1. The following table lists the weekly revenues of a small business.

<table>
<thead>
<tr>
<th>week</th>
<th>revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2,118</td>
</tr>
<tr>
<td>2</td>
<td>$2,345</td>
</tr>
<tr>
<td>3</td>
<td>$2,861</td>
</tr>
<tr>
<td>4</td>
<td>$3,101</td>
</tr>
<tr>
<td>5</td>
<td>$3,004</td>
</tr>
<tr>
<td>6</td>
<td>$3,207</td>
</tr>
</tbody>
</table>

In which week did the business experience the greatest increase in revenue, as compared to the previous week?

(a) 2  (d) 5  
(b) 3  (e) 6  
(c) 4

2. James has taken 4 tests in his chemistry class. His mean over these tests is 78, and he remembers that three of his scores were 71, 76 and 78. What was his third score?

(a) 71  (d) 78  
(b) 75  (e) 87  
(c) 76
3. What is the median of the following set of numbers?

{8, 2, 23, 7, 14, 23, 19, 22, 20, 5}

(a) 14  
(b) 14.3  
(c) 16.5  
(d) 20.5  
(e) 23

THE NEXT TWO (2) QUESTIONS concern the following frequency distribution of weights (in pounds) of packages shipped by the LoCal Company.

<table>
<thead>
<tr>
<th>weight</th>
<th>quantity shipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

4. What is the mean weight of the packages they shipped?

(a) 3.0  
(b) 3.50  
(c) 3.56  
(d) 4.0  
(e) 19.0

5. What is the median weight of the packages they shipped?

(a) 3.0  
(b) 3.50  
(c) 3.56  
(d) 4.0  
(e) 19.0

6. Which of the following statements concerning measures of central tendency (averages) and measures of dispersion is FALSE?

(a) The standard deviation is commonly used for a measure of dispersion when the mean is considered.

(b) The quartile deviation is the measure of dispersion often used with the median.

(c) The mean is the most useful average for data sets with many extreme values.

(d) A data set may have more than one mode.

(e) A standard deviation of 0 for a data set means that all the numbers in the data set are the same.
7. A data set has 23 elements and a mean of 17. If the numbers 19, 30 and 31 are added to the set, then which of the following can you be absolutely sure is true?

(a) The new data set will have 23 elements.
(b) The mode will increase.
(c) The median will increase.
(d) The mean will increase.
(e) The standard deviation will increase.

8. Data has been gathered for a component of a complex manufacturing system. The manufacturer states that the probability of an electrical component failing in the first five years of operation is 0.12, and the probability of a mechanical component failing is 0.31. The probability that an electrical component or a mechanical component will fail in the first five years is 0.28. What is the probability that both an electrical component and a mechanical component fail in the first five years?

(a) 0.03 (d) 0.43
(b) 0.15 (e) 0.9
(c) 0.29

9. What is the probability of an event that NEVER happens?

(a) 0 (d) 1
(b) 0.2 (e) \( \frac{5}{4} \)
(c) \( \frac{2}{3} \)

10. What is the probability of rolling two standard dice and getting a total of 6 on the upward faces, but not having double 3 showing?

(a) 0.028 (d) 0.167
(b) 0.111 (e) 0.545
(c) 0.139

11. Which of the following is not a probability?

(a) 0 (d) 1
(b) \( \frac{1}{3} \) (e) 1.23
(c) 0.61

12. Donna received 6 bills from creditors, 2 checks for payments for services and 3 advertisements in the mail. The mail was randomly sorted. What is the probability that the top two envelopes in her stack of mail contained checks?

(a) 0.017 (d) 0.031
(b) 0.018 (e) 1
(c) 0.025
13. A researcher is investigating the population of trapdoor spiders on a 4 acre plot. The first time she and her crew go to the plot they capture and tag 264 spiders, they then release them. About a month later they return to the plot and capture 370 spiders. Of these 370 spiders, 133 were spiders that had been tagged on the previous visit. What should the researcher’s estimate of the trapdoor spiders population be?

(a) 186  
(b) 501  
(c) 734  
(d) 62,568  
(e) 97,680

14. Tracy wanted to do a survey of the best athletes in the city schools, so she wrote to the coach at each school and asked them to recommend students. She then mailed her survey to each of the students that had been recommended. Tracy’s sample is a:

(a) a judgement sample.  
(b) a random sample.  
(c) a stratified random sample.  
(d) a census.  
(e) a count-recount.

15. The volume of oil packaged in Elaine’s Essential oil of Herbs is normally distributed with a mean of 10 ml and a standard deviation of 0.4 ml. What percentage of the packages will contain more than 10.6 ml of oil?

(a) 6.7%  
(b) 15.5%  
(c) 22.6%  
(d) 27.4%  
(e) 43.3%

16. Which of the following is not a characteristic or feature of a normally distributed set?

(a) The mean, median and mode are all the same.  
(b) The shape of the normally distributed set is sometimes called a bell curve.  
(c) About 99% of the data is within 3 standard deviations of the mean.  
(d) More than half the data is more than 1 standard deviation away from the mean.  
(e) Many naturally occurring measurements, such as the weight of a variety of Gala apples, are normally distributed.
17. What is the logical negation of the statement *all children play and some families have pets*?

(a) All children do not play and some families do not have pets.
(b) All children do not play or some families do not have pets.
(c) Some children play or all families have pets.
(d) Some children do not play or all families do not have pets.
(e) Some children do not play and all families do not have pets.

18. Which of the following is the negation of

Some children are not well behaved.

(a) If you are a child, then you are well behaved.
(b) If you do not behave well, then you are not a child.
(c) Some children are not well behaved.
(d) All children are well behaved.
(e) No child is well behaved.

19. If the logical statement *today is a holiday* is a true statement, and the statement *Dave has the day off from work* is false, then which of the following compound logical statements is FALSE?

(a) Today is a holiday or Dave has the day off from work.
(b) Today is a holiday and Dave does not have the day off from work.
(c) If today is a holiday, then Dave does not have the day off from work.
(d) If today is a holiday, then Dave has the day off from work.
(e) If Dave has the day off from work, then today is a holiday.

20. What is the negation of the following implication - *if Dana gets 160 points on her final then she will get an A in COMS*?

(a) If Dana does not get 160 points on her final then she will not get an A in COMS.
(b) If Dana did not get an A in COMS, then she did not get 160 points on her final.
(c) Dana gets 160 points on her final and gets an A in COMS.
(d) Dana does not get 160 points on her final and gets an A in COMS.
(e) Dana gets 160 points on her final and does not get an A in COMS.
21. Form a conclusion using all of the following logical statements.

If Bob’s car does not start then his battery is dead.
If Bob’s car starts, then he will make it to work on time.
Bob’s battery is not dead.

(a) Bob’s car does not start.
(b) Bob’s battery is not dead.
(c) Bob’s car starts.
(d) Bob makes it to work on time.
(e) Bob does not make it to work on time.

22. If you start with the premise

If Dave passes CHEM, then he will graduate.
Dave did not graduate.

and reach the conclusion Dave did not pass CHEM, then what type of reasoning was used?

(a) inductive reasoning
(b) direct reasoning
(c) indirect reasoning
(d) transitivity
(e) probabilistic thinking

23. A survey of 280 movie goers found that 171 saw Alexander and and 183 saw Christmas with the Kranks. What is the best you say about how many saw both?

(a) 12
(b) 74
(c) between 0 and 171, inclusive.
(d) between 74 and 171, inclusive.
(e) between 171 and 183, inclusive.

24. There are 47 people in the Rod and Gun Club. All of them own a fishing rod or a shotgun. If 37 own a fishing rod and 19 own shotguns, then how many own both?

(a) 9
(b) 19
(c) 37
(d) between 9 and 19
(e) between 0 and 9
25. A researcher is studying a very large population of a species of rodents and has found from sample data that the females had a mean weight of 138 gms, with a standard deviation of 6 gms. If her sample size was 100, then what is the estimator of the standard deviation of the sampling distribution that she should use?

(a) 0.06  (d) 6
(b) 0.6    (e) 6.03
(c) 0.603

26. A distribution of grades for a class is as follows:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td>18</td>
<td>22</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>D</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

If the null hypothesis is that there is no difference in the distribution of grades based on class standing, then what is the expected number of Soph. who would receive a grade of B?

(a) 0.18  (d) 1.61
(b) 2.46  (e) 9.31
(c) 0.27

27. The expected and observed distributions for answers to a questionnaire are below.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Expected</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>18</td>
<td>Yes</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>12</td>
<td>No</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

What is the \( \chi^2 \) statistic for this problem?

(a) 0  (d) 1
(b) 0.33  (e) 1.2
(c) 0.4
28. A report states that the mean annual health care cost for an extremely large group of 25 year old people is in the range $1,930 to $2,120 and that there is a 95% chance that these figures are correct. Which of the following statements is FALSE?

(a) The actual mean health care costs for this group may not be in this interval.
(b) This type of statistic is called a confidence interval.
(c) There is a 95% chance that a particular member of the group will have health care costs in that range.
(d) The actual mean health care cost for this group of people is called a parameter in statistical language.
(e) This information was probably obtained from a sample of the population of the study.

29. Consider the polynomial \( P(x) = x^4 - 2x - 2 \). Which of the following can you be **CERTAIN** is TRUE?

(a) \( P(x) \) has an integer root.
(b) \( P(x) \) has a root between 0 and +1.
(c) \( P(x) \) has a root between +1 and +2.
(d) \( P(x) \) has a root between +2 and +3.
(e) \( P(x) \) is a quadratic.

30. For a line with equation \( y = mx + b \), which of the following is FALSE?

(a) The line passes through the point \((0, b)\).
(b) If \( m = 0 \) then the line is horizontal.
(c) If \( m > 0 \) then the graph of the line goes *uphill* left to right as you graph it.
(d) If \( m \neq 0 \) then the line will not cross the \( x \)-axis.
(e) If \( x \) is changed by +1 then \( y \) will change by \( m \).

31. What is the \( y \) coordinate of the point of intersection of the two lines \( y = 2x + 3 \) and \( y = x - 4 \)?

(a) -7    (d) 11
(b) -11   (e) they don’t cross
(c) 7
32. Which of the following is NOT a corner of the region defined by the following system of inequalities?

\[
\begin{align*}
2x + y &\leq 6 \\
x + y &\leq 4 \\
x &\geq 1 \\
y &\geq 0
\end{align*}
\]

(a) (1,0)  
(b) (1,3)  
(c) (1,4)  
(d) (2,2)  
(e) (3,0)

33. If a region is enclosed by four lines which intersect at the corners (2,2), (2,12), (8,11), (14,2), then what is the minimum of \( C=3x-y \) on this region?

(a) -6  
(b) 4  
(c) 13  
(d) 31  
(e) No Minimum

34. Nora’s bakery has just sent out 178 pies. Her cherry pies weigh 1.1 pounds apiece and her apple pies weigh 1.2 pounds apiece. Her shipment weighed 205.7 pounds. If we denote the number of cherry pies by \( x \) and the number of apple pies by \( y \), then which of the systems below can we use to find the number of pies of each type?

(a) \[
\begin{align*}
x + y &= 178 \\
x + y &= 205.7
\end{align*}
\]

(b) \[
\begin{align*}
x + y &= 178 \\
1.1x + 1.2y &= 205.7
\end{align*}
\]

(c) \[
\begin{align*}
1.1x + 1.2y &= 178 \\
x + y &= 205.7
\end{align*}
\]

(d) \[
\begin{align*}
y &= 178 - x \\
x &= 205.7 - y
\end{align*}
\]

(e) \[
\begin{align*}
1.2x + 1.1y &= 205.7 \\
x + y &= 178
\end{align*}
\]

35. A rectangular window in a store is 8 feet high and 15.4 feet long. What is the diagonal measurement of the window?

(a) 7.4 feet.  
(b) 11.7 feet.  
(c) 17.4 feet.  
(d) 23.4 feet.  
(e) 547.5 feet.
36. A picture measures 8 by 10 inches and it is to be framed with a matt that has a constant width of \( x \) inches on all 4 sides, and is to have a total area of 120 square inches when framed. This unknown width \( x \) is a positive root of which of the following equations?

(a) \( x^2 + 18x + 200 = 0 \)  
(b) \( x^2 + 18x - 40 = 0 \)  
(c) \( 4x^2 + 36x + 200 = 0 \)  
(d) \( 4x^2 + 36x - 40 = 0 \)  
(e) \( 2x + 18 - 120 = 0 \)

37. David’s credit card has an interest rate of 19.8% APR, that is compounded monthly. What is the Annual Percentage Yield (APY) for this credit card agreement?

(a) 3.3%  
(b) 19.8%  
(c) 21.7%  
(d) 32.7%  
(e) 39.2%

38. Which of the following general statements about loans with constant monthly payments is \textbf{FALSE}?

(a) The greater the term for a particular loan, the greater the total cost (sum of all payments) of the loan.
(b) The greater the interest rate, the greater the payment is.
(c) The total payments on 30 year house loan may be more than twice the original cost of the house.
(d) If you double the principal of a loan, then the payments will double.
(e) If you double the interest rate, then the payments will double.

39. If Shayla takes out a $9000 loan, at 9.25 % interest, for a term of four years, then how much is her monthly payment?

(a) $69.38  
(b) $187.50  
(c) $204.84  
(d) $225.04  
(e) $267.11

40. At present long term savings rates are about 3% per year. At this rate, with monthly compounding, how much do you need to save per month if you wish to have a balance of $500,000 after 40 years?

(a) $0.01  
(b) $589.93  
(c) $570.71  
(d) $1041.67  
(e) $1075.59
1. Chi-square distribution table:

<table>
<thead>
<tr>
<th>d</th>
<th>.05</th>
<th>.025</th>
<th>.01</th>
<th>.005</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.84</td>
<td>5.02</td>
<td>6.63</td>
<td>7.87</td>
</tr>
<tr>
<td>2</td>
<td>5.99</td>
<td>7.38</td>
<td>9.21</td>
<td>10.60</td>
</tr>
<tr>
<td>3</td>
<td>7.82</td>
<td>9.35</td>
<td>11.34</td>
<td>12.84</td>
</tr>
<tr>
<td>4</td>
<td>9.49</td>
<td>11.14</td>
<td>13.28</td>
<td>14.86</td>
</tr>
</tbody>
</table>

2. Normal curve percentages:

| z  | P  | | z  | P  | | z  | P  |
|----|----| |----|----| |----|----|
| .0 | 0.0| | .1 | 4.0| | .2 | 15.5|
| .1 | 1.0| | .2 | 1.2| | .3 | 1.3| |
| .2 | 1.1| | .3 | 1.3| | .4 | 1.4| |
| .3 | 1.3| | .4 | 1.4| | .5 | 1.5| |
| .4 | 1.4| | .5 | 1.5| | .6 | 1.6| |
| .5 | 1.7| | .6 | 1.7| | .7 | 1.8| |
| .6 | 1.8| | .7 | 1.9| | .8 | 1.9| |
| .7 | 1.9| | .8 | 2.0| | .9 | 2.0| |

3. Chi-square formula:

\[ \chi^2 = \frac{(E_1 - F_1)^2}{E_1} + \frac{(E_2 - F_2)^2}{E_2} + \cdots + \frac{(E_n - F_n)^2}{E_n}. \]

4. Monthly payment formula: \[ M = \frac{P(1 + \frac{i}{12})^N}{(1 + \frac{i}{12})^N - 1} \]

Monthly Savings Formula: \[ D = \frac{12}{i} \left[ \left(1 + \frac{i}{12}\right)^k - 1 \right] M \]