

Instructions: Show all work on paper and attached work sheets to this cover page. If you use a calculator to perform the operations (where problems do not instruct you to complete them by hand), say which steps/commands were used to count as work. Give exact answers where possible. In other cases, round dollars to pennies. All other situations, follow standard rounding rules for means and standard deviations, or round to 4 places unless instructed otherwise in the problem.

1. What is the expected value of the discrete distribution to the right?
2. What is the variance of the distribution to the right?
3. Kappa Sigma fraternity at Ohio State is selling raffle tickets to raise money for a local charity. They plan to sell 500 tickets and tickets cost \$5 each. The prizes to be awarded are – a grand prize of \$500, a second-place prize of \$100 and two third-place prizes of \$40.
 - a. Use the above scenario to fill in the probability model below:

Score, x	Probability, $P(x)$
0	0.07
1	0.13
2	0.18
3	0.30
4	0.22
5	0.08
6	0.02
	$\Sigma P(x) = 1.00$

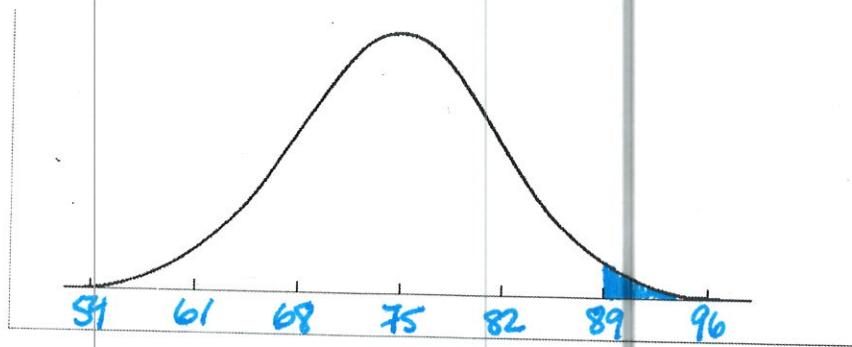
Prize:	Grand	2 nd Place	3 rd Place	None
Amount:	495	95	35	-5
Probability:	$\frac{1}{500}$	$\frac{1}{500}$	$\frac{2}{500}$	$\frac{496}{500}$

- b. Calculate the expected value of your ticket. Show all work. Interpret the expected value in the context of the problem using complete sentences.
4. Consider a university having 15,000 students and let $X =$ of courses for which a randomly selected student is registered. The pmf of X follows.

x	1	2	3	4	5	6	7
$p(x)$.01	.03	.13	.25	.39	.17	.02

- Find the expected value for the scenario above and describe the meaning of the expected value in the context of the problem.
5. If the probability that a randomly selected person has blue eyes is 37% in a certain population, what is the probability of selecting 20 people and 10 or more of them have blue eyes?

6. If the probability of having voted in the last Presidential election in the US is 63%, what is the probability that in a randomly selected sample of 10 people that fewer than half them voted in the last election?
7. What is the probability that you will have fewer than 6 heads in 14 coin flips if the coin is fair?
8. If you roll a fair tetrahedral (4-sided) die 12 times, what is the probability of getting exactly three 4s?
9. What is the expected value of a binomial distribution with 15 trials and the probability of success with each trial is 75%?
10. What is the standard deviation of a binomial distribution with 15 trials and the probability of success with each trial being 75%?
11. When doing a probability problem, what should you look for when determining whether you use 1) counting rules, 2) binomial distribution, 3) normal distribution?
12. The amount of medication in a randomly selected pill has a mean of 200 mg with a standard deviation of 12 mg. If the least amount of medication needed to be effective is 175 mg, what is the probability that a randomly selected pill will contain an effective amount?
13. On the blank graph below, graph the normal distribution with mean of 75 and standard deviation of 7. Label three standard deviations on each side of the mean. Shade the portion of the distribution that represents the probability of a score greater than 89.



14. Molly obtained a 92 on an IQ test administered by her school. If the mean of the test is 100 and the standard deviation is 17, what z-score is equivalent to Molly's score?
15. A variable is normally distributed with mean of 46 and standard deviation of 6. Use the Empirical Rule to estimate what proportion of the population falls between 46 and 58.

MAT223 Homework #9 Key

(1)

1. Score in L1, Prob in L2
 1 Var Stats L1, L2

$$\bar{x} = \text{expected value} = 2.79$$

$$2. \sigma^2 = (1.416297991)^2 = 2.0050$$

$$3b. 495\left(\frac{1}{500}\right) + 95\left(\frac{1}{500}\right) + 35\left(\frac{2}{500}\right) - 5\left(\frac{496}{500}\right) = -3.64$$

For each ticket purchased, one can expect to lose \$3.64 on average.

$$4. E(x) = 4.57$$

Students at the university are taking an average of 4.57 classes

$$5. n = 20 \quad p = .37 \quad x = 10 \Rightarrow \geq 10$$

$$1 - \text{binomialcdf}(20, .37, 9) = .16504\dots$$

$$6. p = .63 \quad n = 10 \quad x \leq 4$$

$$\text{binomialcdf}(10, .63, 4) = .1205\dots$$

$$7. n = 14, \quad p = .5, \quad x < 6 \Rightarrow \leq 5$$

$$\text{binomialcdf}(14, .5, 5) = .211975\dots$$

$$8. n = 12, \quad p = \frac{1}{4}, \quad x = 3$$

$$\text{binomialpdf}(12, \frac{1}{4}, 3) = .258$$

$$9. E(x) = \bar{x} = 15(.75) = 11.25$$

10. Normal distribution - continuous range of values; problem states mean and standard deviation

binomial states fixed # of trials and constant probability for each trial; discrete outcomes divided into success & failure

Counting - event not repeated, dependent probabilities

12. $\mu=200$ $\sigma=12$ < 175

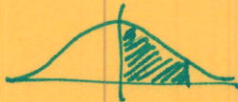
normalcdf (-E99, 175, 200, 12) = .0186

14. $\mu=100$, $\sigma=17$

$z = \frac{92-100}{17} = -.470588\dots$

15. $\mu=46$, $\sigma=6$

$\frac{58-46}{6} = 2$



$\frac{95}{2} = 47.5\%$