Math 9 – Unit 4: Word Problems

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Lesson #5: Uniform Motion (Distance, Rate, and Time)

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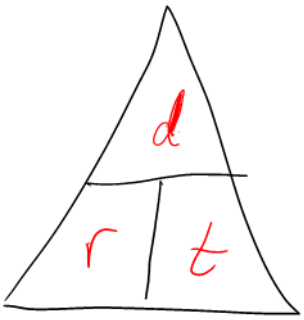
Learning Goal: We are learning to solve word problems involving uniform motion.

The formula we will use is *distance* = *rate x time*, or $d = rt$. (NOTE: rate is also known as speed). However, what if we want to solve for *rate* or *time*? We can create a handy triangle to help!



Calculate the distance travelled: 3 hours at 60 km/h

$d = rt = (60)(3) = 180\text{km}$

Calculate time for the trip: 360 km at 80 km/h

$t = \frac{d}{r} = \frac{360}{80} = 4.5\text{ h}$

Calculate the rate (or speed): 400 km in 5 h.

$r = \frac{d}{t} = \frac{400}{5} = 80\text{ km/h}$

To solve a word problem involving uniform motion, we will again use a chart instead of a "LET" statement.

a) A cruise ship left Halifax for Bermuda at 20 km/h. A private boat left for Bermuda 1 hour later and travelled at 25 km/h. How long did it take the private boat to overtake (or catch up) the cruise ship?

	D	R = S	t
cruise	20(x+1)	20	x+1
private	25(x)	25	x

catch up = equal distance

Equation: $20(x+1) = 25x$

$20x + 20 = 25x$ (−20x, −20x)

$\frac{20}{5} = \frac{5x}{5}$

$4 = x$

∴ The private boat took 4 hours to catch up to the cruise ship.

b) Two cars left a service centre at the same time. One car travelled in one directions at 75 km/h. The other car travelled in the opposite direction at 85 km/h. After how long were they 600 km apart?

	D	R	T (time)
Car 1	75x	75	x
Car 2	85x	85	x

Equation: $75x + 85x = 600$

$\frac{160x}{160} = \frac{600}{160}$

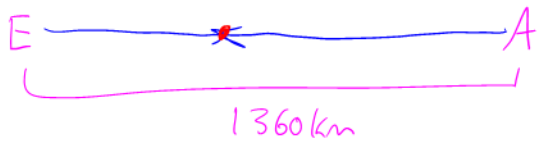
$x = 3.75\text{ h}$

or 3 h, 45 minutes.

∴ After 3.75 hours, they were 600 km apart.

c) Two friends, Elsa in Winnipeg and Anna in Edmonton, decided to meet on the Trans-Canada Highway. The distance from Winnipeg to Edmonton is 1360 km. They both left at 8:00 am Winnipeg time. If Elsa drove at 80 km/h and Anna at 90 km/h, how many hours did they drive before they met?

	D	R	T
Elsa	$80x$	80	x
Anna	$90x$	90	x



Equation: $80x + 90x = 1360$

$170x = 1360$

$x = 8$

∴ They drove 8 hours to meet.

d) A jet left Paris and flew toward Istanbul. Three hours later a passenger plane left flying 120 km/h faster in an effort to catch up to it. After four hours the passenger plane finally caught up. Find the jet's average speed.

	D	R	T
Jet	$7x$	x	7 (4+3)
Plane	$4(x+120)$	$x+120$	4

Equation: $7x = 4(x+120)$

$7x = 4x + 480$

$3x = 480$

$x = 160$

∴ the Jet's speed is 160 km/h

e) A car left a garage and drove 80 km/h. Fifteen minutes later, a second car left the same garage at 100 km/h and travelled in the same direction. How long did it take the second car to catch up to the first car?

f) Lea traveled to her friend's house and back. The trip there took four hours and the trip back took five hours. She averaged 15 mph faster on the trip there than on the return trip. What was Lea's average speed on the outbound trip?

	D	R	T
There	$4(x+15)$	$x+15$	4
Back	$5x$	x	5

Equation: $4(x+15) = 5x$

$4x + 60 = 5x$

$60 = x$

∴ She drove 60 mph on the way back.

Success Criteria:

- I can set up a D-R-T chart to model the word problem
- I can solve for *d*, *r*, or *t* by using the equation $d = r \times t$