



LEARNING TARGETS:

I will be able to translate weighted average word problems involving uniform motion into equations that I can solve.

FOUNDATIONAL SKILLS I WILL RELY ON

- distributing
- combining like terms
- solving equations with variables on both sides

- modeling - creating graphs to represent data
- attending to precision



Weighted Averages -

uniform motion problems for two objects

Two trains are 340 miles apart heading toward each other on the same track. Train A is traveling east at 120 miles per hour, while Train B, a runaway, travels west at 80 miles per hour. How long to emergency personnel to prevent the trains from colliding?



A



B

rate in mph
of hours until the trains collide

	r	t	d = rt
Train A	120	t	120t
Train B	80	t	80t

distance traveled by train A + distance traveled by train B = 340

$$120t + 80t = 340$$

$$200t = 340$$

$$\frac{200t}{200} = \frac{340}{200}$$

$$1 \cdot t = \frac{340}{200}$$

$$t = 1.7 \text{ hours}$$

isolate t by dividing each side by 200



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Weighted Averages -

uniform motion problems for two objects



Jordan and Griffen begin a unicycle race traveling in opposite directions on a circular track that is 5 miles long. Jordan is traveling at a rate of 15 miles per hour while Griffen cruises along at a pace of 18 miles per hour. How long will it take in minutes before they "run into each other"?



	rate in mph ↑ r	# of hours until they collide ↑ t	d = rt
Jordan	15	t	15t
Griffen	18	t	18t

distance traveled by Jordan + distance traveled by Griffen = 5 miles

$$15t + 18t = 5$$

$$33t = 5$$

$$\frac{33t}{33} = \frac{5}{33}$$

$$1 \cdot t = \frac{5}{33}$$

$$t = \frac{5}{33}$$

$$t \approx 0.15 \text{ hrs}$$

convert to minutes

$$\begin{array}{r|l} 0.15 \text{ hr} & 60 \text{ min} \\ \hline & 1 \text{ hr} \end{array}$$

$$\approx 0.15 \times 60 \text{ min}$$

$$\approx 9 \text{ min}$$



Weighted Averages -
uniform motion problems for
one object or group of objects

A pirate ship is traveling due east at a rate of 20 miles per hour. At the same time a ship 175 miles away carrying treasures beyond measure is traveling due west at a rate of 15 miles per hour. When will these two ships meet?

THANKS FOR SHOWING ALL OF YOUR WORK



Weighted Averages -
uniform motion problems for
one object or group of objects

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	r	t	d = rt
Pirate	20	t	20t
Treasure Ship	15	t	15t

$$20t + 15t = 175$$



Weighted Averages -

uniform motion problems for one object or group of objects

It took Mr. and Mrs. Hall 70 minutes to skate 15 miles. The return trip took them 60 minutes. What was their average speed for the trip?

Because Mr. and Mrs. Hall traveled at a different rate on each portion of the trip we will have to use weighted averages of their speeds.

Find the rate of the going portion, followed by the rate for the return portion. The formula for rate is $\text{rate} = \frac{\text{distance}}{\text{time}}$

Since we would like the average speed in miles per hour we will need to convert the minutes to hours.

Going
 70 minutes $\xrightarrow{\text{convert to hrs}}$ $\frac{70 \cancel{\text{m}} \cdot 1 \text{ hr}}{60 \cancel{\text{m}}} = \frac{70 \times 1 \text{ hr}}{60} = \frac{70}{60} \text{ hr}$
 15 miles
 $\text{rate} = \frac{\text{distance}}{\text{time}}$
 $r = \frac{d}{t}$
 $\text{rate} \approx \frac{15 \text{ miles}}{1.17 \text{ hr}} \approx 12.8 \frac{\text{miles}}{\text{hr}}$
 $\approx 12.8 \text{ miles per hour}$
 $\approx 12.8 \text{ mph}$

Return
 60 minutes
 15 miles
 $r = \frac{d}{t}$ $r = \frac{15 \text{ mi}}{1 \text{ hr}} = 15 \text{ mph}$
 $\frac{60 \cancel{\text{m}} \cdot 1 \text{ hr}}{60 \cancel{\text{m}}} = \frac{60 \times 1}{60} = \frac{60}{60} = 1 \text{ hr}$

* Because we are looking for weighted averages we can't just take the average of these two speeds.

$$M = \frac{(\text{rate going})(\text{time going}) + (\text{rate of return})(\text{time of return})}{\text{time going} + \text{time of return}}$$

$$M \approx \frac{(12.8)(1.17) + (15)(1)}{1.17 + 1}$$

$$M \approx \frac{14.976 + 15}{2.17}$$

$$M \approx \frac{29.976}{2.17} \approx 13.8$$

Average speed was 13.8 mph



Weighted Averages -
uniform motion problems for
one object or group of objects

Before school this morning, Mr. Jaydin jogged 2.5 miles in 16 minutes and then sprinted 1 mile in 5 minutes. What was his average speed?

Because Mr. Jaydin traveled at a different rate on each portion of the trip we will have to use weighted averages of their speeds.

Find the rate of the going portion, followed by the rate for the return portion. The formula for rate is $\text{rate} = \frac{\text{distance}}{\text{time}}$

REMINDER:

Since we would like the average speed in miles per hour we will need to convert the minutes to hours.

Going
2.5 miles
16 minutes

← convert minutes to hours

$$\frac{16 \cancel{\text{min}}}{60 \cancel{\text{min}}} = \frac{16}{60} \text{ hr}$$

$$\approx .27 \text{ hr}$$

Return
1 mile
5 minutes

$$\frac{5 \cancel{\text{min}}}{60 \cancel{\text{min}}} = \frac{5}{60} \text{ hr}$$

$$\approx 0.083 \text{ hr}$$

$$\text{rate} = \frac{\text{distance}}{\text{time}}$$

$$r \approx \frac{2.5 \text{ miles}}{0.27 \text{ hr}}$$

$$\approx 9.3 \text{ mph}$$

$$\text{rate} = \frac{\text{distance}}{\text{time}}$$

$$r \approx \frac{1 \text{ mile}}{0.083 \text{ hr}}$$

$$\approx 12.0 \text{ mph}$$

not bad

smoking fast

* Because we are looking for weighted averages we can't just take the average of these two speeds.

$$M = \frac{(\text{rate going})(\text{time going}) + (\text{rate of return})(\text{time of return})}{\text{time going} + \text{time of return}}$$

$$M \approx \frac{(9.3)(0.27) + (12.0)(0.083)}{0.27 + 0.083}$$

$$M \approx \frac{2.511 + 0.996}{0.353}$$

$$M \approx \frac{3.507}{0.353} \approx 9.9 \text{ mph}$$



Weighted Averages -
uniform motion problems for
one object or group of objects

Mrs. Koenecke jogged 3 miles in 25
minutes and then jogged 3 more miles in 30
minutes. What was her average speed in
miles per minute?

THANKS FOR SHOWING ALL OF YOUR WORK



Weighted Averages - practice work

Please complete the following problems for the following class period.

THANKS FOR SHOWING ALL OF YOUR WORK

1. Two airliner are 1600 miles apart and heading toward each other at different altitudes. The first plane is traveling north at 620 miles per hour, while the second is traveling south at 780 miles per hour. When will the planes pass each other?
2. A person walked 1.5 miles in 28 minutes and then jogged 1.2 more miles in 10 minutes. What was the average speed in miles per minute?
3. In a triathlon, Steve swam 0.5 miles in 15 minutes, biked 20 miles in 90 minutes, and ran 4 miles in 30 minutes. What was Steve's average speed for the triathlon in miles per hour?
4. Two buses leave Smithville, at the same time, one traveling north and the other traveling south. The northbound bus travels at 50 miles per hour, and the southbound travels at 65 miles per hour. When will these buses be 345 miles apart?