

LEGEND: **Blue = information provided.**
Black = calculated values.

Red = table values, etc.
Green = ANSWER

Principles of Stability
Stability and Trim Calculations - Empirical Formula (Rolling Period)

USCG 2094-SA-4

STEPS

Your vessel measures 122 feet long by 18 feet in beam. If the natural rolling period at a draft of 6'-09" is 5 seconds, what is the GM?

SOLUTION:

Reference: LaDage

Calculation for Metacentric Height (GM) using the Empirical Formula

$$\text{Time} = \frac{0.44 \times \text{Beam Width}}{\sqrt{\text{GM}}} \qquad \text{GM} = \left[\frac{0.44 \times \text{Beam Width}}{\text{Time}} \right]^2$$

Where: **0.44** = the empirical value
(.797 is used for metric values)
Time = the full natural rolling period of the vessel in seconds
Beam = the overall beam of the vessel

Beam = 18'
Time = 5 seconds

$$\text{GM} = \left[\frac{0.44 \times \text{Beam Width}}{\text{Time}} \right]^2$$

$$\text{GM} = \left[\frac{0.44 \times 18'}{5 \text{ seconds}} \right]^2$$

GM = 2.51'

Select the closest answer

- A) 1.4 feet
- B) 2.1 feet
- C) 2.5 feet ← **ANSWER**
- D) 2.9 feet