

# Terrestrial - Vessel Slip - Calculated

This explanation includes solutions to questions 36, 73, 371, 376, and 377.

## USCG Navigation Problem (Near Coastal) Question 36

The propeller on a vessel has a diameter of 25.3 feet and a pitch of 23.2 feet. What would be the apparent slip if the vessel cruised 515 miles in a 23 hour day (observed distance) at an average RPM of 93?

*1 nautical mile = 6076.12 feet, accepted practice is using 6076 feet.*

*60 converts RPM to rotations per hour, since knots is an hourly measurement.*

*Negative Slip: Observe Speed is greater than Engine Speed*

*Positive Slip: Engine Speed is greater than Observe Speed*

## Explanation (Vessel Slip - Calculated)

**Step 1:** Find the engine distance for the day's run.

Engine Distance for the day = RPM x 60 x Pitch x (day's run, 24 hour) ÷ 6076

**Step 2:** Find slip.

% Slip = (Engine Distance – Observed Distance) ÷ Engine Distance x 100

Solution continues on then next page for Question 36.

Note to Student:

Calculations may not read exactly as the answer is posted. Some calculations round to 6080 feet for a nautical mile which would give a slightly different answer. Others round the decimals to the nearest tenth early in the problem while some will carry all the decimals until the end of the problem. In any event, using the previous steps correctly should give the student a number very close to the correct answer listed. Should you find a greater error, or if it falls between 2 answers forcing you to choose, then recheck your work.

**USCG Navigation Problem (Near Coastal) Question 36**

The propeller on a vessel has a diameter of 25.3 feet and a pitch of 23.2 feet. What would be the apparent slip if the vessel cruised 515 miles in a 23 hour day (observed distance) at an average RPM of 93?

**Step 1:** Find Engine Distance (ED) for the day in nautical miles

$$\text{ED for the day} = \text{RPM} \times 60 \times \text{Pitch} \times (\text{day's run, 23 hour}) \div 6076$$

$$\text{ED for the day} = 93 \times 60 \times 23.2 \text{ ft} \times 23 \text{ hours} \div 6076$$

$$\text{ED for the day} = 490.04 \text{ nautical miles}$$

**Step 2:** Find Slip

$$\% \text{ Slip} = (\text{ED} - \text{Observed Distance}) \div \text{Engine Distance} \times 100$$

$$\% \text{ Slip} = (490.04 - 515) \div 490.04 \times 100$$

$$\% \text{ Slip} = (-24.96) \div 490.04 \times 100$$

$$\% \text{ Slip} = -5.093\%$$

$$\text{Slip} = -.05093$$

$$\text{Answer: } -.051$$

USCG Book Nav Problem (Near Coastal) Question 36 Solution

*1 nautical mile = 6076.12 feet (accepted practice is using 6076 feet).*

*Tip: Make sure to use "pitch" not diameter.*

**Explanation (Vessel Slip - Calculated)**

**Step 1:** Find the engine distance for the day's run.

$$\text{Eng. Distance for the day} = \text{RPM} \times 60 \times \text{Pitch} \times (\text{day's run, 23 hour}) \div 6076$$

**Step 2:** Find slip

$$\% \text{ of Slip} = (\text{Engine Distance} - \text{Observed Distance}) \div \text{Engine Distance} \times 100$$

See note to student at bottom of page 1 of this explanation.