Exit Ticket Sample Solutions

Five people were asked approximately how many hours of TV they watched per week. Their responses were as follows.

$$6 \quad 4 \quad 6 \quad 7 \quad 8$$

1. **Find the mean number of hours of TV watched for these five people.**

   Mean $= \dfrac{6+4+6+7+8}{5} = 6.2$

2. **Find the deviations from the mean for these five data values.**

   The deviations from the mean are $-0.2, -2.2, -0.2, 0.8,$ *and* $1.8.$

3. **Write a new set of five values that has roughly the same mean as the data set above but that has, generally speaking, greater deviations from the mean.**

   There are many correct answers to this question. Check that students' answers contain five numbers, that the mean is around 6.2*, and that the spread of the numbers is obviously greater than that of the original set of five values. Here is one example:* $0, 0, 0, 15, 16.$

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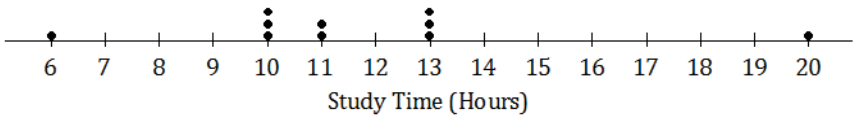
Homework Problem Set Sample Solutions

1. **Ten members of a high school girls' basketball team were asked how many hours they studied in a typical week. Their responses (in hours) were** $20, 13, 10, 6, 13, 10, 13, 11, 11, 10.$

   a. **Using the axis given below, draw a dot plot of these values. (Remember, when there are repeated values, stack the dots with one above the other.)**



   b. **Calculate the mean study time for these students.**

   Mean $= 11.7$

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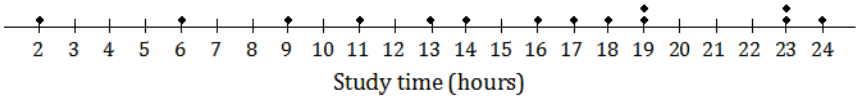
c. **Calculate the deviations from the mean for these study times, and write your answers in the appropriate places in the table below.**

Number of Hours Studied	20	13	10	6	13	10	13	11	11	10
Deviation from the Mean	8.3	1.3	−1.7	−5.7	1.3	−1.7	1.3	−0.7	−0.7	−1.7

d. **The study times for fourteen girls from the soccer team at the same school as the one above are shown in the dot plot below.**



Based on the data, would the deviations from the mean (ignoring the sign of the deviations) be greater or less for the soccer players than for the basketball players?

The spread of the distribution of study times for the soccer players is greater than that for the basketball players. So, the deviations from the mean would be greater for the soccer players than for the basketball players.

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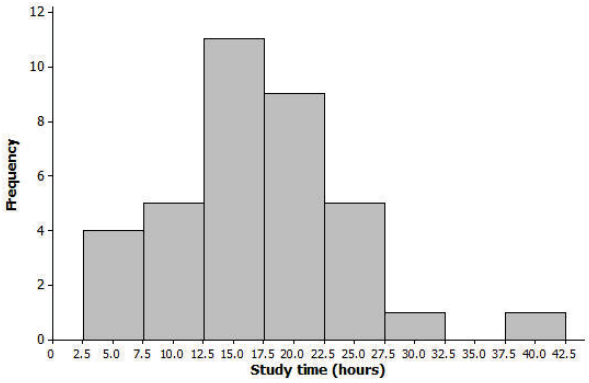
2. **All the members of a high school softball team were asked how many hours they studied in a typical week.**
The results are shown in the histogram below.

(The data set in this question comes from NCTM Core Math Tools, http://www.nctm.org/Classroom-Resources/Core-Math-Tools/Data-Sets/)



a. **We can see from the histogram that four students studied around 5 hours per week. How many students studied around 15 hours per week?**

Eleven students studied around 15 hours per week.

b. **How many students were there in total?**

Number of students $= 4 + 5 + 11 + 9 + 5 + 1 + 0 + 1 = 36$

c. **Suppose that the four students represented by the histogram bar centered at 5 had all studied exactly 5 hours, the five students represented by the next histogram bar had all studied exactly 10 hours, and so on.**
If you were to add up the study times for all of the students, what result would you get?

$$(4 \cdot 5) + (5 \cdot 10) + (11 \cdot 15) + (9 \cdot 20) + (5 \cdot 25) + (1 \cdot 30) + (0 \cdot 35) + (1 \cdot 40) = 610$$

d. **What is the mean study time for these students?**

Mean $= \frac{610}{36} = 16.94$

e. **What would you consider to be a typical deviation from the mean for this data set?**

Answers will vary. A correct answer would be something between 4 and 10 hours. (The mean absolute deviation from the mean for the original data set was 5.2, and the standard deviation was 7.1.)

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3. **A small car dealership tests the fuel efficiency of sedans on its lot. It chooses 12 sedans for the test. The fuel efficiency (mpg) values of the cars are given in the table below. Complete the table as directed below.**

Fuel Efficiency (miles per gallon)	29	35	24	25	21	21	18	28	31	26	26	22
Deviation from the Mean	3.5	9.5	-1.5	-0.5	-4.5	-4.5	-7.5	2.5	5.5	0.5	0,5	-3.5
Squared Deviation from the Mean	12.25	90.25	2.25	0.25	20.25	20.25	56.25	6.25	30.25	0.25	0.25	12.25

a. **Calculate the mean fuel efficiency for these cars.**

25.5

b. **Calculate the deviations from the mean, and write your answers in the second row of the table.**

See chart.

c. **Square the deviations from the mean, and write the squared deviations in the third row of the table.**

See chart.

d. **Find the sum of the squared deviations.**

251.25

e. **What is the value of n for this data set? Divide the sum of the squared deviations by $n - 1$.**

12; 22.84090909

f. **Take the square root of your answer to part (e) to find the standard deviation of the fuel efficiencies of these cars. Round your answer to the nearest hundredth.**

4.78

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4. **The same dealership decides to test fuel efficiency of SUVs. It selects six SUVs on its lot for the test. The fuel efficiencies (in miles per gallon) of these cars are shown below.**

   21 21 21 30 28 24

   Calculate the mean and the standard deviation of these values. Be sure to show your work, and include a unit in your answer.

   Mean = 145 ÷ 6 = 24.1667 miles per gallon

   Deviation from the mean: -3.1667, -3.1667, -3.1667, 5.833, 3.833, -0.1667

   Squared deviation: 10.02798889, 10.02798889, 10.02798889, 34.023889, 14.691889, 0.02778889

   Sum of the Squared deviations: 78.82753356

   Standard Deviation: 3.9707 miles per gallon

Note: Students might get somewhat varying answers for the standard deviation depending on how far they round the value of the mean. Encourage students, when calculating the standard deviation, to use several decimal places in the value that they use for the mean.

5. **Consider the following questions regarding the cars described in Problems 3 and 4.**

   a. **What is the standard deviation of the fuel efficiencies of the cars in Problem 3? Explain what this value tells you.**

      The standard deviation in Problem 3 was only 4.78 miles per gallon. Since the standard deviation is smaller, more of their cars are close to the mean of 25.5 miles per gallon.

   b. **You also calculated the standard deviation of the fuel efficiencies for the cars in Problem 4. Which of the two data sets (Problem 3 or Problem 4) has the larger standard deviation? What does this tell you about the two types of cars (sedans and SUVs)?**

      The standard deviation in Problem 3 was only 4.78 miles per gallon which is much lower than Problem 4's standard deviation of 8.878 miles per gallons. This means that the data for Problem 3 is closer together (not as spread out). Not only was the gas mileage better for the Problem 3 cars but since the standard deviation is smaller, more of their cars are close to that mean.

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REVIEW – Slope

6. For each slope and point given below, determine a point that is on the graph of the line determined by the slope and point. For example, if the slope is $\frac{1}{3}$ and the point is (1, 2), then (4, 3) or (-2, 1) are also on the line with slope $\frac{1}{3}$ and point (1, 2). There are many possible answers to each one.

A. slope = $\frac{4}{5}$ and point A (0, 3)

(-10, -5), (-5, -1), (5, 7)

B. slope = $-\frac{1}{2}$ and point B (2, 0)

(-2, 2), (0, 1), (4, -1)

C. slope = 3 and point C (2, 3)

(0, -3), (1, 0), (3, 6)

D. slope = -4 and point D (-1, 2)

(-2, 6), (0, -2), (1, 6)

7. Explain the method you used to complete Exercise 6.

Answers will vary. Some students may use graph paper, while other use the coordinate point and the slope. Add the numerator to the y-value and the denominator to the x-value.

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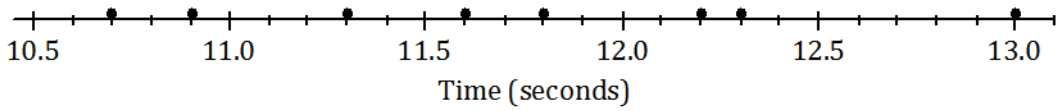
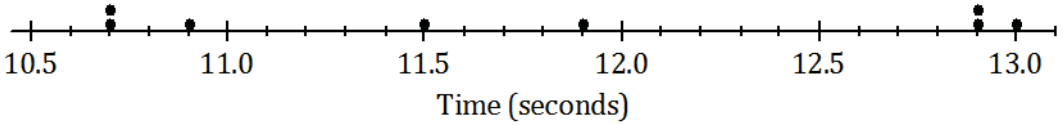
Homework Problem Set Sample Solutions

1. At a track meet, there are three men's 100 m races. The times for eight of the sprinters are recorded to the nearest $\frac{1}{10}$ of a second. The results of the three races for these eight sprinters are shown in the dot plots below.

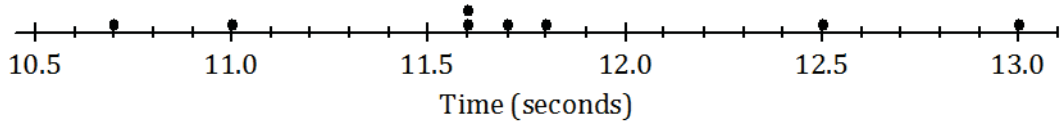
Race 1



Race 2



Race 3



A. Remember that the size of the standard deviation is related to the sizes of the deviations from the mean. Without doing any calculations, indicate which of the three races has the smallest standard deviation of times. Justify your answer.

Race 3 has the smallest standard deviation because several race times are clustered around the mean.

B. Which race had the largest standard deviation of times? (Again, don't do any calculations!) Justify your answer.

Race 2 has the largest standard deviation because the race times are spread out from the mean.

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C. Roughly what would be the standard deviation in Race 1? (Remember that the standard deviation is a typical deviation from the mean. So, here you are looking for a typical deviation from the mean, in seconds, for Race 1.)

Around 0.5–1.0 second would be a sensible answer.

D. Use your calculator to find the mean and the standard deviation for each of the three races. Write your answers in the table below to the nearest thousandth.

	Mean	Standard Deviation
Race 1	11.725	0.767
Race 2	11.813	1.013
Race 3	11.738	0.741

E. How close were your answers for Parts A - C to the actual values?

Answers will vary based on students' responses.

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2. A large city, which we will call City A, holds a marathon. Suppose that the ages of the participants in the marathon that took place in City A were summarized in the histogram below.

A. Make an estimate of the mean age of the participants in the City A marathon.

Around 40 years would be a sensible estimate.

B. Make an *estimate* of the standard deviation of the ages of the participants in the City A marathon.

Between 8 and 15 years would be a sensible estimate.

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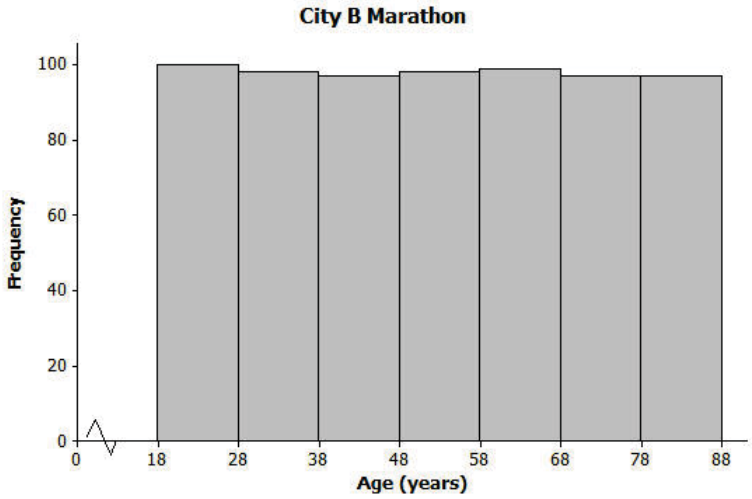
A smaller city, City B, also held a marathon. However, City B restricts the number of people of each age category who can take part to 100. The ages of the participants are summarized in the histogram below.



C. Approximately what was the mean age of the participants in the City B marathon? Approximately what was the standard deviation of the ages?

Mean is around 53 years; standard deviation is between 15 and 25 years.

D. Explain why the standard deviation of the ages in the City B marathon is greater than the standard deviation of the ages for the City A marathon.

In City A, there is greater clustering around the mean age than in City B. In City B, the deviations from the mean are generally greater than in City A, so the standard deviation for City B is greater than the standard deviation for City A.

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