

Data Distance Detectives

Construct graphs, compare spread, and generate random samples.

GRADE 8 • TEKS 8.11

8.11 "Excerpt: use statistical procedures to describe data"

NAME _____

DATE _____

Spread, Patterns, and Samples

MAD measures average distance from the mean. Scatterplots show paired values. Random samples can differ in center, spread, and proportions; matching means alone do not establish representativeness.

Worked example

Four wait times are 11, 13, 15, and 17 minutes. Find and interpret the MAD.

Mean = $56/4 = 14$ minutes. Distances = 3, 1, 1, 3 minutes. MAD = $8/4 = 2$ minutes. The average distance from the mean is 2 minutes.

Distance from mean 14 min

Wait (min)	Distance (min)
11	3
13	1
15	1
17	3

Complete seven tasks using these invented data. Materials: pencil, eight identical-size slips labeled 1-8, an opaque bag or cup, and a partner for Task 7.

1. Calculate and explain

Robot test times are shown below. Find the mean, fill each distance from it, and calculate the MAD. Interpret the result.

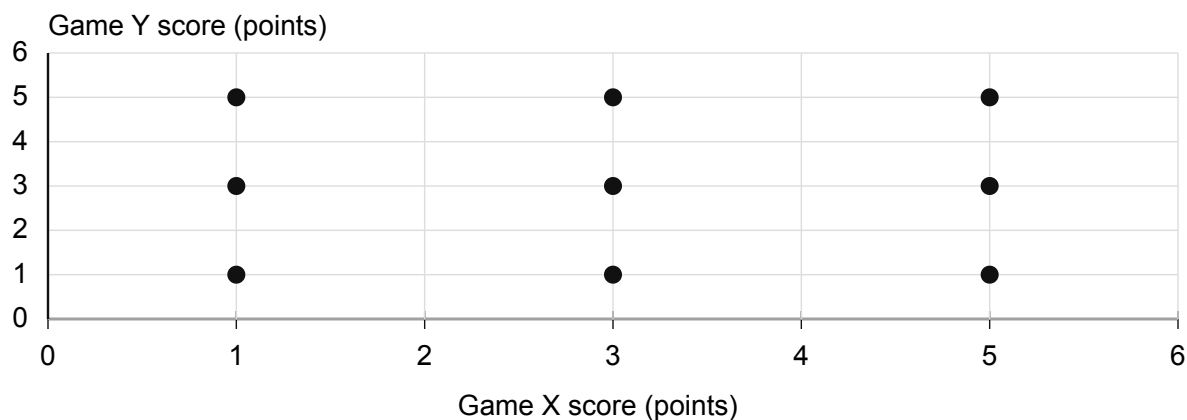
Write two distances per row, in the same order

Test times (min)	Two distances (min)
2, 4	
6, 8	

2. Interpret paired scores

Does Game X predict Game Y? Classify the association and explain using the points.

Scores in two games

**3. Build a scatterplot**

Plot and label these pairs. Describe the pattern. Does it prove cause? Explain.

Practice (10-minute units), baskets made out of 10

1. (1, 2)

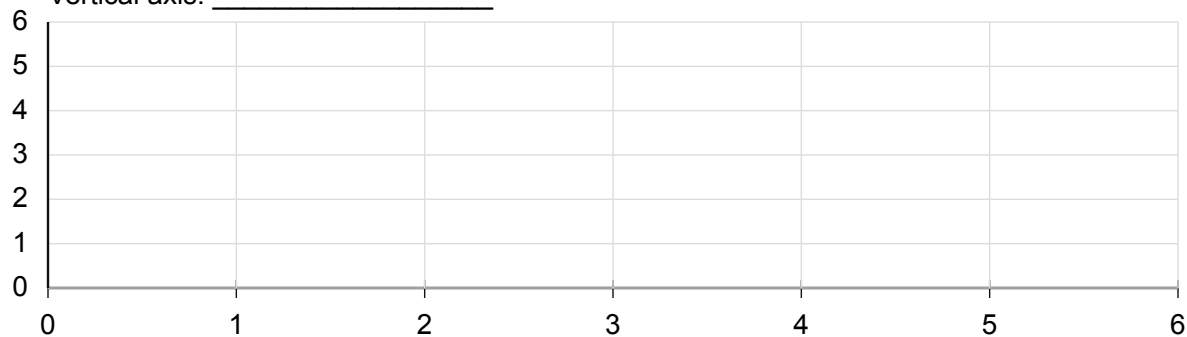
2. (2, 3)

3. (3, 4)

4. (4, 5)

Plot title: _____

Vertical axis: _____



Horizontal axis: _____

4. Recognize a nonlinear pattern

Construct this second scatterplot. Add a title and axis labels. Describe its shape and explain why a straight-line summary would hide the pattern.

Horizontal position, height (both in game units)

1. (0, 4)

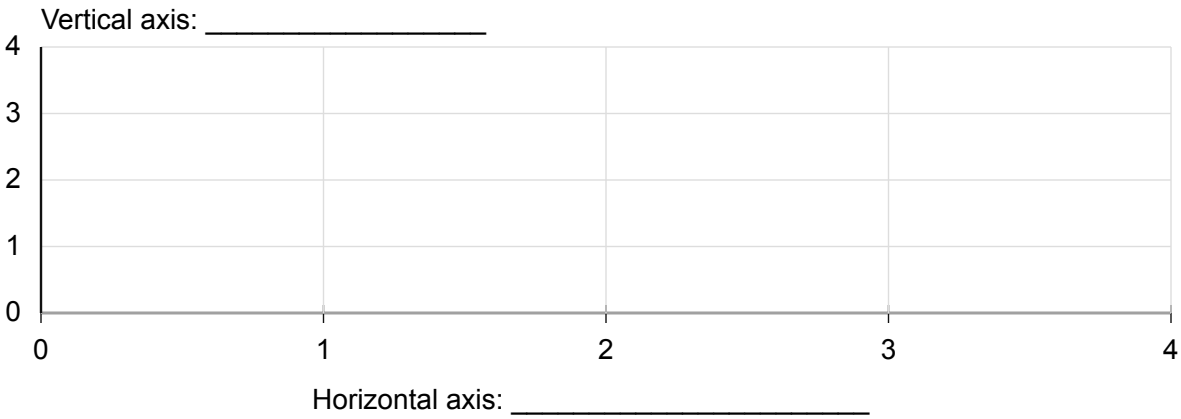
2. (1, 1)

3. (2, 0)

4. (3, 1)

5. (4, 4)

Plot title: _____



5. Generate three random samples

Population: IDs 1-8 have ratings 2, 2, 4, 4, 6, 6, 8, 8 respectively. Its mean is 5. Mix the eight ID slips in the bag. Without looking, draw three IDs without replacement. Record IDs, corresponding ratings, and their mean. Return all slips, mix, and repeat twice for three samples of size three.

Your simulated samples: one row per trial

Trial	Three IDs	Three ratings	Sample mean
1			
2			
3			

6. Compare with the known population

Using your three samples, find each mean's distance from 5. Which sample means are closest (list all ties)? Choose one closest sample. Find its fraction of ratings below 5 and compare with the population fraction $\frac{4}{8}$. Explain why a close mean does not guarantee a matching fraction.

7. Look across repeated samples

Share results with a partner who independently drew three samples using the same procedure. Record all six sample means. Explain why samples of the same size can differ. Describe how choosing only high-rating IDs would change the sampling process and likely distort the result.

TEACHER NOTES

Require actual blind draws and recorded sample evidence, not copied model samples. Use the same eight-ID population for both partners, replacing all three slips between trials. No numeric result is prescribed for a random draw. Check every sampled rating against its ID and each mean arithmetically. Both construction tasks require student plots; answer plots print only in the key. Datasets contain at most nine observations. Accept appropriate qualifiers about association and representativeness.

TASK 1

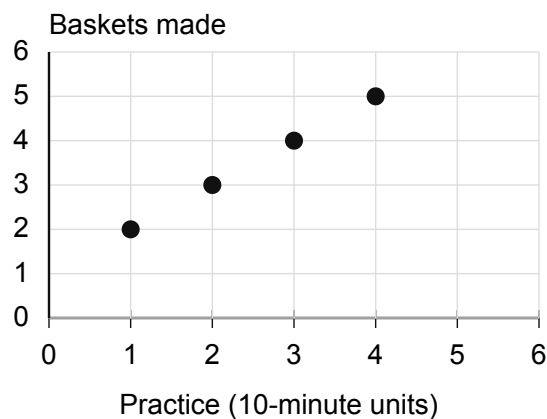
Mean 5; distances 3, 1, 1, 3; MAD 2 minutes. Times are, on average, 2 minutes from the mean.

TASK 2

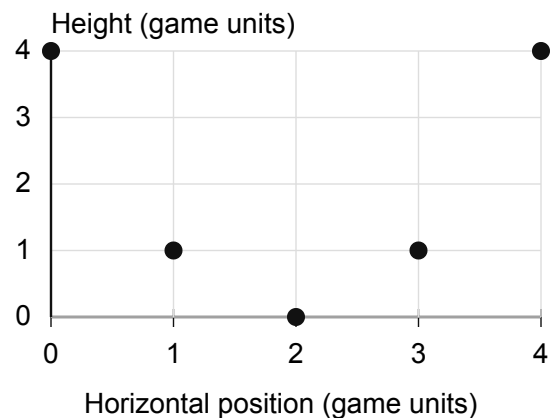
No association is evident. At each Game X score, Game Y scores span the same values 1, 3, and 5. There is no consistent rising, falling, or curved pattern; Game X does not help predict Game Y in these data.

TASK 3

Plot all four supplied points. Positive, approximately linear association. These observational pairs alone do not rule out other differences among players.

Practice and baskets**TASK 4**

Plot all five points. Nonlinear U-shaped association: height falls and then rises. A straight line hides that change in direction.

Five game positions

TASK 5

Results vary. Each row must have three distinct IDs, the matching ratings, and their sum divided by 3. Example only: IDs 1, 4, 8 give ratings 2, 4, 8 and mean $14/3$. Students must generate their own draws. Identical slips and blind, well-mixed draws give each ID an equal chance. Replacement occurs between complete trials, not within a sample.

TASK 6

Compute absolute distance from 5 and list all tied minimums. Choose any one closest sample. Count ratings below 5 and divide by 3; compare with $1/2$. With three ratings, this fraction cannot equal $1/2$ exactly. A near mean can coexist with a different category proportion. Use absolute differences, not signed differences. Check the actual drawn IDs and ratings; accept tied closest sample means.

TASK 7

Six means depend on the actual draws. Different random subsets can have different means even with equal sample size. Choosing only high-rating IDs removes equal selection chances and favors higher sample means. A single random sample need not mirror every population characteristic.