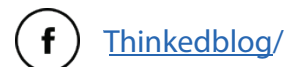
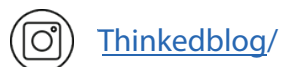




# CSS Past Paper **Statistics** (2017)

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**FEDERAL PUBLIC SERVICE COMMISSION  
COMPETITIVE EXAMINATION - 2017  
FOR RECRUITMENT TO POSTS IN BS-17  
UNDER THE FEDERAL GOVERNMENT**

Roll Number

**STATISTICS**

<b>TIME ALLOWED: THREE HOURS</b>	<b>PART-I (MCQS)</b>	<b>MAXIMUM MARKS = 20</b>
<b>PART-I(MCQS): MAXIMUM 30 MINUTES</b>	<b>PART-II</b>	<b>MAXIMUM MARKS = 80</b>

**NOTE: (i) Part-II is to be attempted on the separate Answer Book.**  
**(ii) Attempt ONLY FOUR questions from PART-II by selecting TWO questions from EACH SECTION. ALL questions carry EQUAL marks.**  
**(iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.**  
**(iv) Candidate must write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.**  
**(v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.**  
**(vi) Extra attempt of any question or any part of the attempted question will not be considered.**  
**(vii) Use of Calculator is allowed.**

**PART-II**  
**SECTION-I**

- Q. No. 2. (a)** Suppose a set of observations has mean  $\bar{X}$  and variance  $s^2$ . What happens to the mean and variance if each score is divided by  $s$  and then  $\bar{X}$  is subtracted from each quotient? Is the result same if you first subtract  $\bar{X}$  from each score and then divide the difference by  $s$ ? **(8)**

- (b)** Calculate **(12)**  
**(i) S. D**                      **(ii) Co-efficient of variation**  
**(iii) Co-efficient of Skewness and discuss the result from the following weekly wages of 300 workers.**

Weekly wages	Below 5	Below 10	Below 15	Below 20	Below 25	Below 30	Below 35
No. of workers	7	78	120	189	205	275	300

- Q. No. 3. (a)** If the probability that an individual suffers a bad reaction of a given serum is 0.001, determine the probability that out of 2000 individuals (a) exactly 3 and (b) more than 2 individuals will suffer a bad reaction. Find the answer using both poisson and the binomial distributions. **(8)**

- (b)** A random variable to assume the value 1 with probability  $p$ , with probability  $q = 1 - p$ . Prove that (a)  $E(X) = p$  and (b)  $E[(X - \bar{X})^2] = pq$ . **(6)**

- (c)** An experiment consists of drawing three cards in succession from a well-shuffled ordinary deck of cards. Let  $E_1$  be the event "king" on the first draw,  $E_2$  be the event "king" on the second draw,  $E_3$  be the event "king" on the third draw. State in words the meaning of each of the following: **(6)**

- (i)  $\text{pr}\{E_1\bar{E}_2\}$                       (ii)  $\bar{E}_1 + \bar{E}_2$                       (iii)  $\bar{E}_1\bar{E}_2\bar{E}_3$   
 (iv)  $\text{pr}\{E_1 + E_2\}$                       (v)  $\text{pr}\{\bar{E}_3|E_1\bar{E}_2\}$                       (vi)  $\text{pr}\{E_1E_2 + \bar{E}_2E_3\}$

- Q. No. 4. (a)** What is regression model? Write the assumptions made in a linear regression. Also proof the Comment on the unbiasedness of regression estimates. **(8)**

- (b)** Calculate coefficient of correlation by the method of least squares for the following paired values of X and Y variables. Also verify that this value of  $r$  is same as that obtained by pearson's formula. **(12)**

X	10	12	13	17	18
Y	5	6	7	9	13

**SECTION-II**

- Q. No. 5.** (a) Discuss time reversal test and explain the factor reversal test. (8)
- (b) Per capita income of a person from 1980-81 to 1986-87 and the consumer price index with 1980-81 were as follows: (12)

Year	Income per capita (Rs)	Index Nos.
1980-81	1627	100
1981-82	1851	103.5
1982-83	1993	103.4
1983-84	2290	109.4
1984-85	2494	110.9
1985-86	2735	113.8
1986-87	2970	115.6

Find real wages and real income indices.

- Q. No.6.** (a) What is the difference between population census and vital statistics? What are the various uses of vital statistics for a country? (8)
- (b) The population and its distribution by sex and number of births in a tehsil in 1991 and survival rates are given below: (12)

Group	Population	Males	Females	Male birth	Female birth	Total birth	Survival rate
15-19	11832	6145	5687	65	60	125	0.91
20-24	10538	5214	5324	144	132	276	0.90
25-29	9375	4655	4720	135	127	262	0.84
30-34	7843	3910	3933	82	81	163	0.87
35-39	7270	3600	3670	62	56	118	0.85
40-44	6315	3290	3025	12	15	27	0.83
45-49	5394	2793	2601	3	3	6	0.82
Total	58567	29607	28960	503	474	977	

From the given data, calculate

- (i) General fertility rate (ii) Age specific fertility rate  
 (iii) Total fertility rate (iv) Gross production rate  
 (v) Net reproduction rate

Assuming no mortality.

- Q. No. 7.** (a) Given the following data obtained from a completely randomized design with four treatments; analyse the given data and draw conclusion about the equality of treatment effects. (8)

Treatments			
T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
20.9			5.8
12.4	23.7	13.2	6.1
10.1	14.4	10.2	4.8
4.2	9.0	5.1	1.5

- (b) Give Statistical model for completely randomized design with one observation per unit. (6)
- (c) What is the role of randomization in the process of the experimentation? Discuss and define experimental error. What factors are responsible for determining the number of replications? (6)

## STATISTICS

- Q.No.8.**      **(a)** A random sample of 100 workers in a farm took an average of 14 minutes to complete a task. A random sample of 150 workers in another large farm took an average of 11 minutes to complete the task. Can it be assumed at 1% level of significance that the average time taken by the workers in the two farms is same, if the S.D. of the workers of first farm and second farm are 2 minutes and 3 minutes respectively? **(8)**
- (b)** Describe the general procedure for testing a hypothesis about a difference between population mean, when sample size is large. **(6)**
- (c)** Distinguish between: **(6)**
- (i)** Sampling error and non-sampling error
  - (ii)** Sampling with replacement and without replacement
  - (iii)** Probability and non-probability Sampling

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