**FINAL EXAM QUESTIONS**

**Theory** **- 20 questions**

**Week 1 Questions**

**Q1.** If the explained sum of squares is 35 and the total sum of squares is 49, what is the residual sum of squares?

1. 10
2. **14**
3. 12
4. 18

**Solution**: B

**Explanation**: Total Sum of Squares = Explained Sum of Squares + Residual Sum of Squares

SST = SSE + SSR

SSR = SST – SSE = 49 – 35 = 14

**Week 2 Questions**

**Q2. We have developed a regression model:**

Rent = b0+ b1\* House\_WithPool

**where** House\_WithPool is a dummy variable set to 1 if a house has a Pool and is set to 0 otherwise.

The Regression summary output is

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | S.E. | t Value | Pr>|t| |
| Intercept | 1542.149 | 2.954 | 12.58\*\*\* | <.001 |
| House\_WithPool | 253.666 | 3.123 | 11.42\*\*\* | <.001 |

What is the average rent of a house with Pool given the summary output?

1. 1542.149
2. 1795.815
3. 1288.483
4. 253.666

Answer: B

**Week 3 Questions**

**Q3**. An electronics store wants to use a regression-based model to estimate the demand

elasticity of 60” 4k HDTVs based on its price. Which of the following models

would be the easiest to interpret elasticity, given that all the models perform equally well?

* 1. Linear model
  2. **Log-Log model**
  3. Log-Linear model
  4. Linear-Log model

**Solution**: B

**Explanation**: Log-Log model is the most appropriate as it would provide ***elasticity*** as the coefficient of the dependent variable, which may be explained in a linear manner, and hence a linear regression may be used in that case under all the normal assumptions for simple linear regression

**Q4**. Why do we use Log-Transformations when we perform transformation of variables?

1. To achieve a more linear relationship
2. To make a distribution more normal
3. To make the variance more constant
4. **All the above**

**Solution**: D

**Explanation**: All the statements stated in options A, B and C are the objectives of performing Log Transformations.

**WEEK 5 Questions**

**Q5.** In an annual survey in Whoville, the town council wants to know what types of beverages people want in the vending machines. However, the surveys are constructed so poorly that most residents refuse to participate and answer them. As a result, due to the low response rate, the survey did not end up reaching all members in the community. Is this result or inconsistency possibly caused by non-response bias?  
A. True  
B. False  
**Answer:** A. True, this is a case of non-response bias as most people being surveyed refused to participate.

**Q6.** What can we conclude based on the following table?  
A. X and Y are perfectly correlated  
B. X and Y are related  
C. X and Y are not related  
D. Both A and B

Solution D; Both A and B, as Y = X\*2, and the correlation of X and Y is = 1.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **X** | -10 | -5 | -1 | 1 | 5 | 10 |
| **Y** | -20 | -10 | -2 | 2 | 10 | 20 |

**Week 6 Questions**

**Q7.** A company with market value $100 million announced a stock split of 2 for 1. Each share is worth $50 before the stock split. What is the market value of the company after the stock split?

1. $50 million
2. **$100 million**
3. $150 million
4. $200 million

**Ans: B (Market Value of Firm remains same after Stock Split)**

**Q8.** Beta of Company A = 0, Company B = 1, Company C = 1.5 and Company D = 2. Which company moves **exactly along** with the market?

1. Company A
2. **Company B**
3. Company C
4. Company D

**Ans: B (Beta=1 implies that the company moves exactly with the market).**

**WEEK 8 Questions**

**Q9.** Which of the following is not a measure for risk-adjusted performance?

1. Sharpe ratio
2. Jensen’s alpha
3. Holding period return
4. Treynor ratio

**Answer:** C

Sharpe ratio and Treynor ratio use returns adjusted with risk-free rate, and Jensen’s alpha is a measure of the excess returns earned by the portfolio compared to returns suggested by the CAPM model.

**Q10.** Which of the following is a Fama-French factor?

1. Value
2. Inflation
3. Momentum
4. Carry trade

**Answer:** A

Fama-French factors include market, size, value factors and others.

**WEEK 9 Questions**

The following questions are based on the **Advertising dataset (Advertising.csv).** The sales are in thousands of units, while the advertising budgets (TV, Radio, Newspaper) are in thousands of dollars.

**Q11.** The following figure is the summary of a linear regression model (Sales ~ TV + Radio + Newspaper) . Which media are statistically significant with respect to contribution to sales?

A screenshot of a cell phone

Description automatically generated

1. TV and Radio
2. Radio and Newspaper
3. TV and Newspaper
4. None of the above

**Solution A.** Examining the p-values associated with each predictor’s t-statistic, the p-values for TV and radio are low, but the p-value for newspaper is not. This suggests that only TV and radio are related to sales.

**Q12.** Let us consider that in a small town, there are 100 households that possess a TV. Out of the 70 households that use the TV, 50 are viewing a particular channel. The rating of the channel is  
a.70/100  
b.40/100  
c.60/100  
d.50/100  
Answer: D. Rating = (Households viewing the channel)/(Total TV Households)

**Q13.** From the regression output, an R-squared of 0.8972 is calculated. How strong is the relationship in our linear regression model?

1. Very strong because the R-squared records a very low percentage of variability in the response that is explained by the predictors.
2. Very strong because the R-squared records a very high percentage of variability in the response that is explained by the predictors.
3. Not strong because the R-squared records a very low percentage of variability in the response that is explained by the predictors.
4. Not strong because the R-squared records a very high percentage of variability in the response that is explained by the predictors.

**Solution B.** The predictors explain almost 90% (R-squared=0.8972) of the variance in sales.

**Q14.** The following two plots are those of residuals vs fitted values. Choose the correct option regarding the relationship between advertising budget and sales.

A close up of a map

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1. There seems to be homoskedasticity.
2. There seems to be heteroskedasticity.

**Solution B.** From the chart of residuals vs fitted values, the red line is curved and the residuals seems to increase as the fitted Y values increase, so heteroskedasticity exists.

**Week 10 Questions**

**Q15.** Which of the following is not a characteristic of display advertising?

1. Works better with retargeting
2. Can be contextual
3. High click-through rates
4. Comes in many sizes

Answer: C

**Q16.** According to social media marketing materials, which of the following is not a way to establish a strategic presence?

1. Identify engaging content
2. Identify social media usage history of each user
3. Identify key participants and influencers
4. Identify methods to engage in dialogue

Answer: B

**Week 12 Questions**

A restaurant is considering opening a drive-through window for customer service. Management estimates that customers will arrive at the rate of 25 per hour during the morning office hours and at the rate of 10 per hour during the rest of the day.

Assume Poisson arrival and exponential service times.

**Q17.** During the morning office hours, the management would like to ensure with a 90% confidence (or service level) that no more than 4 cars will be in the system at any time. At what rate per hour would the service person need to operate at in order to meet a 90% service level? (Please select the closest answer)

1. 37.23
2. 39.62
3. 35.41
4. 40.28

Answer: B

**Q18.** During the rest of the day, the management would like to ensure with a 98% confidence (or service level) that no more than 2 cars will be in the system at any time. What would be the utilization at this point? (Please select the closest answer)

1. 0.321
2. 0.292
3. 0.271
4. 0.350

Answer: C

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**Week 14 Questions**

**Q19.** Positive Tracking Signal - Most of the time, the actual values are below the forecasted values.

1. True
2. False

**Answer:** False

**Week 15 Questions**

**Q20.** Which of the following factors does Safety Stock NOT depend on?

1. Lead Time
2. Price per unit of the stock
3. Demand uncertainty
4. Stock out service level (How strong the desire to NOT stock out)

Ans. B; Safety stock is dependent on all the rest as per the formula, SS = z\*SD\*sqrt(LT), also can be viewed in the slides for ROP.

**===================================================**

**Coding/Calculations** **- 20 questions**

**Week 1 Questions**

**Q1**. You work as a Data Analyst for a car dealership. Let us work with the mtcars data set to help our customers. The dataset can be accessed in the following manner:

> carsData <- as.data.frame(mtcars)

We shall only require 4 columns: mpg (mileage in miles per gallon), disp (engine displacement in cubic inches), hp (gross horsepower) and wt (weight in 1000 lbs).

You are asked to find the best model (simple linear regression with the highest adjusted R-squared value) to predict ‘mpg’ using exactly two of the available three predictor variables – disp, hp and wt.

Now that you have the best model, use the same to predict the mileage and its range(lower and upper bound of the prediction) of a new car with the following feature values (use the predict function with interval = “prediction”)

> newData <- data.frame(disp = 250, hp = 175, wt = 3.5)

1. **Predicted Value = 18.0946; Lower Bound = 12.69385; Upper Bound = 23.49535**
2. Predicted Value = 19.0946; Lower Bound = 11.69385; Upper Bound = 24.49535
3. Predicted Value = 18.9406; Lower Bound = 17.39485; Upper Bound = 33.49128
4. Predicted Value = 18.0946; Lower Bound = 15.47389; Upper Bound = 20.69538

**Solution**: A

**Explanation**: The following Code may be used to find the correct answer

> carsData <- as.data.frame(mtcars)

> ols\_reg1 <- lm(mpg~disp+hp, carsData)

> summary(ols\_reg1)

Call:

lm(formula = mpg ~ disp + hp, data = carsData)

Residuals:

Min 1Q Median 3Q Max

-4.7945 -2.3036 -0.8246 1.8582 6.9363

Coefficients:

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

(Intercept) 30.735904 1.331566 23.083 < 2e-16 \*\*\*

disp -0.030346 0.007405 -4.098 0.000306 \*\*\*

hp -0.024840 0.013385 -1.856 0.073679 .

---

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

Residual standard error: 3.127 on 29 degrees of freedom

Multiple R-squared: 0.7482, Adjusted R-squared: 0.7309

F-statistic: 43.09 on 2 and 29 DF, p-value: 2.062e-09

> ols\_reg2 <- lm(mpg~disp+wt, carsData)

> summary(ols\_reg2)

Call:

lm(formula = mpg ~ disp + wt, data = carsData)

Residuals:

Min 1Q Median 3Q Max

-3.4087 -2.3243 -0.7683 1.7721 6.3484

Coefficients:

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

(Intercept) 34.96055 2.16454 16.151 4.91e-16 \*\*\*

disp -0.01773 0.00919 -1.929 0.06362 .

wt -3.35082 1.16413 -2.878 0.00743 \*\*

---

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

Residual standard error: 2.917 on 29 degrees of freedom

Multiple R-squared: 0.7809, Adjusted R-squared: 0.7658

F-statistic: 51.69 on 2 and 29 DF, p-value: 2.744e-10

> ols\_reg3 <- lm(mpg~wt+hp, carsData)

> summary(ols\_reg3) # Highest R-Squared

Call:

lm(formula = mpg ~ wt + hp, data = carsData)

Residuals:

Min 1Q Median 3Q Max

-3.941 -1.600 -0.182 1.050 5.854

Coefficients:

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

(Intercept) 37.22727 1.59879 23.285 < 2e-16 \*\*\*

wt -3.87783 0.63273 -6.129 1.12e-06 \*\*\*

hp -0.03177 0.00903 -3.519 0.00145 \*\*

---

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

Residual standard error: 2.593 on 29 degrees of freedom

Multiple R-squared: 0.8268, Adjusted R-squared: 0.8148

F-statistic: 69.21 on 2 and 29 DF, p-value: 9.109e-12

> newData <- data.frame(disp = 250, hp = 175, wt = 3.5)

> predict(ols\_reg3, newdata = newData, interval = "prediction")

fit lwr upr

1 18.0946 12.69385 23.49535

**Week 2 Questions**

Please use the data set ‘direct\_marketing.csv’ to answer the following question.

**Q2.** We are interested in the effects of categorical variable ‘Gender’ and numerical variable ‘Salary’ on ‘AmountSpent’. After running the linear regression of ‘AmountSpent’ on ‘Gender’ and ‘Salary’, which of the following is correct?

1. The intercept is significant on 95% confidence level
2. Male customers spend less than female customers
3. The ‘Salary’ effect is not significant on 95% confidence level
4. For one certain customer, higher salary generally means higher amount spent

Answer: D.

The code:

A screenshot of a cell phone

Description automatically generatedAccording to the output, the intercept is not significant on 95% confidence level, answer A is incorrect. GenderMale’s coefficient is positive, answer B is incorrect. The ‘Salary’ effect is significant on 95% confidence level, answer C is incorrect. For one specific customer, since Salary’s coefficient is positive, higher salary means higher amount spent.

**Week 4 Questions**

**Instructions**

We are interested in predicting which houses have median value greater than $30,000 using the variables in the **Boston housing dataset**.

The dataset ***Boston*** will be loaded into the environment once the following command is run:

library(MASS)

Please run the following code in R to learn more about the variables in the dataset:

?Boston

Create a new binary variable ***Result*** with a value of 1 if the ***medv*** (median value of owner-occupied homes in $1000s) variable is greater than $30k and 0 otherwise.

Create a logistic regression to model this question using all the variables in the ***Boston*** dataset. Please do not forget to remove the ***medv***variable while building the model. Use the information from the model to answer the following two questions. Select the closest answer.

**Q3.** Which variable is statistically significant at 5% significance level but not statistically significant at 1% significance level?

1. *rm*
2. *rad*
3. *tax*
4. *ptratio*

**Answer**: C

**Explanation:** From the model summary, it is evidentthe variable *tax* is statistically significant at 5% significance level but not at 1% significance level.

**Q4.** How should one interpret the coefficient of *rm*?

1. If *rm* increases by 1 unit, the natural log of the odds of the house median value being greater than $30,000 increases by 2.355.
2. If *rm* increases by 1 unit, the odds of the house median value being greater than $30,000 increase by 2.021.
3. If *rm* increases by 1 unit, the odds of the house median value being greater than $30,000 increase by exp(2.854).
4. All of the above.

**Answer**: A

**Explanation:** If *rm* increases by 1 unit, the natural log of the odds of the house median value being greater than $30,000 increases by 2.355. This is the direct interpretation of the coefficient of *rm* = 2.355.

**Code:**

# Using Boston dataset predict which houses will have median house price 30K

# Feature engineering, Introduce a variable Result and apply value has 1 for greater than or equal to 30

# and 0 for less than that.

library(MASS)

library(ROCR)

Boston$Result <- ifelse(Boston$medv > 30,1,0)

names(Boston)

Boston$medv <- NULL

# Apply logistic regression algorithm on Boston data set train

logis <- glm(Result ~ ., data = Boston, family = binomial)

# Answer to QUESTION 1 and 2

summary(logis)

# Predict using the model built

Boston$pred <- predict(logis,data=Boston,type="response")

# Calculate confusion matrix

confusion\_matrix <- table(actual=Boston$Result,predict=Boston$pred > 0.5)

**Week 7 Questions**

Use “AMZN.csv” for the following two questions.

AMZN.csv file includes daily closing price for Amazon.com, Inc from 10/22 to 11/22. The monthly risk-free rate is 0.19%.

The formula for Sharpe Ratio is as follows:

A picture containing object

Description automatically generated

**Q5.** What is the monthly Sharpe Ratio for Amazon.com? (Please use arithmetic return and omit 10/22 when calculating the daily returns, i.e.: only 23 data points are used to calculate Sharpe Ratio)

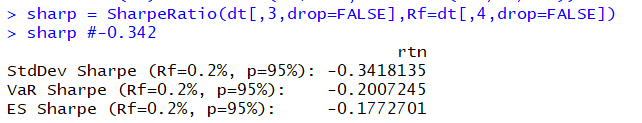
A. 0.34

B.-0.34

C. 1.23

D. -1.23

Answer: B



# install.packages("PerformanceAnalytics")

dt <- read.csv("AMZN.csv",header=TRUE)

# arithmetic return

rtn <- diff(dt$Adj\_Close)/dt$Adj\_Close[-length(dt$Adj\_Close)]

# omit the first row

dt <- dt[-1,]

# add the return to the data

dt$rtn <- rtn

# add one column of monthly risk-free rate

dt$rf <- 0.19/100

# calculate the sharpe ratio using the function

library(PerformanceAnalytics)

row.names(dt) <- as.Date(dt$Date, format=c("%m/%d/%Y"))

sharp = SharpeRatio(dt[,3,drop=FALSE],Rf=dt[,4,drop=FALSE])

sharp #-0.342

#sharpe ratio is negative because excess-return is negative

**Q6.** Calculate the holding period return for the Amazon stock from 10/22/2019 to 11/22/2019 (include the beginning and the end dates).

1. **-1.27%**
2. -0.56%
3. -2.22%
4. +2.22%

Answer: A

Solution: (prod(dt$rtn+1)-1)

**WEEK 8 Questions**

Please use the data set UPS\_KO.csv to answer the following questions. For each column:

Date: This column represents date from 09/2014 to 08/2019.

Mkt\_RF: This column represents market premium (i.e., Market return – risk\_free rate).

SMB: This column represents size factor.

HML: This column represents value factor.

RF: This column represents risk free rate.

UPS: This column represents return of UPS.

KO: This column represents return of KO.

**Q7.** Use excess returns of UPS and KO and run three-factor (i.e., Mkt\_RF, SMB, HML) models for both UPS and KO. Which of the following factor is statistically significant at the 0.01 significance level for both models?

1. **Market premium**
2. SMB
3. HML
4. None of above

**Q8.** Which firm(s) has statistically significant alpha (95% confidence level) according to the models from question 3?

1. UPS
2. KO
3. Both of UPS and KO
4. Neither UPS nor KO

Solutions for questions 3 and 4:

**Answer for question 3: A**

**Answer for question 4: D**

**A screenshot of a cell phone screen with text

Description automatically generatedCode**:

**Output for UPS:**

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**Output for KO:**

A screenshot of a cell phone

Description automatically generated

**Week 10**

**Firm A’s Cost – Profit structure from a digital ad campaign:**

|  |  |
| --- | --- |
| **Metric** | **Value** |
| Average CPC (cost per click) | $0.83 |
| Conversion Rate | 4.5% |
| Average Sale Value | $132 |
| Profit Margin | 12.75% |

**Q9:**

For this question, ignore the Life Time Value (LTV) of the customer acquisition and only assume single sale per conversion. Also assume that the Firm A’s goal is to maximize its profit.

What is the Break Even Point CPC per Avg. Sale i.e. what we should be spending per click for one sale? Should Firm A go ahead with its digital marketing campaign?

1. 0.657, No
2. **0.757, No**
3. 0.657, Yes
4. 0.757, Yes

Ans:

Cost per conversion: $0.83/0.045 = $18.4444

Profit Margin per sale: $132\*0.1275 = $16.83

BEP CPC per Avg. Sale = $16.83 \* .045 = **$0.75735**

**Since, $0.75735 < $0.83, Firm A should not be spending on the digital advertising campaign**

**Q10:**

Suppose the LTV of each conversion is $ 198. Should Firm A go ahead with the digital marketing campaign? What is its average profit/ loss per conversion if Firm A goes ahead with the digital campaign?

1. No, -$5.40
2. No, -$6.80
3. Yes, $5.40
4. **Yes, $6.80**

Ans.

Cost per conversion (sale): $0.83/0.045 = $18.4444

Profit Margin per sale: $198\*0.1275 = $25.245

BEP CPC per Avg. Sale = $25.245\* .045 = **$1.136**

**Since, $ 1.136 > $0.83, Firm A should be spending on the digital advertising campaign.**

**Average Profit per conversion =** Profit Margin per sale - Cost per conversion

= 25.245 - 18.444

= $ 6.801

**Week 11**

Please use the Facebook Ad dataset ***KAG\_conversion\_data\_wrangled.csv*** for the next set of questions. We advise to solve these questions using R (preferably using *dplyr* library wherever applicable) after reviewing the code provided for Week 11 and other resources provided for learning *dplyr* in R Learning Guide

Load the dataset as:

data <- read.csv("KAG\_conversion\_data\_wrangled.csv",stringsAsFactors = FALSE)

**Q11.** Which ad (ad\_id) has the highest cost per click?

Answer: 1121223

Code: data %>% filter(CPC== max(CPC)) %>% select(ad\_id)

**Q12.** What percentage of ads (ad\_id) have a cost per click (CPC) of at least $1? (>=1). NOTE: Please round the answer to 2 decimal places

Answer: 78.83%

Code: round((data %>% filter(CPC >=1 ) %>% nrow())/(data %>% nrow())\*100,2)

**Q13.**Which age group did ***Campaign 936*** (campaign\_id = 936) reach out most to with respect to mean number of impressions?

Answer: 47

Code: data %>% filter(campaign\_id == 936) %>% group\_by(age) %>% summarise(Impr = mean(Impressions)) %>% arrange(desc(Impr))

**Week 13 Questions:**

**Use the following for Questions 14 and 15. Assume 3 sigma limits**:

Consider a steel rod cutting process. A critical dimension is the rod length. David has taken 4 rods per day for the past 10 days and measured them. The data from his samples are given in the table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample Number | Rod lengths (mm) | | | |
| (i) | (ii) | (iii) | (iv) |
| 1 | 144 | 146 | 154 | 146 |
| 2 | 151 | 150 | 134 | 153 |
| 3 | 145 | 139 | 143 | 152 |
| 4 | 154 | 146 | 152 | 148 |
| 5 | 157 | 153 | 155 | 157 |
| 6 | 157 | 150 | 145 | 147 |
| 7 | 149 | 144 | 137 | 155 |
| 8 | 141 | 147 | 149 | 155 |
| 9 | 158 | 150 | 149 | 156 |
| 10 | 145 | 148 | 152 | 154 |

**Q14.** What are the upper and lower control limits for the R chart?  
a. UCLr = 25.4845 mm, LCLr = 0.00 mm

b. UCLr = 24.7687 mm, LCLr = 1.32 mm

c. UCLr = 27.8445 mm, LCLr = 0.67 mm

d. UCLr = 26.4712 mm, LCLr = 0.00 mm

**Answer**: D

**Explanation**:

(average of all ranges)

UCLr = D4 \*

UCLr = 2.282 \* 11.6

UCLr = 26.4712

LCLr = D3 \*

LCLr = 0 \* 11.6

LCLr = 0

**Q15.** What are the upper and lower control limits for the x-bar chart?

a. UCLx=157.6314 mm, LCLx=140.7186 mm

b. UCLx=157.7454 mm, LCLx=152.5898 mm

c. UCLx=158.9409 mm, LCLx=151.3867 mm

d. UCLx=159.1478 mm, LCLx=150.1852 mm

**Answer**: A

**Explanation**:

(average of all sample means)

UCL = + A2 \*

UCL = 149.175 + 0.729 \* 11.6

UCL = 157.6314

LCL = - A2 \*

LCL = 149.175 - 0.729 \* 11.6

LCL = 140.7186

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample Number | Rod lengths | | | | Sample Mean (mm) | Sample Range(mm) |
| (i) | (ii) | (iii) | (iv) |
| 1 | 144 | 146 | 154 | 146 | 147.5 | 10 |
| 2 | 151 | 150 | 134 | 153 | 147 | 19 |
| 3 | 145 | 139 | 143 | 152 | 144.75 | 13 |
| 4 | 154 | 146 | 152 | 148 | 150 | 8 |
| 5 | 157 | 153 | 155 | 157 | 155.5 | 4 |
| 6 | 157 | 150 | 145 | 147 | 149.75 | 12 |
| 7 | 149 | 144 | 137 | 155 | 146.25 | 18 |
| 8 | 141 | 147 | 149 | 155 | 148 | 14 |
| 9 | 158 | 150 | 149 | 156 | 153.25 | 9 |
| 10 | 145 | 148 | 152 | 154 | 149.75 | 9 |
|  |  |  |  |  | **149.175** | = **11.6** |

**Q16.** Food served at a restaurant should be between 38°C and 49°C when it is delivered to the customer. The process used to keep the food at the correct temperature has a process standard deviation of 2°C and the mean value for these temperature is 40°C. According to process capability index (Cpk), is this process capable of meeting the requirements?

a. Yes, Cpk is 3.333

b. Yes, Cpk is 4

c. No, Cpk is 0.3333

d. No, CpK is 0.4

**Answer**: C

**Explanation**:

Cpk = Minimum of [{(upper specification-/3s}, {-lower specification)/3s}]

Cpk = Minimum of [{(49 – 40)/ (3\*2)}, {(40 – 38)/ (3\*2)}] = 0.3333

Cpk = Minimum of [{1.5}, {0.3333}] = 0.3333

Process is not capable because Cpk<1

**Week 14 Questions**

**For Question 17 and 18, refer to the following table (alpha = 0.8):**

**Abbreviations**

1. **ES :** Exponential Smoothing
2. **RSFE :** RunningSum of Forecast Error
3. **MFE :** Mean Forecast Error
4. **MAD :** Mean Absolute Deviation
5. **TS :** Tracking Signal

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Month** | **Actual** | **ES** | **Error** | **RSFE** | **MFE** | **Abs Error** | **MAD** | **TS** |
| 1 | Jan | 18 | 17 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 2 | Feb | 17 | 17.80 | -0.80 | 0.20 | 0.10 | 0.80 | 0.90 | 0.22 |
| 3 | Mar | 15.9 | 17.16 | -1.26 | -1.06 | -0.35 | 1.26 | 1.02 | -1.04 |
| 4 | Apr | 17.5 | 16.15 | 1.35 | X | Y | 1.35 | 1.10 | 0.26 |
| 5 | May | 18 | 17.23 | 0.77 | 1.06 | 0.21 | 0.77 | A | B |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Month** | **Actual** | **ES** | **Error** | **RSFE** | **MFE** | **Abs Error** | **MAD** | **TS** |
| 1 | Jan | 18 | 17 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 2 | Feb | 17 | 17.80 | -0.80 | 0.20 | 0.10 | 0.80 | 0.90 | 0.22 |
| 3 | Mar | 15.9 | 17.16 | -1.26 | -1.06 | -0.35 | 1.26 | 1.02 | -1.04 |
| 4 | Apr | 17.5 | 16.15 | 1.35 | X | Y | 1.35 | 1.10 | 0.26 |
| 5 | May | 18 | 17.23 | 0.77 | 1.06 | 0.21 | 0.77 | A | B |

**Q17:**

**What are the missing values of Running Sum of Forecast Error (RSFE) and Mean Forecast Error (MFE) (i.e. values of X and Y)?**

1. X = 0.36, Y = 0.09
2. X = 0.27, Y = 0.08
3. X = -0.36, Y = -0.09
4. X = 0.29, Y = 0.07

**Solution: D. X** = 0.29, Y = 0.07

**Explanation:** Please refer Week 14 Excel Sheet

**Q18:**

**What are the missing values of Mean Absolute Deviation (MAD) and Tracking Signal (TS) (i.e. values of A and B)?**

1. A = 1.00, B = 0.92
2. A = 1.04, B = 1.02
3. A = -0.96, B = -0.92
4. A = 1.12, B = 0.17

**Solution: B.** A = 1.04, B = 1.02

**Explanation:** Please refer Week 14 Excel Sheet

**Week 15 Questions**

**Use the below for the next two questions:**

You work at GTRI in their IT group. One of your jobs is building minicomputers for use by researchers. Keeping costs down is important. Also important is having the inputs to make minicomputers quickly when requested. Of particular interest are memory chips.

Records show that on average 8,000 memory chips are used per year. Each unit costs $10 and holding cost is 5% of the unit cost. The ordering cost is $50.

**Q19.** What is the expected number of orders per year if EOQ (Economic Order Quantity) is used?

1. 4
2. 3
3. 5
4. 6

Ans. D

EOQ = sqrt(2\*D\*S/H) = sqrt(2\*8000\*50/0.5) = 1265

Expected number of orders (N) = D/EOQ = 8000/1265 = 6

**Q20.** Assume that the above demand varies with a standard deviation of 400 and it takes 7 days for your order to arrive. Number of working days in a year can be taken as 300. If the current Service Level Agreement (SLA) with R&D is 96%, when should you order for more stock of memory chips? (Take z-score of 96% as 1.75)

1. When there are 2000 chips left
2. When there are 2039 chips left
3. When there are 2300 chips left
4. When there are 2045 chips left

Ans. B

ROP = Expected demand during lead time + safety stock = d\*LT + z\*sd\*sqrt(LT) = (8000/300)\*7 + 1.75\*400\*sqrt(7) = 186.67 + 1852.03 = 2038.7 = 2039