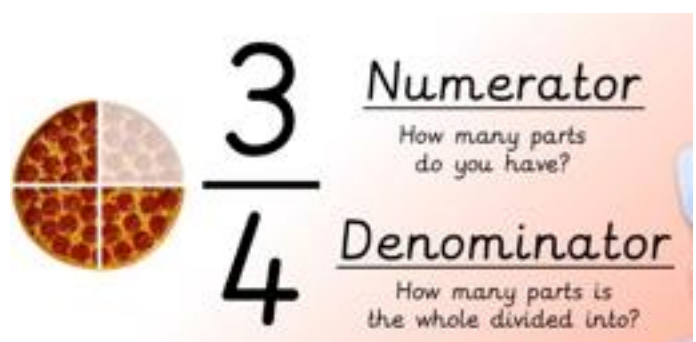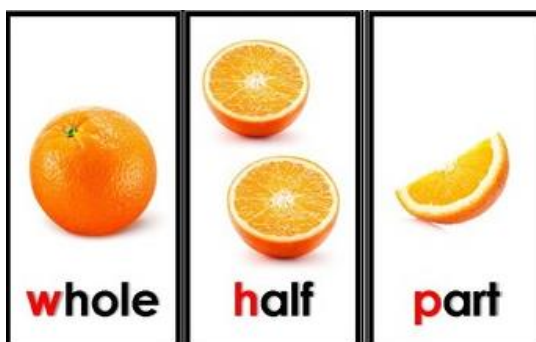# Fractions

Concrete resources:
Fraction wall cubes &/or tiles,
Fraction plates/pizzas + objects,
Paper shapes (cut or folded)

The models & images at each stage are only examples & a range of different apparatus may be used. However, ways of recording should follow what is set out in this policy to ensure consistency throughout the school.
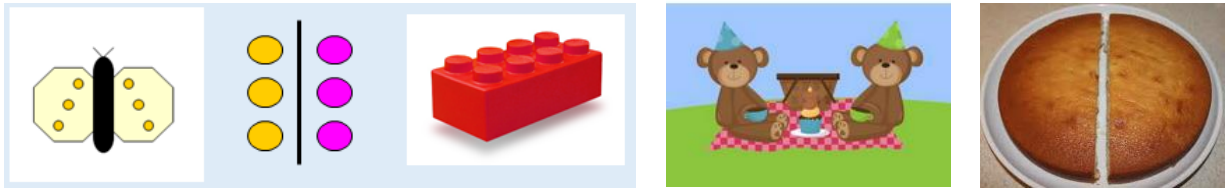
At all stages, teachers should:
- Develop children's fluency & recall of basic number facts *(fractions require recall times tables facts and recognition of multiples and factors)*
- Develop children's fluency in mental calculation & discuss different strategies for solving the same calculation *(e.g. ¼ can be found by halving and halving again OR by dividing by 4)*
- Develop children's understanding of the = symbol *(used for recording equivalent fractions)*
- Teach inequality alongside teaching equality
- Use empty box problems
- Move between the concrete and the abstract
- Contextualise the mathematics
- Discuss & explain why processes work
- Make links between the different mathematical operations

Early Foundations for Fractions

- Use pictorial representations and concrete resources to halve numbers.
- Begin to share quantities using practical resources, role play, stories and songs.
- Divide cakes, pizza, shapes etc. by cutting into two halves and link to sharing between two people.
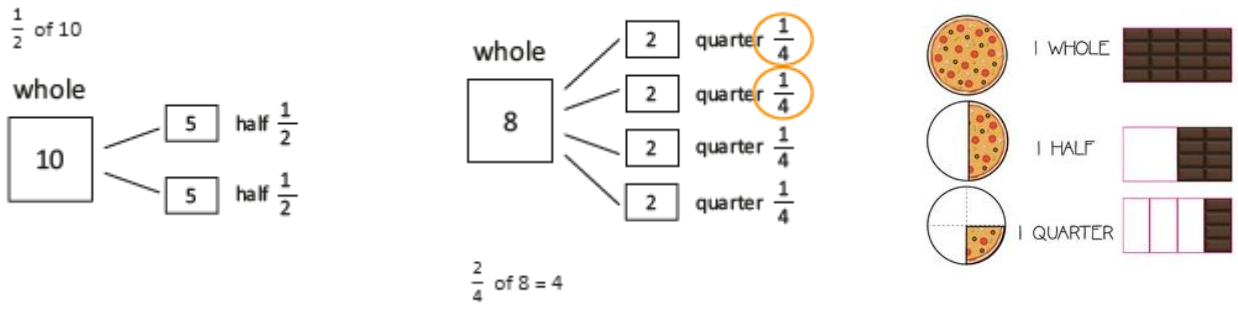

- Fold paper to find fractions of shapes.

| whole | half | half | half of a half quarter | half of a half quarter | half of a half quarter |
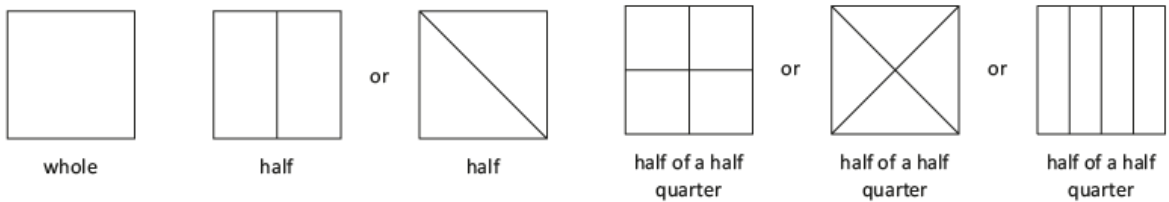
Can you spot any patterns? Can you find different ways of showing the same fraction?
Can you predict how many pieces the paper will be folded into with each fraction?

- Shading/colouring fractions of shapes.
- Exploring how many different ways to show a particular fraction of a shape.
  Children should understand that equal parts will not necessarily look the same but will have the same area.
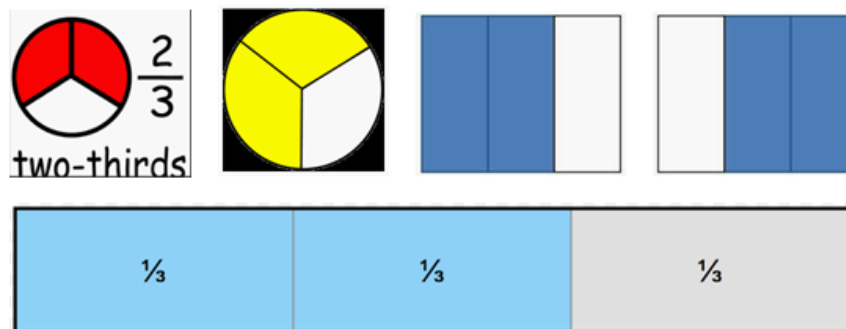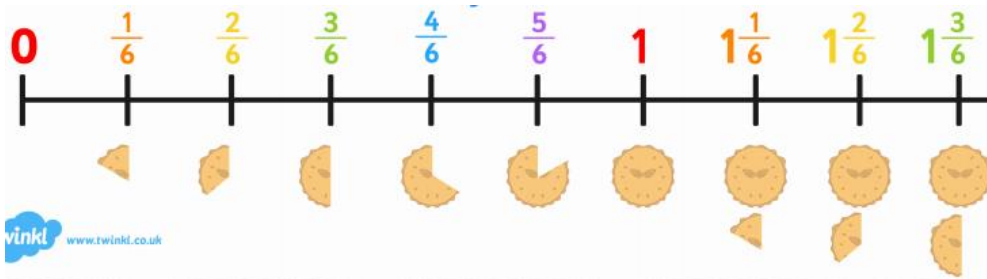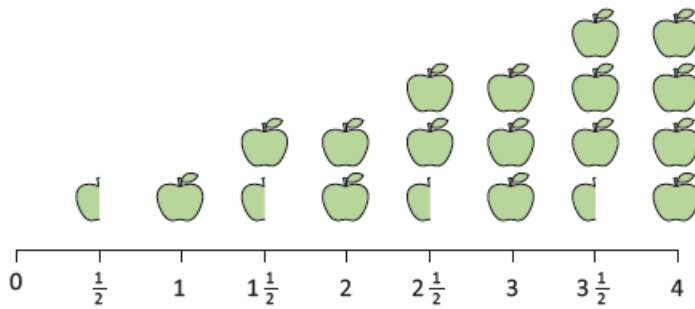
- Understand that a fraction is a part of a whole; use the terms 'part' and 'whole'.

$\frac{1}{2}$ of 10

whole

```
┌────┐
│ 10 │ ─── 5   half 1/2
└────┘ ─── 5   half 1/2
```

whole

```
┌────┐      2   quarter (1/4)
│  8 │ ───  2   quarter (1/4)
└────┘ ───  2   quarter 1/4
            2   quarter 1/4
```

$\frac{2}{4}$ of 8 = 4

I WHOLE

I HALF

I QUARTER

- Count with fractions & relate to a position on a number line between the whole numbers.

```
0    1/2    1    1 1/2    2    2 1/2    3    3 1/2    4
```

```
0    1/6    2/6    3/6    4/6    5/6    1    1 1/6    1 2/6    1 3/6
```

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Understanding the Different Representations

Fractions are used to in a number of different situations. Children need lots of practical experience of the different meanings of a fraction.   As they become more confident, they should be able to move fluently between the different representations.
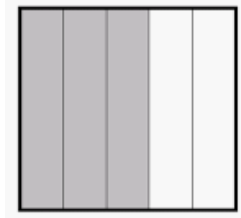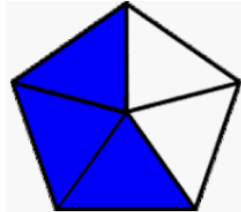
Words

three-fifths

three out of five

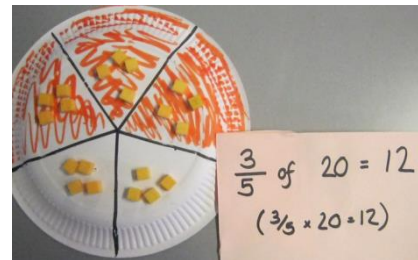*three divided into five*

Digits

$$\frac{3}{5}$$

Part of a shape

Part of a set

Three out of five are yellow.

Part of a quantity or number

$\frac{3}{5}$ of $20 = 12$

$(\frac{3}{5} \times 20 = 12)$

A position on a number line
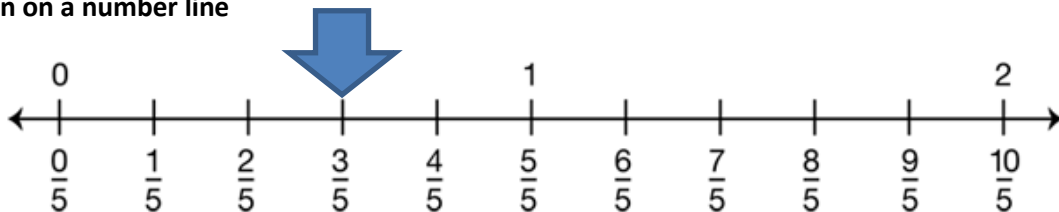
A division calculation

$3 \div 5$

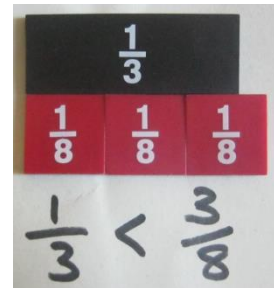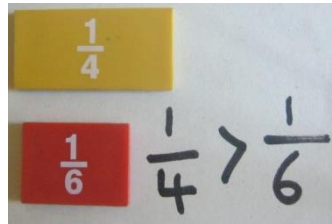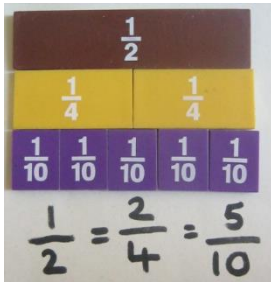**A way of interpreting a remainder**

$23 \div 5 = 4 \; r \, 3$

$= 4 \; \frac{3}{5}$

Progression in Fraction Calculations:
Addition & Subtraction

NB: Steps 1 to 3 provide the underlying foundations for all four operations (+ - x ÷).

Step 1: Use practical apparatus to represent fraction, understand that a fraction is 'part' of a whole & recognise that the same fraction can be represented in more than one way (see early foundations).

Step 2: Use fraction wall tiles to find equivalent fractions. Use fraction tiles to compare fractions.
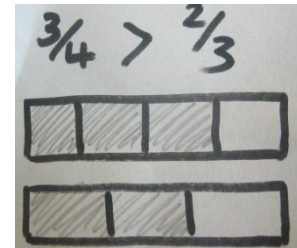

Children can create their own fraction walls from strips of paper.

Children should begin to recognise general patterns: *e.g. the bigger denominators the smaller the piece.*

**Step 3: Draw bar models to represent & compare fractions.**

- Children should discuss strategies for drawing approximately equal parts.
- Beware of an over-reliance on halving (halving can help draw quarters and other even numbers; but halving a shape doesn't help with the drawing of thirds).
- Children who find it difficult to estimate and draw their own equal parts need lots more opportunities to use practical apparatus and pictorial representations to help develop their mental images of fractions.
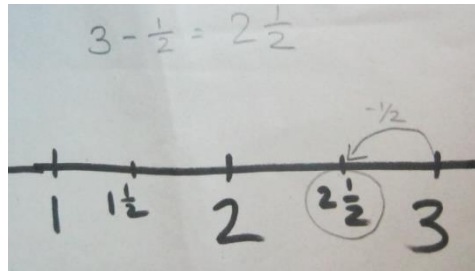
Step 4: Use practical apparatus to model adding and subtracting fractions with the same denominator.
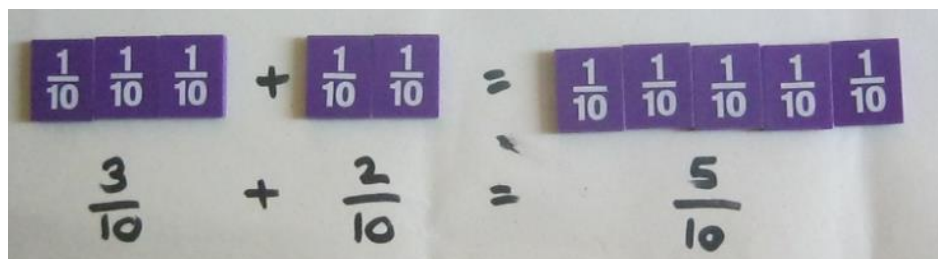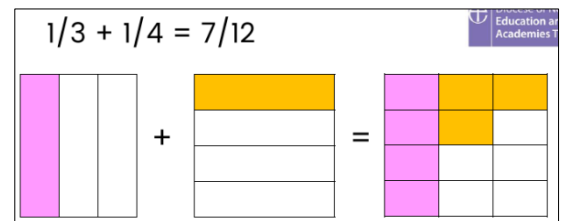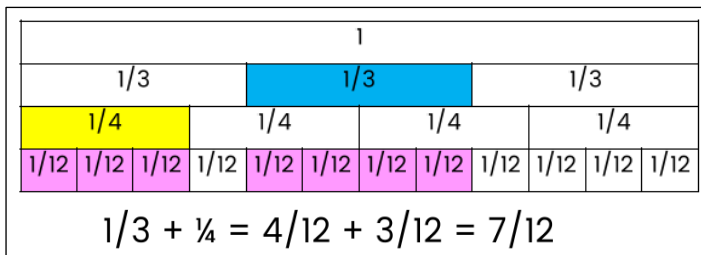
Step 5: Use diagrams and bar models to add and subtract fractions with same denominator.

$$\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

7/8 − 2/8 = 5/8
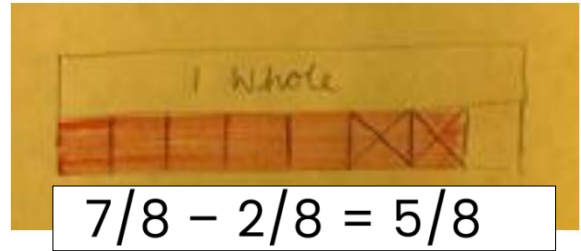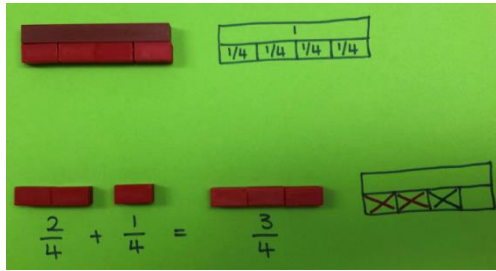
Counting forwards & backwards along a fraction number line can be used as an additional model.

$3 - \frac{1}{2} = 2\frac{1}{2}$

Step 5: Add and subtract fractions with different denominators by converting them to an equivalent common denominator.

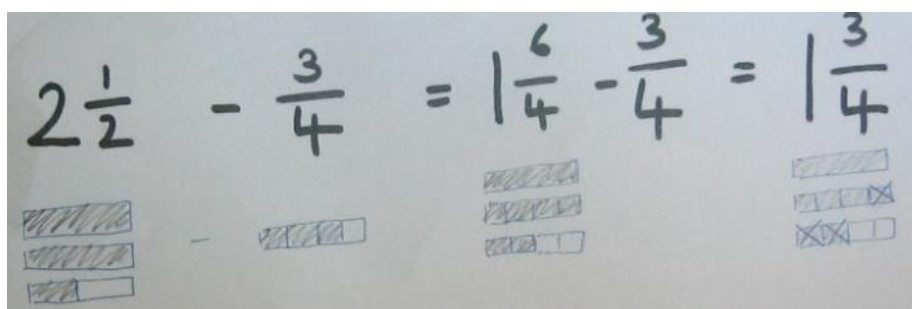| 1			
1/3	1/3		1/3
1/4	1/4	1/4	1/4
1/12 1/12 1/12 1/12	1/12 1/12 1/12 1/12	1/12 1/12 1/12 1/12	

1/3 + ¼ = 4/12 + 3/12 = 7/12

1/3 + 1/4 = 7/12

Start with denominators that are simple multiples of each other (e.g. halves and quarters).
Extend to any denominators.
Encourage children to look for the lowest common denominator.

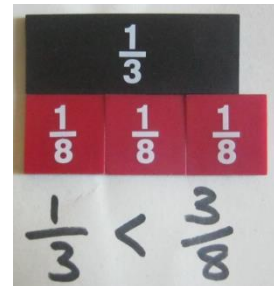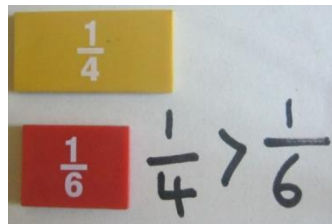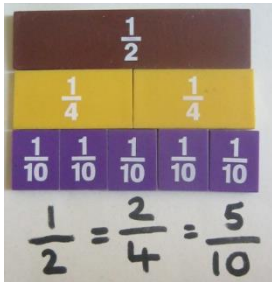**Step 6: Extend the above methods to mixed numbers.**

$\frac{4}{3} = 1\frac{1}{3}$

$$2\frac{1}{2} - \frac{3}{4} = 1\frac{6}{4} - \frac{3}{4} = 1\frac{3}{4}$$

Progression in Fraction Calculations:
Multiplication & Division

NB: Steps 1 to 3 provide the underlying foundations for all four operations (+ - x ÷).

Step 1: Use practical apparatus to represent fraction, understand that a fraction is 'part' of a whole & recognise that the same fraction can be represented in more than one way (see early foundations).

Step 2: Use fraction wall tiles to find equivalent fractions. Use fraction tiles to compare fractions.
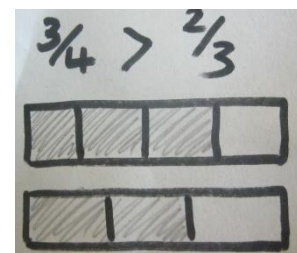

Children can create their own fraction walls from strips of paper.

Children should begin to recognise general patterns: *e.g. the bigger denominators the smaller the piece.*

Step 3: Draw bar models to represent & compare fractions.

 - Children should discuss strategies for drawing approximately equal parts.
 - Beware of an over-reliance on halving (halving can help draw quarters and other even numbers; but halving a shape doesn't help with the drawing of thirds).
 - Children who find it difficult to estimate and draw their own equal parts need lots more opportunities to use practical apparatus and pictorial representations to help develop their mental images of fractions.

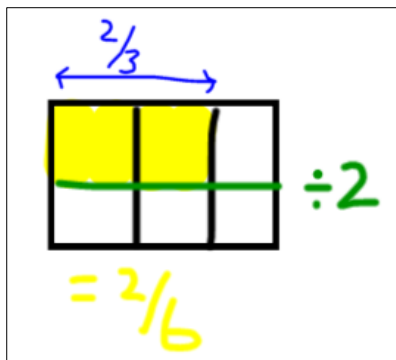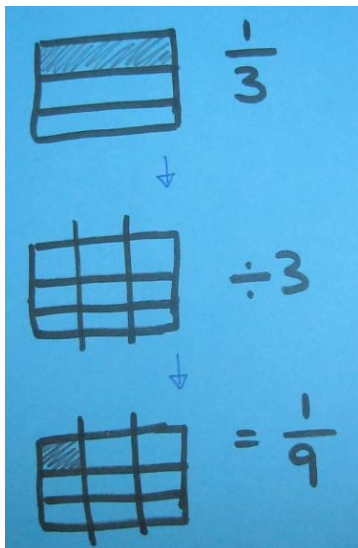**Step 4: Relate multiplication of fractions by a whole number to repeated addition.**
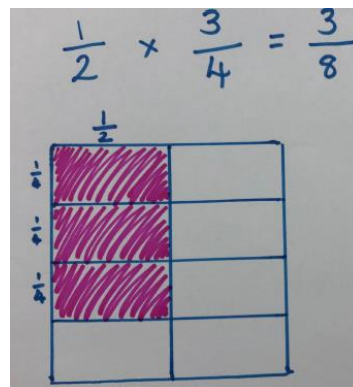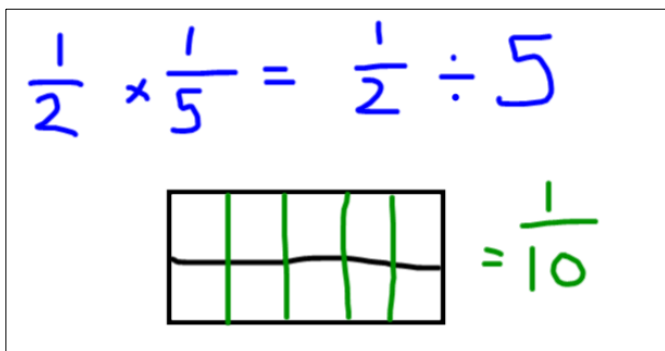**Represent with apparatus and bar models.**
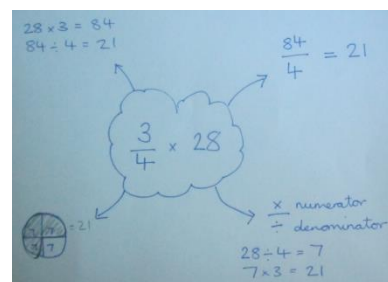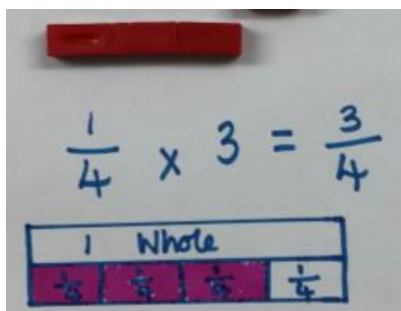
Children should recognise that ¼ x 3 means the same as ¼ of 3.
Children should have opportunities to discuss & compare alternative methods.

Step 5: Divide fractions by drawing a bar model, then dividing it into the divisor.

$\frac{1}{3}$

$\div 3$

$= \frac{1}{9}$

$\frac{2}{3}$

$\div 2$

$= \frac{2}{6}$

Relate division to multiplying by a fraction.

$\frac{1}{2} \times \frac{1}{5} = \frac{1}{2} \div 5$

$= \frac{1}{10}$

$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

Step 6: Multiply mixed numbers by partitioning into wholes and parts and recombining.

$2\frac{1}{4} \times 3 =$

$2 \times 3 = 6$

$\frac{1}{4} \times 3 = \frac{3}{4}$

$= 6\frac{3}{4}$

$2\frac{1}{3} \times 5 = 11\frac{2}{3}$

$2 \times 5 = 10$

$\frac{1}{3} \times 5 = \frac{5}{3} = 1\frac{2}{3}$