Team Members: _____

School: _____

1. In the multiplication $A6BC \times 7 = D9E98$, each distinct letter represents a single distinct digit. Find the digit represented by each of the letters.

Team Members: _____

School: _____

2. All of John's steps with his left foot are 0.5 metres. His right foot steps are the same, except that every third one is twice as long. He starts with his left foot and alternates, except that after every third left foot step, he takes a step back with his left foot. How many steps, forward and backward, does he take to travel the 19 metres from the bus stop to the Ministry of Silly Walks?

Team Members: _____

School: _____

3. Two trains are traveling towards each other on the same track, each train moving at 30 km/h. The trains start out 60 km apart. There is a dragonfly travelling back and forth between the trains at 40 km/h. How far has the dragonfly travelled in total when it is squashed between the colliding trains?

Team Members: _____

School: _____

4. Find all integers x, y such that $x + y = xy$.

Team Members: _____

School: _____

5. Show that if a, b, c and d are positive integers such that $a/b < c/d$, then

$$\frac{a}{b} < \frac{a+c}{b+d} < \frac{c}{d}.$$

Team Members: _____

School: _____

6. At your high school, sixty percent of the students are fans of Buffy the Vampire Slayer, and seventy percent are fans of Xena. Eighty percent of Buffy fans are also Xena fans. What fraction of the Xena fans are also Buffy fans?

Team Members: _____

School: _____

7. A triangle lies inside a rectangle. Prove that the perimeter of the triangle is smaller than the perimeter of the rectangle.

Team Members: _____

School: _____

8. Let us say that a 5-digit number is *fantastic* if (i) its digits are from 1 to 9, (ii) it contains each digit only once, and (iii) it contains the digits 2, 4 and 8, in that order, but not necessarily consecutively. (For instance, 24385 is fantastic.) How many fantastic numbers are there?

Team Members: _____

School: _____

9. Given that x and y satisfy $x + y = 12$ and $x^3 + y^3 = 36$, what is $x^2 + y^2$?

Team Members: _____

School: _____

10. On Anthrax Island, there are 42 red chameleons, 49 blue chameleons and 59 green chameleons. Whenever two chameleons of different colour meet, they will both immediately change to the third colour. Is it possible that all of the chameleons on the island will ever be of the same colour?