QUESTION 1

The scores, in percents, on Ms. Fields's last Chemistry test were:

84, 86, 64, 53, 91, 90, 72, 69, 52, 82, 94, 94, 92, 87

Let:

A = the mode of the scores
B = the arithmetic mean of the values rounded to the nearest whole number
C = the median of the scores
D = the sum of the outliers (let $D = 0$ if the data set has no outliers)
E = the interquartile range of the data set
F = Cherry was absent the day of the test and has to make it up the next day. What score must she get, rounded to the nearest whole number, if Ms. Fields wants the class average to be at least 80%?

Find $A + B + C + D + E + F$.

QUESTION 2

Chanda wanted to see if there was a correlation between the ages of the members of the Rickards Math Team and their performance on a practice test. The least squares regression line of the data can be represented by $\hat{y} = 7.08x + 42$. She found that $\bar{y} = 89$, $s_x = 1.2$, and that $s_y = 12.5$ where x represents the ages of the members on the math team and y represents their test scores. Let:

$$\begin{aligned} A &= \text{the correlation between the two quantitative variables} \\ B &= \text{the coefficient of determination for the data set} \\ C &= \text{the value of } \bar{x} \\ D &= \text{the residual of point (15, 92)} \\ E &= \text{the sum of the residuals} \end{aligned}$$

Find $A + B + C + D + E$ rounded to 4 decimal places.

QUESTION 3

Let:

A = Karthik is stuck in a Monty-Hall scenario where he could win a lifetime supply of Sperrys if he chooses the right door out of 3 possible choices. Karthik picks door 2, and the game show host opens door 1 revealing it is as the wrong door. What is the probability that Karthik will win if he decides to stick to door 2?

B = What is the probability that no two individuals in a room of 25 people have the same birthday? Assume no individual was born on February 29th.

C = Cherry is in a deuce situation in her tennis match. This is when both players are tied and an individual needs to win 2 consecutive points to win the game. If the probability that Cherry will win a single point is 0.6, then what is the probability that she will emerge victorious in this game?

Find ABC rounded to 4 decimal places.

QUESTION 4

Let X be a random variable that is normally distributed with mean 12 and standard deviation 7. Let Y be a random variable that is normally distributed with mean 23 and standard deviation 24. Assume X and Y are independent.
Let:

$$\begin{aligned} A &= \text{the mean of } X+Y \\ B &= \text{the standard deviation of } X+Y \\ C &= \text{the mean of } 3X+4Y \\ D &= \text{the variance of } 3X+4Y \end{aligned}$$

Find $AB+CD$.

QUESTION 5

Aman is investigating the number of light bulbs produced by Light Bulb Co.'s factories around the world on a particular day. Based on a random sample from 196 factories, the hypotheses are:

$$H_0\text{: } \mu = 7,300$$
$$H_a\text{: } \mu > 7,300$$

Assume that the population standard deviation is $\sigma = 250$. The test rejects H_0 at the 2.5% level of significance. Calculate the power of the test against the alternative $\mu = 7350$. Round your answer to four decimal places.

QUESTION 6

Mr. Jones grades his students on a scale of 0 to 1, with a 0.6 needed to pass his class. The scores of his students are modeled by the following density:

$$f(x) = \begin{cases} \frac{5}{2}x & 0 \leq \text{x} \leq 0.4 \\ \frac{10}{9}x + \frac{5}{9} & 0.4 \leq \text{x} \leq 1 \\ 0 & otherwise \end{cases}$$

Let:

A = What is the probability that a randomly selected student passes Mr. Jones's class?

B = What score is at the 87.5 percentile of the distribution? Round your answer to 3 decimal places.

Compute AB.

QUESTION 7

Starting with 43, for all true statements subtract 2 and for all false statements add 3.

- A type II error occurs when we reject the null hypothesis H_0 when H_0 is actually true.
- The standard deviation of a set of numbers is always positive.
- The least squares regression line can only be calculated when both variables are quantitative.
- As the number of degrees of freedom in a t-distribution increase, the t-distribution approaches the normal z-distribution.
- When the mean is greater than the median, the distribution is skewed left.
- The Poisson Distribution is a continuous function.
- When testing a claim, the smaller the p-value, the stronger the evidence against H_0 provided by the data.
- If the p-value is as small as or smaller than a significance level α, we say that the data is not statistically significant at level α.

QUESTION 8

Students at Rickards must take one each of classes A*, B*, C* and classes X*, Y*, Z*. Below is a frequency table showing the number of students taking each combination of offered classes.

Classes	X*	Y*	Z*
A*	20	26	26
B*	32	38	30
C*	5	21	24

If a student is selected uniformly at random, let X denote the event the student is taking a class $X*$ for all classes at Rickards. Let:

$$\begin{aligned} W &= P((A \cup Y)' \cap (C \cup Z)') \\ X &= P(A \cap X') \\ Y &= P(A \cup C) \cup P(X \cup Z) \\ Z &= P((A \cap X) \cup (B \cap Y) \cup (C \cap Z)) \end{aligned}$$

Find the exact value of $W + X + Y + Z$.

QUESTION 9

Let:

- Samuel wants to know the mean weight of the trucks produced at his factory. The standard deviation of all the trucks produced at his factory is 45 pounds. He wants a margin of error of 5 pounds with 90% confidence. Let $A =$ the minimum size of the sample must Samuel take. Round the critical value needed to two decimal places.

- Dr. Fraser gave a calculus test. Carson's score of 98 is higher than 96.7% of the class and Bob's score of 74 is higher than 44.3% of the class. Given that the scores are normally distributed, round all necessary critical values to the nearest hundredth. Let $B =$ the sum of the mean and standard deviation of the test scores, rounded to the nearest hundredth.

- Ms. Fields gives an environmental science test to her first period and sees that the mean score is 65 and the standard deviation is 6. She curves the test so that the mean score is 75 and the standard deviation is 9. If Philip receives a score of 85 after the curve, let $C =$ his original score rounded to nearest whole number.

Compute $A - BC$.

QUESTION 10

The probability distribution for the amount of money (in dollars) Nihar makes selling Rickards Invitatoinal t-shirts is given in the following table, in which X is a random variable.

x	55	60	68	79	84	90
$P(X = x)$	0.12	0.18	0.18	0.30	0.16	0.06

$$\begin{aligned} A &= \text{the value of } E(X) \\ B &= \text{the value of } \sigma(X) \\ C &= \text{the value of } Var(X) \\ D &= \text{the value of } E(X^2) \end{aligned}$$

Compute $A + B + C + D$ to four decimal places.

QUESTION 11

In a nationwide poll of 1000 middle schoolers in 6th, 7th, and 8th grade, respondents were asked if they ate cafeteria food for lunch, brought lunch from home, or a mix of both. Their answers are presented in the following contingency table:

	Type of Lunch		
Grade	Cafeteria	Home	Both
6th	150	165	55
7th	175	220	35
8th	75	105	20

Pruthak wanted to see if there was a relationship between the grade that students were in and their lunch routines.

A = the degrees of freedom in this problem

B = the expected number of 7th graders who bring lunch from home

C = the X^2 value for the data set rounded to four decimal places

D = the P-value for the data set rounded to four decimal places

E = 0 if there is a relationship between grade level and lunch routine or 1 if there is no relationship between grade level and lunch routine when using a 10% significance level

Compute $E(A + B + C + D)$ to four decimal places.

QUESTION 12

Samuel Walters becomes doubtful when Cherry tells him that the attendance at Club Panda is 34 members at every meeting. Samuel decides to conduct a simple random sample of 15 club meetings. Samuel finds that the sample mean attendance at Club Panda meetings is 36.2 members with a standard deviation of 2.8 members.
Assuming a 10% significance level, let:

A = the degrees of freedom in the scenario
B = the critical value at this significance level rounded to three decimal places
C = 0 if Cherry's statement should be rejected or 1 if Cherry's statement should not be rejected
D = the t-statistic rounded to three decimal places

Determine $AC + BD$. Round your answer to four decimal places.

QUESTION 13

The Towers of Hanoi is a famous problem where one has 3 pegs and 3 disks with all 3 disks stacked on top of one another. Each disk on top is slightly smaller than the one below it. The objective of the problem is to transfer all 3 disks to another peg by only moving one disk at a time and with the provision that a larger disk cannot be placed on top of a smaller disk. What is the minimum number of moves required to transfer 10 disks from one peg to another?

QUESTION 14

You have a bag with 20 blue balls and 20 yellow balls. Every turn, you pick 2 balls at random from the bag. If the balls are the same color, then you place a yellow ball into the bag. If the color of the balls differs, a blue ball is put into the bag. The other balls are discarded. What is the color of the last ball? Assume that you have 10 additional blue balls outside of the bag.