Chapter 1 Test Review Packet

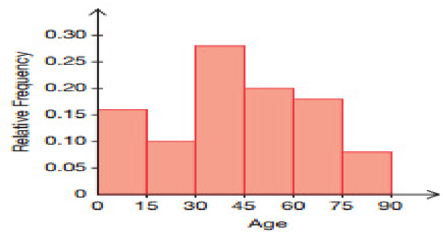
Name KEY Date

1. The table displays the ages of the people attending a family reunion.

Age (years)	Number of People Attending	Relative Frequency
0–15	8	0.16
15–30	5	0.10
30–45	14	0.28
45–60	10	0.20
60–75	9	0.18
75–90	4	0.08

a. Determine the relative frequency of each interval to complete the table.
See table.

b. Construct a relative frequency histogram for the data.



c. Does the histogram approximate a normal distribution? Explain.
No. The histogram does not approximate a normal distribution because it is neither bell-shaped nor symmetrical about the mean.

a. Determine the percent of tablet computers with a battery life between 1 standard deviation below the mean and 1 standard deviation above the mean.
Approximately 68% of the tablet computers have a battery life between 1 standard deviation below the mean and 1 standard deviation above the mean.

b. Determine the percent of tablet computers with a battery life between 5.6 hours and 8.4 hours.
Approximately 95% of the tablet computers have a battery life between 5.6 hours and 8.4 hours.

A battery life of 5.6 hours is 2 standard deviations below the mean and a battery life of 8.4 hours is 2 standard deviations above the mean. I know that approximately 95% of data in a normal distribution is between 2 standard deviations below the mean and 2 standard deviations above the mean.

3. The heights of 8-year-old girls in a large school district are normally distributed with a mean of 50 inches and a standard deviation of 2.5 inches.

a. Calculate the z-score for Ava, an 8-year-old girl in the school district who is 53 inches tall.

$$z = \frac{53 - 50}{2.5}$$

$$z = 1.2$$

b. Explain the meaning of the z-score that you found in part (a).

Ava's z-score means that her height is 1.2 standard deviations above the mean.

c. What percent of 8-year-old girls in the school district are shorter than Ava? Explain your method.

Approximately 88.49% of the 8-year-old girls in the school district are shorter than Ava.

I used a graphing calculator and entered normalcdf(0, 53, 50, 2.5).

4. The wait times for the telephone help line at a computer company are normally distributed with a mean of 12 minutes and a standard deviation of 5 minutes.

a. If Marco calls the help line, what is the probability that his call will be answered within 10 minutes? Explain the method you used.

The probability that Marco's call will be answered within 10 minutes is 0.3364, or 33.64%.

I used a graphing calculator and entered normalcdf (0, 10, 12, 5).

b. If Sophia calls the help line, what is the probability that she will have to wait over 20 minutes for her call to be answered? Explain the method you used.

The probability that Sophia will have to wait over 20 minutes for her call to be answered is approximately 5.5%.

I used a graphing calculator and entered normalcdf(20, 1×10^{99}, 12, 5).

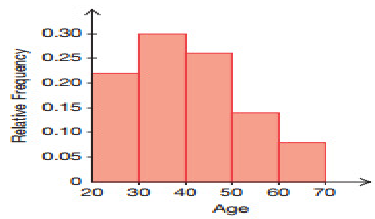
Part B

1. The table displays the ages of the people attending a family reunion.

Age (years)	Number of Employees	Relative Frequency
21–30	11	0.22
30–40	15	0.30
40–50	13	0.26
50–60	7	0.14
60–70	4	0.08

a. Determine the relative frequency of each interval to complete the table.
See table.

b. Construct a relative frequency histogram for the data.



c. Does the histogram approximate a normal distribution? Explain.
No. The histogram does not approximate a normal distribution because it is neither bell-shaped nor symmetrical about the mean.

2. The mean battery life of one model of laptop computer is 6 hours with a standard deviation of 0.6 hour. Assume that the battery life is normally distributed.

a. Determine the percent of laptop computers with a battery life between 1 standard deviation below the mean and 1 standard deviation above the mean.
Approximately 68% of the laptop computers have a battery life between 1 standard deviation below the mean and 1 standard deviation above the mean.

b. Determine the percent of laptop computers with a battery life between 4.8 hours and 7.2 hours.
Approximately 95% of the laptop computers have a battery life between 4.8 hours and 7.2 hours.

A battery life of 4.8 hours is 2 standard deviations below the mean and a battery life of 7.2 hours is 2 standard deviations above the mean. I know that approximately 95% of data in a normal distribution is between 2 standard deviations below the mean and 2 standard deviations above the mean.

3. The heights of 12-year-old boys in a large school district are normally distributed with a mean of 61 inches and a standard deviation of 2.5 inches.

a. Calculate the z-score for Logan, a 12-year-old boy in the school district who is 57 inches tall.

$$z = \frac{57 - 61}{2.5}$$

$$z = -1.6$$

b. Explain the meaning of the z-score that you found in part (a).

Logan's z-score means that his height is 1.6 standard deviations below the mean.

c. What percent of 12-year-old boys in the school district are shorter than Logan? Explain your method.

Approximately 5.48% of the 12-year-old boys in the school district are shorter than Logan.

I used a graphing calculator and entered normalcdf(0, 57, 61, 2.5).

4. The wait times for an electric company to restore service after an outage is reported are normally distributed with a mean of 25 minutes and a standard deviation of 15 minutes. Kelly calls to report an outage.

a. What is the probability that her electric service will be restored within 20 minutes after she makes the call? Explain the method you used.

The probability that the electric service at Kelly's home will be restored within 20 minutes is approximately 0.3217, or 32.17%.

I used a graphing calculator and entered normalcdf(0, 20, 25, 15).

b. What is the probability that she will have to wait over 45 minutes for her electric service to be restored? Explain the method you used.

The probability that Kelly will have to wait over 45 minutes for her service to be restored is approximately 0.1390, or 13.90%.

I used a graphing calculator and entered normalcdf(45, 1×10^{99}, 25, 15).

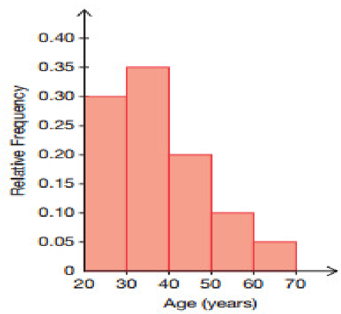
PART C

1. The table displays the ages of the teachers at North Central High School.

Age (years)	Number of Teachers	Relative Frequency
20–30	18	0.30
30–40	21	0.35
40–50	12	0.20
50–60	6	0.10
60–70	3	0.05

a. Determine the relative frequency of each interval to complete the table.
See table.

b. Construct a relative frequency histogram for the data.



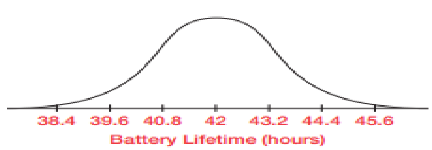
c. Does the histogram approximate a normal distribution? Explain.
No. This histogram does not approximate a normal distribution because it neither bell-shaped nor symmetrical about the mean.

d. What changes in the data would result in a distribution that is closer to a normal distribution?

Fewer younger teachers and more older teachers, with a peak in the middle would result in a distribution that is closer to a normal distribution.

2. The lifetime of a certain type of battery is normally distributed. The battery's mean lifetime is 42 hours with a standard deviation of 1.2 hours.

a. Use the mean and standard deviation to label the intervals on the horizontal axis of the normal curve. Include 3 standard deviations above and below the mean.



b. Determine the percent of batteries with a lifetime between 1 standard deviation below the mean and 1 standard deviation above the mean.
About 68% of batteries have a lifetime between 1 standard deviation below the mean and 1 standard deviation above the mean.

c. Determine the percent of batteries with a lifetime between 39.6 hours and 44.4 hours.
About 95% of batteries have a lifetime between 39.6 hours and 44.4 hours.

A battery life of 39.6 hours is 2 standard deviations below the mean and a battery life of 44.4 hours is 2 standard deviations above the mean. I know that approximately 95% of data in a normal distribution is between 2 standard deviations below the mean and 2 standard deviations above the mean.

3. The weights of a large group of 18-month-old girls are normally distributed with a mean of 24 pounds and a standard deviation of 3.5 pounds.

   a. Determine the z-scores for weights of 17 pounds and 27.5 pounds. Interpret the meaning of each z-score.

   The z-score for a weight of 17 pounds is -2 which means that a weight of 17 pounds is 2 standard deviations below the mean.

   The z-score for a weight of 27.5 pounds is 1 which means that a weight of 27.5 pound is 1 standard deviation above the mean.

   $$z = \frac{17 - 24}{3.5} = \frac{-7}{3.5} = -2$$

   $$z = \frac{27.5 - 24}{3.5} = \frac{3.5}{3.5} = 1$$

   b. Calculate the percent of 18-month-old girls who weigh between 17 pounds and 27.5 pounds. Explain your reasoning.

   Approximately 81.5% of 18-month old girls weigh between 17 pounds and 27.5 pounds.

   Approximately 47.5% of the data in a normal distribution is within the mean and two standard deviations below the mean, so about 47.5% of 18-month-old girls weigh between 17 pounds and 24 pounds.

   Approximately 34% of the data in a normal distribution is within the mean and one standard deviation below the mean, so about 34% of 18-month-old girls weigh between 24 pounds and 27.5 pounds.

   So, about 47.5% + 34% = 81.5% of 18-month old girls weigh between 17 pounds and 27.5 pounds.

4. All students who complete the Algebra 2 course at Ridgeway High School take a common final exam. The exam scores are normally distributed with a mean of 105 and a standard deviation of 16.

   a. Kyle and Ethan are Algebra 2 students who took the final exam. Kyle's score was 135 and Ethan's score was 93. Calculate the z-score for each student. Round your answers to the nearest tenth.

   Kyle:

   $$z = \frac{135 - 105}{16} = \frac{30}{16} = 1.875$$

   Ethan:

   $$z = \frac{93 - 105}{16} = \frac{-12}{16} = -0.75$$

   b. Explain what each student's z-score means.

   Kyle's final exam score was 1.875 standard deviations above the mean.

   Ethan's final exam score was 0.75 standard deviation below the mean.

   c. What percent of the students had a final exam score lower than Ethan's score? Explain your method.

   Approximately 22.66% of the students scored lower than Ethan.

   I used a graphing calculator and I entered normalcdf(0, 93, 105, 16).

   d. What percent of the students who took the exam received scores that fell between Ethan and Kyle's scores? Explain your method.

   Approximately 74.30% of the students scored higher than Ethan and lower than Kyle.

   I used a graphing calculator and entered normalcdf(93, 135, 105, 16).

   e. Test scores are often reported as percentiles rather than z-scores. Determine Ethan and Kyle's percentiles on the final exam. Round your answers to the nearest whole number. Explain your reasoning.

   Ethan scored higher than 22.66% of the students, so his score was at the 23rd percentile.

   Kyle scored higher than 22.66% + 74.30% = 96.96% of the students, so his score was at the 97th percentile.

   f. Calculate the 75th percentile score for the final exam to the nearest whole number. Explain your method.

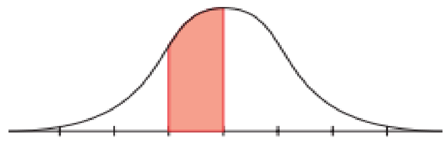
   The 75th percentile score is approximately 116.

   I used the invNorm feature on a graphing calculator.

   invNorm(0.75, 105, 16) ≈ 116

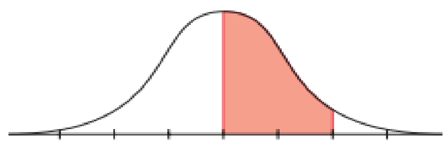
5. For each interval, shade the portion of the normal curve. Then calculate the probability.

   a. Determine the probability of randomly selecting a data value between the mean and one standard deviation below the mean.



   The probability of randomly selecting a data value between the mean and one standard deviation below the mean is 0.34, or 34%.

   b. Determine the probability of randomly selecting a data value between the mean and two standard deviations above the mean.



   The probability of randomly selecting a data value between the mean and two standard deviations above the mean is 0.475, or 47.5%.

6. Heather is ordering pizza for her son's birthday party. Mario's Pizza has a mean delivery time of 25 minutes with a standard deviation of 8 minutes, while Authentic Pizza has a mean delivery time of 30 minutes with a standard deviation of 4 minutes. The delivery times of both pizza shops are normally distributed. Heather wants to have the pizza delivered between 20 and 30 minutes after she orders it so it will be hot and ready to serve at the best time during the party.

   a. What is the probability that Mario's Pizza will delivery the pizza between 20 and 30 minutes after she orders it? Explain your work.

   The probability that Mario's delivery will be between 20 and 30 minutes is 0.4680, or 46.80%.

   normcdf(20, 30, 25, 8) ≈ 0.4680

   b. What is the probability that Authentic Pizza will delivery the pizza between 20 and 30 minutes after she orders it? Explain your work.

   The probability that Authentic Pizza's delivery will be between 20 and 30 minutes is 0.4938, or 49.38%.

   normcdf(20, 30, 30, 4) ≈ 0.4938

   c. Which pizzeria should Heather choose in order to have the best chance of having the pizza delivered when she wants it?

   She should choose Authentic Pizza because their probability of delivering between 20 and 30 minutes is a little higher than Mario's Pizza.

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