1.To compute the 95% confidence interval for the population mean μ using classical methods, we use the formula:

Confidence Interval=$\bar{y} \pm Z_{\alpha/2} \cdot \sigma/\text{sqrt}(n)$

Variables:

- Sample mean ($\bar{y}$): 176
- Population standard deviation (σ): 3
- Sample size (n): 10
- Confidence level: 95% so $Z_{\alpha/2}=1.96$

Steps:

1. Compute the standard error of the mean:

   SE=σ/sqrt(n)=3/sqrt10≈0.949

2. Compute the margin of error:

   Margin of Error=$Z_{\alpha/2} \cdot$SE=1.96*0.949≈1.86

3. Compute the confidence interval:

   Confidence Interval=$\bar{y}$±Margin of Error=176±1.86

   Lower bound: 176−1.86=174.14

   Upper bound: 176+1.86=177.86

Result:

The 95% confidence interval for μ using classical methods is:

[174.14,177.86]

2.Obtain 95% posterior credible intervals for μ for each of the cases:
(a) θ = 176, τ = 8; (b) θ = 176, τ = 1000 (c)θ = 0, τ = 1000. The result is below:

(a) θ = 176, τ = 8, Prior1:

```
> posteriorSummaryExact
$posterior_mean
[1] 176
```

$posterior_standard_deviation
[1] 0.9420824

$posterior_quantiles
 0.50 0.025 0.975
[1] 176.0000 174.1536 177.8464

(b) *$\theta = 176, \tau = 1000$*

$posterior_mean
[1] 176

$posterior_standard_deviation
[1] 0.9486829

$posterior_quantiles
[1] 176.0000 174.1406 177.8594

(c) *$\theta = 0, \tau = 1000$*

> posteriorSummaryExact
$posterior_mean
[1] 175.9998

$posterior_standard_deviation
[1] 0.9486829

$posterior_quantiles
[1] 175.9998 174.1405 177.8592

3.Comparison

Classical Model Confidence Interval:

[174.14,177.86]

Bayesian Credible Intervals Comparison:

1. (a):

   [174.1536,177.8464]

Very close to the classical interval but slightly shifted.

2. (b):

   [174.1406,177.8594]

   Almost identical to the classical interval.

3. (c):

   [174.1405,177.8592]

   Also very close to the classical model, but slightly influenced by the prior mean ($\theta=0$\theta = 0$\theta=0$).

4.Conclusion:

- Case (b): $\theta=176$, $\tau=1000$ is the closest to the classical result.

Case (b): $\theta = 176$, $\tau = 1000$ is the closest to the classical method, almost exactly the same. This is because the prior mean (θ) matches the sample mean ($\bar{y}$) perfectly, and the prior variance (τ^2) is very large, minimizing the influence of the prior on the posterior.