

*ThemeVille*<sup>TM</sup>  
**Math**  
*See the themes behind the details*

**Avi Patil, Ph.D.**

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**ThemeVille Math 4**

*Worktext*

*Second Edition*

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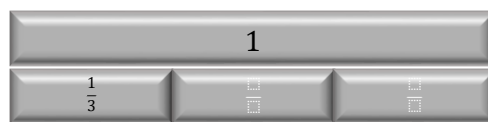
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## Fractions - Introduction

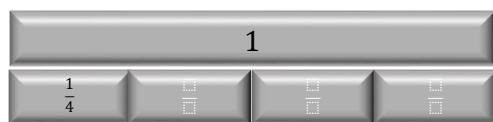
Fill in the blanks:



1 is divided in 2 parts.

Each part is  $\frac{1}{2} \rightarrow$  One half

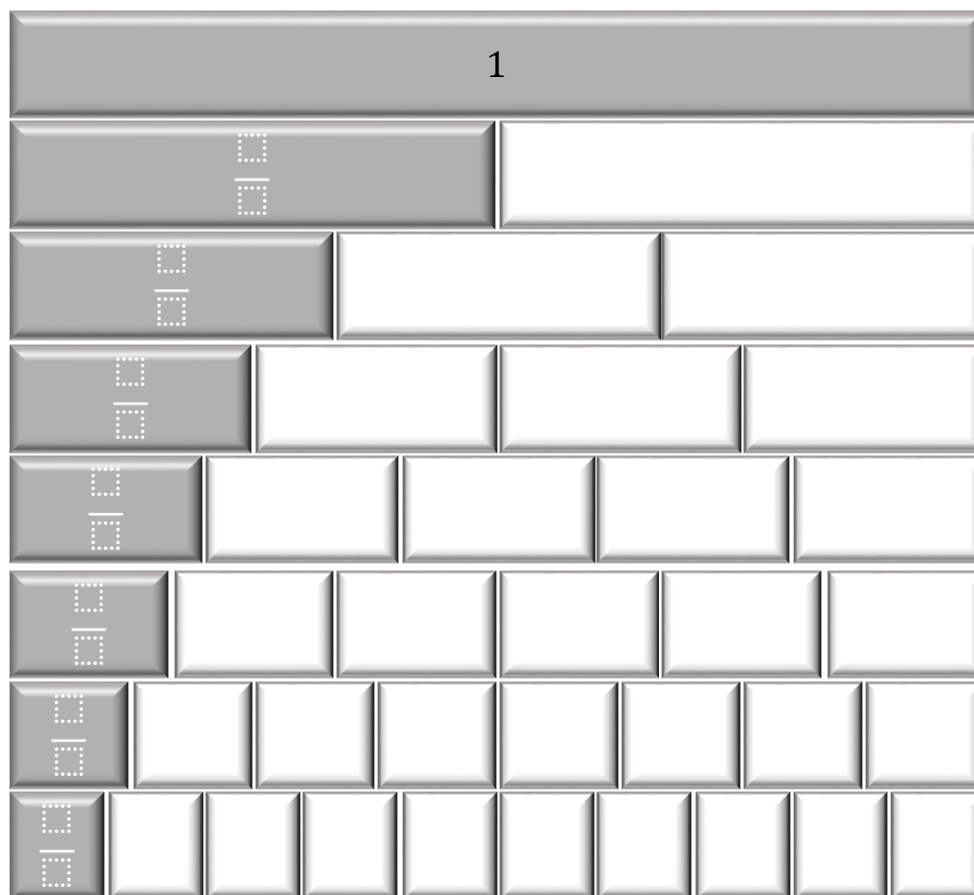
..... is divided in ..... parts.

Each part is  $\frac{\square}{\square} \rightarrow$  One third

..... is divided in ..... parts.

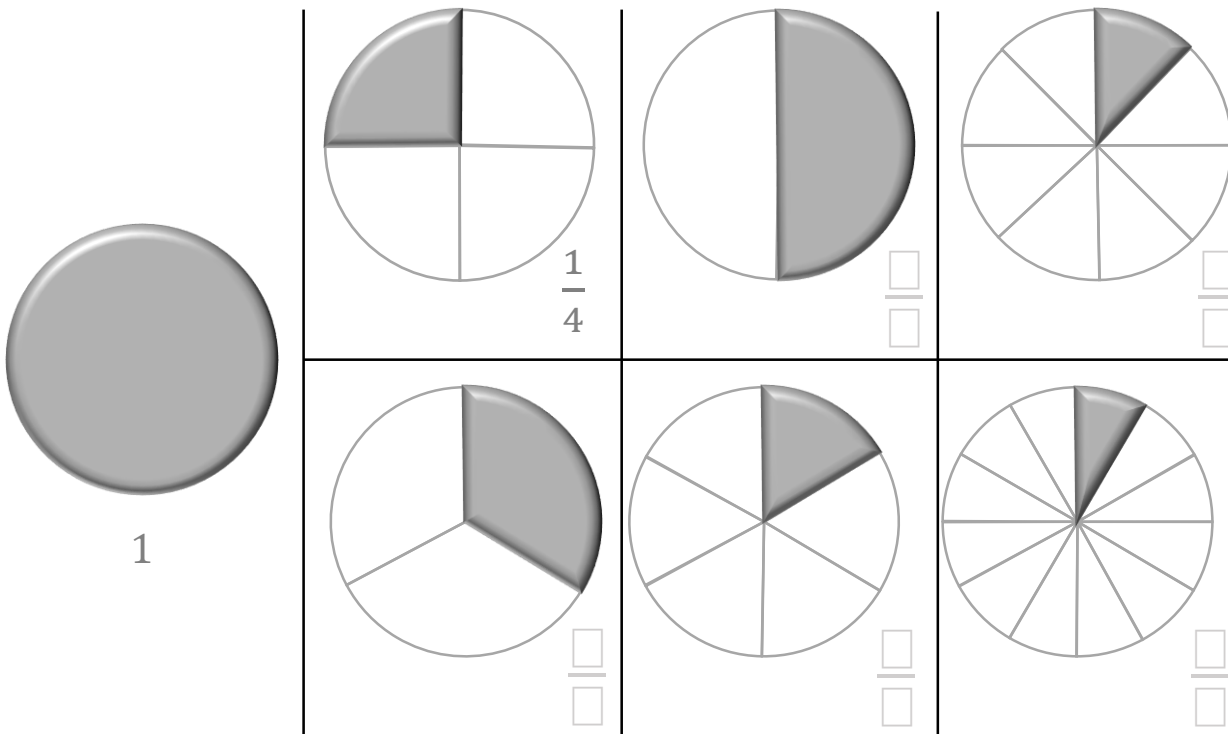
Each part is  $\frac{\square}{\square} \rightarrow$  One fourth

..... is divided in ..... parts.

Each part is  $\frac{\square}{\square} \rightarrow$  One fifth

**Fraction notation:**  $\frac{1}{4}$   $\leftarrow$  Numerator  
 $\frac{1}{4}$   $\leftarrow$  Denominator

# Sample page

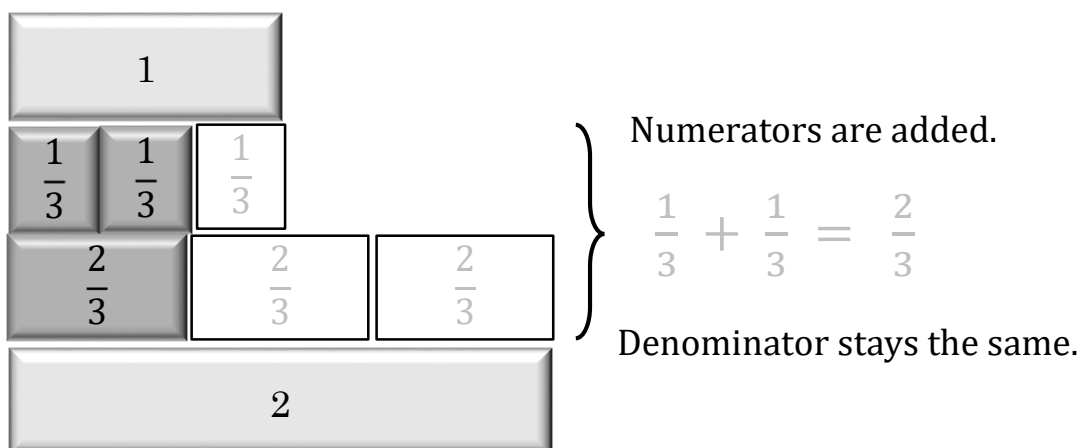


Write as fractions	Write in words
One fifth → $\frac{1}{5}$	$\frac{1}{6}$ → One sixth
One eighth →	$\frac{1}{3}$ →
One half →	$\frac{1}{5}$ →
One third →	$\frac{1}{8}$ →
One tenth →	$\frac{1}{12}$ →
One fourth →	$\frac{1}{10}$ →
One ninth →	$\frac{1}{4}$ →
One twelfth →	$\frac{1}{6}$ →

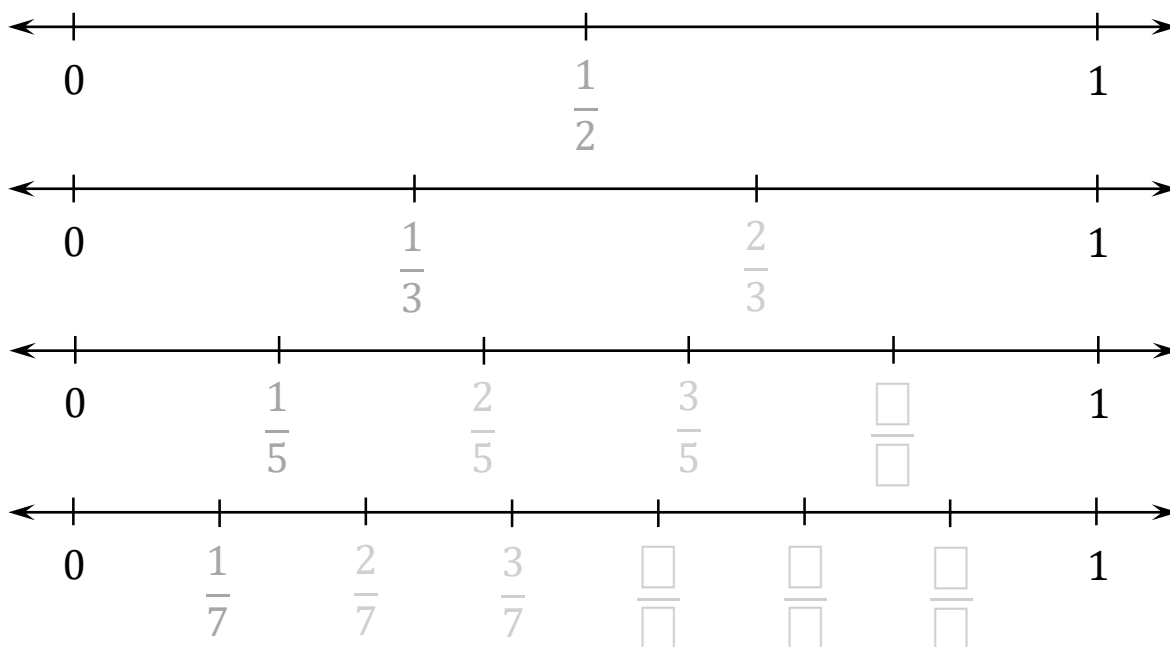
To the Teacher: After filling in answers for few problems, please ask the student to show with rectangular and circular tiles.



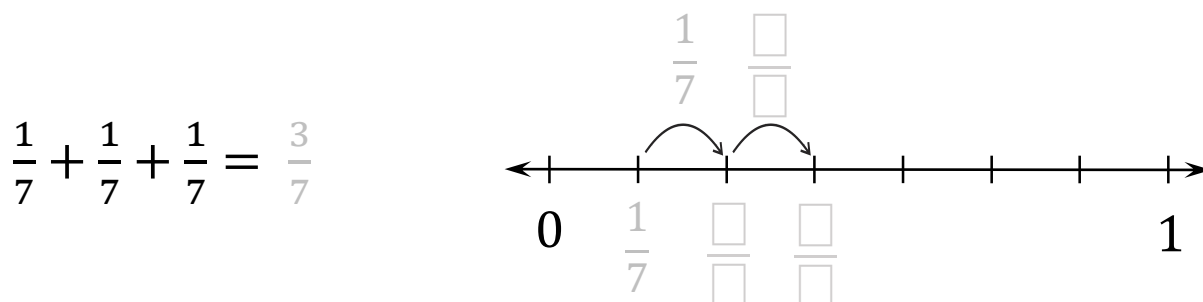
## Addition of fractions



Fill the number lines:



Add the following fractions and show with hops on the number line:



# Sample page

Add the following fractions:

$$\frac{1}{3} + \frac{1}{3} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{5} + \frac{1}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{2}{5} + \frac{1}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{2}{5} + \frac{2}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{3}{5} + \frac{1}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{3}{11} + \frac{4}{11} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{7}{9} + \frac{1}{9} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$\frac{2}{7} + \frac{3}{7} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

Decompose the following fractions into unit fractions. Show few problems with rectangular tiles and circular tiles.

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

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

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

$$\frac{2}{5} =$$

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

$$\frac{5}{6} =$$

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

$$\frac{5}{8} =$$

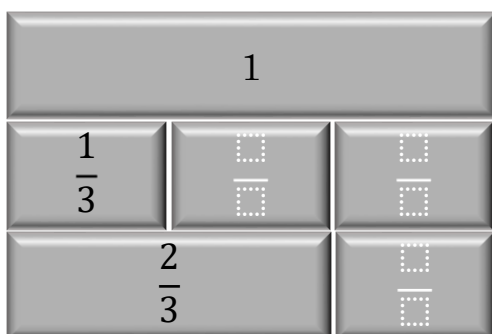
To the Teacher: After solving problems on the last page, please ask the student to show few problems with rectangular tiles.

## Fractions: Making of One

Fill in the blanks:

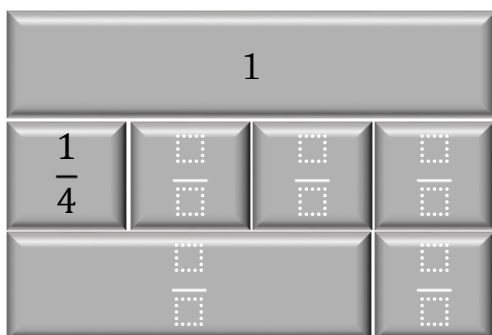


$$\frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1$$



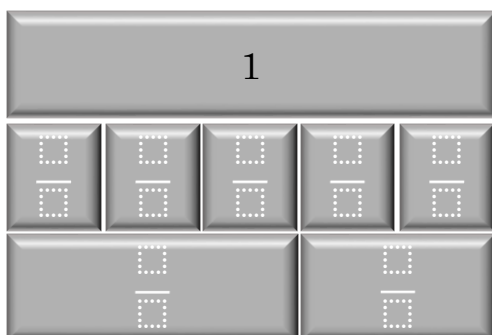
$$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{\square}{\square} = 1$$

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



$$\frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} = \square$$

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} = \square$$



$$\frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} = \square$$

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} = \square$$

# Sample page

Perform the additions:

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

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

$$\frac{5}{6} + \frac{1}{6} = \frac{\square}{\square} = \square$$

$$\frac{5}{8} + \frac{3}{8} = \frac{\square}{\square} = \square$$

$$\frac{3}{5} + \frac{2}{5} = \frac{\square}{\square} = \square$$

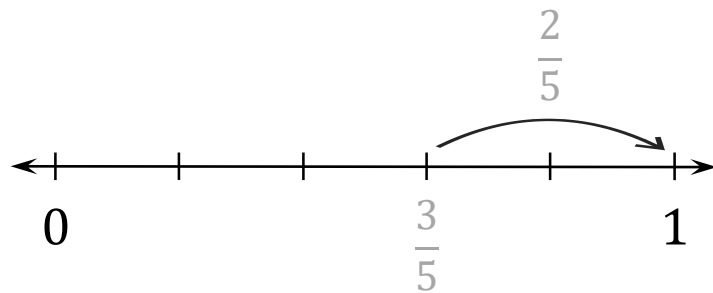
$$\frac{3}{4} + \frac{1}{4} = \frac{\square}{\square} = \square$$

$$\frac{7}{10} + \frac{3}{10} = \frac{\square}{\square} = \square$$

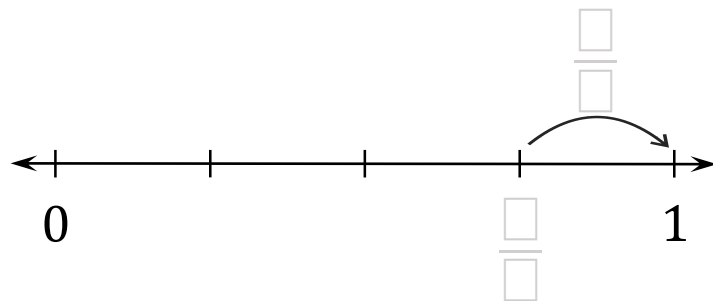
$$\frac{7}{12} + \frac{5}{12} = \frac{\square}{\square} = \square$$

Perform the additions and show with number line.

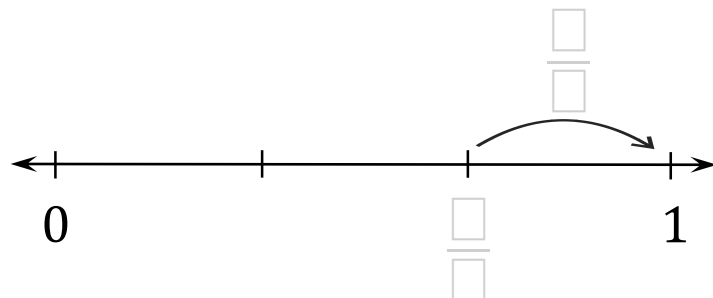
$$\frac{3}{5} + \frac{2}{5} = \frac{5}{5} = 1$$



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



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



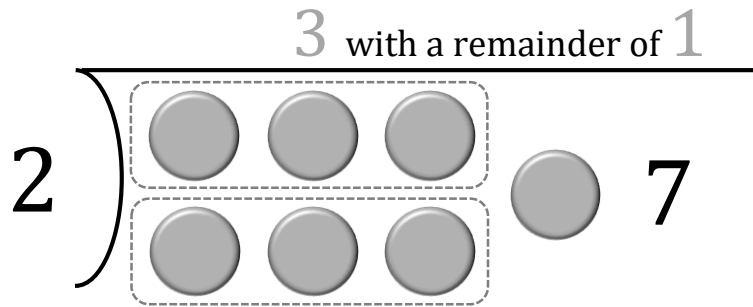
## Mixed numbers

Fill in the blanks:

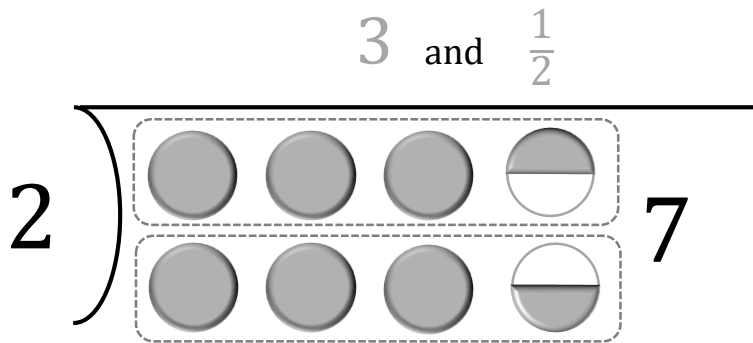
If seven pizzas are divided in two parts, how much pizza will be in each part?

**Step 1:**

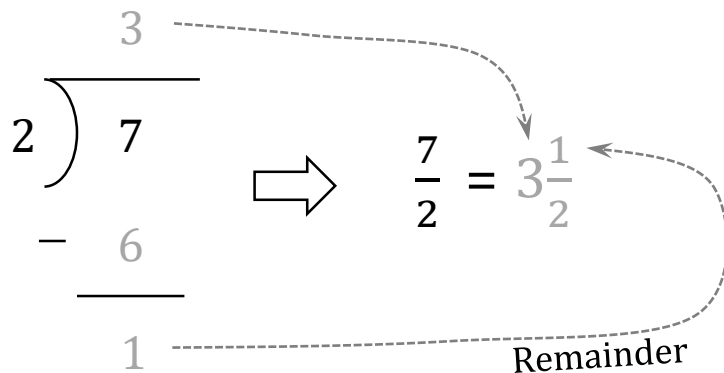
Each part is 3 pizzas with a remainder of 1 pizza

**Step 2:**

The remainder of 1 is divided in 2 parts.



**Note:** 3 and  $\frac{1}{2}$  is written as  $3\frac{1}{2}$ . ← Mixed number

**Summary:**

When 7 pizzas are divided in 2 equal parts, each part is  $3\frac{1}{2}$  pizza.

If three pizzas are divided in two parts, how much pizza will be in each part?

$$3 \text{ divided in } 2 \text{ parts} \rightarrow 2 \overline{) 3} \rightarrow \frac{3}{2}$$

$$\begin{array}{r} 1 \\ 2 \overline{) 3} \\ - 2 \\ \hline 1 \end{array} \Rightarrow \frac{3}{2} = 1\frac{1}{2} \Rightarrow \text{When 3 pizzas are divided in 2 parts, each part is } 1\frac{1}{2}$$


---

If five pizzas are divided in two parts, how much pizza will be in each part?

$$\square \text{ divided in } \square \text{ parts} \quad \square \overline{) \square} \rightarrow \frac{\square}{\square}$$

$$\begin{array}{r} \square \\ \square \overline{) \square} \\ - \square \\ \hline \square \end{array} \Rightarrow \frac{\square}{\square} = \square \frac{\square}{\square} \Rightarrow \text{When 5 pizzas are divided in 2 parts, each part is } \square \frac{\square}{\square}$$


---

If eight pizzas are divided in three parts, how much pizza will be in each part?

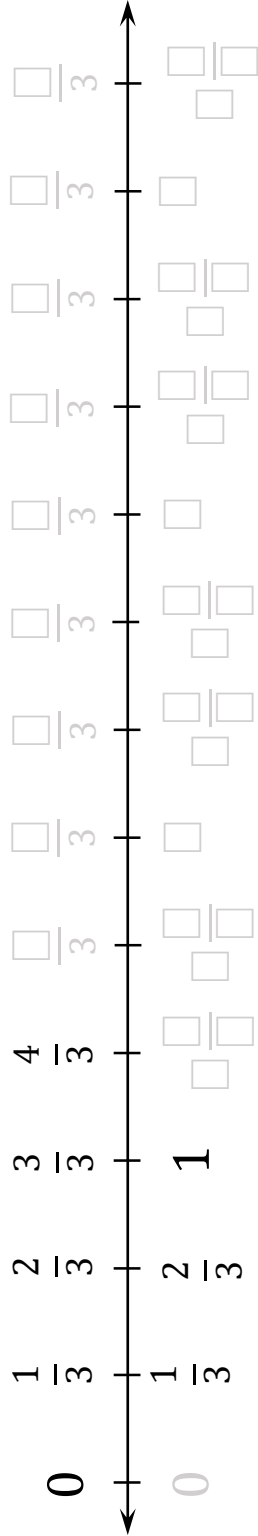
$$\square \text{ divided in } \square \text{ parts} \quad \square \overline{) \square} \rightarrow \frac{\square}{\square}$$

$$\begin{array}{r} \square \\ \square \overline{) \square} \\ - \square \\ \hline \square \end{array} \Rightarrow \frac{\square}{\square} = \square \frac{\square}{\square} \Rightarrow \text{When 8 pizzas are divided in 3 parts, each part is } \square \frac{\square}{\square}$$


---

Conversion to Improper Fractions

Fill in the numbers on a number line:



Convert mixed numbers to improper fractions. Show them on a number line.

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

$$2 \times 3 = 6$$

$$6 + 1 = 7$$

$$2 \frac{2}{3} = \frac{8}{3}$$

$$\square \times \square = \square$$

$$\square + \square = \square$$

$$3 \frac{2}{3} = \frac{10}{3}$$

$$\square \times \square = \square$$

$$\square + \square = \square$$

Convert the mixed numbers to improper fractions:

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 4\frac{1}{2} = \frac{\square}{\square} \end{array}$$

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 5\frac{1}{2} = \frac{\square}{\square} \end{array}$$

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 2\frac{1}{5} = \frac{\square}{\square} \end{array}$$

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 3\frac{2}{5} = \frac{\square}{\square} \end{array}$$

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 2\frac{1}{10} = \frac{\square}{\square} \end{array}$$

$$\begin{array}{c} \square + \square = \square \\ \square \times \square = \square \\ 1\frac{2}{7} = \frac{\square}{\square} \end{array}$$



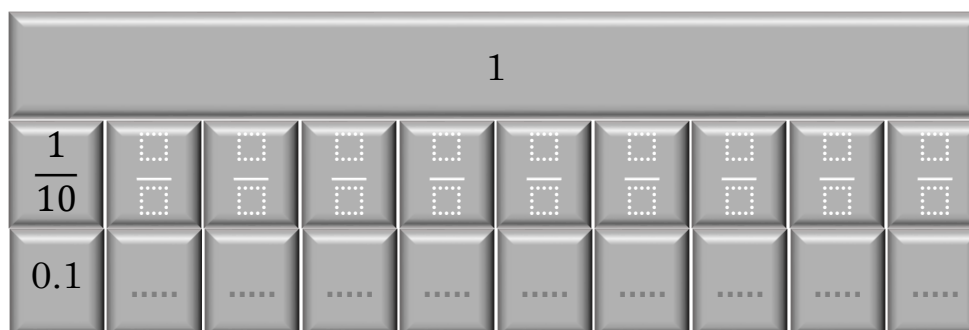
Decimals: Introduction

Decimals are fractions with a place value of tenth, hundredth and so forth.

$$\frac{1}{10} = 0.1 = .1$$

↑      ↑  
Decimal point

Fill in the blanks below with fractions and decimals



# Sample page

Convert from fractions to decimals and vice versa:

$\frac{1}{10} =$	$\frac{3}{10} =$	$\frac{8}{10} =$	$\frac{9}{10} =$
$1\frac{1}{10} =$	$1\frac{3}{10} =$	$1\frac{8}{10} =$	$1\frac{9}{10} =$
$4\frac{1}{10} =$	$4\frac{3}{10} =$	$4\frac{8}{10} =$	$4\frac{9}{10} =$
$4\frac{4}{10} =$	$4\frac{5}{10} =$	$4\frac{7}{10} =$	$4\frac{2}{10} =$
$0.1 = \frac{\square}{10}$	$0.2 = \frac{\square}{10}$	$0.3 = \frac{\square}{\square}$	$0.7 = \frac{\square}{\square}$
$1.1 = \square\frac{\square}{10}$	$1.2 = \square\frac{\square}{10}$	$1.3 = \square\frac{\square}{\square}$	$1.7 = \square\frac{\square}{\square}$
$1.6 = \square\frac{\square}{10}$	$1.9 = \square\frac{\square}{\square}$	$1.5 = \square\frac{\square}{10}$	$1.4 = \square\frac{\square}{10}$
$7.6 = \square\frac{\square}{10}$	$7.9 = \square\frac{\square}{\square}$	$7.5 = \square\frac{\square}{10}$	$7.4 = \square\frac{\square}{10}$
$2\frac{5}{10} =$	$1\frac{7}{10} =$	$0.3 = \frac{\square}{10}$	$0.4 = \frac{\square}{\square}$
$6.4 = \square\frac{\square}{\square}$	$6.7 = \square\frac{\square}{\square}$	$\frac{9}{10} =$	$\frac{3}{10} =$
$3\frac{1}{10} =$	$1\frac{3}{10} =$	$1.8 = \square\frac{\square}{10}$	$1.2 = \square\frac{\square}{10}$

## Addition of Mixed Numbers

Perform the following additions:

$$3 + \frac{2}{5} = \square \frac{\square}{\square}$$



$$\frac{3}{5} + \frac{1}{5} = \frac{\square}{\square}$$



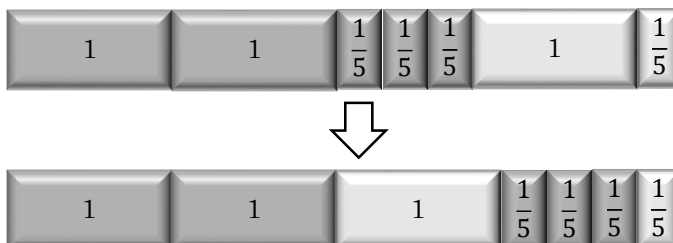
$$2 + 1\frac{2}{5} = \square \frac{\square}{\square}$$



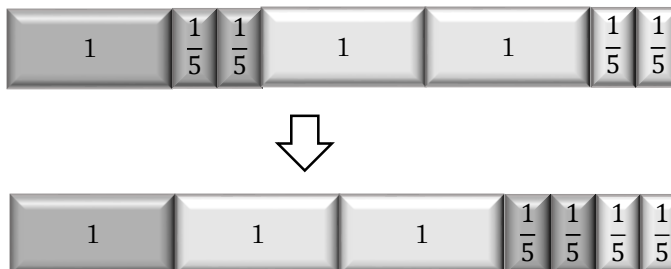
$$2\frac{3}{5} + \frac{1}{5} = \square \frac{\square}{\square}$$



$$\begin{aligned} &2\frac{3}{5} + 1\frac{1}{5} \\ &= 3\frac{3}{5} + \frac{1}{5} \quad \text{Add ones only} \\ &= 3\frac{4}{5} \quad \text{Add fractions} \end{aligned}$$



$$\begin{aligned} &1\frac{2}{5} + 2\frac{2}{5} \\ &= \square \frac{\square}{\square} + \square \frac{\square}{\square} \quad \text{Add ones only} \\ &= \square \frac{\square}{\square} \quad \text{Add fractions} \end{aligned}$$



To the Teacher: After solving few problems, please ask the student to show them with rectangular tiles.

# Sample page

Perform the following additions:

Steps: (1) Add ones only.

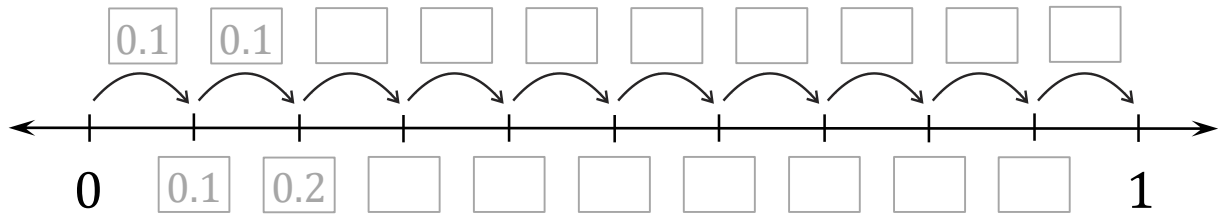
(2) Add fractions.

(3) Show the operation with rectangular tiles for first six problems.

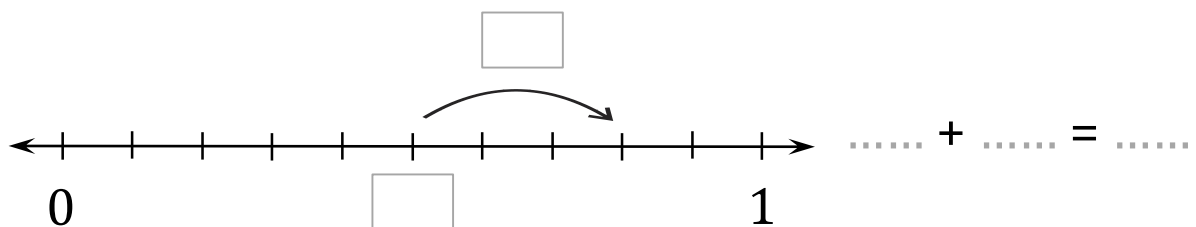
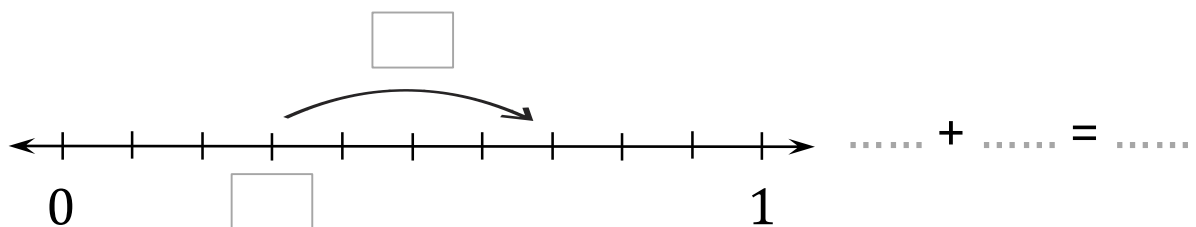
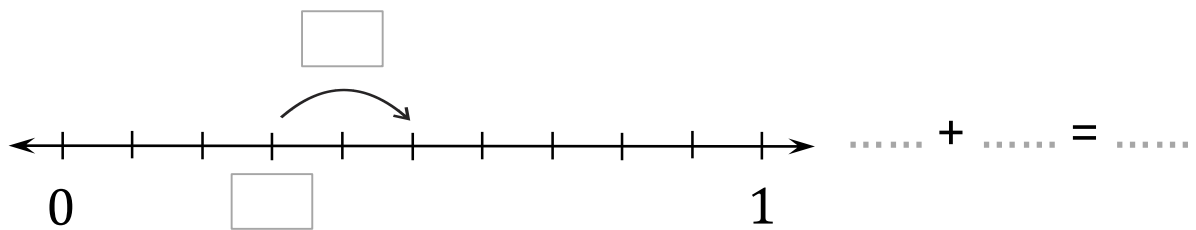
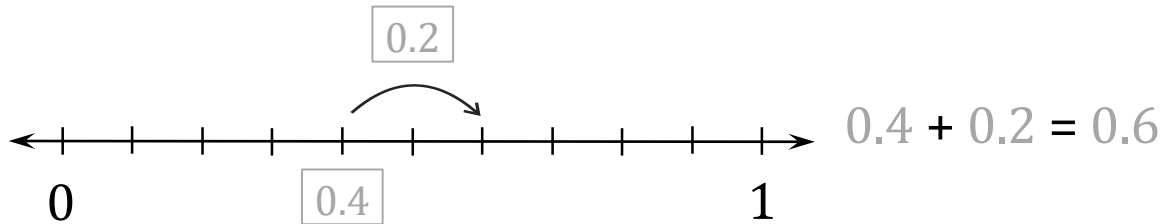
$4 + 2\frac{2}{3}$ $= \square \frac{\square}{\square}$	$3 + 2\frac{2}{3}$ $= \square \frac{\square}{\square}$	$2\frac{1}{3} + 1\frac{1}{3}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$
$1\frac{2}{5} + 2\frac{1}{5}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$	$3\frac{1}{5} + 1\frac{1}{5}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$	$1\frac{1}{3} + 1\frac{1}{3}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$
$2\frac{1}{7} + 3\frac{2}{7}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$	$3\frac{2}{11} + 4\frac{3}{11}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$	$1\frac{3}{9} + 4\frac{2}{9}$ $= \square \frac{\square}{\square} + \frac{\square}{\square}$ $= \square \frac{\square}{\square}$
$1\frac{1}{11} + 1\frac{1}{11}$ $=$ $=$	$5\frac{5}{7} + 1\frac{1}{7}$ $=$ $=$	$3\frac{2}{9} + 3\frac{2}{9}$ $=$ $=$

## Decimals with number lines

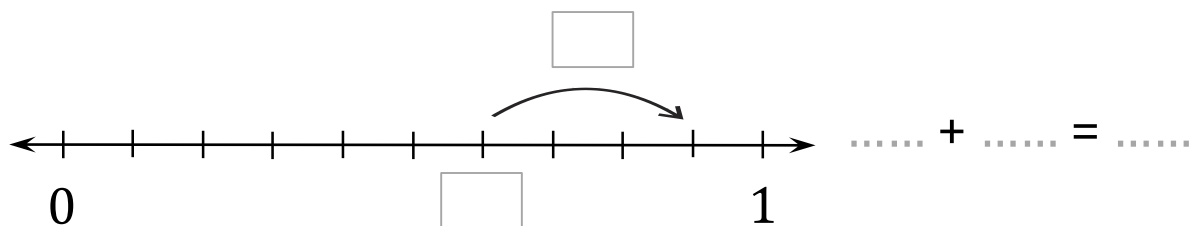
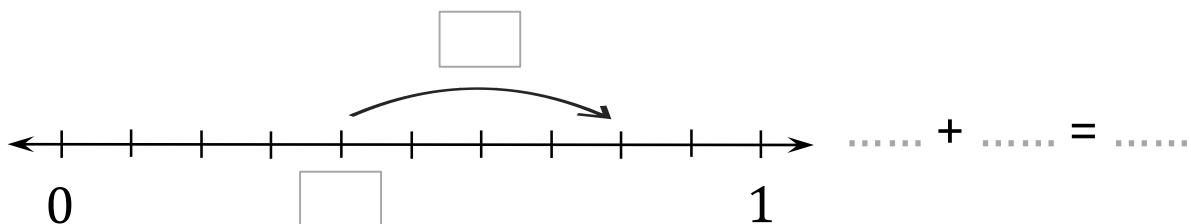
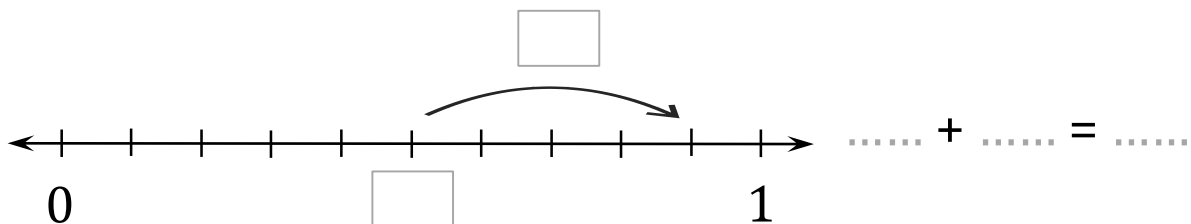
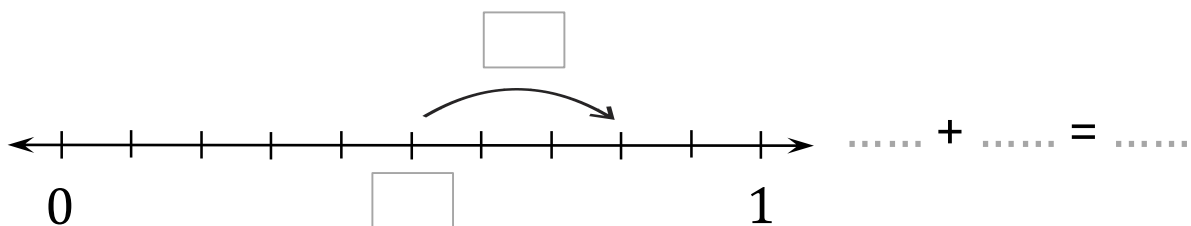
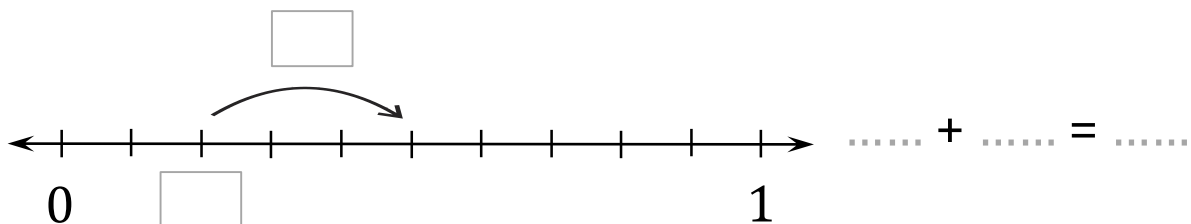
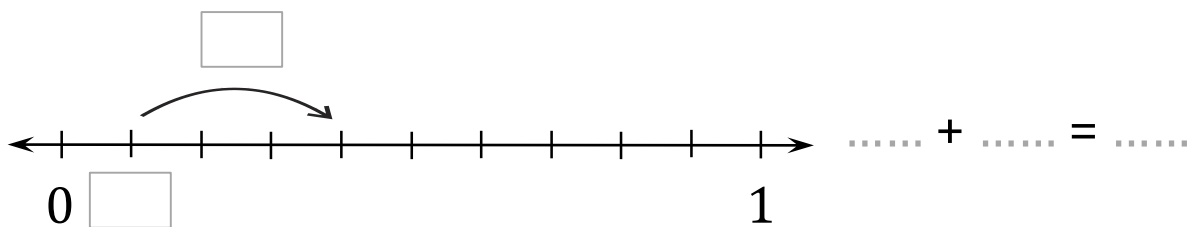
Fill the number line below:



Write addition equations below in fractions and decimal format:































































# Sample page



## Decimals: Place Values

Fill in the numbers below:

<i>1s place</i>	<i>.1s place</i>
0.1	
0.2	 
<input type="text"/>	  
<input type="text"/>	   
<input type="text"/>	    
<input type="text"/>	     
<input type="text"/>	      
<input type="text"/>	       
<input type="text"/>	        
 <input type="text"/>	<input type="text"/> 1.0
 <input type="text"/>	<input type="text"/> 1.1 
 <input type="text"/>	 
 <input type="text"/>	  
 <input type="text"/>	   

# Sample page

<i>1s place</i>			<i>.1s place</i>									
1	1.9	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
1 1	2.0											
1 1	2.1	.1										
1 1	<input type="text"/>	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
1 1 1	<input type="text"/>											
1 1 1	<input type="text"/>	.1										
1 1 1	<input type="text"/>	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
1 1 1 1	<input type="text"/>											
1 1 1 1	<input type="text"/>	.1										
1 1	2.4	.1	.1	.1	.1							
1 1 1 1	4.2	.1	.1									
1 1 1	<input type="text"/>	.1										
1	<input type="text"/>	.1	.1	.1								
1 1 1 1	<input type="text"/>	.1										
1	<input type="text"/>	.1	.1	.1	.1							
1 1 1	<input type="text"/>	.1	.1	.1								

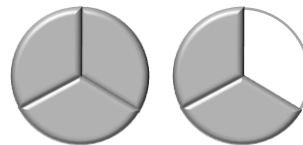


## Addition of Fractions

Fill in the blanks:



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



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



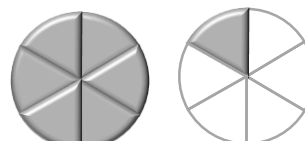
$$\frac{\square}{3} = \square$$



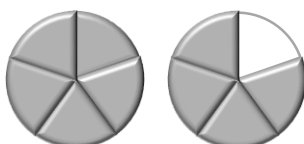
$$\frac{\square}{3} = \square \frac{\square}{\square}$$



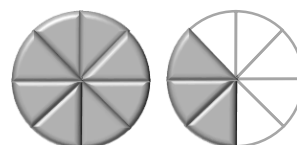
$$\frac{\square}{\square} = \square \frac{\square}{\square}$$



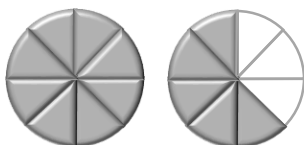
$$\frac{\square}{\square} = \square \frac{\square}{\square}$$



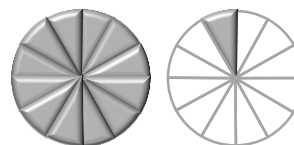
$$\frac{\square}{\square} = \square \frac{\square}{\square}$$



$$\frac{\square}{\square} = \square \frac{\square}{\square}$$

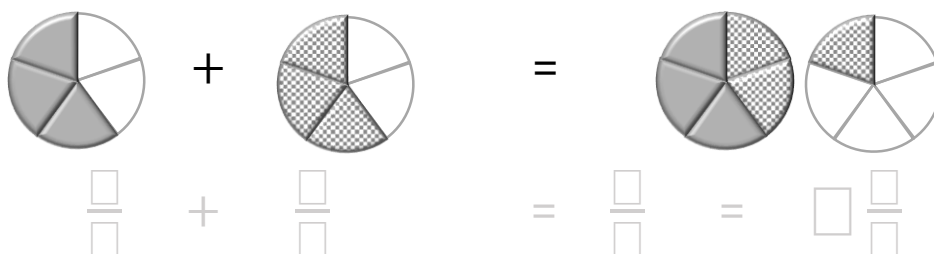
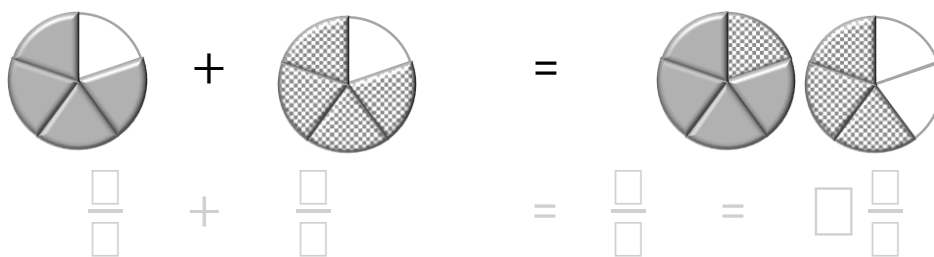
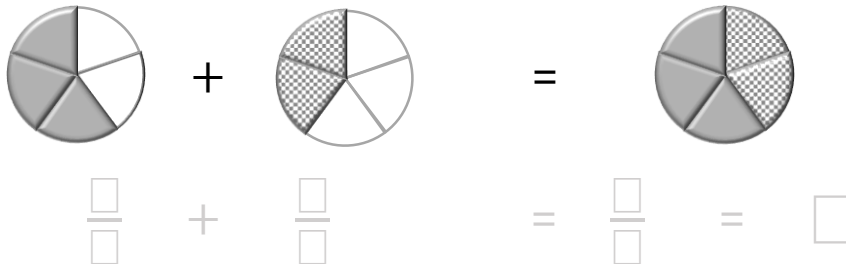
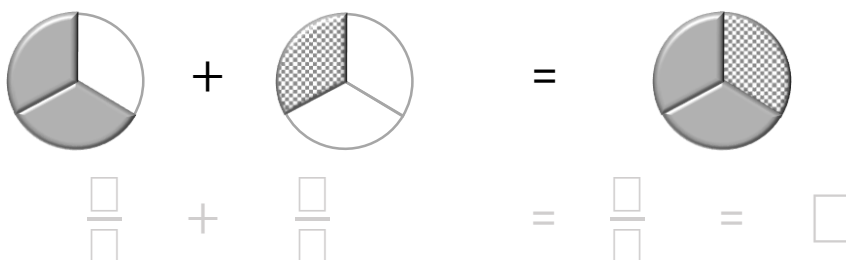
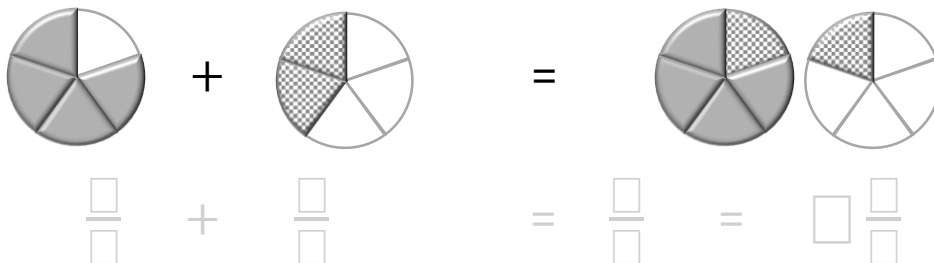
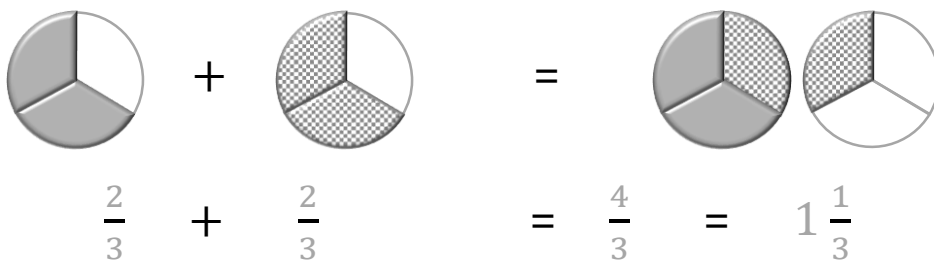


$$\frac{\square}{\square} = \square \frac{\square}{\square}$$



$$\frac{\square}{\square} = \square \frac{\square}{\square}$$

# Sample page



To the Teacher: Please ask the student to show few problems with tiles.

## Decimals – Decomposition

Decompose the following numbers:

$  \begin{array}{ccc}  1s & 0.1s & 0.01s \\  \downarrow & \downarrow & \downarrow \\  4.58 = 4 + 0.5 + 0.08  \end{array}  $	$  \begin{array}{ccc}  1s & 0.1s & 0.01s \\  \downarrow & \downarrow & \downarrow \\  1.68 = \dots + \dots + \dots  \end{array}  $
$3.56 = \dots + \dots + \dots$	$7.41 = \dots + \dots + \dots$
$3.01 = \dots + \dots + \dots$	$4.5 = \dots + \dots + \dots$
$0.78 = \dots + \dots + \dots$	$3.08 = \dots + \dots + \dots$
$6.08 = \dots + \dots + \dots$	$0.63 = \dots + \dots + \dots$
$0.52 = \dots + \dots + \dots$	$5.7 = \dots + \dots + \dots$
$4.07 = \dots + \dots + \dots$	$2.09 = \dots + \dots + \dots$
$2.01 = \dots + \dots + \dots$	$0.64 = \dots + \dots + \dots$
$0.86 = \dots + \dots + \dots$	$7.4 = \dots + \dots + \dots$
$3.08 = \dots + \dots + \dots$	$3.04 = \dots + \dots + \dots$
$6.3 = \dots + \dots + \dots$	$0.73 = \dots + \dots + \dots$

### Sample page

Compose a number by adding numbers below:

$4 + 0.3 + 0.07 = \dots\dots\dots$

$1 + 0.3 + 0.04 = \dots\dots\dots$

$6 + 0.3 = \dots\dots\dots$

$0.4 + 0.02 = \dots\dots\dots$

$0.7 + 0.03 = \dots\dots\dots$

$5 + 0.3 = \dots\dots\dots$

$6 + 0.03 = \dots\dots\dots$

$3 + 0.06 = \dots\dots\dots$

$5 + 0.2 + 0.06 = \dots\dots\dots$

$7 + 0.8 + 0.08 = \dots\dots\dots$

$0.7 + 0.04 = \dots\dots\dots$

$3 + 0.3 = \dots\dots\dots$

$8 + 0.2 = \dots\dots\dots$

$0.7 + 0.02 = \dots\dots\dots$

$5 + 0.04 = \dots\dots\dots$

$1 + 0.07 = \dots\dots\dots$

$4 + 0.8 = \dots\dots\dots$

$0.6 + 0.03 = \dots\dots\dots$

$0.5 + 0.01 = \dots\dots\dots$

$3 + 0.5 = \dots\dots\dots$

$3 + 0.02 = \dots\dots\dots$

$7 + 0.01 = \dots\dots\dots$

$8 + 0.4 + 0.06 = \dots\dots\dots$

$4 + 0.2 + 0.05 = \dots\dots\dots$

$0.7 + 0.06 = \dots\dots\dots$

$8 + 0.1 = \dots\dots\dots$

$4 + 0.8 = \dots\dots\dots$

$0.3 + 0.08 = \dots\dots\dots$

$8 + 0.04 = \dots\dots\dots$

$7 + 0.06 = \dots\dots\dots$

$2 + 0.6 = \dots\dots\dots$

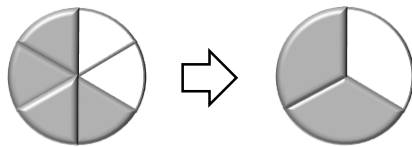
$0.5 + 0.04 = \dots\dots\dots$

To the Teacher: (1) Material needed: Decimals chips for 1s, 0.1s, 0.01s (2) Please ask the student to pick chips making following numbers sequentially (one at a time): 1, 0.1, 0.01, 6, 0.6, 0.06, 3, 0.3, 0.03, 0.8, 8, 0.08, 5, 0.5, 0.05, 0.7, 0.07, 7, 0.02, 2, 0.2, 4, 0.4, 0.04 (2) Please ask to show few numbers on this page with chips.

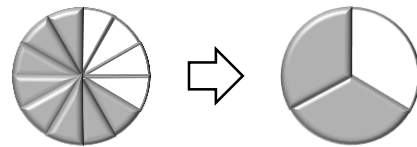
## Expansion/Reduction of Fractions

Value of a fraction remains same after multiplying or dividing its numerator and denominator by the same number.

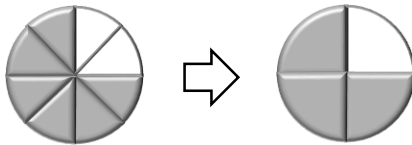
Fill in the blanks below. Show with circular tiles.



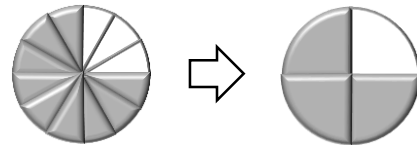
$$\frac{4}{6} \xrightarrow{\div 2} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div 2}$$



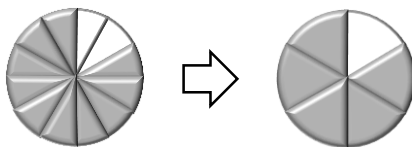
$$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}}$$



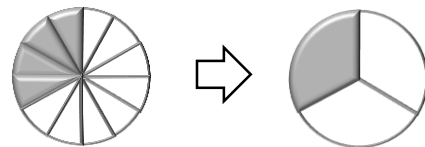
$$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}}$$



$$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}}$$



$$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}}$$



$$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}} \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \xrightarrow{\div \boxed{\phantom{00}}}$$

To the Teacher: After solving few problems of reduction, please ask the student to show them with circular tiles.

# Sample page

Fill in the blanks by multiplying or dividing numerator and denominator by the same number.

$\frac{3}{4} = \frac{6}{8}$	$\frac{10}{12} = \frac{\square}{6}$	$\frac{4}{12} = \frac{\square}{3}$	$\frac{3}{4} = \frac{\square}{8}$
$\frac{2}{12} = \frac{\square}{6}$	$\frac{2}{5} = \frac{\square}{10}$	$\frac{2}{5} = \frac{\square}{15}$	$\frac{4}{5} = \frac{\square}{10}$
$\frac{8}{12} = \frac{\square}{3}$	$\frac{5}{6} = \frac{\square}{12}$	$\frac{4}{10} = \frac{\square}{5}$	$\frac{6}{8} = \frac{\square}{4}$
$\frac{6}{10} = \frac{\square}{5}$	$\frac{9}{12} = \frac{\square}{4}$	$\frac{8}{10} = \frac{\square}{5}$	$\frac{4}{6} = \frac{\square}{3}$
$\frac{3}{5} = \frac{\square}{10}$	$\frac{2}{3} = \frac{\square}{6}$	$\frac{2}{3} = \frac{\square}{12}$	$\frac{3}{4} = \frac{\square}{12}$

Reduce the fraction to its lowest denominator by dividing numerator and denominator by the same number.

$\frac{4}{6} = \frac{2}{3}$	$\frac{8}{12} = \frac{\square}{\square}$	$\frac{4}{8} = \frac{\square}{\square}$	$\frac{8}{10} = \frac{\square}{\square}$
$\frac{2}{12} = \frac{\square}{\square}$	$\frac{9}{12} = \frac{\square}{\square}$	$\frac{2}{8} = \frac{\square}{\square}$	$\frac{4}{10} = \frac{\square}{\square}$
$\frac{6}{15} = \frac{\square}{\square}$	$\frac{6}{10} = \frac{\square}{\square}$	$\frac{2}{12} = \frac{\square}{\square}$	$\frac{6}{15} = \frac{\square}{\square}$
$\frac{8}{10} = \frac{\square}{\square}$	$\frac{2}{8} = \frac{\square}{\square}$	$\frac{4}{10} = \frac{\square}{\square}$	$\frac{9}{12} = \frac{\square}{\square}$
$\frac{10}{12} = \frac{\square}{\square}$	$\frac{6}{8} = \frac{\square}{\square}$	$\frac{6}{10} = \frac{\square}{\square}$	$\frac{8}{12} = \frac{\square}{\square}$

## Addition with unlike denominators

Add the following fractions after expanding to least common denominators:

$$\frac{2}{3} + \frac{1}{4} \xrightarrow{\text{Multiples of denominators}} \begin{array}{l} 3, 6, 9, \textcircled{12}, 15, 18, 21, 24, 27 \\ 4, 8, \textcircled{12}, 16, 20, 24, 28 \end{array}$$


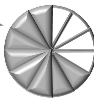


↓

$$\frac{2}{3} = \frac{\square}{12}, \quad \frac{1}{4} = \frac{\square}{12}$$

$$= \frac{\square}{\square} + \frac{\square}{\square}$$

$$= \frac{\square}{\square}$$

Interpret the addition with place value frame:

Place values →	$\frac{1}{2}$ s place	$\frac{1}{3}$ s place	$\frac{1}{4}$ s place	$\frac{1}{6}$ s place	$\frac{1}{12}$ s place	$\frac{1}{15}$ s place
		 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>			 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>	
			 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>		 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>	

To the Teacher: Please ask the student to perform the following activities with circular chips:

- (1) Select two tiles of  $\frac{1}{3}$ s and one tile of  $\frac{1}{4}$ s as per the problem.
- (2) Exchange tiles of  $\frac{1}{3}$ s for the tiles of the common denominator (i.e.  $\frac{1}{12}$ s in the above problem)
- (3) Exchange tiles of  $\frac{1}{4}$ s for the tiles of the common denominator (i.e.  $\frac{1}{12}$ s in the above problem)
- (4) How much is the total? Is it same as the answer?

Add the following fractions after expanding to least common denominators:

$$\frac{2}{3} + \frac{1}{6}$$

Multiples of denominators  $\rightarrow 3, 6, 9, 12, 15$   
 $6, 12, 18, 24$

$\downarrow$




$$\frac{2}{3} = \frac{\square}{\square}, \quad \frac{1}{6} = \frac{\square}{6}$$

$\leftarrow$

$$= \frac{\square}{\square} + \frac{\square}{\square}$$

$$= \frac{\square}{\square}$$

Interpret the addition with place value frame:

Place values $\rightarrow$	$\frac{1}{2}$ s place	$\frac{1}{3}$ s place	$\frac{1}{4}$ s place	$\frac{1}{6}$ s place	$\frac{1}{12}$ s place	$\frac{1}{15}$ s place
		 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>		 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>		
				 <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 5px auto;"></div>		

To the Teacher: Please ask student to perform the following activities with circular chips:

- (1) Select two tiles of  $\frac{1}{3}$ s and one tile of  $\frac{1}{6}$ s as per the problem.
- (2) Note that the tile of  $\frac{1}{6}$  need not be exchanged for anything because its denominator is the common denominator.
- (3) Exchange tiles of  $\frac{1}{3}$ s for the tiles of the common denominator (i.e.  $\frac{1}{6}$ s in the above problem)
- (4) How much is the total? Is it same as the answer?



# Sample page

$$\frac{1}{4} + \frac{2}{5} \xrightarrow{\text{Multiples of denominators}} 4, \dots\dots\dots$$

$$5, \dots\dots\dots$$

$$= \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} + \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$= \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$\frac{1}{4} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}, \quad \frac{2}{5} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

Place values →	$\frac{1}{2} s \text{ place}$	$\frac{1}{3} s \text{ place}$	$\frac{1}{4} s \text{ place}$	$\frac{1}{5} s \text{ place}$	$\frac{1}{12} s \text{ place}$	$\frac{1}{20} s \text{ place}$
			$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$	$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$		$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$
						$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$

$$\frac{2}{5} + \frac{3}{10} \xrightarrow{\text{Multiples of denominators}} 5, \dots\dots\dots$$

$$10, \dots\dots\dots$$

$$= \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}} + \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$= \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

$$\frac{2}{5} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}, \quad \frac{3}{10} = \frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$$

Place values →	$\frac{1}{2} s \text{ place}$	$\frac{1}{3} s \text{ place}$	$\frac{1}{4} s \text{ place}$	$\frac{1}{5} s \text{ place}$	$\frac{1}{8} s \text{ place}$	$\frac{1}{10} s \text{ place}$
				$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$		$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$
						$\frac{\boxed{\phantom{0}}}{\boxed{\phantom{0}}}$

# Sample page

$$\frac{1}{3} + \frac{3}{5} \xrightarrow{\text{Multiples of denominators}} \dots\dots\dots$$

$$= \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} + \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \quad \leftarrow \quad \frac{1}{3} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}, \quad \frac{3}{5} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$= \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

Place values →

$\frac{1}{2} s \text{ place}$	$\frac{1}{3} s \text{ place}$	$\frac{1}{4} s \text{ place}$	$\frac{1}{5} s \text{ place}$	$\frac{1}{12} s \text{ place}$	$\frac{1}{15} s \text{ place}$
	$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$		$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$		$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$
					$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$

$$\frac{1}{4} + \frac{3}{8} \xrightarrow{\text{Multiples of denominators}} \dots\dots\dots$$

$$= \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} + \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}} \quad \leftarrow \quad \frac{1}{4} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}, \quad \frac{3}{8} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

$$= \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$$

Place values →

$\frac{1}{2} s \text{ place}$	$\frac{1}{3} s \text{ place}$	$\frac{1}{4} s \text{ place}$	$\frac{1}{5} s \text{ place}$	$\frac{1}{8} s \text{ place}$	$\frac{1}{12} s \text{ place}$
		$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$		$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$	
				$\frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$	