Practice Final Exam

The following exam was given at a previous session.

1

2.0/2.0 points (ungraded)

Statistical Reasoning

Which type of reasoning can be used for each of the following statements?

1. Based on a recent survey, the fraction of the population that prefer sweet to sour is between 73 and 76 percent.

Select an option

2. There is a 20% chance of rain tomorrow.

Select an option

3. I will bet you 20$ to 1$ that my football team would win tomorrow's match.

Select an option

4. The chance that two random people have the same birthday is at least 1/365.

Select an option

Submit You have used 2 of 2 attempts

2

0.0/2.0 points (ungraded)

Which of the following statements hold for all sets A and B?

- [ ] $B - A = B \cap A^c$
- [ ] $A \times B \subseteq A \cup B$
- [ ] $(A \Delta B) - B = \emptyset$
- [ ] $(A \cup B) - (A \cap B) = (A - B) \cup (B - A)$

Submit You have used 3 of 3 attempts

3

0.0/2.0 points (ungraded)

A bag contains 5 red balls and 5 blue balls. Three balls are drawn randomly without replacement. Find:

- the probability that all 3 balls have the same color,

- the conditional probability that we drew at least one blue ball given that we drew at least one red ball.

Submit You have used 0 of 4 attempts

4

0.0/2.0 points (ungraded)

Students who party before an exam are twice as likely to fail as those who don't party (and presumably study). If 20% of the students partied before the exam, what fraction of the students who failed went partying?

Submit You have used 0 of 4 attempts

5

0.0/5.0 points (ungraded)

Random variables X and Y are distributed according to

$X \setminus Y$	1	2	3
1	0.12	0.08	0.20
2	0.18	0.12	0.30

and $Z = \max\{X, Y\}$. Evaluate:

- X and Y are independent,

Select an option

- $P(Y \neq 3)$,

- $P(X < Y)$,

- $E[Z]$,

- $V[Z]$.

Submit You have used 0 of 4 attempts

6

0.0/3.0 points (ungraded)

X follows normal distribution $\mathcal{N}(\mu, \sigma^2)$ whose pdf satisfies $\max_x f(x) = 0.0997356$ and cdf satisfies $F(-1) + F(7) = 1$. Determine

- μ,

- σ,

- $P(X \leq 0)$.

Submit You have used 0 of 4 attempts

7

0.0/2.0 points (ungraded)

A hen lays eight eggs weighing 60, 56, 61, 68, 51, 53, 69, and 54 grams, respecitvely. Use the unbiased estimators discussed in class to estimate the weight distribution's

- mean,

- variance.

Submit You have used 0 of 4 attempts

8

0.0/2.0 points (ungraded)

A biologist would like to estimate the average life span of an insect species. She knows that the insect's life span has standard deviation of 1.5 days. According to Chebyshev's Inequality, how large a sample should she choose to be at least 95% certain that the sample average is accurate to within ± 0.2 days?

Submit You have used 0 of 4 attempts

9

0.0/2.0 points (ungraded)

Suppose that an underlying distribution is approximately normal but with unknown variance. You would like to test $H_0 : \mu = 50$ vs. $H_1 : \mu < 50$. Calculate the p-value for the following 6 observations: 48.9, 50.1, 46.4, 47.2, 50.7, 48.0.

- less than 0.01
- between 0.01 and 0.025
- between 0.025 and 0.05
- between 0.05 and 0.1
- more than 0.1

Submit You have used 0 of 4 attempts

10

0.0/4.0 points (ungraded)

20% of the items on a production line are defective. Randomly insptect items, and let X_1 be the number of inspections till the first defective item is observed, and X_5 be the number of inspections till the fifth defective item is observed. In both cases, X_1 and X_5 inlcude the defective item itself (e.g. if the items are $\{good, good, defective\}, X_1$ is 3). Calculate

$E\left(X_5\right)$,

$V\left(X_5\right)$,

$E\left(X_5 | X_1 = 4\right)$,

$V\left(X_5 | X_1 = 4\right)$.

Submit You have used 0 of 4 attempts

11 (For Fun)

0 points possible (ungraded)

Model Selection

A k-piece-constant function is define by $k-1$ thresholds $-100 < t_1 < t_2 < \cdots < t_{k-1} < 100$ and k values

$a_1, a_2, \ldots, a_k$. Let

$$f(x) = \begin{cases} a_1, & -100 \le x < t_1, \\ a_2, & t_1 \le x < t_2, \\ \vdots & \\ a_i, & t_{i-1} \le x < t_i, \\ \vdots & \\ a_k, & t_{k-1} \le x \le 100. \end{cases}$$

be a k-piece-constant function. Suppose you are given n data points $((x_1, y_1), \ldots, (x_n, y_n))$ each of which is generated in the following way:

1. first, x is drawn according to the uniform distribution over the range $[-100, 100]$.

2. second y is chosen to be $f(x) + \omega$ where ω is drawn according to the normal distribution $\mathcal{N}(0, \sigma)$

You partition the data into a training set and a test set of equal sizes. For each $j = 1, 2, \ldots$ you find the j-piece-constant function g_j that minimizes the root-mean-square-error (RMSE) on the training set. Denote by $train(j)$ the RMSE on the training set and by $test(j)$ the RMSE on the test set.

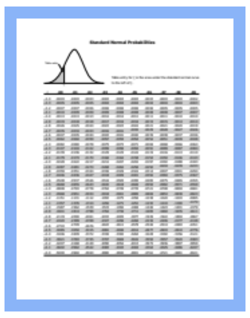
Which of the following statements is correct?

- [ ] $train(j)$ is a monotonically non-increasing function.
- [ ] $test(j)$ is a monotonically non-increasing function.
- [ ] $test(j)$ has a minimum close to $j = k$
- [ ] $train(j)$ has a minimum close to $j = k$
- [ ] if $j > n/2$, $train(j) = 0$

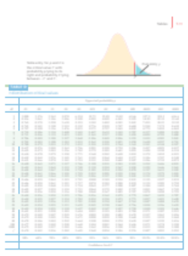
Submit

You have used 0 of 3 attempts

untitled 1 / 2 — 64% +



1



2

Discussion

Topic: Final / Practice Final

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Questtion 6, Part 3

What are the steps to get to the numbers 0.12, 0.38, 05 for z = 1, 2, 3 needed for E(Z)? I am aware that Z = max(X, Y) but I don't find ...

2

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