Design and Analysis of Experiments Using JMP 15

Sample Questions

The following sample questions are not inclusive and do not necessarily represent all of the types of questions that comprise the exams. The questions are not designed to assess an individual's readiness to take a certification exam.

Question 1

You are designing an experiment to improve your process yield by at least 20 percentage points. You have two factors and expect them to be equally important in increasing yield. You plan on using an alpha of 0.05 and a beta of 0.1. What is the minimum power, expressed as a proportion, for your experiment? _____

correct answer= "0.9"

Question 2

You are interested in determining the maximum yield from your process. You believe 5 factors affect the yield:

- Factor A, a numeric factor that can vary between 30 and 40
- Factor B, a numeric factor that cannot be controlled
- Factor C, a non-numeric factor with three levels
- Factor D, a non-numeric factor with 2 levels
- Factor E, a numeric factor that can only be set at values 2, 5, and 10.

Which statement about these factors is correct?

A. Factors A and B should be included as continuous factors.
B. Factor B should not be included.
C. Factor C should be included as a categorical factor and Factor E as a discrete numeric factor.
D. Factors D and E should be included as categorical factors.

correct answer= "C"

Question 3

A two-level fractional factorial design for 4 continuous factors in 8 runs is created. Which model terms in the most complex linear model can be estimated from this design?

A. Main effects only
B. Main effects and some two-factor interactions
C. Main effects and all two-factor interacations
D. Main effects and all interactions

correct answer= "B"

Question 4

You include a categorical factor with five levels. How will the addition of this main effect to the model affect the minimum number of runs?

A. Increase the minimum number of runs by 4.
B. Increase the minimum number of runs by 1.
C. Increase the minimum number of runs by 5.
D. Increase the minimum number of runs by 2.

correct answer= "A"

Question 5

The response Y currently has an average of 40. The lower specification limit is 210. The development team is planning an experiment to learn how to increase the response and are calculating the power. The team decides they want to be able to detect a change in the response of at least 30. One of the factors is X1. It is a continuous factor. A wide range, from 75 to 125, should produce a large effect. What value do you enter for the Anticipated Coefficient for X1?

A. 15
B. 30
C. 100
D. 170

correct answer= "A"

Question 6

Which two statements represent restricted randomization? (Choose two.)

A. You cannot complete all runs in one lot of product.
B. You group runs to make it easier to execute the experiment, but you randomize the groups.
C. You randomly select both experimental unit and treatment combination.
D. You reset factor settings before each run, even if they remain the same as the previous run.
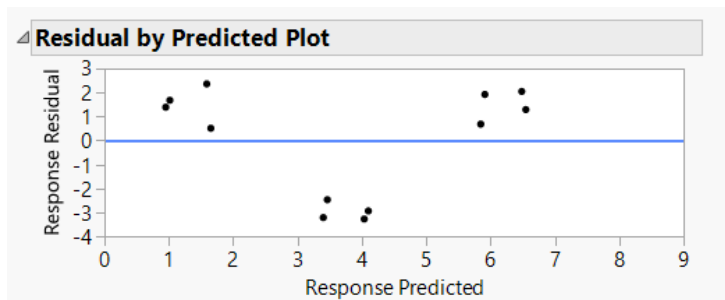
correct answer= "A,B"

Question 7

The team will design an experiment to improve the response in a process. The measurement of the response is imprecise. You have 12 treatment combinations to test and decide to add replication. Which choice demonstrates replication?

A. Include 4 new treatment combinations, for a total of 16 runs.
B. Measure the response twice at the end of each run for a total of 24 measurements.
C. Test each treatment combination again for a total of 24 runs.
D. Add 3 blocks for a total of 12 runs.

correct answer= "C"

Question 8

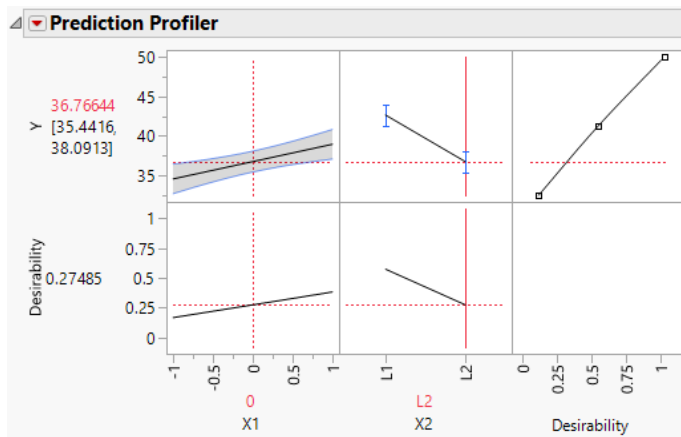After analyzing your data, you examine the plot of the residuals versus the predicted values shown below.

How will the relationship seen here prompt you to change your model?

A. There is no need to change the model.
B. Add a quadratic term to the model.
C. Add one or more interaction terms to the model.
D. Add another main effect to the model.

correct answer= "B"

Question 9

Refer to the Prediction Profiler report below:

A. The factor setting is locked at its optimal location.
B. The factor setting is locked and cannot be changed by maximizing the desirability.
C. The factor setting is locked but can be changed by the user.
D. The factor is a categorical factor.

correct answer= "B,C"

Question 10

For which reason would you want to add runs to an experiment?

A. To fit a smaller assumed model.
B. To ensure variance of model estimates remains stable.
C. To add aliasing of effects.
D. To discriminate among several highly likely models

correct answer= "D"

Question 11

You would use the Augment Design platform to accomplish which goal?

A. to specify additional model terms of interest
B. to change a factor from Easy to Hard to change
C. to find optimal design points to replicate
D. to add a new categorical factor of interest

correct answer= "A"

Question 12

Which two statements define power? (Choose two.)

A. Power is the probability of detecting a real effect.
B. Power is one minus the probability of making a Type II error.
C. Power is the probability of making a Type II error.
D. Power is the probability of rejecting the null hypothesis when its true.

correct answer= "A,B"

Question 13

Four quantities are related to the power of the test associated with a parameter estimate. Which changes would increase the power?

A. Increase the number of blocks, increase the size of the effect, increase the response variance, decrease the stated level of significance (alpha).
B. Increase the number of runs, increase the size of the effect, decrease the response variance, increase the stated level of significance (alpha).
C. Decrease the number of runs, decrease the size of the effect, decrease the response variance, increase the stated level of significance (alpha).
D. Increase the number of runs, increase the size of the effect, increase the response mean, decrease the stated level of significance (alpha).
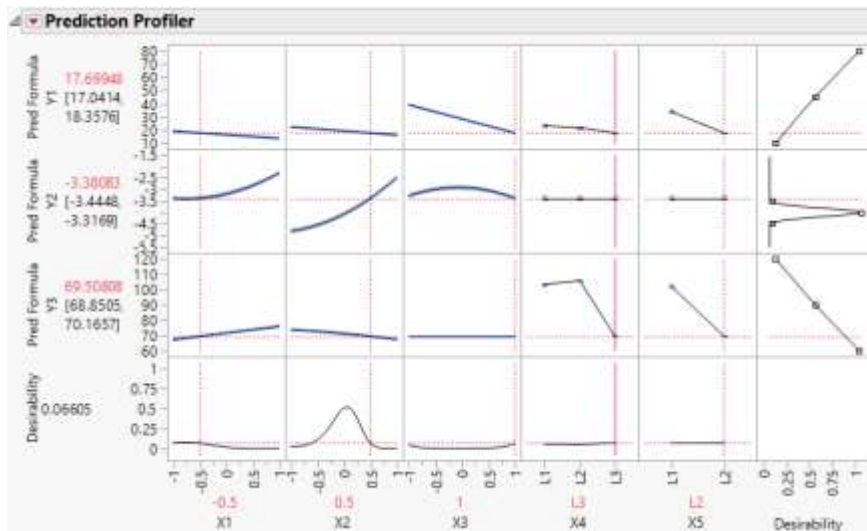
correct answer= "B"

Question 14

A data table created by the DOE platform automatically contains several scripts. Which of those scripts do you use to make changes to your design?

A. Model
B. Evaluate Design
C. DOE Simulate
D. DOE Dialog

correct answer= "D"

Question 15

In the Prediction Profiler shown below, which statement is true?

A. One goal is to minimize Y3.
B. The optimum settings are X1 = −0.5, X2 = 0.5, X3 = 1, X4 = L3, X5 = L2.
C. X3 is a blocking factor.
D. Desirability is 1.

correct answer= "A"

Question 16

After analyzing your experiment, you determine the blocking factor is NOT a significant model effect. What action do you take?

A. Remove the blocking factor from the model.
B. Remove any interaction effects between the blocking factor and other factors.
C. Take no action with respect to the blocking factor.
D. Make sure to include the blocking factor in future experiments.

correct answer= "C"

Question 17

You performed a screening experiment and saw favorable results. You want to add follow-up runs to be able to determine if any two-factor interactions are active. Because a significant amount of time will pass between the original experiment and the follow-up experiment, you are concerned about a shift in the process. Which step must be part of your augmentation process?

A. Increase the power of the quadratic effects in the model to make them easier to detect.
B. Place the new runs into a separate block so the blocking factor absorbs the possible process shift.
C. Foldover the design so your main effects will not be confounded with the two factor interactions.
D. Replicate the entire design to reduce the variability of the regression coefficients because of the large process variability.

correct answer= "B"

Question 18

You ran an experiment using a Resolution V fractional factorial design and have determined there are 4 active factors. You now want to determine which of the factors have active quadratic effects. How do you augment your design?

A. Add center points.
B. Replicate the design.
C. Add axial points.
D. Fold over the design.

correct answer= "C"

Question 19

The team designed the experiment with all factors defined to be easy to change. The experiment was then run without randomizing the factor settings in every run. What impact will that disconnect have during the regression analysis and model selection?

A. Factors with no effect that were not randomized are more likely to be found significant and factors with an effect that were randomized are more likely not to be found significant.
B. Factors with no effect that were not randomized are less likely to be found significant and factors with an effect that were randomized are more likely to be found significant.
C. Factors with no effect that were not randomized are less likely to be found significant and factors with an effect that were randomized are less likely to be found significant.
D. The effects of the factors that were randomized or not randomized are no more or less likely to be found significant but blocks should be included in the model.

correct answer= "A"

Sample Scenario

The Design and Analysis of Experiments Using JMP 14 exam has a practical section on the exam where you will be asked to work with sample data and work in JMP to answer the test questions. Below is a sample of the type of scenario you could see on the exam. It is recommended that you have a copy of JMP 14 in order to practice working with DOE in JMP.

Question 20

In this scenario you will use the sample data table **Tiretread.jmp**. You can access this data table from the sample data tables provided in JMP. A snapshot of the table is shown below.

There are 4 response columns: ABRASION, MODULUS, ELONG, and HARDNESS. Using the data table in JMP, answer the next three questions.

What is the goal for the response MODULUS?

a. Maximize
b. Minimize
c. Match Target
d. None

correct answer: a

What is the relative importance of the 4 responses?

a. ABRASION is more important than any of the other responses
b. HARDNESS is twice as important as ELONG
c. All responses have equal importance
d. None of the responses has an importance assigned

correct answer: c

Suppose you determine that ABRASION and ELONG are twice as important as MODULUS and HARDNESS. Which of the following sets of importance values could be used to reflect this determination?

Response	Importance
ABRASION	.75
MODULUS	.25
ELONG	.75
HARDNESS	.25

a.

Response	Importance
ABRASION	1
MODULUS	2
ELONG	1
HARDNESS	2

b.

Response	Importance
ABRASION	.5
MODULUS	.25
ELONG	.5
HARDNESS	.25

c.

Response	Importance
ABRASION	.25
MODULUS	.25
ELONG	.25
HARDNESS	.25

d.

correct answer: c