

**ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2011
EXAMINATION CATEGORY: TECHNICAL**

PAPER II: GENERAL SUBJECT KNOWLEDGE FOR: **STATISTICS**

Date	: October 29, 2011
Total Marks	: 100
Examination Time	: 1 hour 30 minutes
Reading Time	: 15 Minutes

INSTRUCTIONS

1. Do not write anything during the first 15 minutes. This time is to be spent in reading the instructions, the questions and to make sure that no pages are missing.
2. **Part A** consists of 70 multiple choice questions of one mark each (70X1=70 marks).
Part B consists of 10 short answer questions of 3 marks each (10X3=30 marks).
All questions are compulsory.
3. Marks will be given based on the knowledge of the subject, clarity and preciseness of your response.
4. All answers are to be written on the separate answer sheet.
5. This question booklet consists of **13** pages including this page.

Part A: 70 multiple choice questions of one mark each (70X1=30 marks)

{In this part, four answer choices (a, b, c, d) are provided for each question and you are to choose only one answer. Write the question number with the corresponding answer choice (either a, b, c or d) on the separate answer sheet}.

1. A shopkeeper tells you that she sells maximum yellow shirt compared to other shirts. In statistics, yellow shirt is a
 - (a) Mean
 - (b) Median
 - (c) Mode
 - (d) Does not mean anything

2. In the real world, the word ‘average’ is commonly understood to be
 - (a) Mean
 - (b) Median
 - (c) Mode
 - (d) All of the above

3. When there are few extreme values, which of the following is typically used?
 - (a) Mean
 - (b) Median
 - (c) Mode
 - (d) All of the above

4. A sample is a
 - (a) Portion of the population
 - (b) Totality of things under consideration
 - (c) Summary measure
 - (d) Population

5. A person prays five times a week. What is the probability that he will pray on Sunday?
 - (a) 0.3
 - (b) 0.4
 - (c) 0.7
 - (d) 1

6. Given the values: 4,7,9,15,9,4, the range is
 - (a) 4
 - (b) 6.5
 - (c) 9
 - (d) 11

7. Given the values: 2,3,4,4,7,8, the median is
 - (a) 3
 - (b) 3.5
 - (c) 4
 - (d) 4.5

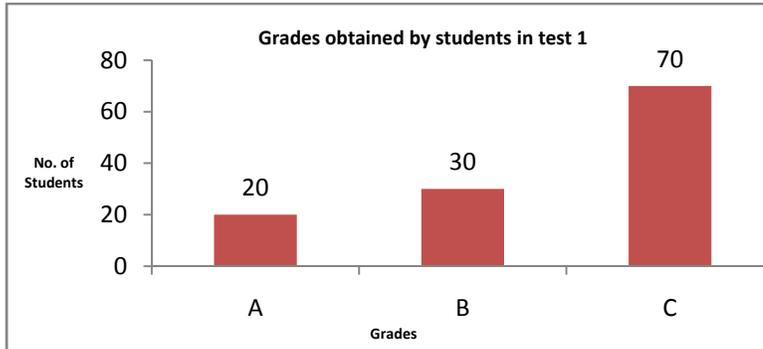
8. Given the values: 14, 16, 21, 19, 14, 21, the mode is
- (a) 14
 - (b) 21
 - (c) Both 14 and 21
 - (d) Cannot be determined
9. If the median age of Thimphu is 30 years, which is the correct interpretation?
- (a) Whole population of Thimphu are 30 years old
 - (b) Maximum population of Thimphu are 30 years old
 - (c) 50% of the population in Thimphu are below 30 years old
 - (d) 50% of the population in other Dzongkhags are below 30 years old
10. The mean of 40 observations is 160. One of the observations was wrongly copied as 165 instead of the actual value 125. The correct mean is
- (a) 159
 - (b) 161
 - (c) 163
 - (d) 165
11. If variance is given as 49 km^2 , then standard deviation is
- (a) 7 km^2
 - (b) 7 km
 - (c) 49 km^2
 - (d) 49 km
12. The semi-quartile range is used when
- (a) Median is the measure of central tendency
 - (b) Middle 50% of the scores are of primary importance
 - (c) Distribution has extreme scores
 - (d) All of the above
13. The standard deviation is used when
- (a) Arithmetic mean is used for the central tendency
 - (b) Statistics having the greater stability is sought
 - (c) Other statistics like correlation coefficient are to be computed later
 - (d) All of the above
14. An empirical relation between the mean, median and mode is
- (a) $\text{Mean} - \text{Mode} = 3(\text{Mean} - \text{Median})$
 - (b) $\text{Mean} - \text{Mode} = 3(\text{Median} - \text{Mean})$
 - (c) $\text{Mean} - \text{Mode} = 3(\text{Mean} + \text{Median})$
 - (d) $\text{Mean} - \text{Median} = 3(\text{Mean} + \text{Mode})$
15. The range is used when
- (a) Data are too scant
 - (b) Data are too scattered
 - (c) Knowledge of extreme scores or of total dispersion is all that is required
 - (d) All of the above

16. A five number summary (maximum and minimum values, upper and lower quartiles and median) can be represented by a
- (a) Scatter plot
 - (b) Box plot
 - (c) Bar chart
 - (d) Pie chart
17. Which of the following is not a sampling method?
- (a) Systematic
 - (b) Estimation
 - (c) Cluster
 - (d) Stratified
18. Which of the following is true about skewness?
- (a) Refers to the degree of asymmetry in a distribution.
 - (b) Positively skewed when mean is greater than the median in positively
 - (c) Negatively skewed distribution has an extended tail pointing to the left
 - (d) All of the above
19. The confidence level is the probability value $(1-\alpha)$ associated with a confidence interval. If the confidence level is 95% or 0.95, the value of α is
- (a) 0.01
 - (b) 0.05
 - (c) 0.95
 - (d) 1
20. If $P(A) = 1/6$ and $P(B) = 2/6$ and they are mutually exclusive. What is the $P(A \text{ or } B)$?
- (a) $1/6$
 - (b) $1/3$
 - (c) $1/2$
 - (d) $1/18$
21. If a fair die is thrown once, what is the probability of obtaining a 5?
- (a) $1/6$
 - (b) $1/3$
 - (c) $1/2$
 - (d) 1
22. A quadratic equation is of the form: $ax^2 + bx + c = 0$. If $a = 0$, then the equation is
- (a) Linear equation
 - (b) Still a quadratic equation
 - (c) Cubic equation
 - (d) None of the above

23. If $a < b$ and $c < d$, then

- (a) $ac = bd$
- (b) $a + c < b + d$
- (c) $a + c > b + d$
- (d) $a + c = b + d$

24. The bar chart given below shows grade obtained by students in test I. What percent of students obtained grade A?



- (a) 16.7
- (b) 20.0
- (c) 25.0
- (d) 58.3

25. In continuation to question 24, suppose that in the test II, if the number of students who obtained grade A increased to 60 from 20. What percent of students now obtained grade A given that 5 students had dropped after test I?

- (a) 25.0
- (b) 50.0
- (c) 52.2
- (d) 58.3

26. For the 2×2 matrix $\begin{bmatrix} 5 & 4 \\ 6 & 7 \end{bmatrix}$, the determinant is

- (a) -2
- (b) -11
- (c) 11
- (d) 22

27. Dzongkhag A has a population of 35,000 while Dzongkhag B has a population of 20,000. Assume that people in Dzongkhag A migrate to Dzongkhag B. How many people should migrate so that the populations in both Dzongkhags are exactly equal?

- (a) 7,500
- (b) 15,000
- (c) 27,500
- (d) 55,000

28. Two persons (A and B) reported their heights as 150 cm and 155 cm respectively. Person C reported as 1.6m. The shorted person is
- (a) A
 - (b) B
 - (c) C
 - (d) Cannot be determined
29. A family of three: father, mother and son are all Chess players. Father is a stronger player compared to his mother. If the son wants to maximize his chance of winning two games in succession, he should play
- (a) Father-mother-father
 - (b) Mother-father-mother
 - (c) Father-father-mother
 - (d) Any of the above
30. If \bar{x} is the estimator of the population mean μ . The value of the \bar{x} is the
- (a) Estimate of the population mean μ
 - (b) Estimate of the sample mean \bar{x}
 - (c) Estimator of the population mean μ
 - (d) Estimator of the sample mean \bar{x}
31. In statistics, population refers to
- (a) Only people
 - (b) Other than people
 - (c) Entire group we are interested in
 - (d) None of the above
32. Which of the following is false about variance?
- (a) It is a measure of the spread of a distribution about its average value
 - (b) Larger the variance, the further observations tend to be from the mean, on average
 - (c) Square root of the variance gives the standard deviation
 - (d) It is not always positive
33. Suppose that Sonam was 120 cm tall in January 2009 and 140 cm tall in January 2010. By extrapolation, Sonam would be 160 cm by January 2011. Which of the following is true?
- (a) It did not assume that she continued to grow at the same rate
 - (b) This assumption must remain true for all upcoming years
 - (c) This must eventually become a false assumption
 - (d) None of the above
34. In the simple random sampling
- (a) Each individual is chosen entirely by chance
 - (b) Each unit of the population has equal chance of being selected
 - (c) Each unit of the population is equally likely to be chosen at any stage in the sampling process
 - (d) All of the above

35. Quartiles are values that divide a sample data into
- (a) Four groups
 - (b) Five groups
 - (c) 100 groups
 - (d) None of the above
36. If the upper quartile is 10 and lower quartile is 6, then Inter-quartile range is
- (a) 4
 - (b) 6
 - (c) -4
 - (d) -6
37. The y-intercept of $7y = 8x - 7$ is
- (a) $8/7$
 - (b) $7/8$
 - (c) -1
 - (d) 1
38. A square whose one of the sides is 10 cm has an area of
- (a) 10 cm
 - (b) 10 cm^2
 - (c) 100 cm
 - (d) 100 cm^2
39. 50% of a number is 75. 80% of that number is
- (a) 100
 - (b) 120
 - (c) 125
 - (d) 150
40. If a disease rate among children is reported as 2.5%. If you are to report per 1,000 children, the disease rate is
- (a) 0.25 per 1,000 children
 - (b) 2.5 per 1,000 children
 - (c) 25 per 1,000 children
 - (d) 250 per 1,000 children

41. The table below shows the distribution of 850 women who visited the hospital.

Number of visits to hospital	None	One	Two	Three	Four or more visits
Number of women	200	350	150	100	50

The total number of women who visited at least twice is

- (a) 150
 - (b) 300
 - (c) 500
 - (d) 650
42. Using the same table in question 41, how many women visited at least once?
- (a) 150
 - (b) 350
 - (c) 650
 - (d) 850
43. If 23.2% of the population was poor in 2003, it was roughly equivalent to
- (a) One out of four persons
 - (b) One out of three persons
 - (c) Two out of three persons
 - (d) Two out of five persons
44. From the given set $\{ \frac{2}{3}, \frac{5}{19}, 4, \frac{8}{25}, 1, \frac{7}{2} \}$, the smallest value is
- (a) $\frac{2}{3}$
 - (b) $\frac{5}{19}$
 - (c) $\frac{8}{25}$
 - (d) 1
45. If there are four candidates for one slot, what is the probability that one of the candidates will not be selected?
- (a) 0.25
 - (b) 0.50
 - (c) 0.75
 - (d) 1
46. You are interested to study about median age of all the civil servants in Bhutan. Suppose that you have access to the data and calculated the median age of all the civil servants. The median age you obtained
- (a) Has a sampling error
 - (b) Is a sample median
 - (c) Is a population median
 - (d) None of the above

47. 90 degree equals
- (a) $\pi/2$
 - (b) $\pi/4$
 - (c) 2π
 - (d) π
48. $4x + 2y = 14$ and $2x - y = 1$, the solution of the linear equation is
- (a) $x = 2$ and $y = 3$
 - (b) $x = 3$ and $y = 2$
 - (c) $x = 2$ and $y = 1$
 - (d) $x = 3$ and $y = 1$
49. A car travelled a distance of 150 km in 3 hours, the speed was
- (a) 50 km/hr
 - (b) 450 km/hr
 - (c) 147 km/hr
 - (d) 150 km/hr
50. In a right triangle, the lengths of two sides are given as 3 cm and 4 cm respectively. The length of the hypotenuse is (Hint: use Pythagora's theorem)
- (a) 5 cm
 - (b) 7 cm
 - (c) 13 cm
 - (d) 25 cm
51. Which of the following is false?
- (a) Parallelogram has four sides
 - (b) Rectangle has four right angles
 - (c) Square is a rectangle but with four equal sides
 - (d) Rectangle can never be a square
52. $\int 2x \, dx$ is
- (a) $x + C$
 - (b) $2x + C$
 - (c) $x^2 + C$
 - (d) $x^3 + C$
53. The derivative of $f(x) = 2/x$ is
- (a) $-2/x^2$
 - (b) $2/x^2$
 - (c) $x^2/2$
 - (d) $-x^2/2$

54. The simple interest on Nu. 5,000 for 24 months at 5% per annum is
- (a) Nu. 20
 - (b) Nu. 240
 - (c) Nu. 500
 - (d) Nu. 6,000
55. Slope of a line, in trigonometry, is equal to
- (a) $\tan\theta$
 - (b) $\sin\theta$
 - (c) $\cos\theta$
 - (d) None of the above
56. If the radius of a circle is 2 cm, the circumference of the circle (in cm) is
- (a) 2π
 - (b) 4π
 - (c) 4
 - (d) 16π
57. $1!$ is equal to 1. But $0!$ is equal to
- (a) 0
 - (b) 1
 - (c) $\sqrt{2}$
 - (d) Undefined
58. If ${}^nC_6 = {}^nC_{10}$, then n is
- (a) 4
 - (b) 6
 - (c) 16
 - (d) 60
59. If $\log_5 a = 3$, the value of a is
- (a) 5
 - (b) 15
 - (c) 125
 - (d) 243
60. Complex number is written in the form: $\mathbf{a + bi}$ where \mathbf{a} and \mathbf{b} are real numbers but \mathbf{i} is
- (a) -1
 - (b) $\sqrt{-1}$
 - (c) 1
 - (d) 2

61. If $f(x)=5 - x^2$, then the function is
- (a) Even
 - (b) Odd
 - (c) Neither even nor odd
 - (d) Cannot be determined
62. $\lim_{x \rightarrow 1} [(x - 1)^2 + 5]$ is
- (a) 0
 - (b) 4
 - (c) 5
 - (d) 7
63. A sequence: 1,4,7,10,13...is
- (a) Geometric
 - (b) Arithmetic
 - (c) Exponential
 - (d) None of the above
64. If $\tan \theta=4/3$, in which quadrant does θ lie? (Hint: the $\tan \theta$ is positive)
- (a) Only in first quadrant
 - (b) Only in second quadrant
 - (c) Either in first or third quadrant
 - (d) Either in second or fourth quadrant
65. If x and y are real numbers and m is a rational number then, $(xy)^m$ is equal to
- (a) $x^m \cdot y^m$
 - (b) $x^m \cdot y$
 - (c) $x \cdot y^m$
 - (d) $m(xy)$
66. If $a > 1$ and $x > y$, then
- (a) $\log_a x > \log_a y$
 - (b) $\log_a x < \log_a y$
 - (c) $\log_a x = \log_a y$
 - (d) None of the above
67. Which of the following is a proper fraction?
- (a) $5/3$
 - (b) $(5x-7)/(x^2+5x+6)$
 - (c) $(2x^3+6x^2-9)/(x^2-3x+2)$
 - (d) None of the above
68. The sum of first 20 odd numbers is 400; the sum of first 50 odd numbers is
- (a) 600
 - (b) 1250
 - (c) 2500
 - (d) 3000

69. Which of the following statistical software is used for data analysis?

- (a) SPSS
- (b) STATA
- (c) SAS
- (d) All of the above

70. The World Statistics Day is observed on

- (a) September 20
- (b) October 20
- (c) November 20
- (d) December 20

Part B. 10 short answer questions of 3 marks each (10X3=30 marks).

1. Distinguish between statistic and statistics.
2. Describe about sample and population. Elaborate with an example.
3. Explain how mathematics knowledge is important in the field of statistics.
4. Table below shows the number of men by their education level in three regions. Use the following table to answer the questions: 4a and 4b.

Level of education	Regions			Total
	Region A	Region B	Region C	
Primary	100	150	25	275
Secondary	50	75	50	175
Tertiary	25	15	10	50
	175	240	85	500

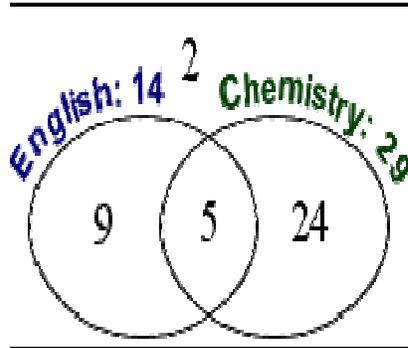
- 4a) What percent of men has the highest level of education? Which region has the maximum?
- 4b) Which graphical representation will best describe the above table?
5. Certainly, statistics is not merely summarizing the data using mean, median and mode.

A	48	52	60	60	60	68	72
B	0	10	60	60	60	110	120

From the two sets of data (A and B), mean=median=mode=60. Do you think the two data sets are similar? What are the alternative measures? (Simply describe; no need to calculate).

6. Does correlation necessarily mean causation (cause and effect)? Explain with an example.
7. Who is considered “The Father of Statistics”? Mention his contributions.

8. 20% of the employees are college graduates. Of these, 75% are in supervisory position. Of those who did not attend college, 20% are in supervisory positions. What is the probability that a randomly selected supervisor is a college graduate? (Hint: Use Bayes' theorem)
9. Assume that you have approached a corporate organization which does not have yet a statistician. How can you convince the management that a statistician like you is also important?
10. From the Venn diagram given below, answer the questions: 10a and 10b.



10a) What is the probability that randomly chosen from 40 students is taking chemistry but not english? (Hint: Proportion is probability)

- (a) 0.35
- (b) 0.60
- (c) 0.73
- (d) 0.83

10b) What is the probability that randomly chosen from 40 students is neither taking chemistry nor english? (Hint: Proportion is probability)

- (a) 0.05
- (b) 0.13
- (c) 0.23
- (d) 0.35