

AP Statistics

Chapter 6: Random Variables

Day 2

HW: p. 354-356, #15, 19, 21, 23, 25, 27-30

Variance of a Discrete Random Variable

The variance can be found by using this formula:

$$\text{Var}(X) = \sigma_x^2 = \sum (x_i - u_x)^2 p_i$$

Standard Deviation of a Discrete Random Variable

The standard deviation can be found by using this formula:

$$\sigma_x = \sqrt{\sigma_x^2}$$

Example (Apgar Scores)

Value:	0	1	2	3	4	5	6	7	8	9	10
Probability:	0.001	0.006	0.007	0.008	0.012	0.020	0.038	0.099	0.319	0.437	0.053

Compute the variance and standard deviation. Interpret the standard deviation of the random variable X.

$$\mu_x = 8.128$$

$$\sigma_x^2 = \sum (0-8.128)^2 (.001) + (1-8.128)^2 (.006) \dots + (10-8.128)^2 (.053) = 2.065$$

$$\sigma_x = \sqrt{2.065} = 1.437$$

* on average, a randomly chosen baby's Apgar score will vary 1.437 from the mean.

Example (# of Cars Owned by Families of Students at a Small High School)

Number of cars, x	0	1	2	3	4
Probability (P(x))	0.05	0.15	0.35	0.30	?

Compute the variance and standard deviation. Interpret the standard deviation of the random variable X.

$$\mu_x = 2.35$$

$$\sigma_x^2 = 1.13$$

$$\sigma_x = 1.06$$

* On average, a randomly selected families # of cars owned will vary 1.06 cars from the mean.

Continuous Random Variable

The probability of continuous random variables is found the same way we found probabilities under a bell-curve.

Use your z-scores and table A.

$$z = \frac{x - \text{mean}}{\text{standard deviation}}$$

Example

The heights of young women closely follow the Normal distribution with mean $\mu = 64$ inches and standard deviation $\sigma = 2.7$ inches. This is a distribution for a large set of data. Now choose one young woman at random. Call her height Y . If we repeat the random choice very many times, the distribution of values of Y is the same Normal distribution that describes the heights of all young women.

Find the probability that the chosen woman is between 68 and 70 inches tall.

Example

$$\mu = 64 \text{ inches}$$

$$\sigma = 2.7 \text{ inches}$$

Find the probability that the chosen woman is between 68 and 70 inches tall.

$$Z = \frac{68 - 64}{2.7} = 1.48$$

$$P(Z = 1.48) = .9306$$

$$Z = \frac{70 - 64}{2.7} = 2.22$$

$$P(Z = 2.22) = .9868$$

$$P(1.48 < Y < 2.22)$$

$$.9868 - .9306$$

$$= .0562$$

