Warm-Up

1. Suppose a car can run on ethanol and gas and you have a 15 gallons tank to fill. You can buy fuel that is either 30 percent ethanol or 80 percent ethanol. How much of each type of fuel should you mix so that the mixture is 40 percent ethanol?
2. In January of the year 2000, I was one more than eleven times as old as my son William. In January of 2009, I was seven more than three times as old as him. How old was my son in January of 2000?

Warm-Up

Suppose a car can run on ethanol and gas and you have a 15 gallons tank to fill. You can buy fuel that is either 30 percent ethanol or 80 percent ethanol. How much of each type of fuel should you mix so that the mixture is 40 percent ethanol?

30%	x	.3x
80%	15-x	12-.8x
40%	15	6

$.3x+12-.8x=6$

$-.5x=-6$

$12=x$

So… 12 gal of 30%

3 gal of 80%

Warm-Up

In January of the year 2000, I was one more than eleven times as old as my son William. In January of 2009, I was seven more than three times as old as him. How old was my son in January of 2000?

Let w→ William in 2000 and i→ I in 2000

$11w+1=i$

$(i+9)=3(w+9)+7$

$11w+1+9=3w+27+7$

$11w+10=3w+34$

$8w=24$

$w=3$

So… William is 3 in 2000

Announcements

Last day of the semester is today.

Your Word Problem Informal will be on Thursday.

No School on Monday or Tuesday.

Hidden Figures for Quarter 3

Unit Map

Today - Word Problems Day 3 (Travel and Work Problems)

Monday - No School

Tuesday - No School

Wednesday - Word Problem Review Day/Complete the MAP

Thursday - Word Problem Informal Assessment

Motion and Task Problems

1/18/2019

Motion Word Problems...

Remember that distance = rate x time, or d=rt.

We can solve a motion problem either by using a chart, or a system of equations.

We will use a chart that looks like this

	r	t	d
Object 1			
Object 2			

Uniform Motion

What is it? What does it look like? What does it mean for distance?

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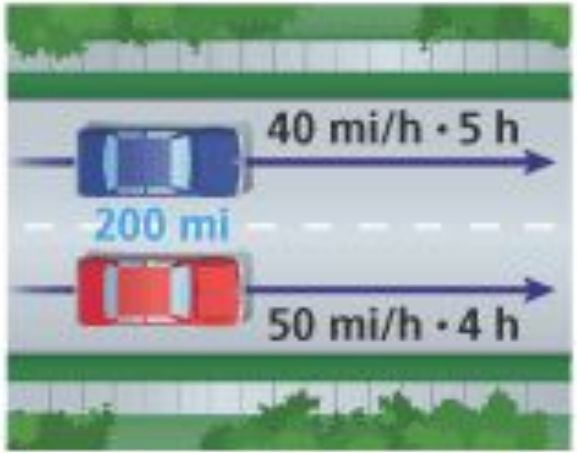
These problems involve two objects starting from the same place, but at different times. The question will typically ask, “When will they meet?”

If there start at the same place, and later they meet, their distance must be

_____



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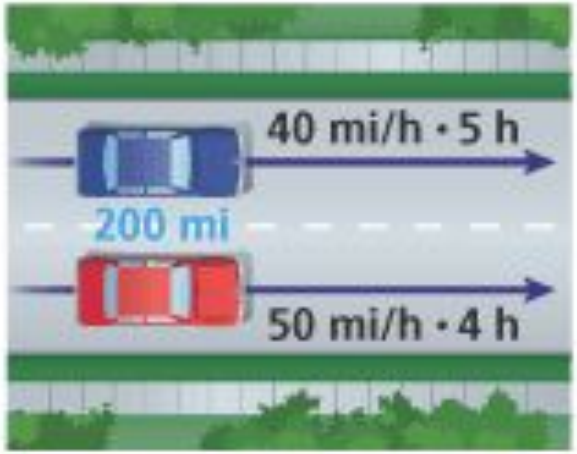

Example 1 - Uniform Motion

A train leaves a station, traveling at 50 miles per hour. Two hours later, a second train leaves on a parallel track traveling the same direction at 60 miles per hour. In how many hours will the second train catch up with the first train? (Assume there are no stops and the trains travel at constant speed)

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	r	t	d
Train 1			
Train 2			

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	r	t	d
Train 1	50	x	
Train 2	60	x-2	

Example 1 - Uniform Motion

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	r	t	d
Train 1	50	x	50x
Train 2	60	x-2	60x-120

Example 1 - Uniform Motion

These trains started at the same place and will now meet. Their distances are the same, so set each train's distance equal to the other.

$50x=60x-120$

	r	t	d
Train 1	50	x	50x
Train 2	60	x-2	60x-120

Example 1 - Uniform Motion

You end up getting that x= 12

In context, that means that train 1 has been traveling for 12 hours when they meet.

Let's make sure we answer the question...

	r	t	d
Train 1	50	x	50x
Train 2	60	x-2	60x-120

Example 1 - Uniform Motion

A train leaves a station, traveling at 50 miles per hour. Two hours later, a second train leaves on a parallel track traveling the same direction at 60 miles per hour. In how many hours will the second train catch up with the first train? (Assume there are no stops and the trains travel at constant speed) **So.. .x-2=10. Train 2 has traveled 10 hours**

	r	t	d
Train 1	50	x	50x
Train 2	60	x-2	60x-120

Opposite Direction

What is it? What does it look like? What does it mean for distance?

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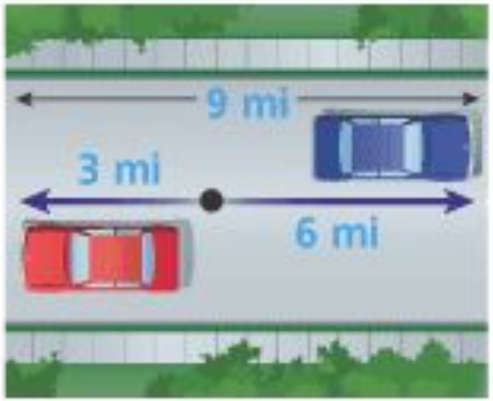
What is it? What does it look like? What does it mean for distance?

These problems involve two objects starting from the same place, but going in opposite directions from each other.

If there start at the same place, and then go in opposite directions, their distance must _____.

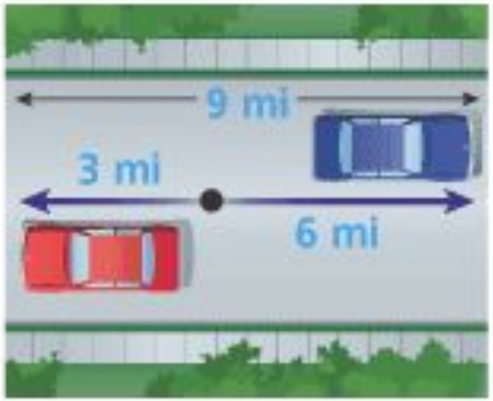


Opposite Direction

What is it? What does it look like? What does it mean for distance?

These problems involve two objects starting from the same place, but going in opposite directions from each other.

If there start at the same place, and then go in opposite directions, their distance must **ADD TO EQUAL A TOTAL DISTANCE.**



Example 2 - Opposite Direction

Two planes take off from the same airport at the same time, heading in opposite directions. One plane is traveling 200 mph faster than the other. In 5 hours, they are 5,500 miles apart. Find the average rate of speed for each plane.

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	r	t	d
Plane 1			
Plane 2			

Example 2 - Opposite Direction

Two planes take off from the same airport at the same time, heading in opposite directions. One plane is traveling 200 mph faster than the other. In 5 hours, they are 5,500 miles apart. Find the average rate of speed for each plane.

	r	t	d
Plane 1	x	5	
Plane 2	200+x	5	

Example 2 - Opposite Direction

Two planes take off from the same airport at the same time, heading in opposite directions. One plane is traveling 200 mph faster than the other. In 5 hours, they are 5,500 miles apart. Find the average rate of speed for each plane.

	r	t	d
Plane 1	x	5	5x
Plane 2	200+x	5	1000+5x

Example 2 - Opposite Direction

Since they are traveling in opposite directions and now they are 5,500 miles apart, that means that the two plans distances total 5,500 miles.

$5x+1000+5x=5,500$

	r	t	d
Plane 1	x	5	5x
Plane 2	200+x	5	1000+5x

Example 2 - Opposite Direction

You end up getting that x= 450

In context, that means that plane 1 is traveling 540 mph.

Let's make sure we answer the question...

	r	t	d
Plane 1	x	5	5x
Plane 2	200+x	5	1000+5x

Example 2 - Opposite Direction

Two planes take off from the same airport at the same time, heading in opposite directions. One plane is traveling 200 mph faster than the other. In 5 hours, they are 5,500 miles apart. Find the average rate of speed for each plane.

So... plane 1 is traveling 450 mph, and plane 2 is traveling 200+(450)=650 mph

	r	t	d
Plane 1	x	5	5x
Plane 2	200+x	5	1000+5x

Round Trip

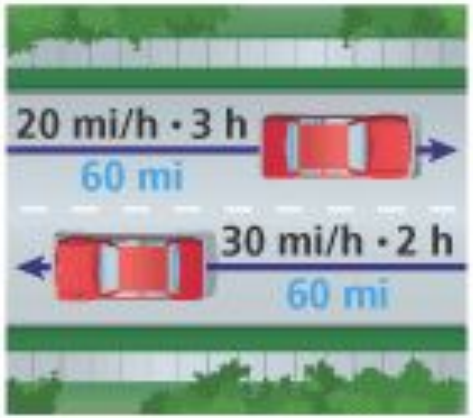
What is it? What does it look like? What does it mean for distance?

Round Trip

What is it? What does it look like? What does it mean for distance

These problems involve one objects going somewhere and then coming back.

If you go somewhere, and then come back,
the distance of each trip must be _____.

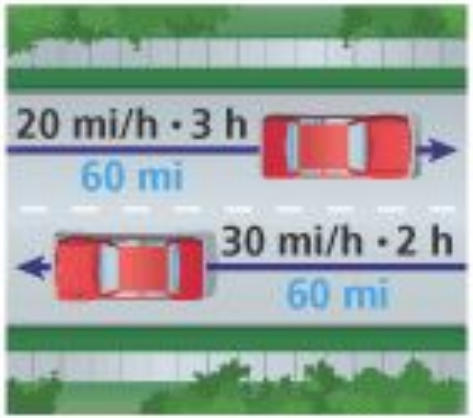


Round Trip

What is it? What does it look like? What does it mean for distance

These problems involve one objects going somewhere and then coming back.

If you go somewhere, and then come back, the distance of each trip must be **EQUAL**.



Example 3 - Round Trip

Noya drives into the city to buy a software program at a computer store. Because of traffic conditions, she averages only 15 mi/h. On her drive home she averages 35 mi/h. If the total travel time is 2 hours, how long does it take her to drive to the computer store?

Example 3 - Round Trip

Noya drives into the city to buy a software program at a computer store. Because of traffic conditions, she averages only 15 mi/h. On her drive home she averages 35 mi/h. If the total travel time is 2 hours, how long does it take her to drive to the computer store?

	r	t	d
There			
Back			

Example 3 - Round Trip

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	r	t	d
There	15	x	
Back	35	2-x	

Example 3 - Round Trip

Noya drives into the city to buy a software program at a computer store. Because of traffic conditions, she averages only 15 mi/h. On her drive home she averages 35 mi/h. If the total travel time is 2 hours, how long does it take her to drive to the computer store?

	r	t	d
There	15	x	15x
Back	35	2-x	70-35x

Example 3 - Round Trip

Since Noya is traveling there and back, that means that the two trips are equal in distance.

$15x=70-35x$

	r	t	d
There	15	x	15x
Back	35	2-x	70-35x

Example 3 - Round Trip

You end up getting that x= 1.4

In context, that means that the trip there took 1.4 hours.

Let's make sure we answer the question...

	r	t	d
There	15	x	15x
Back	35	2-x	70-35x

Example 3 - Round Trip

Noya drives into the city to buy a software program at a computer store. Because of traffic conditions, she averages only 15 mi/h. On her drive home she averages 35 mi/h. If the total travel time is 2 hours, how long does it take her to drive to the computer store?

So… it takes Noya 1.4 hours to get to the computer store.

	r	t	d
There	15	x	15x
Back	35	2-x	70-35x

So in a nutshell

Distance = Rate x Time - ALWAYS

Use the chart

Based on the question, we may do different things with the distance to solve the problem.

Uniform motion -- distances are equal

Opposite direction -- distances add to equal a total distance

Round trip -- distances are equal

Want additional help with travel problems?

http://www.phschool.com/itext/math/sample_chapter/Ch02/02-05/PH_Alg1_ch02-05_Obj2.html

Example 4 - Work Problems

If Jon can do a certain job in 4 hours, and Ava can do the same job in 6 hours, how long would it take them to do the job together?

Example 4 - Work Problems

If Jon can do a certain job in 4 hours, and Ava can do the same job in 6 hours, how long would it take them to do the job together?

$$\frac{1}{4} + \frac{1}{6} = \frac{1}{x}$$

x=24, so they could do the job in 2.4 hours

Classwork/Homework

Motion and Task Problems are below - 17 problems total

Solve the following opposite direction problems.

1. One plane took off from San Francisco, traveling east. At the same time, another plane took off from the same airport, traveling west. The plane traveling east was going 140 miles per hour faster than the plane traveling west. After three hours, the planes were 2, 700 miles apart. How fast was each plane going?

2. Two trains left the station at the same time, traveling in opposite directions. After five hours, they were 475 miles apart. One train was traveling 25 miles per hour faster than the other. How fast was the faster train going?

3. Two cyclists travel from the same point in opposite directions on a course. One is traveling at an average of 14 miles per hour and the other at an average of 22 miles per hour. After three hours, how far apart are they?

4. Two buses left Bakersfield at the same time. One headed east, and one headed west. The one headed east was going 8 miles per hour slower than the westbound bus. After 4 hours, the buses were 720 miles apart. How fast was each bus going?

5. Two long distance runners started at the same point, at the same time, running in opposite directions. One runner ran an average of 3 miles per hour faster than the other. After 2.5 hours, they were 27 miles apart. How fast was the faster runner going?

Solve the following uniform motion problems.

1. A cyclist, riding at 18 miles per hour, leaves town. Four hours later, another cyclist leaves town from the same starting point, traveling in the same direction at an average of 24 miles per hour. How long does it take the second cyclist to catch up to the first cyclist?

2. A jet plane, traveling an average of 350 miles per hour, passes a propeller plane that took off from the same airport two hours before. The propeller plane is traveling at an average of 210 miles per hour. How far from the airport does the jet plane catch up to the propeller plane?

3. Jamal left home and was driving to his brother's house in Colorado at an average speed of 51 miles per hour. One hour later, his sister left from the same house and traveled at an average of 68 miles per hour to catch up with him. She traveled by the same roads as Jamal. How long did it take her to catch up?

4. A train leaves Mt. Carmel traveling at 32 miles per hour. Two hours later, a second train leaves Mt. Carmel, traveling at 48 miles per hour on a track parallel to the first train. How far from Mt. Carmel will the two trains meet?

5. An airplane takes off from Seattle to Los Angeles, traveling at an average of 450 miles per hour. One hour later, a plane on the same route takes off, traveling an average of 600 miles per hour. How long will the first plane be in the air before it is passed by the second plane?

Solve the following round trip problems.

1. A pilot flew an average of 400 miles per hour on a flight out. On the return flight to same airport, he flew at an average speed of 600 miles per hour. The total flight time was 10 hours. How far did he fly each way?

2. Kennan went out in his sailboat on Lake Tahoe one Sunday afternoon. He sailed at 8 miles per hour for the trip out. He sailed twice as fast on the trip back. The entire trip took 7.5 hours. How far did he go on the sailboat for the total trip?

3. Carrie drove to the mountains, averaging 52 miles per hour. Coming back by the same roads, she averaged 40 miles per hour. The total driving time was 11.5 hours. How far away did she travel?

4. One airplane pilot flew at 340 miles per hour to her destination. On her return trip, she flew at 360 miles per hour. Her total flying time was 7 hours. How far was it from one airport to the other?

5. Mike and Jess put their canoe in the river and paddled downstream at 16 miles per hour. Then, they turned the canoe around and paddled upstream at 4 miles per hour to return to their car. How far did they go downstream if the whole trip took 5 hours?

Work Problems

1. Suppose one painter can paint the entire house in twelve hours, and the second painter takes eight hours to paint a similarly-sized house. How long would it take the two painters together to paint the house?
2. Brooks can mow a lawn in 4 hours. Jeremy can mow the same lawn twice as fast. How long would it take them working together?