

### True or False:

A mathematical model shows the relationship between quantifiable and non-quantifiable information. **F**

The EMV approach and Utility theory always result in the same choice of alternatives. **F**

The decision theory processes of maximizing expected monetary value (EMV) and minimizing expected opportunity loss (EOL) should lead us to choose the same alternatives. **T**

The process of isolating linear trend and seasonal factors to develop a more accurate forecast is called regression. **F**

The Delphi method solicits input from customers or potential customers regarding their future purchasing plans. **F**

A picture, drawing, or chart of reality is not a schematic model. **F**

Utility values typically range from -1 to +1. **F**

Develop a model is the first step in quantitative analysis. **F**

Quantitative factors are data that can be accurately calculated. **T**

Minimum EOL will always equal EVwPL. **F**

When using the EOL as a decision criterion, the best decision is the alternative with the largest EOL value. **F**

A medium-term forecast typically covers a two-to four-year time horizon. **F**

Daily demand for newspapers for the last 10 days has been as follows: 12,13,16,15,12,18,14,12,13,15 (listed from oldest to most recent), then the Forecast sales for the next day using a two-day moving average is 14. **T**

Interviews, statistical sampling, and company reports provide input data for quantitative analysis models. **T**

Fixed values in a Quantitative Model are known as parameters. **T**

Decision variables may also be called parameters. **F**

Model variables can be controllable or uncontrollable. **T**

A series of steps or procedures that are repeated is known as an algorithm. **T**

A model is a representation of a situation. **T**

Trying various approaches and picking the one resulting in the best decision is called incomplete enumeration. **F**

Testing the data and model should be done before the results have been analyzed. **T**

A sensitivity analysis allows a manager to answer the “what if” questions. **T**

One problem in using a quantitative model is that the necessary data may be unavailable. **T**

Time-series models attempt to predict the future by using historical data. **T**

A moving average forecasting method is a causal forecasting method. **F**

The most common quantitative causal model is regression analysis. **T**

The naïve forecast for the next period is the actual value observed in the current period. **T**

Mean absolute deviation (MAD) is simply the sum of forecast errors. **F**

In a weighted moving average, the weights assigned must sum to 1. **F**

A scatter diagram is a graphical depiction of the relationship between the dependent and independent variables. **T**

There is no relationship between variables unless the data lie in a straight line. **F**

Error is the difference in the actual value and the predicted value. **T**

The regression line minimizes the sum of the squared errors. **T**

The SSR indicates how much of the total variability in the dependent variable is explained by the regression model. **T**

The coefficient of determination takes on values between -1 and +1. **F**

The coefficient of determination gives the proportion of the variability in the dependent variable that is explained by the regression equation. **T**

The correlation coefficient has values between -1 and +1. **T**

Errors are also called residuals. **T**

The regression model assumes the errors are normally distributed. **T**

An F-test is used to determine if there is a relationship between the dependent and independent variables. **T**

The multiple regression model includes several dependent variables. **F**

Another name of a dummy variable is a binary variable. **T**

The best model is a statistically significant model with a high  $r^2$  and few variables. **T**

Multicollinearity exists when an independent variable is correlated to other independent variables. **T**

The coefficient of determination is found by taking the square root of the coefficient of correlation. **F**

The coefficient of determination is the proportion of total variation in Y that is explained by X. **T**

A goal of many waiting line problems is to help a firm find ideal level of services that minimize the cost of waiting and the cost of providing the service. **T**

Balking refers to customers who refuse to join the queue. **T**

An M/M/2 model has Poisson arrivals exponential service times and two channels. **T**

When looking at the arrivals at the ticket counter of a movie theater, we can assume an unlimited queue. **T**

In the multichannel model (M/M/m), we must assume that the average service time for all channels is the same. **T**

An automatic car wash is an example of a constant service time model. **T**

A hospital ward with only 30 beds could be modeled using a finite population model. **T**

The three basic components of a queuing process are arrivals, service facilities, and the actual waiting line. **T**

The wait time for a single-channel system is more than twice that for a two-channel system using two servers working at the same rate as the single server. **T**

The linear programming transportation model allows us to solve problems where supply does not equal demand. **T**

A bank with a single queue to move customers to several tellers is an example of a single-channel system. **F**

Linear programming is a qualitative technique which helps to collect data systematically. **F**

The four queuing models (M/M/1, M/M/S, M/D/1 and limited population) that have three characteristics in common are Poisson distribution arrivals, FIFO discipline and a single-service phase. **T**

If an independent variable is correlated with a combination of other independent variables, the condition of multicollinearity exists. **T**

The coefficient of correlation also expresses the degree of strength of the linear relationship. **T**

MCQ:

Which of the following is not a quantitative factor:

- a) Inventory levels.
- b) Technological breakthroughs.
- c) Demand.
- d) Labor cost.

Expressing profits through the relationship among unit price, fixed costs, and variable costs is an example of

- a) A sensitivity analysis model.
- b) A quantitative analysis model.
- c) A post-optimality relationship.
- d) A parameter specification model.

A pessimistic decision-making criterion is

- a) Maximax.
- b) Maximin.
- c) Decision making under certainty.
- d) Minimax regret.

The following is an opportunity loss table.

|              | States of Nature |    |    |
|--------------|------------------|----|----|
| Alternatives | A                | B  | C  |
| Alt 1        | 30               | 0  | 10 |
| Alt 2        | 5                | 20 | 0  |
| Alt 3        | 0                | 20 | 25 |

What decision should be made based on the minimax regret criterion?

- a) Alternative 1
- b) Alternative 2
- c) Alternative 3
- d) State of Nature C

Which of the following is not considered to be one of the components of time series?

- a) Trend
- b) Seasonality
- c) Cycles
- d) Variance

A tracking signal was calculated for a particular set of demand forecasts. This tracking signal was positive. This would indicate that

- a) Demand is greater than the forecast.
- b) Demand is less than the forecast.
- c) Demand is equal to the forecast.
- d) The MAD is negative.

Which of the following is not one of the steps in the quantitative analysis approach?

- a) Defining the problem
- b) Developing a Solution
- c) Observing a hypothesis
- d) Testing a Solution
- e) Implementing the Results

The condition of improper data yielding misleading results is referred to as

- a) Garbage in, Garbage out
- b) Break-even point
- c) Uncontrollable variable
- d) Postoptimality

Trying various approaches and picking the one that results in the best decision is called

- a) The trial-and-error method
- b) Incomplete enumeration
- c) Complete enumeration
- d) Algorithmic approximation

What is the formula for the break-even point of a simple profit model?

$\text{Fixed Cost} / (\text{Selling Price Per Unit} - \text{Variable Cost Per Unit})$

The point at which the total revenue equals total cost (meaning zero profit) is called the

- a) Zero-profit solution
- b) Optimal-profit solution
- c) Break-even point
- d) Fixed-cost solution

An analysis to determine how much a solution would change if there were changes in the model or the input data is called

- a) Sensitivity or postoptimality analysis
- b) Schematic or iconic analysis
- c) Break even analysis
- d) Both B and C

Which of the following is a technique used to determine forecasting accuracy?

- a) Exponential smoothing
- b) Moving average
- c) Delphi method
- d) Mean absolute percent error

A medium-term forecast is considered to cover what length of time?

- a) 2-4 weeks
- b) 1 month to 1 year
- c) 2-4 years
- d) 5-10 years
- e) 20 years

A market research survey is available for \$10,000. Using a decision tree analysis, it is found that the expected monetary value with the survey is \$75,000. The expected monetary value with no survey is \$62,000. What is the expected value of sample information?

(None of the above)

Daily demand for newspapers for the last 10 days has been as follows: 12,13,16,15,12,18,14,12,13,15 (listed from oldest to most recent). Forecast sales for the next day using a two-day weighted moving average where the weights are 3 and 1 (the highest weight is for the most recent number).

(14.5)

The ability to examine the variability of a solution due to changes in the formulation of a problem is an important part of the analysis of the results. This type of analysis is called ----- analysis.

(sensitivity)

A seasonal index of ----- indicates that the season is average.

(1)

The following is a payoff table giving profits for various situations:

|               | States of Nature |     |     |
|---------------|------------------|-----|-----|
| Alternatives  | A                | B   | C   |
| Alternative 1 | 120              | 140 | 120 |
| Alternative 2 | 200              | 100 | 50  |
| Alternative 3 | 100              | 120 | 180 |
| Do Nothing    | 0                | 0   | 0   |

What decision would an optimist make?

(Alternative 2)

The break-even point is an example of a

(quantitative analysis model)

What is the range of the Hurwicz criterion coefficient of realism a ?

(0 to 1)

The correlation coefficient resulting from a particular regression analysis was 0.25. What was the coefficient of determination?

- a) 0.5
- b) - 0.5
- c) 0.0625
- d) There is insufficient information to answer the question.
- e) None of the above

The coefficient of determination resulting from a particular regression analysis was 0.85. What was the correlation coefficient, assuming a positive linear relationship?

- a) 0.5
- b) - 0.5
- c) 0.922
- d) There is insufficient information to answer the question.
- e) None of the above



A healthcare executive is using regression to predict total revenues. She has decided to include both patient length of stay and insurance type in her model. Insurance type can be grouped into three categories: Government-Funded, Private-Pay, and Other. Her model is

- a)  $Y = b_0$
- b)  $Y = b_0 + b_1 X_1$
- c)  $Y = b_0 + b_1 X_1 + b_2 X_2$
- d)  $Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3$
- e)  $Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4$

The condition of an independent variable being correlated to one or more other independent variables is referred to as

- a) Multicollinearity
- b) Statistical significance
- c) Linearity
- d) Nonlinearity
- e) The significance level for the F-test is not valid

Which of the following equalities is correct?

- a)  $SST = SSR + SSE$
- b)  $SSR = SST + SSE$
- c)  $SSE = SSR + SST$
- d)  $SST = SSC + SSR$
- e)  $SSE = \text{Actual Value} - \text{Predicted Value}$

The sum of squared error (SSE) is

- a) A measure of the total variation in Y about the mean.
- b) A measure of the total variation in X about the mean.
- c) A measure in the variation of Y about the regression line.
- d) A measure in the variation of X about the regression line.
- e) None of the above.

Most systems use a queue discipline known as (FIFO)

A graph of the sample points that will be used to develop a regression line is called (A regression plot)

If computing a causal linear regression model of  $Y = a + bX$  and the resultant  $r^2$  is very near zero, then one would be able to conclude that

- a)  $Y = a + bX$  is a good forecasting method.
- b)  $Y = a + bX$  is not a good forecasting method.
- c) A multiple linear regression model is a good forecasting method for the data.
- d) A multiple linear regression model is not a good forecasting method for the data.
- e) None of the above.

Which of the following statements is true about  $r^2$ ?

- a) It is also called the coefficient of correlation
- b) It is also called the coefficient of determination
- c) It represents the percent of variation in  $X$  that is explained by  $Y$ .
- d) It represents the percent of variation in the error that is explained by  $Y$ .
- e) It ranges in value from -1 to +1.

The customer who arrives at a bank, sees a long line, and leaves to return another time is

- a) Balking
- b) Cropping
- c) Reneging
- d) Blithering

Most systems use a queue discipline known as -----

- a) Shortest processing time
- b) Longest processing time
- c) FIFO
- d) Earliest due date

Which of the following distributions is most often used to estimate the arrival pattern?

- a) Negative exponential
- b) Normal
- c) Poisson
- d) Erlang

In queuing analysis, total expected cost is the sum of total ..... plus total .....

- a) Service costs, arrival costs
- b) Facility costs, calling costs
- c) Calling costs, waiting costs
- d) Service costs, waiting costs

In queuing theory, the calling population is another name for .....

- a) The queue size
- b) The servers
- c) The arrivals
- d) The service rate

Linear programming is usually used by managers involved in portfolio selection to

(Maximize return on investment)

In production scheduling LP problems, inventory at the end of this month is set equal to

(Inventory at the end of last month + this month's production – this month's sales)

Which of the following is not an assumption in common queuing mathematical models?

(Service rates follow the normal distribution)

A multiple regression model differs from a simple linear regression model because the multiple regression model has more than one:

(Independent variable)

Decision Variables: (Tell how much or how many of something to produce, invest, purchase, hire, etc.)

In LP, variable do not have to be integer valued and may take on any fractional value. This assumption is called: (Divisibility)