

THE UNIVERSITY OF ZAMBIA

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

2019/2020 ACADEMIC YEAR FINAL EXAMINATIONS

DEM 2414: RESEARCH AND STATISTICAL METHODS IN DEMOGRAPHY

TIME: THREE HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTIONS A AND C; ONE QUESTION FROM SECTIONS B AND ONE FROM SECTION D.

SECTION A

ANSWER ALL QUESTIONS IN THIS SECTION. THIS SECTION CARRIES 25 MARKS.

1. Select **any three** incorrectly formulated hypotheses out of the hypotheses given below:
 - a) There is a negative relationship between education and income.
 - b) The less religious an individual is, the greater is the likelihood of heavenly damnation.
 - c) The higher educational level of an individual, the better the chances of job success
 - d) Female workers are lazy and thus less likely to succeed in more demanding jobs
 - e) There is a relationship between social class and academic progress.
 - f) The higher the contraceptive rate, the lower the fertility level.

2. Select **any three** correct statements that reflect the rationale for measurement of variables and concepts.
 - a) To facilitate the manipulation of relationships between different variables in research.
 - b) To assign numbers to responses to questions according to rules.
 - c) To concretely capture the meaning of abstract concepts.
 - d) To make concrete concepts more or less abstract.
 - e) To facilitate the construction of socioeconomic indicators required in planning.

3. Select **any three** statements that are an accurate reflection of a **conceptual definition or operational definition**.
 - a) A researcher defines corruption in terms of bribery.
 - b) Defining a concept in a concrete rather than an abstract manner.
 - c) Defining a concept in an abstract rather than concrete manner.
 - d) Capturing the meaning of concept by asking concrete and specific questions.
 - e) Measuring corruption by asking respondents how often they pay bribes at police roadblocks.

4. Indicate **three of the following** statements do not accurately capture the meaning of a **numeric indicator**.
 - a) Management's opinion on whether GSB's graduates have relevant skills for the job market.
 - b) The amount of money each GSB student spends on food every month.
 - c) Views of vendors who start their business on their own without any external assistance.
 - d) The median age of GSB female students.
 - e) Students' attitudes towards increasing tuition fees.
 - f) The average monthly salaries of academic staff at public universities.

5. Indicate which **three of the statements** below represent ratio or interval scales of measurement implied.
- The number of hours John Zulu spends studying.
 - Degree classification at the University of Zambia.
 - Students' religious denominations.
 - The breakdown of the university population by sex
 - The distribution of students by height.
 - The amount of money UNZA female students spend on perfumes on a monthly basis.
6. Select any **three statements** below that do not indicate the existence of a researchable problem requiring further investigation.
- A researcher finds that despite the government has implemented the policy of universal free education in the country, the enrolment in a large number of schools shows serious decline.
 - A researcher presents a report with the necessary solutions and recommendations to conclusively deal with the problem of climate change.
 - A researcher has established the cause of HIV/AIDS and developed a drug with universal acceptance.
 - A demographer confronts a problem with conflicting reasons on why fertility is not declining even after making condoms free.
 - A civil engineer proposes that devolving business activities to the outskirts of Lusaka will solve the problem of traffic congestion in the central business district.
7. Select any **three statements** that accurately reflect the reasons for formulating research objectives.
- To narrow or limit the study to a specific area of investigation.
 - To collect any information the researcher fancies.
 - To use action rather than non-action verbs.
 - To assist in the systematic construction of questionnaires.
 - To guide research in more systematic way.
8. Select any **three information sources** that represent **unpublished literature**.
- Newspaper article on declining reading standards
 - A doctoral dissertation correlates of poor reading culture in Zambia.
 - An article in peer – reviewed journal on poor reading culture in Zambia.
 - The Minister of Finance's budget speech reproduced in the Times of Zambia.
 - A recommended textbook on business ethics from Oxford University Press.
9. A researcher concludes that the higher a woman's **level of education**, the greater the likelihood of the **contraceptive use**, but notes that the effects of **education** on fertility are mediated through **breastfeeding**.

Identify any **three variables** below that are represented in the statement above.

- Dependent
- Independent
- Antecedent

- d) Intervening
- e) Confounding

10. Select **any three correct criteria** below for defining a population.

- a) In terms of random numbers
- b) In terms of people or households
- c) In terms of a reference period
- d) In terms of a sampling frame
- e) In terms of geographical area.
- f) In terms of units of reference

11. Select **any three incorrect definitions** of the population.

- a) Any students enrolled at Evelyn Hone
- b) All UNZA students enrolled at GER Campus in 2019 academic year.
- c) Some of the students enrolled at NRDC campus in the 2019 academic year
- d) Some of the female of the students enrolled in the MBA programme at CBU
- e) All GSB marketing students in the in the 2019 academic year.

12. Select **any three correct examples** of applied research in the statements below.

- a) A master's degree research on student's attitudes towards rumour mongering.
- b) Research testing the validity of a theory on gender mainstreaming.
- c) A feasibility study on the establishment of a shopping mall in Kafue.
- d) An environmental impact assessment on the construction of railway line between Chipata and Serenje.
- e) A doctoral research on the relevance of the supply and model to the understanding of marriage dynamics.
- f) A study on the efficacy of the social transfer scheme /program in the newly established districts.

13. Select **any three correct statements** that accurately reflect the positivist paradigm in research.

- a) A researcher argues that that social reality exists independently of the observer
- b) A school of thought that postulates that there are such things as social facts
- c) A methodological position that stresses the subjective dimension of social reality
- d) A methodological perspective that stresses the use of quantitative methods
- e) The application of qualitative methodology in research.

14. Select **any three variables** among these below that are likely to influence change in another variable.

- a) Categorical variable
- b) Dependent variable
- c) Independent variable
- d) Intervening variable
- e) Antecedent variable

15. Select **any three situations below** which do not constitute a researchable problem.

- a) Investigation a researcher's own views on xenophobic violence in South Africa.
- b) A study of the effect of maize shortages on the price of mealie meal.
- c) An investigation on the impact of unemployment levels on crime rates in Zambia.
- d) Investigation of the effect of religious faith on heavenly salvation.
- e) A study of the effect of gender on social mobility.

f) An investigation of impact of witchcraft on climate change.

16. Identify which of **three statements** below is not why researchers conduct literature review.

- a) To read scholarly articles in order to enhance one's chances of passing examinations.
- b) To become familiar with prior research on the phenomenon of interest
- c) To identify potential methodological problems in the research area
- d) To develop a list of pertinent problems relative to the phenomenon of interest
- e) To read books just to satisfy one's intellectual curiosity.
- f) To read books in order to impress the dissertation supervisor.

17. Which **one** of the following properties of scales of measurement are associated with ordinal scales?

- a) Magnitude
- b) Equal intervals
- c) Absolute or natural zero
- d) None

18. Which **one** of the following properties of scales of measurement are associated with nominal scales?

- a) Magnitude
- b) Equal intervals
- c) Absolute or natural zero
- d) None

19. Which **two** of the following properties of scales of measurement are associated with interval scales?

- a) Magnitude
- b) Equal intervals
- c) Absolute or natural zero
- d) None

20. Which of the following properties of scales of measurement are associated with ratio scales?

- a) Magnitude
- b) Equal intervals
- c) Absolute or natural zero
- d) None

21. Select **any three incorrect statements** regarding open-ended and closed-ended questions.

- a) Open-ended questions directly provide quantitative data based on the researcher's predetermined response categories
- b) Closed-ended questions provide quantitative data in the participant's own words
- c) Open-ended questions provide qualitative data in the participant's own words
- d) Closed-ended questions directly provide qualitative data in the participants' own words
- e) Close-ended questions are the source of numeric data.

22. Indicate which of the following sampling techniques represent **equal probability selection methods**.

- a) Systematic sampling
- b) Snowball sampling
- c) Proportionate stratified sampling
- d) Cluster sampling
- e) Purposive sampling
- f) Multistage sampling

g) Quota sampling

23. Indicate any of **unequal probability selection methods** in the sampling designs represented by the situations below:

- a) A researcher selects students in his class for a study on gossiping after which he writes a report.
- b) A researcher selects 100 students using a table of random numbers and then gives self-administered questionnaires to the students.
- c) A researcher investigating marijuana abuse identifies a group of students who use marijuana and then asks them to refer him to others who use the drug.
- d) A researcher selects every tenth household after having selected the first household randomly from serially numbered households.
- e) A researcher carrying out research on corruption identifies those who are knowledgeable about the vice and then interviews for his research.

24. A researcher studying patterns among GSB students wants to select a stratified sample of 100 of them. Four hundred (400) of these students are in the blended group while six hundred (600) are in the evening group. What is the probability of selecting any of these students into the sample? Indicate any **three incorrect answers** among these below.

- a) 1 out of 5
- b) 1 out of 4
- c) 1 out of 10
- d) 1 out of 6
- e) 2 out of 20
- f) 100 out of 1000

25. Which **three of the questions** below are properly formulated?

- a) You do not think the government is fighting inflation strongly, do you?
- b) How old were you last birthday?
- c) Do you watch cinemas and play video games in your spare time?
- d) Do you enjoy watching movies?
- e) Are you of the view that diminishing returns in agriculture account for the exponential decline in Zambia's gross national product?
- f) Are you in support of the gross abuse of human rights by the current regime?
- g) Do you participate in athletic events?
- h) Is your father an alcoholic?

26. Which **three of the questions** below are not matrix or rating questions?

- a) A question used when respondents are asked to make a judgment in terms of sets of ordered categories, reflecting the intensity of judgment involved.
- b) A question with predetermined options to choose from.
- c) A method of organizing a large number of questions that have the same response categories.
- d) A question that applies only to a segment of the sample.
- e) A question without predetermined categories to choose from.

27. Which **three scenarios** below do not represent a longitudinal study?

- a) A researcher studying AIDS concludes that the more promiscuous one's behaviour, the greater is the probability of contracting AIDS.
- b) A researcher follows a cohort of prostitutes over a period of two years to study their adherence to antiretroviral therapy.
- c) A researcher at UNZA hypothesizes that due to the unchanging sexual behaviour of Zambians, he foresees an increase in the number of AIDS victims in the next 10 years.

- d) A demographer reports that that 65% of AIDS cases are among prostitutes and 35% among the rest of the population.
- e) A social scientist investigating the increasing levels of recidivism among juvenile delinquents after an exhaustive five-year tracer study of 2,500 juveniles concludes that this is due to breakdown of the family in Zambia.

28. Which **three** of the statements below represents a **theory**?

- a) A postulated relationship between two poverty and crime
- b) A school of thought or research perspective
- c) An established relationship between the Protestant ethic and the spirit of capitalism
- d) Phenomenological approach to the study of contraceptive use among students
- e) The use of survey research as the accepted way of conducting research.
- f) A statement of the relationship between social disorder and suicide rates.

29. Indicate **any three statements** below which are not an accurate representation of **problem definition**.

- a) A researcher identifies factors contributing to alcohol abuse.
- b) A researcher formulates an objective to investigate alcohol abuse at CBU.
- c) A researcher justifies the investigation of alcohol abuse because government urgently wants to come up with interventions to deal with the problem.
- d) Based on figures, statistics, and other relevant information, a researcher establishes that there is a 20 percent increase in alcohol abuse in Zambia.
- e) A researcher discovers that despite government efforts to curb corruption an increasing number of civil servants are involved in the scourge.

30. Indicate **any three statements** below which are not an accurate representation of **problem analysis**.

- a) A researcher identifies factors contributing to alcohol abuse.
- b) A researcher formulates an objective to investigate alcohol abuse at CBU.
- c) A researcher justifies the investigation of alcohol abuse because government urgently wants to come up with interventions to deal with the problem.
- d) Based on figures, statistics, and other relevant information, a researcher establishes that there is a 20 percent increase in alcohol abuse in Zambia.
- e) A researcher discovers that despite government efforts to curb corruption an increasing number of civil servants are involved in the scourge.

31. Given below are data on UNZA students, you are required to do the following:

- a) Use **proportionate stratified sampling** to select a sample of 100 from 2,000 students the table given below.
- b) Indicate the **criteria of stratification** used.

Family income	Gender	
	Male	Female
Low income	400	200
Middle income	500	400
High income	400	100

SECTION B

ANSWER ONE QUESTIONS IN THIS SECTION. EACH QUESTION CARRIES 25 MARKS.

1.
 - a. Briefly explain the difference between **pure** and **applied** research and give an example of each type.
 - b. What is the difference between **problem identification**, **problem definition**, and **problem analysis**?
 - c. What are the **three conditions reasons** that signal the existence of a problem?
 - d. What is the difference between **review of theory** and **review of empirical literature**?
 - e. Why are **specific objectives** important in research?

2.
 - a. What is **measurement** and **why is measurement important** in research?
 - b. What is a **hypothesis** and how is stated?
 - c. What is an **operational definition** and why is it **important**?
 - d. What are the **major scales of measurement** and **why are they important** in research?
 - e. What is a **questionnaire** and what is the **link between measurement and questionnaire construction**?

3.
 - a. What do you understand by research design?
 - b. Briefly discuss **the three major components** of the research design.]
 - c. What is differences between **probability** and **nonprobability sampling**?
 - d. Under what circumstances would you use the following sampling designs:
 - i. Purposive sampling
 - ii. Simple random sampling
 - iii. Systematic sampling
 - iv. Snowball sampling.
 - e. With the aid of simple diagrams, briefly discuss the differences between **experimental** and **quasi-experimental designs**.

SECTION C

ANSWER ALL QUESTIONS IN THIS SECTION. THIS SECTION CARRIES 25 MARKS.

1. What type of graph would be appropriate to show the percentage of students enrolled in the different schools of the University of Zambia?
 - a) A pie chart
 - b) A histogram
 - c) A polygon
 - d) A bar chart
 - e) None of the above

2. Which of the following descriptive statistics is least affected by adding an outlier to a data set?
 - a) The mean
 - b) The median
 - c) The range

- d) The standard deviation
 - e) All of the above
3. In a normal distribution, what percent of the values is within
- a) One standard deviation of the mean?
 - b) One and half standard deviations of the mean?
 - c) Two standard deviations of the mean?
 - d) Two and half standard deviations of the mean?
 - e) Three standard deviations of the mean?
4. Indicate which of the statements below is **True** or **False** or **Neither** in describing the margin of error
- a) It is the same thing as a standard error
 - b) It is the standard deviation of a sampling distribution
 - c) It is the equivalent of a critical value or z-score
 - d) It is a measure of the accuracy of the sample value in estimating the population value
 - e) It is the sampling error
5. Indicate which of the probability statements below is **True** or **False** or **Neither**:
- a) Events are mutually exclusive if the occurrence of one event precludes the occurrence of another event.
 - b) Events are independent if the occurrence of one event influences the occurrence
 - c) Events are dependent if the occurrence of one event increases the likelihood of occurrence of another event.
 - d) The sum of mutually exclusive events is equal to 0.50.
6. Indicate which of the statements below is **True** or **False** or **Neither** in capturing the main axioms of probability
- a) A probability lies between -1 and +1
 - b) A probability lies between 0 and 1
 - c) The sum of probabilities of mutually exclusive events is equal to 0.50
 - d) The sum of probabilities of mutually exclusive events is equal to 1.
 - e) The complement of a probability of an event, A or $P(A)$, is $1-P(A)$
 - f) The complement of a probability of an event, A or $P(A)$, is $P(A)-1$
7. Indicate the scales of measurement associated with the following types of data
- a) Qualitative data
 - b) Quantitative data
8. What type of graphs do you associate with?
- a) Qualitative data
 - b) Quantitative data.
9. When $p < .05$ is reported in a journal article that you read for an observed relationship, it means that the author has rejected the null hypothesis (assuming that the author is using a significance or alpha level of .05).
- a) True
 - b) False

10. When $p > .05$ is reported in a journal article that you read for an observed relationship, it means that the author has rejected the null hypothesis (assuming that the author is using a significance or alpha level of .05).
- True
 - False
11. A random sample of 250 students from a normally distributed population of DEM 2414 students was found to have mean score at the end of the semester 49 with a standard deviation of 11. Based on this information answer the following questions.
- What is the point estimate of the mean score in the course for all the students.
 - Find the 95% confidence interval estimate of the students' mean performance and interpret the result.
 - If the score of 45 is the cut – off point for a pass grade with those below designated as failures,
 - What was the number of failures in the course?
 - How many students passed the test?
 - What was the percentile score of a student called Banda with a mark of 73?
 - What was the probability of performing better than Banda?
 - How many students performed worse than Banda?
12. Indicate if the statements below are (i) true (ii) false (iii) neither
- A one-tailed test is used when a researcher has a non-directional hypothesis
 - A two tailed test is used when a researcher has a directional hypothesis
 - A one-tailed test is also used when a researcher has a directional hypothesis.
13. Indicate which of the following examples below refers to (i) **Descriptive** (ii) **Inferential Statistics** or (iii) or **Neither**.
- A social scientist concluding, on the basis of sample information that the English proficiency level among all primary school students in the country has improved since the introduction of English medium of instruction.
 - The social scientist giving a statistical breakdown of the primary students in his EMI project in the form of bar and pie charts and histograms to depict the age and sex composition of the sample.
14. For each of the statements below, select **one** correct answer out of the options given in bold within the brackets and separated by slashes.
- A distribution is symmetrical if the coefficient of skewness is **(zero/negative /positive)**
 - A distribution is negatively skewed if the coefficient of skewness is **(zero/negative /positive)**
 - A distribution is positively skewed if the coefficient of skewness is **(zero/negative /positive)**
15. Indicate which of the statements below is **True** or **False** or **Neither** about a weighted mean:
- It is an arithmetic mean in which each value is given an equal weight as any other value in the distribution.
 - It is an arithmetic mean in which each value is given arbitrary group weight regardless of their importance in the overall group.
 - It is an arithmetic mean in which each value is weighted according to its importance in the overall group.
 - It is an arithmetic mean in which each value is weighted according to its importance in the overall group.

16. Indicate which of the statements below is **True** or **False** or **Neither** about the percentile rank?

- a) It shows the score below which a certain number of measurements are located.
- b) It shows the percentage of observations falling below a score.
- c) It is the score below which half the observations are located.
- d) It is the third quartile in a distribution of measurements.

17. A researcher obtains the following age on his students. Interpret each of the measures of central tendency and dispersion. Interpret of the statistics below.

a)	Mean	22.5
b)	Median	22.0
c)	Mode	22.0
d)	Standard deviation	22.0
e)	Coefficient of skewness	0.93

18. Indicate which of the statements below is **True** or **False** or **Neither**.

- a) If the significance level is increased from 5% to 10%, the probability of committing Type I error decreases
- b) If the significance level is decreased from 10% to 5%, the probability of committing Type II error increases
- c) The scale of measurement associated with analysis of variance is ordinal
- d) Both regression analysis and analysis of variance are parametric tests

SECTION D

ANSWER ONE QUESTION IN THIS SECTION. EACH QUESTION CARRIES 25 MARKS.

1. It has been observed that in a certain province, the proportion of women who delivered through Caesarian section is very high. A study is therefore conducted to discover why this is the case. As small height is known to be one of the risk factors related to difficulty deliveries, the researcher may want to find out if there is a difference between the mean height of women in this province who had normal deliveries and of those who had Caesarian sections. Suppose that the researcher had these results. Is there any reason to believe that those with normal deliveries had a higher mean weight than those with Caesarian section? Use 5 percent level of significance.

Type of delivery	Number of women in study	Mean height in cm	Standard deviation
Normal delivery	60	156	3.1
Caesarian section	52	154	2.8

2. A demographer collects assault rates (measured in terms of number assaults per 100,000 per population) and unemployment rates among the youth between 2006 and 2018 over a ten year period and wants to establish if there is any bearing on assault rate. The data are given below.

Year	Unemployment rate	Assault rate
2006	11.0	3.1
2007	7.0	3.2
2008	5.2	2.8
2009	4.3	2.3
2010	3.5	2.3
2011	3.2	2.2
2012	4.1	2.9
2013	3.9	2.9
2014	3.6	3.2
2015	7.1	3.2
2016	8.4	3.6
2017	7.7	4.2
2018	6.3	4.7

- Compute the Pearson product moment correlation coefficient and interpret the result.
 - Find the regression of assault rate on youth unemployment interpret the constants in the context of the question.
 - Give the least squares regression equation based on b)
 - Predict the assault rate if youth unemployment rises by 7 percent.
 - If the assault rate is 5, what could be the estimated youth unemployment rate?
 - What amount of variation in the assault rate is accounted for by the youth unemployment rate?
3. Given below are quota preferences of UNZA students disaggregated by sex.
- Verify the claim by a member of the University Senate that there is a relationship between quota preference and sex.
 - The Senator further claims that female students are more inclined towards law and psychology while males are more likely to opt for demography, public administration, and economics. Do you agree or disagree with the Senator? Use percentages to demonstrate how you have reached your conclusion.

Quota	Male	Female
Law	10	20
Demography	11	10
Public Administration	12	8
Psychology	14	30
Economics	13	12

TABLE I Proportions of Area under the Standard Normal Curve

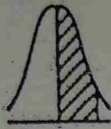
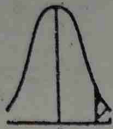
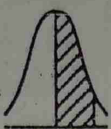
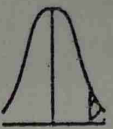
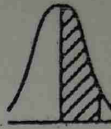
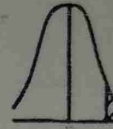
								
z	$0 \ z$	$0 \ z$	z	$0 \ z$	$0 \ z$	z	$0 \ z$	$0 \ z$
0.00	.0000	.5000	0.55	.2088	.2912	1.10	.3643	.1357
0.01	.0040	.4960	0.56	.2123	.2877	1.11	.3665	.1335
0.02	.0080	.4920	0.57	.2157	.2843	1.12	.3686	.1314
0.03	.0120	.4880	0.58	.2190	.2810	1.13	.3708	.1292
0.04	.0160	.4840	0.59	.2224	.2776	1.14	.3729	.1271
0.05	.0199	.4801	0.60	.2257	.2743	1.15	.3749	.1251
0.06	.0239	.4761	0.61	.2291	.2709	1.16	.3770	.1230
0.07	.0279	.4721	0.62	.2324	.2676	1.17	.3790	.1210
0.08	.0319	.4681	0.63	.2357	.2643	1.18	.3810	.1190
0.09	.0359	.4641	0.64	.2389	.2611	1.19	.3830	.1170
0.10	.0398	.4602	0.65	.2422	.2578	1.20	.3849	.1151
0.11	.0438	.4562	0.66	.2454	.2546	1.21	.3869	.1131
0.12	.0478	.4522	0.67	.2486	.2514	1.22	.3888	.1112
0.13	.0517	.4483	0.68	.2517	.2483	1.23	.3907	.1093
0.14	.0557	.4443	0.69	.2549	.2451	1.24	.3925	.1075
0.15	.0596	.4404	0.70	.2580	.2420	1.25	.3944	.1056
0.16	.0636	.4364	0.71	.2611	.2389	1.26	.3962	.1038
0.17	.0675	.4325	0.72	.2642	.2358	1.27	.3980	.1020
0.18	.0714	.4286	0.73	.2673	.2327	1.28	.3997	.1003
0.19	.0753	.4247	0.74	.2704	.2296	1.29	.4015	.0985
0.20	.0793	.4207	0.75	.2734	.2266	1.30	.4032	.0968
0.21	.0832	.4168	0.76	.2764	.2236	1.31	.4049	.0951
0.22	.0871	.4129	0.77	.2794	.2206	1.32	.4066	.0934
0.23	.0910	.4090	0.78	.2823	.2177	1.33	.4082	.0918
0.24	.0948	.4052	0.79	.2852	.2148	1.34	.4099	.0901
0.25	.0987	.4013	0.80	.2881	.2119	1.35	.4115	.0885
0.26	.1026	.3974	0.81	.2910	.2090	1.36	.4131	.0869
0.27	.1064	.3936	0.82	.2939	.2061	1.37	.4147	.0853
0.28	.1103	.3897	0.83	.2967	.2033	1.38	.4162	.0838
0.29	.1141	.3859	0.84	.2995	.2005	1.39	.4177	.0823
0.30	.1179	.3821	0.85	.3023	.1977	1.40	.4192	.0808
0.31	.1217	.3783	0.86	.3051	.1949	1.41	.4207	.0793
0.32	.1255	.3745	0.87	.3078	.1922	1.42	.4222	.0778
0.33	.1293	.3707	0.88	.3106	.1894	1.43	.4236	.0764
0.34	.1331	.3669	0.89	.3133	.1867	1.44	.4251	.0749
0.35	.1368	.3632	0.90	.3159	.1841	1.45	.4265	.0735
0.36	.1406	.3594	0.91	.3186	.1814	1.46	.4279	.0721
0.37	.1443	.3557	0.92	.3212	.1788	1.47	.4292	.0708
0.38	.1480	.3520	0.93	.3238	.1762	1.48	.4306	.0694
0.39	.1517	.3483	0.94	.3264	.1736	1.49	.4319	.0681
0.40	.1554	.3446	0.95	.3289	.1711	1.50	.4332	.0668
0.41	.1591	.3409	0.96	.3315	.1685	1.51	.4345	.0655
0.42	.1628	.3372	0.97	.3340	.1660	1.52	.4357	.0643
0.43	.1664	.3336	0.98	.3365	.1635	1.53	.4370	.0630
0.44	.1700	.3300	0.99	.3389	.1611	1.54	.4382	.0618
0.45	.1736	.3264	1.00	.3413	.1587	1.55	.4394	.0606
0.46	.1772	.3228	1.01	.3438	.1562	1.56	.4406	.0594
0.47	.1808	.3192	1.02	.3461	.1539	1.57	.4418	.0582
0.48	.1844	.3156	1.03	.3485	.1515	1.58	.4429	.0571
0.49	.1879	.3121	1.04	.3508	.1492	1.59	.4441	.0559
0.50	.1915	.3085	1.05	.3531	.1469	1.60	.4452	.0548
0.51	.1950	.3050	1.06	.3554	.1446	1.61	.4463	.0537
0.52	.1985	.3015	1.07	.3577	.1423	1.62	.4474	.0526
0.53	.2019	.2981	1.08	.3599	.1401	1.63	.4484	.0516
0.54	.2054	.2946	1.09	.3621	.1379	1.64	.4495	.0505

Table I (continued)

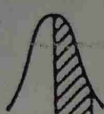
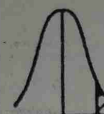
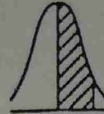
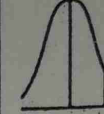
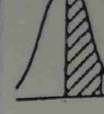
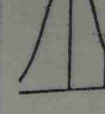
								
z	z	z	z	z	z			
1.65	.4505	.0495	2.22	.4868	.0132	2.79	.4974	.0026
1.66	.4515	.0485	2.23	.4871	.0129	2.80	.4974	.0026
1.67	.4525	.0475	2.24	.4875	.0125	2.81	.4975	.0025
1.68	.4535	.0465	2.25	.4878	.0122	2.82	.4976	.0024
1.69	.4545	.0455	2.26	.4881	.0119	2.83	.4977	.0023
1.70	.4554	.0446	2.27	.4884	.0116	2.84	.4977	.0023
1.71	.4564	.0436	2.28	.4887	.0113	2.85	.4978	.0022
1.72	.4573	.0427	2.29	.4890	.0110	2.86	.4979	.0021
1.73	.4582	.0418	2.30	.4893	.0107	2.87	.4979	.0021
1.74	.4591	.0409	2.31	.4896	.0104	2.88	.4980	.0020
1.75	.4599	.0401	2.32	.4898	.0102	2.89	.4981	.0019
1.76	.4608	.0392	2.33	.4901	.0099	2.90	.4981	.0019
1.77	.4616	.0384	2.34	.4904	.0096	2.91	.4982	.0018
1.78	.4625	.0375	2.35	.4906	.0094	2.92	.4982	.0018
1.79	.4633	.0367	2.36	.4909	.0091	2.93	.4983	.0017
1.80	.4641	.0359	2.37	.4911	.0089	2.94	.4984	.0016
1.81	.4649	.0351	2.38	.4913	.0087	2.95	.4984	.0016
1.82	.4656	.0344	2.39	.4916	.0084	2.96	.4985	.0015
1.83	.4664	.0336	2.40	.4918	.0082	2.97	.4985	.0015
1.84	.4671	.0329	2.41	.4920	.0080	2.98	.4986	.0014
1.85	.4678	.0322	2.42	.4922	.0078	2.99	.4986	.0014
1.86	.4686	.0314	2.43	.4925	.0075	3.00	.4987	.0013
1.87	.4693	.0307	2.44	.4927	.0073	3.01	.4987	.0013
1.88	.4699	.0301	2.45	.4929	.0071	3.02	.4987	.0013
1.89	.4706	.0294	2.46	.4931	.0069	3.03	.4988	.0012
1.90	.4713	.0287	2.47	.4932	.0068	3.04	.4988	.0012
1.91	.4719	.0281	2.48	.4934	.0066	3.05	.4989	.0011
1.92	.4726	.0274	2.49	.4936	.0064	3.06	.4989	.0011
1.93	.4732	.0268	2.50	.4938	.0062	3.07	.4989	.0011
1.94	.4738	.0262	2.51	.4940	.0060	3.08	.4990	.0010
1.95	.4744	.0256	2.52	.4941	.0059	3.09	.4990	.0010
1.96	.4750	.0250	2.53	.4943	.0057	3.10	.4990	.0010
1.97	.4756	.0244	2.54	.4945	.0055	3.11	.4991	.0009
1.98	.4761	.0239	2.55	.4946	.0054	3.12	.4991	.0009
1.99	.4767	.0233	2.56	.4948	.0052	3.13	.4991	.0009
2.00	.4772	.0228	2.57	.4949	.0051	3.14	.4992	.0008
2.01	.4778	.0222	2.58	.4951	.0049	3.15	.4992	.0008
2.02	.4783	.0217	2.59	.4952	.0048	3.16	.4992	.0008
2.03	.4788	.0212	2.60	.4953	.0047	3.17	.4992	.0008
2.04	.4793	.0207	2.61	.4955	.0045	3.18	.4993	.0007
2.05	.4798	.0202	2.62	.4956	.0044	3.19	.4993	.0007
2.06	.4803	.0197	2.63	.4957	.0043	3.20	.4993	.0007
2.07	.4808	.0192	2.64	.4959	.0041	3.21	.4993	.0007
2.08	.4812	.0188	2.65	.4960	.0040	3.22	.4994	.0006
2.09	.4817	.0183	2.66	.4961	.0039	3.23	.4994	.0006
2.10	.4821	.0179	2.67	.4962	.0038	3.24	.4994	.0006
2.11	.4826	.0174	2.68	.4963	.0037	3.25	.4994	.0006
2.12	.4830	.0170	2.69	.4964	.0036	3.30	.4995	.0005
2.13	.4834	.0166	2.70	.4965	.0035	3.35	.4996	.0004
2.14	.4838	.0162	2.71	.4966	.0034	3.40	.4997	.0003
2.15	.4842	.0158	2.72	.4967	.0033	3.45	.4997	.0003
2.16	.4846	.0154	2.73	.4968	.0032	3.50	.4998	.0002
2.17	.4850	.0150	2.74	.4969	.0031	3.60	.4998	.0002
2.18	.4854	.0146	2.75	.4970	.0030	3.70	.4999	.0001
2.19	.4857	.0143	2.76	.4971	.0029	3.80	.4999	.0001
2.20	.4861	.0139	2.77	.4972	.0028	3.90	.49995	.00005
2.21	.4864	.0136	2.78	.4973	.0027	4.00	.49997	.00003

TABLE IV Critical Values of Chi Square

df	Level of significance for a non-directional test					
	.20	.10	.05	.02	.01	.001
1	1.64	2.71	3.84	5.41	6.64	10.83
2	3.22	4.60	5.99	7.82	9.21	13.82
3	4.64	6.25	7.82	9.84	11.34	16.27
4	5.99	7.78	9.49	11.67	13.28	18.46
5	7.29	9.24	11.07	13.39	15.09	20.52
6	8.56	10.64	12.59	15.03	16.81	22.46
7	9.80	12.02	14.07	16.62	18.48	24.32
8	11.03	13.36	15.51	18.17	20.09	26.12
9	12.24	14.68	16.92	19.68	21.67	27.88
10	13.44	15.99	18.31	21.16	23.21	29.59
11	14.63	17.28	19.68	22.62	24.72	31.26
12	15.81	18.55	21.03	24.05	26.22	32.91
13	16.98	19.81	22.36	25.47	27.69	34.53
14	18.15	21.06	23.68	26.87	29.14	36.12
15	19.31	22.31	25.00	28.26	30.58	37.70
16	20.46	23.54	26.30	29.63	32.00	39.29
17	21.62	24.77	27.59	31.00	33.41	40.75
18	22.76	25.99	28.87	32.35	34.80	42.31
19	23.90	27.20	30.14	33.69	36.19	43.82
20	25.04	28.41	31.41	35.02	37.57	45.32
21	26.17	29.62	32.67	36.34	38.93	46.80
22	27.30	30.81	33.92	37.66	40.29	48.27
23	28.43	32.01	35.17	38.97	41.64	49.73
24	29.55	33.20	36.42	40.27	42.98	51.18
25	30.68	34.38	37.65	41.57	44.31	52.62
26	31.80	35.56	38.88	42.86	45.64	54.05
27	32.91	36.74	40.11	44.14	46.96	55.48
28	34.03	37.92	41.34	45.42	48.28	56.89
29	35.14	39.09	42.69	46.69	49.59	58.30
30	36.25	40.26	43.77	47.96	50.89	59.70
32	38.47	42.59	46.19	50.49	53.49	62.49
34	40.68	44.90	48.60	53.00	56.06	65.25
36	42.88	47.21	51.00	55.49	58.62	67.99
38	45.08	49.51	53.38	57.97	61.16	70.70
40	47.27	51.81	55.76	60.44	63.69	73.40
44	51.64	56.37	60.48	65.34	68.71	78.75
48	55.99	60.91	65.17	70.20	73.68	84.04
52	60.33	65.42	69.83	75.02	78.62	89.27
56	64.66	69.92	74.47	79.82	83.51	94.46
60	68.97	74.40	79.08	84.58	88.38	99.61

Find the row corresponding to the indicated degrees of freedom, find the column corresponding to the chosen level of significance, the critical value of χ^2_{crit} is at the intersection of that row and that column. If $\chi^2_{obs} \geq \chi^2_{crit}$, then H_0 is rejected.

DEM 2414: STATISTICAL FORMULAS

1)

$$Z_{\text{obs}} = \frac{\mu_1 - \mu_2}{\sqrt{\frac{\sigma_1^2 + \sigma_2^2}{n_2 + n_2}}}$$

2)

$$r = \frac{N \sum XY - (\sum X) \cdot (\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2] [N \sum Y^2 - (\sum Y)^2]}}$$

3)

$$A = \bar{Y} - B \bar{X}$$

$$B = \frac{N \sum XY - (\sum X) \cdot (\sum Y)}{[N \sum X^2 - (\sum X)^2]}$$

4)

$$\chi^2 = \frac{\sum \sum (O_{ij} - E_{ij})^2}{E_{ij}}$$

$$E_{ij} = \frac{r \cdot c}{N}$$