Math 316 Spring 2026 **Midterm Exam 1** **February 2, 2026**

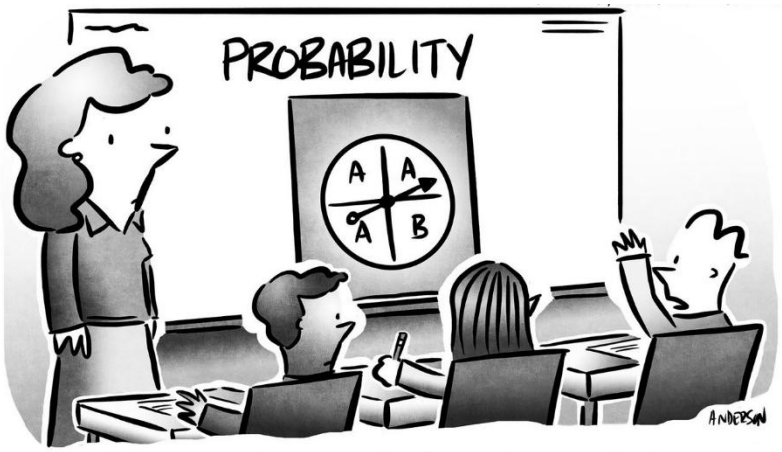
Name: _____

Problem	1	2	3 / 4	5 / 6	7 / 8	Total
Possible	20	22	23	14	21	100
Received						

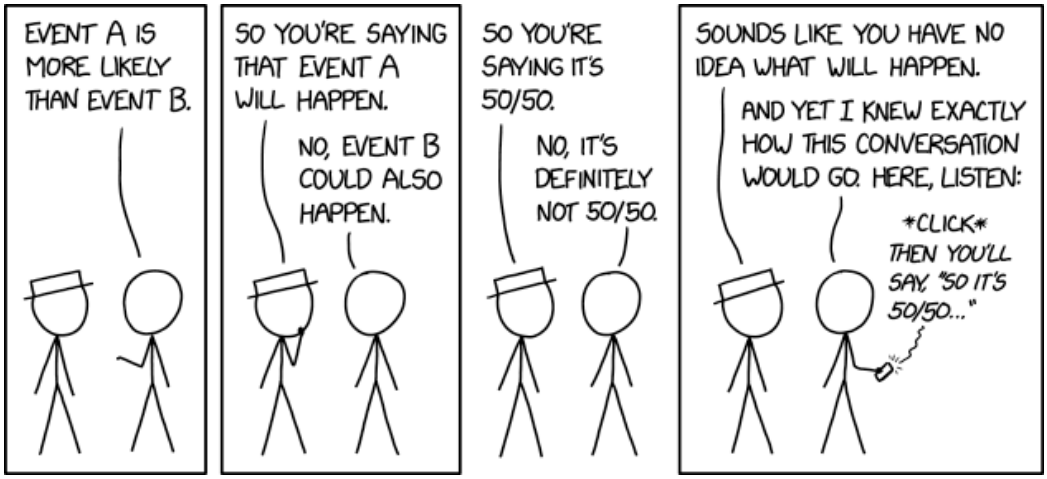
DO NOT OPEN YOUR EXAM UNTIL TOLD TO DO SO.

YOU MAY USE A 3 X 5 CARD (BOTH SIDES) OF HANDWRITTEN NOTES AND A CALCULATOR.

FOR FULL CREDIT, SHOW ALL WORK RELATED TO FINDING EACH SOLUTION.

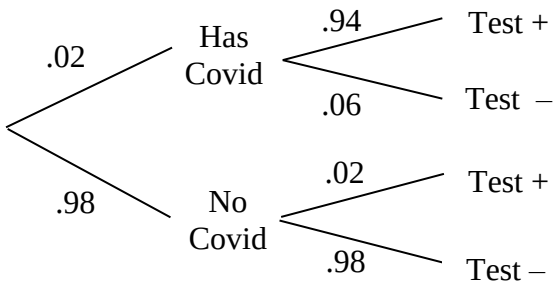


"I know mathematically that A is more likely, but I gotta say, I feel like B wants it more."



20 points 1. For the iHealth Covid-19 Antigen Rapid Test, a positive result is accurate 94% of the time, and a negative test is accurate 98% of the time. Suppose that 2% of the population currently has Covid.

Find the four values in the table below. Give values to four digits after the decimal (careful on rounding).



	Results of test: No Test	Positive	Negative
Probability person <u>has</u> Covid	.02		
Probability person <u>does not</u> have Covid	.98		

For example, this value is $\Pr\{No\ Covid \mid Test-\}$

Show all pertinent work below.

22 points **2.** Suppose that the average height of men in the United States is normally distributed with a mean of 70 inches and a standard deviation of 4 inches.

/4 (a) What fraction of men's heights are less than 68 inches?

/4 (b) What fraction of men's heights are greater than 71 inches?

/4 (c) What fraction of men's heights are between 68 and 71 inches?

/4 (d) What height is at the 20^{th} percentile?

/4 (e) What height is at the 80^{th} percentile?

/2 (f) What fraction of men's heights are between the two heights you found in (d) and (e)?

15 points **3**. Suppose that the average height of men in the United States is normally distributed with a mean of 70 inches and a standard deviation of 4 inches.

/6 (a) If you take a sample of 4 men, find $\Pr\{68 \leq \bar{Y} \leq 71\}$, the probability that the sample mean $\bar{Y}$ will be between 68 and 71 inches.

/6 (b) If you take a sample of 25 men, find $\Pr\{68 \leq \bar{Y} \leq 71\}$, the probability that the sample mean $\bar{Y}$ will be between 68 and 71 inches.

/3 (c) If you take a sample of n men where $n > 25$, which one of the following is true? (Just circle one of the three statements.)

$\Pr\{68 \leq \bar{Y} \leq 71\} >$ the probability that you found in (b)

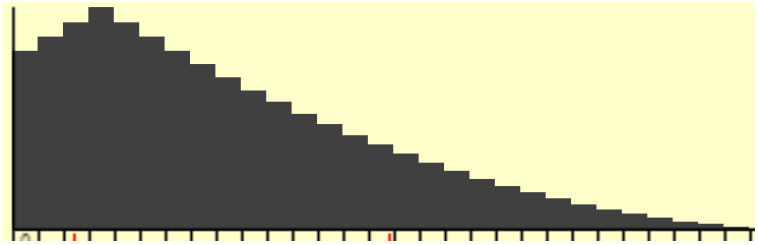
$\Pr\{68 \leq \bar{Y} \leq 71\} =$ the probability that you found in (b)

$\Pr\{68 \leq \bar{Y} \leq 71\} <$ the probability that you found in (b)

8 points **4**. Find the expected value μ_Y and standard deviation σ_Y given the following probability distribution for random variable Y. **Show all pertinent work**.

k	$\Pr\{Y = k\}$
0	.2
1	.6
2	.2

9 points **5**. The population distribution at right has a mean of 8 and a standard deviation of 6.



The sampling distributions using

$$n = 2,\ n = 5 \text{ and } n = 25$$

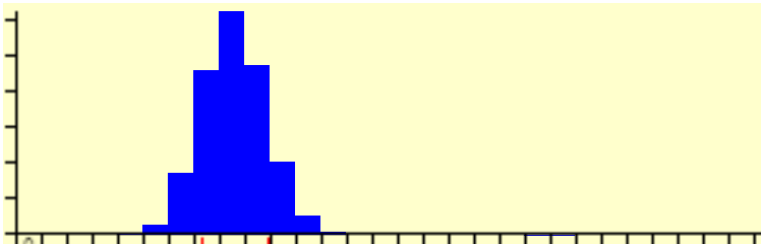
are shown below right (<u>not</u> in this order).

Determine the sample size in each case, and compute the sample mean and standard deviation for each sampling distribution.

$n =$

$mean =$

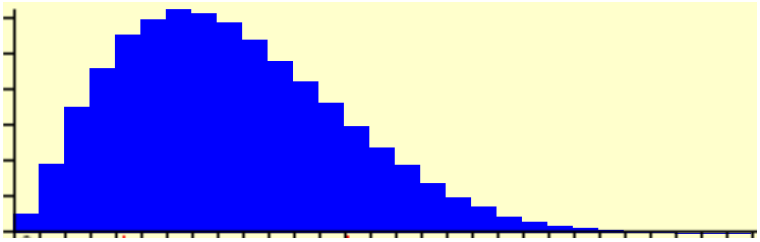
$SD =$



$n =$

$mean =$

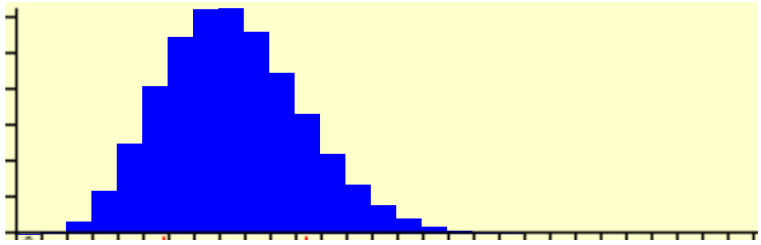
$SD =$



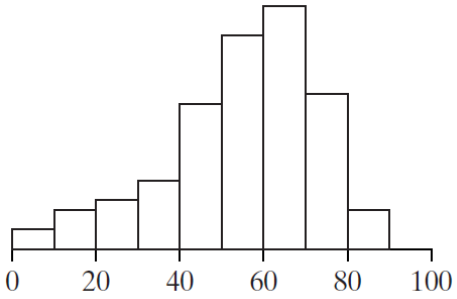
$n =$

$mean =$

$SD =$



5 points **6**. <u>Estimate</u> the mean and standard deviation of the data shown in the histogram at right.



For the next problem: ${}_5C_0 = 1,\ {}_5C_1 = 5,\ {}_5C_2 = 10,\ {}_5C_3 = 10,\ {}_5C_4 = 5,\ {}_5C_5 = 1$

13 points **7.** Suppose that approximately 30% of the population has Type A-positive blood. You take a sample of 5 persons. Let Y denote the number of persons in the sample with Type A-positive blood. Find each of the following.

/3 (a) $\Pr\{Y = 2\} =$

/7 (b) $\Pr\{Y < 2\} =$

/3 (c) $\Pr\{Y \geq 2\} =$

8 points 8. We are interested in hair color vs. eye color.

/2 (a) Find $Pr\{Black\ Hair\}$.

Hair color

Eye Color	Brown	Black	Red	TOTAL
Brown	500	300	20	820
Blue	800	200	50	1,050
TOTAL	1,300	500	70	1,870

/3 (b) Find $\Pr\{Black\ Hair \mid Brown\ Eyes\}$.

/3 (c) Are Black Hair and Brown Eyes independent traits or not? Explain/show work.