Homework Problem Set Sample Solutions

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Consider the following scenario.

The company that created a popular video game "Leaders" plans to release a significant upgrade of the game. Users earn or lose points for making decisions as the leader of an imaginary country. In most cases, repeated playing of the game improves a user's ability to make decisions. The company will launch an online advertising campaign, but at the moment, they are not sure how to focus the advertising. Your goal is to help the company decide how the advertising campaign should be focused. Five videos have been proposed for the following target audiences:

Video 1: Target females with beginning level scores

Video 2: Target males with advanced level scores

Video 3: Target all users with middle range level scores

Video 4: Target males with beginning level scores

Video 5: Target females with advanced level scores

1. **Why might the company be interested in developing different videos based on user scores?**

    Answers may vary.

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2. **Thirty female users and twenty-five male users were selected at random from a database of people who play the game regularly. Each of them agreed to be part of a research study and report their scores. A leadership score is based on a player's answers to leadership questions. A score of 1 to 40 is considered a beginning level leadership score, a score of 41 to 60 is considered a middle level leadership score, and a score of greater than 60 is considered an advanced level leadership score.**

Use the following data to make a dot plot of the female scores, a dot plot of the male scores, and a dot plot of the scores for the combined group of males and females.

Female scores:

10	20	20	20	30	30	30	40	40	40
50	50	55	65	65	65	65	65	70	70
70	70	76	76	76	76	76	76	76	76

Male scores:

15	20	20	25	25	25	25	30	30	30
30	30	30	35	35	35	35	35	40	40
40	45	45	45	50					

Leadership Score (Females)

Leadership Score (Males)

Leadership Score
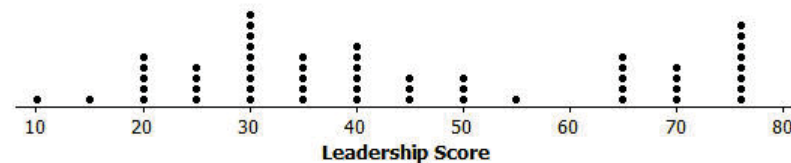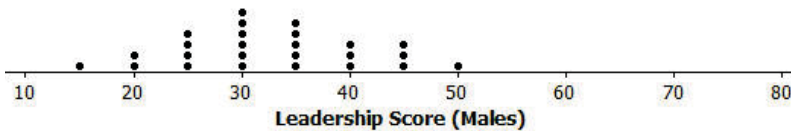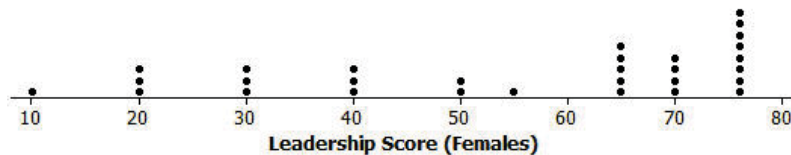
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3. **What do you think is a typical score for a female user? What do you think is a typical score for a male user? Explain how you determined these typical scores.**

    The mean score for the female users is approximately 54.9, and the median score is 65. The median is a better description of a typical score for females. Students may note that the mean score describes a female user at the middle level of leadership, and the median score describes a female user at the advanced level. The median is a better description of a typical score for females.

    The mean score for the male users is approximately 32.6, and the median score is 30. This has an approximate symmetrical distribution, and this is why the mean and the median are nearly equal. The mean is a good description of a typical score for males. Students may further indicate that this describes males at the beginning level of this game.

4. **Why is it more difficult to report a typical score for the overall group that includes both the males and females?**

    The overall distribution is difficult to summarize in terms of shape. It obviously combines the symmetrical shape from the male users and the skewed shape from the female users. The mean score of all users is approximately 44.8. The median score is 40. The mean and the median are not the same, but the values are relatively close. The mean is often interpreted as a balance point for this type of distribution. This interpretation of a mean is developed in the next lesson; however, it is also discussed in the Grade 6 standards and could be introduced again with this Problem Set.

5. **Production costs will only allow for two video advertisements to be developed. Which two videos would you recommend for development? Explain your recommendations.**

    In recommending which videos to produce based on the dot plots and measure of center, students will generally select Video 4 (males with beginning level scores) and Video 5 (females with advanced level scores).

REVIEW – Slope and Writing Equations of Lines

6. Determine the slope between each pair of coordinates.

A. (0, 0) and (2, 3)

$$\frac{3}{2}$$

B. (0, 0) and (-2, 3)

$$-\frac{3}{2}$$

C. (0, 0) and (2, -3)

$$-\frac{3}{2}$$

D. (0, 0) and (-2, -3)

$$\frac{3}{2}$$

E. (0, 0) and (0, 3)

undefined

F. (0, 0) and (2, 0)

0

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7. Graph each set of coordinates from Exercise 6 and check if the slopes you found were correct.

A.

B.

C.

D.

E.

F.
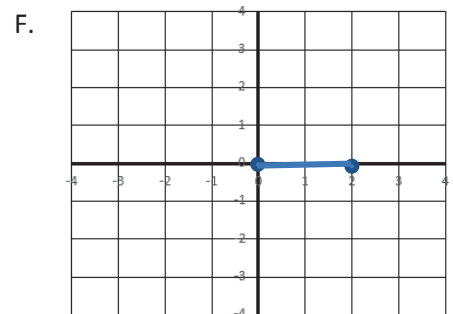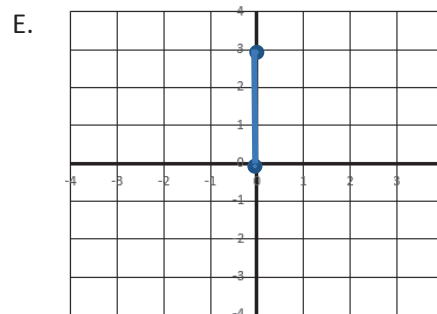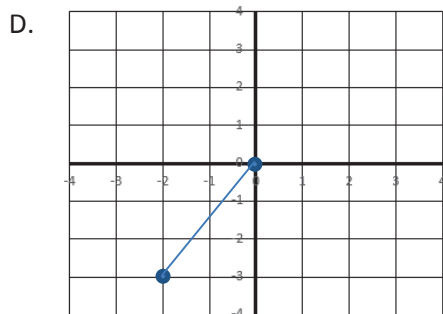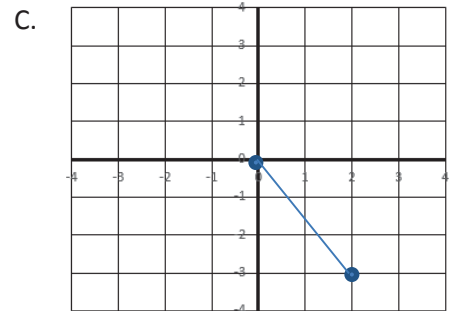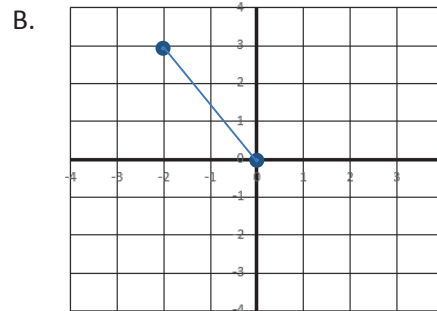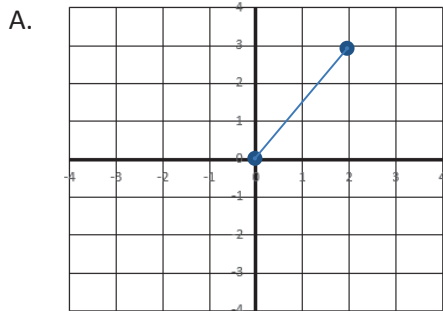
8. Write the equation of each line for the graphs in Exercise 7. Use the formula *y = mx + b*, where *m = slope* and *b = y-intercept*.

A. $y = \dfrac{3}{2}x$

B. $y = -\dfrac{3}{2}x$

C. $y = -\dfrac{3}{2}x$

D. $y = \dfrac{3}{2}x$

E. $x = 0$

F. $y = 0$

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Homework Problem Set Sample Solutions

Consider another example of balance. Mr. Jackson is a mathematics teacher at Waldo High School. Students in his class are frequently given quizzes or exams. He indicated to his students that an exam is worth 4 quizzes when calculating an overall weighted average to determine their final grade. During one grading period, Scott got an 80% on one exam, a 90% on a second exam, a 60% on one quiz, and a 70% on another quiz.

How could we represent Scott's test scores? Consider the following number line.

Scott's Test Scores
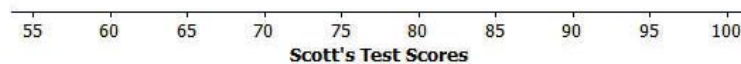
1. What values are represented by the number line?

   The values represented along the number line are percents.

2. If one "•" symbol is used to represent a quiz score, how might you represent an exam score?

   Since an exam is worth 4 quizzes, students could use a stack of 4 of the "•" symbols to represent an exam score.

3. Represent Scott's exams and quizzes on this number line using "•" symbols.

   The following dot plot could be used to represent Scott's scores:

Score
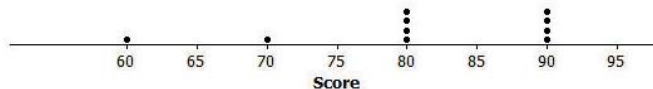
4. Mr. Jackson indicated that students should set an 85% overall weighted average as a goal. Do you think Scott met that goal? Explain your answer.

   Students' responses may vary. The overall weighted average could be represented by the balance point for the dot plot. The balance point is approximately 81% and is less than the goal set by Mr. Jackson.

5. **Place an X on the number line at a position that you think locates the balance point of all of the "•" symbols. Determine the sum of the distances from the X to each "•" on the right side of the X.**

   Answers depend on a student's estimate of the balance point. If students placed their estimate close to the mean, the sum of the distances on the right side of their estimate would be approximately the same as the sum of the distances on the left side.

6. **Determine the sum of the distances from the X to each "•" on the left side of the X.**

   Answers depend on a student's estimate of the balance point. If students placed their estimate close to the mean, the sum of the distances on the right side of their estimate would be approximately the same as the sum of the distances on the left side.

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7. **Do the total distances to the right of the X equal the total distances to the left of the X?**

   Answers depend on students' estimates.

8. **Based on your answer to Problem 7, would you change your estimate of the balance point? If yes, where would you place your adjusted balance point? How does using this adjusted estimate change the total distances to the right of your estimate and the total distances to the left?**

   Changes in the position would be based on whether or not the sum of the distances on the right equals the sum of the distances on the left. Students would adjust their estimate by moving the position of their balance point to equalize the sums of the distances.

9. **Scott's weighted average is 81. Recall that each exam score is equal to 4 times a quiz score. Show the calculations that lead to this weighted average.**

   A weighted average of 81 would be based on multiplying each exam score by 4 (representing that an exam score is worth 4 times a quiz score). For this problem, the weighted average is

$$\frac{(60 + 70 + (4 \cdot 80) + (4 \cdot 90))}{10} = 81.$$

10. **How does the calculated mean score compare with your estimated balance point?**

    Answers may vary. This question asks students to compare their estimates to the weighted average.

11. **Compute the total distances to the right of the mean and the total distances to the left of the mean. What do you observe?**

    The weighted average, like the mean discussed earlier, is a balance point. After each exam is represented by 4 "•" symbols (where each "•" represents the same weight), the result is 10 "•" symbols, which determines the mean or weighted average of Scott's test scores. The sum of the distances to the right of the balance point is equal to the sum of the distances to the left of the balance point. If a student estimated 81% as the balance point, then:

    The sum of the distances to the right:

    $$4 \cdot |90 - 81| = 4 \cdot |9| = 36$$

    The sum of the distances to the left:

    $$|60 - 81| + |70 - 81| + 4 \cdot |80 - 81| = 21 + 11 + 4 = 36$$

    Therefore, for estimates of a balance point that is less than or greater than 81%, the distances are not equal.

12. **Did Scott achieve the goal set by Mr. Jackson of an 85% average? Explain your answer.**

    Scott did not achieve Mr. Jackson's goal since his average is 81%.