Student Name: _____

**1** Compute the sample mean $\overline{X}_.$ for the following 5 numbers: 1, 4, 2, 3, 4
   (a) 2.8
   (b) 3.00
   (c) 2.24
   (d) 1.4
   (e) None of the above are correct

**2** Compute the sample variance $S^2$ for the following 5 numbers: 3, 4, 2, 4, 5
   (a) 1.04
   (b) 1.5
   (c) 1.3
   (d) 1.10
   (e) None of the above answers are correct

**3** Suppose you have 10 numbers and have computed the mean to be 6.0. You then discover that the last number in the data was entered incorrectly. It was entered as 9.0 when it should have been 8.0. If you replace the incorrect value (9.0) with the correct one (8.0), and recompute the mean, you will obtain a new mean of
   (a) 6.9
   (b) 4.9
   (c) It is impossible to determine
   (d) 5.9

**4** Suppose two different scores, each with a minimum of zero and a maximum possible value of 25, are summed to produce a "total raw admission score" that is used to determine university admissions. Suppose that score $A$ has a mean of $\mu_1$ and a standard deviation of $\sigma$, and score $B$ has a mean of $\mu_2$ and a standard deviation of $2\sigma$. Joseph has a $Z$-score of $+1$ on Score $A$ and a $Z$-score of $-1$ on Score $B$, while Marilyn has a $Z$-score of $-1$ on Score $A$ and a $Z$-score of $+1$ on Score $B$. Which student will have the higher total raw admission score?

  (a) Joseph

  (b) Both will have the same mark.

  (c) Marilyn


**5** You have 4 numbers, $a, b, c, d$. If you multiply them all by 4, the mean of the resulting data set will be

  (a) $16(a + b + c + d)$

  (b) $4(a + b + c + d)$

  (c) $a + b + c + d$

  (d) $(a + b + c + d)/4$


**6** You have 10 numbers with a sample mean of $9.0$ and a sample variance of $11.0$. You discover that the last number in the list was recorded as $10.0$ when it should have been recorded as $14.0$. If you correct your error and correctly recompute the sample variance, what value will you obtain?

  (a) $11.0$

  (b) $14.988$

  (c) $13.489$

  (d) $12.14$

  (e) None of the above answers are correct

**7** Consider the following data array

5  3  1  2

5  9  9  8

5  7  15  2

4  7  6  1

Compute

$$\sum_{i=2}^{4}\sum_{j=1}^{3} X_{i,j}$$

(a) 59
(b) 72
(c) 66
(d) 67
(e) None of the above.


**8** You have a sample of $N$ observations, and you transform them to $Z$-scores. Assuming the original scores are not all equal, the quantity
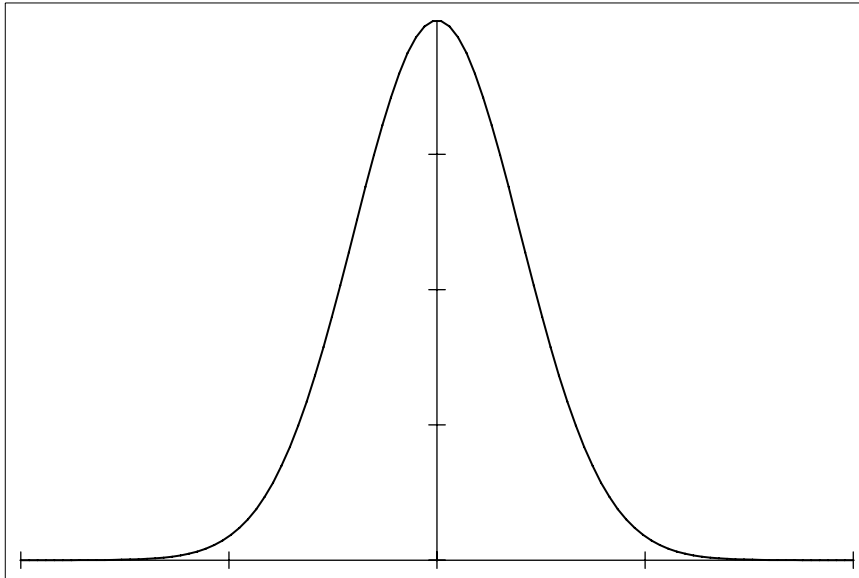
$$\sum_{i=1}^{N} Z_i^2$$

will always be equal to
(a) $N-1$
(b) 0
(c) 1
(d) $N$
(e) Cannot be determined from the information given


**9** You have the following set of data: 1,5,3,7,8 Find the median
(a) 5
(b) 4
(c) 7
(d) 3

**10** Which of the following is *not* true of the median

   (a)  Multiplying all values by 5 multiplies the median by 5.

   (b)  The value for combined groups cannot be determined from the sample sizes and group values of the individual groups

   (c)  It is sensitive to outliers

   (d)  It is the middle value in a distribution

**11** Widgets are weighed on a scale that is accurate to the nearest 100 grams. A group of 50 widgets is weighed.The heaviest widget is recorded as 9000 grams, the lightest at 4000 grams. The inclusive range is the difference between the upper real limit and lower real limit for the data. What is the inclusive range for these data?

   (a)  5100

   (b)  5001

   (c)  5200

   (d)  5050

**12** You have a set of data that have a mean of 58 and a standard deviation of 12. You wish them to have a mean of 67 and a standard deviation of 11, while retaining the shape of the present distribution. What values of $a$ and $b$ in the linear transformation formula $Y = aX + b$ will produce a new set of data with the desired mean and standard deviation?

   (a)  $a = 0.91667, b = 13.833$

   (b)  $a = 1.8333, b = 13.833$

   (c)  $a = 1.0909, b = 12.833$

   (d)  $a = 0.91667, b = 27.667$

   (e)  $a = 1.9167, b = -13.833$

**13** Suppose you have *evenly spaced* numbers, and the distance between adjacent numbers is $k$. It is well known that, if $N = 3$, the sample mean of the 3 numbers is the middle value and their sample *variance* is $k^2$. Suppose $N = 5$.

Find an expression for the sample *variance* of the 5 numbers.

   (a)  $5k^2$

   (b)  $2k^2$

   (c)  $k^2$

   (d)  $2.5k^2$

   (e)  None of the above answers are correct

**14** The probability distribution shown below is



(a) Symmetric and Bimodal
(b) Positively Skewed
(c) None of the above answers are correct
(d) Negatively Skewed
(e) Symmetric and Unimodal

**15** For the following data array, compute $\overline{X}_{\bullet3}$

$$
\begin{array}{cccc}
5 & 4 & 1 & 2 \\
5 & 3 & 4 & 9 \\
5 & 2 & 20 & 1 \\
4 & 4 & 8 & 2
\end{array}
$$

(a) 11.0
(b) 7.25
(c) 6.1875
(d) 8.25

**16** For the following data, compute $X_{..}$

$$
\begin{array}{cccc}
7 & 7 & 1 & 2 \\
7 & 3 & 7 & 14 \\
5 & 2 & 49 & 0 \\
4 & 4 & 14 & 5
\end{array}
$$

(a) 32. 75
(b) 8. 1875
(c) 131
(d) 130
(e) 129

**17** For the following frequency distribution of number of children for psychology faculty members at a major Eastern institution

| X | f |
|---|---|
| 3 | 3 |
| 2 | 6 |
| 1 | 3 |
| 0 | 8 |

Compute the sample mean
(a) 4. 8
(b) 1. 2
(c) 1.0
(d) 2. 2

**18** Group A is composed of a sample of 10 observations, and has a sample mean of 3 and a sample variance of 30. Group B is composed of a sample of 10 observations, and has a sample mean of 5 and a sample variance of 10. If A and B are combined to form one large group, what will be the variance of this combined group?
(a) 27. 11
(b) 24.0
(c) 20.0
(d) 4. 4721
(e) None of the above answers are correct

**19** Which of the following is *not* true?

   (a) $P_{50} = (P_{75} + P_{25})/2$

   (b) $P_{50} = Q_2$

   (c) The 3rd decile is equal to $P_{30}$

   (d) $P_{50} = Median$


**20** Jamal took an exam where the class mean was $\overline{X}. = 76$ and the class standard deviation was $S = 10$. What $Z$-score must Jamal exceed to have a grade that exceeds 75?

   (a) $-0.31623$

   (b) $0.4$

   (c) $-0.1$

   (d) $-0.2$

   (e) None of the above answers are correct.


**21** In the frequency distribution below, what is the *cumulative relative frequency* of the value $X = 1$?

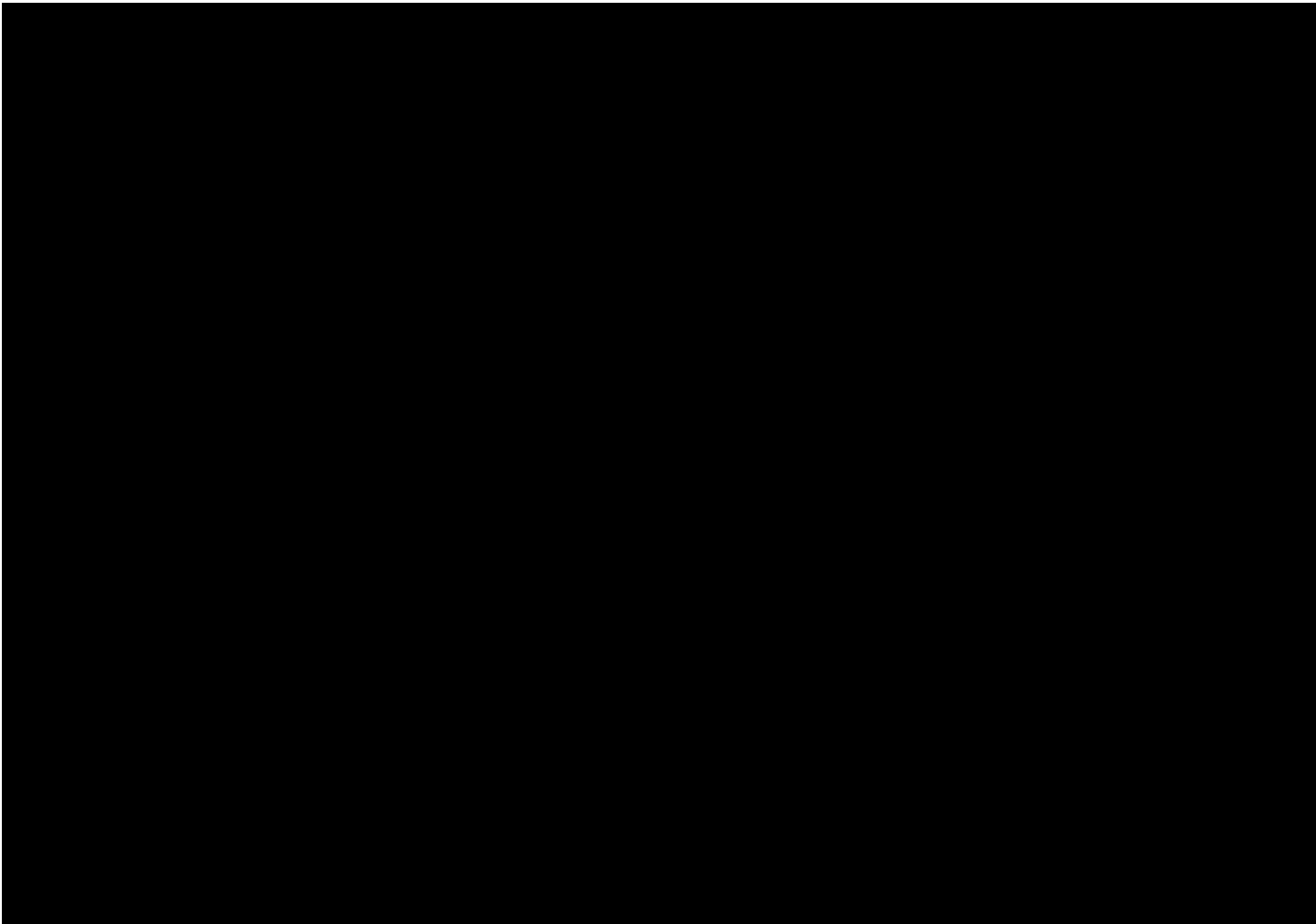| X | f |
|---|---|
| 3 | 7 |
| 2 | 7 |
| 1 | 7 |
| 0 | 4 |

   (a) $0.72$

   (b) $0.83$

   (c) $0.44$

   (d) $0.16$

   (e) None of the above answers are correct


**22** In a normal distribution with a mean of 60 and a standard deviation of 20, which of the following scores is at the 10th percentile?

   (a) $34.369$

   (b) $44.369$

   (c) $43.855$

   (d) $32.307$

   (e) None of the above answers are correct

**23** IQ scores have a distribution that is approximately normal in shape, with a mean of 100 and a standard deviation of 15. What percentage of scores is at or above an IQ of 116?

(a) 12. 464

(b) 14. 306

(c) 15. 737

(d) 16. 355

(e) None of the above answers are correct

**24** Group A has a mean of 0 and a standard deviation of 1. Group B has a mean of 0 and a standard deviation of 1. 11.

The populations have a normal distribution. Consider the proportion of scores at or above 3.0 in Group B, and the proportion of scores at or above 3.0 for Group A? What is the ratio of these proportions?

(a) 1. 273 8

(b) 3. 566 5

(c) 2. 547 5

(d) 3. 057

**25** You have a set of 11 numbers with a mean of 18. If you add an additional number to the original group, and that new number has a value of 23, what will be the mean of the new set of 12 numbers?

(a) 20. 258

(b) 22. 1

(c) 12. 892

(d) 18. 417

(e) None of the above answers are correct.

**28** IQ scores have a distribution that is approximately normal in shape, with a mean of 100 and a standard deviation of 15 in the general population. Assuming a normal distribution is a good approximations, what proportion of the general population has IQ scores betweeen $81.0$ and $107.0$?

(a)  $0.67699$

(b)  $0.57699$

(c)  $0.63469$

(d)  $0.47699$

(e)  None of the above answers are correct

**29** Fred took an exam and got a $Z$-score of $1.76$. For which of the following exam metrics will Fred get the highest raw score?

(a)  Mean $= 75.2$, Standard Deviation $= 11.3$

(b)  Mean $= 79.9$, Standard Deviation $= 10.1$

(c)  Mean $= 70.3$, Standard Deviation $= 11.0$

**30** You have 10 numbers with a mean of 11.0. You first add 5.0 to all the numbers, *then* divide them all by 3.0. What will the mean of the numbers be when you are finished?

   (a) 5.4333

   (b) 5.3333

   (c) 8.6667

   (d) 5.2333

   (e) None of the above answers are correct


**31** When we compare the stem-leaf diagram with a standard frequency histogram plot, we see:

   (a) The stem-leaf diagram allows one to recover accurate estimates of summary statistics like the mean and variance more easily.

   (b) The stem-leaf diagram does not allow one to see the basic shape of the distribution.

   (c) The frequency histogram is easier to construct with a typewriter

   (d) The stem-leaf diagram throws away information about the individual numbers, while the frequency histogram does not.


**32** Four distributions of 25 numbers have the identical shape, except that the X distribution has a mean of 100 and a standard deviation of 15, while the Y distribution has a mean of 20 and a standard deviation of 10, the W distribution a mean of 50, and a standard deviation of 20, and the K distribution a mean of 500 and a standard deviation of 100. Which of the following scores has the highest percentile rank in its respective distribution?

   (a) A score of 70 in the W distribution.

   (b) A score of 30 in the Y distribution.

   (c) A score of 650 in the K distribution.

   (d) A score of 119.5 in the X distribution.


**33** After the first statistics exam, the professor posts the grades, and you compute your *Z*-score. It is +1.4. A day later, the professor announces that he forgot to scale the grades, and that he is linearly rescaling the grades so that the mean changes from 60 to 78, and the standard deviation changes from 10 to 12. What will your *Z*-score become?

   (a) 1.6

   (b) 1.4

   (c) 1.2

   (d) 1.0

   (e) It is impossible to determine from the information given

**35** Compute the correlation coefficient for the following data:

1  4

2  5

4  4

5  3

2  6

(a) $-0.53403$

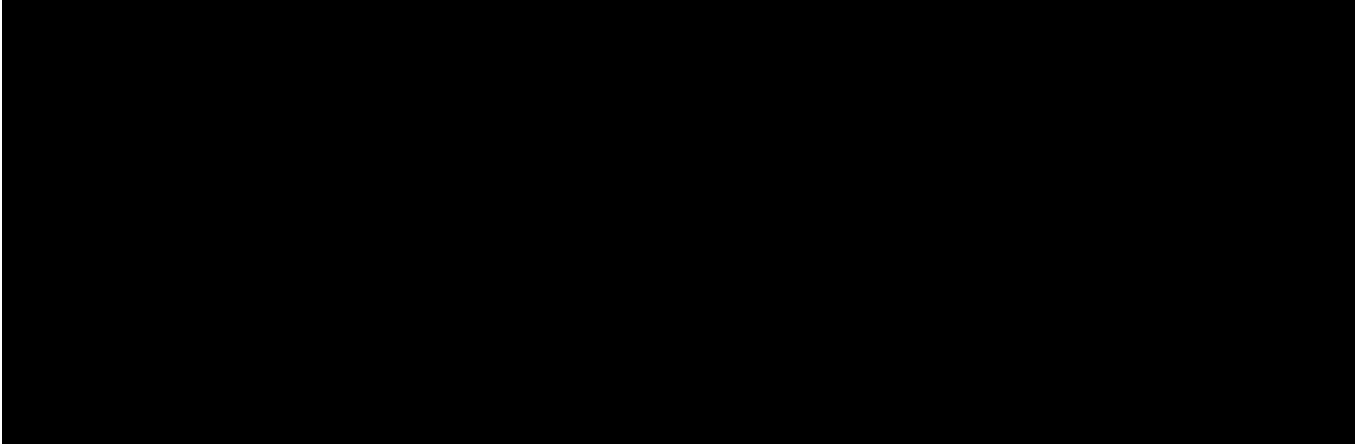(b) $-.1268$

(c) 0

(d) $-0.61382$

(e) $-.4329$

**36** $X$ has a variance of 40. $Y$ has a variance of 40. $X$ and $Y$ have a covariance of 21. 6. Find the variance of $X - Y$.

(a) 77. 28

(b) 36. 8

(c) 33. 12

(d) 123. 2

**37** Given three *uncorrelated* variables X, Y, and Z, all with means of 15 and variances of 100. Consider the linear combination $W = 7X + 11Y + 9Z$. What would be its mean?

(a) 405

(b) $\frac{19683}{50}$

(c) 2700

(d) 810

(e) None of the above answers are correct

**38** Given three *uncorrelated* variables X, Y, and Z, all with means of 15 and variances of 100. Consider the linear combination $W = 8X + 12Y - 10Z$. What would be its variance?

(a) 30 799

(b) 30 805

(c) 30 800

(d) 30 792

(e) None of the above.


**39** $X$ has a variance of 40. $Y$ has a variance of 54. $X$ and $Y$ have a covariance of 21. 379. Find the correlation $r_{Y,X}$.

(a) 0.46

(b) 0.414

(c) 9. 8976 × 10$^{-3}$

(d) 0.506


**40** Suppose that you computed the covariance and the variances for 2 variables with $N$ in the denominator of each of the 3 formulas, instead of $N - 1$, and you computed the correlation coefficient with these "new" definitions of sample variance and covariance. What effect would that have on the value of a positive correlation coefficient?

(a) It would make it lower

(b) It would stay the same

(c) It is impossible to say

(d) It would make it higher

**44** Suppose $W = bX + a$, where $b = s_{Y,X}$, the covariance between $Y$ and $X$, and $a$ is an unknown constant. In that case, what is the covariance of $W$ and $Y$?

(a) $s_{X,Y}^2$

(b) $2s_{Y,X}^2$

(c) $s_{Y,X}^2 + ba$

(d) The answer cannot be determined from the information provided.

**45** Which of the following expressions is a correct formula for the variance of $W$ when $W$ is obtained from $X$ and $Y$ from the formula $W = 4X + 3Y$?

(a) $s_W^2 = 4s_X^2 + s_Y^2 + 14s_{X,Y}$

(b) $s_W^2 = 16s_X^2 + 9s_Y^2 + 24s_{X,Y}$

(c) $s_W^2 = 4s_X^2 + 9s_Y^2$

(d) $s_W^2 = 2s_X^2 + 9s_Y^2 + 12s_{X,Y}$