

Rational Expressions and Equations Lesson #9: Solving Problems Involving Rational Equations

Guideline for Solving Problems

1. Read the problem carefully, and understand what is being asked.
2. Introduce a variable to represent an unknown quantity (usually the quantity that is being asked for).
3. Write an algebraic equation (in this case a rational equation) to represent the given information.
4. Solve the equation.
5. State the solution to the problem. Check that the solution "makes sense".

Problems Involving Distance, Speed, and Time



Ex. #1

Competing in an endurance race, Shannon cycled for 120 km, then swam for 12 km. Her average cycling speed was eight times faster than her average swimming speed. Shannon took nine hours to complete the race.

- a) If her average swimming speed is s km/h, use the information above to complete the table.

	km	km/h	h
	Distance	Speed	Time
Cycle	120	$8s$	$\frac{120}{8s}$
Swim	12	s	$\frac{12}{s}$

- b) Calculate her average swimming speed.

$$\text{cycle time} + \text{swim time} = 9$$

$$\frac{120}{8s} + \frac{12}{s} = 9$$

$$8s \left(\frac{120}{8s} \right) + 8s \left(\frac{12}{s} \right) = 8s(9)$$

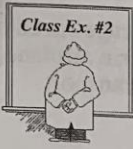
$$120 + 96 = 72s$$

$$216 = 72s$$

$$s = 3$$

Her average swimming speed

$$= \underline{\underline{3 \text{ km/h}}}$$



St. Andre Students' Council is travelling from Knoxtown to Harperville for the Students' Council National Conference. From the travel budget allowed for the trip, the St. Andre Students' Council has two options. They can leave tonight by bus, or they can save three hours by leaving tomorrow morning and using the express train which travels 25 km/hr faster than the bus.

If the distance between Knoxtown and Harperville is 1500 km, determine how long it would take to travel by express train.

longer faster
 BUS TRAIN
 $\frac{1500}{s} = \frac{1500}{s+25} + 3$

	Distance (km)	Speed (km/h)	Time (h)
Bus	1500	s	$\frac{1500}{s}$
Train	1500	s+25	$\frac{1500}{s+25}$

bus time - train time = 3

$$\frac{1500}{s} - \frac{1500}{s+25} = 3$$

$$s(s+25)\left(\frac{1500}{s}\right) - s(s+25)\left(\frac{1500}{s+25}\right) = s(s+25)(3)$$

$$1500(s+25) - 1500s = 3s(s+25)$$

$$1500s + 37500 - 1500s = 3s^2 + 75s$$

$$0 = 3s^2 + 75s - 37500$$

$$0 = 3(s^2 + 25s - 12500)$$

$$0 = 3(s+125)(s-100)$$

$$s = -125 \text{ or } s = 100$$

(reject since $s > 0$)

$$s = 100$$

$$\text{train time} = \frac{1500}{100+25} = \frac{1500}{125}$$

$$= \underline{\underline{12 \text{ hours}}}$$

Complete Assignment Questions #1 - #11