Part 1

0 points possible (ungraded)

Aeneron Motors is prototyping its latest line of energy-efficient racecars which it intends to showcase at the next international racecar competition in March 2017. Aeneron cars have solar panels that help to power the car for longer durations. There are two vehicle models available for testing, the Li-ion polymer augmented XPD-77 and the Li-ion standard augmented EZM-81. The systems are the same except for one extra battery that augments the solar charging system. While expensive, these batteries offer a great gravimetric energy density. This means that more energy can be stored per kilogram of battery.

The engineering team is now faced with the challenge of building high-speed prototypes that can travel long distances while consuming very little energy.

As of now, there are two main variables that influence the overall distance traveled (Z) by each car given one full battery charge: the battery type and the amount of sunlight during a test run. Data has been collected from the many tests conducted on the cars. You have been assigned to establish the relationships among these variables and to predict how the distance traveled will change as the different variables change.

Amount of sunlight (thousands of Lux)	Li-ion type (polymer = 0, standard = 1)	Distance Traveled with One Charge (km)
31	Type0	306.96
44	Type0	307.34
37	Type0	270.4
36	Type0	249.94
23	Type0	138.83
39	Type0	327.31
27	Type0	327.62
51	Type1	389.89
69	Type0	528.2
35	Type1	330.9
21	Type0	201.44
23	Type1	276.95
35	Type0	351.33
50	Type0	477.87
45	Type0	283.36
31	Type1	356.84
40		

57	Type0	507.58
70	Type1	490.81
57	Type0	451.64
57	Type0	334.79
46	Type1	432.4
44	Type0	388.11
52	Type1	377.77
40	Type0	456.99
63	Type0	287.54
46	Type0	451.19
43	Type1	503.29
41	Type0	364.63
44	Type1	307.8
27	Type1	361.27
39	Type1	476.5
48	Type0	367.87
40	Type0	277.1
63	Type1	393.3
66	Type1	467.7
44	Type1	531.2
55	Type0	419.82
63	Type0	398.74
64	Type1	505.63
63	Type0	524.85
53	Type0	430.1
57	Type0	303.3
60	Type0	497.27
23	Type1	458.09
47	Type1	262.68
49	Type0	437.32

32	Type1	400.84
51	Type1	276.54
25	Type1	448.17
48	Type0	233.35
46	Type0	317.14
55	Type1	504.94
21	Type1	398.94
45	Type0	115.83
22	Type0	363.66
43	Type1	276.98
50	Type0	281.46
23	Type1	517.48
61	Type1	271.06
33	Type1	494.81
56	Type0	307.58
34	Type1	469.76
31	Type1	274.72
63	Type1	362.27
	Type1	443.73

Regress the amount of sunlight and battery type against distance traveled using battery type as a class (also known as dummy or categorical) variable.
This means that distance travelled is your dependent (y) variable.

Create a 95% confidence interval for the value of your sunlight estimator.

What is the upper bound?
Enter your answer rounded to two decimal places. For example, if your answer is 12.3456, you should enter 12.35 in the box below.

6.74

6.63

6.74

What is the lower bound?

Enter your answer rounded to two decimal places. For example, if your answer is 12.3456, you should enter 12.35 in the box below.

4.28

4.33

4.28

Explanation

To calculate this interval you should make the type indicator a binary or class variable and run the appropriate regression. Once you complete this, your regression results should yeild various estimator results. Many regression programs can output a 95% prediction interval for each estimator. In case your program doesn't output this, you would use your standard error and a t-statistic from a two tailed t-distribution with n-2 df at the 95% level. Alternatively you can use a one tailed t-distribution with 97.5% level and n-2 df. Your confidence interval is then your estimator plus or minus your t-statistic multiplied by your standard error.

Submit You have used 3 of 3 attempts

Answers are displayed within the problem

Part 2

0 points possible (ungraded)

With $\alpha = .01$, does your battery type estimator show a difference between the two battery types?

Choose the correct answer.

- (●) Yes
- ( ) No
- ( ) Unable to answer with current information

Explanation

After you run your regression, you should have a table of outputs. Next to your battery type class variable should be a p-value. If this p-value is less than .01, you would reject your null hypothesis and you could say that the battery type estimator shows a difference. Otherwise, you would fail to reject your null hypothesis.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Part 3

0 points possible (ungraded)

You want to predict the distance traveled on a given trip. You know the amount of sunlight will be 57 (thousand) Lux.

For a standard battery, what would you expect the distance traveled to be?

Enter your answer rounded to two decimal places. For example, if your answer is 12.3456, you should enter 12.35 in the box below.

468.97 468.9745

468.97

For a polymer battery, what would you expect the distance traveled to be?

Enter your answer rounded to two decimal places. For example, if your answer is 12.3456, you should enter 12.35 in the box below.

420.31 420.31361

420.31

Explanation

To predict distance traveled under certain circumstances, you should plug in your expected variables into your regression equation using your estimators. In this case (amount_sunlight*sunlight_estimator)+(binary_type*battery_estimator)+intercept. Your equations should look like:

Standard Battery=57*5.48081+48.66089*1+107.90744
Polymer Battery=57*5.48081+48.66089*0+107.90744

Submit You have used 1 of 3 attempts

Answers are displayed within the problem