

Chapter 2—Basic Mathematical and Measurement Concepts

MULTIPLE CHOICE

1. Given the following subjects and scores, which symbol would be used to represent the score of 3?

Subject	1	2	3	4	5
Score	12	21	8	3	30

- a. X_8
- b. X_4
- c. X_3
- d. X_2

ANS: B PTS: 1 MSC: WWW

2. We have collected the following data:

$$X_1 = 6, X_2 = 2, X_3 = 4, X_4 = 1, X_5 = 3$$

For these data, $\sum_{i=1}^{N-1} X_i$ is equal to ____.

- a. 16
- b. 10
- c. 7
- d. 13

ANS: D PTS: 1 MSC: WWW

3. Reaction time in seconds is an example of a(n) ____ scale.

- a. ratio
- b. ordinal
- c. interval
- d. nominal

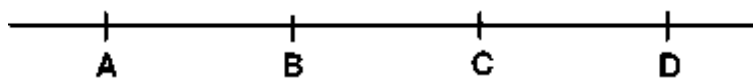
ANS: A PTS: 1

4. After performing several clever calculations on your calculator, the display shows the answer 53.655001. What is the appropriate value rounded to two decimal places?

- a. 53.65
- b. 53.66
- c. 53.64
- d. 53.60

ANS: B PTS: 1

5. Consider the following points on a scale:



If the scale upon which A, B, C, and D are arranged is a nominal scale, we can say ____.

- a. $B = 2A$
- b. $B - A = D - C$
- c. both a and b
- d. neither a nor b

ANS: D PTS: 1

6. When rounded to two decimal places, the number 3.175000 becomes ____.
- a. 3.17
 - b. 3.20
 - c. 3.18
 - d. 3.10

ANS: C PTS: 1 MSC: WWW

Exhibit 2-1

Given the following data:

$X_1 = 1, X_2 = 4, X_3 = 5, X_4 = 8, X_5 = 10$

7. Refer to Exhibit 2-1. Evaluate ΣX .
- a. 1
 - b. 18
 - c. 27
 - d. 28

ANS: D PTS: 1

8. Refer to Exhibit 2-1. Evaluate ΣX^2 .
- a. 56
 - b. 784
 - c. 206
 - d. 28

ANS: C PTS: 1

9. Refer to Exhibit 2-1. Evaluate $(\Sigma X)^2$.
- a. 56
 - b. 784
 - c. 206
 - d. 28

ANS: B PTS: 1

10. Refer to Exhibit 2-1. Evaluate $\sum_{i=2}^4 X_i$.

- a. 17
- b. 27
- c. 28
- d. 23

ANS: A PTS: 1

11. Refer to Exhibit 2-1. Evaluate $\sum_{i=2}^N X_i + 5$.
- a. 53
 - b. 47
 - c. 48
 - d. 32

ANS: D PTS: 1

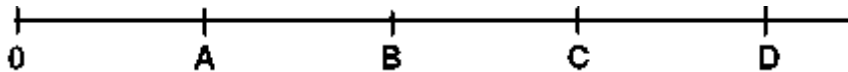
12. Refer to Exhibit 2-1. Evaluate $\sum_{i=2}^N (X_i + 5)$.
- a. 47
 - b. 53
 - c. 48
 - d. 32

ANS: A PTS: 1

13. A discrete scale of measurement ____.
- a. is the same as a continuous scale
 - b. provides exact measurements
 - c. necessarily uses whole numbers
 - d. b and c

ANS: B PTS: 1

14. Consider the following points on a scale:



If the scale upon which A , B , C , and D are arranged is an interval scale, we can say ____.

- a. $B = 2A$
 - b. $B - A = D - C$
 - c. both a and b
 - d. neither a nor b
15. The number 83.476499 rounded to three decimal places is ____.
- a. 83.477
 - b. 83.480
 - c. 83.476
 - d. 83.470

ANS: B PTS: 1 MSC: WWW

ANS: C PTS: 1

16. The number 99.44650 rounded to two decimal places is ____.
- a. 99.45
 - b. 99.46
 - c. 99.44
 - d. 99.40

ANS: A PTS: 1

17. "Brand of soft drink" is measured on a(n) ____.
- a. nominal scale
 - b. ordinal scale
 - c. interval scale
 - d. ratio scale

ANS: A PTS: 1

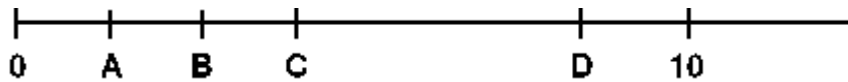
18. At the annual sailing regatta, prizes are awarded for 1st, 2nd, 3rd, 4th, and 5th place. These "places" comprise a(n) ____.
- a. nominal scale
 - b. ordinal scale
 - c. interval scale
 - d. ratio scale

ANS: B PTS: 1

19. Which of the following numbers is rounded incorrectly to two decimal places?
- a. $10.47634 \rightarrow 10.48$
 - b. $15.36485 \rightarrow 15.36$
 - c. $21.47500 \rightarrow 21.47$
 - d. $8.24501 \rightarrow 8.25$
 - e. $6.66500 \rightarrow 6.66$

ANS: C PTS: 1

20. Consider the following points on a scale:



If the scale upon which points A , B , C , and D are shown is an ordinal scale, we can meaningfully say ____.

- a. $B - A < D - C$
 - b. $B < C/2$
 - c. $B = 2A$
 - d. $C > B$
21. A continuous scale of measurement is different than a discrete scale in that a continuous scale ____.
- a. is an interval scale, not a ratio scale
 - b. never provides exact measurements
 - c. can take an infinite number of intermediate possible values
 - d. never uses decimal numbers
 - e. b and c

ANS: D PTS: 1

22. Sex of children is an example of a(n) ____ scale.
- a. ratio
 - b. nominal
 - c. ordinal
 - d. interval

ANS: B PTS: 1

23. Which of the following variables has been labeled with an incorrect measuring scale?
- the number of students in a psychology class – ratio
 - ranking in a beauty contest – ordinal
 - finishing order in a poetry contest – ordinal
 - self-rating of anxiety level by students in a statistics class – ratio

ANS: D PTS: 1

24. A nutritionist uses a scale that measures weight to the nearest 0.01 grams. A slice of cheese weighs 0.35 grams on the scale. The variable being measured is a ____.
- discrete variable
 - constant
 - continuous variable
 - random variable

ANS: C PTS: 1

25. A nutritionist uses a scale that measures weight to the nearest 0.01 grams. A slice of cheese weighs 0.35 grams on the scale. The true weight of the cheese ____.
- is 0.35 grams
 - may be anywhere in the range 0.345-0.355 grams
 - may be anywhere in the range 0.34-0.35 grams
 - may be anywhere in the range 0.34-0.36 grams

ANS: B PTS: 1

26. In a 10-mile cross-country race, all runners are randomly assigned an identification number. These numbers represent a(n) ____.
- nominal scale
 - ratio scale
 - interval scale
 - ordinal scale

ANS: A PTS: 1

27. In a 10-mile cross-country race, a comparison of each runner's finishing time would represent a(n) ____.
- nominal scale
 - ratio scale
 - interval scale
 - ordinal scale

ANS: B PTS: 1

28. The sum of a distribution of 40 scores is 150. If we add a constant of 5 to each score, the resulting sum will be ____.
- 158
 - 350
 - 150
 - 195

ANS: B PTS: 1

Exhibit 2-2

Given the following set of numbers:

$$X_1 = 2, X_2 = 4, X_3 = 6, X_4 = 10$$

29. Refer to Exhibit 2-2. What is the value for ΣX ?
- a. 12
 - b. 156
 - c. 480
 - d. 22

ANS: D PTS: 1

30. Refer to Exhibit 2-2. What is the value of ΣX^2 ?
- a. 156
 - b. 22
 - c. 480
 - d. 37

ANS: A PTS: 1 MSC: WWW

31. Refer to Exhibit 2-2. What is the value of X_4^2 ?
- a. 4
 - b. 6
 - c. 100
 - d. 10

ANS: C PTS: 1

32. Refer to Exhibit 2-2. What is the value of $(\Sigma X)^2$?
- a. 480
 - b. 484
 - c. 156
 - d. 44

ANS: B PTS: 1

33. Refer to Exhibit 2-2. What is the value of N ?
- a. 2
 - b. 4
 - c. 6
 - d. 10

ANS: B PTS: 1

34. Refer to Exhibit 2-2. What is the value of $(\Sigma X)/N$?
- a. 5
 - b. 4
 - c. 6
 - d. 5.5

ANS: D PTS: 1

35. Classifying subjects on the basis of sex is an example of using what kind of scale?
- a. nominal

- b. ordinal
- c. interval
- d. ratio
- e. bathroom

ANS: A PTS: 1 MSC: WWW

36. Number of bar presses is an example of a(n) ____ variable.
- a. discrete
 - b. continuous
 - c. nominal
 - d. ordinal

ANS: A PTS: 1

37. Using an ordinal scale to assess leadership, which of the following statements is appropriate?
- a. *A* has twice as much leadership ability as *B*
 - b. *X* has no leadership ability
 - c. *Y* has the most leadership ability
 - d. all of the above

ANS: C PTS: 1

38. The number of legs on a centipede is an example of a(n) ____ scale.
- a. nominal
 - b. ordinal
 - c. ratio
 - d. continuous

ANS: C PTS: 1

39. What are the real limits of the observation of 6.1 seconds (measured to the nearest second)?
- a. 6.05–6.15
 - b. 5.5–6.5
 - c. 6.0–6.2
 - d. 6.00–6.20

ANS: A PTS: 1 MSC: WWW

40. What is 17.295 rounded to one decimal place?
- a. 17.1
 - b. 17.0
 - c. 17.2
 - d. 17.

ANS: D PTS: 1

41. What is the value of 0.05 rounded to one decimal place?
- a. 0.0
 - b. 0.1
 - c. 0.2
 - d. 0.5

ANS: A PTS: 1

42. The symbol " Σ " means:

- a. add the scores
- b. summarize the data
- c. square the value
- d. multiply the scores

ANS: A PTS: 1

43. A therapist measures the difference between two clients. If the therapist can say that Rebecca's score is higher than Sarah's, but can't specify how much higher, the measuring scale used must have been a(n) _____ scale.
- a. nominal
 - b. ordinal
 - c. interval
 - d. ratio

ANS: B PTS: 1 MSC: WWW

44. An individual is measuring various objects. If the measurements made are to determine into which of six categories each object belongs, the measuring scale used must have been a(n)_____ scale.
- a. nominal
 - b. ordinal
 - c. interval
 - d. ratio

ANS: A PTS: 1 MSC: WWW

45. If an investigator determines that Carlo's score is five times as large as the score of Juan, the measuring scale used must have been a(n) _____ scale.
- a. nominal
 - b. ordinal
 - c. interval
 - d. ratio

ANS: D PTS: 1 MSC: WWW

The following problem(s) are for your own use in evaluating your skills at elementary algebra. If you do not get all the problem(s) correct you should probably review your algebra.

46. Where $3X = 9$, what is the value of X ?
- a. 3
 - b. 6
 - c. 9
 - d. 12

ANS: A PTS: 1

47. For $X + Y = Z$, X equals _____.
- a. $Y + Z$
 - b. $Z - Y$
 - c. Z/Y
 - d. Y/Z

ANS: B PTS: 1

48. $1/X + 2/X$ equals _____.
- a. $2/X$

- b. $3/2X$
- c. $3/X$
- d. $2/X^2$

ANS: C PTS: 1

49. What is $(4 - 2)(3 \cdot 4)/(6/3)$?
- a. 24
 - b. 1.3
 - c. 12
 - d. 6

ANS: C PTS: 1

50. $6 + 4 \times 3 - 1$ simplified is ____.
- a. 29
 - b. 48
 - c. 71
 - d. 17

ANS: D PTS: 1

51. $X = Y/Z$ can be expressed as ____.
- a. $Y = (Z)(X)$
 - b. $X = Z/Y$
 - c. $Y = X/Z$
 - d. $Z = X + Y$

ANS: A PTS: 1

52. 2^4 equals ____.
- a. 4
 - b. 32
 - c. 8
 - d. 16

ANS: D PTS: 1

53. $\sqrt{81}$ equals ____.
- a. ± 3
 - b. ± 81
 - c. ± 9
 - d. ± 27

ANS: C PTS: 1

54. $X(Z + Y)$ equals ____.
- a. $XZ + Y$
 - b. $ZX + YX$
 - c. $(X)(Y)(Z)$
 - d. $(Z + Y)/X$

ANS: B PTS: 1

55. $1/2 + 1/4$ equals ____.

- a. 1/6
- b. 1/8
- c. 2/8
- d. 3/4

ANS: D PTS: 1

56. X^6/X^2 equals ____.

- a. X^8
- b. X^4
- c. X^2
- d. X^3

ANS: B PTS: 1

TRUE/FALSE

1. When doing summation, the number above the summation sign indicates the term ending the summation and the number below indicates the beginning term.

ANS: T PTS: 1 MSC: WWW

2. ΣX^2 and $(\Sigma X)^2$ generally yield the same answer.

ANS: F PTS: 1 MSC: WWW

3. With nominal scales there is a numerical relationship between the units of the scale.

ANS: F PTS: 1

4. If IQ was measured on a ratio scale, and John had an IQ of 40 and Fred an IQ of 80, it would be correct to say that Fred was twice as intelligent as John.

ANS: T PTS: 1

5. An ordinal scale possesses the attributes of magnitude and equal interval.

ANS: F PTS: 1

6. Most scales used for measuring psychological variables are either ratio or interval.

ANS: F PTS: 1

7. Measurement is always approximate with a continuous variable.

ANS: T PTS: 1 MSC: WWW

8. It is standard practice to carry all intermediate calculations to four more decimal places than will be reported in the final answer.

ANS: F PTS: 1

9. In rounding, if the remainder beyond the last digit is greater than 1/2, add one to the last digit. If the remainder is less than 1/2, leave the last digit as it is.

ANS: T PTS: 1

10. It is legitimate to do ratios with interval scaling.

ANS: F PTS: 1

11. The number of students in a class is an example of a continuous variable.

ANS: F PTS: 1

12. The real limits of a discrete variable are those values that are above and below the recorded value by one half of the smallest measuring unit of the scale.

ANS: F PTS: 1

13. When rounding, if the decimal remainder is equal to $1/2$ and the last digit of the answer is even, add 1 to the last digit of the answer.

ANS: F PTS: 1

14. A fundamental property of a nominal scale is equivalence.

ANS: T PTS: 1

15. An interval scale is like a ratio scale, except that the interval scale doesn't possess an absolute zero point.

ANS: T PTS: 1

16. A discrete variable requires nominal or interval scaling.

ANS: T PTS: 1 MSC: WWW

17. Classifying students into whether they are good, fair, or poor speakers is an example of ordinal scaling.

ANS: T PTS: 1

18. Determining the number of students in each section of introductory psychology involves the use of a ratio scale.

ANS: T PTS: 1 MSC: WWW

19. In a race, Sam came in first and Fred second. Determining the difference in time to complete the race between Sam and Fred involves an ordinal scale

ANS: F PTS: 1

20. If the remainder of a number = $1/2$, we always round the last digit up.

ANS: F PTS: 1

DEFINITIONS

1. Define continuous variable.

ANS:

Answer not provided.

PTS: 1 MSC: WWW

2. Define discrete variable.

ANS:

Answer not provided.

PTS: 1

3. Define interval scale.

ANS:

Answer not provided.

PTS: 1

4. Define nominal scale.

ANS:

Answer not provided.

PTS: 1

5. Define ratio scale.

ANS:

Answer not provided.

PTS: 1 MSC: WWW

6. Define real limits of a continuous variable.

ANS:

Answer not provided.

PTS: 1

SHORT ANSWER

1. How does an interval scale differ from an ordinal scale?

ANS:

Answer not provided.

PTS: 1

2. Give two differences between continuous and discrete scales.

ANS:

Answer not provided.

PTS: 1

3. What are the four types of scales and what mathematical operations can be done with each?

ANS:

Answer not provided.

PTS: 1

4. Prove algebraically that $\sum_{i=1}^N (X_i + \alpha) = \sum_{i=1}^N X_i + N\alpha$.

ANS:

Answer not provided.

PTS: 1

5. What is a discrete variable? Give an example.

ANS:

Answer not provided.

PTS: 1

6. Student A claims that because his IQ is twice that of Student B, he is twice as smart as Student B. Is student A correct? Explain.

ANS:

Answer not provided.

PTS: 1

7. What is meant by "the real limits of a continuous variable."

ANS:

Answer not provided.

PTS: 1

MSC: WWW

8. The faculty of a psychology department are trying to decide between three candidates for a single faculty position. The department chairperson suggests that to decide, each faculty person should rank order the candidates from 1 to 3, and the ranks would then be averaged. The candidate with the highest average would be offered the position. Mathematically, what is wrong with that proposal?

ANS:

Answer not provided.

PTS: 1

MSC: WWW