**Investigation** - **Recurring Decimals**

All *real* numbers can be grouped into either of the following two categories:

*Rational Numbers* - Any number that can be expressed as a fraction; *Irrational Numbers* - Any other number.

All integers (positive and negative whole numbers),

terminating decimals (0.36, 0.125, ...) and

recurring or repeating decimals (0.3333333333, 0.121212121212, ...) are *rational.*All non-terminating decimals such as or , are *irrational.*

1. is a recurring decimal. Without using a calculator, write  in decimal form. What will be in decimal form? What will  be? (Check each prediction with a calculation.)

2. Are all fractions with a denominator of 9 recurring decimals? Investigate.

3. Which other values for the denominator produce recurring decimals? Using a calculator, the decimal value displayed for the fraction  is 0.2857 142. Could this be a recurring decimal? Without using a calculator, write  as a decimal (produce at least 12 values after the decimal point).

4. Investigate the recurring decimals for . Investigate the recurring decimals for 

*5.* Investigate fractions with a denominator of 13. Investigate fractions with a denominator of 17.

6. Investigate to find which denominators give recurring decimals and which give terminating decimals. Can all fractions be written as either a repeating or a terminating decimal? What factors must the denominator have if the fraction is a recurring decimal? What if the recurring decimal has some non recurring digits at the beginning?

What is the fraction for 0. 1212121212 Let x=0.12121212121212 (1)  
Therefore l00x= 12.121212121212 (2) (2)-(1) 99x=12  
Therefore or 4/33.

7. Investigate the fractions for other recurring decimals. Be sure to include decimals such as 0.6666666666..., 0.1666666666..., 0.27272727..., 0.214214214 ,O.3214214214...