Discrete Random Variables

- Topics: Standard deviation of a discrete random variable

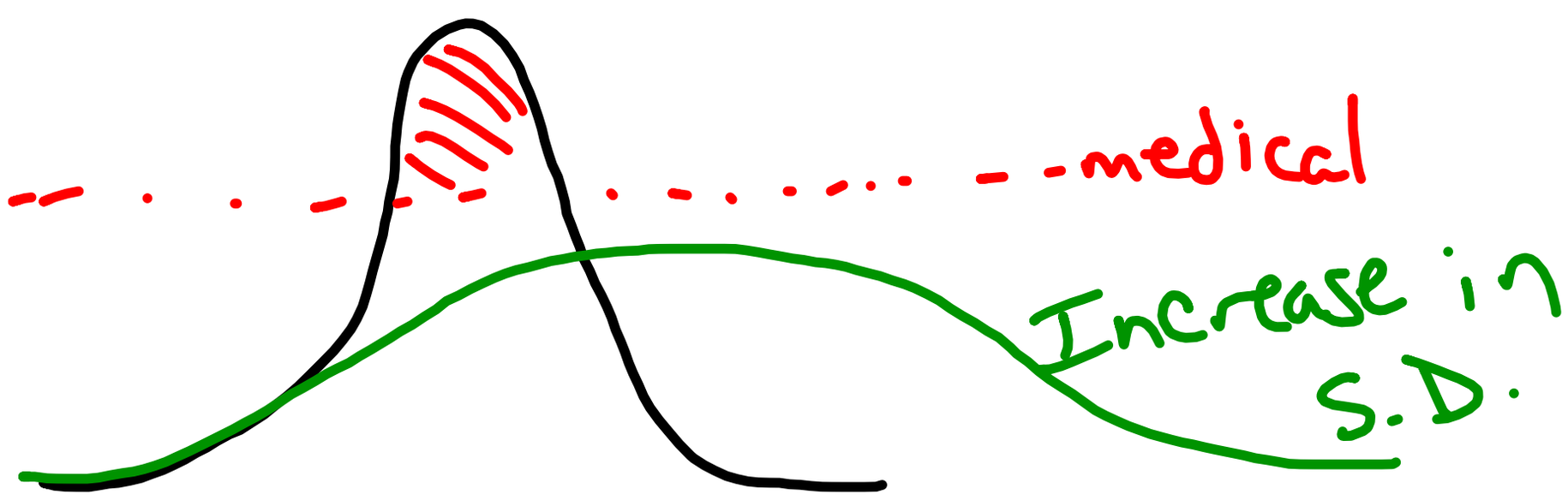
- Objective: Students will be able to calculate mean expected value given a probability distribution.

- Standards: AP Stats: VAR-5 (EU), VAR-5.C (LO), VAR-5.C.3 (EK)

Standard Deviation of a Discrete Random Variable

Definition: The most important characteristics of any probability distribution are the ***mean (or expected value)*** and the ***standard deviation*** (a measure of how spread out the values are).

Flattening the curve = increase S.D.



Standard Deviation of a Discrete Random Variable

Calculating the Standard Deviation:

Step 1: Calculate the mean (expected value) of X. μ_X

Step 2: Calculate the variance of X.

Step 3: Calculate the standard deviation of X = $\sqrt{Variance(x)}$

Value of X	−2	0	2
Probability	.10	.80	.10

① $(-2 * .10) + (0 * .80) + (2 * .10) = 0$

② $(-2-0)^2(.10) + (0-0)^2(.80) + (2-0)^2(.10) = .8$ Variance

③ S.D. $= \sqrt{.8} = .894$

Standard Deviation of a Discrete Random Variable

Example 1: A construction company is considering submitting bids for two contracts. The company estimates that it has a 20% chance of winning any given bid. Here is the probability distribution of X, equals the number of bids the company wins:

$X = \#$ of bids won	0	1	2
$P(X)$	0.64	0.32	0.04

Given that $\mu_x = 0.4$. EV, mean
Round your answer to two decimal places.

$\sigma_X =$ [ ] bids

Variance

② $(0-0.4)^2(.64)+(1-0.4)^2(.32)+(2-0.4)^2(0.04) = .32$

③ $SD = \sqrt{.32} = .5656 \sim .57$

Standard Deviation of a Discrete Random Variable

Example 2: A pizza shop delivers an extra large pizza, which is sold for $20, and costs the pizza shop $12 to make. The pizza shop has a delivery policy that says if the pizza takes longer than half an hour to arrive, there is no charge. Experience has shown that delivery takes longer than half an hour only 10% of the time.

Let the random variable X be the pizza shop's profit for a randomly selected delivery order for one of these pizzas. Here is the probability distribution for X:

	Late	On-time
$X =$ profit	$-\$12$	$\$8$
$P(X)$	0.10	0.90

② $(-12-6)^2(.10) + (8-6)^2(.90) = 36$

Given that $\mu_x = \$6$

③ $SD = \sqrt{36} = 6$

Round your answer to two decimal places.

$\sigma_X =$ 6 dollars

You should be working on the following skills:

1. Expected Value
2. Mean (expected value) of a discrete random variable
3. Standard deviation of a discrete random variable