Feedback — Quiz 2

Help Center

You submitted this quiz on **Mon 11 May 2015 8:37 AM PDT**. You got a score of **10.00** out of **10.00**. However, you will not get credit for it, since it was submitted past the deadline.

Question 1

Consider the following data with x as the predictor and y as as the outcome.

```
x <- c(0.61, 0.93, 0.83, 0.35, 0.54, 0.16, 0.91, 0.62, 0.62)
y <- c(0.67, 0.84, 0.6, 0.18, 0.85, 0.47, 1.1, 0.65, 0.36)
```

Give a P-value for the two sided hypothesis test of whether β_1 from a linear regression model is 0 or not.

Your Answer		Score	Explanation
0.391			
0.05296	✔	1.00	
2.325			
0.025			
Total		1.00 / 1.00	

Question Explanation

```
summary(lm(y ~ x))$coef
```

```
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   0.1885     0.2061  0.9143  0.39098
## x             0.7224     0.3107  2.3255  0.05296
```

Question 2

Consider the previous problem, give the estimate of the residual standard deviation.

Your Answer		Score	Explanation
0.223	✔	1.00	
0.05296			
0.3552			
0.4358			
Total		1.00 / 1.00	

Question Explanation

```
summary(lm(y ~ x))$sigma
```

```
## [1] 0.223
```

Question 3

In the `mtcars` data set, fit a linear regression model of weight (predictor) on mpg (outcome). Get a 95% confidence interval for the expected mpg at the average weight. What is the lower endpoint?

Your Answer		Score	Explanation
18.991	✔	1.00	
-6.486			
-4.00			
21.190			
Total		1.00 / 1.00	

Question Explanation

```
data(mtcars)
fit <- lm(mpg ~ I(wt - mean(wt)), data = mtcars)
confint(fit)
```

```
##                   2.5 % 97.5 %
## (Intercept)      18.991 21.190
## I(wt - mean(wt)) -6.486 -4.203
```

Question 4

Refer to the previous question. Read the help file for `mtcars`. What is the weight coefficient interpreted as?

Your Answer		Score	Explanation
The estimated expected change in mpg per 1 lb increase in weight.			
The estimated expected change in mpg per 1,000 lb increase in weight.	✔	1.00	
The estimated 1,000 lb change in weight per 1 mpg increase.			
It can't be interpreted without further information			
Total		1.00 / 1.00	

Question Explanation

This is the standard interpretation of a regression coefficient. The expected change in the response per unit change in the predictor.

Question 5

Consider again the `mtcars` data set and a linear regression model with mpg as predicted by weight (1,000 lbs). A new car is coming weighing 3000 pounds. Construct a 95% prediction interval for its mpg. What is the upper endpoint?

Your Answer	Score	Explanation
-5.77		
14.93		

27.57	✔	1.00
21.25		
Total		1.00 / 1.00

Question Explanation

```
fit <- lm(mpg ~ wt, data = mtcars)
predict(fit, newdata = data.frame(wt = 3), interval = "prediction")
```

```
##     fit   lwr   upr
## 1 21.25 14.93 27.57
```

Question 6

Consider again the `mtcars` data set and a linear regression model with mpg as predicted by weight (in 1,000 lbs). A “short” ton is defined as 2,000 lbs. Construct a 95% confidence interval for the expected change in mpg per 1 short ton increase in weight. Give the lower endpoint.

Your Answer		Score	Explanation
-12.973	✔	1.00	
-6.486			
-9.000			
4.2026			
Total		1.00 / 1.00	

Question Explanation

```
fit <- lm(mpg ~ wt, data = mtcars)
confint(fit)[2, ] * 2
```

```
##   2.5 %  97.5 %
## -12.973  -8.405
```

```
## Or equivalently change the units
```

```
fit <- lm(mpg ~ I(wt * 0.5), data = mtcars)
confint(fit)[2, ]
```

```
##   2.5 %  97.5 %
## -12.973  -8.405
```

Question 7

If my X from a linear regression is measured in centimeters and I convert it to meters what would happen to the slope coefficient?

Your Answer		Score	Explanation
It would get multiplied by 10			
It would get multiplied by 100.	✔	1.00	
It would get divided by 10			
It would get divided by 100			
Total		1.00 / 1.00	

Question Explanation

It would get multiplied by 100.

Question 8

I have an outcome, Y, and a predictor, X and fit a linear regression model with $Y = \beta_0 + \beta_1 X + \epsilon$ to obtain $\hat{\beta}_0$ and $\hat{\beta}_1$. What would be the consequence to the subsequent slope and intercept if I were to refit the model with a new regressor, $X + c$ for some constant, c?

Your Answer	Score	Explanation
The new slope would be $c\hat{\beta}_1$		
The new slope would be $\hat{\beta}_1 + c$		
The new intercept would be $\hat{\beta}_0 + c\hat{\beta}_1$		

The new intercept would be $\hat{\beta}_0 - c\hat{\beta}_1$	✔	1.00
Total		1.00 / 1.00

Question Explanation

This is exactly covered in the notes. But note that if $Y = \beta_0 + \beta_1 X + \epsilon$ then $Y = \beta_0 - c\beta_1 + \beta_1(X + c) + \epsilon$ so that the answer is that the intercept gets subtracted by $c\beta_1$

Question 9

Refer back to the mtcars data set with mpg as an outcome and weight (wt) as the predictor. About what is the ratio of the the sum of the squared errors, $\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2$ when comparing a model with just an intercept (denominator) to the model with the intercept and slope (numerator)?

Your Answer		Score	Explanation
0.25	✔	1.00	
0.75			
0.50			
4.00			
Total		1.00 / 1.00	

Question Explanation

This is simply one minus the R^2 values

```
fit1 <- lm(mpg ~ wt, data = mtcars)
fit2 <- lm(mpg ~ 1, data = mtcars)
1 - summary(fit1)$r.squared
```

```
## [1] 0.2472
```

```
sse1 <- sum((predict(fit1) - mtcars$mpg)^2)
sse2 <- sum((predict(fit2) - mtcars$mpg)^2)
sse1/sse2
```

```
## [1] 0.2472
```

Question 10

Do the residuals always have to sum to 0 in linear regression?

Your Answer		Score	Explanation
◉ If an intercept is included, then they will sum to 0.	✔	1.00	
○ The residuals never sum to zero.			
○ The residuals must always sum to zero.			
○ If an intercept is included, the residuals most likely won't sum to zero.			
Total		1.00 / 1.00	

Question Explanation

They do provided an intercept is included. If not they most likely won't.