Name _____ Score _____ Teacher _____ Date _____

Beta Conjugate Priors

Use positive integer Beta shapes. Interpret a+b as prior strength and a/(a+b) as the mean. For geometric data, F is the number of failures before the first success, so observing F=f contributes one success and f failures.

1. Start with Beta(2,6). Observe one Bernoulli outcome success. Find the posterior.

Given: The likelihood contributes one theta factor per success and one (1-theta) factor per failure.

2. Find c so f(theta)=c theta^2(1-theta)^5 is a PDF on [0,1]. Identify its Beta family.

Given: Shapes a and b are positive integers.

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Beta Conjugate Priors

Use positive integer Beta shapes. Interpret a+b as prior strength and a/(a+b) as the mean. For geometric data, F is the number of failures before the first success, so observing F=f contributes one success and f failures.

3. **For a Beta(4,6) prior, find its mean and prior strength, and describe whether it favors theta below, near, or above 1/2.**

Given: Use mean a/(a+b) and strength a+b.

4. **A Beta(5,6) prior is updated by 3 successes and 1 failures. Compare prior and posterior means and give the one-step predictive success probability.**

Given: For a Bernoulli parameter, the posterior mean is the next-success predictive probability.

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Beta Conjugate Priors

Use positive integer Beta shapes. Interpret a+b as prior strength and a/(a+b) as the mean. For geometric data, F is the number of failures before the first success, so observing F=f contributes one success and f failures.

5. **Find c so f(theta)=c theta^5(1-theta)^5 is a PDF on [0,1]. Identify its Beta family.**

Given: Shapes a and b are positive integers.

6. **For a Beta(1,1) prior, find its mean and prior strength, and describe whether it favors theta below, near, or above 1/2.**

Given: Use mean a/(a+b) and strength a+b.

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Beta Conjugate Priors

Use positive integer Beta shapes. Interpret a+b as prior strength and a/(a+b) as the mean. For geometric data, F is the number of failures before the first success, so observing F=f contributes one success and f failures.

7. **A Beta(2,1) prior is updated by 2 successes and 4 failures. Compare prior and posterior means and give the one-step predictive success probability.**

Given: For a Bernoulli parameter, the posterior mean is the next-success predictive probability.

8. **Start with Beta(3,1). Observe one Bernoulli outcome failure. Find the posterior.**

Given: The likelihood contributes one theta factor per success and one (1-theta) factor per failure.