

*Part A: Data Calculations***Practice 1**

1.

$$\text{Mean: } 14.29 \quad \frac{(5 + 10 + 10 + 10 + 20 + 20 + 25)}{7} = 14.29$$

$$\text{Median: } 10 \quad \{\cancel{5}, \cancel{10}, \cancel{10}, 10, \cancel{20}, \cancel{20}, \cancel{25}\}$$

Mode: 10

2.

$$\text{Average (mean): } \frac{(55 + 60 + 65 + 70 + 80 + 90 + 90 + 100)}{8} = 76.25$$

$$\text{Median: } \{\cancel{55}, \cancel{60}, \cancel{65}, 70, 80, \cancel{90}, \cancel{90}, \cancel{100}\} \frac{(70 + 80)}{2} = 75$$

3.

Fifty percent of the class passed. This represents four students.

4.

Step-by-Step option response:

$$\text{Sum of the original: } 3 \times 52 = 156$$

$$\text{Sum with the new element: } 156 + 52 = 208$$

$$\text{Mean with new element: } \frac{208}{4} = 52$$

Equation option response:

$$\bar{x} = \frac{(3 \cdot 52) + 52}{4} = 52$$

5.

Step-by-Step option response:

$$\text{Sum of the original: } 28.3 \times 24 = 679.2$$

$$\text{Sum with the new elements: } 679.2 + 6.4 + 4.3 = 689.9$$

$$\text{Mean with the new elements: } \frac{689.9}{(24 + 2)} = \frac{689.9}{26} = 26.53$$

Equation option response:

$$\bar{x} = \frac{(28.3 \cdot 24) + (6.4 + 4.3)}{26} = 26.53$$

6.

Step-by-Step option response:

$$\text{Sum of the original set: } 27.5 \times 8 = 220$$

$$\text{Sum of the desired average: } 30 \times 9 = 270$$

$$\text{Necessary element: } 270 - 220 = 50$$

Equation option response:

$$\frac{(27.5 \cdot 8) + n}{9} = 30$$

$$n = 50$$

7.

Step-by-Step option response:

Sum of the original set:  $90 \times 12 = 1080$

Sum of desired average:  $90 \times 13 = 1170$

Necessary element:  $1170 - 1080 = 90$

Equation option response:

$$\frac{(90 \cdot 12) + n}{13} = 90$$

$$n = 90$$

8.

box plot

9.

histogram

10.

B

11.

A

12.

C

13.

50%

14.

50%

15.

3

16.

$$\text{IQR} = 25 - 8 = 17$$

17.

mean: increases

median: increases

mode: increase

range: remains the same

IQR: remains the same

18.

mode

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19.  
range

20.  
mean (average)

21.  
Similarities Sample:  
Both the mean and the median represent the center of the data set.

Differences Sample:  
The median is the middle number of an ordered data set. The amount of numbers on each side of the median is balanced. The value of each element is not considered when finding the median. The mean is the center value of the elements. The mean represents what number all the elements would be if all the elements were equal. The mean is the balancing point of the data set.

### *Part A: Data Calculations*

#### **Practice 2**

1.  
Sample: Using a bar graph or dot plot, the mean can be determined by multiplying the value of each category by the total number of elements in that category, adding these values together, and then dividing by the total number of elements. The median can be found by finding the middle element when listed in order.

2.  
mode = 7.5  
median =  $\{0, 2.5, 7.5, 7.5, 7.5, 7.5, 7.5, 7.5, 10, 10, 10\} \frac{(7.5 + 7.5)}{2} = 7.5$   
mean =  $\frac{((0 \cdot 1) + (2.5 \cdot 1) + (7.5 \cdot 5) + (10 \cdot 3))}{10} = 7$

3.  
Yes, since each element of the data set can be determined and the median was already determined, the IQR can also be determined.

4.  
Step-by-Step option response:  
Sum of the Original Set: 200  
Sum with new elements: 270  
Mean with new elements: 27  
New average (mean): 27

Equation option response:  
 $\bar{x} = \frac{(25 \cdot 8) + 48 + 22}{10} = 27$

5.

Step-by-Step option response:

Sum of the Original set: 125

Sum with new elements: 210

Mean with new elements: 14

New average (mean): 14

Equation option response:

$$\bar{x} = \frac{(12.5 \cdot 10) + 15 + 22 + 12 + 16 + 20}{15} = 14$$

6.

Step-by-Step option response:

Sum of Original set: 356

Sum of Desired Average: 450

Necessary Element: 94

Equation option response:

$$\frac{(89 \cdot 4) + n}{5} = 90$$

$$n = 94$$

7.

Step-by-Step option response:

Sum of Original set: 1780

Sum of Desired Average: 1890

Necessary Element: 110

Equation option response:

$$\frac{(89 \cdot 20) + n}{21} = 90$$

$$n = 110$$

8.

bar graph

9.

box plot

10.

C

11.

A

12.

B

---

13.

$$1 \leq \text{goals scored} \leq 4$$

14.

25%

15.

$$\left(\frac{1}{4}\right)(48) = 12 \text{ games}$$

16.

In order to calculate the average, you need the elements of the data set. You cannot calculate the average using a box plot, which is used to show the spread of the data.

17.

mean: decreased

median: decreased

range: decreased

IQR: remained the same

18.

IQR

19.

mode

20.

median

21.

Sample: Adding an element that is the same as the mean will leave the mean unchanged. When an element that is the same as the mean is added to the data set, the mean remains the same because it is already the same as the equal value created by the mean.

*Part B: Interpreting Data***Practice 1**

1.

normally distributed

2.

right-skewed

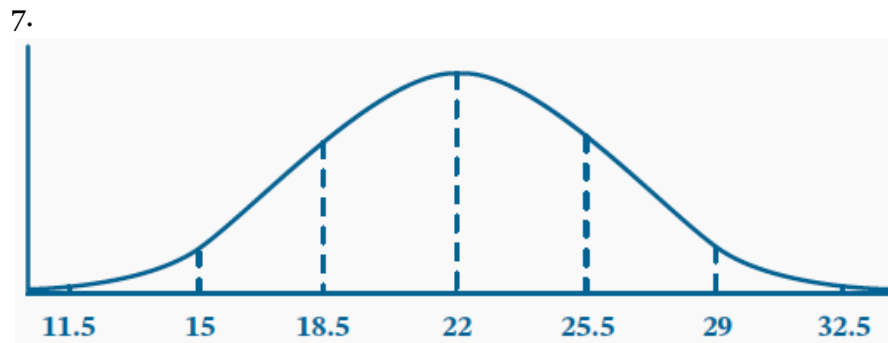
3.

Sample: This rule states that 68% of the data elements will fall within one standard deviation from the mean, 95% of the data elements will fall within two standard deviations from the mean, and 99.7% of the data elements will fall within three standard deviations from the mean.

4.  
20 (center of graph)

5.  
2.5 (distance between vertical lines)

6.  
 $17.5 < x < 22.5$  (one standard deviation from the mean on both sides)



8.  
 $34\% + 34\% = 68\%$

9.  
 $\frac{5\%}{2} = 2.5\%$

10.  
 $34\% + 50\% = 84\%$

11.  
Ms. Nance's class has a much better chance of being correct.  
Mr. Miller:  $2.35\% + 13.5\% = 15.85\%$   
Mr. Miller's class was -2 and -3 standard deviations away from the mean.  
Ms. Nance:  $34\% + 34\% = 68\%$   
Ms. Nance's class was -1 standard deviation and 1 standard deviation away from the mean.

12.  
60, 82, 85, 87, 90, 91, 92, 96  
 $Q_1 = 83.5$   
 $Q_3 = 92$   
 $IQR = 8$   
lower  $< 83.5 - 1.5(8)$   
lower  $< 71.5$   
upper  $> 91.5 + 1.5(8)$   
upper  $> 103.5$   
Allison's score of 60 is a lower outlier.

13.

2, 2, 3, 5, 5, 6, 8, 9, 10, 16

Q1 = 3

Q3 = 9

IQR = 6

upper >  $9 + 1.5(6)$ 

upper &gt; 18

Mikey is incorrect. Sixteen is not an outlier because it is not above the upper boundary of 18.

14.

If Mikey included 22, an outlier, when calculating the mean, the average will increase because the outlier is higher than the rest of the data.

15.

	min	Q1	med	Q3	max	range	IQR
Rory	-8	-6	-2	0	12	20	6
Fran	-2	0	6	12	14	16	12

16.

Rory is the better golfer because 75% of his scores are better (below) Fran's Q1 data. Fran's range may be smaller, but 75% of his scores are above zero.

17.

Cup o' Coffee

mean:  $\frac{(2 + 2 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 5 + 5 + 5)}{18} = 3.61$

median: 4

Joe's

mean:  $\frac{(1 + 2 + 3 + 3 + 3 + 3 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 5 + 5 + 5 + 5 + 5)}{18} = 3.78$

median: 4

18.

Joe's coffee shop has a higher mean than Cup o' Coffee. Therefore, Joe's is the better coffee shop.

### Part B: Interpreting Data

#### Practice 2

1.

left-skewed

2.

normally distributed

3.

Two standard deviations: 95%

One standard deviation: 68%

4.

21 (center of graph)

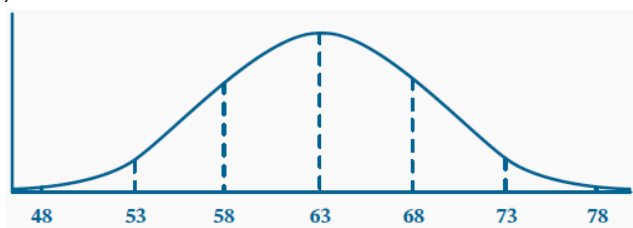
5.

3 (distance between vertical lines)

6.

 $18 \leq x \leq 24$  (one standard deviation away from the mean on both sides)

7.



8.

$$50\% + 34\% + 13.5\% = 97.5\%$$

9.

$$13.5\% + 68\% = 81.5\%$$

10.

$$\frac{0.3\%}{2} = 0.15\%$$

11.

 $2.35\% + 0.15\% = 2.5\%$  chance that all students will read for more than 25 minutes.

A better range would be one standard deviation from the mean, or between 17.5 minutes and 22.5 minutes. Asking students to read between 18 and 23 minutes every night would make more sense, since it may be difficult to determine less than one minute of reading.

12.

$$Q_1 = 2$$

$$Q_3 = 4$$

$$IQR = 2$$

$$\text{lower} < 2 - 1.5(2)$$

$$\text{lower} < -1$$

$$\text{upper} > 4 + 1.5(2)$$

$$\text{upper} > 7$$

There are no outliers in the data set.

13.

Having two games with zero goals will bring the average down, because those scores increase the number of elements without increasing the sum of the scores.

14.

$$Q_1 = 60$$

$$Q_3 = 68$$

$$IQR = 8$$

$$\text{upper} > 68 + 1.5(8)$$

$$\text{upper} > 80$$

Any score above 80 is an outlier. The two students that scored 100 are making the class average much higher.

15. When the outliers are removed the class average is a 61.67, a very significant drop. Because this is a very low score, Mr. Riley should retest the class on the material.

16.

$$(0.75)(36) = 27$$

17.

$$25\%$$

18.

$$\text{Eagles: } (0.25)(24) = 6$$

$$\text{Tigers: } (0.25)(36) = 9$$

19.

Fifty percent of Eagle player's heights are greater than all of the heights of Tiger players, since the median height for Eagles players is equal to the maximum height of Tiger players.

20.

A dot plot should be used for small data sets. If you had to graph 600 dots on a number line, there is a very good chance that errors will be made.

21.

For high school students, there is a group of students that takes much longer than the median and pulls the average up. For the college students, there is a group of students that takes much less time than the median which pulls the average down.

## Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	2	1	3	1	4	4	5	5	2	3	4	5

1.

$$\frac{2}{5}x = \frac{1}{3}(x + 6) \text{ LCD}=15$$

$$15\left(\frac{2}{5}x = \frac{1}{3}(x + 6)\right)$$

$$6x = 5(x + 6)$$

$$6x = 5x + 30$$

$$x = 30$$

2.

Thirty is natural, whole, integer, rational, real, or  $\{\mathcal{N}, \mathcal{W}, \mathcal{Z}, \mathcal{Q}, \mathcal{R}\}$ .

3.

$3 + \left \frac{1}{2}n - 8\right  = 5$		
$\left \frac{1}{2}n - 8\right  = 2$		Addition Property of Equality (subtract 3 from both sides to isolate the absolute value expression)
$\frac{1}{2}n - 8 = 2$	$-\left(\frac{1}{2}n - 8\right) = 2$	Definition of absolute value
	$\frac{1}{2}n - 8 = -2$	Multiplication Property of Equality (multiply both sides of Case 2 by $-1$ )
$\frac{1}{2}n = 10$	$\frac{1}{2}n = 6$	Addition Property of Equality (add 8 to both sides of the equation)
$n = 20$	$n = 12$	Multiplication Property of Equality (multiply both sides of the equation by 2)

4.

$-4 3x + 5  - 6 = 1$		
$-4 3x + 5  = 7$		Addition Property of Equality (add 6 to both sides to isolate the absolute value expression)
$ 3x + 5  = -\frac{7}{4}$		Multiplication Property of Equality (multiply both sides by $-\frac{1}{4}$ to isolate the absolute value expression)
no solution		Distance cannot be negative (definition of absolute value)

5.

$$\frac{4}{5} < 2x - 7 \leq 5$$

$$\frac{4}{5} < 2x - 7 \quad \text{AND} \quad 2x - 7 \leq 5$$

$$5\left(\frac{4}{5} < 2x - 7\right)$$

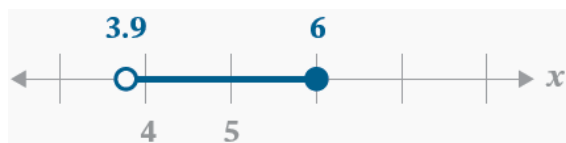
$$4 < 10x - 35 \quad \text{AND} \quad 2x \leq 12$$

$$39 < 10x \quad \text{AND} \quad x \leq 6$$

$$\frac{39}{10} < x$$

$$3.9 < x$$

$$3.9 < x \leq 6$$



6.

$$-\left|\frac{2}{3}x + 1\right| < -5$$

$$\left|\frac{2}{3}x + 1\right| > 5$$

$$\frac{2}{3}x + 1 > 5 \quad \text{OR} \quad -\left(\frac{2}{3}x + 1\right) > 5$$

$$\frac{2}{3}x > 4 \quad \text{OR} \quad \frac{2}{3}x + 1 < -5$$

$$x > 6 \quad \text{OR} \quad \frac{2}{3}x < -6$$

$$x < -9$$

$$x < -9 \quad \text{OR} \quad x > 6$$



7.

$$\frac{3x+4}{5} = \frac{x}{8}$$

$$(3x+4)(8) = (5)(x)$$

$$24x + 32 = 5x$$

$$32 = -19x$$

$$x = -\frac{32}{19}$$

8.

$$\frac{5}{3} = \frac{x-6}{4}$$

$$(5)(4) = (3)(x - 6)$$

$$20 = 3x - 18$$

$$38 = 3x$$

$$x = \frac{38}{3}$$

9. D

Distractor rationale:

A) This divides the terms by  $-3$  rather than multiplying terms by  $-3$  and has the incorrect sign for  $y$ .

B) This divides the terms by  $-3$  rather than multiplying terms by  $-3$ .

C) This has an incorrect sign for  $15y$ .

$$2(5y - \frac{1}{3}x) = C$$

$$5y - \frac{1}{3}x = \frac{C}{2}$$

$$-\frac{1}{3}x = \frac{C}{2} - 5y$$

$$x = -\frac{3C}{2} + 15y$$

10. D

Distractor rationale:

A) This incorrectly has 44 as the distance rather than the midpoint and uses addition rather than subtraction.

B) This incorrectly has 44 as the distance rather than the midpoint.

C) This uses addition rather than subtraction. This would result in negative race times.

This problem is completed using mental math and does not require a worked solution.

11. C

Distractor rationale:

A) Both cases of the absolute value inequality were not considered.

B) Both cases of the absolute value inequality were not considered.

D) The inequality symbol was incorrectly changed resulting in an OR rather than AND inequality.

$$4|x - 2| \leq 8$$

$$|x - 2| \leq 2$$

$$x - 2 \leq 2$$

$$x \leq 4$$

AND

$$-(x - 2) \leq 2$$

$$x - 2 \geq -2$$

$$x \geq 0$$

12. B

Distractor rationale:

- A) This number rounds 40.9 down to 40 rather than to 41 mph.
- C) This sets mph = f/s without any unit conversion.
- D) This multiplies 60 ft by 12 in rather than converting to miles.

$$\left(\frac{60 \text{ ft}}{1 \text{ sec}}\right)\left(\frac{1 \text{ mi}}{5,280 \text{ ft}}\right)\left(\frac{60 \text{ sec}}{1 \text{ min}}\right)\left(\frac{60 \text{ min}}{1 \text{ hour}}\right) = \frac{((60)(1 \text{ mi})(60)(60))}{((5,280)(1)(1 \text{ hour}))} = 41 \text{ mph}$$