Consider the sample data 1, 5, 2, 4, 0, 3, 4.

1. The sample mean of this data is
   a) 4   b) 2   c) 14   d) 0   e) ??

2. The sample median for this dataset is
   a) 4   b) 1   c) 2   d) 0   e) none of these.

3. The sample standard deviation for this dataset is (approximately)
   a) 4.67   b) 1.00   c) 2.00   d) 2.16   e) none of these.

4. The $z$-score for the point $x = 3.5$ is (approximately)
   a) 0.00   b) 0.32   c) 0.69   d) 0.75   e) none of these.

5. Old Faithful, located in Yellowstone National Park, is the world’s most famous geyser;
   pose that the distribution of the "waiting times" between eruptions of the Old Faithful
   approximately bell-shaped with a mean of 79 minutes and a standard deviation of 14.5
   minutes. Approximately what percent of the waiting times between eruptions fall in
   the 50 to 108 minutes?

   (a) 68%
   (b) 81.5%
   (c) 19.5%
   (d) 95%
   (e) 2.5%

**Use the following information for equations 6 and 7.**

The next two questions refer to the following table of data collected from a survey of a
company’s employees concerning their feelings toward a proposed revision of their pension
plan:

<table>
<thead>
<tr>
<th>Decision</th>
<th>Blue-collar workers</th>
<th>White-collar workers</th>
<th>Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>For</td>
<td>67</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td>Against</td>
<td>63</td>
<td>18</td>
<td>9</td>
</tr>
</tbody>
</table>

6. If an employee is selected at random, the probability that the employee is blue-collar
   worker is
   a) $\frac{67}{130}$   b) .5   c) $\frac{110}{200}$   d) $\frac{130}{200}$   e) None of these.

7. If an employee is selected at random, the probability that the employee is a White-collar
   worker and is against the proposed revision is
   a) $\frac{18}{110}$   b) $\frac{32}{50}$   c) $\frac{32}{200}$   d) $\frac{50}{110}$   e) None of these.
Use the following information to answer questions 8-9.
Scores on the Standard-Binet Intelligence Test (IQ) are normally distributed with mean $\mu = 100$ and standard deviation $\sigma = 16$.

8. People with IQ scores above 132 are considered to be ”gifted”. What is the probability that a randomly selected individual is gifted?

(a) .1554  
(b) .0228  
(c) .3410  
(d) .9772  
(e) .4772

9. In order to qualify for membership in a certain organization, one must have an IQ at the 90% percentile. The minimum IQ score required for membership in this organization is closest to

(a) 118.5  
(b) 112.6  
(c) 133  
(d) 90  
(e) 120.48

This is for Questions 10-12.
The following table gives the probability distribution of a random variable $x$:

<table>
<thead>
<tr>
<th>$x$</th>
<th>-1</th>
<th>0</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$p(x)$</td>
<td>0.2</td>
<td>0.2</td>
<td>0.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

10. Find $P(0 \leq x < 3)$;
    a) 0.2  b) 0.7  c) 0.8  d) 1.0  e) none of these.

11. Find the mean of $x$.
    a) 1.1  b) 0.25  c) 1.3  d) 0.9  e) none of these.

12. Find the standard deviation of $x$.
    a) 1.89  b) 0.0  c) 1.37  d) 1.1  e) none of these.
Use the following to answer questions 13 and 14.
A pediatrician measured the heights of 20 randomly selected 6-year old girls. The average height for these 6-year old girls is $x = 44.85$ inches with a standard deviation $s = 3.39$.

13. A 90% confidence interval for $\mu$ is

(a) (43.84, 46.86)
(b) (43.54, 46.16)
(c) (43.36, 46.34)
(d) (43.60, 46.10)
(e) None of the above.

14. Which of the following would produce a narrower interval than the 90% confidence interval computed above?

(a) Measure the heights of a random sample of 50 6-year old girls.
(b) Measure the heights of a random sample of 10 6-year old girls.
(c) Compute a 95% confidence interval rather than a 90% confidence interval.
(d) Compute a 99% confidence interval rather than a 90% confidence interval.
(e) None of the above.

For Questions 15 and 16, let $z$ be the standard normal random variable.

15. Find $P(-2.12 \leq z \leq 1.56)$.

(a) 0.4830
(b) 0.9236
(c) 0.0424
(d) 0.4406
(e) None of these.

16. Find $P(z < -1.34)$.

(a) 0.0901
(b) 0.4099
(c) 0.9099
(d) 0.8198
(e) None of these.
Use the following information for questions 17 and 18.

According to published records in 2003, the national average salary for a registered nurse (RN) was $47,858. Suppose that the standard deviation of salary was $7,750. Let $\bar{x}$ denote the mean salary of a random sample of 100 RNs, selected nationally.

17. Find $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$.

(a) 4785, 775
(b) 47858, 775
(c) 47858, 7750
(d) 47858, 775
(e) 4785, 77.5

18. Find the probability that the mean salary for a random sample of 100 RNs is between $46,000 and $48,000.

(a) 0.4918
(b) 0.0714
(c) 0.5632
(d) 0.4204
(e) 0.4999

19. You are a travel agent and wish to estimate, with 95% confidence, the proportion of vacationers who use the internet to make reservations for lodging. Your estimate has to be accurate within 4% of the population proportion. The minimum sample size needed is closest to,

(a) 423
(b) 1
(c) 307
(d) 601
(e) 1037
20. A certain population follows a normal distribution with mean $\mu$ and a standard deviation $\sigma = 2.5$. Suppose that we draw a random sample of 50 observations and test, at $\alpha = 0.05$, $H_0 : \mu = 10$ vs $H_a : \mu > 10$. Which of the following is the correct rejection region?

(a) Reject $H_0$ if $z > 1.96$
(b) Reject $H_0$ if $z < 1.645$
(c) Reject $H_0$ if $z > 1.282$
(d) Reject $H_0$ if $z > 2.326$
(e) Reject $H_0$ if $z > 1.645$

Use the following information for questions 21, 22, and 23.

Suppose that we are interested in comparing the academic success of college students who belong to fraternal organizations with the academic success of those who do not belong to fraternal organizations. Cumulative GPA is used to measure academic success. Random samples of size 40 are taken from each population. The sample results are listed in the following table.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fraternity members</td>
<td>$n_1 = 40$</td>
<td>$X_1 \text{ bar} = 2.03$</td>
<td>$s_1 = 0.68$</td>
</tr>
<tr>
<td>Nonmembers</td>
<td>$n_2 = 40$</td>
<td>$X_2 \text{ bar} = 2.21$</td>
<td>$s_2 = 0.59$</td>
</tr>
</tbody>
</table>

At 0.05 significance level, test the claim that the GPAs of the two populations are different.

21. Choose the correct hypotheses to test the claim.

(a) $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \leq 0$
(b) $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \leq 0$
(c) $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \leq 0$
(d) $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \leq 0$
(e) $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \leq 0$. 
22. Find the value of the standardized test statistic.

(a) 2.32
(b) −0.32
(c) 1.85
(d) 1.26
(e) None of the above.
23. Find the $P$-value for the test.

(a) 0.3924  
(b) 0.0351  
(c) 0.6076  
(d) 0.1076  
(e) 0.0523

24. At the significance level of 0.05, which of the following is the correct conclusion?

(a) Accept $H_0$ since the $P$-value is less than 0.05  
(b) Fail to accept $H_0$ since the $P$-value is greater than 0.05  
(c) Accept $H_0$ since the $P$-value is greater than 0.05  
(d) Fail to accept $H_0$ since the $P$-value is less than 0.05  
(e) None of the above.
Use the following information for questions 25 and 26.
Many people sleep late on the weekends to make up for "short nights" during the workweek. The Better Sleep Council reports that more than 60% of us get about 8 hours of sleep per night on the weekend. A random sample of 350 adults found that 235 had about 8 hours of sleep each night last weekend.

25. Set up the null and alternative hypotheses to test the claim that more than 60% of us get about 8 hours of sleep per night during the weekend.

(a) Accept $H_0$ since the $P$-value is less than 0.05
(b) Fail to accept $H_0$ since the $P$-value is greater than 0.05
(c) Accept $H_0$ since the $P$-value is greater than 0.05
(d) Fail to accept $H_0$ since the $P$-value is less than 0.05
(e) None of the above.
26. Find the standard test statistic for this test.

(a) Accept $H_0$ since the $P$-value is less than 0.05
(b) Fail to accept $H_0$ since the $P$-value is greater than 0.05
(c) Accept $H_0$ since the $P$-value is greater than 0.05
(d) Fail to accept $H_0$ since the $P$-value is less than 0.05
(e) None of the above.
1. Medical researchers have noted that adolescent females are much more likely to deliver low-birth-weight babies than are adult females. Because low-birth-weight babies have higher mortality rates, a number of studies have examined the relationship between birth weight and mother’s age for babies born to young mothers. The following data on $x =$ material age (in years) and $y =$ birth weight of baby (in grams) summarizes the results of such a study.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>2289</td>
</tr>
<tr>
<td>17</td>
<td>3393</td>
</tr>
<tr>
<td>18</td>
<td>3271</td>
</tr>
<tr>
<td>15</td>
<td>2648</td>
</tr>
<tr>
<td>16</td>
<td>2897</td>
</tr>
<tr>
<td>19</td>
<td>3327</td>
</tr>
<tr>
<td>17</td>
<td>2970</td>
</tr>
<tr>
<td>16</td>
<td>2535</td>
</tr>
<tr>
<td>18</td>
<td>3138</td>
</tr>
<tr>
<td>19</td>
<td>3573</td>
</tr>
</tbody>
</table>

$N = 10$  \( \text{Sum } x = 170 \)  \( \text{Sum } y = 30041 \)  \( \text{Sum } x^2 = 2910 \)  \( \text{Sum } y^2 = 91785351 \)
2. Ten randomly selected college students, who participated in a learning community, were given self-esteem surveys before and after participating in a learning community. A learning community is a group of students who take one or more courses together. Typically, each learning community has an academic theme and is intended to integrate academic learning and community living. The scores on the surveys are as follows:

<table>
<thead>
<tr>
<th>Student</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-score</td>
<td>18</td>
<td>14</td>
<td>11</td>
<td>23</td>
<td>19</td>
<td>21</td>
<td>21</td>
<td>21</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Post-score</td>
<td>17</td>
<td>17</td>
<td>10</td>
<td>25</td>
<td>20</td>
<td>19</td>
<td>24</td>
<td>22</td>
<td>10</td>
<td>24</td>
</tr>
</tbody>
</table>

\[ \mu_d = \text{post-score} - \text{pre-score} \]

(a) Do the data provide sufficient evidence to conclude that self-esteem scores were higher after participating in a learning community?

(b) Set up a 90% confidence interval for the difference in a self-esteem scores for before and after participating in a learning community.
3. In a random sample of 49 individuals are selected, the probability that the sample mean is less than 96 is closest to

(a) .5990
(b) .4599
(c) .25
(d) .401
(e) .5901