Algebra: Challenging problems

The following questions are taken from an article written by Tom M. Giambrone, from Indiana University Pennsylvania.

1. Omar the Rope Maker decided to make a rope long enough to stretch around the Earth (the circumference of which is 40000 kilometers). Having completed the task, he discovered that he had actually made the rope 12 metres too long. Now wanting to cut the rope (it was somewhat of a record length), he decided to put the ends of the rope together and have all his relatives help him hold the rope and equal distance off the ground all the way around the earth. Which of these animals could pass under the rope: (a) ant, (b) snake, (c) Omar, (d) adult elephant, (e) blue whale?

2. A contractor constructed a brick wall. He employed one bricklayer who could build the wall in ten hours and another bricklayer who could build the wall in 9 hours. Working together, the bricklayers laid 10 fewer bricks an hour than is they had worked independently. It took them exactly 5 hours to build the wall. How many bricks are in the wall?

3. 2 ferryboats started at the same instant from opposite sides of a river, traveling across the water at right angles to the shore. They first met 720 yards from the nearest shore and, on reaching the opposite side, spent 10 minutes in the slip before starting back. They met again 400 yards from the nearest shore. What is the width of the river?

4. A little boy liked to play on the ‘up’ escalator of a department store. When he walked up the escalator, he counted 10 steps and the trip took 20 seconds. When he ran down, he counted 50 steps and the trip took 30 seconds. How many steps of the escalator were visible at one time?

5. Consider this fortunate incident. A girl was crossing a railroad bridge when, halfway across, she saw a train 50 metres away moving toward her. She immediately turned and ran so that the train missed her by the narrowest of margins. If she had tried to cross the bridge, the train would have struck her one metre before she could have reached the end. How long is the bridge?