

AP Statistics - Random Variables, Expected Value and Combining Variables - Quiz

Common Core AP STAT 4.7, AP STAT 4.8, AP STAT 4.9, HSS-MD.A.1, HSS-MD.A.2, HSS-MD.B.5 · maths-pdf.fr/en/

Name: _____ Class: _____ Date: ____/____/____

Ten multiple-choice questions check the rules for means and standard deviations of random variables. Read each explanation, since adding standard deviations is the most common error.

AP Statistics · Common Core State Standards: **AP STAT 4.7, AP STAT 4.8, AP STAT 4.9, HSS-MD.A.1, HSS-MD.A.2, HSS-MD.B.5**

Questions

Question 1

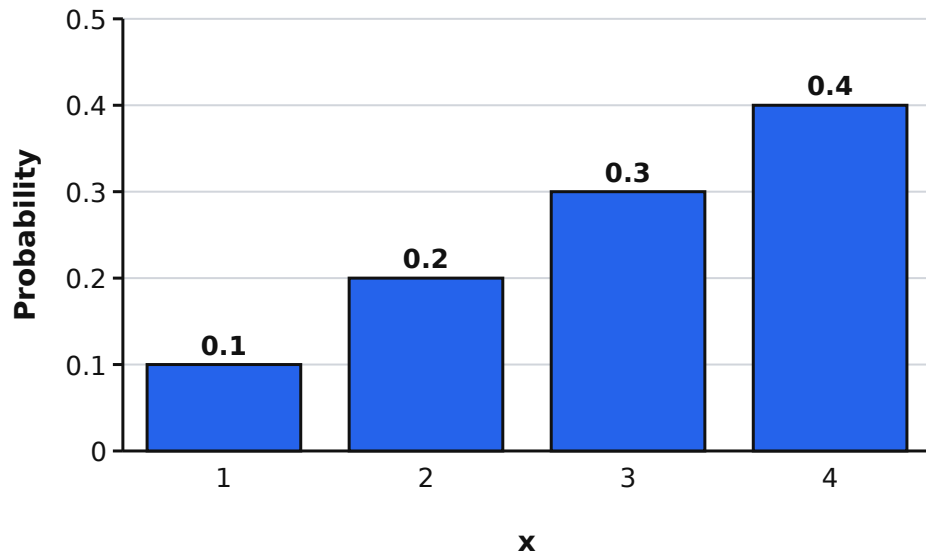
x	0	1	2
P(x)	0.5	0.3	0.2

Distribution of X.

What is the mean of X?

- A. 1.0
- B. 0.7
- C. 0.5
- D. 0.3

Question 2



Histogram of Y.

What is $E(Y)$?

- A. 3
- B. 2.5
- C. 4
- D. 1

Question 3

Variable	Mean	SD
X	10	3
Y	6	4

Independent variables.

What is the standard deviation of $X + Y$?

- A. 5
- B. 7
- C. 25
- D. 1

Question 4

Variable	Mean	SD
X	10	3
Y	6	4

Independent variables.

What is the mean of $X - Y$?

- A. 16
- B. -4
- C. 4
- D. 7

Question 5

If $Y = 4X + 1$, and X has standard deviation 2, the standard deviation of Y is:

- A. 9
- B. 2
- C. 4
- D. 8

Question 6

A fair game has expected net gain of:

- A. 1
- B. the cost to play
- C. 0
- D. the largest prize

Question 7

Which probabilities could define a distribution?

- A. 0.4, 0.4, 0.4
- B. 0.25, 0.25, 0.5
- C. 0.5, 0.6, -0.1
- D. 0.2, 0.2, 0.2

Question 8

Independent X , Y have sd 5 and 12. The sd of $X - Y$ is:

- A. 7
- B. 17
- C. 169
- D. 13

Question 9

The expected value of a random variable is best interpreted as:

- A. the most likely value
- B. the long-run average of many repetitions
- C. the middle value
- D. the largest value

Question 10

If the weights of two independent items have means 3 and 5 lb, the mean total weight is:

- A. 8 lb
- B. 15 lb
- C. 4 lb
- D. 2 lb

Answers

1. **B** - $0(0.5) + 1(0.3) + 2(0.2) = 0.7$. The mean is not the middle value of the list of x .
2. **A** - $1(0.1) + 2(0.2) + 3(0.3) + 4(0.4) = 0.1 + 0.4 + 0.9 + 1.6 = 3.0$.
3. **A** - $\sqrt{9 + 16} = 5$. Adding $3 + 4 = 7$ is the common error.
4. **C** - Means subtract: $10 - 6 = 4$.
5. **D** - Multiplying by 4 scales the sd by 4, and adding 1 does not change it: $4(2) = 8$.
6. **C** - A fair game neither favors nor penalizes the player in the long run.
7. **B** - They must be between 0 and 1 and add to 1. Only the first option meets both rules.
8. **D** - $\sqrt{25 + 144} = \sqrt{169} = 13$. Variances add for differences too.
9. **B** - It is the long-run mean, not necessarily the most likely or even a possible value.
10. **A** - Means always add: $3 + 5 = 8$.

Remember

- Probabilities in a distribution are between 0 and 1 and sum to 1.
- Mean (expected value): sum of $x p$; interpret it as the long-run average.
- Standard deviation: square root of the sum of $(x - \text{mean})^2 p$.
- For $a + bX$: mean $a + b \mu$, standard deviation $|b| \sigma$.
- For independent X, Y : means add or subtract; variances add (also for $X - Y$).