

Warm-Up | Solving Rate Problems



Lesson Question



Lesson Goals

Analyze relationships between two .

Organize the quantitative relationships of and work problems in a table.

Solve rate and problems using linear equations.



Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

strategy	of action designed to achieve a specific goal
linear equation	an algebraic equation with constants and terms of highest 1
properties of equality	the that allow the balancing, manipulating, and of equations (e.g., the addition property of states “if $x = y$, then $x + z = y + z$ ”)

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Words to Know

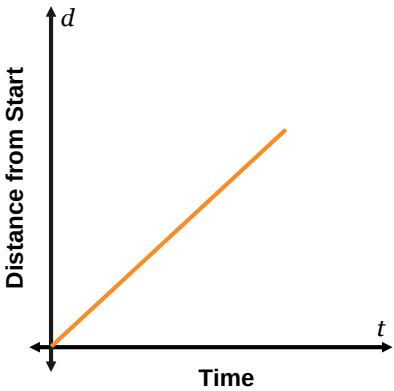
quantity	measurable of things or events
rate	a comparing quantities measured in different



Rates

Tobias trains for a marathon by running for a few hours at a constant speed. The graph shows his typical workout.

What can be said about the relationship between the two quantities?



When the quantity of time increases, the quantity of distance as well.

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Solving a Rate Problem

Maryanne drove to a friend’s house at an average **rate** of 55 miles per hour. She took the same route on the way back, and her average was 45 miles per hour. If she spent a total of 2 hours driving, how far did she drive in all?

- Question How far did she drive in all?
- Clues
- Set up a table.
- Check

SET UP A TABLE

Maryanne drove to a friend’s house at an average rate of 55 miles per hour. She took the same route on the way back, and her average rate was 45 miles per hour. If she spent a total of 2 hours driving, how far did she drive in all?

	Rate (mi/h)	Time (h)	Distance (mi)
Trip to Friend’s	55		
Trip Home	45	$2 - t$	$45(2 - t)$

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Writing Linear Equations to Solve Rate Problem

Maryanne drove to a friend's house at an average rate of 55 miles per hour. She took the same route on the way back, and her average rate was 45 miles per hour. If she spent a total of 2 hours driving, how far did she drive in all?

	Rate (mi/h)	Time (h)	Distance (mi)
Trip There	55	t	$55t$
Trip Home	45	$2 - t$	$45(2 - t)$

Write a **linear equation** and use the **properties of equality** to solve for the

distance.

$$55t = 45(2 - \text{ })$$

$$55t = 90 - 45t$$

$$\text{ } = 90$$

$$t = 0.9 \text{ hours}$$

Distance to the friend's home:

$$55(0.9) = \text{ } \text{ mi}$$

$$\text{Total Distance: } \text{ } \text{ miles}$$

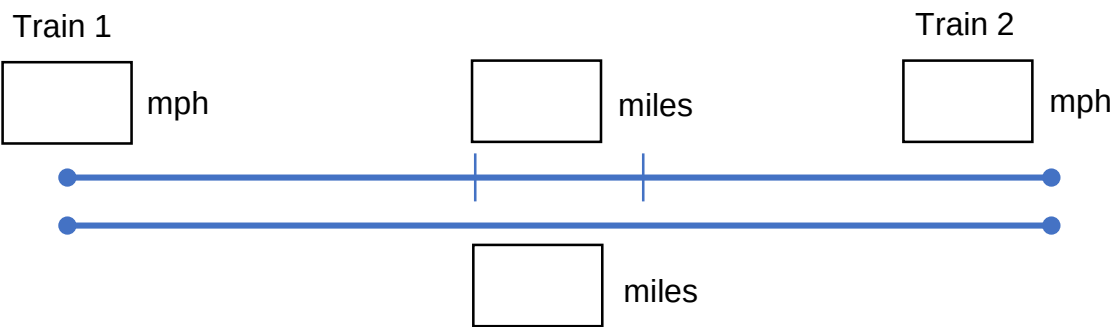
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Writing Equations to Solve Rate Problems

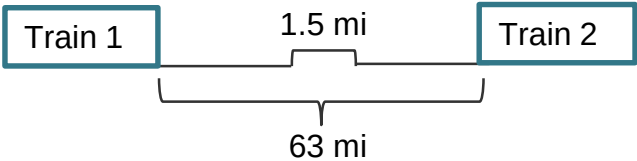
Example: A train heads west at 80 miles per hour, and another train heads east on a parallel track at the same time, traveling at 70 miles per hour. The train conductors can see each other when the trains are 1.5 miles apart. If the trains start 63 miles apart, how long does it take for them to see each other?



WRITE AN EQUATION

A train travels west at 80 miles per hour, and another train heads east on a parallel track at the same time, traveling at 70 miles per hour. The train conductors can see each other when the trains are 1.5 miles apart.

	Rate (mph)	Time (h)	Distance (mi)
Train 1	80	t	$80t$
Train 2	70	t	$70t$



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If the trains start 63 miles apart, how long does it take for them to see each other?

$$63 - 1.5 = \boxed{} \text{ mi.}$$

This is how far the two trains have traveled together.

$$\boxed{} + \boxed{} = 61.5$$

$$150t = 61.5$$

$$t = \boxed{} \text{ hour}$$

The trains have traveled 0.41 hour before they see each other.

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Units and Rate Problems

MISCONCEPTIONS

When solving rate problems, make sure the units for the quantities are

3 miles per hour

$\frac{2}{3}$ hour

• $d = \boxed{}$

• $d = (3)\left(\frac{2}{3}\right)$

• $d = 2$
2 miles

3 miles per hour

40 minutes

The speed is given in miles per *hour*,
but the time is given in *minutes*.

You have to do a conversion from
minutes to hours before solving.

$$40 \text{ min} \times \frac{1 \text{ h}}{60 \text{ min}} = \boxed{} \text{ hour}$$

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Solving a Work Problem

SET UP A TABLE

Nate and Roger are painting a fence. Nate can paint the entire fence in 4 hours and Roger can paint it in 5 hours. How long would it take them to paint the entire fence if they were working together?

	Rate (part/h)	Time (h)	Part of Fence Painted
Nate		t	
Roger		t	

WRITE AND SOLVE AN EQUATION

Nate and Roger are painting a fence. Nate could paint the entire fence in 4 hours and Roger could paint it in 5 hours.

	Rate (part/h)	Time (h)	Part of Fence Painted
Nate	$\frac{1}{4}$	t	$\frac{1}{4}t$
Roger	$\frac{1}{5}$	t	$\frac{1}{5}t$

It takes hours, minutes for them to paint a fence working together.

How long would it take them to paint the entire fence if they were working together?

$$\frac{1}{4}t + \frac{1}{5}t = 1$$

$$\frac{t}{4} + \frac{t}{5} = 1$$

$$\frac{5t}{20} + \frac{4t}{20} = 1$$

$$\frac{\boxed{}}{\boxed{}} = 1$$

$$\boxed{} = 1$$

$$t = \frac{20}{9} \text{ h}$$

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Solving a Work Problem

Example: Working together, Paula and Renee can clean up their yard in 2 hours. It would have taken Paula 3 hours to do the job alone. How long would it have taken Renee to clean the yard alone?

	Rate (part/h)	Time (h)	Part of Yard Cleaned
Paula		2	
Renee	r	2	

Write an equation:

$$\frac{1}{3}(2) + r(2) = \boxed{}$$

SOLVE THE EQUATION

Working together, Paula and Renee can clean up their yard in 2 hours. It would have taken Paula 3 hours to do the job alone. How long would it have taken Renee to clean the yard alone?

	Rate (part/h)	Time (h)	Part of Yard Cleaned
Paula	$\frac{1}{3}$	2	$\frac{2}{3}$
Renee	r	2	$2r$

The equation $\frac{2}{3} + 2r = 1$ can be used to find Renee's rate of work per hour, r .

$$\boxed{} = \frac{1}{3}$$

$$r = \frac{1}{6}$$

It would take Renee $\boxed{}$ hours to clean the yard herself.

Summary

Solving Rate Problems

**Lesson
Question**

How can you use tables to help solve rate and work problems?

**Answer**

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Review: Key Concepts

Rate and work problems involve a product of the rate and time quantities involved.

To solve these problems:

- Create a to organize information.
- an equation for the situation.
- Solve the equation, and the solution.

Summary

Solving Rate Problems

Use this space to write any questions or thoughts about this lesson.