THE UNIVERSITY OF ZAMBIA

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES

2016 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 EACH FROM SECTIONS B AND D.

SECTION A

ANSWER ALL QUESTIONS IN THIS SECTION. THIS SECTION CARRIES 30 PERCENT.

1. Which form of reasoning is the process of drawing a specific conclusion from a set of premises?

    a) Rationalism
    b) Deductive reasoning
    c) Inductive reasoning
    d) Probabilistic

2. Which of the following is a correct definition of a population

    a) All students enrolled at Evelyn Hone
    b) All UNZA students enrolled at GER Campus in 2013 academic year.
    a) Some of the students enrolled at NRDC campus in the 2013 academic year
    b) Some of the students enrolled at CBU

3. Which of the following statements best describes applied or pure research.

    a) Research to study gossiping patterns among UNZA students
    b) Research to investigate dressing patterns among students
    c) Feasibility study on the establishment of a gymnasium at UNZA
    d) An opinion poll on students' attitudes towards street vending on campus
    e) Research meant to find a cure for HIV AIDS.

4. Which of the following statements are true or false about positivism.

    a) Positivism is a hypothesis that states that social reality exists independently of the observer
    b) Positivism is a school of thought that argues that there are such things as social facts
    c) Positivism is a theory that stresses the subjective dimension of social reality
    d) Positivism is a research perspective that stresses the use of quantitative methods
    e) Positivism is a paradigm that believes in in the qualitative methodology.

5. Research that is done to examine the findings of someone else using the "same variables but different people" is which of the following?

a) Exploration
b) Hypothesis
c) Replication
d) Empiricism

6. Which of the following is not a form of nonrandom sampling?

a) Snowball sampling
b) Convenience sampling
c) Quota sampling
d) Purposive sampling
e) They are all forms of nonrandom sampling

7. Which of the following best describes quantitative research?

a) The collection of nonnumeric data
b) Research involving the use of statistics
c) Research that is exploratory
d) Focus group discussion

8. A variable that is presumed to cause a change in another variable is called a(n):

a) Categorical variable
b) Dependent variable
c) Independent variable
d) Intervening variable

9. Sources of researchable problems can include:

a) Researchers' own experiences as social scientists.
b) Practical issues that require solutions
c) Theory and past research
d) All of the above

10. A review of the literature prior to formulating research questions allows the researcher to do which of the following?

a) To become familiar with prior research on the phenomenon of interest
b) To identify potential methodological problems in the research area
c) To develop a list of pertinent problems relative to the phenomenon of interest
d) All of the above

11. The feasibility of a research study should be considered in light of:

a) Cost and time required to conduct the study
b) Skills required of the researcher
c) Potential ethical concerns
d) All of the above

12. What is the opposite of a variable?

a) Constant
b) An extraneous variable

c) A dependent variable
d) A data set

13. An ordinal scale is used to rank order people, objects, or characteristics.

a) True
b) False

14. Which scale is the simplest form of measurement?

a) Nominal
b) Ordinal
c) Interval
d) Ratio

15. Researchers use both open-ended and closed-ended questions to collect data. Which of the following statements is true or false?

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

16. Which of the following can best be described as a nominal variable?

a) Age
b) Annual income
c) Grades in MAT 1110
d) Religious affiliation

17. Which of the following sampling techniques is an equal probability selection method in which every individual in the population has an equal chance of being selected?

a) Simple random sampling
b) Systematic sampling
c) Proportionate stratified sampling
d) Cluster sampling
e) All of the above are given an equal chance of selection.

18. Mr. Banda is giving a breakdown of the characteristics of the students who participated in a research on drug abuse at CBU. Which of the following methods does he appear to be using?

a) Prediction
b) Description
c) Explanation
d) Exploration

19. In which of the following nonrandom sampling techniques does the researcher ask the research participants to identify other potential research participants?

a) Simple random sampling
b) Convenience

c) Purposive
d) Quota
e) None of the above

20. In framing questions for research, certain pitfalls have to be avoided. Identify the pitfalls in the questions below:

    a) You don't think the government is fighting inflation strongly, don't you?
    b) Do you watch cinemas and play video games in your spare time?
    c) Are you of the view that diminishing returns in agriculture account for the exponential decline in Zambia's gross national product?
    d) Are you in support of the gross abuse of human rights by the current regime?
    e) Do you participate in sports because you are a fit?
    f) Is your father an alcoholic?

21. Indicate what sort of questions are being referred to here:

    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 question asked depending on the response to the preceding question
    d) A method of organizing a large of questions that have the same response questions
    e) A question that applies only to a segment of the sample.
    f) A question without predetermined categories to choose from.

22. Briefly explain what you understand by these terms:

    a) Population
    b) Sampling unit
    c) Responding unit
    d) Unit of reference

23. Briefly, in a sentence only, describe the following methods of data collection:

    a) Primary data
    b) Secondary data
    a) Qualitative data
    b) Quantitative data

24. Define the following concepts as briefly as possible:

    a) Conceptual definition
    b) Operational definition
    c) Numeric indicator
    d) Non-numeric indicator

SECTION B

ANSWER ONE QUESTION IN THIS SECTION. THIS SECTION CARRIES 20 PERCENT.

1. Answer the following questions on measurement and instrument development:

    a) What is measurement?
    b) What is a questionnaire?
    c) What is the link between measurement and questionnaire construction?
    d) Describe in the correct sequence, the stages in questionnaire construction.

2. For each of the following research designs below do the following:

    a) Describe it in some detail and ;
    b) Explain the circumstances under which you use it.
    c) The pros and cons of the design

    i. Descriptive design
    ii. Explanatory design
    iii. Longitudinal design
    iv. Experimental design
    v. Quasi- experimental design

3. For each of the following sampling designs below do the following:

    a) Describe it in some detail and ;
    b) Explain the circumstances under which you use it.
    c) The pros and cons of the design

    i. Proportionate stratified sampling
    ii. Disproportionate stratified sampling
    iii. Linear systematic sampling
    iv. Multistage sampling
    v. Snowball sampling

SECTION C

ANSWER ALL QUESTIONS IN THIS SECTION. THIS SECTION CARRIES 30 PERCENT.

1. Given the data below on the length of service of a random sample of KCM employees. Answer the questions that immediately follow:

Years of service	Number of employees
1-2	21
3-4	45
5-6	50
7-8	66
9-10	55
11-12	24

a) Find the mean of years served by the workers and, in a sentence or two, explain what this means.
b) Find the standard deviation of the distribution and, very briefly, explain what this suggests.
c) Find the median year of service and in a sentence or two, explain what this means.
d) Find the modal year of study and very briefly explain what this means.
e) What is the percentage of students with years of service above 5.5 years?
f) Above which year of service did 75% of the workers fall?

2. For the following statistical tests, indicate what the correct positions are:

		What is the scale of measurement?	Does it require the use of the normal curve? (Yes/No)	Does it make any inferences about the mean? (Yes/No)
a)	Analysis of variance			
b)	Difference between means			
c)	Single sample test for means			
d)	Regression analysis			
e)	Chi – square test of independence			
f)	Chi – square goodness of fit test			

3. Given a situation where you have collected the data given below, indicate the type of graph that would be appropriate for the graphical representation of the data:

a) Distribution of examination results in DEM 2210
b) Distribution of students in DEM 4210 by sex
c) Racial classification of students
d) Lecturers' salaries at CBU.

4. Indicate which of the following statements is true, false of neither:

a) In a drug manufacturing plant, a chemist testing the efficiency of a new drug, changes the significance level from 5% to 10% thereby decreasing the probability of Type 1 error.

b) In a car manufacturing firm, an engineer testing a new car changes the significance level from 10% to 5% thereby increasing the probability of Type II error.

c) In a Zambia Bureau of Standards (ZABS) laboratory, a scientist testing the toxicity of yellow maize changes the significance level from 5% to 10%, thereby increasing the probability of Type 1 error.

d) A researcher concludes, based on 1 percent level of significance, that there is a relationship between religious affiliation and criminal behaviour after obtaining the following statistics from an SPSS output:

$X^2 = 12.27$, df = 5, p=.0055

e) A researcher concludes, based on 5 percent level of significance, that there is a statistically significant difference in the ages of male and students at CBU after obtaining the following statistics from an SPSS output:

z = 0.64, df = 98, p=0934

5. Which of the following statements sounds like a null hypothesis?

   a) The coin is not fair
   b) There is a correlation in the population
   c) There is no difference between male and female incomes in the population
   d) The defendant is guilty

6. What does it mean when you calculate a 95% confidence interval?

   a) The process you used will capture the true parameter 95% of the time in the long run
   b) You can be "95% confident" that your interval will include the population parameter
   c) You can be "5% confident" that your interval will not include the population parameter
   d) All of the above statements are true

7. Hypothesis testing and estimation are the two key branches of the field of inferential statistics?
   a) True
   b) False

8. . A _____ is a numerical characteristic of a sample and a _____ is a numerical characteristic of a population.
   a) Sample, population
   b) Population, sample
   c) Statistic, parameter
   d) Parameter, statistic

9. A sampling distribution might be based on which of the following?
   a) Sample means
   b) Sample correlations
   c) Sample proportions
   d) All of the above

10. _____ results if you fail to reject the null hypothesis when the null hypothesis is actually false.
   a) Type I error
   b) Type II error
   c) Type III error
   d) Type IV error

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.

    a) Find the point estimate of the mean score performance in the course and the bound on the errors of estimation and interpret the result.

    b) Find the 95% confidence interval estimate of the students' mean performance and interpret the result.

    c) If the score of 39.5 is the cut – off point for a pass grade with those below designated as failures,

        i. What was the number of failures in the course?
        ii. How many students passed the test?
        iii. What was the percentile score of a student called Banda with a mark of 73?
        iv. What was the probability of performing better than Banda?
        v. How many students performed worse than Banda?

12. Indicate if the statements below are (i) true (ii) false (iii) neither

    a) A one-tailed test is used when a researcher has a non-directional hypothesis

    b) A two tailed test is used when a researcher has a directional hypothesis

    c) A one-tailed test is also used when a researcher has a directional hypothesis.

13. Indicate which of the following examples below refers to (a) descriptive (b) inferential statistics or (c) or neither.

    a) 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.

    b) 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. Select the correct answer out of the ones between the slash.

    a) A distribution is symmetrical if the coefficient of skewness is zero/negative /positive
    b) A distribution is negatively skewed if the coefficient of skewness is zero/negative /positive
    c) A distribution is positively skewed if the coefficient of skewness is zero/negative /positive

15. Indicate if the statements below are i) true ii) false iii) 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.

SECTION D

ANSWER ONE QUESTION IN THIS SECTION. THIS SECTION CARRIES 20 PERCENT.

1. A developer is considering alternative sites for constructing a shopping mall in Lusaka and Kitwe using the mean household incomes (in thousands) in the two cities as a proxy variable for purchasing power. For a random sample in Lusaka with 30 households, the average annual income is K45, 000 with a standard deviation of K1, 500. For a random sample of 40 households in Kitwe, the average annual income is K44, 600 with a standard deviation of K2, 400. The investor eventually decides to construct a shopping mall in Lusaka on the premise that the purchasing power of Lusaka residents is significantly higher than that of Kitwe residents. Is his decision justified? Test this hypothesis at 1% level of significance?

2. A senior member of Lusaka Golf Club claims that attendance at club meetings is determined by the distance between the members' homes and the club. To argue his case, he collects data on a random sample of 10 club members and collects data on the monthly attendance at meetings and their distance from home.

Subjects	Attendance (per month)	Travel distance (miles)
A	15	4
B	24	2
C	22	3
D	16	7
E	7	6
F	20	3
G	21	3
H	24	3
I	18	6
J	10	5

a) Compute the Pearson product moment correlation coefficient and interpret the result.
b) Find the regression of attendance on travel distance and interpret the constants in the context of the question.
c) Predict the number meetings attended by a member who stays 7.7 miles away.
d) If a member attends 13 meetings per month, what be the estimated distance of his home from the club?
e) What amount of variation in attendance is accounted for by distance?

3. Given below are quota preferences of UNZA students disaggregated by sex.

   a) Verify the claim by a member of the University Senate that there is a relationship between quota preference and sex.

   b) 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 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

END OF EXAMINATION

TABLE I Proportions of Area under the Standard Normal Curve

z	 O z	 O z	z	 O z	 O z	z	 O z	 O 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	 O z	 O z	z	 O z	 O z	z	 O z	 O 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	.4922	.0008
2.02	.4783	.0217	2.59	.4952	.0048	3.16	.4922	.0008
2.03	.4788	.0212	2.60	.4953	.0047	3.17	.4922	.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

	Level of significance for a non-directional test					
df	.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_o is rejected.**