

Statistical Exam Preparation Questions

1. A cartographer is studying the map-interpretation abilities of different people. A random sample of 12 seniors and 16 freshmen (28 total people) answer a set of interpretive questions from the map, and the 28 scores are placed in a single, overall rank order. How would the cartographer test the hypothesis that higher map interpretation scores occur for the seniors?
2. The executive body overseeing establishment of the new European Union has 200 members appointed in proportion to the *population* of the 15 participating countries. How would a researcher test to see if the distribution of representatives by country is also proportional to the *financial assets* of the states?
3. The U.S. Department of Housing and Urban Development is attempting to reduce crime rates in various public housing projects. Data are collected from a sample of projects for a number of variables thought to be associated with this crime, including resident age, income, unemployment, and existence of support programs. What test could be used to determine the degree of influence of any of these factors on crime?
4. A farmer in Manitoba is concerned about the threat of hailstorms and wants to know whether he should purchase insurance. He has a 35-year record of hailstorm frequency and knows that anywhere from 0 to 4 storms have hit his farm in the past, with an average frequency of 1.4 hail-storms per year. How can he calculate the likelihood of a hailstorm hitting his farm next year?
5. An economic geographer wants to examine the relationship between population size and the number of retail establishments for a set of Australian cities. What technique should be applied?
6. A small village in southeastern England has a 78-year record showing the number of days in May with measurable precipitation (greater than 0.10 centimeters). Some years are totally dry, with no measurable precipitation, but during one year, rainfall occurred 16 days of the month. The average for the 78-year record is 3.2 days with measurable precipitation. What method should be used to calculate the likelihood of 10 or more days of rainfall for this upcoming May?
7. A regional planner obtains random samples of home costs from four Michigan counties. Suppose these home costs are only slightly skewed in each county and that home prices within each county vary about the same amount. What test should the planner use to learn if the differences in home cost by county are significant?
8. A geographer wants to see if monthly rents for student housing vary according to the distance of the rental property from campus. He suspects the closer an apartment unit to campus, the higher the rent. How can he test whether this distance decay effect is present?
9. Officials in Somerset, England, know from a recent sample survey that 3.2 percent of their residents are "senior elderly," that is, age 80 or older. What will they be calculating if they try to estimate the likelihood that the true population proportion of senior elderly is between 3.0 and 3.4 percent?
10. From a recent nationwide study it is known that the typical American watches 25 hours of television per week (with a population standard deviation of 5.6 hours). Suppose 50 New Orleans residents are randomly selected and their viewing hours are calculated (both average and standard deviation). What technique should be used to determine whether New Orleans television viewing habits differ from the nationwide viewing habits?
11. A demographer has recorded the number of children per family in 140 households in the Indian state of Kerala. She suspects from a quickly sketched histogram that this distribution is very positively skewed. What inferential statistic could she use to test this suspicion?
12. Geographic consultant Pierre Portage is studying visitor activity patterns in the provincial park system of Quebec. Administrators of the park system want to know if park attendance levels differ from May to August, using the same set of parks in each case. What technique should Pierre advise them to apply?
13. A geographer has two isoline maps of Pakistan: one showing mean annual precipitation and the other showing population density. Suppose the same random sample of points is selected from each map (i.e., if a particular location is chosen on the first map, that same location on the second map is also included in the analysis). Assume that both variables are from normally distributed spatial populations. What technique

will determine the degree to which the two map surfaces are associated?

14. Environmentalists are investigating the effects of thermal plume (higher temperatures) in Chesapeake Bay around a water discharge pipe at Calvert Cliffs nuclear power plant. Suppose power plant personnel wish to estimate surface water temperatures at various distances from the discharge point. What statistical procedure would be most appropriate?
15. Geoscientist *Gary Gabbro* is studying soil erosion rates of several soil orders (alfisols, aridisols, etc.). He eventually wants to use the ANOVA test to evaluate differences in erosion rate by soil order. He has taken a systematic spatial sample of observations from each soil type, but is not sure if any of the underlying populations from which these samples have been taken is normally distributed, an ANOVA assumption. What should he do before running the ANOVA?
16. Chinese agricultural officials are conducting an extensive study of crop damage resulting from insect infestations in the lower Liao River Valley. It is hypothesized that one possible factor associated with the extent of insect damage is the amount of fertilizer used by different farmers. What test would be used to determine the importance of fertilizer use levels on the amount of insect damage?
17. A random sample exit poll of Jefferson County voters resulted in the following opinions regarding a commercial-retail blue law that would prohibit businesses from being open on Sunday. In Drumlintown, 48 percent were in favor of such a law, while outside Drumlintown, 54 percent were in favor. How would a geographer test the hypothesis that support for the blue law is higher outside Drumlintown than in the city?
18. The people of Great Britain seem less interested in joining the European Union when compared to many other European countries. By contrast, a recent referendum in Germany showed 71 per-cent of their voters favored joining the Union. Using recent information from a sample of British voters, how would a British economist discover if the percentage of British favoring the Union is significantly lower than the percentage of Germans who share this attitude? Is this a one-tailed or two-tailed test?
19. A medical geographer wants to predict the number of physicians living in a city based on the median family income of the city. Suppose this relationship has been tested for another set of cities in the state, but not for this particular place. What statistical technique is appropriate?
20. A seismologist in New Zealand has been monitoring earthquakes in the region for years. Many years no "noticeable" quakes (above 3 on the Richter scale) occurred, but one year there were six such quakes. How will the seismologist calculate the probability of more than one earth-quake of this magnitude next year?
21. Suppose an urban planner in San Francisco, California, wants to determine if residents in rental units differ from residents in owner-occupied units with regard to the percentage favoring city rent control legislation. If random samples of residents are taken from both types of residents, what statistical test should be used?
22. Transportation planners in Minneapolis, Minnesota, are concerned about the effect of weather on the ridership levels of public transit. The feeling is that days with "bad" weather conditions (cold and snow) tend to attract more riders than "good" weather days (warm and sunny). Given daily ridership data from local bus routes, and knowing the overall population variability in these rates, how could the difference in ridership levels be statistically validated?
23. Experts who handle snow-making equipment for Tamarac Lodge and Ski Resort suspect a relationship between the direction of the overnight wind and the need to make snow during the late winter/early spring season. Using a sample(s) of data on these conditions during this period for the last five seasons, how could they test this relationship?
24. In a list of 50 test scores, the average score is 74.1 out of 100. What statistic could be calculated to determine how much the typical score varies from this mean?
25. The cost of a "market basket" of groceries is obtained from a random sample of grocery stores in Boston, Atlanta, Minneapolis, and San Diego. The total cost of the same list of food items (same national brands and sizes) is recorded for each store in every city surveyed. What test should be used to learn if the market basket costs between cities are different?

26. A region contains three different types of rock: limestone, calcareous marl, and sandstone. Suppose a similar-sized area is sampled in each rock type, and the number of springs in each rock type is tabulated. What test can be used to determine if the density of springs differs by rock type?
27. A Japanese city has five major shopping centers. A random sample of shoppers at each center is asked how much money they spent shopping in the center that day. What statistical test could be used to see if the typical shopper at the different centers spends differing amounts of money? Assume the pattern of expenditures at each center is not normal, but very positively skewed.
28. Elmwood, Oklahoma, has two restaurants. Suppose a random sample of patrons at each restaurant is asked the distance they have traveled to eat (the distribution of distances is severely non-normal). What test is appropriate to determine whether patrons travel different distances to eat?
29. A geographer plans to make a choropleth map of Texas counties, showing median family income. However, she wants to use a method of classification that will highlight the unusual counties (outliers) in the data. That way, those looking at the map will quickly spot the "extreme" counties. What method of classification should she use?
30. A climatologist is conducting a study of "lake effect snow" along the shores of Lake Ontario. He has collected data from a number of monitoring sites at different distances from the lake and recorded the total amount of snowfall at each of these monitoring sites through last winter. What statistical technique should he use to determine if there is any relationship between snowfall amount and distance from the lake?
31. A choropleth map of states in Mexico used the following legend categories: 11.37 to 16.26, 16.27 to 21.36, 21.37 to 26.36, 26.37 to 30.14. What method of classification has been used?
32. The housing department at Everbrown University has just completed a sample of 86 students. Each student surveyed was asked the distance of his/her rental unit from campus and the monthly rental cost of that unit. Given this information, what technique could housing personnel use to predict the monthly rent for a student who selects an apartment 1.5 miles from campus?
33. A recent earthquake in eastern Turkey resulted in the following number of deaths and injuries in 11 villages located at increasing distances from the earthquake epicenter: 520, 410, 320, 310, 50, 170, 210, 140, 100, 50, 20. That is, 520 deaths and injuries occurred in the village closest to the epicenter, 410 deaths and injuries occurred in the village second closest to the epicenter, and so on. If no further information is available, how can these data be used to decide if proximity to the epicenter is related to the number of casualties and injuries?
34. A random sample of residents whose homes are on the floodplain of the Mississippi River are surveyed regarding their attitudes toward various flood management policies. After a flood has occurred, the same set of residents is surveyed again about these issues. What test should be used to determine if attitudes regarding flood management policies have changed?
35. Steve ("Smokey") Jones is a ranger in Plywood National Forest, and he has access to forest fire records over a 65-year period. Most years are fire-free, but one dry year 16 fires burned ten acres or more. He has discovered the average is 1.8 fires per year. How can he calculate the odds of one or more fires in Plywood next year?
36. A 1997 survey of winter guests at Tamarac Lodge showed that 28 percent of the respondents did not ski during their visit. A consultant expects that a significantly higher percentage of visitors to Tamarac Lodge this upcoming winter will not ski. How can she test this hypothesis? Is this a one-tailed or two-tailed test?
37. In previous years, the overall average travel time for a boat trip down the Colorado River through Grand Canyon National Park was six days. Because of river congestion and overuse, park personnel think the trip might take longer now. How can they determine if boat trips now take longer?
38. A geographic researcher has been studying the relationship of distance from Lake Ontario and the amount of "lake effect snow." Some friends of hers live in this study area and have a cabin two miles from the lake. What technique should she apply to estimate how much snowfall they received last winter?
39. A glaciologist studying temperature variation in Antarctica has proposed that temperatures are significantly warmer today than 300 years ago. Using 100 test sites around the continent, he has (1) measured the

average temperature over the last year, and (2) estimated the temperature at those sites 300 years ago from the chemical composition of ice bores. How would he test for warming over this time period?

40. An economic geographer is studying the spatial patterns of income in Melbourne, Australia, and it is known that the average family income is \$38,346. A sample survey of 15 Melbourne families reveals an average of \$40,480. How can the geographer test to see if the sample of 15 families is representative of Melbourne?
41. A cartographer is studying the relative effectiveness of different types of maps. The same map is produced by computer in two ways: color and black-and-white. A random sample of 15 people is selected to answer a set of interpretive questions from the color map, and another random sample of 15 people is selected to answer the same set of questions from the black-and-white map. The score for each participant is recorded. How would the cartographer test the hypothesis that higher map interpretation scores occur when the color map is used? Is this a one-tailed or two-tailed test?
42. Environmentalists are investigating the effects of thermal plume (higher temperatures) in Chesapeake Bay around a water discharge pipe at Calvert Cliffs nuclear power plant. What technique could they use to see if the temperature of surface water is related to distance from the pipe?
43. An environmental planner has been collecting sulfur dioxide level readings from a sample of monitoring sites located at different distances downwind from a coal-burning utility power plant in the Ohio River Valley. What statistical technique can she use to predict the sulfur dioxide level at an unmonitored site 12 miles down-wind from the power plant?
44. Texas is known for taking capital punishment seriously; more executions occur here than in any other state. However, a geographer is curious about whether attitudes vary across the state. As one part of the study, people from El Paso (west Texas) and Beaumont (east Texas) are sampled. In each city, the geographer has estimated what percentage of population is in favor of the death penalty. What technique should be used to see if these attitudes differ statistically?
45. A hurricane has recently moved up the Atlantic coast of the United States, causing damage in major coastal cities. Suppose the amount of damage (in millions of dollars) is as follows—with the cities listed by location from south to north (i.e., the southernmost city is listed first; the northernmost city last): 786, 451, 507, 410, 202, 51, 171, 35, 27, 58. How can these data be evaluated to learn if location northward or southward is significantly related to the amount of damage?
46. The agricultural extension agent in an Oregon county is concerned about the adverse effects of hailstorms on farms in her region. Hailstorm activity has been recorded over the last 55 years. Some years, no hailstorms occur anywhere in the county. However, in one extreme year, nine hailstorms occurred. How can she calculate the probability of the county experiencing exactly two hailstorms next year?
47. The chair of a local environmental action group feels that a strong relationship exists between the volume of recycled material left along the curb for pickup and the age of the homeowner. What method would be used to confirm this observation statistically?
48. Suppose a demographer for the Ontario provincial government is looking at both the number of migrants moving into economic development areas and the number of migrants leaving the same sample set of areas. How can she test the number of in-migrants and the number of out-migrants for statistically significant differences?
49. Recent financial difficulties have affected the economies of many Asian countries. A researcher has both the 1995 and current annual volume of exports from the same set of randomly selected Asian countries. He notices the distributions of these export volumes is very positively skewed, with a few countries (e.g., Japan) having much larger volumes of exports than other countries. How can he test to learn whether the volume of Asian exports has declined?
50. Personnel at an Ontario provincial park want to locate a new campground on a riverfront site that will not be flooded too frequently. Budget managers advise a location be chosen that will be flooded no more frequently than once a decade. Historical records show that flooding has occurred nine different years on that site in the last century. What procedure should be used to determine the probability that this site will not be flooded too frequently in the next 25 years?