(A) Lesson Context

BIG PICTURE of this UNIT:	• How do we analyze and then make conclusions from a data set? • How do I present my data and the outcomes of my analysis? • How do I use data & statistics to make decisions? • How do I decide on the validity/reliability of my data? Of my analysis? Of my conclusions? Of my decision?		
CONTEXT of this LESSON:	Where we've been Determining the central tendency of a data set, given an assortment of data presentations	Where we are Measuring the dispersion of a data set, using range & quartiles and visualizing the dispersion using a box and whisker plot	Where we are heading How do I analyze and make conclusions from a data set, in whatever way this data gets presented?

(B) Lesson Objectives:

a. Construct frequency histograms, polygons & CFG and use them to determine quartiles & draw BW plots
b. Calculate the quartiles of a data set
c. Present the quartiles using a visual ➔ a box & whisker plot

(C) Requirements for each data set

From the following grouped frequency table, you are required to:

(a) Prepare a frequency histogram & then a Frequency Polygon
(b) Use the table to ESTIMATE the mean
(c) Prepare Cumulative Frequency Graph
(d) Use the CFG to ESTIMATE the median, Q1 & Q3
(e) Prepare a B&W plot

(D)Example #1 Ages of players in a community football league

ages	# of players
0 - 5	70
5 - 10	400
10 - 15	850
15 - 20	600
20 - 25	400
25 - 30	200
30 - 35	150
35 - 40	100
40 - 45	100
45 - 50	80
50+	50

Histogram

Mean and Median Estimates:

CFG
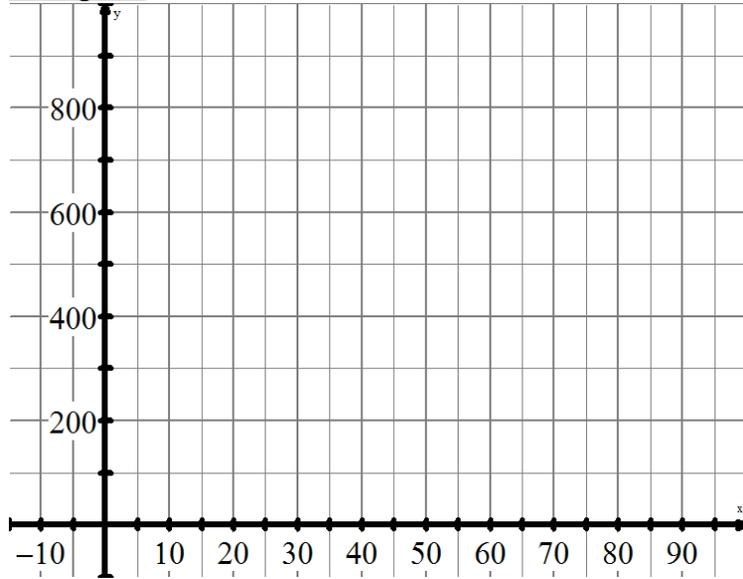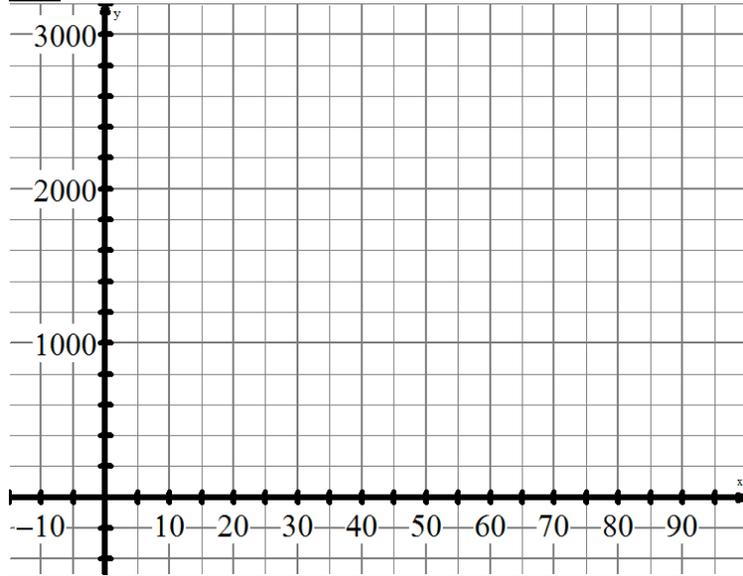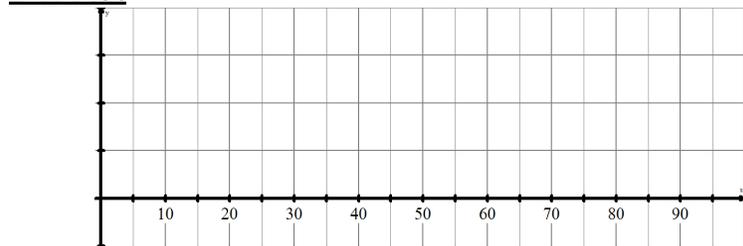
Quartiles

B-W Plot

Example #2 years of experience of doctors in city A hospitals

years of experience	Frequency
0 - 5	1400
5 - 10	1750
10 - 15	1150
15 - 20	800
20 - 25	400
25 - 30	200
30 - 35	120
35 - 40	80
40 - 45	50
45 - 50	30
50 - 70	20

Histogram

Mean and Median Estimates:

CFG
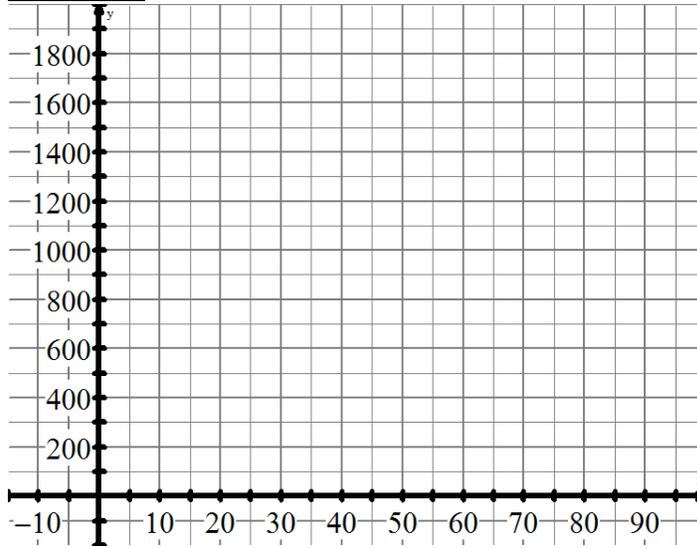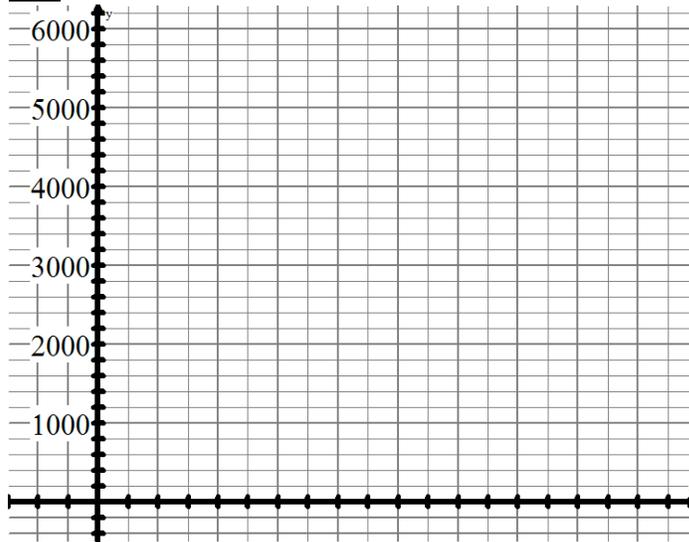
Quartiles

B-W Plot
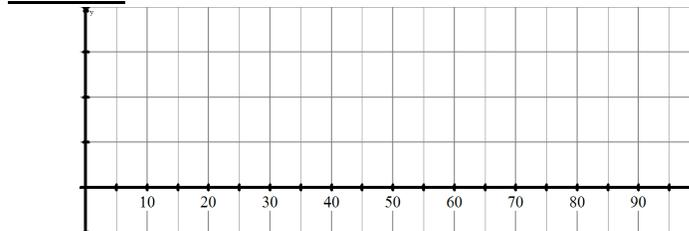
(E) Example #3 years of experience of doctors in city B hospitals

years of experience of
doctors in city B hospitals

| Years	Frequency
0 - 5	250
5 - 10	600
10 - 15	1100
15 - 20	1800
20 - 25	1200
25 - 30	800
30 - 35	180
35 - 40	50
40 - 45	20
45 - 50	0
50 - 70	0

Histogram

Mean and Median Estimates:

CFG
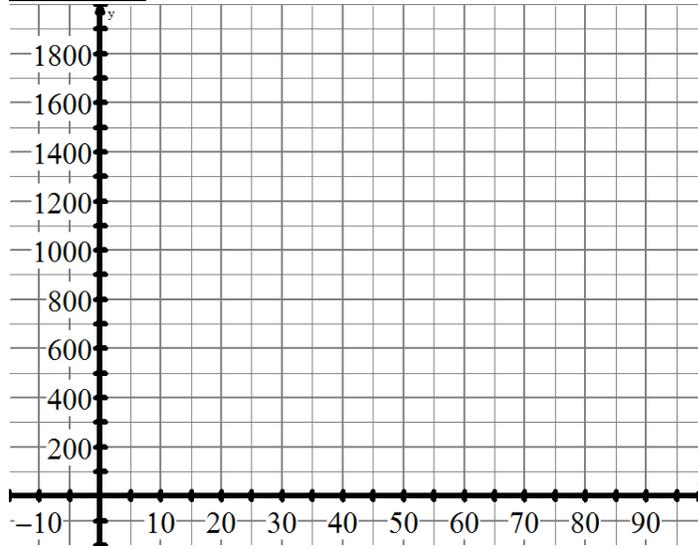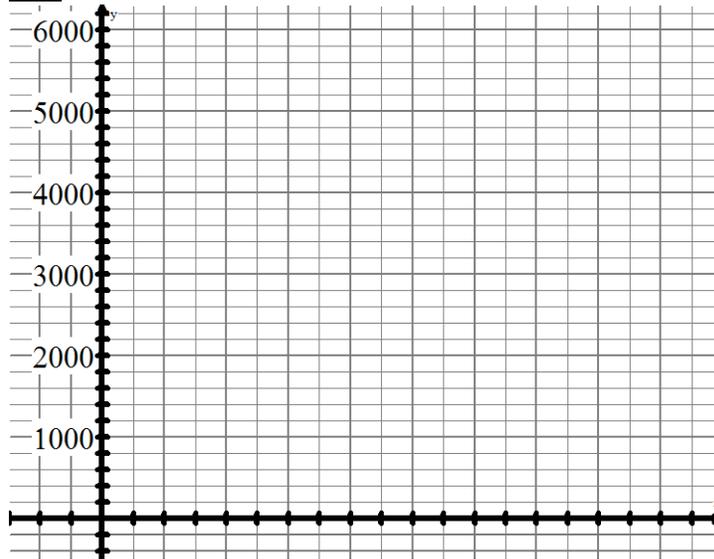
Quartiles

B-W Plot
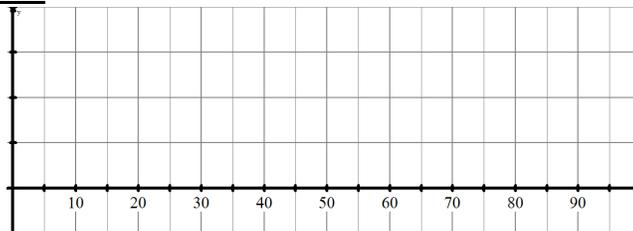
Example #4 Number of Research Papers published

Number of Research Papers published	Frequency
0 - 3	10
3 - 6	30
6 - 9	40
9 - 12	75
12 - 15	150
15 - 18	225
18 - 21	500
21 - 24	600
24 - 27	270
27 - 30	100

Histogram

Mean and Median Estimates:

CFG
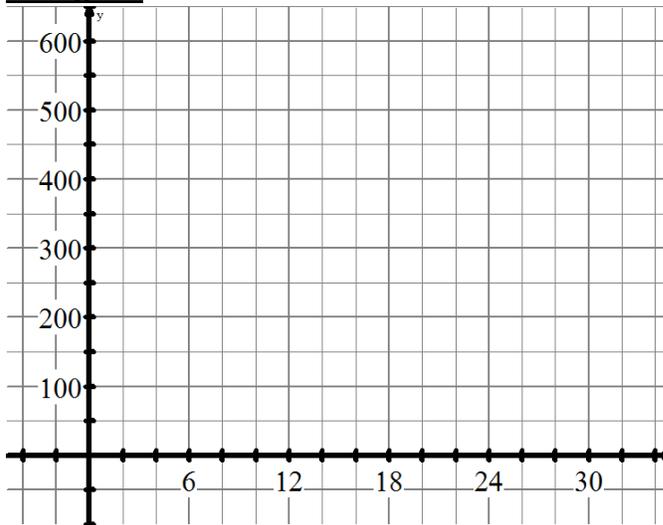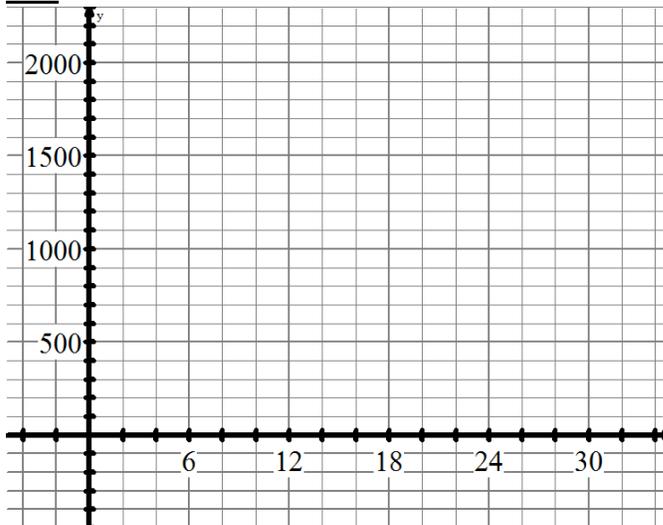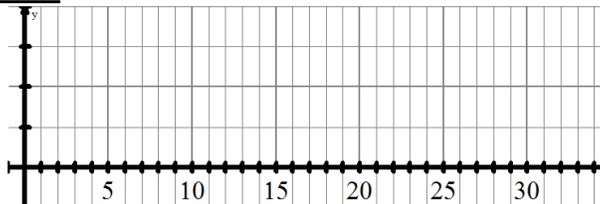
Quartiles

B-W Plot

(F) **Example #5 -** Ages of Teaching Faculty in U of T

Ages of Teaching Faculty in U of T	
Ages	Frequency
25 - 30	25
30 - 35	50
35 - 40	90
40 - 45	120
45 - 50	210
55 - 60	220
60 - 65	135
65 - 70	90
70 - 75	40
75 - 80	20

Histogram

Mean and Median Estimates:

CFG
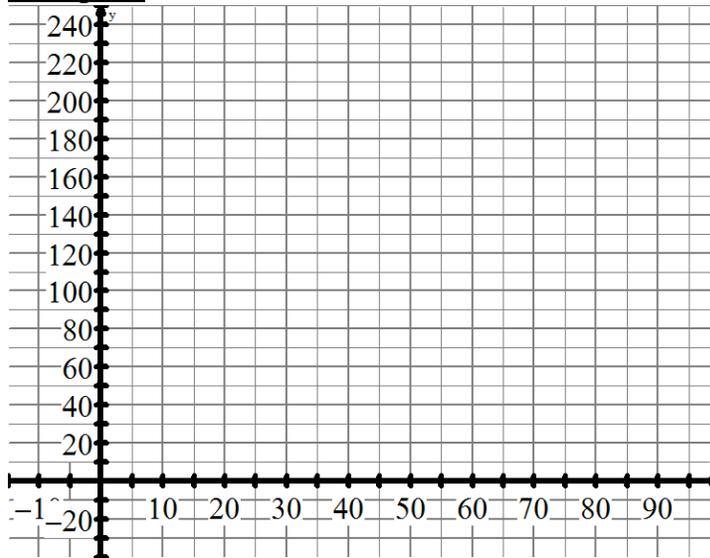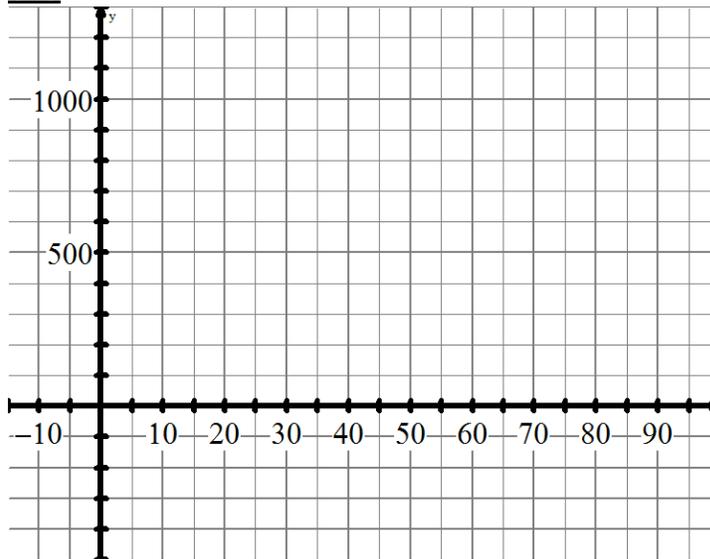
Quartiles

B-W Plot
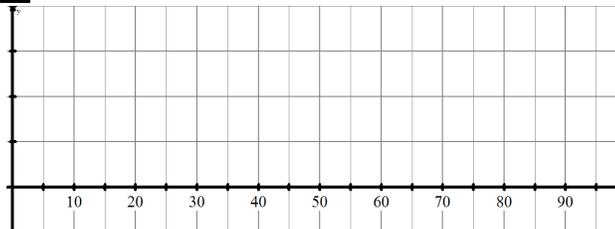
Name: _____   Date: _____

The 5 Number Summary
Algebra 1

After understanding the central tendency of a data set, it is important to understand how the rest of the data set is **distributed**. We can do this by looking at numbers that divide the data set into quarters – known as the **quartiles.**

Exercise #1: Shown below are the scores 16 students received on a math quiz.

$$52, 60, 66, 66, 68, 72, 72, 73, 74, 75, 80, 82, 84, 91, 92, 98$$

(a) What is the median of this data set?

(b) Find the **range** of the data set (defined as the difference between the largest data value and the smallest data value).

(c) What is the median of the lower half of this data set (known as the **first quartile**, Q_1)?

(d) What is the median of the upper half of this data set (known as the **third quartile**, Q_3)?

Exercise #2: What would be an appropriate name, in terms of quartiles, for the median? Explain.

The first and third quartiles are sometimes known as the lower and upper quartiles, respectively. The quartiles, the median, and the lowest and highest values in a data set comprise what is known as the **five number summary** and can be graphically represented on a **box-and-whisker plot.**

Exercise #3: Using the same data set construct a box-and-whisker plot on the number line given below.

Exercise #4: The ages of the 15 employees of the Cool Curry House are given below.

$$16, 17, 17, 18, 19, 22, 25, 26, 29, 33, 33, 37, 40, 42, 44$$

(a) Determine the median and quartile values for this data set.

(b) Create a box-and-whiskers diagram below.

Exercise #5: Twenty of Mr. Greco's physics students recently took a quiz. The results of this quiz are shown in the following box-and-whiskers diagram. Assume that all scores are whole numbers.
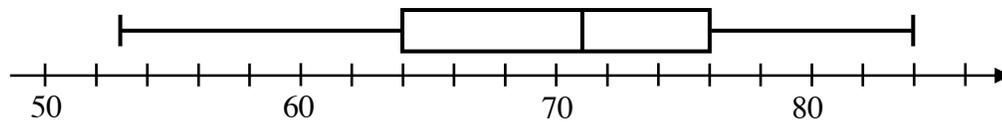
(a) What was the median score on Mr. Greco's math quiz?

(b) What was the range of the scores on Mr. Greco's math quiz?

(c) What score was greater than or equal to 75% of all other scores on this quiz?

(d) Mr. Greco regularly sets the passing grade on his quizzes to be the score of the lower quartile. What is the passing grade on this quiz?

Exercise #6: Which of the following box-and-whiskers diagram shows a data set with the greatest median?

(1)

(3)

(2)

(4)
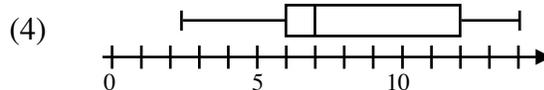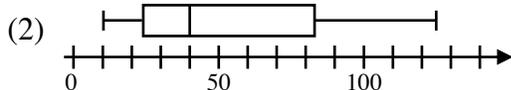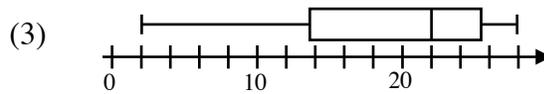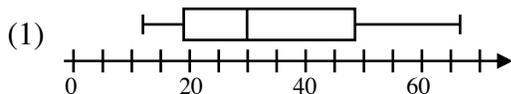
Name: _____   Date: _____

The 5 Number Summary
Algebra 1 Homework

Skills

1. Which of the following data sets, given in ascending order, has the greatest range?

   (1) $\{3, 4, 7, 10, 18\}$ (3) $\{-2, 5, 8, 11, 26\}$

   (2) $\{65, 66, 70, 72\}$ (4) $\{-5, -2, 4, 7, 10\}$

2. Given the box-and-whiskers diagram shown below, which of the following represents the third quartile value for this data set?

   (1) 12   (3) 6

   (2) 18   (4) 19
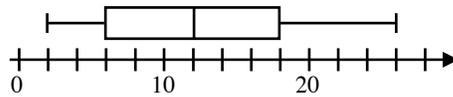
3. Given the box-and-whiskers diagram shown below, which of the following represents the range of this data set?

   (1) 110   (3) 60

   (2) 40   (4) 75
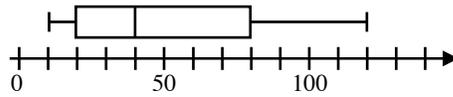
4. According to the following box-and-whiskers diagram, which of the following values represents the lower quartile of this data set?

   (1) 20   (3) 28

   (2) 13   (4) 16
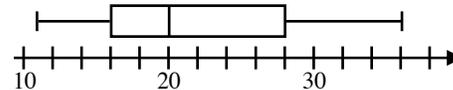
5. Which of the following box-and-whiskers diagram represents a data set whose median value is equal to 65?

   (1)

   (3)

   (2)

   (4)
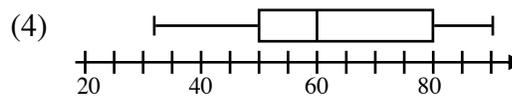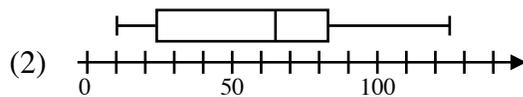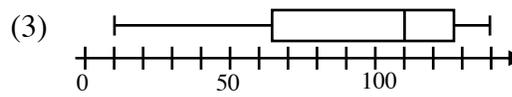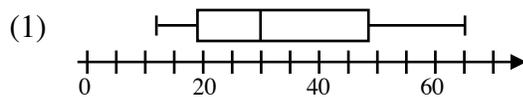
Applications

6. The ages of 12 fast-food workers are given in the data set below.

$$17, 18, 18, 19, 20, 21, 22, 23, 25, 25, 34, 47$$

(a) Calculate the five number summary. Label each of the five numbers with what they represents (i.e. min, max, lower quartile, etc.).

(b) Create a box-and-whiskers diagram of this data set below.
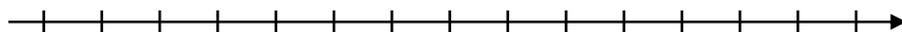
7. Mr. Daly gives a math test and records the grades of his 17 students as follows:

$$67, 72, 74, 74, 78, 80, 80, 82, 85, 85, 86, 87, 90, 92, 92, 95, 98$$

Create a box-and-whisker diagram of this data set below.

8. The speeds, in miles per hour, of 24 cars on a particular road are recorded and represented on the box-and-whiskers diagram shown below. Answer each of the following questions based on this diagram.

(a) What is the range of this data set?
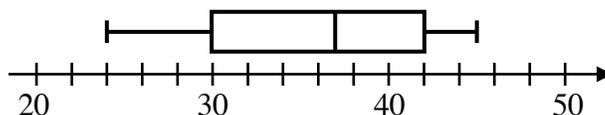
(b) What is the maximum speed of the 24 drivers?

(c) How many drivers drove between 30 and 42 miles per hour?

(d) If the speed limit on this part of the road is 35 miles per hour, are more people speeding or are more people going below the speed limit? Justify.

Name: _____   Date: _____

Cumulative Frequency Histograms
Algebra 1

Exercise #1: Arlington High School gave a final exam to all students taking Zoology. The total number of students taking this examination was 180. The test grades for these students were grouped into a table below.

Interval (Test Scores)	Frequency
51 - 60	15
61 - 70	30
71 - 80	55
81 - 90	50
91 - 100	30

(a) How many students scored "60 or less" on the test?

(b) How many students scored "70 or less" on the test?

(c) How many students scored "80 or less" on the test?

(d) How many students scored "90 or less" on the test?

(e) How many students scored "100 or less" on the test?

The answers to the above questions are found by adding the "frequencies" from the intervals in the table above. The histogram that displays these "accumulated" results is called a **cumulative frequency histogram**.

Exercise #2: Fill in the cumulative frequency table given the frequency table below.

Interval (Test Scores)	Frequency
51 - 60	15
61 - 70	30
71 - 80	55
81 - 90	50
91 - 100	30

| Interval (Test Scores)	Cumulative Frequency
51 - 60	
51 - 70	
51 - 80	
51 - 90	
51 - 100	

Exercise #3: What must the last entry of the cumulative frequency table always be equal to? Explain.

Exercise #4: The table below lists the heights of students, in inches, in Mr. Munson's 2nd period class.

Interval (Student Heights)	Frequency
50 - 54	1
55 - 59	3
60 - 64	8
65 - 69	12
70 - 74	4

Interval (Student Heights)	Cumulative Frequency
50-54	
50-59	
50-64	
50-69	
50-74	

(a) Fill in the cumulative frequency table above.

(b) Construct a cumulative frequency histogram for this data set.
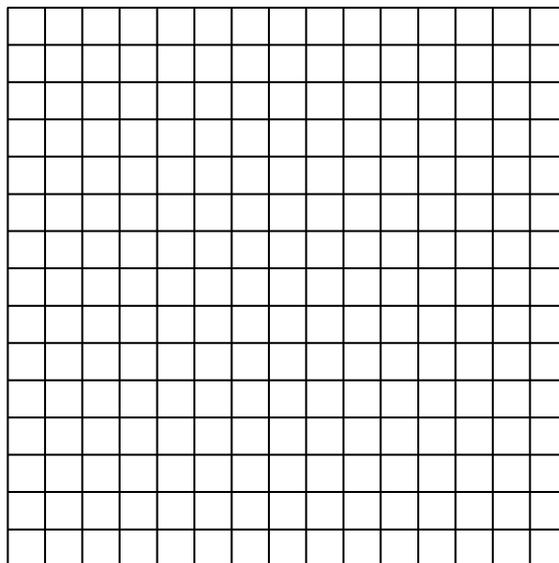
Exercise #5: A cumulative frequency table is given for the scores received on an Algebra 1 quiz.

(a) How many students took the quiz?

(b) Students receive an A if they earned a 90% or better on the quiz. How many students received an A? Show how you arrive at your answer.

Score Interval	Cumulative Frequency
60 to 69	3
60 to 79	8
60 to 89	20
60 to 99	29

Name: _____   Date: _____

Cumulative Frequency Histograms
# Algebra 1 Homework

Applications

1. In the table below, the heights of 24 Varsity and Junior Varsity basketball players are given.

Heights (# of inches)	Frequency
71	1
72	2
73	3
74	6
75	8
76	2
77	2

Heights (# of inches)	Cumulative Frequency
71	
71 - 72	
71 - 73	
71 - 74	
71 - 75	
71 - 76	
71 - 77	

(a) Complete the cumulative frequency table above.

(b) What height represents the lower quartile?   (c) What height represents the upper quartile?

(d) Construct a cumulative frequency histogram on the grid below. Carefully label your axes.
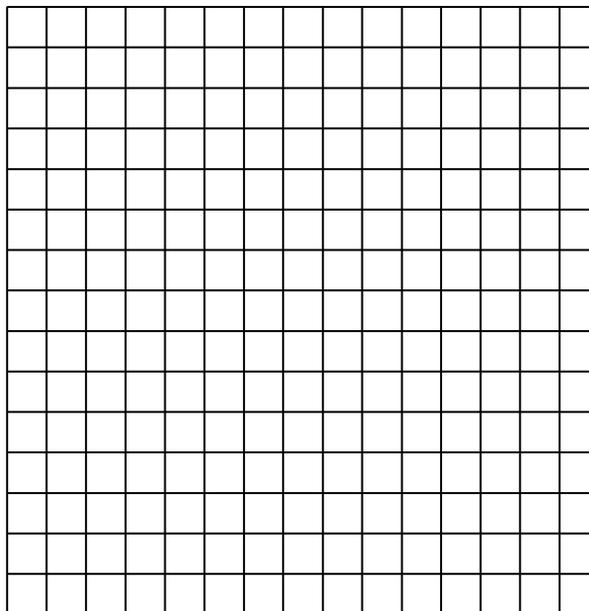
2. Traffic safety engineers sampled 80 speeds of cars driving along a road with a speed limit of 40 mph. Their results are given in the table below.

Speed Interval (mph)	Frequency (no. of cars)
25 to 29	5
30 to 34	12
35 to 39	25
40 to 44	21
45 to 49	8
50 to 54	4

Speed Interval (mph)	Cumulative Frequency (no. of cars)
25 to 29	
25 to 34	
25 to 39	
25 to 44	
25 to 49	
25 to 54	

(a) Fill out the cumulative frequency table above.

(b) What percent of drivers were traveling below the speed limit?

(c) Construct a cumulative frequency histogram on the grid to the right.
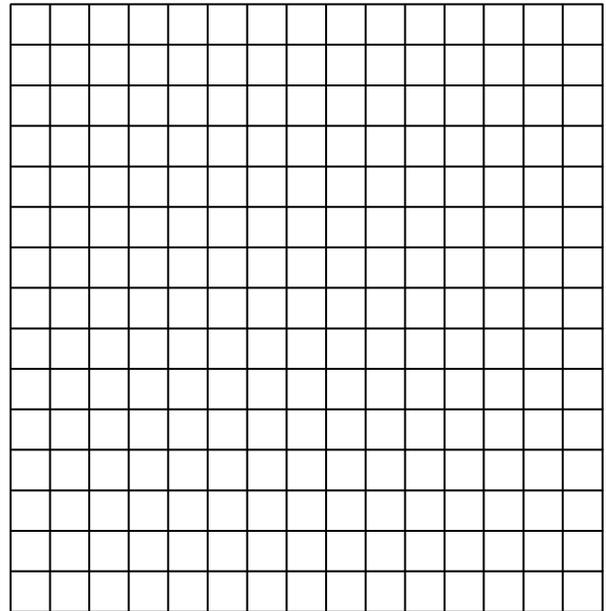
3. A survey of gasoline prices at New York gas stations showed the cumulative distribution below.

(a) How many gasoline stations were surveyed?

(b) How many gasoline stations are charging more than $3.19 per gallon? Show how your arrived at your answer.

Gas Price Interval (In dollars per gallon)	Cumulative Frequency
2.90 to 2.99	3
2.90 to 3.09	5
2.90 to 3.19	15
2.90 to 3.29	22
2.90 to 3.39	32

(c) What percent of gasoline stations charged less than $3.10 per gallon?