**Is it time for a raise?**

Mrs. Gallas’ employees have been working very hard and it’s time she gives them a raise. She is trying to decide if she should give everyone a $10 raise (add $10 per hour) or double everyone’s wage (multiply by 2).

1. Copy the data collected from yesterday’s lesson below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *X*  | 1 | 5 | 7 | 10 | 15 | 25 |
| Probability |  |  |  |  |  |  |

Mean: Standard Deviation:

1. To make a decision about what raise should be given, complete the tables below and calculate the new mean and standard deviation using an applet or your calculator.
2. Option 1: Add $10 per hour to all employees

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *X🡪* Old Wage | 1 | 5 | 7 | 10 | 15 | 25 |
| *Y 🡪* New Wage |  |  |  |  |  |  |
| Probability |  |  |  |  |  |  |

 Mean: Standard Deviation:

How did adding a constant affect the mean and standard deviation?

1. Option 2: Double the original wage of all employees

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *X* *🡪* Old Wage | 1 | 5 | 7 | 10 | 15 | 25 |
| *Z 🡪* New Wage |  |  |  |  |  |  |
| Probability |  |  |  |  |  |  |

 Mean: Standard Deviation:

How did multiplying by a constant affect the mean and standard deviation?

1. Which option would you prefer? Why?

Transforming Probability Distributions

Important ideas:

**Check Your Understanding**

Let *X* = the number billionaires in a randomly selected state. Based on current records, the probability distribution of *X* is as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of Billionaires | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | 13 | 17 | 56 | 58 | 118 | 165 |
| Probability | 0.10 | 0.24 | 0.06 | 0.06 | 0.04 | 0.08 | 0.04 | 0.04 | 0.06 | 0.08 | 0.02 | 0.02 | 0.02 | 0.06 | 0.02 | 0.02 | 0.02 | 0.02 |

The random variable *X* has mean $μ\_{x}=$ 12.68 and standard deviation $σ\_{x}=$ 29.02. Suppose a law is passed requiring each billionaire to pay $1,000,000 to their state. Let *Y* = the money received by a randomly selected state.

1. Consider the graph of the probability distribution of *X* and a separate graph of the probability distribution of *Y*. How would their shapes compare?
2. Find the mean of *Y*.
3. Calculate and interpret the standard deviation of Y.
4. Each state agrees to invest $500,000 to improve roads. Therefore, the net amount (*N*) of money a randomly selected state has after the billionaire tax is *N* = *Y* – $500,000. Describe the shape, mean, and standard deviation of the probability distribution of *N*.