Name: ______________________ Hour: ____ Date: ____

Lesson 6.2: Day 2: How much will you make next year?

After much thought Mrs. Gallas has finally decided on permanent employee wages which are randomly assigned using the probability distribution *X* given below. Additionally, at the end of every year she gives her employees an hourly raise. The bonuses are assigned randomly according to the probability distribution *Y* given below. Assume *X* and *Y* are independent.

1. Find the mean, variance and standard deviation of the probability distribution of *X*, the hourly wages.

X	9	12	15
Probability	0.30	0.45	0.25

Mean: 11.85 Variance: 4.93 Standard Deviation: 2.22

2. Find the mean, variance and standard deviation of the probability distribution of *Y*, the annual hourly raise.

Y	$1	$3
Probability	0.70	0.30

Mean: 1.60 Variance: .839 Standard Deviation: .917

3. Let *N* = the new hourly wage for the upcoming year (*X* + *Y*). What are all the possible new hourly wages for the new year?

10, 12, 13, 15, 16, 18

a. What is the probability of an employee being assigned a $9 wage **AND** a $1 raise? Show your work.

$P(9 \cap 1) = P(9) \times P(1) = .3 \times .7 = .21$

b. Complete the table below for the probability distribution of *N* = *X* + *Y* and find the mean and standard deviation.

N	10	12	13	15	16	18
Probability	.21	.09	.315	.135	.175	.075

Mean: 13.45 Variance: 5.76 Standard Deviation: 2.40

4. If *N* = *X* + *Y*, complete the following in terms of *X* and *Y*:

$\mu_N = \mu_x + \mu_y$ $\sigma_N = \sqrt{\sigma_x^2 + \sigma_y^2}$

Name: ______________________________ Hour: _____ Date: ______

Lesson 6.2 Day 2– Combining Probability Distributions

Important ideas:

LT#1 Adding and subtracting Random Variables X & Y:

$\mu_{X+Y} = \mu_X + \mu_Y$ | $\mu_{X-Y} = \mu_X - \mu_Y$

$\sigma_{X+Y} = \sqrt{\sigma_X^2 + \sigma_Y^2}$ | $\sigma_{X-Y} = \sqrt{\sigma_X^2 + \sigma_Y^2}$

LT#2: Normal Prob. Dist.

Find new mean and standard deviation!

Check Your Understanding

A large auto dealership keeps track of sales and lease agreements made during each hour of the day. Let X = the number of cars sold and Y = the number of cars leased during the first hour of business on a randomly selected Friday. Based on previous records, the probability distributions of X and Y are as follows:

Cars sold x_i	0	1	2	3
Probability p_i	0.3	0.4	0.2	0.1

Mean: $\mu_X = 1.1$ Standard deviation: $\sigma_X = 0.943$ × 500 = 471.50

Cars leased y_i	0	1	2
Probability p_i	0.4	0.5	0.1

Mean: $\mu_Y = 0.7$ Standard deviation: $\sigma_Y = 0.64$ × 300 = 192

Define $T = X + Y$. Assume that X and Y are independent.

1. Find and interpret μ_T.

$\mu_T = 1.8$ over many many Fridays, the dealer expects to sell & lease, on average, about 1.8 cars.

2. Calculate and interpret σ_T.

$\sigma_T = \sqrt{.943^2 + .64^2} = \sqrt{1.2988} = 1.14$

3. The dealership's manager receives a \$500 bonus for each car sold and a \$300 bonus for each car leased. Find the mean and standard deviation of the manager's total bonus B.

$\mu B = 500(1.1) + 300(.7)$
$= 550 +$
$= 760$

$\sigma_B = \sqrt{(500 \times .943)^2 + (300 \times .64)^2}$
$= \sqrt{259176.25}$
$= \$509.09$