

Math Sheet

Name _____ Score _____ Teacher _____ Date _____

Normal Conjugate Priors

The unknown mean has a normal prior and observations have known variance. Add precisions: prior precision $1/\tau^2$ and data precision n/σ^2 . Use the supplied sample mean and keep variance distinct from standard deviation.

- 1. Prior $\theta \sim N(4, 2)$. A sample of $n=2$ observations has mean 1; each observation has known variance 8. Find the posterior and compare its mean and variance with the prior and data.**

Given: The sample mean has variance observation variance divided by n , so its precision is n/σ^2 .

- 2. Prior $\theta \sim N(5, 4)$. A sample of $n=3$ observations has mean 3; each observation has known variance 1. Find the posterior mean and variance.**

Given: The sample mean has variance observation variance divided by n , so its precision is n/σ^2 .

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3. Prior $\theta \sim N(6, 8)$. One observation $x=6$ has known variance 2. Find the posterior mean and variance.

Given: The second normal parameter shown is variance. Observation variance is known.

4. Prior $\theta \sim N(1, 1)$; observations 18, 20 each have known variance 4. Update sequentially and verify the batch result.

Given: Observations are conditionally independent given θ .

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- 5. Prior $\theta \sim N(2, 2)$. A sample of $n=6$ observations has mean 3; each observation has known variance 8. Find the posterior mean and variance.**

Given: The sample mean has variance observation variance divided by n , so its precision is n/σ^2 .

- 6. Prior $\theta \sim N(3, 4)$. A sample of $n=2$ observations has mean 5; each observation has known variance 1. Find the posterior and compare its mean and variance with the prior and data.**

Given: The sample mean has variance observation variance divided by n , so its precision is n/σ^2 .

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The unknown mean has a normal prior and observations have known variance. Add precisions: prior precision $1/\tau^2$ and data precision n/σ^2 . Use the supplied sample mean and keep variance distinct from standard deviation.

7. Prior $\theta \sim N(4, 8)$. One observation $x=3$ has known variance 2. Find the posterior mean and variance.

Given: The second normal parameter shown is variance. Observation variance is known.

8. Prior $\theta \sim N(5, 1)$; observations 22, 24 each have known variance 4. Update sequentially and verify the batch result.

Given: Observations are conditionally independent given θ .
