



## THE 2023 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

THE STUART J. MURPHY AWARD  
(THE 8-11 YEARS OLD CATEGORY)

### SHORTLISTED

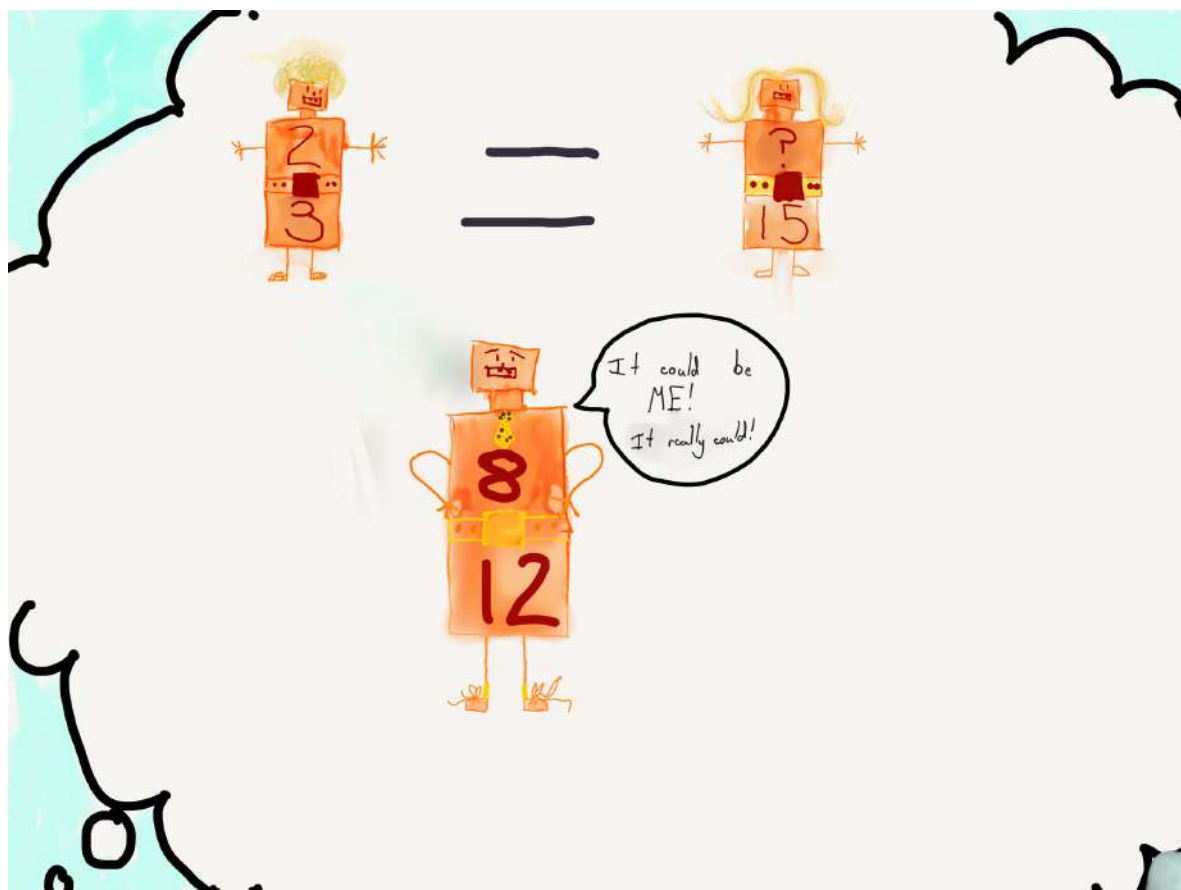
'Are you equivalent, proper, improper or mixed?'  
by Olivia Joyce (9 years old) at Laxton Junior School (UK)

You can read the author's inspiration for the story and the judges' comments  
on:

[www.mathsthroughstories.org/ymsa2023](http://www.mathsthroughstories.org/ymsa2023)

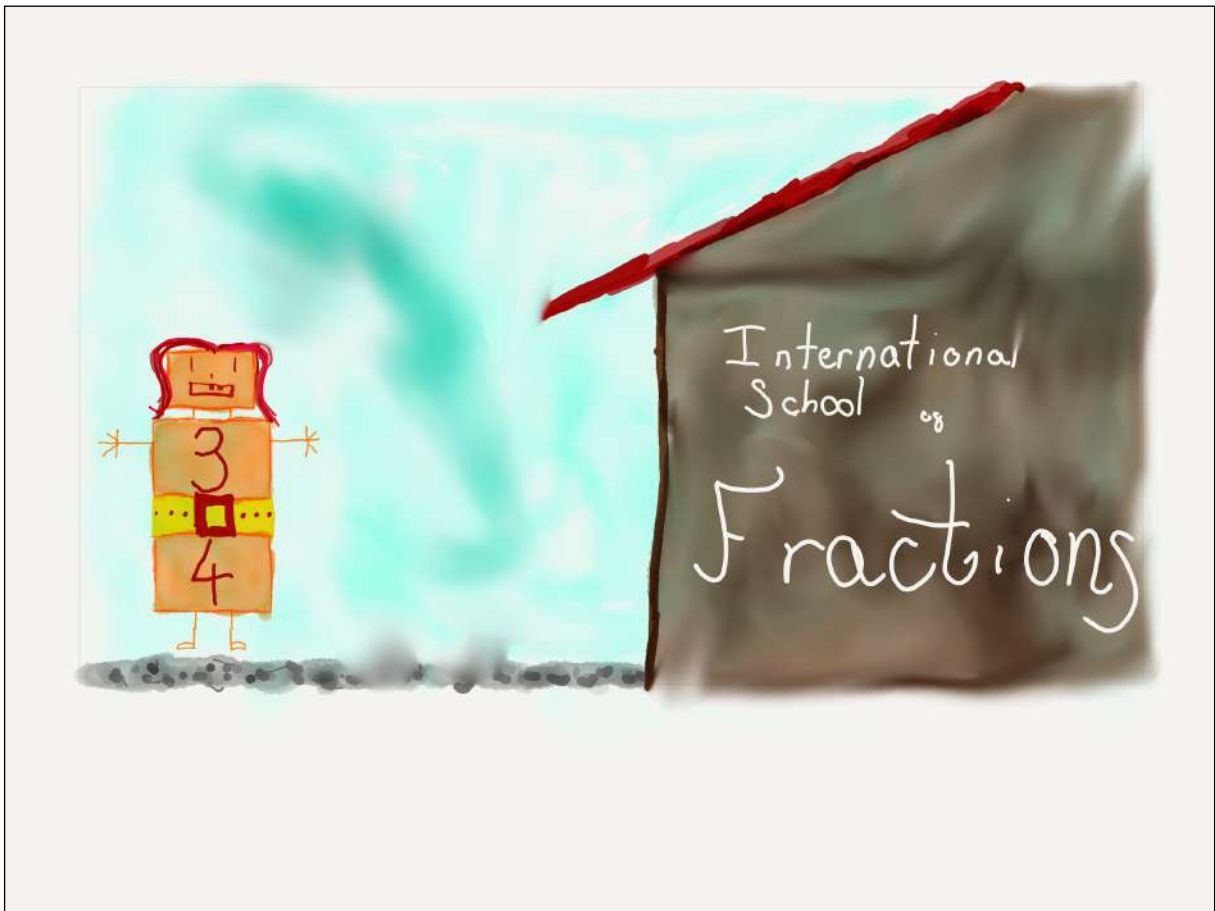
#YMSAMaths

Are you equivalent, proper, improper or mixed?



Olivia Joyce

Welcome to The International School of Fractions. ThreeQuarters is a young girl in Miss OneWhole's class. Her name may seem rather strange but it is not really. In her school, pupils all have names corresponding to their heights and the heights are all fractions of the teacher's height - the class teacher, Miss



OneWhole, has been given the height of one whole unit.

To make life easier, the children and teachers have their fraction numbers on their uniforms. These change of course as they all grow - some faster than others! So the numbers are updated several times during the school year.

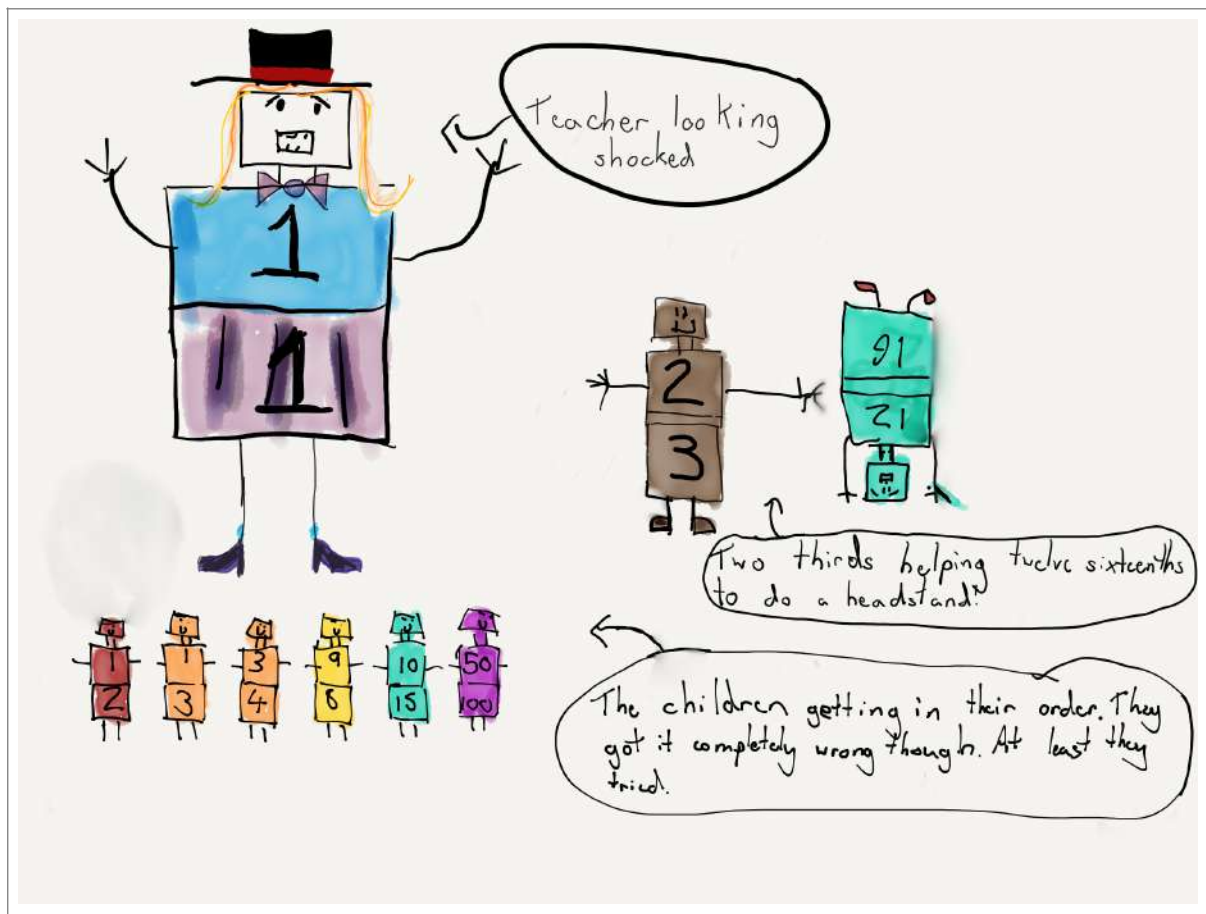
Today is the class photograph. ThreeQuarters has a feeling it could be a little chaotic.

Miss OneWhole shouts out "Children please get yourselves in height order ready for our class photo."

Most of the class look puzzled.

The teacher announces "It should be easy. We have been studying fractions this term, and your height is shown on your uniform."

The classmates know that Miss OneWhole will expect them all to work quickly. However, they forget to work together and forget to think about the rules they have learnt about fractions. Their first attempt at an order could be described as a random disaster!

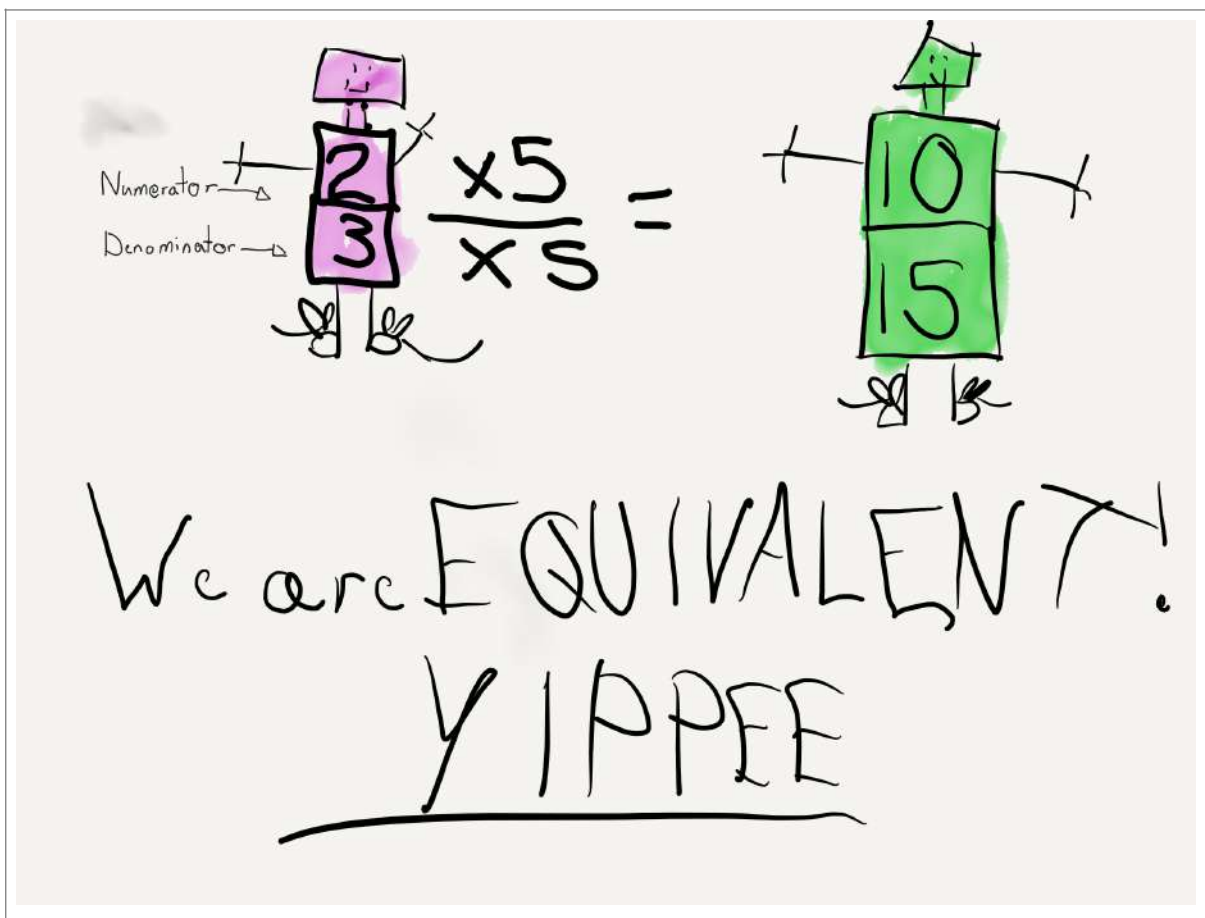


TwoThirds looked at OneThird and says "This will be easy, I am definitely taller than you."

But just then TenFifteenths walks over and shouts "My numbers are bigger, I must be taller!"

ThreeQuarters knowingly mutters "That is incorrect, you are EQUIVALENT."

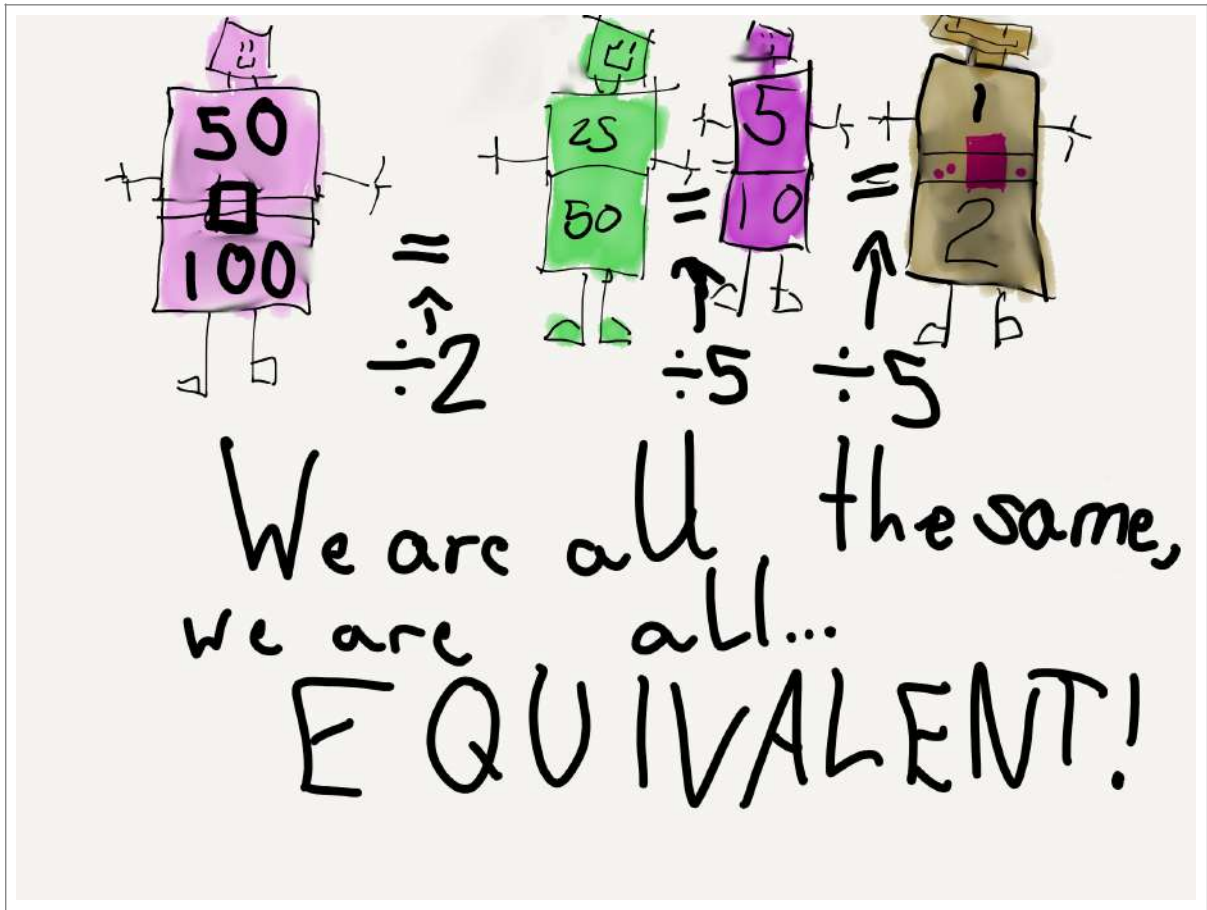
"Equivalent," shrugs TenFifteenths, "Unlikely as I have 10 and 15 in my number and you only have 2 and 3 which are very small numbers."



ThreeQuarters then announces "EQUIVALENT Fractions are equal even though they have different numerators and denominators. As long as you multiply or divide the numerator and denominator by the same number, they are equivalent."

TenFifteenths looks relieved and says "Yeah, if I divide my numbers by 5 I get 10 divided by 5 = 2, and 15 divided by 5 = 3, so 2/3. We are equivalent, and therefore the same height."

The class was making progress. Suddenly FiftyOneHundredths blurts out "I feel given my big numbers I should be the tallest but I know I can easily divide both my numbers by 2 and 5. This is easy, I can become lots of equivalent fractions."

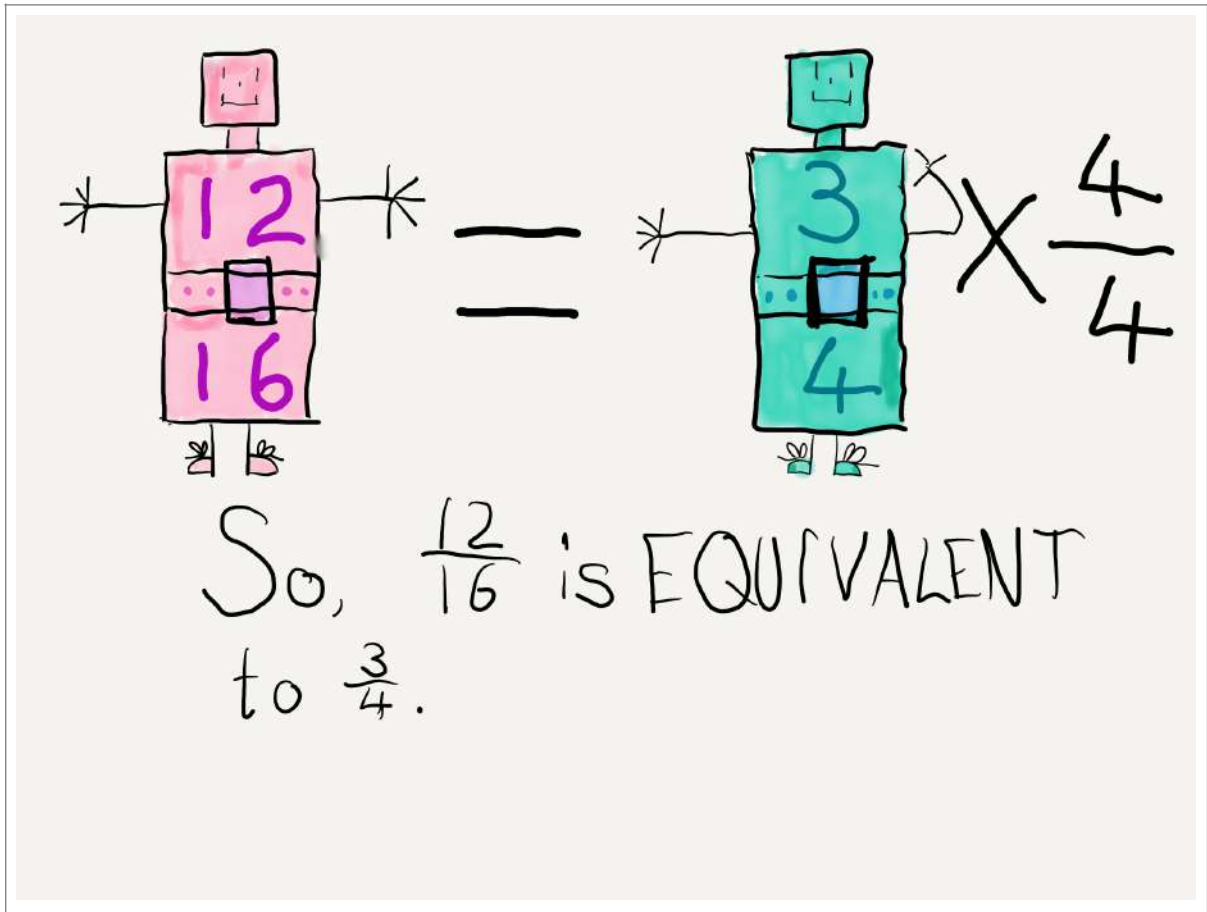


FiftyOneHundredths quickly realises that she is equivalent to OneHalf.

It is now the turn of TwelveSixteenths, another of the 'big' numbers, to think about whether he could be equivalent.

He is not sure but he asks himself "Can I divide my numbers by something?"

It is obvious that since both his numbers are EVEN, he could definitely divide by 2. However, TwelveSixteenths knows his 4 times table and could see that he could divide his numerator and denominator by 4.

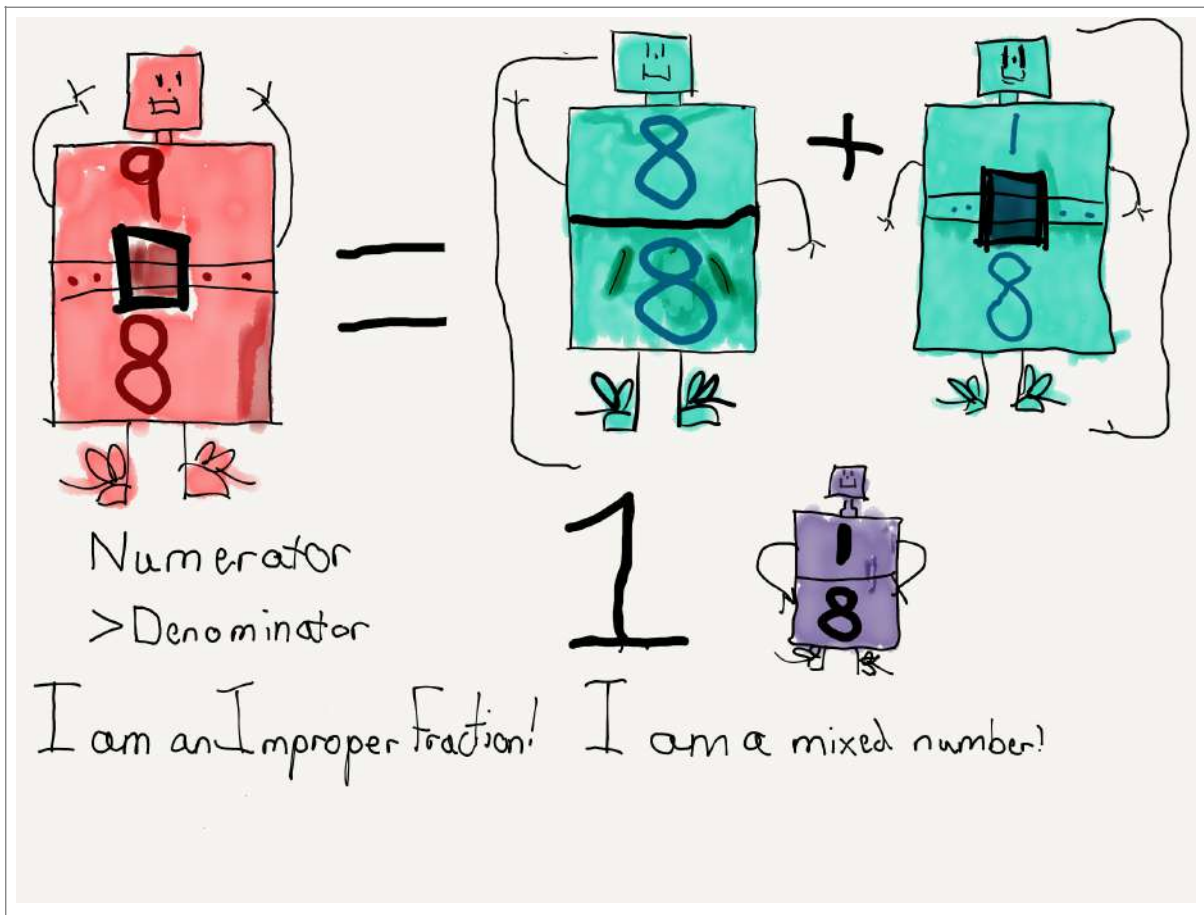


He runs over to ThreeQuarters and says excitedly "We are EQUIVALENT and we will be next to each other in our height order for the class photo!"

There are just two children left. OneThird and NineEighths have been quiet during the discussions.

OneThird is quietly confident that he is the smallest in the class and states "I will be first in the height order, as one third I know I am smallest here."

NineEighths however is not so confident. She knows she is tall but her numbers are confusing. She could see that her top number is bigger than her bottom number and she is the only one in the class like this. She feels sort of special but wants to make sure she understands what it means.



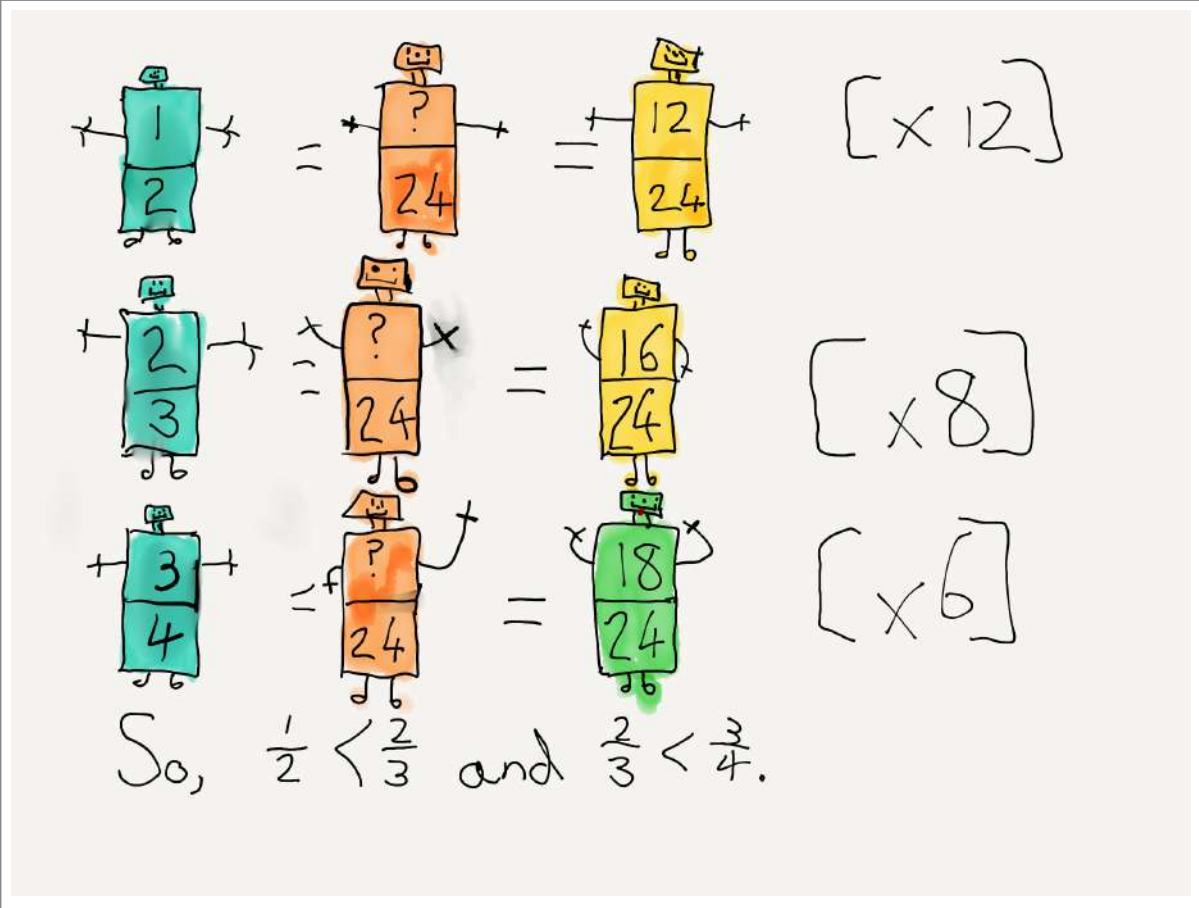
Miss OneWhole had been listening to the class working so well together. She says "When the numerator is bigger than the denominator we then have an improper fraction and we have the choice of writing those fractions as a Mixed Number - a number of Wholes plus a fraction."

This sounds interesting. The class pays attention.

Miss OneWhole goes on "NineEighths you know you are taller than me. You are one whole plus one eighth. You are very special in our class as you are the only Improper Fraction!"



The class are close to sorting out their order. They know  $\frac{1}{3}$  is smallest and  $\frac{9}{8}$  is biggest. They have three pairs of equivalent fractions. They have to decide the order for OneHalf, TwoThirds and ThreeQuarters. They could easily see that TwoThirds and ThreeQuarters are bigger than OneHalf, but they wonder whether there is a way to sort it all out using EQUIVALENT fractions.



So,  $\frac{1}{2} < \frac{2}{3}$  and  $\frac{2}{3} < \frac{3}{4}$ .

ThreeQuarters says "If we can find a denominator that is the same for all of us, then we just need to compare our numerators to find our order."

TwoThirds asks "But how can we find a COMMON DENOMINATOR?"

OneHalf has the answer "There will be many common denominators but one that will always work is to multiply our denominators together, so 2 times 3 times 4 which is 24."

So they find their equivalent fractions with denominators of 24 and it is very easy to then see their order.

They have done it. They line up in height order and are ready for the photographer. They just need to remember to smile for the camera!



## BLURB

Today is Miss OneWhole's class photograph at The International School for Fractions. The pupils need to line up in height order. This sounds easy but the children have forgotten almost everything they had learnt. Join them for the chaos.

## ABOUT THE AUTHOR



My name is Olivia Joyce and I am nine years old. I live near Oundle in England. I attend Laxton Junior School, also in Oundle. This year we have been studying fractions at school and I thought the idea of things being the same even though they may look different, could be an intersecting idea for a story. I also recently started using a digital painting app and wanted to do all my drawings for this story using it.