The QUIC (1.0)

This is a 25-item measure of quantitative reasoning. You are not permitted to use electronic devices of any kind when answering these questions. Answering these questions does not require complex calculations; the answers rely on understanding basic concepts and knowing a few important numbers. Answer every question regardless of how certain you are about your answer. There is no penalty for incorrect answers.

___ 1. What is the mean of the following set of numbers: \{12, 8, 23, 5, 5, 7\}
   a. 7.5
   b. 10.0
   c. 5.0
   d. 12.0

___ 2. A research article in a scientific journal is described as “peer-reviewed”. This means:
   a. Other scientists have certified the results reported aren’t fraudulent.
   b. Reviewers have read and critiqued the article before it was published.
   c. People reading the published article have rated how sound and valuable it is.
   d. The conclusions reached in the article are in accord with current scientific beliefs.

___ 3. You read that a new drug has been shown to have a statistically significant benefit in comparison to a currently used drug in the treatment of high blood pressure. This means:
   a. The new drug is substantially better for treating high blood pressure than the currently used drug.
   b. The new drug is no better for treating high blood pressure than the currently used drug.
   c. The difference between the new drug and the currently used one in the treatment of high blood pressure is unlikely to be due to chance.
   d. The difference between the new drug and the currently used one is only statistical and doesn’t suggest it has any benefit.
4. A salesperson is discussing the merits of purchasing a new car and presents you with this graph. Which of the conclusions below is true based on this graph?

![Cost per mile graph]

a. Driving an old car costs $\frac{3}{4}$ as much per mile as driving a new car.

b. Driving an old car costs $\frac{1}{2}$ as much per mile as driving a new car.

c. Driving a new car costs $\frac{3}{4}$ as much per mile as driving a old car.

d. Driving a new car costs $\frac{1}{2}$ as much per mile as driving a old car.

5. A cluster of cases of an uncommon but serious respiratory illness has been found in a nearby community. Residents have voiced a number of opinions about the situation, although no assessments have been conducted evaluating this particular cluster. Which of the following general statements is valid?

a. Groupings like this can occur randomly.

b. If there weren’t a common cause present, the distribution of cases would be spread evenly rather than clustered in one community.

c. There is no reason to suspect there may be a problem.

d. If the rate of the illness in the community is greater to a statistically significant extent than the rate elsewhere, then the grouping can’t be random.
6. Which of the following represents the approximate percentage of the world’s population living in the United States?
   a. 4%
   b. 12%
   c. 20%
   d. 33%

7. A defining factor of a true experiment, as opposed to a correlational study, is:
   a. The presence of a control group.
   b. Evidence for the reliability of the measures used.
   c. Random assignment to the different conditions of the study.
   d. Completion of a study in a laboratory.

8. The chances of an internship application being accepted are represented by the numbers below. In which case are the chances of a success highest?
   a. 75%
   b. 4/5
   c. .10
   d. 60 out of 90

9. A charity reports that it received 1,000 donations during a recent campaign and that the average donation was $500. You wonder whether that average figure was affected by a few quite large contributions. What other number would best help you evaluate that?
   a. The median contribution.
   b. The modal contribution.
   c. The mean contribution.
   d. The total sum of contributions.
10. A newspaper headline declares “STUDY SHOWS THAT E-CIGARETTES LESS HARMFUL THAN TOBACCO.” The evidence for that is likely to be most reliable if the study referred to is:

a. A meta-analysis.
b. A quasi experiment.
c. A correlational study.
d. A case-control study.

11. The QB College Preparatory Program notes that its participants are 20% relatively more likely to get into a prestigious college or university than control applicants who have equivalent academic and other backgrounds but did not participate in the QB Program. Which of the following outcomes is consistent with this claim?

a. 5% control acceptance rate vs. 6% QB acceptance rate
b. 4% control acceptance rate vs. 24% QB acceptance rate
c. 4% control acceptance rate vs. 12% QB acceptance rate
d. 8% control acceptance rate vs. 10% QB acceptance rate

12. You are deciding whether to purchase a new bicycle helmet design that a large study suggests reduces head injuries to a statistically significant degree over a current design. However, this new bicycle helmet is much more expensive than the current one. What additional information would best help you evaluate whether it would be worthwhile to purchase the new helmet?

a. How statistically significant the difference was.
b. What the degrees of freedom were for the test of significance.
c. What the variance was for the head injury measure.
d. What the effect size of the difference was.
13. A study of marathon runners found that there is a relationship between finishing times and how much broccoli the runners’ reported consuming the week before the marathon. Runners eating more broccoli tended to have shorter finishing times. Which headline below would best represent this finding?

a. EAT BROCCOLI, RUN FASTER!

b. EATING BROCCOLI NEGATIVELY IMPACTS MARATHON SPEED!

c. EATING BROCCOLI POSITIVELY IMPACTS MARATHON SPEED!

d. EATING BROCCOLI ASSOCIATED WITH MARATHON SPEED!

14. A new disease, Vacheritis, has a 1% probability of occurring in the population. A random sample of individuals is given a test for Vacheritis. This test gives a true positive (i.e., detects the disease) 80% of the time in those who actually have Vacheritis and gives a false positive result 10% of the time for people who get tested but don’t have the disease. Someone you know was in that sample and tested positive for Vacheritis. How concerned should your acquaintance be that he or she has Vacheritis?

a. The chances are this person does not have the disease.

b. There is a moderate (near 50/50) chance the person has the disease.

c. The person probably has the disease, but there is still a good chance he or she doesn’t.

d. The chances are high the person has the disease.

15. An article claims “THE UNITED STATES HAS THE BEST UNIVERSITIES IN THE WORLD”. This is based on annual rankings showing that around 75% of the top-ranked universities in the world are in the United States. Which of the following statements best represents these ranking results?

a. Universities in the United States are, on average, the best in the world.

b. Twenty five percent of universities in the United States are not top-ranked.

c. Of the best universities in the world, most are in the United States.

d. Twenty five percent of universities in the world are top-ranked.
16. Medical researchers have developed a new cream for treating skin rashes. New treatments often work but sometimes make rashes worse. Even when treatments don’t work, skin rashes sometimes get better and sometimes get worse on their own. As a result, it is necessary to test any new treatment in an experiment to see whether it makes the skin condition of those who use it better or worse than if they had not used it.

Researchers have conducted an experiment on patients with skin rashes. In the experiment, one group of patients use the new cream for two weeks, and a second group did not use the new cream.

In each group, the number of people whose skin condition got better and the number whose condition got worse were recorded in the table below. Because patients do not always complete studies, the total number of patients in each of the two groups is not exactly the same, but this does not prevent assessment of the results.

Please indicate whether the experiment shows that using the new cream is likely to make the skin condition better or worse. What result does the study support?

<table>
<thead>
<tr>
<th>Result</th>
<th>Rash Got Better</th>
<th>Rash Got Worse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients who did use the new skin cream</td>
<td>223</td>
<td>75</td>
</tr>
<tr>
<td>Patients who did not use the new skin cream</td>
<td>107</td>
<td>21</td>
</tr>
</tbody>
</table>

a. People who used the skin cream were more likely to get better than those who didn’t.

b. People who used the skin cream were more likely to get worse than those who didn’t.

c. People who used the skin cream had the same outcome as people who didn’t.

d. People who used the skin cream were more likely to drop out of the study.

17. A tax preparation company advertises that it could save Americans who do their own taxes a sum total of a billion dollars if they used its services instead. Assume that approximately 50 million Americans do their own taxes. How much, approximately, would each of these individual taxpayers save on average if he or she had the tax preparation company complete his or her taxes?

a. $2,000

b. $200

c. $20

d. $2
18. A medical study is described as a Randomized Controlled Trial (or RCT). This means:
   a. Eligible participants receive randomly determined levels of a drug treatment of interest.
   b. Eligible participants are randomly assigned to treatment and control groups.
   c. A random selection of third variables is assessed to see if they account for any results obtained in the study.
   d. Both eligible participants and researchers are blind to (unaware of) the conditions to which participants belong.

19. You put $2000 in an attractive and stable investment that yields 12% interest compounded annually and make no withdrawals or deposits to the account. After 20 years, your investment is worth nearly $20,000. This is an example of what growth pattern?
   a. linear growth.
   b. exponential growth.
   c. cubic growth.
   d. logistic growth.

20. A new weekly lottery game (OKTX) developed together by the states of Texas and Oklahoma began two years ago. Officials are troubled, however, because many more major winners of the OKTX lottery have been residents of Texas than residents of Oklahoma. This is despite the fact that records show that the same percentage of individuals in both states buy OKTX lottery tickets regularly and spend the same amount of money on tickets when they play the lottery. Which of the following is the most reasonable conclusion from these findings?
   a. The discrepancy in number of winners is probably due to chance.
   b. Residents of Oklahoma are less willing to buy lottery tickets.
   c. Residents of both states have roughly equal chances of winning the lottery.
   d. The lottery is biased in favor of residents of Texas.
21. A major component of the rankings of American colleges and universities that appear annually are ratings of the reputation of those institutions by experts who work in the higher education field. You wonder about the degree to which those experts agree in their ratings of the individual institutions they evaluate. This kind of evidence addressing the adequacy of a measure is called what?

a. homogeneity.
b. internal validity.
c. external validity.
d. reliability.

22. A large county wanted to reduce traffic accidents on its roads. It installed speed cameras and signs indicating their presence at the five intersections that had the most accidents in the county the previous year. Records showed that over the year following camera and sign installation, there was a drop in the number of accidents at these intersections. Which of the following is not a plausible explanation of this outcome?

a. The sites were selected because they had high numbers of accidents one year and this by itself may account for a decline in accident rates.
b. The presence of speed cameras and signs may account for a decline in accident rates.
c. Changes from year to year (e.g., safer car designs, the aging of drivers, weather) may account for a decline in accident rates.
d. The fact that accident rates are subject to the law of diminishing returns may account for their decline.

23. A polling firm is hired to conduct a nationally representative survey in the United States to determine Americans’ likely preference in a political contest. If the firm uses random sampling procedures, approximately how many individuals are needed to yield reasonably sound findings (e.g., a margin of error of ± 4 percentage points). Again, the answer to this question does not require any calculations. You should have a sense of the approximate answer.

a. 100
b. 1,000
c. 10,000
d. 100,000
24. What is the approximate standard deviation of the following set of numbers? Reminder: you don’t need to calculate the standard deviation to answer this question. You should be able to answer on the basis of an estimate, and it should take you much less than a minute to do so.

\{21, 27, 33, 33, 35, 35, 37, 38, 40, 45\}

a. 2.0
b. 6.0
c. 12.0
d. 24.0

25. A new anti-depressant was tested in a large trial on people suffering from the disorder. In comparison to a placebo and to a widely prescribed anti-depressant, the new medication both proved more effective and less likely to cause serious side effects. On the basis of this evidence, the drug was approved for use. However, recent reports suggest the anti-depressant may be harming senior citizens. What key question would this raise about the initial trial?

a. Did it examine the results for men and women separately?
b. How long a time period did the study cover?
c. What was the placebo?
d. What were the demographics of the people included in the trial?