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Confidence interval sample questions and answers

Sometimes in statistics it is useful to see spent examples of problems. These examples can help us find out similar problems. In this article, we will go through the process of conducting a statistical conclusion for the result relating to two means of the population. Not only will we see how to test the hypothesis about the difference between the two means of the population, we will also adjust the confidence interval for this difference. The methods we use are sometimes referred to as two samples of t test and two samples of t trust interval. Suppose we want to test the mathematical abilities of school class children. One question we can have is if the top grade levels have higher test scores. A simple random sample of 27 third-graders is given a math test, their answers are scored, and the results find that the average score is 75 points with a standard sample deviation of 3 points. A simple random sample of 20 fifth-graders is given the same math test and their answers are typed. The average score for fifth-graders is 84 points with a standard sample deviation of 5 points. Given this scenario, we ask the following questions: Do these samples give us evidence that the average test score of the population of all fifth-graders exceeds the average test score of the population of all third-graders? What is a 95% confidence interval for the difference in average test scores between third-graders and fifth-graders populations? We have to choose which procedure to use. In doing so, we need to make sure and verify that the conditions for this procedure have been met. We are asked to compare two means of population. One collection of methods that can be used to do this are those for two sample t-procedures. In order to use these t-procedures for two samples, we need to make sure that the following conditions hold up: We have two simple random samples from two populations of interest. Our simple random samples do not make up more than 5% of the population. The two specimens are not obsterated from each other, and there is no correspondence between the objects. The variable is usually distributed. Both the population and the standard deviation are unknown to both segments of the population. We see that most of these conditions are met. We were told we had simple random samples. The population we are studying is large because there are millions of students at these grade levels. A condition we cannot automatically assume is if test scores are usually distributed. Since we have a fairly large sample size, according to the reliability of our t-procedures, we do not necessarily need the variable to be distributed normally. Since the conditions are arranged, we perform a couple of preliminary calculations. A standard error is an estimate of standard deviation. For this statistic, add selective variance of samples, and then take a square root. This gives the formula: $(s_1^2/n_1 + s_2^2/n_2)^{1/2}$ Using the value above, we see the value the standard error is $(3^2 / 27 + 5^2 / 20)^{1/2} = (1 / 3 + 5 / 4)^{1/2} = 1.2583$ We can use conservative approximation for our degrees of freedom. This may underestimate the number of degrees of freedom, but it is much easier to calculate than with the Welch formula. We use a smaller of the two sample sizes, and then we take one of that number. For our example, the smaller of the two samples is 20. This means that the number of degrees of freedom is $20 - 1 = 19$. We want to test the hypothesis that fifth-grade students have an average test score that exceeds the average score of third-grade students. Let μ_1 be the average population of all fifth-graders. Similarly, we allow μ_2 to be the average population score of all third-graders. The hypotheses are as follows: $H_0: \mu_1 - \mu_2 = 0$ $H_a: \mu_1 - \mu_2 > 0$ Test Statistics - this is the difference between the sample of means, which is then divided into a standard error. Since we use standard sample deviations to estimate standard population deviation, the test statistics on t-distribution. The value of the test statistics is $(84 - 75) / 1.2583$. That's about 7.15. Now we determine what the p-value is for this hypothesis test. We look at the value of test statistics, and where it is on t-distribution with 19 degrees of freedom. For this distribution we have 4.2×10^{-7} as our p-value. (One way to determine this is to use the RT function in Excel.) Because we have such a small p-value, we reject the zero hypothesis. The conclusion is that the average test score for fifth-graders is higher than the average test score for third-graders. Since we have established that there is a difference between average scores, we now define a trust interval for the difference between these two means. We already have a lot of what we need. The confidence interval for the difference should have both an estimate and a margin of error. Assessing the difference of two means is easy to calculate. We just find the difference in sample remedies. This difference in sample means estimating the difference in population of funds. For our data, the difference in sample means $84 - 75 = 9$. The margin of error is a little more difficult to calculate. To do this, we need to multiply the corresponding statistics by the standard error. The statistics we need are by consulting a table or statistical software. Once again using conservative approximation, we have 19 degrees of freedom. For 95% of the confidence interval, we see that $t^* = 2.09$. We could use the T.INV function in Excel to calculate this value. Now we have put everything together and see that our margin of error is 2.09×1.2583 , which is approximately 2.63. The confidence interval is 9 ± 2.63 . The interval is between 6.37 and 11.63 points on a test that selected fifth and third grades. HomeNewsSwings and Answers - LettersYo all 1 photoValues 2, 1995No speed limit! Interesting article Virtual Speed (July 95). Here's a rare car for honorable mention: '57 Plymouth Fury with 318 V-8, double four-barrel carbonydrates, three-speed Torque-Flite automatic button, and 831/44-inch Sure-Grip differential. What does a 150-plus mph sound like with four people in the car? Jeff Hoelzel Allentown, Pa.It hard to believe. Even though Motor Trend didn't test this exact model in the '58, it's safe to say that the car's top speed was limited to well below 150 mph by a three-speed transmission and maximum engine speed.

Fury was available with a 150-mile speedometer that may have been more than a little optimistic because the actual top speed was probably no more than 120 mph. At one time, however, Fury's most powerful was among an elite group of full-size, hot production cars. - Ed. I'd be willing to bet my speed limiter that most MT readers find staged events like July's high-speed article to be just a handy excuse for a hot tread rod from a bunch of performance cars. Steve DeYachimoLafin, Nev.And why not? Any excuse to drive a car's performance is a good one. The positive response to our cover story has been overwhelming, which has us coming up with more ways to get through the latest production technique. -EdWhy were not Porsche 968 and Dodge Stealth included in the test to finish all tests (Virtual Speed)? Mark WilsonCambridge, Mass.Unfortunately, both 968 and Stealth were unavailable at the time of the Test, but both would surely have turned in respectable numbers. In the past, we've recorded a top speed of 154.6 mph in twin-turbocharged stealth. And while we haven't had the ability to push the 968 to its limit, Porsche publishes a top speed of 156 mph for the 968 when equipped with a six-speed transmission. - Ed. The Ford Probe GT has not compiled its list of entrants in the Virtual Speed shootout, even with a \$1.98 speed secret applied. I was wondering how close to the 140-mile compartment?C. MartinPittsburgh, Pa.We recorded a top speed of 133 mph with a Ford Probe GT during our 1994 Bang for the Buck test (August '94). Close, but no cigar. - Ed. As for this old driver, your July issue was worthless. With radar, CB radios and cellphones, what does a 100-plus-mile car do on the highway? The drivers of tugboats and funeral homes are quite busy. J.B. MaassKankakee, Ill.Viper GTS UncoveredIn your July issue was another of those Dodge ads (pages 58-59) with the car under the brezent. What's there? Chrysler Atlantic? Brad HansenMuscatine's Iowa-covered car is a teaser glimpse of the upcoming 96 Viper GTS coupe expected to begin production this spring. - Ed. What year is this? I read the July editorial board of C. Van Tune Great Car-But What Year Is It? with special interest. Having given birth in the 40s, I grew up with the evolution of the car. We loved our stay here. I remember sneaking a peak under the canvases of new vehicles as they sat on a truck. Was it or what? Someone said that nowadays, if one particular design is successful, then other manufacturers will follow. I would once put a set of wheels and motor on a hard-boiled egg and drive it-at least the egg looks like an egg. I believe that automakers and designers should take a small risk every time. I know this is their perception of the future, but lately it seems that the future has stood still. Gary LutherLas Vegas, Nev.If I had a dollar for every time I couldn't determine a year of car, I would be able to buy that Ferrari F355 you were behind the wheel. Not only is it difficult to define the year, but also the model. For example, the only visual difference between the V-6 Camaro and the V-8 Z28 is the exhaust and the small emblem. Because each generation produces fewer car enthusiasts, the government has an easier time regulating cars, centralizing emissions testing and crushing older cars. Most Gen-Xers don't like cars the way boomers did; they are more concerned with stereo energy than horsepower. If my engine had half the power of some of these stereos, I would race Warren Johnson for a ProStock title! As a 27-year-old Gene Xer, I always thought I had grown up the last decade. Scott HiddleFidelfia, Pa.End of An AgeChevrolet Caprice, Buick Roadmaster and Cadillac Fleetwood: These models are part of our automotive culture. Now they risk becoming part of automotive history if GM executes its plan to eliminate its last three full-size, V-8-powered, rear-wheel drive cars. GM voluntarily surrenders the market entirely to Ford. FoMoCo will have full control over traditional full-size, limousines, taxis, police, hearing and coaching markets. Also, people carrying boats or trailers will have to buy Ford or buy trucks. People at Ford should be doing cartwheels in anticipation of the market that GM is handing them over on silver film. Dale Stafford Livenworth, Kan.Sad, but true. After the '96 model year, the production facility for these large GM-sedans will be switched to building trucks. -Ed. Dreams of Electric SheepIt is disappointing that your May 95 Washington report on the U.S. Office of Government Accounting (GAO) congressional report covers only the most negative research findings on electric vehicles (EVs). There is a lot of information in the 137-page study, including: EVs produce virtually no tail pit emissions and a net impact on air quality - savings from reducing tail pit emissions minus additional smoke emissions associated with increased power generation are generally considered significantly smaller than that of [cars with an internal combustion engine]. As for the cost, EVs are still largely in the demonstration stage. As output increases, costs will decrease proportionally. The fast-growing EV industry is preparing to meet consumer needs. Unlike your point of view, with careful reading of the GAO report, the EV industry finds its overall tone Robert T. HaydenExecutic DirectorElectric Vehicle Association of America San Francisco, Calif. The Question CornerI has seen a lot of cars being lowered, similar to race cars, and I've heard that engineers have specifically designed vehicles to be a certain height off the ground. Does your car's decline affect the design of engineers? If so, is the change significant? What are the advantages and disadvantages of reducing your car? Jodonn P. DiazLemon Grove, Calif.An unfamiliar owner can easily get into trouble, lower the car. As with many other aspects of the vehicle, the height of the trip in the warehouse is the judgment of engineers about the optimal balance between many factors, including ground clearance, ride quality, angular abilities and infusion/egress. Reducing suspension also reduces the center of the car's weight, reducing the body roll and improving rotation, but improved handling is due to ride quality and ground clearance. Bumps, springs, wheels and tyres may need to be changed as part of the packaging; these components can also be updated to improve handling without decreasing. Have a job in a professional store specializing in after-sales performance; You get the look and feel what you want for the first time around. -Ed. Driving MusicBeing someone who likes to listen to loud music while driving, I'd like to know what music, if any, your staff listens to while testing cars. Eric RiveraNaperville, Il., while testing vehicles: No. We focus on engine sounds, cabin noise levels, wind leakage and many other aspects of each car. But as the test day goes by and it's time to relax, our tastes run the gamut from executive editor Bob Nady's 24-hour talk radio station to senior road test editor Mac DeMere's worldwide format, and from managing editor Suzanne Perrao's nine-hour nail CD collection editor C. Tune Van's Steely Dan library. The best drive song of all time? Gold Earring's 1974 hit Radar of Love scores many voices. -Ed. Letters: Motor Trend6420 Wilshire Blvd.Los Angeles CA 90048-5515.Contributions: Unwanted materials must be accompanied by back mail. This magazine will take no responsibility for the loss or damage to this. 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