LESSON MAKER PRO

Predict the Pattern

Use probability distributions to describe results and predict totals.

HIGH SCHOOL · MM.D3D.C.18.c

MM.D3D.C.18.c "Find the mean, standard deviation, median, and interquartile range of a probability distribution and make long-term predictions about future possibilities..."

NAME _____ DATE _____

CENTERS AND SPREAD

Find the mean by adding each outcome times its probability. Find the standard deviation (SD) by taking the square root of the sum of each probability times (outcome - mean)^2. For these distributions, list four equally likely outcomes in order, including repeats: the median is the middle of all four, Q1 is the middle of the first two, Q3 is the middle of the last two, and IQR = Q3 - Q1. For n trials, predict a total of n times the mean; use the mean and SD for a roughly symmetric distribution, or the median and IQR when a long tail pulls the mean.

WORKED EXAMPLE

Find the mean, SD, median, and IQR of the distribution shown.

PROBABILITY DISTRIBUTION

Outcome	Probability
1	1/4
3	1/4
5	1/4
7	1/4

1. Mean = (1 + 3 + 5 + 7)/4 = 4.
2. SD = square root of (9 + 1 + 1 + 9)/4 = square root of 5.
3. Median = (3 + 5)/2 = 4; Q1 = (1 + 3)/2 = 2; Q3 = (5 + 7)/2 = 6.
4. IQR = 6 - 2 = 4.

Answer: Mean = 4; SD = square root of 5; median = 4; IQR = 4.

PRACTICE 6 problems

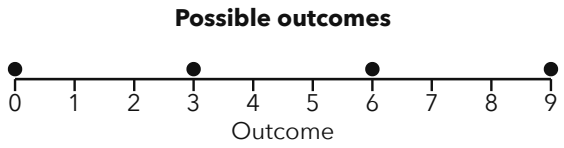
1 Find the mean and SD of the distribution shown.

PROBABILITY DISTRIBUTION

Outcome	Probability
0	1/4
2	1/2
4	1/4

ANSWER _____

2 Each dot is one equally likely outcome. Find Q1, Q3, and the IQR.



ANSWER _____

3 A distribution gives 0 and 4 equal probabilities. Find its mean and SD.

ANSWER _____

4 Find the mean and median of the distribution shown. Which better describes a typical outcome?

PROBABILITY DISTRIBUTION

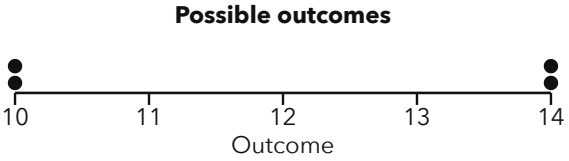
Outcome	Probability
1	3/4
9	1/4

ANSWER _____

5 An app sends 0 alerts on a day with probability 3/4 and 4 alerts with probability 1/4. Predict the total number of alerts over 80 days.

ANSWER _____

6 Each dot is one equally likely outcome. Find the median and IQR.



ANSWER _____

APPLY IT Show your work

1 Four equally likely commute-time outcomes are 10, 20, 20, and 30 minutes. Find the mean and SD per commute. Predict the total commute time over 20 commutes.

WORK SPACE

ANSWER _____

2 A game at a school fair has four equally likely prize outcomes: $0, $0, $0, and $8. Find the mean and median prize. Which better describes a usual prize? Predict the total prizes paid over 40 plays.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Each row shows one equally likely result for each game. Find the mean, median, and SD for each game. Which game has outcomes more tightly clustered around its mean? Explain.

GAME PRIZES IN DOLLARS

Result	Game A	Game B
1	0	0
2	0	2
3	0	2
4	8	4

WORK SPACE AND ANSWER

ANSWER KEY

Predict the Pattern

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the mean and SD of the distribution shown.	**Mean = 2; SD = square root of 2.**
2	Each dot is one equally likely outcome. Find Q1, Q3, and the IQR.	**Q1 = 1.5; Q3 = 7.5; IQR = 6.**
3	A distribution gives 0 and 4 equal probabilities. Find its mean and SD.	**Mean = 2; SD = 2.**
4	Find the mean and median of the distribution shown. Which better describes a typical outcome?	**Mean = 3; median = 1. The median better describes a typical outcome.**
5	An app sends 0 alerts on a day with probability 3/4 and 4 alerts with probability 1/4. Predict the total number of alerts over 80 days.	**80 alerts.**
6	Each dot is one equally likely outcome. Find the median and IQR.	**Median = 12; IQR = 4.**

PART 2 · APPLY IT

1. **Mean = 20 minutes; SD = 5 times the square root of 2 minutes; predicted total = 400 minutes.** The squared deviations from 20 average to (100 + 0 + 0 + 100)/4 = 50, so SD is the square root of 50. Multiply the mean of 20 minutes by 20 commutes.
2. **Mean = $2; median = $0. The median better describes a usual prize. Predicted total = $80.** The mean is ($0 + $0 + $0 + $8)/4 = $2, while the middle two outcomes are both $0. Multiply $2 by 40 plays for the predicted total.

CHALLENGE

Game A: mean = $2, median = $0, SD = 2 times the square root of 3 dollars. Game B: mean = $2, median = $2, SD = the square root of 2 dollars. Game B is more tightly clustered around its mean because its SD is smaller.

Accept square root notation written with a radical symbol and equivalent simplified forms. Long-term totals are predictions, not guaranteed results.