



AP Statistics FRQ Practice · Unit 1

Minutes Spent on a Pre-Class Video · numberbender.com

Name: _____

Date: _____

Score: / 4

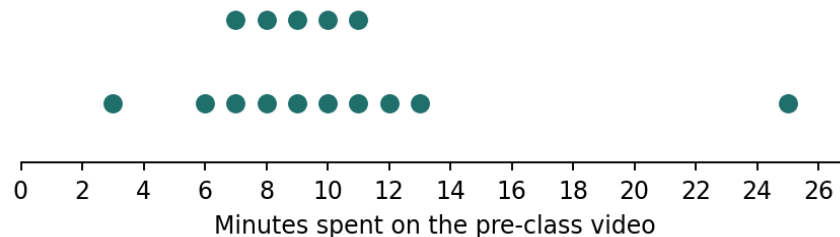
What this question practices

- Five-number summary and the $1.5 \times \text{IQR}$ outlier rule
- Describing a distribution in context
- Choosing a measure of center
- Normal-distribution probabilities

Show all your work. Answer each part in complete sentences, in the context of the problem. The data are hypothetical.
Suggested time: 13 minutes.

A math teacher who uses a flipped classroom recorded how many minutes each of 15 students spent watching the pre-class video for one lesson. The times, in minutes, are listed below.

Minutes
3, 6, 7, 7, 8, 8, 9, 9, 10, 10, 11, 11, 12, 13, 25



The mean of the 15 times is 9.93 minutes and the standard deviation is 4.88 minutes.

(a) Find the five-number summary of the times. Then use the $1.5 \times \text{IQR}$ rule to determine whether any times are outliers. Show your work.

(b) Describe the distribution of video-watching times.



(c) The teacher wants to report a single number for the typical watching time. Should she use the mean (9.93 minutes) or the median (9 minutes)? Explain.

(d) Across a large school district, watching times for this kind of lesson are approximately normal with mean 9.5 minutes and standard deviation 2.4 minutes. What proportion of students in the district watch for more than 12 minutes? Show your work.





Each part is scored *E* (essentially correct), *P* (partially correct) or *I* (incorrect), the way AP readers score free-response questions. Compare your work with the model solution, then with the scoring note.

(a) Find the five-number summary of the times. Then use the $1.5 \times \text{IQR}$ rule to determine whether any times are outliers. Show your work.

→ With 15 values, the median is the 8th value: 9 minutes.

→ Q_1 is the median of the 7 values below the median (3, 6, 7, 7, 8, 8, 9), which is 7. Q_3 is the median of the 7 values above it (10, 10, 11, 11, 12, 13, 25), which is 11.

Min = 3, $Q_1 = 7$, Median = 9, $Q_3 = 11$, Max = 25

IQR = $11 - 7 = 4$; $7 - 1.5(4) = 1$, $11 + 1.5(4) = 17$

→ The fences are 1 and 17 minutes. The time of 25 minutes is above 17, so it is an outlier. No time is below 1, so there are no low outliers.

Scoring. Essentially correct: all five values, the fence calculations, and 25 identified as the only outlier. Partially correct: the five-number summary is right but the outlier check is missing or has one error.

(b) Describe the distribution of video-watching times.

→ **Shape:** the distribution of watching times is skewed to the right, with a high outlier at 25 minutes.

→ **Center:** the median watching time is 9 minutes.

→ **Variability:** the middle half of students watched between 7 and 11 minutes (IQR = 4 minutes), and the times range from 3 to 25 minutes.

Scoring. Essentially correct: shape, outlier, center and variability, all in the context of minutes spent watching the video. Partially correct: two or three of these, or no context.

(c) The teacher wants to report a single number for the typical watching time. Should she use the mean (9.93 minutes) or the median (9 minutes)? Explain.

→ She should use the median. The distribution is skewed right and has a high outlier, which pulls the mean up but has almost no effect on the median.

$\bar{x}_{\text{without } 25} = \frac{124}{14} \approx 8.86$ minutes; the median is still 9

→ For example, removing the 25-minute time lowers the mean from 9.93 to about 8.86 minutes, while the median stays at 9 minutes. The median is resistant; the mean is not.

Scoring. Essentially correct: chooses the median and links the choice to the skew or the outlier. Partially correct: chooses the median with a weak or generic reason.



(d) Across a large school district, watching times for this kind of lesson are approximately normal with mean 9.5 minutes and standard deviation 2.4 minutes. What proportion of students in the district watch for more than 12 minutes? Show your work.

→ Let X be a student's watching time, with X approximately Normal(mean 9.5, SD 2.4).

→ Standardize 12 minutes, then use the standard normal table or a calculator (normalcdf with lower bound 12, upper bound 1000, mean 9.5, SD 2.4).

$$z = \frac{12 - 9.5}{2.4} \approx 1.04$$

$$P(X > 12) = P(Z > 1.04) \approx 0.149$$

→ About 14.9% of students in the district watch for more than 12 minutes.

Scoring. Essentially correct: correct distribution and boundary shown (with z or labeled calculator inputs) and an answer of about 0.149. Partially correct: correct answer with no work, or a work error such as using the wrong tail.

