National Testing Agency

Question Paper Name :	Applied Bayesian for Analytics 29th August 2021 Shift 1
Subject Name :	Applied Bayesian for Analytics
Creation Date :	2021-08-29 13:53:53
Duration :	180
Total Marks :	100
Display Marks:	Yes

Applied Bayesian for Analytics

Group Number :	1
Group Id :	603489224
Group Maximum Duration :	0
Group Minimum Duration :	120
Show Attended Group? :	No
Edit Attended Group? :	No
Break time :	0
Group Marks :	100
Is this Group for Examiner? :	No

Applied Bayesian for Analytics-1

Section Id :	603489330
Section Number :	1
Section type :	Online
Mandatory or Optional :	Mandatory

Number of Questions : 50

Number of Questions to be attempted : 50

Section Marks : 100

Enable Mark as Answered Mark for Review and Clear Response : Yes

Sub-Section Number : 1

Sub-Section Id : 603489608

Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 60348915908 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A test says you do have flu, but you really don't. This is an example of?

1. True Positive
2. True Negative
3. False Positive
4. False Negative

Options :

60348959773. 1

60348959774. 2

60348959775. 3

60348959776. 4

Question Number : 2 Question Id : 60348915909 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The estimated probabilities of an event before any new data is collected are known as what probabilities?

1. Prior
2. Posterior
3. Conditional
4. Simple

Options :

60348959777. 1

60348959778. 2

60348959779. 3

60348959780. 4

Question Number : 3 Question Id : 60348915910 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The updated probabilities of an event in light of newly collected data are known as what probabilities?

1. Prior
2. Posterior
3. Conditional
4. Simple

Options :

60348959781. 1

60348959782. 2

60348959783. 3

60348959784. 4

Question Number : 4 Question Id : 60348915911 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A Civil Engineer wishes to investigate the punctuality of electric trains by considering a number of train journeys. In the sample, 50% of trains had a destination for New York, 30% Vegas and 20% Washington DC. The probabilities of a train arriving late in New York, Vegas and Washington DC are 40%, 35% and 25% respectively. If the Engineer picks a train at random from this group, what is the probability that it terminated in New York?

1. 56%
2. 56.1%
3. 54%
4. 56.3%

Options :

60348959785. 1

60348959786. 2

60348959787. 3

60348959788. 4

Question Number : 5 Question Id : 60348915912 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A chartered analyst can choose any one of three routes to get to work-A, B or C. The probabilities that she arrives on time using routes A, B, and C are 50%, 52%, and 60% respectively. If she is equally likely to choose any one of the routes and arrives on time, calculate the probability that she chose route A.

1. 28.3%
2. 25.6%
3. 30.9%
4. 20.5%

Options :

60348959789. 1

60348959790. 2

60348959791. 3

60348959792. 4

Question Number : 6 Question Id : 60348915913 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

When modeling WinBUGS, having missingness makes data imbalanced. Imagine you have a large vector of data with some missingness. What would you do to model?

1. Discard
2. Model the missingness
3. Put NA in missingness
4. Use Imbalanced Data

Options :

60348959793. 1

60348959794. 2

60348959795. 3

60348959796. 4

Question Number : 7 Question Id : 60348915914 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which one of the following is true for checking convergence?

1. Trace Plots
2. History
3. Burn-In No
4. Correlation

Options :

60348959797. 1

60348959798. 2

60348959799. 3

60348959800. 4

Question Number : 8 Question Id : 60348915915 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Imagine in a conditional distribution calculation, not all parameters conditional distribution is in a closed form. Which of the following algorithm is best suited?

1. MH
2. GIBBS
3. MH and GIBBS
4. Importance Sampling

Options :

60348959801. 1

60348959802. 2

60348959803. 3

60348959804. 4

Question Number : 9 Question Id : 60348915916 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Following is the WinBUGS code for a bivariate normal distribution:

```
for (i in 1:N)

{

 beta[i,] ~ dmnorm(mu.beta[],

Omega.beta[,])

}
```

What prior would be appropriate for the precision matrix "Omega.beta[,]?

1. dwish (R [,], 2)
2. dwish (R [], 2)
3. Inv-gamma (R, 2)
4. Gamma (R [], 2)

Options :

60348959805. 1

60348959806. 2

60348959807. 3

60348959808. 4

Question Number : 10 Question Id : 60348915917 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Suppose you have a set of counts, Y that you want to regress on X, according to:

- log(mu.Y[i]) <- a + bX; where Y itself is ~ negative binomially with mean mu.Y and shape-parameter r.
- Y[i] ~ dnegbin(p[i], r[i])
- p[i] will need to be expressed as a function of r, a, b and X[i]

Which one of the following is correct:

1. It is nonlinear expression and can't be computed
2. Its linear and GIBBS algorithm works
3. Its non-linear and MH needed to compute
4. A and B need to be bounded and MH needed

Options :

60348959809. 1

60348959810. 2

60348959811. 3

60348959812. 4

Question Number : 11 Question Id : 60348915918 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following feature of Bayesian methods is a disadvantage?

1. Length and distance that gives the highest overall probability may be determined
2. They are used to calculate evolutionary distance
3. Computationally Bayesian methods are better
4. A specific mutational model is required

Options :

60348959813. 1

60348959814. 2

60348959815. 3

60348959816. 4

Question Number : 12 Question Id : 60348915919 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Consider a Bayesian estimation problem, with data $\{X_1, X_2, ..., X_n\}$ i.i.d (identically independently distributed) from N(0, 1) and N(0, 1) prior. Letting $S_n = \sum_{i=1}^{n} X_i$, the posterior mean is?

1. S_n/n
2. $S_n/(n+1)$
3. $n(S_n)/(n+1)$
4. $(S_n+1)/(n+2)$

Options :

60348959817. 1

60348959818. 2

60348959819. 3

60348959820. 4

Question Number : 13 Question Id : 60348915920 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Let X ~ Unif [0, Θ]. Then, the maximum likelihood estimates of Θ, given i.i.d samples $\{X_1, X_2, ..., X_n\}$ is?

1. $\sum_{i=1}^{n} \frac{Sn}{n}$
2. $\text{Min}_{\,i = 1, ..., n} X_i$
3. $\text{Max}_{\,i = 1, ..., n} X_i$
4. $1/2\ (\text{Max}_{\,i = 1, ..., n} X_i - \text{Min}_{\,i = 1, ..., n} X_i)$

Options :

60348959821. 1

60348959822. 2

60348959823. 3

60348959824. 4

Question Number : 14 Question Id : 60348915921 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Suppose that we are trying to fit a linear and 10^{th} degree polynomial to data coming from a cubic function, corrupted by standard Gaussian noise. Let M_1 and M_2 denote the models corresponding to the linear and 10-degree polynomial. Then,

1. Bias(M_1) ≤ Bias(M_2), Variance(M_1) ≤ Variance(M_2)
2. Bias(M_1) ≤ Bias(M_2), Variance(M_1) ≥ Variance(M_2)
3. Bias(M_1) ≥ Bias(M_2), Variance(M_1) ≤ Variance(M_2)
4. Bias(M_1) ≥ Bias(M_2), Variance(M_1) ≥ Variance(M_2)

Options :

60348959825. 1

60348959826. 2

60348959827. 3

60348959828. 4

Question Number : 15 Question Id : 60348915922 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Let X_i, i = 1, 2, ..., 4 be independent Bernoulli r.v.s each with mean p = 0.1 and let S = $\sum_{i=1}^{4} X_i$.
Then,

1. E (X_1| S=2) = 0.1
2. E (X_1| S=2) = 0.5
3. E (X_1| S=2) = 0.25
4. E (X_1| S=2) = 0.75

Options :

60348959829. 1

60348959830. 2

60348959831. 3

60348959832. 4

Question Number : 16 Question Id : 60348915923 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

If the purpose is to calculate the probability of one event AND a second event, the odds scores for the events are ________

1. Added
2. Multiplied
3. Multiplied and added
4. Subtracted

Options :

60348959833. 1

60348959834. 2

60348959835. 3

60348959836. 4

Question Number : 17 Question Id : 60348915924 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

When one uses Gibb's sampling

1. Posterior is known form
2. Posterior is unknown form
3. Conditional Distributions are known form
4. Conditional Distributions are unknown form

Options :

60348959837. 1

60348959838. 2

60348959839. 3

60348959840. 4

Question Number : 18 Question Id : 60348915925 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following is true

1. Bayes theorem is called inverse probability
2. Bayes theorem does not involve likelihood
3. Bayes theorem is same as conditional probability
4. Bayes probability is same as classical probability

Options :

60348959841. 1

60348959842. 2

60348959843. 3

60348959844. 4

Question Number : 19 Question Id : 60348915926 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A public health official wants to understand disease incidence rate in a region but got a very small sample size (about 20).

Which of the following is his best option to analyse?

1. Use classical probability
2. Use Bayes probability
3. Use Machine Learning
4. None of these

Options :

60348959845. 1

60348959846. 2

60348959847. 3

60348959848. 4

Question Number : 20 Question Id : 60348915927 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

What makes Bayesian statistics different from other kinds of statistics?

1. It deals with frequentist probability
2. It deals with conditional probability
3. It only can be used for large datasets
4. If can only be used if the data is qualitative

Options :

60348959849. 1

60348959850. 2

60348959851. 3

60348959852. 4

Question Number : 21 Question Id : 60348915928 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A _____ uses prior data to estimate the value of an unknown parameter so that the error between the estimator and the true value of the parameter is minimized.

Which of the following fills the gap?

1. Bayes estimator
2. Conditional estimator
3. Frequentist estimator
4. Average estimator

Options :

60348959853. 1

60348959854. 2

60348959855. 3

60348959856. 4

Question Number : 22 Question Id : 60348915929 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Let $\{X_1, X_2, ..., X_n\}$ be i.i.d. sample from $N(\mu, \sigma^2)$, with $\sigma > 0$. Letting $\hat{\mu}_n = \frac{1}{n}\sum_{i=1}^{n} X_i$. Then, which of the following statements is true

1. $\sum_{i=1}^{n}(X_i - \hat{\mu}_n)^2 = \sum_{i=1}^{n}(X_i - \mu)^2$
2. $\sum_{i=1}^{n}(X_i - \hat{\mu}_n)^2 \leq \sum_{i=1}^{n}(X_i - \mu)^2$
3. $\sum_{i=1}^{n}(X_i - \hat{\mu}_n)^2 > \sum_{i=1}^{n}(X_i - \mu)^2$
4. An inequality / equality relating $\sum_{i=1}^{n}(X_i - \hat{\mu}_n)^2$ and $\sum_{i=1}^{n}(X_i - \mu)^2$ does not always hold

Options :

60348959857. 1

60348959858. 2

60348959859. 3

60348959860. 4

Question Number : 23 Question Id : 60348915930 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Consider a regression problem, with scalar input $X \in R$, and target $Y \in R$. Suppose (X, Y) is bivariate normal with non-zero means, positive variances, and non-zero correlation. Then, the optimal predictor, for the square loss, as a function of X is:

1. Quadratic
2. Constant
3. Linear
4. None of these

Options :

60348959861. 1

60348959862. 2

60348959863. 3

60348959864. 4

Question Number : 24 Question Id : 60348915931 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Suppose X is uniformly distributed over [0, 5] and Y is uniformly distributed over [0, 4]. If X and Y are independent, then P(max(X, Y) > 3) is

1. 9/20
2. 1/20
3. 11/20
4. 1

Options :

60348959865. 1

60348959866. 2

60348959867. 3

60348959868. 4

Question Number : 25 Question Id : 60348915932 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Let Z = (X, Y) be a bivariate normal random variable. Then, which of the following statements is false?

1. X and Y are independent if and only if they are uncorrelated
2. X + Y is univariate normal
3. Y | X = x is distributed as normal random variable
4. X + Y and X – Y are independent

Options :

60348959869. 1

60348959870. 2

60348959871. 3

60348959872. 4

Question Number : 26 Question Id : 60348915933 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a certain place it rains on one third of the days. The local evening newspaper attempts to predict whether or not it will rain the following day. Three quarters of rainy days and three fifths of dry days are correctly predicted by the previous evening's paper. Given that this evening's paper predicts rain, what is the probability that it will actually rain tomorrow?

1. 1.6
2. 0.48
3. 0.98
4. 0.001

Options :

60348959873. 1

60348959874. 2

60348959875. 3

60348959876. 4

Question Number : 27 Question Id : 60348915934 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

There are five machines in a factory. Of these machines, three are working properly and two are defective. Machines which are working properly produce articles each of which has independently a probability of 0.1 of being imperfect. For the defective machines this probability is 0.2. A machine is chosen at random, and five articles produced by the machine are examined. What is the probability that the machine chosen is defective given that, of the five articles examined, two are imperfect and three are perfect?

1. 0.6519
2. 0
3. 0.991
4. 0.56

Options :

60348959877. 1

60348959878. 2

60348959879. 3

60348959880. 4

Question Number : 28 Question Id : 60348915935 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A dishonest gambler has a box containing 10 dice which all look the same. However, there are actually three types of dice.

- There are 6 dice of type A which are fair dice with Pr(6 | A) = 1/6 (where Pr(6 | A) is the probability of getting a 6 in a throw of a type A die.
- There are 2 dice of type B which are biased with Pr(6 | B) = 0.8
- There are 2 dice of type C which are biased with Pr(6 | C) = 0.04

The gambler takes a dice from the box at random and rolls it. Find the conditional probability that it is of type B given that it gives a 6.

1. 0.34
2. 0.78
3. 0.10
4. 0.597

Options :

60348959881. 1

60348959882. 2

60348959883. 3

60348959884. 4

Question Number : 29 Question Id : 60348915936 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Given the value of λ, the number of transactions made by customer i at an online store in a year has a Poisson (λ) distribution, with Xi, independent of Xj for i ≠ j. The value of λ is unknown. Our prior distribution for λ is a gamma (5, 1) distribution. We observe the number of transactions in a year for 45 customers and $\sum_{i=1}^{45} xi$=182.

Using Chi-Square table find the lower 2.5% and upper 2.5% point of the prior distribution of λ.

1. [1.6235, 10.24]
2. [0.001, 9.65]
3. [25, 0.09]
4. [1.34, 20.89]

Options :

60348959885. 1

60348959886. 2

60348959887. 3

60348959888. 4

Question Number : 30 Question Id : 60348915937 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Given the value of λ, the number of transactions made by customer i at an online store in a year has a Poisson (λ) distribution, with Xi, independent of Xj for i ≠ j. The value of λ is unknown. Our prior distribution for λ is a gamma (5, 1) distribution. We observe the number of transactions in a year for 45 customers and $\sum_{i=1}^{45} xi$=182.

What is the posterior distribution of λ.

1. Gamma (187, 46)
2. Normal (0, 10)
3. Beta (1, 1)
4. Inverse-Gamma (187, 46)

Options :

60348959889. 1

60348959890. 2

60348959891. 3

60348959892. 4

Question Number : 31 Question Id : 60348915938 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Given the value of λ, the number X_i of transactions made by customer i at an online store in a year has a Poisson (λ) distribution, with X_i independent of X_j for i ≠ j. The value of λ is unknown. Our prior distribution for λ is a gamma (5, 1) distribution. We observe the number of transactions in a year for 45 customers and $\sum_{i=1}^{45} x_i = 182$.

Using a normal approximation to the posterior distribution, based on the posterior mean and variance, the 95% posterior credible interval for λ would be

1. [3.48, 4.64]
2. [-1.65, -2.78]
3. [0.98, 1.78]
4. [0.91, -2.02]

Options :

60348959893. 1

60348959894. 2

60348959895. 3

60348959896. 4

Question Number : 32 Question Id : 60348915939 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Given the value of λ, the number of transactions made by customer i at an online store in a year has a Poisson (λ) distribution, with Xi, independent of Xj for i ≠ j. The value of λ is unknown. Our prior distribution for λ is a gamma (5, 1) distribution. We observe the number of transactions in a year for 45 customers and $\sum_{i=1}^{45} x_i = 182$.

What is the expression for the posterior predictive probability that a customer makes 'm' transactions in a year

1. $\binom{186+m}{m}$
2. $\binom{186+m}{m}\left(\frac{46}{47}\right)^{187}\left(\frac{1}{47}\right)^{m}$
3. $\left(\frac{0.05}{1.05}\right)\left(\frac{1}{1.05}\right)^{m}$
4. $\left(\frac{1.05}{2.05}\right)\left(\frac{1}{47}\right)^{m}$

Options :

60348959897. 1

60348959898. 2

60348959899. 3

60348959900. 4

Question Number : 33 Question Id : 60348915940 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A random sample of n = 1000 people was chosen from a large population. Each person was asked whether they approved of a proposed new law. The number answering 'Yes' was x = 372. (For the purpose of exercise all the other responses and non-responses are treated as simply "Not Yes"). Assume that x is an observation from the binomial (n, p) distribution where p is the unknown proportion of people in the population who would answer "Yes".

Our prior distribution for p is a uniform distribution on (0, 1).

Let p = $\emptyset(\theta)$ so $\theta = \emptyset^{-1}(p)$ where $\emptyset(y)$ is the standard normal distribution function and $\emptyset^{-1}(z)$ is its inverse

What is the ML estimate of p?

1. 0.372
2. 0.99
3. 1.78
4. 5.8

Options :

60348959901. 1

60348959902. 2

60348959903. 3

60348959904. 4

Question Number : 34 Question Id : 60348915941 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A random sample of n = 1000 people was chosen from a large population. Each person was asked whether they approved of a proposed new law. The number answering 'Yes' was x = 372. (For the purpose of exercise all the other responses and non-responses are treated as simply "Not Yes"). Assume that x is an observation from the binomial (n, p) distribution where p is the unknown proportion of people in the population who would answer "Yes".

Our prior distribution for p is a uniform distribution on (0, 1).

Let p = $\emptyset(\theta)$ so $\theta = \emptyset^{-1}(p)$ where $\emptyset(y)$ is the standard normal distribution function and $\emptyset^{-1}(z)$ is its inverse.

Find the ML estimate of θ

1. 0.326
2. -0.326
3. 0.372
4. 0.311

Options :

60348959905. 1

60348959906. 2

60348959907. 3

60348959908. 4

Question Number : 35 Question Id : 60348915942 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A particular species of fish makes an annual migration up a river. On a particular day there is a probability of 0.4 that the migration will start. If it does then an observer will have to wait T minutes before seeing a fish, where T has an exponential distribution with mean 20 (i.e., an exponential (0.05) distribution). If the migration has not started, then no fish will be seen.

Find the conditional probability that the migration has not started given that no fish has been seen after one hour.

1. 0.769
2. 0.967
3. 0.976
4. 0.679

Options :

60348959909. 1

60348959910. 2

60348959911. 3

60348959912. 4

Question Number : 36 Question Id : 60348915943 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A particular species of fish makes an annual migration up a river. On a particular day there is a probability of 0.4 that the migration will start. If it does then an observer will have to wait T minutes before seeing a fish, where T has an exponential distribution with mean 20 (i.e., an exponential (0.05) distribution). If the migration has not started, then no fish will be seen.

How long does the observer have to wait without seeing a fish to be 90% sure that the migration has not started?

1. 35.8 minutes
2. 20 log 10
3. 8.53 minutes
4. 32.3 minutes

Options :

60348959913. 1

60348959914. 2

60348959915. 3

60348959916. 4

Question Number : 37 Question Id : 60348915944 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

We are interested in the mean λ, of a Poisson distribution. We have a prior distribution for λ with density

$$f^{(0)}(\lambda) = \begin{cases} 0 & (\lambda \leq 0) \\ k_0(1+\lambda)e^{-\lambda} & (\lambda > 0) \end{cases}$$

Find the prior mean of λ

1. 2
2. 1.5
3. 2.5
4. 10

Options :

60348959917. 1

60348959918. 2

60348959919. 3

60348959920. 4

Question Number : 38 Question Id : 60348915945 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

We are interested in the mean λ, of a Poisson distribution. We have prior distribution for λ with density

$$f^{(0)}(\lambda) = \begin{cases} 0 & (\lambda \leq 0) \\ k_0(1+\lambda)e^{-\lambda} & (\lambda > 0) \end{cases}$$

Find the prior standard deviation of λ

1. 1.323
2. 3.5
3. 7
4. 16

Options :

60348959921. 1

60348959922. 2

60348959923. 3

60348959924. 4

Question Number : 39 Question Id : 60348915946 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

We are interested in the mean λ, of a Poisson distribution. We have prior distribution for λ with density

$$f^{(0)}(\lambda) = \begin{cases} 0 & (\lambda \le 0) \\ k_0(1+\lambda)e^{-\lambda} & (\lambda > 0) \end{cases}$$

We observed data x1, x2, ..., xn where, given λ, these are independent observations from the Poisson (λ) distribution.

Find the likelihood.

1. $\frac{e^{-n\lambda}\lambda^S}{\prod x_i!}$
2. 1/2
3. $e^{-(n+1)\lambda}\lambda^S + e^{-(n+1)\lambda}\lambda^{S+1}$
4. None of the above

Options :

60348959925. 1

60348959926. 2

60348959927. 3

60348959928. 4

Question Number : 40 Question Id : 60348915947 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

We are interested in the mean λ, of a Poisson distribution. We have prior distribution for λ with density

$$f^{(0)}(\lambda) = \begin{cases} 0 & (\lambda \leq 0) \\ k_0(1+\lambda)e^{-\lambda} & (\lambda > 0) \end{cases}$$

We observed data $x_1, x_2, \ldots, x_n$ where, given λ, these are independent observations from the Poisson (λ) distribution.

Find the posterior mean of λ.

1. $e^{-(n+1)\lambda}\lambda^{S+1}$
2. $\frac{\Gamma(3)\Gamma(2)}{\Gamma(5)} + \frac{\Gamma(2)\Gamma(3)}{\Gamma(5)}$
3. $\frac{\left\{\frac{(s+1)}{(n+1)} + \frac{(s+1)(s+2)}{(n+1)}\right\}}{\left\{1 + \frac{(s+1)}{(n+1)}\right\}}$
4. None of the above

Options :

60348959929. 1

60348959930. 2

60348959931. 3

60348959932. 4

Question Number : 41 Question Id : 60348915948 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a fruit packaging factory, apples are examined to see whether they are blemished. A sample of n apples is examined and given the value of a parameter θ, representing the proportion of apples which are blemished, we regard x, the number of blemished apples in the sample, as an observation from the binomial (n, θ) distribution. The value of θ is unknown. Our prior density for θ is

$$f^{(0)}(\theta) = \begin{cases} k_0(20\theta(1-\theta)^3+1) & (0 \le \theta \le 1) \\ 0 & (otherwise) \end{cases}$$

We observe n = 10 apples and x= 4. Find the likelihood function.

1. $\binom{10}{4}\theta^4(1-\theta)^6$
2. $\frac{\Gamma(2)}{\Gamma(1)\Gamma(1)}\theta^{5-1}(1-\theta)^{7-1}$
3. $\frac{\Gamma(6)}{\Gamma(2)\Gamma(4)}\theta^{6-1}(1-\theta)^{10-1}$
4. None of the above

Options :

60348959933. 1

60348959934. 2

60348959935. 3

60348959936. 4

Question Number : 42 Question Id : 60348915949 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a fruit packaging factory, apples are examined to see whether they are blemished. A sample of n apples is examined and given the value of a parameter θ, representing the proportion of apples which are blemished, we regard x, the number of blemished apples in the sample, as an observation from the binomial (n, θ) distribution. The value of θ is unknown. Our prior density for θ is

$$f^{(0)}(\theta) = \begin{cases} k_0(20\theta(1-\theta)^3+1) & (0 \le \theta \le 1) \\ 0 & (otherwise) \end{cases}$$

We observe n = 10 apples and x= 4. Find the posterior mean of

1. 0.1439
2. 0.9134
3. 0.3914
4. 0.1932

Options :

60348959937. 1

60348959938. 2

60348959939. 3

60348959940. 4

Question Number : 43 Question Id : 60348915950 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a small survey, a random sample of 50 people from a large population is selected. Each person is asked a question to which the answer is either "Yes" or "No". Let the proportion in the population who would answer "Yes" be θ. Our prior distribution for θ is a beta (1.5, 1.5) distribution. In the survey, 37 people answer "Yes".

Find the prior mean and prior standard deviation of θ.

1. [0.5, 0.25]
2. [0.5, 34]
3. [0.8, 0.25]
4. [0.8, 34]

Options :

60348959941. 1

60348959942. 2

60348959943. 3

60348959944. 4

Question Number : 44 Question Id : 60348915951 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a small survey, a random sample of 50 people from a large population is selected. Each person is asked a question to which the answer is either "Yes" or "No". Let the proportion in the population who would answer "Yes" be θ. Our prior distribution for θ is a beta (1.5, 1.5) distribution. In the survey, 37 people answer "Yes".

Find the prior probability that $\theta < 0.6$

1. 0.2311
2. 0.4766
3. 0.2647
4. 0.6264

Options :

60348959945. 1

60348959946. 2

60348959947. 3

60348959948. 4

Question Number : 45 Question Id : 60348915952 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a small survey, a random sample of 50 people from a large population is selected. Each person is asked a question to which the answer is either "Yes" or "No". Let the proportion in the population who would answer "Yes" be θ. Our prior distribution for θ is a beta (1.5, 1.5) distribution. In the survey, 37 people answer "Yes".

Find the likelihood.

1. $\binom{50}{37}\theta^{37}(1-\theta)^{13}$
2. $\binom{50}{37}\theta^{1.5-1}(1-\theta)^{1.5-1}$
3. $\binom{50}{37}\theta^{38.5-1}(1-\theta)^{14.5-1}$
4. None of the above

Options :

60348959949. 1

60348959950. 2

60348959951. 3

60348959952. 4

Question Number : 46 Question Id : 60348915953 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a small survey, a random sample of 50 people from a large population is selected. Each person is asked a question to which the answer is either "Yes" or "No". Let the proportion in the population who would answer "Yes" be θ. Our prior distribution for θ is a beta (1.5, 1.5) distribution. In the survey, 37 people answer "Yes".

Find the posterior mean and posterior standard deviation of θ.

1. [0.26, 0.7]
2. [0.64, 0.06]
3. [0.726, 0.06]
4. [0.06, 0.726]

Options :

60348959953. 1

60348959954. 2

60348959955. 3

60348959956. 4

Question Number : 47 Question Id : 60348915954 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a small survey, a random sample of 50 people from a large population is selected. Each person is asked a question to which the answer is either "Yes" or "No". Let the proportion in the population who would answer "Yes" be θ. Our prior distribution for θ is a beta (1.5, 1.5) distribution. In the survey, 37 people answer "Yes".

Find the posterior probability that $\theta < 0.6$

1. 0.004
2. 0.249
3. 0.528
4. 0.0249

Options :

60348959957. 1

60348959958. 2

60348959959. 3

60348959960. 4

Question Number : 48 Question Id : 60348915955 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The populations, ni, and the number of cases, xi, of a disease in a year in each of six districts are given in the table below.

Population (n)	Cases (x)
120342	2
235967	5
243745	3
197452	5
276935	3
157222	1

We suppose that the number Xi in a district with population ni is a Poisson random variable with mean $n_i\lambda/100000$. The number in each district is independent of the numbers in the other districts, given the value of λ. Our prior distribution for λ is a gamma distribution with mean 3.0 and standard deviation 2.0

Find the parameters of the prior distribution

1. [2, 3]
2. [2.25, 3]
3. [2.25, 0.75]
4. [1, 0.75]

Options :

60348959961. 1

60348959962. 2

60348959963. 3

60348959964. 4

Question Number : 49 Question Id : 60348915956 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The populations, ni, and the number of cases, xi, of a disease in a year in each of six districts are given in the table below.

Population (n)	Cases (x)
120342	2
235967	5
243745	3
197452	5
276935	3
157222	1

We suppose that the number Xi in a district with population ni is a Poisson random variable with mean $n_i\lambda/100000$. The number in each district is independent of the numbers in the other districts, given the value of λ. Our prior distribution for λ is a gamma distribution with mean 3.0 and standard deviation 2.0

Find the prior probability that $\lambda < 2.0$

1. 0.367
2. 0.305
3. 0.723
4. 0.673

Options :

60348959965. 1

60348959966. 2

60348959967. 3

60348959968. 4

Question Number : 50 Question Id : 60348915957 Question Type : MCQ Option Shuffling : No

Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The populations, ni, and the number of cases, xi, of a disease in a year in each of six districts are given in the table below.

Population (n)	Cases (x)
120342	2
235967	5
243745	3
197452	5
276935	3
157222	1

We suppose that the number Xi in a district with population ni is a Poisson random variable with mean $n_i\lambda/100000$. The number in each district is independent of the numbers in the other districts, given the value of λ. Our prior distribution for λ is a gamma distribution with mean 3.0 and standard deviation 2.0

Find the posterior distribution of λ

1. Beta (21.25, 13.06)
2. Gamma (21.25, 13.06)
3. Normal (21.25, 13.06)
4. None of the Above

Options :

60348959969. 1

60348959970. 2

60348959971. 3

60348959972. 4