Ratio, Proportion and Rates of Change

Age 14+ Level ★★
Worksheet 3

1. **Bike Shop**
   I walk to the bike shop at 3 miles per hour and cycle back along the same route at 12 miles per hour.

   What is my average speed, in miles per hour, for the time I am travelling?

2. **Very Long Line**
   If the line on the right were 0.2mm thick, how long would it need to be to cover an area of one square metre?

3. **Inches and Barleycorns**
   Yards, furlongs, inches, cubits, chains and barleycorns are all imperial measures of length.

   There are 220 yards in a furlong and 36 inches in a yard. There are 44 cubits in a chain and 54 barleycorns in a cubit. 1 furlong is the same as 10 chains.

   How many barleycorns are the same length as 1 inch?

4. **Ratio Riddle**
   The ratio $a : b = 2 : 3$ and the ratio $a : c = 3 : 4$.
   What is the ratio $b : c$?

5. **Tyneside Average Speed**
   A van travels from Newcastle to South Shields at an average speed of 30 mph and returns by the same route at an average speed of 40 mph. What is the van's average speed for the whole journey?

6. **Dolly Dolphin**
   Dolly Dolphin swims at a constant speed. When she swims against a current of 2m/s, she travels at 6 m/s.

   Dolly swims upstream in this current for 2 minutes, then turns round and swims back to her starting point. What is her average speed?

These problems are adapted from UKMT (ukmt.org.uk) and SEAMC (seamc.asia) problems.