UNITED KINGDOM MATHEMATICS TRUST

Open Ended Tasks

These are open ended questions and are not intended for use in a competition format.

It is expected that these will be used in the classroom with groups of pupils and would foster research on the part of the pupils (and maybe the teacher!).

Some guidelines are given but the intention is for the pupils to do some research by whatever means is appropriate, other than simply asking someone else.

Thomas the Shunting Engine

The coal wagons are in the wrong order. They have been lined up in the order 3, 1, 2, 4 but they should be in the order 4, 3, 2, 1 to be ready for the final delivery of coal to their respective coke ovens.
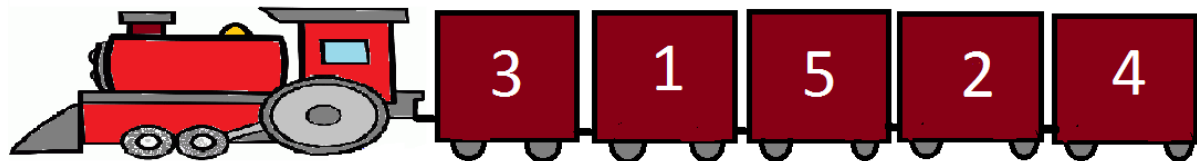
Moving a coal wagon forward and back one space (i.e. swapping two coal wagons) is considered two shunts.

Can you move the wagons to the correct order in 10 shunts? Can you get the wagons to the correct order in fewer than 10 shunts?
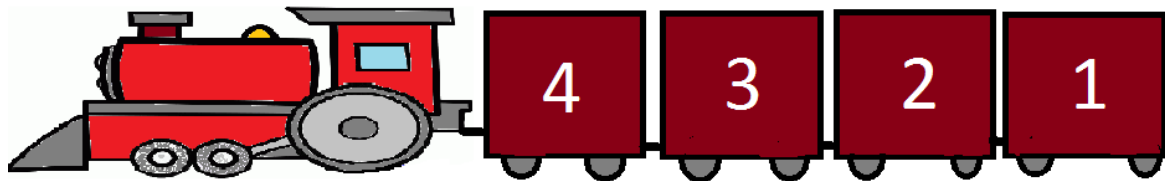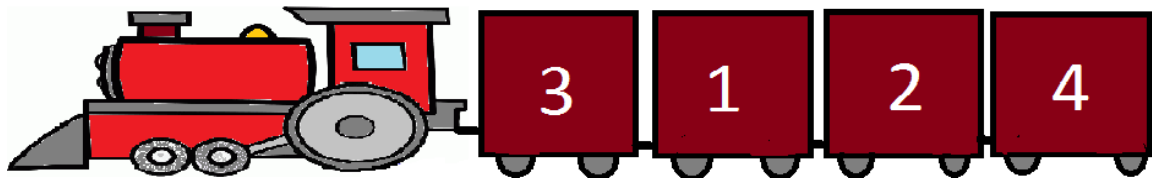
The next day, five wagons were in the wrong order: 3, 1, 5, 2, 4. They needed to be in the reverse order to be ready to deliver their loads; 5, 4, 3, 2, 1.

What is the fewest number of shunts needed to move the wagons to the correct place?
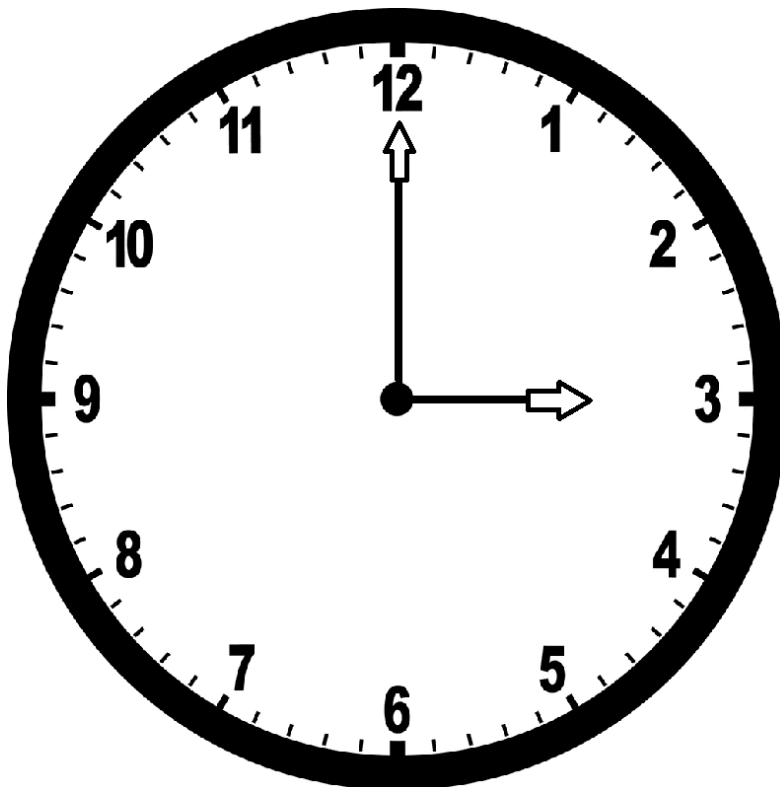
Clockface

At three o' clock the hour and minute hands are at 90 degrees to each other.

What time are they next at right angles?
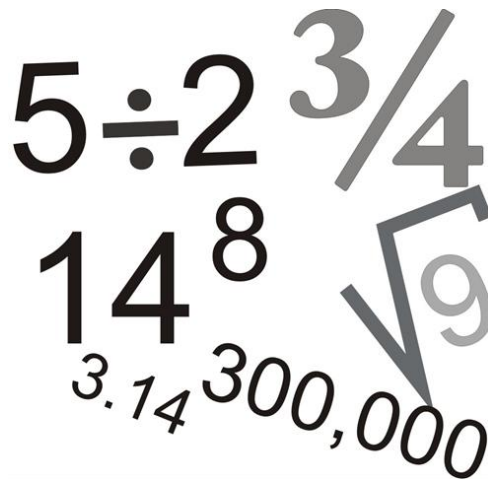
What about after that?

Competition mathematics

In a competition you can score 0, 1, 2, or 3 marks on each of the six questions asked.

There is just one way to score 18 marks. What is this?

How many ways are there of getting a score of 16 marks?

Are some marks impossible to get?

Graphing fractions

The sevenths are an interesting set of fractions:

$$\frac{1}{7} = 0.142857142\ldots$$

$$\frac{2}{7} = 0.28571428\ldots$$

What is $\frac{3}{7}$ as a decimal?

Plot the coordinates (1,4), (4,2), (2,8), (8,5), (5,7), (7,1) on a graph. What shape do you get?

Investigate the thirteenths and the seventeenths likewise.

Why not think in three dimensions: (1,4,2) (4,2,8), (2,8,5) …?