

SCSS Advanced Lesson Planning

Grade Level: 6th Grade Subject: Mathematics

<u>Day</u>	<u>Standard</u>	<u>Activity/Assignment</u>	<u>Instructions</u>	<u>Additional Resources/Information</u>
31	6.SP.4	Dot Plots	Read over Lesson 6.4 Dot Plots on pages 122-123. Complete #1-7 on pages 124-125.	
32	6.NS.7a	Comparing and Ordering Rational Numbers	Read over Lesson 3.5 Comparing and Ordering Rational Numbers on pages 74-76. Choose 10 problems to complete on page 76. Show your work on a separate sheet of paper.	
33	6.NS.6c	Plotting Coordinates on a Map	Read over Lesson 4.5 Plotting Coordinates on a Map on pages 92-93. Complete #1-10 on pages 93-94.	
34	6.SP.5	Measures of Central Tendency	Read over Lesson 5.3 Measures of Central Tendency on pages 106-107. Choose THREE problems from each of the following sections to complete (9 problems total): #1-5 #6-10 #11-15 Show your work on a seperate sheet of paper.	
35	6.SP.4	Histograms	Read over Lesson 6.2 Histograms on pages 117-119. Complete #1-2 on page 119.	

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36	6.EE.2a	Translating Expressions	Read over Lesson 7.6 Translating Expressions on page 140. Choose 10 problems to complete on page 141.	
37	6.EE.8	Writing Inequalities	Read over Lesson 8.8 Writing Inequalities on pages 167-168. Complete #1-10 on page 168.	
38	6.EE.8	Solving Inequalities	Read over Lesson 8.9 Solving Inequalities on pages 168-170. Choose 12 problems to complete on page 171.	
39	6.NS.1	Multiplying Fractions	Read over Lesson 1.6 Multiplying Fractions on page 29. Choose 12 problems to complete on page 30.	
40	6.EE.2c	Evaluate Expressions	Read over Lesson 7.7 Evaluate Expressions on page 141. Choose 12 problems to complete on page 142 (Choose from #1-24).	

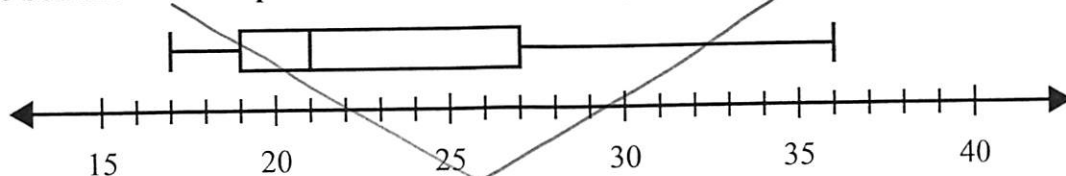
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41	6.NS.5	Integers	Read over Lesson 3.1 Integers on page 67. Complete #1-12 on page 68.	
42	6.NS.7a	Graphing Rational Numbers on a Number Line	Read over Lesson 3.4 Graphing Rational Numbers on a Number Line on pages 70-72. Complete #1-10 on page 73.	
43	6.EE.9	Independent and Dependent Variables	Read over Lesson 8.5 Independent and Dependent Variables on pages 159-160. Complete #1-8 on page 160.	
44	6.EE.9	Equations and Tables	Read over Lesson 8.6 Equations and Tables on page 161. Complete #1-4 on page 162.	
45	6.SP.4	Stem and Leaf Plots	Read over Lesson 6.5 Stem and Leaf Plots on pages 125-127. Complete #1-4 on page 128.	

Activity

Use the box and whisker plot to answer the following questions. (DOK 2)



1. What is the median of the data set? _____
2. What is the maximum of the data set? _____
3. What is the minimum of the data set? _____
4. What is the Q3 of the data set? _____
5. What is the Q1 of the data set? _____
6. What is the IQR of the data set? _____
7. What is the range of the data set? _____

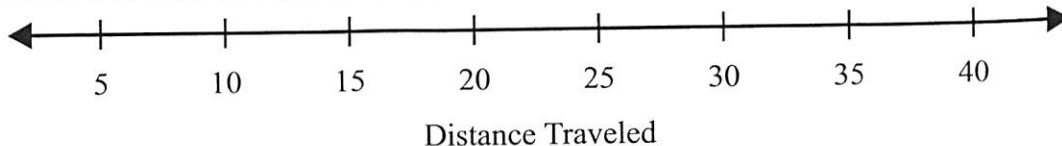
*** 6.4 Dot Plots ***

A **dot plot**, sometimes called a line plot, is another way of displaying a data set. It uses the frequencies of each entry of a data set to describe a certain category.

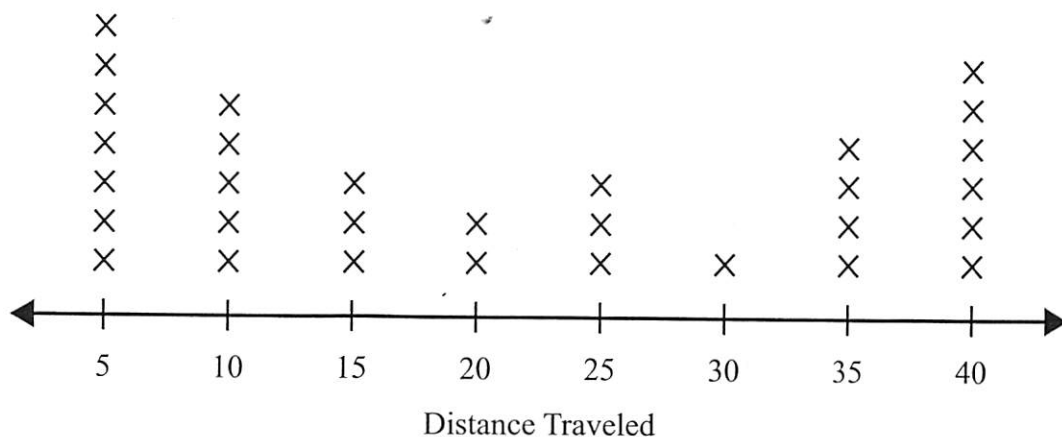
Example 1: The frequency table below displays the number of weekly miles that an individual travels one way to work. Use the frequency table to construct a dot plot.

Distance in Miles	Frequency
5	7
10	5
15	3
20	2
25	3
30	1
35	4
40	6

Step 1: Draw a number line from 5 to 40.



Step 2: Draw an equal number of marks as frequency for each distance traveled.



Step 3: Interpret the dot plot by finding the minimum and maximum.

The minimum is described by the shortest distance traveled one way to work. So the minimum for this data set is 5 miles.

The maximum is described by the longest distance traveled one way to work. So the maximum for this data set is 40 miles.

Step 4: Interpret the data by finding the Q1, median, and Q3. To do so, list the data from least to greatest.

5 5 5 5 5 5 10 10 10
 10 10 15 15 15 20 20
 25 25 25 30 35 35 35
 35 40 40 40 40 40 40

Step 5: The median is the middle number in the data set.

5 5 5 5 5 5 10 10 10
 10 10 15 15 15 **20** 20
 25 25 25 30 35 35 35
 35 40 40 40 40 40 40

The median is 20.

Step 6: Q1 and Q3 are the medians of the lower and upper half.

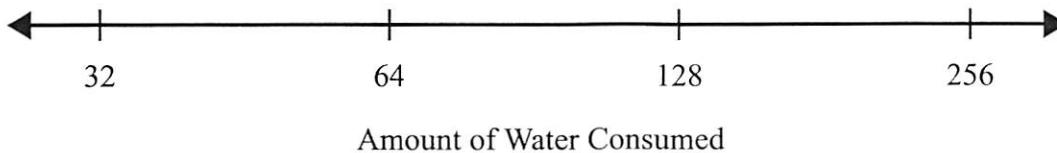
5 5 5 5 5 5 **10** 10 10 10 10 15 15 15
 20 25 25 25 30 35 35 **35** 35 40 40 40 40 40 40
 Q1 is 10, and Q3 is 35.

Activity

Given the frequency table, construct a dot plot. (DOK 2)

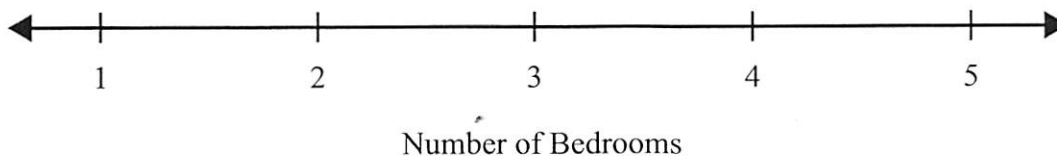
1. The frequency table below describes the amount of water (in fluid ounces) consumed by a certain number of individuals. Use the table of data to create a dot plot on the number line below.

Amount of Water Consumed (fl oz)	Frequency
32	8
64	15
128	9
256	1

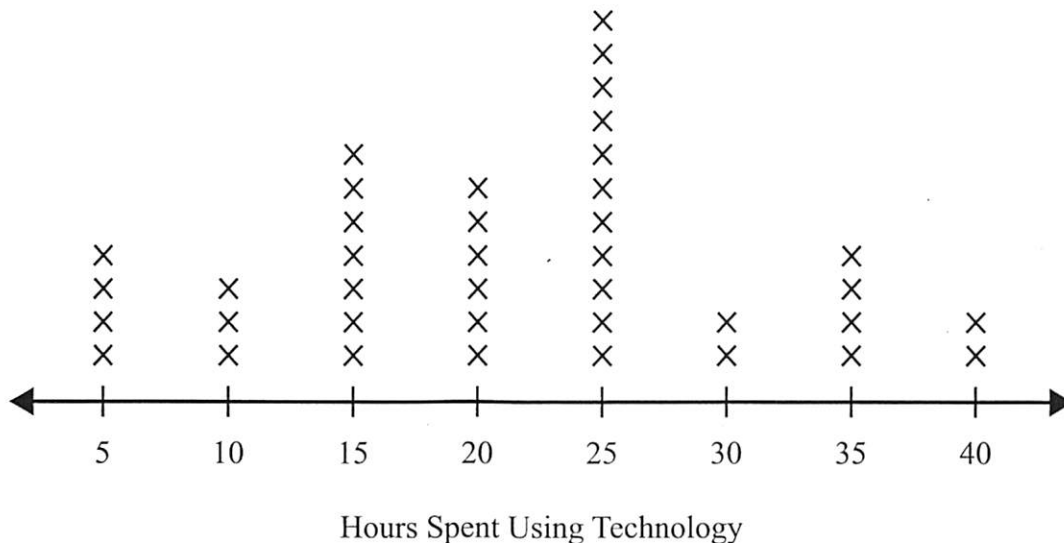


2. The frequency table below describes the number of bedrooms in an individual's house. Use the table of data to create a dot plot on the number line below.

Number of Bedrooms	Frequency
1	6
2	8
3	5
4	3
5	2



The dot plot below describes the weekly hours that an individual spends using technology. Use the dot plot to answer questions 3–7. (DOK 2)



3. What is the minimum amount of hours spent using technology per week? _____
4. What is the maximum amount of hours spent using technology per week? _____
5. What is the most popular amount of time spent using technology per week? _____
6. What is the median amount of hours spent using technology per week? _____
7. How many people spend between 15 and 25 hours using technology per week? _____

6.5 Stem-and-Leaf Plots

Another way to show data is to construct a stem-and-leaf plot. A **stem-and-leaf plot** is used to show the shape and distribution of a data set.

Example 1: The data set below describes the exam scores from Mr. Bailey’s math class. Construct a stem-and-leaf plot.

88 84 86 88 82 76 70 92 96 88 98 96

Step 1: List the data from least to greatest.
70 76 82 84 86 88 88 88 92 96
96 98

Step 2: Since the data set contains only two-digit numbers, group the data by the digit in the tens column.
70 76
82 84 86 88 88 88
92 96 96 98

3.5 Comparing and Ordering Rational Numbers

To compare the values of integers, fractions, and decimals, use the greater than ($>$), less than ($<$), and equal to ($=$) signs.

Example 1: Compare the integers -9 and -14 .
Determine which number is closer to zero.
The closer a negative number is to zero, the greater it is. Since -9 is closer to zero than -14 , $-9 > -14$.

Example 2: Compare the fractions $\frac{4}{5}$ and $\frac{7}{10}$.

Step 1: Check the denominators (bottom numbers of the fractions). If the denominators are different, find a common denominator by finding the LCM. The LCM in this case is 10. Since already $\frac{7}{10}$ has the proper denominator, convert only $\frac{4}{5}$.

$$\begin{array}{ccc} & \xrightarrow{\quad} & \\ \frac{4}{5} & \begin{array}{c} \times 2 \\ \hline \times 2 \end{array} & \frac{8}{10} \end{array}$$

Step 2: Now that the denominators are the same, compare the numerators.

$$\frac{8}{10} \boxed{?} \frac{7}{10}$$

Step 3: Since 8 is greater than 7, we use the $>$ sign.

$$\frac{8}{10} > \frac{7}{10}$$

Example 3: Compare the decimals 89.31 and 89.24 .

Step 1: Compare the whole number portion of each decimal. Since both decimals have a whole number portion equal to 89, move to the decimal portion.

Step 2: Reading from left to right, compare each decimal place. Start with the tenths place.

$$89.31 \qquad 89.24$$

Since $3 > 2$, $89.31 > 89.24$. You would continue to compare the decimal places until one digit was larger than the other and then choose the appropriate sign.

Example 4: Compare 5 and $\frac{4}{7}$.

When comparing a positive integer and a positive proper fraction, the integer is always greater than the fraction. The opposite is true if both are negative. If one is negative and one is positive, the positive number is greater.

Both positive: $5 > \frac{4}{7}$

Both negative: $-5 < -\frac{4}{7}$

One positive, one negative: $-5 < \frac{4}{7}$

Example 5: Compare 5.468 and 5.

Step 1: Compare the whole number portion of each number. Since both have a whole number portion equal to 5, move to the decimal portion.

Step 2: Rewrite both numbers so that they have an equal amount of digits to the right of the decimal point. Reading from left to right, compare each decimal place. Start with the tenths place.

$$5.468 \quad 5.000$$

$$\text{Since } 4 > 0, 5.468 > 5.$$

Example 6: Compare $\frac{5}{8}$ and 0.626.

Step 1: Convert the fraction into a decimal.

$$\frac{5}{8} = 0.625$$

Step 2: Compare the whole number portion of each decimal. Since both are equal to 0, move to the decimal portion.

Step 3: Compare the digits in the tenths place.

$$0.625 \quad 0.626$$

Since they are equal, move to the hundredths place.

$$0.625 \quad 0.626$$

Since they are equal, move to the thousandths place.

$$0.625 \quad 0.626$$

Answer: Since $5 < 6$, $0.625 < 0.626$.

To order more than 2 integers, fractions, or decimals, use the strategies described in the examples below.

Example 7: Order the following decimals from greatest to least.
0.3, 0.029, 0.208, 0.34

Step 1: Arrange the numbers with the decimal points directly under each other.

$$0.3$$

$$0.029$$

$$0.208$$

$$0.34$$

Step 2: Fill in empty place values with zeros so that each decimal number has the same number of digits after the decimal points.

$$0.300$$

$$0.029 \leftarrow \text{Smallest}$$

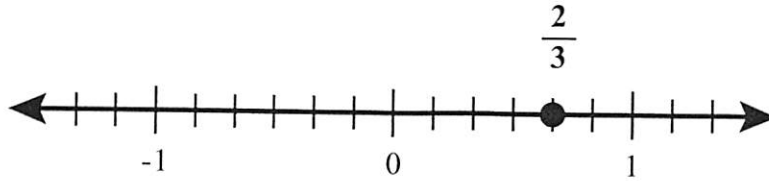
$$0.208$$

$$0.340 \leftarrow \text{Largest}$$

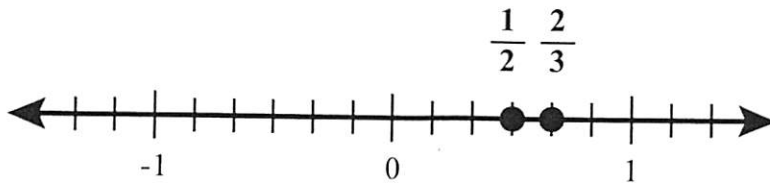
Answer: 0.34, 0.3, 0.208, 0.029

Example 8: Plot $\frac{2}{3}$ and $\frac{1}{2}$ on the number line. Then, decide which number is larger.

Step 1: Plot $\frac{2}{3}$ on the number line.



Step 2: Plot $\frac{1}{2}$ on the number line.



Answer: Since $\frac{2}{3}$ is to the right of $\frac{1}{2}$, $\frac{2}{3}$ is greater than $\frac{1}{2}$. That is, $\frac{2}{3} > \frac{1}{2}$.

Activity

Compare the rational numbers by writing $>$, $<$ or $=$. (DOK 2)

1. $-1 \square -\frac{1}{3}$

9. $-4 \square 3\frac{1}{2}$

17. $\frac{8}{9} \square \frac{2}{3}$

2. $|-18| \square 18.235$

10. $0.4670 \square 0.467$

18. $-\frac{5}{6} \square -\frac{1}{6}$

3. $-5 \square -50$

11. $\frac{4}{6} \square \frac{7}{12}$

19. $-\left|\frac{1}{2}\right| \square \left|-\frac{1}{3}\right|$

4. $-47 \square -47\frac{1}{2}$

12. $-\frac{5}{8} \square -1$

20. $-62 \square -61$

5. $0.56 \square 1.06$

13. $990.235 \square 990.242$

21. $12.35 \square 11.101$

6. $\left|-\frac{10}{9}\right| \square \left|-\frac{9}{10}\right|$

14. $-|7| \square -|18|$

22. $\frac{4}{7} \square \frac{5}{7}$

7. $1.34 \square 1.31$

15. $-\frac{3}{4} \square -\frac{1}{3}$

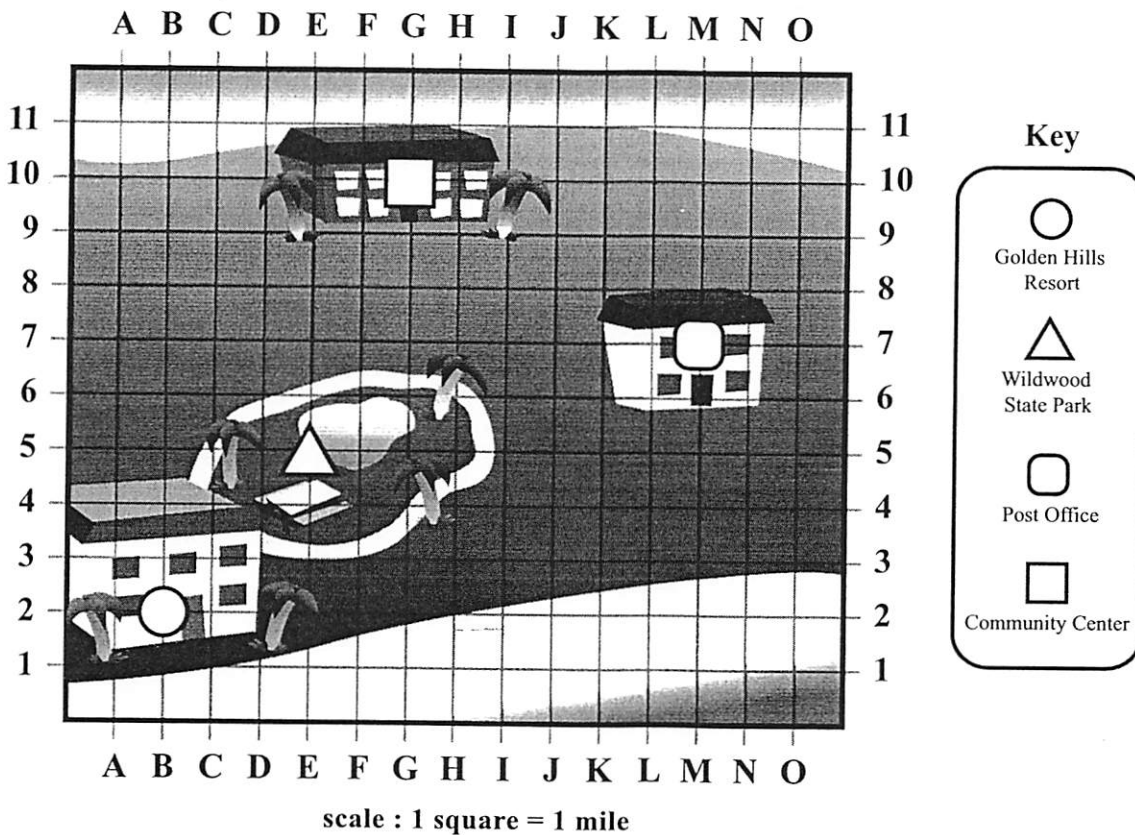
8. $-\frac{9}{10} \square -\frac{2}{5}$

16. $0.203 \square 0.230$

4.5 Plotting Coordinates on a Map

Coordinate planes can also be thought of as maps. Maps use ordered pairs of letters and numbers to show the location of different things, such as cities or parks. Sometimes maps have a scale that defines the distance represented by each square unit. For example, 1 square unit on a map could represent 1 square mile in a city. A compass can also be included in order to show direction. If direction is not specified, it is assumed that up represents north, right represents east, down represents south, and left represents west. Read through the examples to see how to use maps. Note, when identifying an ordered pair on a map, the order of the pair does not matter. For example, (1, A) and (A, 1) are describing the same location.

Example 1: Find a route from Golden Hills Resort to Wildwood State Park, to the post office, to the community center, and then back to the resort. Include the number of miles traveled and direction.

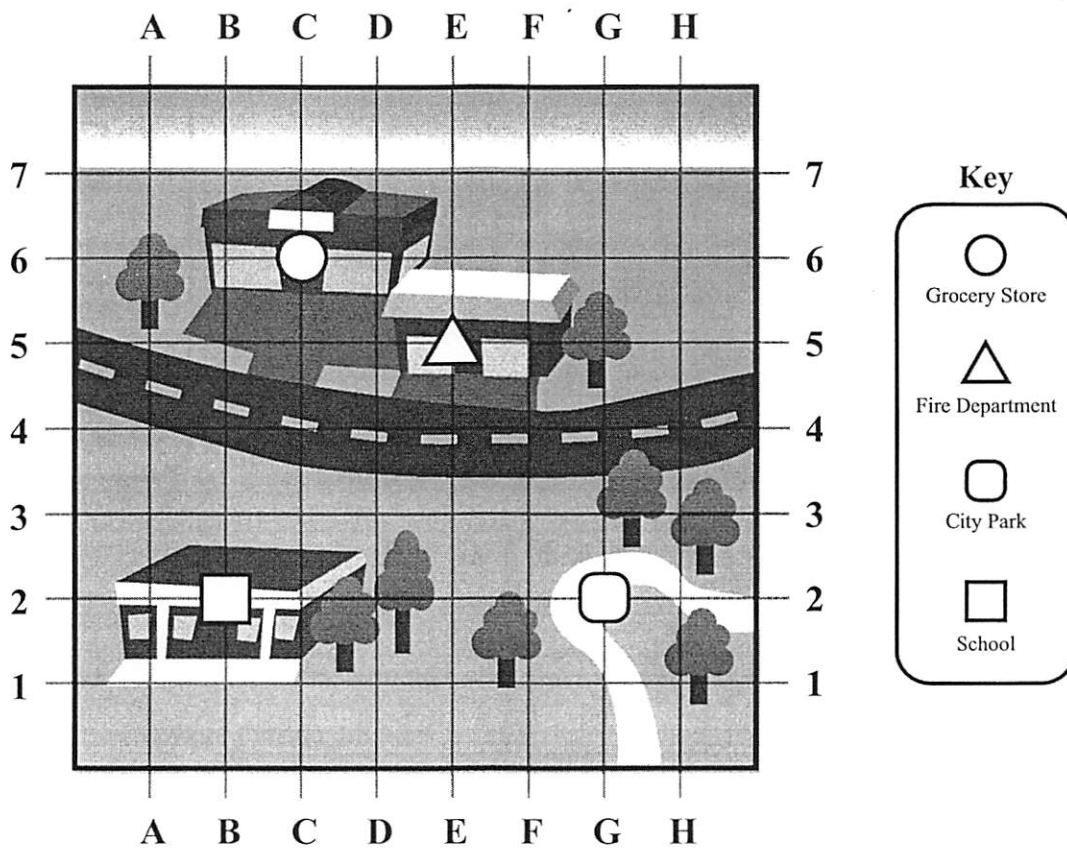


- Step 1:** Start at Golden Hills Resort, location (B, 2).
- Step 2:** Travel 3 miles east (3 squares right) and 3 miles north (3 squares up) to arrive at Wildwood State Park, location (E, 5).
- Step 3:** Travel 8 miles east (8 squares right) and 2 miles north (2 squares up) to arrive at the post office, location (M, 7).
- Step 4:** Travel 6 miles west (6 squares left) and 3 miles north (3 squares up) to arrive at the community center, location (G, 10).

- Step 5:** Travel 5 miles west (5 squares left) and 8 miles south (8 squares down) to arrive at Golden Hills Resort, location (B, 2).
 Note, there is more than one way to arrive at each destination.

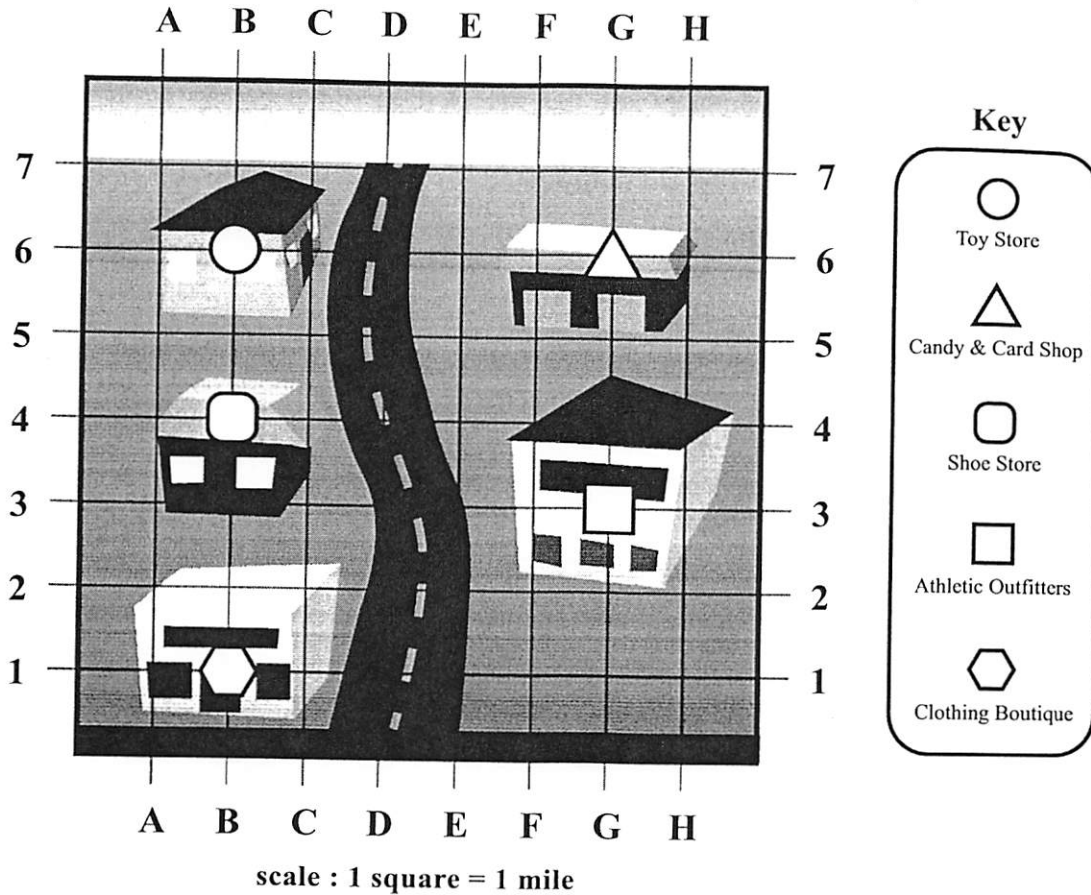
Activity

Use the map below to answer questions 1–5. (DOK 2)



1. The ordered pair of the city park is _____.
2. The ordered pair of the fire department is _____.
3. The grocery is _____ blocks north from the school.
4. The school is _____ blocks west from the city park.
5. Circle the correct answer.
The city park is north/south/east/west of the fire department.

Use the map below to answer questions 6–10. (DOK 2)



- | | |
|--|---|
| <p>6. The ordered pair of Athletic Outfitters is _____.</p> <p>7. The Candy & Card shop is _____ blocks east from the toy store.</p> <p>8. Circle the correct answer.
The shoe store is north/south/east/west of the clothing store.</p> | <p>9. The ordered pair of the toy store is _____.</p> <p>10. Circle the correct answer.
Athletic Outfitters is north/south/east/west of the shoe store.</p> |
|--|---|

4.6 The Coordinate Plane Enrichment

Identify the location of each point by circling the correct answer. (DOK 1)

- | | | | |
|---|--|--|---|
| <p>1. (2, -6)</p> <p>Quadrant I</p> <p>Quadrant II</p> <p>Quadrant III</p> <p>Quadrant IV</p> <p>x-axis</p> <p>y-axis</p> <p>Origin</p> | <p>2. (-7, 15)</p> <p>Quadrant I</p> <p>Quadrant II</p> <p>Quadrant III</p> <p>Quadrant IV</p> <p>x-axis</p> <p>y-axis</p> <p>Origin</p> | <p>3. (0, 0)</p> <p>Quadrant I</p> <p>Quadrant II</p> <p>Quadrant III</p> <p>Quadrant IV</p> <p>x-axis</p> <p>y-axis</p> <p>Origin</p> | <p>4. (-9, -24)</p> <p>Quadrant I</p> <p>Quadrant II</p> <p>Quadrant III</p> <p>Quadrant IV</p> <p>x-axis</p> <p>y-axis</p> <p>Origin</p> |
|---|--|--|---|

3. Bobby, a fast food restaurant owner, conducts a survey on American attitudes about fast food. He assigns everyone who comes to his restaurant a number. Bobby uses a random number generator to select 150 of them to take the survey.
4. A social scientist conducts a study on the length of time that last year's Baltimore County newlyweds dated before they married. She has the phone numbers of everyone who obtained a marriage license from Baltimore County courthouse last year, and she programs her computer to select at random 100 couples to call and survey.
5. Jake, a fast food restaurant owner, conducts a survey to determine how many of his customer's prefer fruit as a side item. He assigns everyone who comes to his restaurant a number. Bobby uses a random number generator to select 150 of them to take the survey.
6. Sally wants to predict who will be the next student body president at her school. She surveys all students who have 1st period lunch regarding their favorite candidate. She does not survey students who have 2nd period or 3rd period lunch.

For 7–8, use the survey data below to answer the questions.

The table below shows the number of students surveyed at Forrest High School that prefer to eat apples, bananas, oranges, and grapes over other fruits. 100 students were randomly selected for the survey.

	Apples	Bananas	Oranges	Grapes
Number of Students	24	32	16	28

7. If there are 1,000 students at Forrest High School, write a proportion that could be used to predict the number of students in the school who prefer apples.
8. Explain how to solve your proportion from #7 to estimate how many students in the school prefer apples. Use complete sentences and provide the final answer for the problem.

✱ 5.3 Measures of Central Tendency ✱

Mean, median, and mode are **measures of central tendency** that are used to describe data. The **mean** of a set of numbers is also known as the average of the set. To find the mean or average of a set of data, add the numbers on the list. Then, divide by the total number of items on the list.

Example 1: Find the mean of 98, 96, 96, 94, 92, 88, 82, 80, 76, 74, 74, 72, 68, 68, and 60.

Step 1: Add up all of the data.

$$98 + 96 + 96 + 94 + 92 + 88 + 82 + 80 + 76 + 74 + 74 + 72 + 68 + 68 + 60 = 1,218$$

Step 2: Divide the total by the number of items in the list. There are 15 items, so divide 1,218 by 15.

Answer: The mean is 81.2.

The **median** is the middle number when data is ordered from lowest to highest. To find the median, arrange the numbers in numerical order. If the list has an odd number of items, the median is the middle number. If the list has an even number of items, the median is the average of the two middle numbers.

Example 2: Find the median of 42, 35, 45, 37, and 41.

Step 1: Arrange the numbers in numerical order: 35 37 41 42 45

Step 2: Find the middle number. 35 37 41 42 45

Answer: The median is 41.

Example 3: Find the median of 14, 53, 42, 6, 14, and 46.

Step 1: Arrange the numbers in numerical order: 6 14 14 42 46 53.

Step 2: Find the average of the two middle numbers.

Answer: $(14 + 42) \div 2 = 28$. The median is 28.

The **mode** is the number that appears most often. To find the mode, count the number of times that each entry appears on the list. The one that appears most is the mode. If no number appears more than any other number, or if all numbers appear the same number of times, there is no mode.

Example 4: Find the mode.

88, 92, 85, 99, 85, 70, 85, 99, 100, 88, 70, 99, 88, 88, 99, 88, 92, 85, 88

Step 1: Find the number that occurs most often.

Answer: The mode is 88 because it is listed 6 times. No other number is listed as often.

Activity

Find the mean for each set. Round all answers to the nearest tenth. (DOK 1)

- | | |
|-----------------------------------|-------------------|
| 1. 65, 70, 80, 90, 95 | 4. 4, 5, 2, 4, 5 |
| 2. 16, 12, 8, 4, 0, 0, 10, 28, 14 | 5. 3, 6, 9, 2, 10 |
| 3. 5, 11, 7, 9, 3 | |

Find the median for each set. Round all answers to the nearest tenth. (DOK 1)

- | | | |
|----------------------------|---------------------------|--------------------------------|
| 6. 35, 55, 40, 30, and 45 | 8. 65, 42, 60, 46, and 90 | 10. 41, 25, 23, 14, 21, and 19 |
| 7. 7, 2, 3, 6, 5, 1, and 8 | 9. 5, 8, 10, 13, 1, and 8 | |

Find the mode in each of the following lists of numbers. (DOK 1)

- | | | |
|--------------------------------|----------------------------------|--------------------------------|
| 11. 48, 32, 56, 32, 56, 48, 56 | 13. 5, 4, 8, 3, 4, 2, 7, 8, 4, 2 | 15. 84, 22, 79, 22, 87, 22, 22 |
| 12. 12, 16, 54, 78, 16, 25, 20 | 14. 11, 9, 7, 11, 7, 5, 7, 7, 5 | |

Activity

Write each correct tally and frequency in the table provided. (DOK 2)

- Students were asked to read a 200-page book and record the time it took to do so. The table below shows the number of minutes it took each student to read the book.

Minutes to Read a 200-Page Book						
115	205	132	155	187	85	111
175	95	200	205	120	160	204
175	185	137	102	230	190	92
110	205	134	145	232	185	225
187	190	155	167	221	98	151

Interval	Tally	Frequency
60–89		
90–119		
120–149		
150–179		
180–209		
210–239		

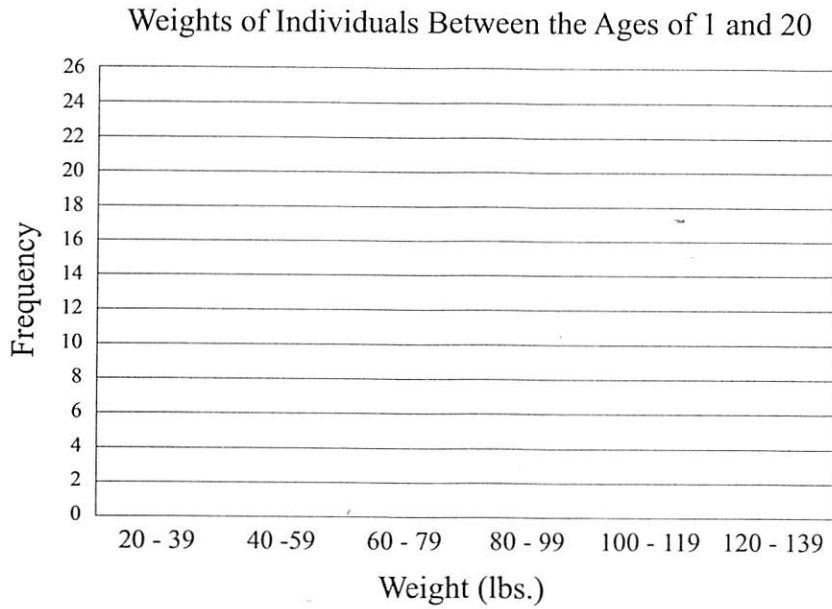
6.2 Histograms

A **histogram** is the graphical representation of a data set or frequency table. It looks like a bar graph except there are no spaces between the bars. The horizontal axis displays the chosen interval while the vertical axis displays the frequencies. Histograms can also be used to describe the **shape** of a data set. The shape of the graph makes it easier to see how spread out or clustered the data is. **Clustering** is when the majority of the data is located in one area.

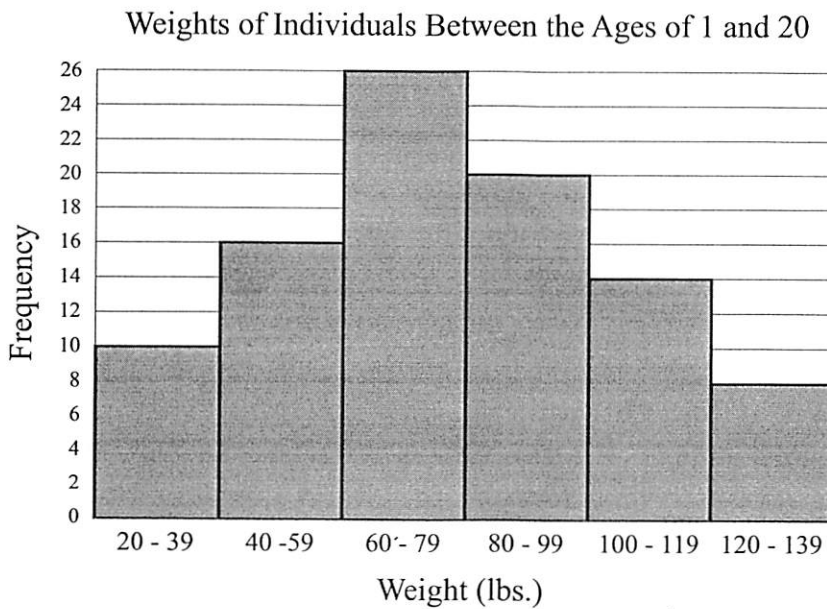
Example 1: The frequency table below describes the weights (in pounds) of individuals between the ages of 1 and 20. Use the frequency table to construct a histogram.

Weight (lbs.)	Frequency
20–39	10
40–59	16
60–79	26
80–99	20
100–119	14
120–139	8

Step 1: Draw and label the axes of the histogram. Since there are 6 intervals, create 6 sections for the intervals on the horizontal axis. Since 26 is the maximum frequency, label the horizontal axis from 0 to 26.



Step 2: Draw the bar for each interval. The height of the bar is given by the frequency.



Step 3: Interpret the histogram. Although the frequency table and the histogram display the same information, use only the histogram to interpret the data.

The histogram shows that 10 individuals from the sample weigh between 20 and 39 pounds; 16 individuals weigh between 40 and 59 pounds; 26 individuals weigh between 60 and 79 pounds; 20 individuals weigh between 80 and 99 pounds; 14 individuals weigh between 100 and 119 pounds; and 8 individuals weigh between 120 and 139 pounds. The individuals within the highest frequency weigh between 60 and 79 pounds. The individuals within the lowest frequency weigh between 120 and 139 pounds.

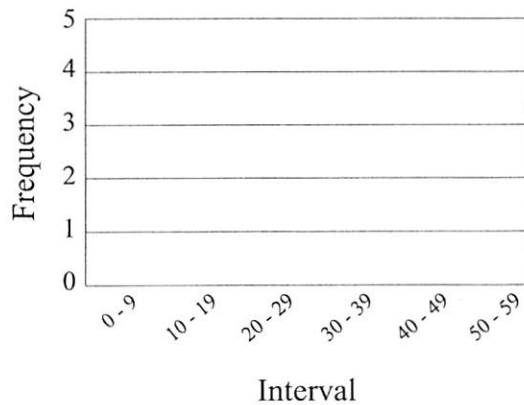
Notice that the majority of the data is in the middle of the graph. When this occurs, it forms a bell-shape. This type of distribution is often referred to as symmetric, or a bell-shaped curve.

Activity

Write each correct tally and frequency in the table provided. Then, create histogram that correctly describes the data set. (DOK 2)

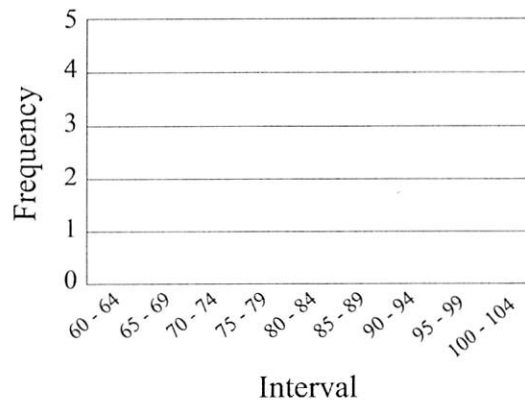
- 14 35 17 28 33
 32 7 34 25 36
 54 12 49 18 9

Interval	Tally	Frequency
0-9		
10-19		
20-29		
30-39		
40-49		
50-59		



- 70 64 63 92 73
 85 76 69 86 64
 94 71 101 74 60

Interval	Tally	Frequency
60-64		
65-69		
70-74		
75-79		
80-84		
85-89		
90-94		
95-99		
100-104		



Answer the following questions. (DOK 2)

15. When is $15 - 8x$ equivalent to $3x + 15$?
- The expressions are equivalent only when $x = 1$.
 - The expressions are equivalent only when $x = 0$.
 - The expressions are equivalent only when $x = 3$ and $x = 0$.
 - The expressions are equivalent only when $x = 6$.
16. When is $2x + 5$ equivalent to $3x - 1$?
- The expressions are equivalent only when $x = 5$.
 - The expressions are equivalent only when $x = 1$.
 - The expressions are equivalent only when $x = 2$ and $x = 4$.
 - The expressions are equivalent only when $x = 6$.

Simplify the following to find an equivalent expression. (DOK 1, 2)

17. $5q + 4(3 + 2q) + 7 =$ _____
18. $3y + 16x - y + 9(y + x) =$ _____
19. $x + x + y + y =$ _____
20. $17 + 2(4t - 3) + 1 =$ _____
21. $6x + 9 - x - 3 =$ _____
22. $2(5y - 3 + 2y) + 6 =$ _____
23. $12 - 15q + 8q =$ _____
24. $5 - 3x + (-2x) + 4 =$ _____
25. $11p + 19 - 4p - 8 + 13p =$ _____
26. $27y - 7 - 14y + 28 =$ _____

* 7.6 Translating Expressions *

Algebraic word problems can be used to describe and present solutions for real life situations. In order to solve a word problem, you must express the verbal ideas algebraically. Key words will help determine the operator or operators needed for the problem.

Operation/Operator	Key Words
Addition: +	increase, add, total, combine, more, more than, plus, more, sum, and
Subtraction: -	difference, subtract, decrease, minus, less, less than, lower than
Multiplication: ×	times, of, multiply, product, double, twice, triple
Division: ÷	divide, quotient, ratio
Exponents: a^x	squared, cubed, to the fourth power

Activity

Translate the verbal description into an algebraic expression. Use x for the variable.
(DOK 3)

1. A number less 4: _____
2. A number multiplied by 4: _____
3. A number raised to the power of 4: _____
4. A number divided by 4: _____
5. Four more than a number: _____
6. Five more guests than planned: _____
7. A number minus eight: _____
8. A number decreased by thirty-one: _____
9. The difference of a number and eighteen: _____
10. Eight dollars per hour: _____
11. The product of eight and a number raised to the third power: _____
12. Nine minus a number: _____
13. Eighty percent of a number: _____
14. A number divided by four: _____
15. Half of a number plus seven: _____

7.7 Evaluating Expressions

To evaluate an expression, substitute variables with specific number values.

Example 1: Evaluate the following expressions when $a = 10$. That is, substitute a with 10.

Expression	Substitute	Simplify
$a + 1$	$10 + 1$	11
$17 - a$	$17 - 10$	7
$9a$	$9(10)$	90
$\frac{30}{a}$	$\frac{30}{10}$	3
$5a + 6$	$5(10) + 6$	$50 + 6 = 56$
a^3	$(10)^3$	$10 \times 10 \times 10 = 1,000$

Example 2: Evaluate the following expressions when $x = 2$, $y = 4$, and $z = 5$.

Expression	Substitute	Simplify
$5xy + z$	$5(2)(4) + 5$	$5(8) + 5 = 40 + 5 = 45$
$xz^2 + 5$	$2(5^2) + 5$	$2(25) + 5 = 50 + 5 = 55$
$\frac{yz}{x}$	$\frac{(4)(5)}{2}$	$\frac{20}{2} = 10$

8.8 Writing Inequalities

An **inequality** is formed by placing $<$, $>$, \leq , or \geq between two expressions. The solution to an inequality will always result in a true statement. The inequality symbols put restrictions on variables. For example, the inequality $x > 6$ implies that x is any number bigger than 6, not including 6.

Symbol	Definition	Example	Translation
$<$	Less than; fewer than	$x < 2$	x is strictly less than 2
$>$	Greater than; more than	$x > 0$	x is strictly greater than 0
\leq	Less than or equal to; fewer than or equal to	$x \leq 9$	x is less than or equal to 9
\geq	Greater than or equal to; more than or equal to	$25 \geq x$	25 is greater than or equal to x

Additional examples:

- a) Five more than a number is less than or equal to 6. $5 + x \leq 6$
 b) Eight is less than a number. $8 < x$
 c) A number can be no more than 23. $x \leq 23$
 d) The difference of a number and 15 is at least 22. $x - 15 \geq 22$
 e) The product of 6 and a number is greater than 25. $6x > 25$

Example 1: Raquel has some extra money to spend on new clothes. She wants to spend no more than \$30 on tops (t) and at least \$55 on bottoms (b). The table below displays the prices for the clothes Raquel has picked out.

Item	Price
Blouse	\$22
Sweater	\$14
Skirt	\$15
Shorts	\$20
Pants	\$35

Step 1: Write the inequalities that describe how much money Raquel can spend on tops and pants.

$$\begin{aligned} \text{no more than \$30 on tops} &\Rightarrow t \leq 30 \\ \text{at least \$55 on bottoms} &\Rightarrow b \geq 55 \end{aligned}$$

Step 2: Based on the inequality in Step 1, will Raquel buy both of the tops that she picked out?

No, because the total cost of the tops is \$36. If we substitute $t = 36$ into the inequality, we get a false statement.

$$t \leq 30$$

$$36 \leq 30$$

Therefore, Raquel will either buy the blouse or the sweater, but not both.

Activity

Use the given equation to complete the table. Then, plot the ordered pairs on your own paper. (DOK 2)

1. $y = 1.5x$

x	y
0	
2	
4	
6	

6. $y = -7x$

x	y
-2	
-1	
1	
2	

2. $y = 4x$

x	y
-1	
0	
1	
2	

7. $y = -x$

x	y
-9	
-5	
7	
9	

3. $y = -3x$

x	y
-2	
-1	
1	
2	

8. $y = 0.5x$

x	y
-8	
-6	
8	
10	

4. $y = x$

x	y
-7	
-3	
5	
8	

9. $y = \frac{4}{5}x$

x	y
-10	
-5	
5	
10	

5. $y = 3x$

x	y
-1	
0	
1	
2	

10. $y = \frac{3}{4}x$

x	y
-4	
0	
4	
8	

Step 3: Based on the inequality in Step 1, will Raquel buy all three bottoms that she picked out?

Yes, because the total cost of the bottoms is \$70. If we substitute $b = 70$ into the inequality, we get a true statement.

$$b \geq 55$$

$$70 \geq 55$$

Therefore, Raquel will buy the skirt, shorts, and pants.

Activity

Identify the inequality that describes each statement. Complete the inequality by writing $<$, $>$, \leq , or \geq . (DOK 2)

- Seventeen is greater than q .
 $17 \square q$
- There are no more than 30 kids, k , in the classroom.
 $k \square 30$
- The sum of r and 12 is greater than or equal to 15.
 $r + 12 \square 15$
- Fourteen more than v is less than or equal to 28.
 $14 + v \square 28$
- Sarah saw at least 15 different animals, a , at the zoo.
 $a \square 15$
- Grant sold fewer than 20 items, i , at his garage sale.
 $i \square 20$
- Eight is less than the product of s and 19.
 $8 \square 19s$
- Eighteen minus, m , is greater than or equal to 6.
 $18 - m \square 6$
- A number t is less than 13.
 $t \square 13$
- Seven is more than w .
 $7 \square w$

* 8.9 Solving Inequalities *

Solutions to inequalities are intervals, or sets, of numbers that satisfy the conditions of the inequality. When solving inequalities, treat the inequality symbol like an equal sign. However, when multiplying or dividing by a negative number, be sure to flip the inequality in the opposite direction.

Example 1: Find the solution or solutions to the inequality given the set of numbers.
 $43 - 4x \leq 24 \quad \{3, 4, 5, 7\}$

Step 1: Substitute 3 for x .

$$43 - 4x \leq 24$$

$$43 - 4(3) \leq 24$$

Step 2: Simplify the left side of the inequality.

$$43 - 4(3) \leq 24$$

$$43 - 12 \leq 24$$

$$31 \leq 24$$

The statement is false; therefore, 3 is not a solution to the inequality.

Step 3: Substitute 4 for x .

$$43 - 4x \leq 24$$

$$43 - 4(4) \leq 24$$

Step 4: Simplify the left side of the inequality.

$$43 - 4(4) \leq 24$$

$$43 - 16 \leq 24$$

$$27 \leq 24$$

The statement is false; therefore, 4 is not a solution to the inequality.

Answer: Given the set $\{3, 4, 5, 7\}$, the solutions to the inequality are 5 and 7.**Example 2:** Find the solution or solutions to the inequality given the set of numbers.
 $x - 3 > 4$ $\{6, 7, 8, 9\}$ **Step 1:** Add 3 to both sides.

$$x - 3 > 4$$

$$x - 3 + 3 > 4 + 3$$

Step 2: Simplify.

$$x - 3 + 3 > 4 + 3$$

$$x > 7$$

Answer: Given the set $\{6, 7, 8, 9\}$, the solutions to the inequality are 8 and 9 since $8 > 7$ and $9 > 7$.**Example 3:** Find the solution or solutions to the inequality given the set of numbers.
 $12 + x \leq 34$ $\{15, 19, 21, 25\}$ **Step 1:** Subtract 12 from both sides.

$$12 + x \leq 34$$

$$12 + x - 12 \leq 34 - 12$$

Step 2: Simplify.

$$12 + x - 12 \leq 34 - 12$$

$$x \leq 22$$

Answer: Given the set $\{15, 19, 21, 25\}$, the solutions to the inequality are 15, 19, and 21 since $15 \leq 22$, $19 \leq 22$, and $21 \leq 22$.

Example 4: Find the solution or solutions to the inequality given the set of numbers.
 $5x \geq 40$ {6, 8, 10, 12}

Step 1: Divide each side by 5.

$$\begin{aligned} 5x &\geq 40 \\ \frac{5x}{5} &\geq \frac{40}{5} \end{aligned}$$

Step 2: Simplify.

$$\begin{aligned} \frac{5x}{5} &\geq \frac{40}{5} \\ x &\geq 8 \end{aligned}$$

Answer: Given the set {6, 8, 10, 12}, the solutions to the inequality are 8, 10, and 12 since $8 \geq 8$, $10 \geq 8$, and $12 \geq 8$.

Example 5: Find the solution or solutions to the inequality given the set of numbers.

$$\frac{x}{7} < 4 \text{ {11, 21, 28, 35}}$$

Step 1: Multiply each side by 7.

$$\begin{aligned} \frac{x}{7} &< 4 \\ 7 \times \frac{x}{7} &< 4 \times 7 \end{aligned}$$

Step 2: Simplify.

$$\begin{aligned} 7 \times \frac{x}{7} &< 4 \times 7 \\ x &< 28 \end{aligned}$$

Answer: Given the set {11, 21, 28, 35}, the solutions to the inequality are 11 and 21 since $11 < 28$ and $21 < 28$.

Example 6: Find the solution or solutions to the inequality given the set of numbers.

$$\frac{2}{3}x > 6 \text{ {6, 8, 10, 12}}$$

Step 1: Multiply each side by the reciprocal of $\frac{2}{3}$.

$$\frac{2}{3}x > 6$$

$$\frac{3}{2} \times \frac{2}{3}x > 6 \times \frac{3}{2}$$

Step 2: Simplify.

$$\frac{3}{2} \times \frac{2}{3}x > 6 \times \frac{3}{2}$$

$$x > 9$$

Answer: Given the set {6, 8, 10, 12}, the solutions to the inequality are 10 and 12 since $10 > 9$ and $12 > 9$.

Activity

Find the solution or solutions to the inequality given the set of numbers. Circle all that apply. (DOK 2, 3)

- | | |
|---|--|
| 1. $x > 16$ {11, 13, 15, 17, 19} | 4. $x \geq 14$ {7, 14, 21, 28, 36, 49} |
| 2. $x \leq 61$ {85, 80, 75, 70, 65, 60, 55} | 5. $x > 29$ {19, 25, 29, 35, 41} |
| 3. $x < 94$ {30, 60, 90, 120, 150} | |

Find the solution or solutions to the inequality given the set of numbers. (DOK 2, 3)

- | | |
|--|--|
| 6. $x - 10 > 32$ {38, 42, 46, 50} | 14. $\frac{x}{2} \geq 12$ {13, 22, 24, 39} |
| 7. $19 + x \leq 22$ {1, 2, 3, 4} | 15. $\frac{5}{9}x < 15$ {29, 28, 27, 26, 25, 24} |
| 8. $9x \geq 90$ {9, 10, 11, 12, 13} | 16. $x - 22 \geq 45$ {66, 67, 68, 69} |
| 9. $\frac{x}{11} < 3$ {55, 44, 33, 22} | 17. $7 + x < 101$ {82, 92, 102, 112} |
| 10. $\frac{4}{5}x > 20$ {20, 25, 30, 35} | 18. $15x > 30$ {0, 1, 2, 3, 4, 5} |
| 11. $x - 5 < 12$ {15, 17, 19, 21} | 19. $\frac{x}{6} \leq 4$ {20, 22, 24, 26} |
| 12. $x + 25 \leq 75$ {52, 50, 48, 46} | 20. $\frac{3}{7}x \geq 18$ {38, 42, 46, 48} |
| 13. $12x \leq 60$ {0, 1, 2, 3, 4, 5} | |

8.10 Graphing Inequalities

To graph an inequality on a number line, plot an open circle or closed circle at the value given in the inequality. An open circle is plotted if $<$ or $>$ is used. This implies that the value at which the circle is plotted is not part of the solution. A closed circle is plotted if \leq or \geq is used. This implies that the value at which the circle is plotted is part of the solution. Next, draw an arrow to the right or left to show what values are included in the solution to the inequality.

Draw an arrow to the right if the inequality meets condition 1 or 2.

Condition 1: $x >$ value, $x \geq$ value

Condition 2: value $<$ x , value \leq x

Draw an arrow to the left if the inequality meets condition 3 or 4.

Condition 3: $x <$ value, $x \leq$ value

Condition 4: value $>$ x , value \geq x

1.6 Multiplying Fractions

Example 1: Multiply: $\frac{1}{2} \times \frac{3}{4}$

Step 1: Multiply the top numbers: $1 \times 3 = 3$. The top of the fraction is 3.

Step 2: Multiply the bottom numbers: $2 \times 4 = 8$. The bottom of the fraction is 8.

Step 3: Write your answer: $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$.

Example 2: $\frac{2}{15} \times \frac{5}{4}$

Step 1: Cancel any common factors on the top and bottom.

Since 2 and 4 have common factors, simplify by reducing.

$$\frac{\cancel{2}^1}{15} \times \frac{5}{\cancel{4}_2} = \frac{1}{15} \times \frac{5}{2}$$

Since 5 and 15 have common factors, simplify by reducing.

$$\frac{1}{\cancel{15}_3} \times \frac{\cancel{5}^1}{2} = \frac{1}{3} \times \frac{1}{2}$$

Step 2: Multiply the top numbers.
 $1 \times 1 = 1$, so the top number is 1.

$3 \times 2 = 6$, so the bottom number is 6.

Step 3: Multiply the bottom numbers.

Step 4: Write your answer. $\frac{2}{15} \times \frac{5}{4} = \frac{1}{6}$

Example 3: Multiply: $3\frac{1}{4} \times \frac{2}{3}$

Step 1: Change $3\frac{1}{4}$ to an improper fraction.

$$3\frac{1}{4} = \frac{(3 \times 4) + 1}{4} = \frac{13}{4}$$

4 simplifies to 2, and 2 simplifies to 1.

$$\frac{13}{2} \times \frac{1}{3}$$

Step 2: When multiplying fractions, you can cancel and simplify terms that have a common factor. The 4 in the first fraction will cancel with the 2 in the second fraction.

$$\frac{13}{\cancel{4}_2} \times \frac{\cancel{2}_1}{3}$$

Step 3: Multiply the simplified fractions.

$$\frac{13}{2} \times \frac{1}{3} = \frac{13}{6}$$

The terms 4 and 2 are both divisible by 2, so divide the 4 and 2 by 2.

Step 4: Change $\frac{13}{6}$ back to a mixed number.

$$\frac{13}{6} = 2\frac{1}{6}$$

Activity

Multiply the fractions and simplify if possible. (DOK 1, 2)

1. $\frac{4}{7} \times \frac{3}{5} = \underline{\hspace{2cm}}$

7. $\frac{3}{8} \times \frac{2}{3} = \underline{\hspace{2cm}}$

13. $2\frac{1}{5} \times 11 = \underline{\hspace{2cm}}$

2. $\frac{3}{4} \times \frac{1}{5} = \underline{\hspace{2cm}}$

8. $\frac{5}{6} \times \frac{3}{10} = \underline{\hspace{2cm}}$

14. $3\frac{7}{8} \times 2\frac{1}{4} = \underline{\hspace{2cm}}$

3. $\frac{2}{3} \times \frac{1}{7} = \underline{\hspace{2cm}}$

9. $\frac{2}{7} \times \frac{1}{4} = \underline{\hspace{2cm}}$

15. $4\frac{2}{3} \times 1\frac{1}{2} = \underline{\hspace{2cm}}$

4. $\frac{2}{3} \times \frac{1}{3} = \underline{\hspace{2cm}}$

10. $\frac{5}{9} \times \frac{1}{5} = \underline{\hspace{2cm}}$

16. $2 \times \frac{3}{4} = \underline{\hspace{2cm}}$

5. $\frac{2}{3} \times \frac{3}{8} = \underline{\hspace{2cm}}$

11. $\frac{8}{9} \times \frac{3}{4} = \underline{\hspace{2cm}}$

17. $6\frac{7}{8} \times 3\frac{3}{4} = \underline{\hspace{2cm}}$

6. $\frac{3}{4} \times \frac{4}{9} = \underline{\hspace{2cm}}$

12. $4\frac{1}{2} \times 5\frac{1}{4} = \underline{\hspace{2cm}}$

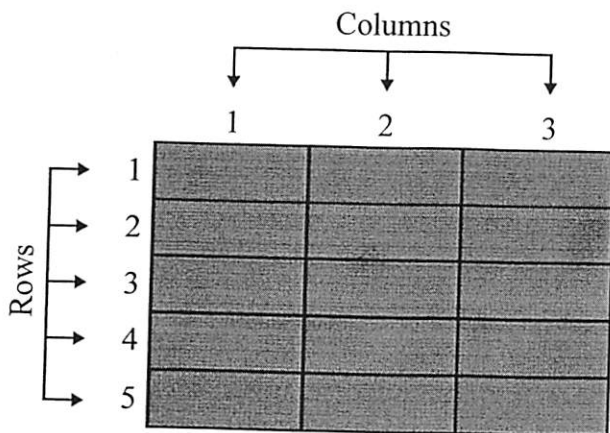
18. $8\frac{1}{2} \times 1\frac{3}{8} = \underline{\hspace{2cm}}$

1.7 Modeling Division (DOK 2)

The rectangle below is divided into 15 parts. The 15 parts are arranged in 3 columns and 5 rows (3×5), or 5 rows and 3 columns (5×3). The relationship between 3, 5, and 15 can be described by the following division number sentences:

$15 \div 3 = 5$

$15 \div 5 = 3$



Activity

Translate the verbal description into an algebraic expression. Use x for the variable.
(DOK 3)

1. A number less 4: _____
2. A number multiplied by 4: _____
3. A number raised to the power of 4: _____
4. A number divided by 4: _____
5. Four more than a number: _____
6. Five more guests than planned: _____
7. A number minus eight: _____
8. A number decreased by thirty-one: _____
9. The difference of a number and eighteen: _____
10. Eight dollars per hour: _____
11. The product of eight and a number raised to the third power: _____
12. Nine minus a number: _____
13. Eighty percent of a number: _____
14. A number divided by four: _____
15. Half of a number plus seven: _____

✱ 7.7 Evaluating Expressions ✱

To evaluate an expression, substitute variables with specific number values.

Example 1: Evaluate the following expressions when $a = 10$. That is, substitute a with 10.

Expression	Substitute	Simplify
$a + 1$	$10 + 1$	11
$17 - a$	$17 - 10$	7
$9a$	$9(10)$	90
$\frac{30}{a}$	$\frac{30}{10}$	3
$5a + 6$	$5(10) + 6$	$50 + 6 = 56$
a^3	$(10)^3$	$10 \times 10 \times 10 = 1,000$

Example 2: Evaluate the following expressions when $x = 2$, $y = 4$, and $z = 5$

Expression	Substitute	Simplify
$5xy + z$	$5(2)(4) + 5$	$5(8) + 5 = 40 + 5 = 45$
$xz^2 + 5$	$2(5^2) + 5$	$2(25) + 5 = 50 + 5 = 55$
$\frac{yz}{x}$	$\frac{(4)(5)}{2}$	$\frac{20}{2} = 10$

Activity

Evaluate the following expressions when $t = 7$. (DOK 2, 3)

1. $t + 3 =$ _____ 4. $3t - 5 =$ _____ 7. $9t \div 3 =$ _____ 10. $\frac{(t^2 - 7)}{6} =$ _____
2. $18 - t =$ _____ 5. $t^2 + 1 =$ _____ 8. $\frac{t^2}{7} =$ _____ 11. $4t + 5t =$ _____
3. $\frac{21}{t} =$ _____ 6. $2t - 4 =$ _____ 9. $5t + 6 =$ _____ 12. $\frac{6t}{3} =$ _____

Evaluate the following expressions when $a = 4$, $b = 2$, $c = 5$, and $d = 10$. (DOK 2, 3)

13. $4a + 2c =$ _____ 17. $a^2 - b =$ _____ 21. $\frac{6b}{a} =$ _____
14. $3bc - d =$ _____ 18. $abd =$ _____ 22. $9a + b =$ _____
15. $\frac{ac}{d} =$ _____ 19. $5c - a =$ _____ 23. $5 + 3bc =$ _____
16. $d - 2a =$ _____ 20. $cd + bc =$ _____ 24. $d^2 + d + 1 =$ _____

7.8 Algebraic Expressions Enrichment

Correctly identify each expression by filling in the blank. (DOK 1, 2)

Word Bank

sum
differenceproduct
quotient

1. $18 - 12$ is a _____ of two terms. 4. $86 \div 2$ is a _____ of two terms.
2. $26 + 17$ is a _____ of two terms. 5. $y \times 24$ is a _____ of two terms.
3. 57×100 is a _____ of two terms.

Chapter 3 The Number System

6th Standard(s) covered: 6.NS.C.5, 6.NS.C.6.a, 6.NS.C.6.c, 6.NS.C.7.a, 6.NS.C.7.b, 6.NS.C.7.c

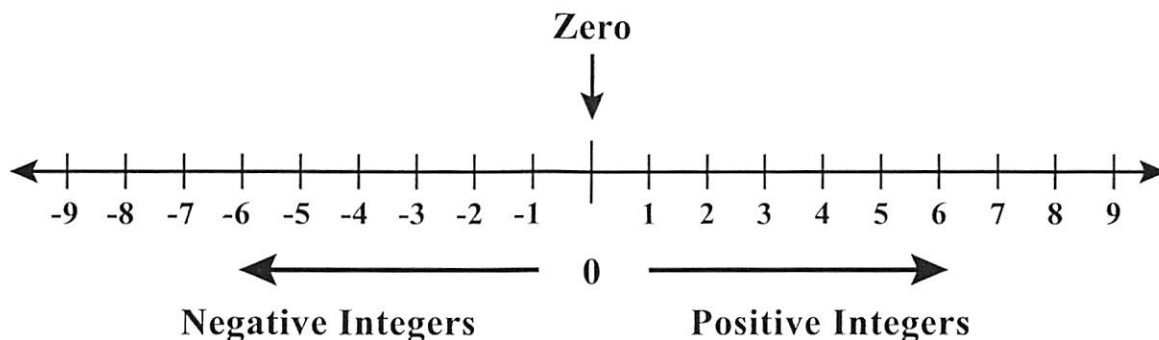
3.1 Integers

An **integer** is any whole number, including zero. Integers greater than zero are called **positive integers**. Positive integers represent changes that result in an increase, or larger number. Generally, a positive integer is given a + sign or no sign at all. For example, you decide to deposit \$50 into your savings account. The \$50 would be considered “positive,” or +50, because it would increase your account balance.

Integers less than zero are called **negative integers**. Negative integers represent changes that result in a decrease, or smaller number. Negative numbers are written with a – sign in front of them. For example, twenty degrees below zero is written as -20° .

Note that zero is neither positive nor negative.

On a number line, integers are ordered smallest to largest, reading from left to right. All negative integers are listed to the left of zero, and all positive integers are listed to the right of zero.



Two or more integers are compared by looking at their positions on a number line. For any two positions on a number line, the number on the right is the greater of the two. For example, +2 is greater than -1 because +2 is on the right side of zero while -1 is on the left side of zero. Also, -6 is less than -3 because -6 is to the left of -3 .

Recall the symbols used to compare greater than, less than, and equal to.

>	<	=
Greater Than	Less Than	Equal To

Activity

Decide whether each situation represents a positive integer or a negative integer. Write positive or negative. (DOK 2)

- Earning \$25 for babysitting: _____
- A loss of 10 yards on the football field: _____
- A temperature of 16 degrees below zero: _____
- Seventy-two feet above sea level: _____

Use $<$, $>$, or $=$ to compare the following integers. (DOK 2)

5. $+6 \square -6$

7. $+8 \square +11$

9. $-2 \square +1$

6. $-5 \square -7$

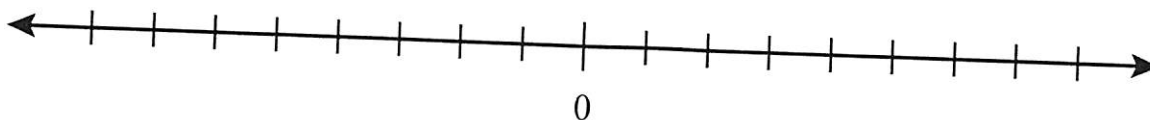
8. $-10 \square 0$

Order the following sets of integers from least to greatest. (DOK 2)

10. $-6, 78, 89, 0, -34$: _____

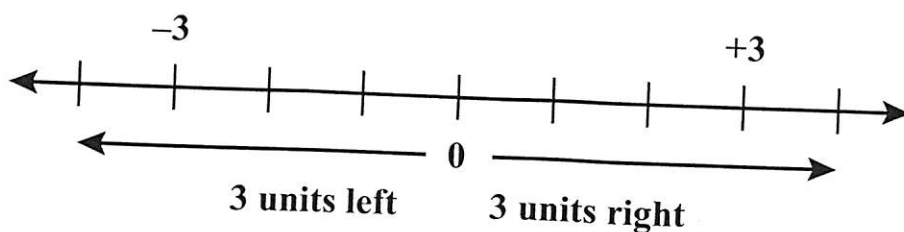
11. $45, -54, 14, -8, 7$: _____

12. Label the number line given the following numbers: $-2, 4, 1, -3, -5, 7, 2, -8, -1$.



3.2 Opposites

Zero is the exact middle of all numbers. Zero has no value. All negative numbers are to the left of zero, and all positive numbers are to the right of zero. **Opposites** are numbers that are the same distance from zero but on different sides of the number line. For example, $+3$ and -3 are opposites because they are both three units away from zero. Positive three, or $+3$, is three units to the right of zero. Negative three, or -3 , is three units to the left of zero. When we add opposite numbers, the sum is always zero.



Both 6 and -6 are the same distance from zero, so their absolute value is the same, 6. The absolute value of $-|6|$ is -6 since the negative sign is on the outside of the absolute value bars.

In order to add or subtract absolute values, first simplify the inside, and then perform the indicated operation.

Example 1: Simplify $|-8| + |2|$.

Step 1: Simplify each absolute value.

$$\begin{array}{l} |-8| + |2| \\ 8 + 2 \end{array}$$

Step 2: Perform the indicated operation.

$$\begin{array}{l} 8 + 2 \\ 10 \end{array}$$

Example 2: Simplify $|-17| - |-5|$

Step 1: Simplify each absolute value.

$$\begin{array}{l} |-17| - |-5| \\ 17 - 5 \end{array}$$

Step 2: Perform the indicated operation.

$$\begin{array}{l} 17 - 5 \\ 12 \end{array}$$

Activity

Simplify the absolute value. (DOK 2)

1. $|9| = \underline{\quad}$

6. $|17| = \underline{\quad}$

11. $|-2| + |6| = \underline{\quad}$

2. $|-2| = \underline{\quad}$

7. $-|-3| = \underline{\quad}$

12. $|10| + |8| = \underline{\quad}$

3. $|-25| = \underline{\quad}$

8. $|-4| - |3| = \underline{\quad}$

13. $|-2| - |4| = \underline{\quad}$

4. $-|-12| = \underline{\quad}$

9. $|-8| - |-4| = \underline{\quad}$

14. $|-3| + |-4| = \underline{\quad}$

5. $-|64| = \underline{\quad}$

10. $|5| + |-4| = \underline{\quad}$

15. $|7| - |-5| = \underline{\quad}$

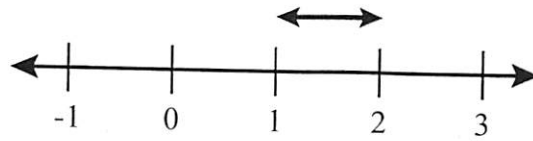
* 3.4 Graphing Rational Numbers on a Number Line *

Rational numbers are numbers that we can write as a fraction. For example, we can write 3 as $\frac{3}{1}$; therefore, we consider 3 a rational number.

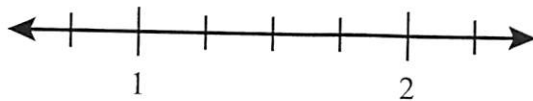
Rational numbers include whole numbers, zero, positive integers, negative integers, positive nonrepeating decimals, and negative nonrepeating decimals.

Example 1: Plot $1\frac{3}{4}$ on a number line.

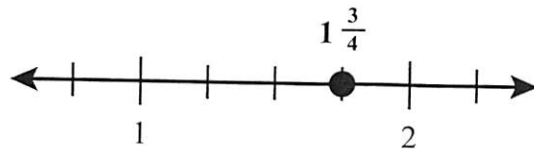
Step 1: $1\frac{3}{4}$ is greater than 1 but less than 2; therefore, it sits between 1 and 2.



Step 2: To mark more accurately where $1\frac{3}{4}$ sits on the number line, divide the space between 1 and 2 into 4 sections.

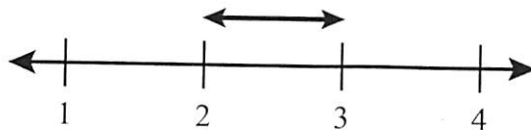


Step 3: Mark your point on the third dash since the fraction portion is $\frac{3}{4}$.

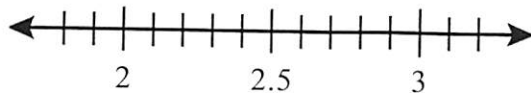


Example 2: Plot 2.7 on a number line.

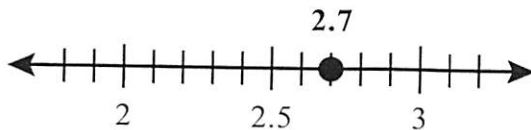
Step 1: 2.7 sits between 2 and 3.



Step 2: To mark more accurately where 2.7 sits on the number line, divide the space between 2 and 3 into 10 sections.

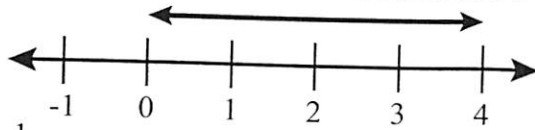


Step 3: Mark your point on the seventh dash since the decimal portion is 0.7, or $\frac{7}{10}$.

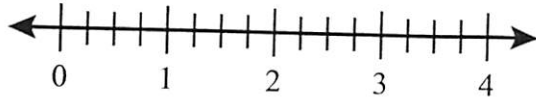


Example 3: Plot $\frac{1}{2}$, 3.25, and $1\frac{1}{4}$ on a number line.

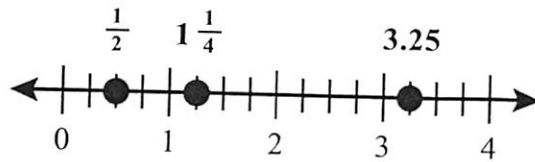
Step 1: All 3 numbers sit somewhere between 0 and 4.



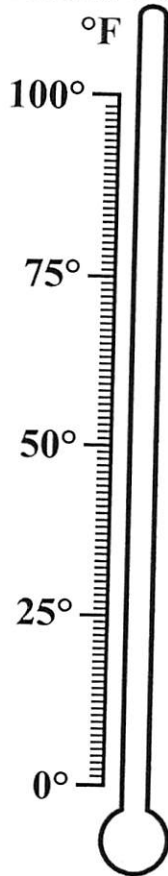
Step 2: $\frac{1}{2}$ is exactly halfway between 0 and 1, 3.25 is a quarter of the way between 3 and 4, and $1\frac{1}{4}$ is a quarter of the way between 1 and 2. Divide the space between each number into 4 sections.



Step 3: Mark each number on the number line.



Example 4: Mark 78°F on the thermometer.



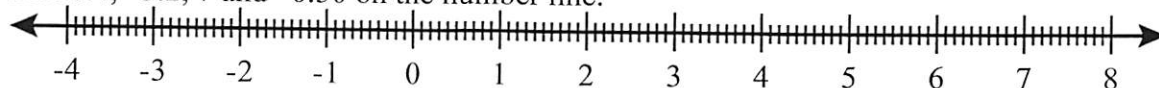
Use the dashes that are already provided to mark the temperature.



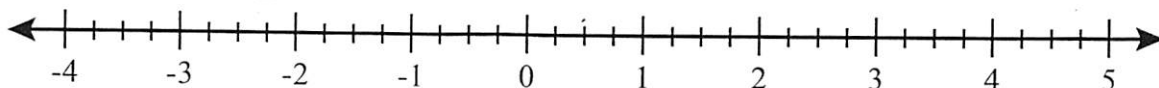
Activity

Use the given number lines to complete questions 1–10. (DOK 1)

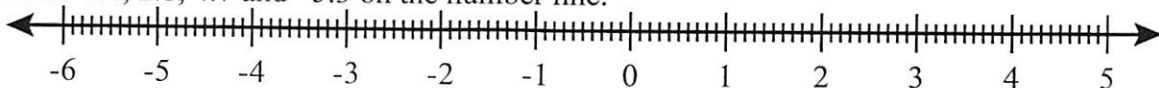
1. Plot 6.4, -3.2, 7 and -0.50 on the number line.



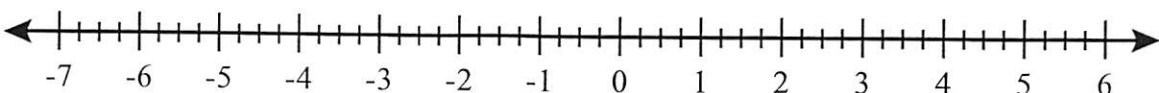
2. Plot $-3\frac{1}{4}$, $4\frac{3}{4}$, $-1\frac{1}{2}$ and 2 on the number line.



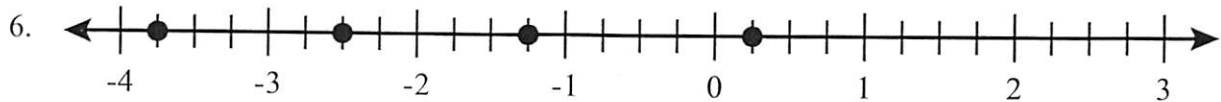
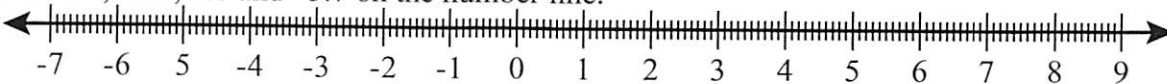
3. Plot -1.4, 2.8, 4.7 and -5.3 on the number line.



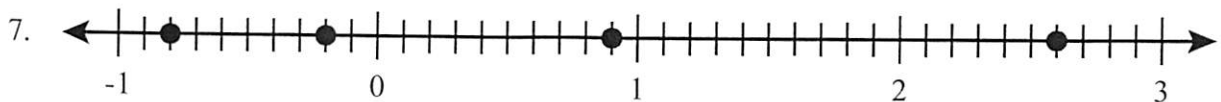
4. Plot $-2\frac{1}{2}$, 3, $5\frac{1}{4}$, and $-6\frac{1}{4}$ on the number line.



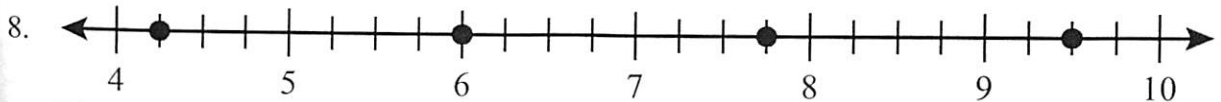
5. Plot 8.9, -6.3, 2.6 and -5.7 on the number line.



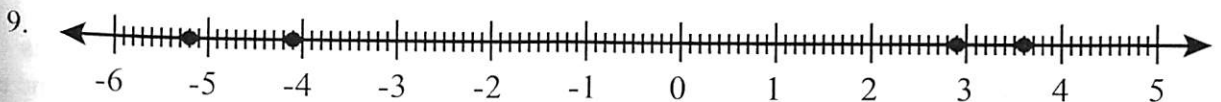
List the numbers plotted above from smallest to largest. _____



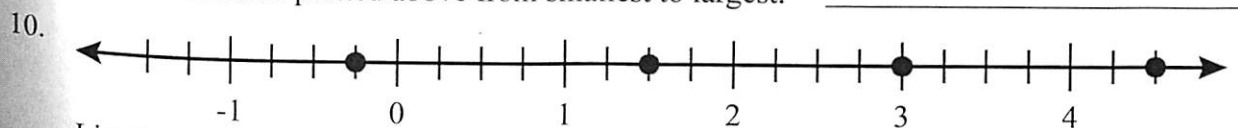
List the numbers plotted above from smallest to largest. _____



List the numbers plotted above from smallest to largest. _____



List the numbers plotted above from smallest to largest. _____



List the numbers plotted above from smallest to largest. _____

Activity

Find the solution to the equation. (DOK 2)

1. $9m = 81$
 $m = \underline{\hspace{2cm}}$

6. $\frac{1}{5}x = 11$
 $x = \underline{\hspace{2cm}}$

11. $15x = 615$
 $x = \underline{\hspace{2cm}}$

16. $3n = 36$
 $n = \underline{\hspace{2cm}}$

2. $3k = 27$
 $k = \underline{\hspace{2cm}}$

7. $\frac{q}{15} = 4$
 $q = \underline{\hspace{2cm}}$

12. $6x = 48$
 $x = \underline{\hspace{2cm}}$

17. $4k = 64$
 $k = \underline{\hspace{2cm}}$

3. $\frac{y}{2} = 166$
 $y = \underline{\hspace{2cm}}$

8. $13m = 52$
 $m = \underline{\hspace{2cm}}$

13. $\frac{1}{60}h = 2$
 $h = \underline{\hspace{2cm}}$

18. $48x = 96$
 $x = \underline{\hspace{2cm}}$

4. $6t = 120$
 $t = \underline{\hspace{2cm}}$

9. $8a = 32$
 $a = \underline{\hspace{2cm}}$

14. $\frac{b}{2} = 167$
 $b = \underline{\hspace{2cm}}$

19. $\frac{1}{4}w = 20$
 $w = \underline{\hspace{2cm}}$

5. $7m = 112$
 $m = \underline{\hspace{2cm}}$

10. $27b = 81$
 $b = \underline{\hspace{2cm}}$

15. $\frac{z}{15} = 3$
 $z = \underline{\hspace{2cm}}$

20. $\frac{x}{3} = 15$
 $x = \underline{\hspace{2cm}}$

* 8.5 Independent and Dependent Variables *

Independent variables function alone and are unaffected by any other variable. Generally, the x -values, or input values, are thought of as independent. **Dependent variables** rely on or respond to the independent variables. Generally, the y -values, or output values, are thought of as the dependent.

Example 1: Determine the independent and dependent variables in the following statement:
The older Christy gets, the taller she gets.

Step 1: Identify the variables.

Christy's age
Christy's height

Step 2: Ask yourself, "Which event must happen for the other event to occur?"
Christy must get older in order to get taller, so height depends on age.

Answer: Since height depends on age, height is the dependent variable. Therefore, age is the independent variable.

Example 2: Alessandra works at the supermarket for a few hours after school in order to earn some extra money. How much money does Alessandra earn?

Step 1: Identify the variables.

The number of hours Alessandra works
The amount of money Alessandra earns

Step 2: Ask yourself, "Which event must happen for the other event to occur?"
Alessandra must work in order to earn money, so the amount of money earned depends on the number of hours worked.

Answer: Since the amount of money earned depends on the number of hours worked, the amount of money earned is the dependent variable. Therefore, the number of hours worked is the independent variable.

Activity

Determine the independent variable in each statement below by circling the correct option.
(DOK 3)

- | | |
|--|--|
| 1. The longer Caleb exercises, the more calories he burns.
Time spent exercising
Calories burned | 4. After a few weeks, Spencer's cactus grew two inches.
Weeks
Inches |
| 2. The more groceries people purchase, the more money people spend.
Money Spent
Number of groceries purchased | 5. The more Bruce eats, the less hungry he is.
The amount of food Bruce eats
How hungry Bruce is |
| 3. Kelley made 12 pancakes with three cups of pancake batter.
Number of pancakes made
Amount of pancake batter | |

Determine the dependent variable in each statement below by circling the correct option.
(DOK 3)

6. The higher the temperature, the more sweat Nur produces.
Temperature
Amount of sweat produced
7. The more Albert stretches, the more flexible he is.
Amount of stretching
Albert's flexibility
8. The harder Coby throws the baseball, the faster the baseball travels.
How hard Coby throws the ball
Speed of the baseball

9. If Darcy studies a certain number of hours, she receives a certain grade.
 Hours studied
 Grade

10. The number of seats in a stadium determines how many tickets can be sold.
 Number of seats
 Tickets sold

*** 8.6 Equations and Tables ***

Given an equation, tables can be constructed to display independent and dependent variables. Generally, the x -values are listed in the left column, and the y -values are listed in the right column of a table. If a table is given horizontally, the x -values are listed in the first row while the y -values are listed in the second row.

Example 1: Mr. Sloan is driving at an average rate of 42 miles per hour. How far can he travel in a certain amount of time?

Step 1: Use the equation $d = rt$, where d represents distance, r represents rate, and t represents time.

When $t = 2$:

$$d = 42t$$

$$d = 42(2)$$

$$d = 84$$

Step 2: Substitute the known values into the distance formula. The only thing we are given is the rate at which Mr. Sloan travels, so substitute 42 for r .

When $t = 3$:

$$d = 42t$$

$$d = 42(3)$$

$$d = 126$$

$$d = rt$$

$$d = 42t$$

Step 3: Construct a table that displays the independent (t) and dependent variable (d). Then, choose values for t

When $t = 4$:

$$d = 42t$$

$$d = 42(4)$$

$$d = 168$$

Step 5: Complete the table.

time in hours (t)	distance (d)
1	
2	
3	
4	

time in hours (t)	distance (d)
1	42
2	84
3	126
4	168

Step 4: Find the distance traveled by substituting each value of t into the equation.

$$d = 42t$$

When $t = 1$:

$$d = 42t$$

$$d = 42(1)$$

$$d = 42$$

The table tells us that after 1 hour, Mr. Sloan traveled 42 miles; after 2 hours, Mr. Sloan traveled 84 miles; after 3 hours, Mr. Sloan traveled 126 miles, and after 4 hours, Mr. Sloan traveled 168 miles.

Activity

Complete the table. (DOK 2)

1. It takes Sophia 22 minutes to read 10 pages. Use the equation shown in the table to find how long it will take Sophia to read a book that is 200 pages, 220 pages, 240 pages, and 260 pages long.

$y = \frac{x}{10} \times 22$	
Pages (x)	Minutes (y)
200	
220	
240	
260	

2. It takes Jose 5 minutes to complete 3 math problems. Use the equation shown in the table to find how long it will take Jose to complete 9 problems, 12 problems, 15 problems, and 18 problems.

$y = \frac{x}{3} \times 5$	
Problems (x)	Minutes (y)
9	
12	
15	
18	

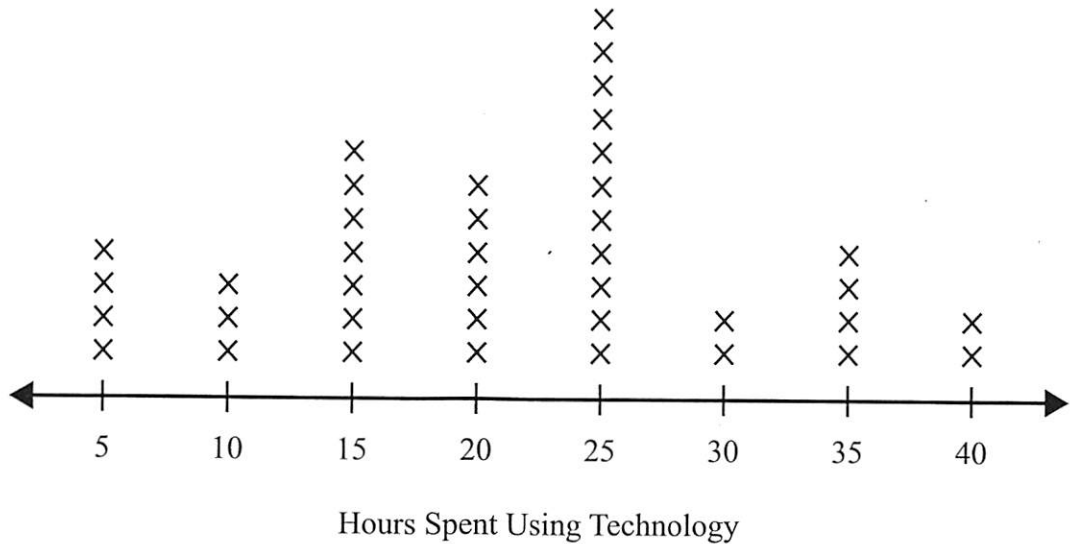
3. The Millwood School of Music is selling bags of popcorn for a fundraiser. Each case holds 50 bags of popcorn. The school keeps \$2.00 for every bag of popcorn sold. Use the equation shown in the table to find how much money the school earns if it sells 6 cases of popcorn, 10 cases of popcorn, 15 cases of popcorn, and 20 cases of popcorn. The equation shows x equals the number of cases of popcorn, and y equals the amount of money the school earns.

$y = (x \times 50) \times \2	
Popcorn sold (x)	Money in dollars (y)
6	
10	
15	
20	

4. It takes Gary 3 minutes to skateboard 0.2 miles. Use the equation shown in the table to find how long it will take Gary to skateboard 0.6 miles, 0.8 miles, 1.0 mile, and 1.2 miles. The equation shows x equals the number of miles, and y equals the number of minutes.

$y = \frac{x}{0.2} \times 3$	
Miles (x)	Minutes (y)
0.6	
0.8	
1.0	
1.2	

The dot plot below describes the weekly hours that an individual spends using technology. Use the dot plot to answer questions 3–7. (DOK 2)



- What is the minimum amount of hours spent using technology per week? _____
- What is the maximum amount of hours spent using technology per week? _____
- What is the most popular amount of time spent using technology per week? _____
- What is the median amount of hours spent using technology per week? _____
- How many people spend between 15 and 25 hours using technology per week? _____

* 6.5 Stem-and-Leaf Plots *

Another way to show data is to construct a stem-and-leaf plot. A **stem-and-leaf plot** is used to show the shape and distribution of a data set.

Example 1: The data set below describes the exam scores from Mr. Bailey’s math class. Construct a stem-and-leaf plot.

88 84 86 88 82 76 70 92 96 88 98 96

Step 1: List the data from least to greatest.
70 76 82 84 86 88 88 88 92 96
96 98

Step 2: Since the data set contains only two-digit numbers, group the data by the digit in the tens column.
70 76
82 84 86 88 88 88
92 96 96 98

Step 3: There are 3 consecutive groups (70s, 80s, and 90s). The stems will be defined by the digit in the tens column: 7, 8, and 9.

**Exam Scores From
Mr. Bailey's Class**

Stem	Leaf
7	
8	
9	

Step 4: The leaves will be defined by the digit in the ones column.

The numbers with a stem of 7 are 70 and 76. Place 0 and 6 in the leaf column.

The numbers with a stem of 8 are 82, 84, 86, 88, 88, and 88. Place 2, 4, 6, 8, 8, and 8 in the leaf column.

The numbers with a stem of 9 are 92, 96, 96, and 98. Place 2, 6, 6, and 8 in the leaf column.

**Exam Scores From
Mr. Bailey's Class**

Stem	Leaf
7	0, 6
8	2, 4, 6, 8, 8, 8
9	2, 6, 6, 8

Example 2: The data set below describes the overall averages for an English class and a history class. Construct a stem-and-leaf plot.

English class: 61 91 66 92 86 77 84 63

History class: 96 71 91 65 76 83 100 89 45

Step 1: List the data from least to greatest.
English class:
61 63 66 77 84 86 91 92

History class:
45 65 71 76 83 89 91 96 100

Step 2: Since the data set contains only two-digit numbers, group the data by the digit in the tens column.

English class:

61 63 66

77

84 86

91 92

History class:

45

65

71 76

83 89

91 96

100

Step 3: There are 6 groups (40s, 60s, 70s, 80s, 90s, and 100s). Note, even though there are no numbers in the 50s, we must still include 5 as one of the stems. The stems will be defined by the digit in the tens column: 4, 5, 6, 7, 8, 9, and 10. Create a column for both English and history.

English Leaf	Stem	History Leaf
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Step 4: For the English leaf,

The leaves will be defined by the digit in the ones column:

There are no numbers with a stem of 4. Leave the leaf column blank.

There are no numbers with a stem of 5. Leave the leaf column blank.

The numbers with a stem of 6 are 61, 63, and 66. Place 1, 3, and 6 in the leaf column.

The number with a stem of 7 is 77. Place 7 in the leaf column.

The numbers with a stem of 8 are 84 and 86. Place 4 and 6 in the leaf column.

The numbers with a stem of 9 are 91 and 92. Place 1 and 2 in the leaf column.

There are no numbers with a stem of 10. Leave the leaf column blank.

English Leaf	Stem	History Leaf
	4	
	5	
1, 3, 6	6	
7	7	
4, 6	8	
1, 2	9	
	10	

Step 5: For the history leaf,

The leaves will be defined by the digit in the ones column:

The number with a stem of 4 is 45. Place 5 in the leaf column.

There are no numbers with a stem of 5. Leave the leaf column blank.

The number with a stem of 6 is 65. Place 5 in the leaf column.

The numbers with a stem of 7 are 71 and 76. Place 1 and 6 in the leaf column.

The numbers with a stem of 8 are 83 and 89. Place 3 and 9 in the leaf column.

The numbers with a stem of 9 are 91 and 96. Place 1 and 6 in the leaf column.

The number with a stem of 10 is 100. Place 0 in the leaf column.

English Leaf	Stem	History Leaf
	4	5
	5	
1, 3, 6	6	5
7	7	1, 6
4, 6	8	3, 9
1, 2	9	1, 6
	10	0

Activity

Complete each stem-and-leaf plot based on the data set provided. (DOK 2)

1. Create a stem-and-leaf plot to show how many points Jack scored in each basketball game.

18, 19, 26, 35, 16, 42, 36, 28, 25, 26, 24, 23, 16

Stem	Leaf

3. Each student in Ms. Jackson's reading group recorded the time he or she read each night. Create a stem-and-leaf plot to show the times.

45, 30, 25, 20, 45, 60, 45, 40, 30, 20, 25, 20, 25, 30, 45, 45, 30, 30, 45, 30

Stem	Leaf

2. Create a stem-and-leaf plot to show how many points Corey scored in each basketball game.

13, 18, 19, 24, 32, 14, 44, 32, 22, 22, 24, 20, 21, 12

Stem	Leaf

4. Create a stem-and-leaf plot to show the science test scores of Mr. Gonzalez's students.

82, 88, 86, 60, 78, 76, 100, 82, 98, 96, 94, 76, 78, 92, 94, 88, 82, 86, 80, 82

Stem	Leaf

6.6 Data Displays Enrichment

Use the given data sets to complete the frequency tables in questions 1–2. (DOK 2)

1. 10 26 13 41 33
 27 52 44 38 12
 17 22 59 16 19

Interval	Tally	Frequency
0–9		
10–19		
20–29		
30–39		
40–49		
50–59		