

Chapter 3 Practice Problems

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 1. A histogram has a bin width of 0.5. The left end point of the first interval is 7.25. What is the left end point of the sixth interval?
 - a. 9.75
 - b. 10.25
 - c. 12.25
 - d. 13.25
- ___ 2. The senior soccer team includes students from all grades but most of its members are from the higher grades. The distribution of the ages of team members would likely be
 - a. U-shaped
 - b. mound-shaped
 - c. right-skewed
 - d. left-skewed
- ___ 3. What term describes the following data?

Score	0	1	2	3	4
Frequency	12	8	6	2	1

- a. right-skewed
- b. left-skewed
- c. symmetric
- d. bimodal
- ___ 4. A set of data has the following properties: mean = 17, median = 15, mode = 14. Which of the following best describes the data set?
 - a. skewed left
 - b. skewed right
 - c. skewed but neither left nor right
 - d. not skewed
- ___ 5. What is the mean mass (in grams) of the screws with masses as tabulated below?

Mass (g)	7.0	7.5	8.0	8.5	9.0
Frequency	1	2	7	4	6

- a. 8.0
- b. 8.25
- c. 8.3
- d. 8.5
- ___ 6. On a fishing trip, Ella caught 6 bass with a mean mass of 1.5 kg and 4 pike with a mean mass of 3.5 kg. What was the mean mass, in kilograms, of all of the fish Ella caught?
 - a. 1.5
 - b. 2.3
 - c. 2.5
 - d. 3.5
- ___ 7. Find the interquartile range of the following Scrabble scores: 120, 150, 201, 185, 201, 162, 210
 - a. 12
 - b. 51
 - c. 90
 - d. 15
- ___ 8. A data set has a mean of 10 and a variance of 4. What is the standard deviation?
 - a. 2
 - b. 4
 - c. 6
 - d. 10
- ___ 9. Using the interquartile range which student’s quiz marks are more consistent?
 - Adam: 14, 15, 17, 20
 - Anne: 14, 14, 17, 19
 - a. Adam’s
 - b. Anne’s
 - c. they are equally consistent
 - d. cannot be determined
- ___ 10. Use the standard deviation to determine which of the two baseball teams has been more consistent in its scoring for the last five games.
 - N.Y: 0, 4, 2, 3, 6

St.L: 1, 3, 3, 5, 7

- a. N.Y
b. St.L
c. they are equally consistent
d. it cannot be determined
- ___ 11. How many of the numbers in the set below are within two standard deviations of the mean?
0, 2, 4, 6, 7, 8
a. 3
b. 4
c. 6
d. 8
- ___ 12. Which of the following is not a property of a normal distribution?
a. the median and mode are equal
b. the area under a normal curve is 1
c. it is symmetric about the mean
d. 99.7% of the data is within 2 standard deviation of the mean
- ___ 13. If $X \sim N(10, 3^2)$, then the standard deviation equals
a. 10
b. 9
c. 3
d. 1
- ___ 14. If $X \sim N(15, 2^2)$, then 68% of the data fall in the interval
a. 9–21
b. 11–19
c. 13–17
d. 15–17
- ___ 15. If $X \sim N(12.4, \sigma^2)$ and 95% of the data lie in the interval 11.8–13.0 the σ equals
a. 1.2
b. 0.3
c. 0.09
d. 0.06
- ___ 16. For $X \sim N(5, 2^2)$ the z -score of $x = 4.2$ is
a. -0.4
b. -0.2
c. 0.2
d. 0.4
- ___ 17. The z -score corresponding to the 44th percentile is
a. -2.62
b. -0.15
c. 0.44
d. 4.40
- ___ 18. Given a normally-distributed data set whose mean is 40 and whose standard deviation is 8, what value of x would have a z -score of -1.25?
a. -10
b. 10
c. 30
d. 50
- ___ 19. Find the percentile corresponding to $x = 15$ if $X \sim N(12, 2.6^2)$.
a. 12th
b. 13th
c. 87th
d. 88th

Short Answer

Answer the following on lined paper. Practice effective communication.

20. In contrast to a bar graph, what type of numerical data is displayed in a histogram?
21. Each student in a large school was asked the day of the week of his or her last birthday. The results were displayed in a histogram. What would be the most likely shape of the histogram?
22. “Some of you did well, some of you did not do so well, but most of you have a mark near the middle.” What shape of distribution would these marks likely have?
23. When 10 students were asked for their favourite number, the responses were: 7, 10, 72, 7, 1600, 4, 1, 7, 2, and 1. What measure of central tendency is the most appropriate to describe their answers?
24. Find the mean age, to one decimal place, in years.

Age (years)	6–10	11–15	16–20	21–25
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Frequency	2	4	7	1
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25. The table below lists the heights in centimetres of all of the teachers in a school. Find the modal interval.

Height (cm)	150–159	160–169	170–179	180–189	190–199
Frequency	6	10	20	18	4

26. Find the standard deviation to one decimal place of the ages, in years, of these five siblings: 10, 12, 12, 17, 20
27. The line of symmetry of a normal curve divides the curve into two parts. What is the area under each of these parts of the curve?
28. If $X \sim N(10, 2^2)$, what is the mean?
29. For $X \sim N(\bar{x}, \sigma^2)$, what percent of the data fall between $\bar{x} - \sigma$ and $\bar{x} + 2\sigma$?
30. Ravi's math contest result put him in the 97th percentile. If 4000 students competed, how many had a score higher than Ravi's score?

Application Problems

Answer the following on lined paper. Practice effective communication.

31. On the last test, most of Mr. D's students received a mark of approximately 70 out of 100. Usually, the distribution of marks is mound-shaped. Mr. D noticed that 5 students failed (i.e. a mark less than 50) while only 2 students had marks over 90. Why was he surprised?
32. The Smiths are very particular about their choice of pets. They select kittens on the basis of 3 qualities: cuteness, fluffiness, and attitude. The qualities are given weights 5, 3, and x respectively. Mittens received scores of 8, 9, and 4 in that order for the three qualities. If his weighted mean score was 7.5, what is the value of x , the weight for attitude?
33. Place the data below in a frequency table with uniform intervals 6–10, 11–15, et cetera. Then use the table to find the approximate mean, median, and mode.
6, 6, 7, 8, 11, 11, 11, 12, 15, 16, 17, 17, 18, 19, 20, 20, 20, 21, 22, 24
34. The following is a list of seven whole numbers arranged from smallest to largest 1, a , 5, 5, b , 7. What are the possible values of a and b if IQR is 7?
35. IQ is normally distributed with a mean of 100. Which are there more of: people with an IQ less than 80 or people with an IQ greater than 110? Explain.
36. The mean age of 120 teachers in a school is 38 years with a standard deviation of 5.3. Six of the teachers in the school are over 54 years of age. Is the distribution of the teachers' ages normal? Explain.
37. How many of the 250 perch netted by a fisherman would you expect to have a mass more than 400 g, if the distribution of their masses is approximately normal with a mean of 300 g and a standard deviation of 80 g?

MDM 4U Ch. 3 Exam Review
Answer Section

MULTIPLE CHOICE

1. ANS: A
2. ANS: D
3. ANS: A
4. ANS: B
5. ANS: C
6. ANS: B
7. ANS: B
8. ANS: A
9. ANS: C
10. ANS: C
11. ANS: C
12. ANS: D
13. ANS: C
14. ANS: C
15. ANS: B
16. ANS: A
17. ANS: B
18. ANS: C
19. ANS: C

SHORT ANSWER

20. ANS:
The type of numerical data displayed in a histogram is continuous data.
21. ANS:
The most likely shape of the histogram would be uniform.
22. ANS:
These marks would likely have a distribution that has a mound-shape.
23. ANS:
The most appropriate measure of central tendency is the mode.
24. ANS:
The mean age, to one decimal place, is 15.5 years.
25. ANS:
The modal interval is 170–179.
26. ANS:
The standard deviation is 3.7 years.

27. ANS:

The area under each of these parts of the curve is $\frac{1}{2}$.

28. ANS:

The mean is 10.

29. ANS:

The percent of the data that fall between $\bar{x} - \sigma$ and $\bar{x} + 2\sigma$ is 81.5%.

30. ANS:

The number of students with a score higher than Ravi's is 120.

PROBLEM

31. ANS:

Mound-shaped distributions are symmetric about the score of greatest frequency, in this case 70. Scores of 50 and 90 are equidistant from 70, so the number of students scoring below 50 should be the same as the number above 90. Therefore, he was surprised because the distribution was not mound-shaped.

32. ANS:

$$7.5 = \frac{8(5) + 9(3) + 4x}{5 + 3 + x}$$

$$7.5 = \frac{67 + 4x}{8 + x}$$

$$60 + 7.5x = 67 + 4x$$

$$3.5x = 7$$

$$x = 2$$

Mitten's weight for attitude is 2.

33. ANS:

Interval	f	m	$f \times m$
6-10	4	8	32
11-15	5	13	65
16-20	8	18	144
21-25	3	23	69

$$\begin{aligned}\text{Mean} &= \frac{\sum(f \times m)}{\sum f} \\ &= \frac{310}{20} \\ &= 15.5\end{aligned}$$

Median = 18 (the midpoint of the interval that contains the 10th and 11th piece of data)

Modal interval = 16–20

34. ANS:

$$\begin{aligned}\text{IQR} &= Q3 - Q1 \\ &= b - a \text{ and}\end{aligned}$$

$$b - a = 4$$

$$\therefore b = a + 4$$

But $a = 1, 2, 3, 4$, or 5 and $b = 5, 6, 7$

$$\therefore (a, b) = (1, 5) \text{ or } (2, 6) \text{ or } (3, 7)$$

35. ANS:

An IQ of 80 is further from the mean than an IQ of 100. Because a normal curve is symmetrical about the mean, the area to the left of IQ = 80 is less than the area to the right of IQ = 110. So there will be more people with an IQ greater than 100.

36. ANS:

$$\begin{aligned}\bar{x} + 3\sigma &= 38 + 3(5.3) \\ &= 53.9\end{aligned}$$

If this were a normal distribution, then only 0.15% of the data would have a value greater than 53.9. But 6 out of 120 or 5% of the teachers are in this category, so the distribution is not normal.

37. ANS:

$$z = \frac{400 - 300}{80}$$

$$= 1.25$$

$$P(Z > 1.25) = 1 - 0.8944$$

$$= 0.1056$$

$$250(0.1056) = 26.4$$

Therefore, 26 fish should have a mass more than 400 g.