



# Welcome to the Whartons Calculation Evening

# Aims



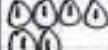
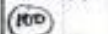


- Share the 3 stages of learning
- Four operations
- Bar Modelling
- How we can use models in other areas of mathematics
- Classroom – Teaching resources

# Stage 1 - Concrete





# Stage 2 - Pictorial

H	T	O
		
		

$$\begin{array}{r}
 400 + 30 + 6 \\
 100 + 50 + 2 \\
 \hline
 500 + 80 + 8
 \end{array}$$


$503 - 15 = 488$


A number line diagram illustrating the subtraction of 15 from 503. The number line is marked with 488, 490, 500, and 503. There are three arcs: one from 488 to 490 labeled -2, one from 490 to 500 labeled -10, and one from 500 to 503 labeled -3.


?	
43	78

0.25	0.25	0.25	0.25
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

$\underbrace{\hspace{10em}}$   
 $\frac{2}{5}$

a 

b 

c 

} 90

# Stage 3 - Abstract

$$\begin{array}{r}
 3517 \\
 + \quad 396 \\
 \hline
 3913
 \end{array}$$

$$\begin{array}{r}
 £23.59 \\
 + £7.55 \\
 \hline
 £31.14
 \end{array}$$

$$\begin{array}{r}
 81,059 \\
 3,668 \\
 15,301 \\
 + 20,551 \\
 \hline
 120,579
 \end{array}$$

# ADDITION

$$\begin{array}{r} \phantom{+} \phantom{1} 7 \phantom{0} 8 \phantom{0} 9 \\ + \phantom{1} 6 \phantom{0} 4 \phantom{0} 2 \\ \hline 1 \phantom{0} 4 \phantom{0} 3 \phantom{0} 1 \\ \hline \phantom{1} 1 \phantom{0} 1 \end{array}$$

# SUBTRACTION

$$\begin{array}{r} \phantom{-} \phantom{1} 8 \phantom{0} 1 \phantom{0} 2 \phantom{0} 1 \\ \phantom{-} \phantom{1} \cancel{9} \phantom{0} \cancel{3} \phantom{0} 2 \\ - \phantom{1} 4 \phantom{0} 5 \phantom{0} 7 \\ \hline \phantom{1} 4 \phantom{0} 7 \phantom{0} 5 \end{array}$$

## Short multiplication

$24 \times 6$  becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ 2 \end{array}$$

Answer: 144

$342 \times 7$  becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ 21 \end{array}$$

Answer: 2394

$2741 \times 6$  becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ 42 \end{array}$$

Answer: 16 446

## Long multiplication

$24 \times 16$  becomes

$$\begin{array}{r} 2 \\ 24 \\ \times 16 \\ \hline 240 \\ 144 \\ \hline 384 \end{array}$$

Answer: 384

$124 \times 26$  becomes

$$\begin{array}{r} 12 \\ 124 \\ \times 26 \\ \hline 2480 \\ 744 \\ \hline 3224 \\ 11 \end{array}$$

Answer: 3224

$124 \times 26$  becomes

$$\begin{array}{r} 12 \\ 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ 11 \end{array}$$

Answer: 3224

## Short division

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \phantom{0} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r } 2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r } 1 \\ 11 \overline{) 496} \\ \underline{44} \phantom{0} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer:  $45\frac{1}{11}$

## Long division

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r } 12 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 12 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 12 \end{array}$$

$15 \times 20$

$15 \times 8$

$$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$$

Answer:  $28\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{120} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

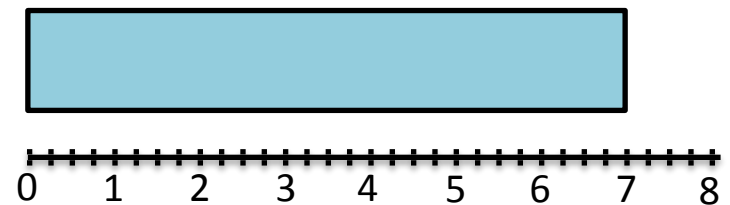
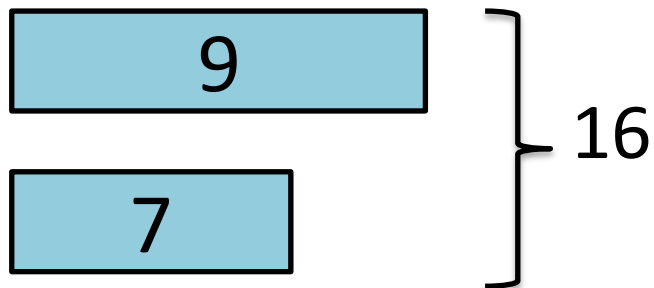
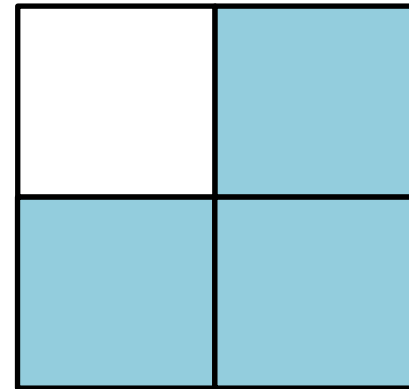
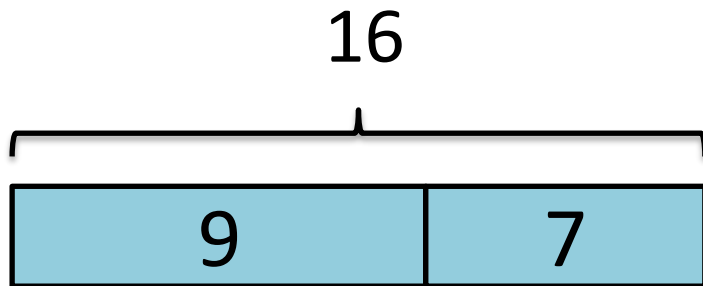
Answer: 28



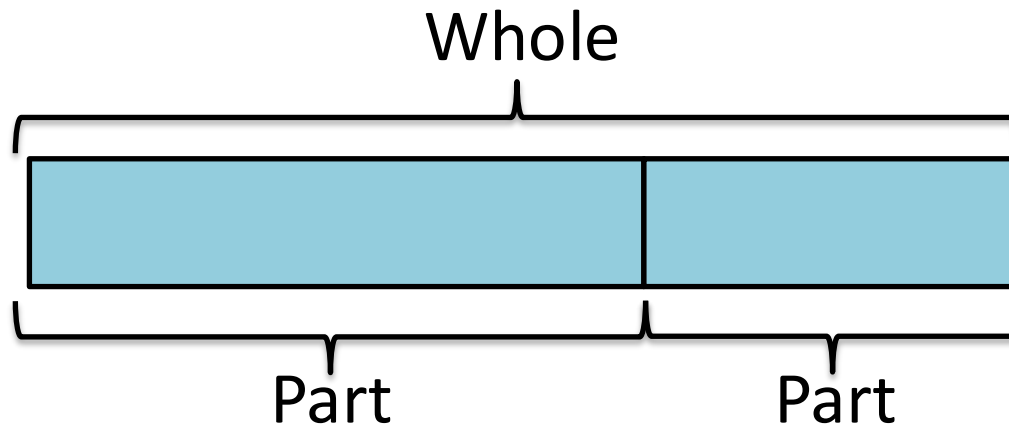
The background of the slide is a vibrant, abstract collage of numbers and mathematical symbols. It features a variety of digits from 0 to 9, as well as symbols like the infinity symbol, a plus sign, and a percent sign. The colors are bright and varied, including shades of blue, green, yellow, orange, and red, creating a dynamic and mathematical atmosphere.

# Bar Modelling

# What Are Bar Models?



# Terminology



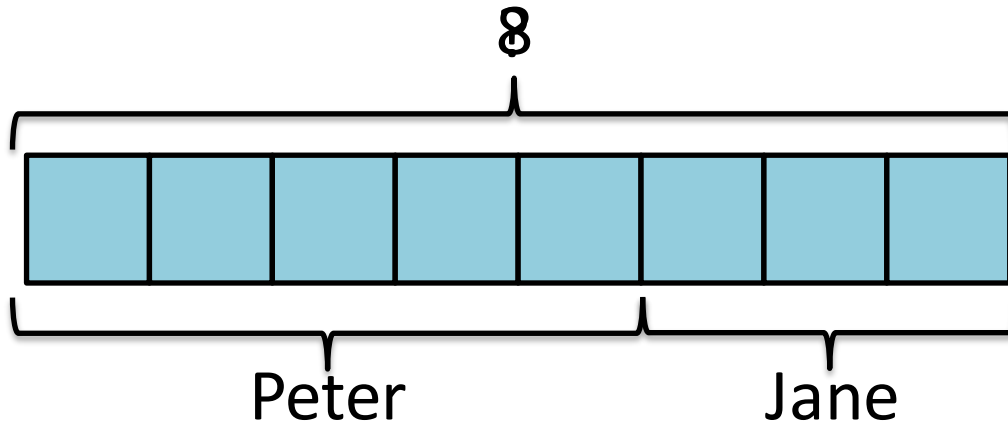
$\text{part} + \text{part} = \text{whole}$

$\text{whole} - \text{part} = \text{part}$

# Addition

Peter has 5 apples and Jane has 3 apples.  
How many apples do they have altogether?

Model (Version 2)



Calculations

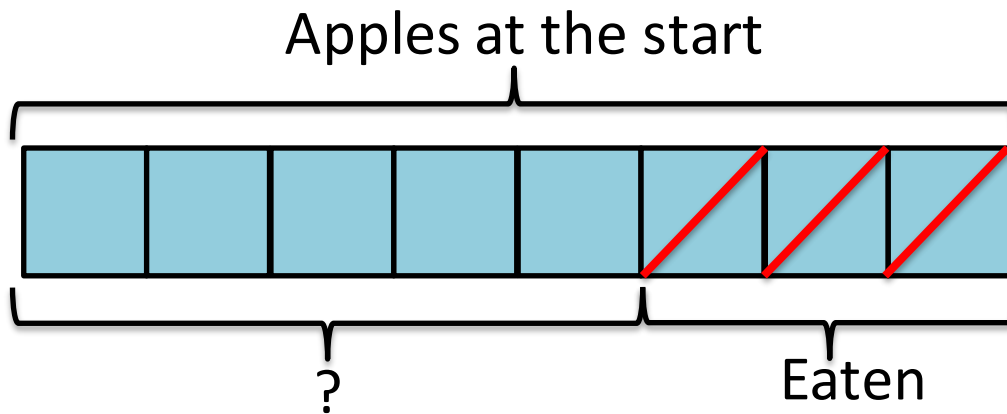
$$5 + 3 = 8$$

*This is called a 'discrete bar model', where each box represents one whole.*

# Subtraction

Jane has 8 apples to begin with. She then eats three apples. How many apples does she have left?

## Model (Discrete)



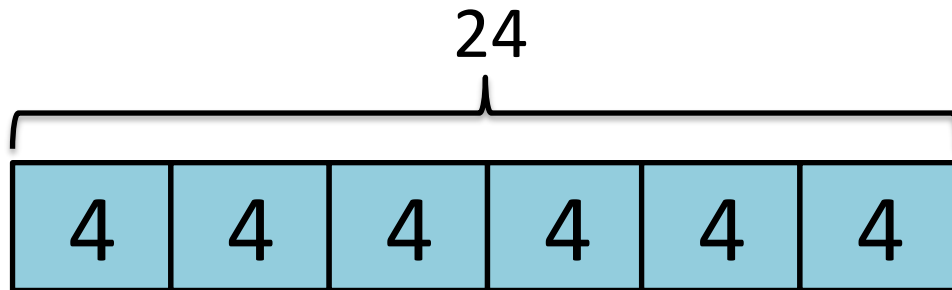
## Calculations

$$8 - 3 = ?$$

# Multiplication

Muffins come in boxes of 4. Peter buys 6 boxes of muffins. How many muffins does Peter buy all altogether?

Model



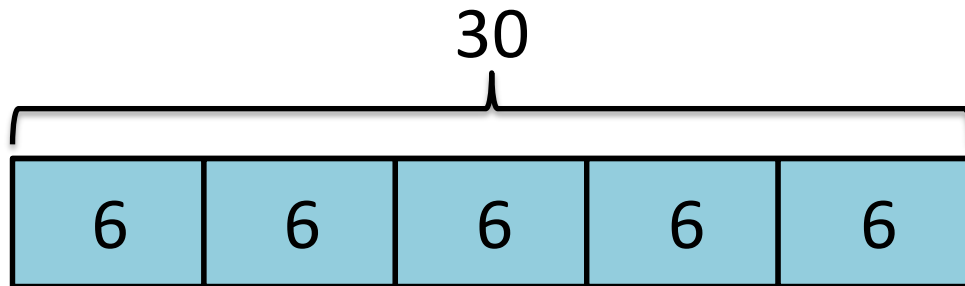
Calculations

$$6 \times 4 = 24$$

# Division (Version 1)

Jane has 30 cakes. She wants to share them equally between five boxes. How many should go in each box?

## Model



Number of cakes in each box = 6

## Calculations

$$30 \div 5 = 6$$

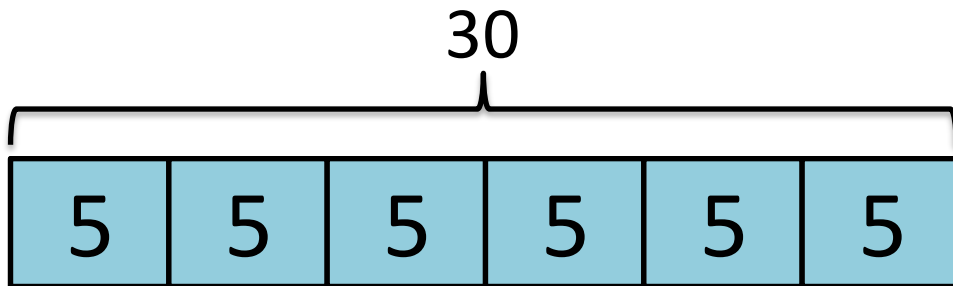
*In this version, we are splitting 30 into 5 equal groups.*



# Division (Version 2)

Jane has 30 cakes. She wants to pack them into boxes with 5 cakes in each box. How many boxes will she need?

## Model



Number of boxes needed = 6

## Calculations

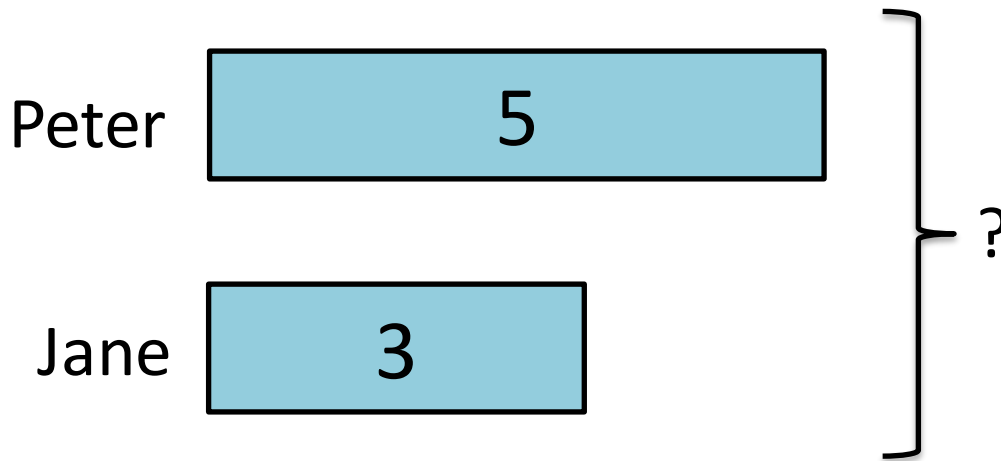
$$30 \div 5 = 6$$

*In this version, we are counting how many fives go into thirty.*

# Addition

Peter has 5 apples and Jane has 3 apples.  
How many apples do they have altogether?

## Model (Version 3)



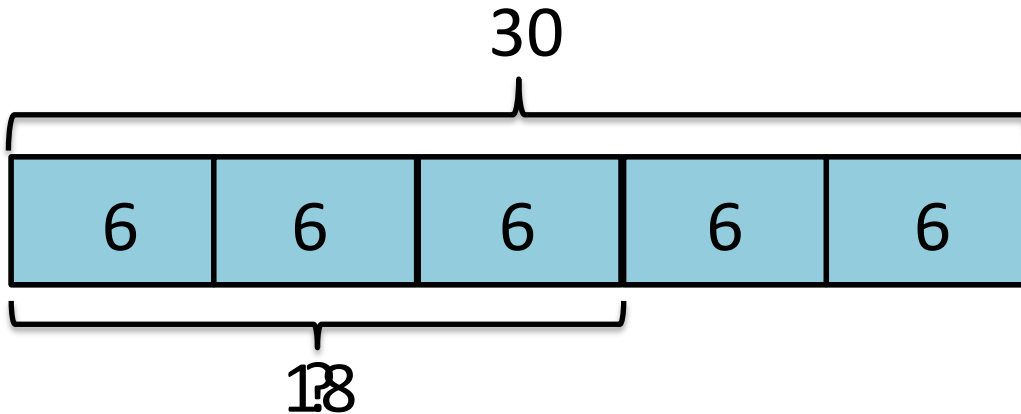
## Calculations

$$5 + 3 = ?$$

# Fraction of an Amount

Peter starts with 30 sweets. He eats  $\frac{3}{5}$  of them. How many sweets does he eat?

## Model



## Calculations

$$30 \div 5 = 6$$

$$3 \times 6 = 18$$

# Ratio

Peter and Jane share £40 in the ratio of 3:5  
How much money does each person get?

## Model

Peter



Jane



£40

## Calculations

$$40 \div 8 = 5$$

$$\text{Peter: } 3 \times 5 = 15$$

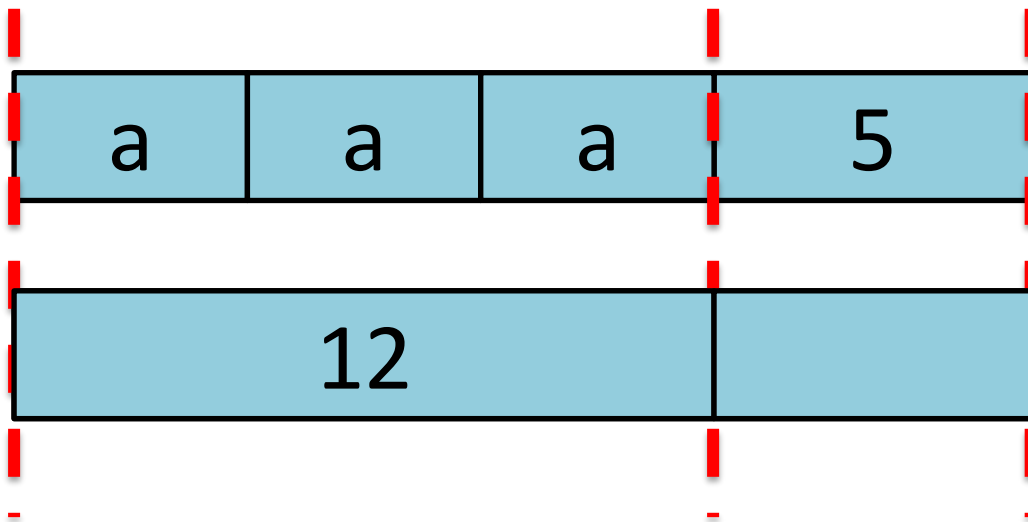
$$\text{Jane: } 5 \times 5 = 25$$

# Solving Equations

Solve...

$$3a + 5 = 17$$

Model



Calculations

$$3a + 5 = 17$$

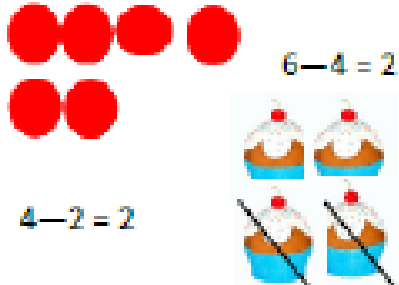
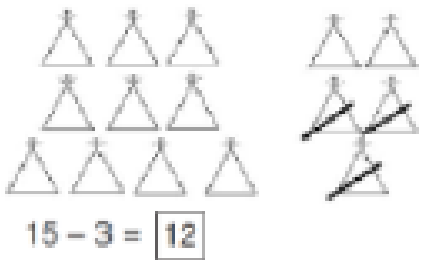
$-5$   $-5$

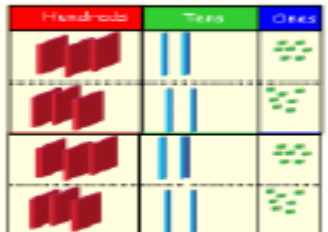
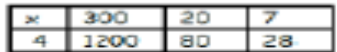
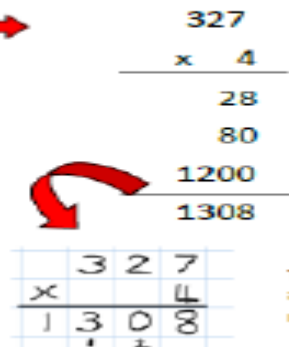
$$3a = 12$$

$\div 3$   $\div 3$

$$a = 4$$

# Calculation Policy

Objective & Strategy	Concrete	Pictorial	Abstract
Taking away ones.	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>6 — 4 = 2</p> <p>4 — 2 = 2</p>	 <p>15 — 3 = 12</p> <p>Cross out drawn objects to show what has been taken away.</p>	$7 - 4 = 3$  $16 - 9 = 7$

Objective & Strategy	Concrete	Pictorial	Abstract
Column Multiplication for 3 and 4 digits $\times$ 1 digit.	 <p>It is important at this stage that they always multiply the ones first.</p> <p>Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. <math>323 \times 2 = 646</math></p>		 <p>This will lead to a compact method.</p>

The background is a vibrant, abstract collage. It features a variety of numbers (0-9) in different colors and sizes, some appearing to be floating or layered. A prominent, stylized figure in shades of purple and pink is visible in the upper left quadrant. The overall color palette is rich and multi-colored, including blues, greens, yellows, oranges, and reds, creating a dynamic and energetic visual field.

Classrooms

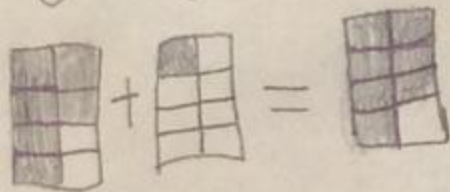


# How To Add + Subtract Fractions

## FRACTIONS

How To Add

$$\frac{6}{8} + \frac{1}{8} = \frac{7}{8}$$



This is A diagram  
OF Adding

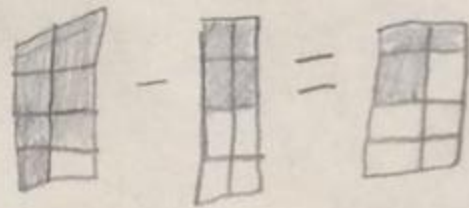
## Top Tip



- Keep the denominator the same
- Add or take away the numerator

How To take away

$$\frac{7}{8} - \frac{4}{8} = \frac{3}{8}$$



This is a diagram  
of Subtracting

# Families of equivalent fractions

Look AT  
ALL of  
these!

mm $\frac{1}{2}$ mm			
$\frac{1}{9}$		$\frac{1}{4}$	
$\frac{1}{6}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

mm $\frac{1}{2}$ mm			
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{1}{15}$
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$
$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$	$\frac{1}{20}$

mm $\frac{1}{4}$ mm			
$\frac{1}{8}$		$\frac{1}{8}$	
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$



TICK  
 $\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$



There are 3 colored in  
 So it will be  
 $\frac{3}{6}$   
 bubble  
 cutter



## Finding Fractions of an amount

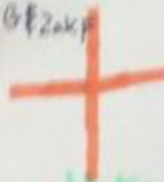
1. Divide the amount by the numerator.

$$\frac{7}{8} \text{ of } 56 \rightarrow 56 \div 8 = 7 \left(\frac{1}{8}\right)$$

2. Times the answer by the numerator.

$$7 \times 7 = 49 \left(\frac{7}{8}\right)$$

Billy & Zak



addition

- you should always have the same denominator.
- you should have a numerator and denominator

Subtraction

■ = 0 or Nothing

# Fractions

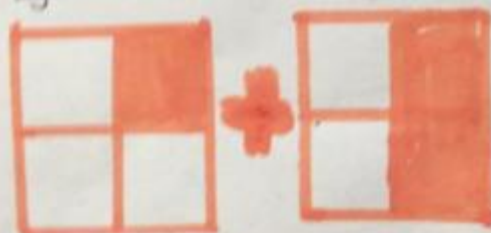
□ = Nothing

how do you add a fraction?

1/3 + 1/3 = 2/3  
 simply add the numerators

Ex: 2/10 + 6/10 = 8/10 or 4/20 + 12/20 = 16/20

Ex:



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



3 Numerator  
4 denominator

How to - Fractions

you take the numerator away from the other numerator and you do

Ex:

$$\frac{2}{8} - \frac{1}{8} = \frac{1}{8} \text{ or } \frac{4}{16} - \frac{2}{16} = \frac{2}{16}$$

$$\frac{4}{8} + \frac{1}{8} = \frac{5}{8} \text{ or } \frac{8}{16} + \frac{2}{16} = \frac{10}{16}$$

## EXAMPLES

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

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

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

Numerator  
denominator







# Maths

Key Words

proper fraction improper fraction

numerator

denominator

mixed number equivalent

quart half

fifth two fifths

convert

per cent (%) percentage

percentage equivalent

Three Types of fraction

proper fraction

improper fraction

mixed number

Three Types of fraction

proper fraction

improper fraction

mixed number

Three Types of fraction

proper fraction

improper fraction

mixed number

What a Good One Looks Like

$$\frac{2}{7} = \frac{6}{21}$$

$$4 \frac{1}{6} = \frac{27}{6}$$

$$3 \frac{8}{9} = \frac{35}{9}$$

$$4 \frac{8}{10} = \frac{48}{10}$$

$$3 \frac{1}{2} = \frac{7}{2}$$



The background of the slide is a vibrant, abstract collage. It features a variety of numbers (0-9) in different colors and sizes, some appearing to be floating or layered. A prominent purple figure, resembling a stylized person or a complex shape, is visible in the upper left quadrant. The overall color palette is rich and multi-colored, including blues, greens, yellows, oranges, and reds.

Any Questions?