

Terrestrial - Fuel, Speed, Distance

Overview

There are two basic formulas used to solve most USCG questions with regards to distance, fuel, and speed. Study Tip: If the student can remember just these two basic formulas and understand how these can be adjusted using the given quantities in the problem, then far less time is spent memorizing multiple formulas to solve each type of question.

Formula (1 of 2):

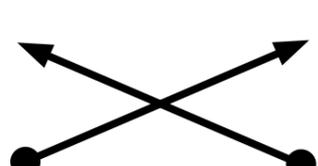
$$\frac{\text{New Consumption}}{\text{Old Consumption}} = \frac{(\text{New Speed})^2 \times \text{New Distance}}{(\text{Old Speed})^2 \times \text{Old Distance}}$$

Formula (2 of 2):

$$\frac{\text{New Consumption}}{\text{Old Consumption}} = \frac{(\text{New Speed})^3}{(\text{Old Speed})^3}$$

By cross multiplying and dividing the fractions the student can adjust either formula to solve for any item requested.

Formula (1 of 2) Cross Multiplied:

$$\frac{\text{New Consumption}}{\text{Old Consumption}} \times \frac{(\text{Old Speed})^2 \times \text{Old Distance}}{(\text{New Speed})^2 \times \text{New Distance}} = \frac{(\text{New Speed})^2 \times \text{New Distance}}{(\text{Old Speed})^2 \times \text{Old Distance}} \times \frac{(\text{Old Speed})^2 \times \text{Old Distance}}{(\text{New Speed})^2 \times \text{New Distance}}$$


Example of formula (1 of 2) after cross multiplication:

- $\frac{\text{New Consumption} \times (\text{Old Speed})^2 \times \text{Old Distance}}{\text{Old Consumption} \times \text{New Distance}} = (\text{New Speed})^2$
- $\frac{\text{New Consumption} \times (\text{Old Speed})^2 \times \text{Old Distance}}{(\text{New Speed})^2 \times \text{New Distance}} = \text{Old Consumption}$

Formula (2 of 2) Cross Multiplied:

$$\frac{\text{New Consumption}}{\text{Old Consumption}} \quad \begin{array}{c} \swarrow \quad \searrow \\ \nwarrow \quad \swarrow \end{array} \quad \frac{(\text{New Speed})^3}{(\text{Old Speed})^3}$$

Example of formula (2 of 2) after cross multiplication:

- $\text{New Consumption} = \frac{\text{Old Consumption} \times (\text{New Speed})^3}{(\text{Old Speed})^3}$
- $\frac{\text{New Consumption} \times (\text{Old Speed})^3}{\text{Old Consumption}} = (\text{New Speed})^3$

Notes on explanations provided on the following pages:

Several abbreviations will be used in the USCG question solutions in the following pages. See below for a list of these abbreviations and other notation.

Most calculators have a cube and cube root key. Many times it is found in the shift or 2nd function keys. Using this feature in lieu of multiplying a number out three times can save time and prevent possible errors.

Abbreviation and symbols:

bbls - Volume of fuel in barrels

kn - Speed in Knots

NC - New Consumption

OC - Old Consumption

NS - New Speed

OS - Old Speed

ND - New Distance

OD - Old Distance

The following pages show solutions to actual USCG questions. The pages are listed numerically by question number but separated into groups of fuel, speed and distance problems. So, if you are looking for a specific question, make sure you scroll all the way to the end of the explanation.

USCG Navigation Problem (Near Coastal) Question 534

You have steamed 803 miles at 13 knots, and consumed 179 tons of fuel. If you have 371 tons of usable fuel remaining, how far can you steam at 16 knots?

$$\frac{NC}{OC} = \frac{(NS)^2 \times ND}{(OS)^2 \times OD} \quad \bullet 1$$

$$\frac{NC}{OC} = \frac{(NS)^2 \times ND}{(OS)^2 \times OD} \quad \bullet 2$$

$$\frac{NC \times (OS)^2 \times OD}{OC \times NS^2} = ND \quad \bullet 2$$

$$ND = \frac{371 \text{ Tons} \times 13^2 \text{ Knots} \times 803 \text{ Miles}}{179 \text{ Tons} \times 16^2 \text{ Knots}}$$

$$ND = 1098.71 \text{ Miles}$$

Answer: 1098.7 Miles

USCG Book Nav Problem Question 534 Solution

Explanation (Fuel Speed Distance - New Distance)

- 1 Carefully look at all the given items in the problem. Verify what the problem is asking to solve. Choose which of the two basic formulas will work with the given items. In this case, formula one is used (see page one for formulas).
- 2 Newly adjusted formula after cross multiplying. Solve for ND.