

# University of Ferrara

## Degree Course in “Economics, Markets and Management”

STATISTICAL METHODS for ECONOMICS and BUSINESS – 26 January 2016

### Q01

If  $B$  is the transposed of the  $n \times k$  matrix  $A$ , then...

- a)  $B$  is the  $n \times k$  matrix whose elements are opposite (symmetric respect to 0) to those of  $A$
- b)  $B$  is the  $n \times k$  matrix whose elements are inverse (symmetric respect to 1) to those of  $A$
- c)  $B$  is the  $k \times n$  matrix whose rows correspond to the columns of  $A$  and viceversa

### Q02

If  $a = (10 \ 15 \ 8 \ -3)$  and  $b = \begin{pmatrix} 2 \\ -2 \\ 0 \\ 5 \end{pmatrix}$ , then the result of the product  $ab$  is...

a) -25

b)  $\begin{pmatrix} 20 & 30 & 16 & -6 \\ -20 & -30 & -16 & 6 \\ 0 & 0 & 0 & 0 \\ 50 & 75 & 40 & -15 \end{pmatrix}$

c) impossible

### Q03

The trace of a square matrix  $A$  is ...

- a) the sum of the elements in the main diagonal of  $A$
- b) the product of the elements in the main diagonal of  $A$
- c) none of the previous answers

### Q04

Let us consider a multiple linear regression model where:  $D$  is the total deviance of the dependent variable and  $Q$  is the sum of squares of regression (sum of squares of the differences between the predicted values and the sample mean of the dependent variable). Then ...

- a) the coefficient of determination  $R^2$  is equal to  $D/Q$
- b) the coefficient of determination  $R^2$  is equal to  $Q/D$
- c) the coefficient of determination  $R^2$  is equal to  $Q/(D-Q)$

### Q05

Let us consider the following results of a multiple linear regression analysis and let  $\alpha=0.01$  be the significance level:

	Coefficients	p-value
Intercept	16.68	0.502
X1	85.54	0.007
X2	1.28	0.054
X3	-4.35	0.124

Which of the following statements is true?

- a) variables X1 and X2 significantly affect the dependent variable of the model
- b) only variable X1 significantly affects the dependent variable of the model
- c) none of the previous statements is true

**Q06**

When does  $R^2$  index of a regression model takes negative values?

- a) when all the explanatory variables are negatively correlated with the dependent variable
- b) when the dependent variable takes only negative values
- c) never

**Q07**

A standardized variable takes values in the set ...

- a)  $(-\infty, +\infty)$
- b)  $[0, 1]$
- c)  $(0, +\infty)$

**Q08**

Let us consider a composite indicator for measuring the customer satisfaction according to  $k > 1$  aspects (informative variables) and the multiplicative aggregation method. When  $k-1$  weights (degrees of importance of the informative variables) are equal to 0 and only one is equal to 1, then...

- a) the composite indicator takes value 1
- b) the composite indicator takes the same value by using the additive method
- c) none of the previous statements is true

**Q09**

Let us consider the following data related to the normalized scores achieved by three athletes in four different races. The greater the score the better the performance. Race 3 presents a higher degree of difficulty, thus the corresponding weight, in the computation of the global score, is greater.

	<b>Race 1</b>	<b>Race 2</b>	<b>Race 3</b>	<b>Race 4</b>
<b>Weight</b>	0.2	0.2	0.4	0.2
<b>Athlete 1</b>	0.75	0.20	0.15	0.50
<b>Athlete 2</b>	0.50	0.60	0.35	0.40
<b>Athlete 3</b>	0.25	0.15	0.50	0.40

By applying the NonParametric Combination methodology to compute the global score, according to Tippett combining function, which athlete is the winner?

- a) Athlete 1
- b) Athlete 2
- c) Athlete 3

**Q10**

In Factor Analysis, the communality of an observed variable X measures...

- a) the variability of X explained by the common factors
- b) the variability of X explained by the specific factor
- c) the variability of X common with the unique factor

**Q11**

The R command to perform a factor analysis is:

- a) fa(...)
- b) factor.analysis(...)
- c) factanal(...)

**Q12**

Let us consider the following output of a Principal Component Analysis related to the first three components:

Component	Eigenvalue	% Variance	Cumulative %
1	5.429	35	35
2	2.102	15	50
3	1.121	7	57

According to these results, how many observed variables are included in the dataset?

- a) 3
- b) 10
- c) it cannot be said

**Q13**

In Cluster Analysis, the “chain effect” is typical of...

- a) the nearest neighbour linkage method
- b) the farthest neighbour linkage method
- c) the average linkage within groups method

**Q14**

In Cluster Analysis, the k-means method is classified as...

- a) hierarchical method
- b) non-hierarchical
- c) additive method

**Q15**

In Cluster Analysis, which of the following properties of the final partition of the units is desirable?

- a) external cohesion and internal separation
- b) internal cohesion and external separation
- c) equidistance between the cluster centroids