

Distance, Rate and Time

Lesson two



Terminal Objective

Given a word problem involving distance, students will be able to apply the formula $d = rt$ to find missing information.

Content Standard Reference:

Grade 6 Algebra and Functions

2.3: Solve problems involving rates, average speed, distance, and time.

Materials

1. Distance, Rate and Time PowerPoint

Time Required

2 classes

Keywords

1. **Rate** – speed
2. **Nautical mile** - about 1.15 miles or 1.852 km.

Keyword

1. **Knot** - 1 nautical mile per hour.

Introduction of Lesson

Anticipatory Set:

You are shipping a container with about 30,000 tennis shoes from Hong Kong to Long Beach.

When are your shoes going to arrive in Long Beach? As long as you know distance and **rate** of speed for the boat, you can figure out when the shoes are expected to arrive.

Student Objective:

Students will learn how to apply the distance formula to find distance traveled, time traveled, or rate (speed).

Purpose:

Calculating distance, rate and time is important for moving cargo into and out of the Port of Long Beach.

Lesson

Input

State the distance formula:

$$d = r \cdot t$$

Define and provide examples for:

- Distance (miles, kilometers, inches, feet, meters ...)
- Rate (mph, kmph, feet per second, meters per minute, **knot**)
- Time (minutes, hours, days, seconds, years, weeks)

Check for Understanding

- What does r stand for? **Answer:** Rate. Units?
Answer: mph, kmph, feet per second, meters per minute
- What does d stand for? **Answer:** Distance. Units?
Answer: miles, kilometers, inches, feet, meters

Lesson cont'd

- What does t stand for? **Answer:** Time. Units?
Answer: minutes, hours, days, seconds, years, weeks
- What is the distance formula? **Answer:** $d=r*t$

Input

First, students will learn how to find distance using the distance formula.

Modeling

If you are traveling for 3 hours at 65 mph, how far will you have gone?

1. Write down the formula.
 $d = r \times t$
2. What are you trying to find AND what do you know?
 $D = ??$
 $r = 65 \text{ mph}$
 $t = 3 \text{ hours}$
3. Substitute known variables and solve.
 $d = 3 \text{ hours} \times 65 \text{ mph}$
 $d = 195 \text{ miles}$

Check for Understanding

If you are traveling for 4 hours at 55 mph, how far will you have gone?

- What is the rate? $r=55$
- What is the time? $t=4$
- How would you apply distance formula?
 $D=r*t$
 $D=55*4$
 $D=220 \text{ miles}$

Lesson cont'd

Guided Practice

If you are traveling for 2 hours to get to your job at the Port of Long Beach at a rate of 35 mph, how far did you travel?

$$d = r \cdot t$$

$$d = 35 \text{ miles/hour} \cdot 2 \text{ hours}$$

$$d = 70 \text{ miles}$$

Modeling

The Glory Sanye, a cargo ship, is traveling from Long Beach to Quigdo Port in China's Jiaozhou Gulf. If it travels for approximately 15 days at a rate of 480 miles per day, how far is the Gloria Sanye traveling?

$$d = r \cdot t$$

$$d = 480 \text{ miles/day} \cdot 15 \text{ days}$$

$$d = 7,200 \text{ miles}$$

Guided Practice

Now, the Glory Sanye is traveling from the Quigdo Port to Dubai in the United Arab Emirates. Now empty, it travels 520 miles per day for 7 days. How far is Quigdo Port from Dubai?

$$d = r \cdot t$$

$$d = 520 \cdot 7$$

$$d = 3,640 \text{ miles}$$

Input

Distance is measured at sea and in aviation (air) by nautical miles. A nautical mile is historically equal to 1° latitude. It is about 1.15 miles or 1.852 km. A nautical mile is abbreviated as nm. A knot equals 1 nautical mile per hour.

Check for Understanding

Students will use nautical miles and knots to solve the next set of problems.

Lesson cont'd

- What is the abbreviation for nautical mile? nm
- How many miles is 1 nautical mile? 1.15 miles
- Who uses nautical miles? Ships and airplanes
- What is a knot? 1 nautical mile per hour

Modeling

The MSC Texas, a cargo ship, is traveling from Hong Kong to Long Beach. It is full of containers, about 8,200 TEUs (1 TEU = Twenty-Foot Equivalent Unit, or a 20-foot-long container). MSC Texas will take about 600 hours (about 25 days) to travel 13,200 nautical miles. How fast is the MSC Texas traveling?

$$d = r \cdot t$$

$$13200 \text{ nm} = r \cdot 600 \text{ hours}$$

$$22 \text{ nm/hour or } 22 \text{ knots} = r$$

Check for Understanding

The MSC Texas is traveling back to Hong Kong but only a third of the containers are full. It will take the MSC Texas about 15 days to travel 12,500 kilometers to Hong Kong. How fast is the MSC Texas traveling on the return trip?

- What is the distance? 12,500 km
- What is the time? 15 days
- How would you find the rate? Substitute distance and time and solve for r

Guided Practice

The MSC Texas is traveling back to Hong Kong but only half of the containers are full. It will take the MSC Texas about 550 hours (about 23 days) to travel 13,200 nm. How fast is the MSC Texas traveling on its return trip?

Lesson cont'd

$$d = rt$$

$$13200 \text{ nm} = r \cdot 550 \text{ hours}$$

$$24 \text{ nm/hour or } 24 \text{ knots} = r$$

Input

Now students will find time using the same formula.

Modeling

You are traveling to Sacramento, CA from Los Angeles, about 375 miles by train. If the train travels an average speed of 30 mph, how long will it take to reach Sacramento?

$$d = r \cdot t$$

$$375 \text{ miles} = 30 \text{ miles/hour} \cdot t$$

$$12.5 = t$$

About 12 $\frac{1}{2}$ hours

Check for Understanding

The new speed trains that the State of California is looking to buy can travel 100 mph. How long would the trip from Los Angeles to Sacramento, about 375 miles, take in the new trains?

- What is the rate? 100 mph
- What is the distance? 375 miles
- How would you find the time? $375 = 100 \cdot t$

Guided Practice

In 2000, trains could only travel 10 mph down Alameda street to get to the train transfer point from the Port of Long Beach. If the distance is 20 miles, how long did it take a train to travel down Alameda Street?

$$d = r \cdot t$$

$$20 \text{ miles} = 10 \text{ miles/hour} \cdot t$$

$$2 \text{ hours} = t$$

Lesson cont'd

Now trains can travel 40 mph down the new 20-mile Alameda Corridor, an expanded rail route. How long will it take trains to travel the Alameda Corridor?

$$D = r \cdot t$$

$$20 \text{ miles} = 40 \text{ miles/hour} \cdot t$$

$$.5 \text{ hour} = t \quad \text{or about } \frac{1}{2} \text{ hour}$$

Closure

Have students summarize in their notes the steps for using the distance formula to find:

- distance
- rate
- time

Have students complete the worksheet for homework.

Worksheet

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Distance, Rate and Time Worksheet

Solve

1. You are shipping a 40-foot container full of athletic shoes, about 30,000 shoes, to Long Beach from Shanghai China, approximately 11,500 nautical miles. The Hyundai Independence cargo ship can travel 23 nm/hour, or 23 knots. How many hours will it take to get the shoes to Long Beach?
2. A car carrier is traveling 442 miles from Tokyo to the Port of Long Beach with new Toyotas. The ship will travel at a rate of 22 knots. How long will it take for the ship to reach the Port?
3. The new Toyota cars will be sent to New York by train, about 2,850 miles. The train will travel an average speed of 50 miles per hour. How long will it take to reach New York?
4. An electronics store is shipping new LCD televisions from Taiwan to Long Beach, about 11,040 nautical miles. The MSC Texas cargo ship can make the trip from Taiwan to Long Beach in 460 hours, about 19 days. How fast will the MSC Texas be traveling?

Worksheet Solutions

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Distance, Rate and Time Worksheet

Solutions

1. You are shipping a 40-foot container full of athletic shoes, about 30,000 shoes, to Long Beach from Shanghai China, approximately 11,500 nautical miles. The Hyundai Independence cargo ship can travel 23 nm/hour, or 23 knots. How many hours will it take to get the shoes to Long Beach?

$$d = rt$$

$$\frac{11,500 \text{ nm}}{23 \text{ nm/hour}} = \frac{23 \text{ nm/hour} \cdot t}{23 \text{ nm/hour}}$$

$$\mathbf{500 \text{ hours} = t}$$

2. A car carrier is traveling 442 nautical miles from Tokyo to the Port of Long Beach with new Toyotas. The ship will travel at a rate of 22 knots. How long will it take the ship to reach the Port?

$$d = rt$$

$$442 \text{ nm} = 22 \text{ nm/hour} \cdot t$$

$$\mathbf{20.1 \text{ hr} = t}$$

3. The new Toyota cars will be sent to New York by train, about 2,850 miles. The train will travel an average speed of 50 miles per hour. How long will it take to reach New York?

$$d = rt$$

$$2850 \text{ miles} = 50 \text{ miles/hour} \cdot t$$

$$\mathbf{57 \text{ hours} = t}$$

4. An electronics store is shipping new LCD televisions from Taiwan to Long Beach, about 11,040 nautical miles. The MSC Texas cargo ship can make the trip from Taiwan to Long Beach in 460 hours, about 19 days. How fast will the MSC Texas be traveling?

$$d = rt$$

$$11,040 \text{ nm} = r \cdot 460 \text{ hour}$$

$$\frac{460 \text{ hour}}{460 \text{ hour}} \quad \frac{460 \text{ hour}}{460 \text{ hour}}$$

$$\mathbf{24 \text{ nm/hour} = r \quad \text{or} \quad 24 \text{ knots} = r}$$