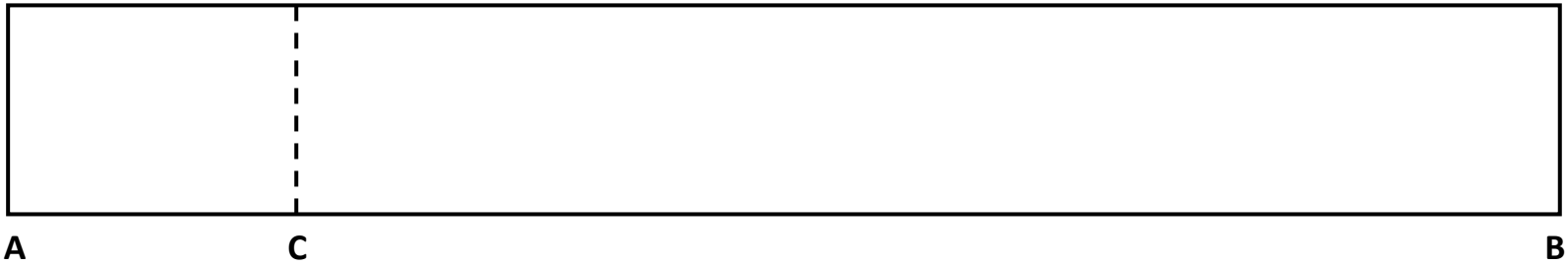
Iteration by paper folding

For this iteration, apart from the initial fold, we are only allowed to fold in half.

Take a strip of paper.

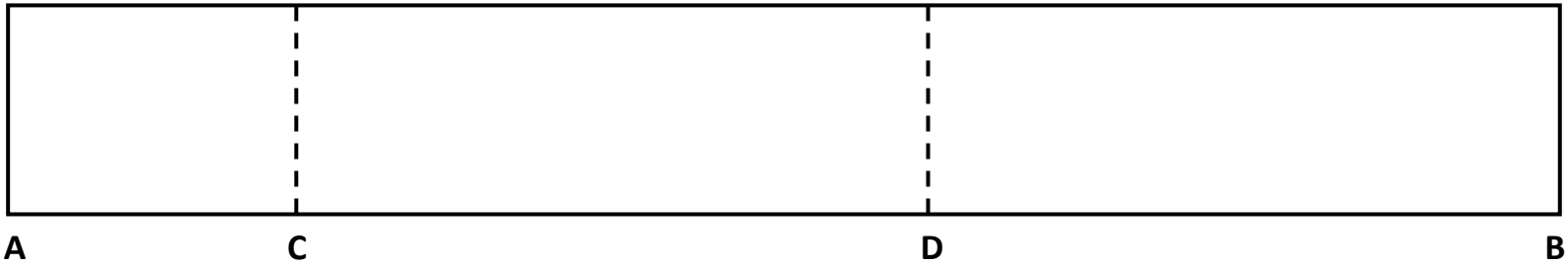
Mark the left hand end as A and the right hand end as B

Make a fold quite close to end A and label this as fold C

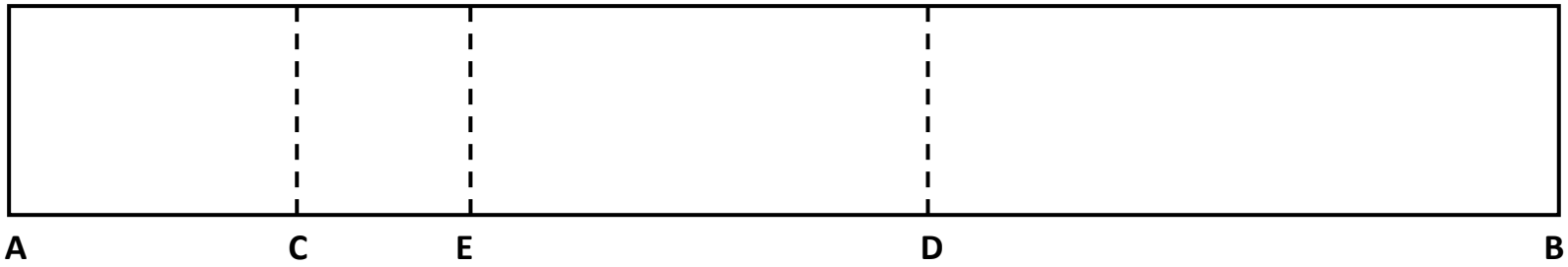


I ask the class to pretend the fold line C is one third of the length of the whole strip, even though this is clearly not true.

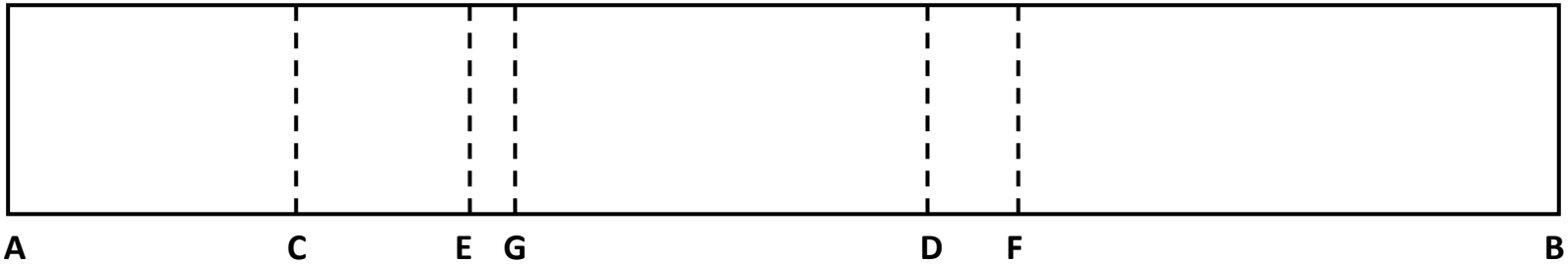
However, if it were to be true it would mean the distance from C to B would be two thirds and if we fold this distance in half, we will produce a new (and more accurate length) of one third



As before, if the distance from B to D is one third, then the distance from D to A must be two thirds and again by folding this in half we will create an even more accurate value for one third



Continuing the process...

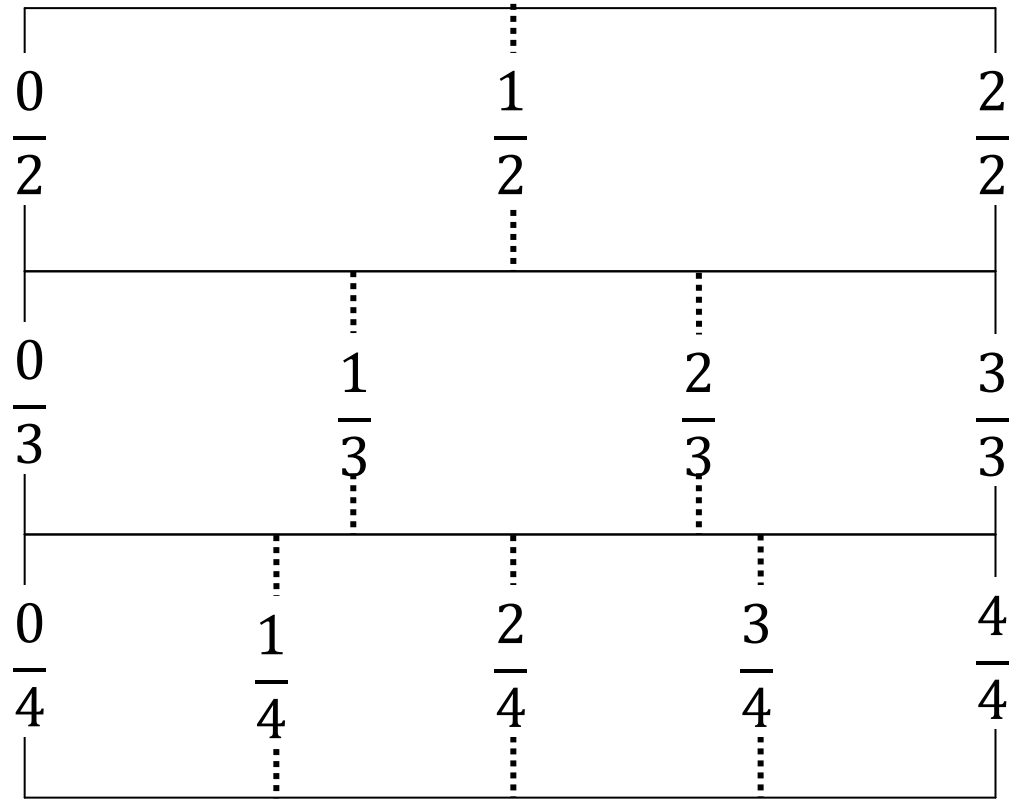


After a further few folds we iterate to one third; the iterative function is $x \rightarrow \frac{1}{2}(1 - x)$

How can we use a similar method to arrive at one fifth, or one seventh or...?

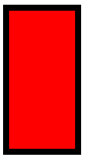
1. **Creating fraction wall number lines**

Make a fraction wall by **carefully folding** equal length strips of paper into halves, thirds, quarters all the way down to twelfths.



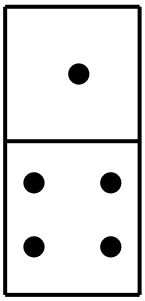
a) Find sets of equivalent fractions
b) Order the fractions starting with the smallest up to the largest
c) Compare the sizes of fractions e.g. which is the biggest $\frac{4}{7}$ or $\frac{3}{5}$?

2. **Cuisenaire and percentages**

If yellow is worth 1  what is red  worth?"

What values are each of the other rods worth?

3. **Dominoes and fractions**

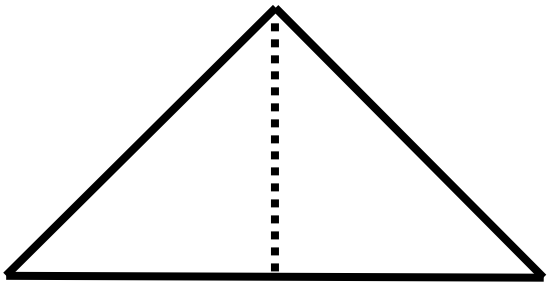
 = $\frac{1}{4}$

For this problem we need to use a 6-6 set of dominoes with all blanks removed; thus reducing the set to 21 dominoes

The task is to find all the possible fractional values for all the dominoes.

4. **Folding and cutting isosceles right-angled triangles (IRATs)**

Experiment 1
Fold an IRAT along its line of symmetry then cut along the fold line.



Experiment 2
Fold a new IRAT as before along its line of symmetry but **do not cut** along the fold line.

Now fold this triangle along its new line of symmetry and this time cut along this 2nd fold line and see what shapes you get.

Continue experimenting with three folds and one cut along the 3rd fold line. Then try four folds and one cut along the 4th fold line.

Explore what happens.

5. Fractions and decimals

In pairs each person has a dice.

The first person to throw the dice is the numerator.

The second person to throw is the denominator.

So if the throws are 5 and 4, then the fraction is $\frac{5}{4}$

The calculator sequence is

5	÷	4	=	1.25

How many different fractional answers can be made using two dice and what are their decimal equivalents

6. Some fraction problems

a) Find the fraction which is exactly half way between $\frac{1}{3}$ and $\frac{1}{2}$

b) Find some more fractions which are **anywhere** in between $\frac{1}{3}$ and $\frac{1}{2}$

c) Try to work out what happens as this sequence of calculations continues:

i) $\frac{1}{2} - \frac{1}{4}$ ii) $\frac{1}{2} - \frac{1}{4} + \frac{1}{8}$ iii) $\frac{1}{2} - \frac{1}{4} + \frac{1}{8} - \frac{1}{16}$