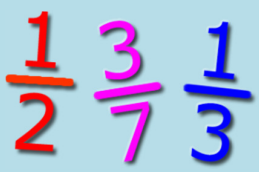
Fascinating Fractions



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INTRODUCTION

For some people 'Fascinating Fractions' may be considered an oxymoron, however, having played with this idea for some time, finding more possible problems, I thought I would write them down … or in the words of Robert M Pirsig: Sometimes just writing down the problems straightens out your head as to what they really are.

MATHEMATICAL CONTENT

- Fractions
- Sequences
- Algebra

APPLICABILITY

KS2 – KS4

These are some fractions between 1/3 and 1/2

2/5, 3/7, 3/8, 4/9, 4/10, 4/11, 5/11, 5/12, 5/13, 5/14 …

I have made different groupings as follows:

a) 2/5, 3/7, 4/9, 5/11... $(n + 1)/(2n + 3)$

b) 3/7, 5/11, 7/15, 9/19... $(2n + 1)/(4n + 3)$

c) 2/5, 3/8, 4/11, 5/14... $(n + 1)/(3n + 2)$

Q1 It looks as though some kind of sequence emerging in the numerators of the original list... but does this continue?

Q2 Is there anything happening with the denominators?

Q3 Looking at the general forms for the sets of fractions a), b) and c) I can see hints of thirds and quarters if we separate out the n part from the other part, e.g. $n/2n$ and 1/3, $2n/4n$ and 1/3, $n/3n$ and 1/2 … are these just a coincidences?

Q4 Does anything similar happen if we consider fractions between 1/5 and 1/3?

Q5 Anne Watson told me the other day for any pair of fractions a/b and c/d, there will always be a fraction between these two of the form $(a + c)/(b + d)$. Is this true... can you prove it?