Time Frame: 50 minutes

Subject Matter: Discrete Probability Distribution TELL ME

Objective: TSWBAT Find the mean, variance and standard deviation for a discrete random variable.

Standards: DA – 5.11

 Materials: Transparencies and Worksheets

SHOW ME

Presentation of Information:

The teacher will discuss the following:

1. Comparison between the mean, variance, and standard deviation of probability distribution and sample.
2. How to compute the mean, variance, and standard deviation of probability distribution.

|  |  |
| --- | --- |
| Mean for a Discrete Random Variable | Mean of a Sample |
| $$μ=X\_{1}\*P\left(X\_{1}\right)+X\_{2}\*P\left(X\_{2}\right)+X\_{3}\*P\left(X\_{3}\right)+…+X\_{n}\*P\left(X\_{n}\right)$$ | $$\overbar{x}= \frac{ΣX}{n}$$ |

|  |  |
| --- | --- |
| Variance and Standard Deviation for a Discrete Random Variable | Variance and SD of a Sample |
| Variance $$σ^{2}= Σ\left[X^{2}\*P\left(X\right)\right]- μ^{2}$$Standard deviation $$σ= \sqrt{σ^{2}}$$ | Variance$$s^{2}= \frac{Σ\left(x- \overbar{x}\right)^{2}}{n-1}$$Standard Deviation$$s= \sqrt{s^{2}}$$ |

Example 1

Find the mean, variance, and standard deviation of the number of spots that appear when a die is tossed.

Solution

|  |  |  |
| --- | --- | --- |
| Mean | Variance | Standard Deviation |
| In the toss of a die, the mean can be computed thus. Outcome X 1 2 3 4\_\_ 5 6\_ Probability P(X) $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $ \frac{1}{6}$$$μ=X\_{1}\*P\left(X\_{1}\right)+X\_{2}\*P\left(X\_{2}\right)+X\_{3}\*P\left(X\_{3}\right)+…+X\_{n}\*P\left(X\_{n}\right)$$$$μ=1\*\frac{1}{6}+2\*\frac{1}{6}+3\*\frac{1}{6}+4\*\frac{1}{6}+5\*\frac{1}{6}+6\*\frac{1}{6}$$$$μ=\frac{21}{6}$$$$μ=3.5 Answer$$ | $$σ^{2}= \left(1^{2}∙\frac{1}{6}+2^{2}∙\frac{1}{6}+3^{2}∙\frac{1}{6}+4^{2}∙\frac{1}{6}+5^{2}∙\frac{1}{6}+6^{2}∙\frac{1}{6}\right)-\left(3.5\right)^{2}$$$$σ^{2}=2.9 Answer$$ | $$σ=\sqrt{2.9}$$$$σ=1.7 Answer$$ |

Example 2

In a family with two children, find the mean of the number of children who will be girls.

Solution

Sample Space: BB, BG, GB, GG

The probability distribution is as follows.

|  |  |  |
| --- | --- | --- |
| Mean | Variance | Standard Deviation |
| Number of Girls X 0 1 2\_\_ Probability P(X) $\frac{1}{4}$ $\frac{2}{4}$ $\frac{1}{4}$ Hence, the mean is$$μ=0\*\frac{1}{4}+1\*\frac{2}{4}+2\*\frac{1}{4}$$$$μ=1 Answer$$ | $$σ^{2}= \left(0^{2}∙\frac{1}{4}+1^{2}∙\frac{2}{4}+2^{2}∙\frac{1}{4}\right)-\left(1\right)^{2}$$$$σ^{2}=0.5 Answer$$ | $$σ=\sqrt{0.5}$$$$σ=0.71 Answer$$ |

Example 3

The probability distribution shown represents the number of trips of 5 nights or more that American adults take per year. (That is, 6% do not take any trips lasting 5 nights or more. 70% take one trip lasting 5 nights or more per year, etc.) Find the mean.

Number of trips X 0 1 2 3 4\_\_\_

Probability P(X) 0.06 0.70 0.20 0.03 0.01

Solution

|  |  |  |
| --- | --- | --- |
| Mean | Variance | Standard Deviation |
| $$μ=\left(0\right)\*\left(0.06\right)+\left(1\right)\*\left(0.70\right)+\left(2\right)\*\left(0.20\right)+\left(3\right)\*\left(0.03\right)+\left(4\right)\*\left(0.01\right)$$$$μ=0+0.70+0.40+0.09+0.04$$$$μ=1.23 Answer$$ | $$σ^{2}= \left(0^{2}∙0.06+1^{2}∙0.70+2^{2}∙0.20+3^{2}∙0.03+4^{2}∙0.01\right)-\left(1.23\right)^{2}$$$$σ^{2}=2.85 Answer$$ | $$σ=\sqrt{2.85}$$$$σ=1.69 Answer$$ |

Homework

1. From past experience, a company has found that in carton of transistors, 92% contain no defective transistors, 3% contain one defective transistor, 3% contain two defective transistors, and 2% contain three defective transistors. Find the mean, variance, and standard deviation for the defective transistors.

Classwork

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: Dec. 9, 2010

1. The number of suits sold per day at a retail store is shown in the table, with the corresponding probabilities. Find the mean, variance, and standard deviation of the distribution.

Number of suits sold X 19 20 21 22 23\_\_\_

Probability P(X) 0.2 0.2 0.3 0.2 0.1

If the manager of the retail store wants to be sure that he has enough suits for the next 5 days, how many should the manager purchase?

1. A bank vice president feels that each savings account customer has, on average, three credit cards. The following distribution represents the number of credit cards people own. Find the mean, variance, and standard deviation. Is the vice president correct?

Number of cards X 0 1 2 3 4\_\_\_

Probability P(X) 0.18 0.44 0.27 0.08 0.03

1. The probability distribution for the number of customers per day at the Sunrise Coffee Shop is shown here. Find the mean, variance, and standard deviation of the distribution.

Number of customers X 50 51 52 53 54\_\_\_

Probability P(X) 0.10 0.20 0.37 0.21 0.12

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1. A public speaker computed the probabilities for the number of speeches she gives each week. Compute the mean, variance, and standard deviation of the distribution shown.

Number of speeches X 0 1 2 3 4\_ 5\_\_

Probability P(X) 0.06 0.42 0.22 0.12 0.15 0.03

If she receives $100 per speech, about how much will she earn per week?

1. A recent survey by an insurance company showed the following probabilities for the number of automobiles each policyholder owned. Find the mean, variance, and standard deviation for the distribution.

Number of automobiles X 1 2 3 4

Probability P(X) 0.4 0.3 0.2 0.1

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Classwork

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: Dec. 10, 2010

1. A concerned parents group determined the number of commercials shown in each of five children’s programs over a period of time. Find the mean, variance, and standard deviation of the distribution.

Number of commercials X 5 6 7 8 9\_\_\_

Probability P(X) 0.2 0.25 0.38 0.10 0.07

1. A study conducted by a TV station showed the number of televisions per household and the corresponding probabilities for each. Find the mean, variance, and standard deviation.

Number of TVs X 1 2 3 4 \_\_\_

Probability P(X) 0.32 0.51 0.12 0.05

 If you were taking a survey on the programs that were watched on television, how many program

diaries would you send to each household in the survey?

1. The following distribution shows the number of students enrolled in CPR classes offered by the local fire department. Find the mean, variance, and standard deviation of the distribution.

Number of students X 12 13 14 15 16\_\_\_

Probability P(X) 0.15 0.20 0.38 0.18 0.09

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1. A florist determines the probabilities for the number of flower arrangements she delivers each day. Find the mean, variance, and standard deviation of the distribution.

Number of arrangements X 6 7 8 9 10\_\_\_

Probability P(X) 0.20 0.20 0.30 0.20 0.10

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