Name ________________________

Class ________________________

Problem 1 – Exact Probabilities

To calculate the probability of exactly *r* successes in *n* Bernoulli trials is ${}_nC_r \cdot p^r q^{n-r}$.

This formula only works in trials where there is a binomial distribution and the events are independent of each other.

On page 1.5, use the Bernoulli formula to determine the probability that a packet of ten memory chips with an average of 2% defective chips has no defects.

In this case, $n = 10$, $r = 0$, $p = 0.02$, $q = 0.98$.

- $P(0)$ =

Now, verify your calculations using the **Binomial Pdf** command from the **Probability** menu. Enter the parameters to that $n = 10$, $p = 0.02$ and *x*-value = 0.

On page 1.8, change the values in cells E1 and E2 to calculate the probabilities of 1, 2, 3, 4, and 5 defective memory chips.

Then use the spreadsheet to find the probabilities of a packet of 25 chips with an average of 2% defective and a packet of 10 chips with an average of 30% defective.

Enter the probabilities in the table at the right.

	$n = 10$, $p = 0.02$	$n = 25$, $p = 0.02$	$n = 10$, $p = 0.3$
0	.		
1			
2			
3			
4			
5			

- How does the distribution of probabilities for 30% defective compare to the distribution of 2% defective?

Problem 2 – Cumulative Probabilities

Let's explore the first example where memory chips were bought in packets of ten where 2% of the memory chips are defective on average. On page 2.2, calculate the probability that there are less than three defective memory chips.

Use the probabilities of 0, 1, and 2 that have already been calculated in Problem 1.

- *P*(less than 3 defects) =

To verify your answer, use the **Binomial Cdf** command in the **Probability** menu. Enter the parameters so that $n = 10$, p =0.03, the lower bound is 0 and upper bound is 2.

Problem 3 – Bernoulli Probability Distributions

On page 3.2 the same spreadsheet from page 1.8 is used, but now a scatter plot shows the distribution of the probabilities. Click the slider to change the *p*-value in cell E2 from 0.1 to 1 in increments of 0.1 and observe the changes.

- What happens to the distribution when the *p*-value is closer to 0? When the *p*-value is closer to 1?

- What does the distribution appear to look like when $p = 0.5$. Explain why this happens.