrix: no columns are assigned

**> summary(lm(mpg ~ mpg,MechaCar\_df))**

Call:

lm(formula = mpg ~ mpg, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-35.129 -11.617 -1.728 9.406 34.871

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 45.129 2.202 20.49 <2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 15.57 on 49 degrees of freedom

Warning messages:

1: In model.matrix.default(mt, mf, contrasts) :

the response appeared on the right-hand side and was dropped

2: In model.matrix.default(mt, mf, contrasts) :

problem with term 1 in model.matrix: no columns are assigned

**>**

lm(mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle + ground\_clearance + **AWD,data=MechaCar\_df) #generate multiple linear regression model**

Call:

lm(formula = mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle +

ground\_clearance + AWD, data = MechaCar\_df)

Coefficients:

(Intercept) vehicle\_length vehicle\_weight spoiler\_angle

-1.040e+02 6.267e+00 1.245e-03 6.877e-02

ground\_clearance AWD

3.546e+00 -3.411e+00

mpg = (6.27)vehicle\_length + (0.001)vehicle\_weight + (0.069)spoiler\_angle + (3.55)ground\_clearance + (-3.41)AWD

summary(lm(mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle + ground\_clearance + AWD,data=MechaCar\_df))

Call:

lm(formula = mpg ~ vehicle\_length + vehicle\_weight + spoiler\_angle +

ground\_clearance + AWD, data = MechaCar\_df)

Residuals:

Min 1Q Median 3Q Max

-19.4701 -4.4994 -0.0692 5.4433 18.5849

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) -1.040e+02 1.585e+01 -6.559 5.08e-08 \*\*\*

vehicle\_length 6.267e+00 6.553e-01 9.563 2.60e-12 \*\*\*

vehicle\_weight 1.245e-03 6.890e-04 1.807 0.0776 .

spoiler\_angle 6.877e-02 6.653e-02 1.034 0.3069

ground\_clearance 3.546e+00 5.412e-01 6.551 5.21e-08 \*\*\*

AWD -3.411e+00 2.535e+00 -1.346 0.1852

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8.774 on 44 degrees of freedom

Multiple R-squared: 0.7149, Adjusted R-squared: 0.6825

F-statistic: 22.07 on 5 and 44 DF, p-value: 5.35e-11

71% of variability of mpg is explained by this regression.

p-value = 0.0000000000535

**<0.05%; reject Null; slope is not zero**

t.test(Lot\_1$PSI, mu=1500)

One Sample t-test

data: Lot\_1$PSI

t = -1.8931, df = 149, p-value = 0.06028

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1497.507 1500.053

sample estimates:

mean of x

1498.78

> t.test(Lot\_2$PSI, mu=1500)

One Sample t-test

data: Lot\_2$PSI

t = -1.8931, df = 149, p-value = 0.06028

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1497.507 1500.053

sample estimates:

mean of x

1498.78

> t.test(Lot\_3$PSI, mu=1500)

One Sample t-test

data: Lot\_3$PSI

t = -1.8931, df = 149, p-value = 0.06028

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1497.507 1500.053

sample estimates:

mean of x

1498.78

Table

Description automatically generated

# DELIVERABLE 3

>

> t.test(lot\_summary$Mean\_PSI, mu=1500)

One Sample t-test

data: lot\_summary$Mean\_PSI

t = -0.92336, df = 2, p-value = 0.4533

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1493.095 1504.465

sample estimates:

mean of x

1498.78

>

> t.test(MechaCar\_tbl$PSI, mu=1500)

One Sample t-test

data: MechaCar\_tbl$PSI

t = -1.8931, df = 149, p-value = 0.06028

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1497.507 1500.053

sample estimates:

mean of x

1498.78

>

> Lot\_1 <- subset(MechaCar\_tbl, Manufacturing\_Lot == "Lot1")

> Lot\_2 <- subset(MechaCar\_tbl, Manufacturing\_Lot == "Lot2")

> Lot\_3 <- subset(MechaCar\_tbl, Manufacturing\_Lot == "Lot3")

>

> t.test(Lot\_1$PSI, mu=1500)

One Sample t-test

data: Lot\_1$PSI

t = 0, df = 49, p-value = 1

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1499.719 1500.281

sample estimates:

mean of x

1500

> t.test(Lot\_2$PSI, mu=1500)

One Sample t-test

data: Lot\_2$PSI

t = 0.51745, df = 49, p-value = 0.6072

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1499.423 1500.977

sample estimates:

mean of x

1500.2

> t.test(Lot\_3$PSI, mu=1500)

One Sample t-test

data: Lot\_3$PSI

t = -2.0916, df = 49, p-value = 0.04168

alternative hypothesis: true mean is not equal to 1500

95 percent confidence interval:

1492.431 1499.849

sample estimates:

mean of x

1496.14