Running Rates

Purpose:

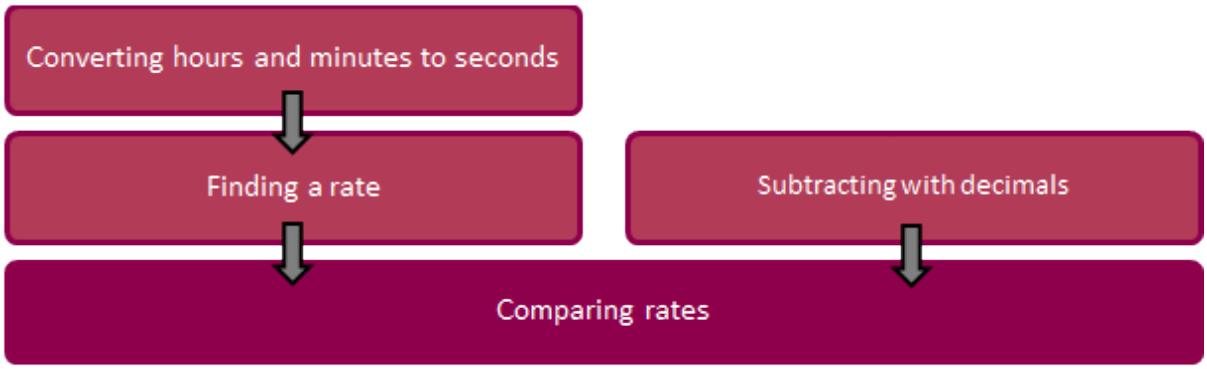
The purpose of this activity is to engage students in solving a problem involving fractions (time in hours, minutes and seconds) and decimals (distance in km) to find a rate.

Achievement Objectives:

NA4-4: Apply simple linear proportions, including ordering fractions.
NA4-5: Know the equivalent decimal and percentage forms for everyday fractions.

Description of mathematics:

The background knowledge and skills that need to be established before and/or during this activity are outlined in the diagram below:



Converting hours and minutes to seconds
How many seconds elapse in two hours, fifteen minutes?

Subtracting with decimals
Find 26.0042 – 13.892

Finding a rate
If I drive 350 km in 5 hours, what is my speed in km/h?

Comparing rates
A red car covers 250 km in 180 minutes and a blue car is travelling at 20 ms^{-1}. Which car is travelling at a faster speed?

This activity may be carried out with step by step guidance, or by allowing the student to follow their own method of solution. With the values involved, tools such as a calculator could be provided, so that ability in numeracy might not become a barrier to the problem solving skills being developed through this activity. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

In the 2014 Auckland marathon, the average time was 4:27:15 for the full and 2:22:53 for the half.

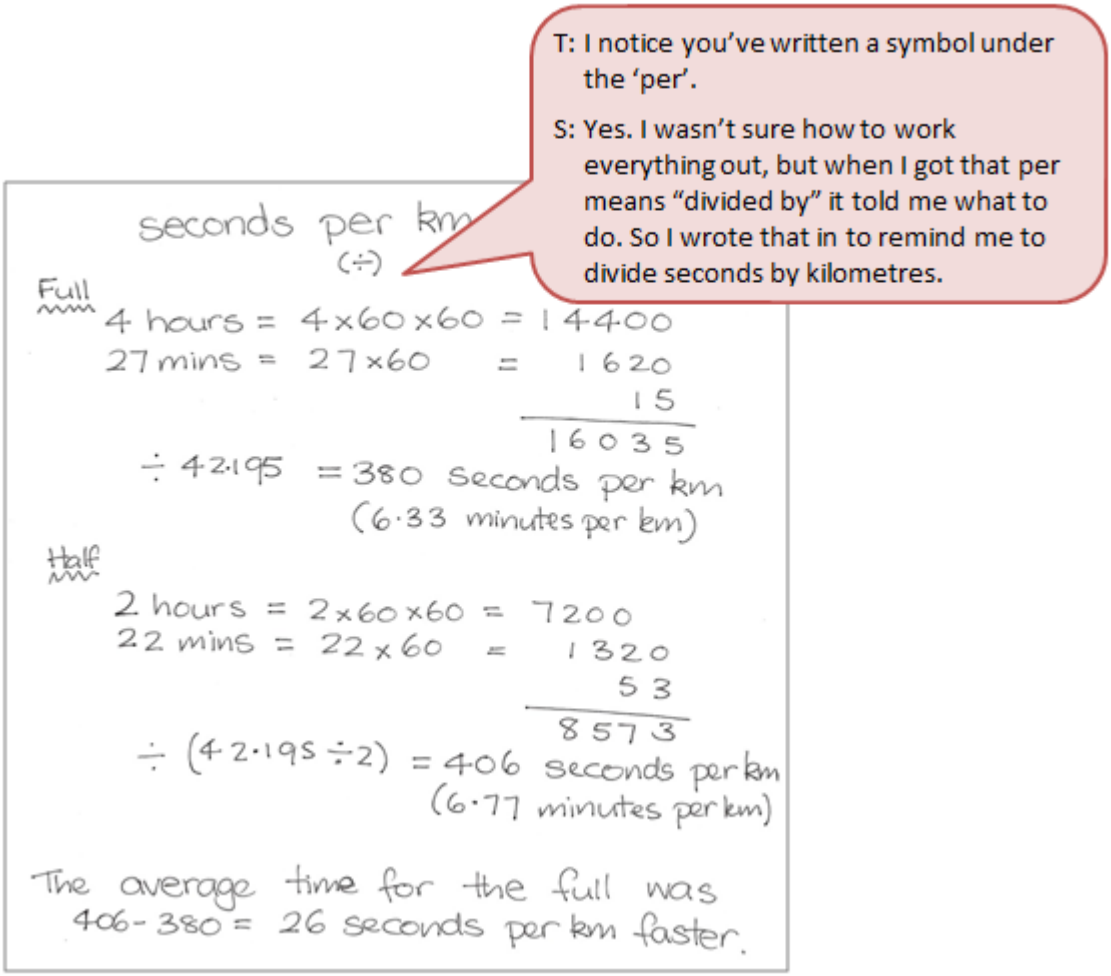
A full marathon is 42.195 km in length. How much faster (in minutes or seconds per km) was the average full marathon pace than the half?

The procedural approach

The student is able to make the appropriate calculations, with guidance, in order to solve the problem.

Prompts from the teacher could be:

1. Find the average time to complete the full marathon, in seconds.
2. If I cover 2 km in 10 minutes, what is my run rate in minutes per km? How did you work that out? What does the per mean you do mathematically?
3. Calculate the average run rate of the full marathon in seconds per km.
4. Find the average time to complete the half marathon, in seconds.
5. Find the distance covered in the half marathon (in km).
6. Calculate the average run rate of the half marathon in seconds per km.
7. Compare the average run rates of the full and half marathons.



The conceptual approach

The student is able to make the appropriate calculations in order to solve the problem.

Prompts from the teacher could be:

1. If I cover 2 km in 10 minutes, what is my run rate in minutes per km? How did you work that out? What does the per mean you do mathematically?
2. Are the times given in a form that is immediately useful for your calculations?
3. How will you compare the average time for the full marathon with the average time for half that distance?