

Year 10 Mathematics Problem Solver

Instructions:

Name: _____

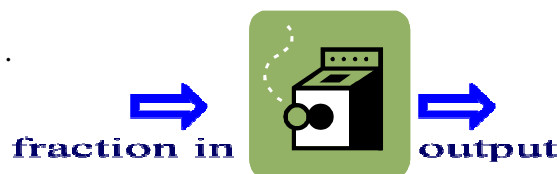
Please use your CAS calculator for this problem solving activity. You are expected to use the following: Define, Substituting numerical values and algebraic fractions into your defined expression. You are not required to perform operations on fractions and algebraic fractions algebraically. You will need to justify your solutions by explaining clearly how you used your CAS calculator.

Challenge Problem : Fraction Machine Investigation

A fraction cracker machine feeds on fractions.

Feed in a fraction f and it produces a new fraction $\frac{1-f}{1+f}$.

Example: Feed in $\frac{3}{5}$ and it calculates $\frac{1-\frac{3}{5}}{1+\frac{3}{5}} = \frac{\frac{2}{5}}{\frac{8}{5}} = \frac{1}{4}$



a) Define a function in your calculator that simulates this machine. Write the calculator command below

b) Feed in $\frac{3}{5}$. What is the result? Write the calculator command and the result below.

c) What results if $\frac{1}{4}$ is fed into the machine?

d) Suppose $\frac{2}{3}$ was fed into the machine. The result is fed back into the machine. The new result is fed back into the machine and so on for 1000 processes altogether. What will the final result be?

- e) What is the result if the general fraction $\frac{a}{b}$ is fed into the machine?

What would be the result after one million processes?

What can you conclude about the number of processes and the resulting fraction?

- f) Investigate what happens when we feed a negative fraction into the machine. Select a few negative fractions and use your calculator to produce the answer. Write all steps below.

- g) What is the result if the general negative fraction $-\frac{a}{b}$ is fed into the machine?

- h) Assume that we want to get a whole number as the output of the machine. For example:
when $f = -\frac{3}{5}$, the machine returns the number 4. Can you come up with the general rule for the fraction f which will produce a whole number as an output?