Unit 3 Review

Multiple Choice

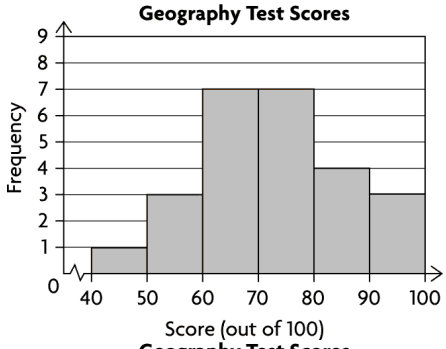
Identify the choice that best completes the statement or answers the question.

____ 1. Which histogram represents the following test scores?

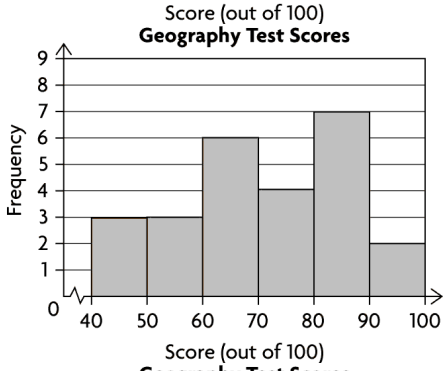
Geography Test 3 Scores (our of 100)

92	85	78	67	54
92	83	78	65	53
90	83	77	62	50
88	80	75	62	48
86	80	68	60	42

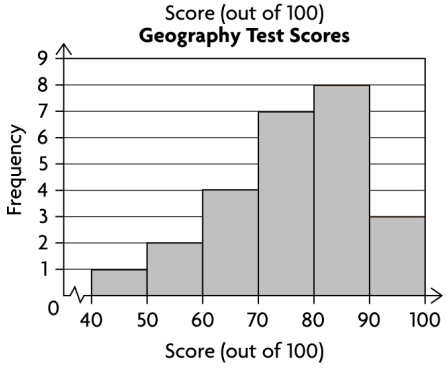
a.

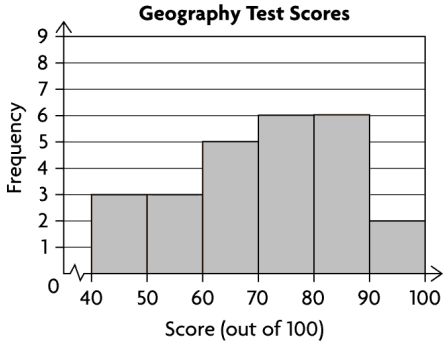


b.



c.



d. 

____ 2. Environment Canada compiled data on the number of lightning strikes per square kilometre in Alberta and British Columbia towns from 1999 to 2008.

0.42	0.04	0.81	0.40	0.03	0.74
0.28	0.03	0.70	0.23	0.03	0.66
0.13	0.02	0.61	0.12	0.01	0.58
0.10	0.00	0.49	0.07	1.08	0.43
0.05	0.91	0.42	0.04	0.88	

Which range of data occurs least frequently?

a. 0.60–0.69
b. 0.70–0.79
c. 0.50–0.59
d. 0.40–0.49

____ 3. A pear orchard has 20 trees with these heights, given in inches.

110	83	104	95
88	80	115	106
97	100	98	93
92	117	75	83
122	115	89	105

Determine the mean, to one decimal place.

a. 98.4 in.
b. 99.4 in.
c. 101.4 in.
d. 100.4 in.

____ 4. The ages of participants in a bonspiel are normally distributed, with a mean of 40 and a standard deviation of 10 years. What percent of the curlers are between 30 and 50?

a. 20%
b. 68%
c. 50%
d. 34%

____ 5. The ages of participants in a bonspiel are normally distributed, with a mean of 40 and a standard deviation of 10 years. What percent of the curlers are older than 60?

a. 1.25%
b. 5%
c. 0%
d. 2.5%

____ 6. Determine the *z*-score for the given value.
$\mu = 91.4$, $\sigma = 3.8$, $x = 87.6$

a. 1
b. –2
c. –1
d. 2

____ 7. Determine the percent of data to the right of the *z*-score: $z = -1.96$.

a. 2.50%
b. 97.50%
c. 1.50%
d. 98.50%

____ 8. Determine the percent of data between the following *z*-scores:
$z = -0.45$ and $z = -0.15$.

a. 76.68%
b. 44.04%
c. 32.64%
d. 11.40%

____ 9. A poll was conducted about an upcoming election. The result that 54% of people intend to vote for one of the candidates is considered accurate within ±7.1 percent points, 19 times out of 20.
State the confidence interval.

a. 54%–61.1%
b. 47.1%–60.9%
c. 46.9%–61.1%
d. 46.9%–54%

____ 10. In a recent survey of high school students, 42% of those surveyed said that the food in the cafeteria was overpriced. The survey is considered accurate to within 6 percent points, 19 times out of 20.
If a high school has 1000 students, state the range of the number of students who would agree with the survey.

a. 520–640
b. 360–420
c. 420–480
d. 360–480

Short Answer

11. Joel researched the average daily temperature in his town.
Average Daily Temperature in Lloydminster, SK

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
average daily temperature (°C)	–10.0	–17.5	–5.0	3.7	10.7	14.3	20.1	14.0	9.8	4.8	–5.8	–14.8

Determine the range of the data.

12. A company measured the lifespan of a random sample of 40 batteries in their MP3 players. Times are in hours.

7.8	11.0	10.5	8.8	9.1	9.4	11.2	9.4	8.6	9.0
9.3	8.5	7.9	9.1	7.1	9.3	9.4	9.7	10.6	8.5
9.2	8.2	7.4	8.8	8.6	8.0	8.0	11.1	9.2	11.4
8.2	9.6	8.5	10.5	10.7	9.5	11.4	8.2	9.7	8.5

If the interval width is 1.0 and starts at 6.5, what is the last interval?

13. Determine the z-score for the given value.
$\mu = 360$, $\sigma = 20$, $x = 315$

14. Determine the percent of data between the following z-scores:
$z = -0.68$ and $z = 1.74$.

15. The results of a survey have a confidence interval of 29% to 37%, 9 times out of 10.
Determine the margin of error.

Problem

16. Alistair has 35 min to get to his after-school job. Despite his best efforts, he is frequently late. His employer says that unless he arrives to work on time consistently, he will lose her job. He has recorded his travel times (in minutes) for the last two weeks: 29, 40, 38, 33, 35, 39, 37, 31, 43, 34. Over the next two weeks, he continues to record his travel times: 36, 31, 38, 38, 33, 39, 36, 34, 36, 33.
Do you think Alistair will lose his job? Use statistics to justify your answer.

17. A tile company produces glass kitchen tiles that has an average thickness of 71 mm, with a standard deviation of 0.4 mm. For premium-quality tiles, the tiles must have a thickness between 70 mm and 71.5 mm. What percent, to the nearest whole number, of the total production can be sold as premium-quality tiles?

18. In a population, 50% of the adults are taller than 175 cm and 25% are taller than 185 cm. Determine the mean height and standard deviation for this population.

19. A manufacturer of plasma televisions has determined that the televisions require servicing after a mean of 62 months, with a standard deviation of 4.5 months. What length of warranty should be offered, if the manufacturer wants to repair less than 1% of the televisions under the warranty?

20. In a pre-election survey in Winnipeg, 22% of those surveyed said they were undecided about whom to vote for in the mayoral election. The survey is considered accurate to within 4.4 percent points, 19 times out of 20.
a) Determine the confidence level and the confidence interval.
b) If there are 450 000 eligible voters in Winnipeg, state the range of the number of people who are undecided.

Unit 3 Review
Answer Section

MULTIPLE CHOICE

1. ANS: D PTS: 1 DIF: Grade 11 REF: Lesson 5.2
   TOP: Frequency tables, histograms, and frequency polygons
   KEY: frequency distribution | histogram | frequency polygon
2. ANS: C PTS: 1 DIF: Grade 11 REF: Lesson 5.2
   TOP: Frequency tables, histograms, and frequency polygons KEY: frequency distribution
3. ANS: A PTS: 1 DIF: Grade 11 REF: Lesson 5.3
   OBJ: 1.3 Explain, using examples, the properties of a normal curve, including the mean, median, mode, standard deviation, symmetry and area under the curve. TOP: Standard deviation
   KEY: mean
4. ANS: B PTS: 1 DIF: Grade 11 REF: Lesson 5.4
   OBJ: 1.7 Solve a contextual problem that involves the interpretation of standard deviation. | 1.9 Solve a contextual problem that involves normal distribution. TOP: The normal distribution
   KEY: normal distribution | mean | standard deviation
5. ANS: D PTS: 1 DIF: Grade 11 REF: Lesson 5.4
   OBJ: 1.7 Solve a contextual problem that involves the interpretation of standard deviation. | 1.9 Solve a contextual problem that involves normal distribution. TOP: The normal distribution
   KEY: normal distribution | mean | standard deviation
6. ANS: C PTS: 1 DIF: Grade 11 REF: Lesson 5.5
   OBJ: 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. TOP: Applying the normal distribution: z-scores
   KEY: z-score | standard normal distribution
7. ANS: B PTS: 1 DIF: Grade 11 REF: Lesson 5.5
   OBJ: 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. TOP: Applying the normal distribution: z-scores
   KEY: z-score | standard normal distribution
8. ANS: D PTS: 1 DIF: Grade 11 REF: Lesson 5.5
   OBJ: 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. TOP: Applying the normal distribution: z-scores
   KEY: z-score | standard normal distribution
9. ANS: C PTS: 1 DIF: Grade 11 REF: Lesson 5.6
   OBJ: 2.1 Explain, using examples, how confidence levels, margin of error and confidence intervals may vary depending on the size of the random sample. | 2.2 Explain, using examples, the significance of a confidence interval, margin of error or confidence level. TOP: Confidence intervals
   KEY: margin of error | confidence interval | confidence level
10. ANS: D PTS: 1 DIF: Grade 11 REF: Lesson 5.6
    OBJ: 2.1 Explain, using examples, how confidence levels, margin of error and confidence intervals may vary depending on the size of the random sample. | 2.2 Explain, using examples, the significance of a confidence interval, margin of error or confidence level. TOP: Confidence intervals
    KEY: margin of error | confidence interval | confidence level

SHORT ANSWER

11. ANS:
37.6°C

PTS: 1 DIF: Grade 11 REF: Lesson 5.1 TOP: Exploring data
KEY: range

12. ANS:
10.5–11.4

PTS: 1 DIF: Grade 11 REF: Lesson 5.2
TOP: Frequency tables, histograms, and frequency polygons KEY: frequency distribution

13. ANS:
–2.25

PTS: 1 DIF: Grade 11 REF: Lesson 5.5
OBJ: 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. TOP: Applying the normal distribution: z-scores
KEY: z-score | standard normal distribution

14. ANS:
71.08%

PTS: 1 DIF: Grade 11 REF: Lesson 5.5
OBJ: 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. TOP: Applying the normal distribution: z-scores
KEY: z-score | standard normal distribution

15. ANS:
±4%

PTS: 1 DIF: Grade 11 REF: Lesson 5.6
OBJ: 2.1 Explain, using examples, how confidence levels, margin of error and confidence intervals may vary depending on the size of the random sample. | 2.2 Explain, using examples, the significance of a confidence interval, margin of error or confidence level. TOP: Confidence intervals
KEY: margin of error | confidence level | confidence interval

PROBLEM

16. ANS:
Using technology, for the first set of times, the mean is 35.9 min and the standard deviation is about 4.1 min. For the second set of times, the mean is 35.4 min and the standard deviation is about 2.5 min.

Alistair was actual late more often, but he reduced his mean time of arrival by 0.5 min and reduced the standard deviation by about 1.5 min. I think he might lose his job because he is still late on average, but his boss might give him another chance to improve his arrival time because Alistair has shown some progress.

PTS: 1 DIF: Grade 11 REF: Lesson 5.3
OBJ: 1.2 Calculate, using technology, the population standard deviation of a data set. | 1.6 Explain, using examples that represent multiple perspectives, the application of standard deviation for making decisions in situations such as warranties, insurance or opinion polls. | 1.7 Solve a contextual problem that involves the interpretation of standard deviation. TOP: Standard deviation
KEY: mean | standard deviation

17. ANS:

Determine the two *z*-scores:

$$z_1 = \frac{70 - 71}{0.4} \qquad z_2 = \frac{71.5 - 71}{0.4}$$

$$z_1 = -2.5 \qquad z_2 = 1.25$$

The *z*-scores are –2.5 and 1.25.
Using the *z*-score table, 89.44% – 1.62% = 87.82% of the data is between these two *z*-scores.
About 88% of the total production can be sold as premium-quality tiles.

PTS: 1 DIF: Grade 11 REF: Lesson 5.5
OBJ: 1.7 Solve a contextual problem that involves the interpretation of standard deviation. | 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. | 1.9 Solve a contextual problem that involves normal distribution.
TOP: Applying the normal distribution: z-scores
KEY: normal distribution | mean | standard deviation | z-score

18. ANS:
Using the *z*-score table, 50% or 0.50 corresponds to a *z*-score of 0.0. This is the mean height of the population. So the mean height is 175 cm.

Then 25% of the population to the right of 185 cm is 75% or 0.75 of the population to the left of 185 cm.
Using the *z*-score table, 0.75 corresponds to a *z*-score of 0.67.

$$z = \frac{x - \mu}{\sigma}$$

$$0.67 = \frac{185 - 175}{\sigma}$$

$$\sigma = \frac{185 - 175}{0.67}$$

$$\sigma = 14.925\ldots$$

The standard deviation is 15.0 cm.

PTS: 1 DIF: Grade 11 REF: Lesson 5.5
OBJ: 1.7 Solve a contextual problem that involves the interpretation of standard deviation. | 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. | 1.9 Solve a contextual problem that involves normal distribution.
TOP: Applying the normal distribution: z-scores
KEY: normal distribution | mean | standard deviation | z-score

19. ANS:
μ = 62 months
σ = 4.5 months
Repair rate, *r* = 1%

Using the *z*-score table, 1% or 0.01 corresponds to a *z*-score of –2.33.

$$z = \frac{x - \mu}{\sigma}$$

$$-2.33 = \frac{x - 62}{4.5}$$

$$-10.485 = x - 62$$

$$x = 51.515$$

I will round down so that fewer than 1% of the televisions require repairs under warranty.
The warranty period should be 51 months.

PTS: 1 DIF: Grade 11 REF: Lesson 5.5
OBJ: 1.6 Explain, using examples that represent multiple perspectives, the application of standard deviation for making decisions in situations such as warranties, insurance or opinion polls. | 1.7 Solve a contextual problem that involves the interpretation of standard deviation. | 1.8 Determine, with or without technology, and explain the z-score for a given value in a normally distributed data set. | 1.9 Solve a contextual problem that involves normal distribution. TOP: Applying the normal distribution: z-scores
KEY: normal distribution | mean | standard deviation | z-score

20. ANS:
a) The confidence level is 19 times out of 20 or 95%.
22% – 4.4% = 17.6%
22% + 4.4% = 26.4%
The confidence interval is 17.6% to 26.4%.
b) 0.176(450 000) = 79 200
0.264(450 000) = 118 800
The number of people who are undecided should be in the range of 79 200 to 118 800.

PTS: 1 DIF: Grade 11 REF: Lesson 5.6
OBJ: 1.6 Explain, using examples that represent multiple perspectives, the application of standard deviation for making decisions in situations such as warranties, insurance or opinion polls. | 1.9 Solve a contextual problem that involves normal distribution. | 2.3 Make inferences about a population from sample data, using given confidence intervals, and explain the reasoning. TOP: Confidence intervals
KEY: mean | range | standard deviation | margin of error | confidence level | confidence interval