

- 1) You have two normally distributed samples. Name the test that is the most appropriate way to test if their population variances are statistically distinguishable.
  - a) Same question, but now you have nine normally distributed samples.
- 2) You are creating a new filtration protocol for drinking water. In your experimental design, you have split thirty different contaminated water samples into two equal portions. You treated one portion with the current protocol and the other with the new protocol. What is the most appropriate way to test whether the new treatment protocol works better than the current one?
- 3) You are studying whether the amount of bioturbation is related to the elevation on a point bar in an estuary. You've extracted twenty cores in which you measured bioturbation and the height relative to the mean low tide. You estimated bioturbation using Mary Droser's 6-point qualitative scale, which ranges from 1 (no burrowing) to 6 (completely churned). Name the test that would allow you to test the strength of the relationship between the amount of bioturbation and elevation.
- 4) You have normally distributed homoscedastic samples. What is the most appropriate way to test simultaneously whether their population means are statistically distinguishable?
- 5) You have measured velocity and grain size in many rivers. Velocity appears normally distributed, but the grain size is clearly log-normally distributed. How should you measure the strength of the linear relationship between grain size and velocity? What must be done with the data before running your test? Be specific.
- 6) You have two large ( $n=1500$ ) samples, one of which is markedly right-skewed, and the other is bimodal. What is the best way to test if the central tendency of their populations is statistically distinguishable?
- 7) You've read that neodymium causes juvenile shrimp to grow deformed gills. In the lab, you've set up 40 aquaria where you've grown juvenile shrimp under different neodymium concentrations. After some time has passed, you measure the percentage of shrimp in each aquarium that have deformed gills.
  - a) How should you quantitatively describe the observed relationship between neodymium concentration and percent deformed gills?
  - b) You've read a study that reported a mathematical relationship between uranium concentration and gill deformation in juvenile shrimp. How could you best test how much the deformation rate for neodymium differs from that of uranium?