TIME, SPEED, AND DISTANCE

All piloting and maneuvering solutions contain three factors: time, speed, and distance. Understanding how to calculate time, speed and distance questions is essential for safe navigation.

10 knots is a short way to say 10 nautical miles per hour. A nautical mile is longer than a statute mile which is used for navigating on land. One nautical mile equals 1.15 statute miles. If it takes someone an hour to travel 45 miles, they must have averaged 45 mph. The same concept applies to a vessel. A ship averaging 20 knots would go 20 nautical miles in one hour or 200 miles in 10 hours.

Two different methods are commonly used to solve the same problem. The best is the one that is easiest for you to use and remember. Method # 1 seems to be the most widely used method.

With these formulas memorized, you can easily solve time, speed and distance problems with paper and pencil or a simple calculator. A nautical slide rule is not always readily available or as accurate as using the formula.

D – Distance in nautical miles

S – Speed in knots

T – Time in minutes
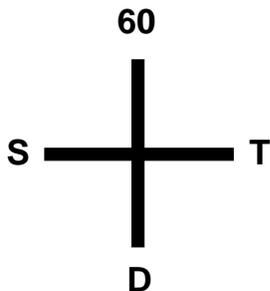
You need to know two factors in order to determine the third:

Method # 1

D = S x T ÷ 60

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T = D x 60 ÷ S

As an aid, use this diagram:

60

S ──┼── **T**

D

 A suggested memory aid is: **60 D Street**.

First, multiply the two known factors that are on the same line, then divide by the third known factor.

1. Before calculating, always convert hours and minutes to total minutes (Example: 01:45 = 105 total minutes)

2. Cover the unknown with your finger.

3. Multiply by the opposites on the same line in the diagram.

4. Divide by the remaining figure on the diagram for the answer.

5. After solving for time, convert total minutes to hours and minutes   (Example: 85 minutes = 01:25)

Example 1: A ship traveled 7 miles in 30 minutes. What was its speed?

Solution: $S = \dfrac{D \times 60}{T} = \dfrac{7 \times 60}{30} = \dfrac{420}{30} = 14$ knots

Example 2: A ship's speed is 15 knots. How far will it travel in 20 minutes?

Solution: $D = \dfrac{S \times T}{60} = \dfrac{20 \times 15}{60} = \dfrac{300}{60} = 5$ Miles

Example 3: A ship's speed is 8 knots. How long will it take for it to travel 6 miles?

Solution: $T = \dfrac{D \times 60}{S} = \dfrac{6 \times 60}{8} = \dfrac{360}{8} = 45$ minutes

Method # 2

Time is in hours and tenths of an hour

D = S x T

S = D ÷ T

T = D ÷ S

When using this method, minutes need to be converted to tenths of an hour.
For instance, 30 minutes divided by 60 = 0.5 or half an hour.

Sometimes tenths of an hour need to be converted to minutes.
For instance, 1.42 hours equals 1 hour 25 minutes. (.42 X 60 = 25.2 rounded to 25 minutes)