Age 14+ Level ★★★
Worksheet 1

1. **Televisual Technology**
   The width : height ratio of television screens changed from 'traditional' $4:3$ to 'widescreen' $16:9$.

   If a traditional screen and a widescreen have the same area, then what is the ratio
   widescreen width : traditional width?

2. **Late for Work**
   Every day, Ms Fanthorpe leaves home at 8:30 and drives to work. If she drives at an average speed of 20 miles per hour, she arrives 3 minutes late. If she drives at an average speed of 30 miles per hour, she arrives 3 minutes early.

   What average speed should she drive at to arrive on time?

3. **Walk up the Escalator**
   Every day, Aimee goes up an escalator on her journey to work. If she stands still, it takes her 60 seconds to travel from the bottom to the top. One day the escalator was broken so she had to walk up it. This took her 90 seconds.

   How many seconds would it take her to travel up the escalator if she walked up at the same speed as before while it was working?

4. **Day Out**
   Chris planned a 210 km bike ride.
   He rode 5 km/h faster than he planned and finished his ride 1 hour earlier than he planned.

   His average speed for the ride was x km/h.
   What is the value of x?

5. **Boys and Girls**
   In September, the ratio of boys to girls in a school was 3:2.

   By June, there were 80 fewer boys and 20 fewer girls in the school, and the ratio of boys to girls was 7:5.

   What was the total number of students in the school in September?

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

Age 14+ Level ★★★
Worksheet 2

1. Laps

The hare and the tortoise start running together around a 300m track.

The hare runs at a constant speed of 15 km/h and the tortoise runs at a constant speed of 13.8 km/h.

On which of the hare's laps will she first pass the tortoise?

2. Petrol Stop

Roberto drove a total distance of 250 km.
The whole journey took him 3 hours, including a 20 minute stop to get petrol.
Before he stopped for petrol, his average speed was 80 km per hour.
After his petrol stop, his average speed was 100 km per hour.

How long did Roberto drive for after his petrol stop?

3. Candles

Two candles have different lengths and different thickness. The shorter one would last 11 hours, the longer one would last for 7 hours.

Both candles are lit at the same time, and 3 hours later both have the same length remaining.

What was the ratio of the length of the longer candle to the shorter candle?

4. Flower Show

It takes four gardeners four hours to dig four circular flower beds, each of diameter four metres.

How long will it take six gardeners to dig six circular flower beds, each of diameter six metres?

5. Marathon Mission

After a year's training, Minnie increased her average speed in the London Marathon by 25%.
By what percentage did her time decrease?

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

Age 14+ Level ★★★
Worksheet 3

1. Traffic Jam

Yesterday evening, Emily's journey home took 25% longer than usual, as she was stuck in a traffic jam.

By what percentage was her average speed reduced compared to normal?

2. 100m Sprint

Anna, Bridgit and Carol run in a 100 m race. When Anna finishes, Bridgit is 16 m behind her and when Bridgit finishes, Carol is 25 m behind her.

The girls run at constant speeds throughout the race.
How far behind was Carol when Anna finished?

3. Backwards Laps

Chris and Sophie are running in opposite directions around a track, with constant speeds. Chris notices that he passes Sophie every 24 seconds.

It takes Chris 60 seconds to complete each lap.
How long does it take Sophie to complete each lap?

4. Fraction of Percentages

The value of W is 25% of X.
The value of X is 45% of Y.
The value of Z is 60% of Y.
What is W as a fraction of Z?

5. Two Trains

Amityville and Brookville are two stations.
Two trains started simultaneously from Amityville and Brookville, each traveling towards the other station with constant velocity.

After they met, one train needed another nine hours to reach Brookville and the other train needed another four hours to reach Amityville.
Find the time taken by each train to complete the journey.

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