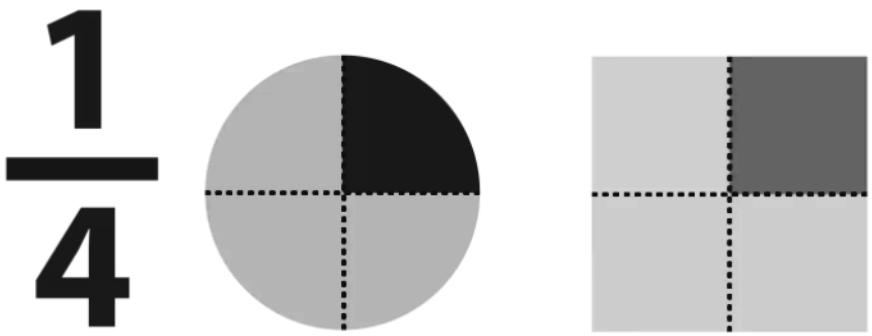


Fraction Frenzy

Schedule

Week 1 - Basic Operations
Week 2 - Sample Word Problems
Week 3 - Challenge Problem #1
Week 4 - Challenge Problem #2

Name: _____

What is a fraction?

definition - parts of a whole in equal pieces

Fractions are used everyday in many different ways! Some examples are:

sharing food *measurement* *splitting bills* *cooking*

business

travel *time* *medicine*

With fractions, we are thinking about when complete pieces are broken in equal parts. Think of when you break a chocolate into equals for you to share with your five friends. In that case, there are 6 total pieces and you would receive 1 out of 6 pieces of chocolate. The 1 out of 6, or ⅙, is what you would call a fraction.

Key Words

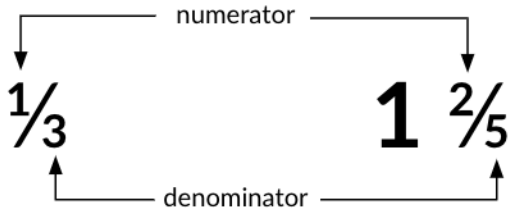
Before we start working on fraction problems, we need to know the words used to describe different parts of the fraction.

fraction - represents a part of a whole or, more generally, any number of equal parts

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

usually written like above

numerator - the top number in a fraction; how many parts we have or are focused on out of the total number of equal parts



denominator - the bottom number in a fraction; how many equal parts the item is divided into

proper fraction - fraction where the top number is less than the bottom number

$\frac{2}{5}$

improper fraction - fraction where the top number is equal to or greater than the bottom number $\frac{7}{4}$

equivalent fraction - fractions that are equal to the same value, even though they may look different

Note: we will go over this in detail later

$\frac{1}{2} = \frac{2}{4} = \frac{5}{10} = \frac{50}{100}$

a group of equivalent fractions

mixed fractions & mixed numbers - a whole number (ex- 1, 8, 99) and a proper fraction combined $2\frac{1}{3}$

2 ⅓ is a mixed fraction that could happen when someone gives you 2 whole chocolates and 1 piece from another chocolate broken into 3 equal pieces

reciprocal - 1 divided by the original number, with fractions we "flip" the top and bottom $2 \rightarrow \frac{1}{2}$ $\frac{1}{4} \rightarrow 4$

Note: we will go over this in detail later

Fraction Operations

Simplification

If fractions are equivalent or equal, at the end of **simplification**, the fractions will reach the same number.

For example, to simplify $\frac{4}{16}$

1.	Rewrite the numerator (top) and the denominator (bottom) as the multiple of the same number.	*Round 1* $\frac{4}{16} \rightarrow \frac{2 \times 2}{2 \times 8}$	*Round 2* $\frac{2}{8} \rightarrow \frac{2 \times 1}{2 \times 4}$
2.	Remove the shared multiple. If there is a multiple that is not '1', repeat Step 1. If not, go to Step 3.	*Round 1* $\frac{\cancel{2} \times 2}{\cancel{2} \times 8} \rightarrow \frac{2}{8}$ We <u>can</u> remove '2' from the numerator and denominator	*Round 2* $\frac{\cancel{2} \times 1}{\cancel{2} \times 4} \rightarrow \frac{1}{4}$ We <u>cannot</u> remove a shared multiple
3.	This is the simplified fraction.	The simplified fraction of $\frac{4}{16}$ is $\frac{1}{4}$	

Equivalent Fractions

To see if two or more fractions are equivalent, simplify all fractions. The fractions with the same simplified fraction are equal.

Working with Mixed Fractions

When adding (+), subtracting (-), multiplying (×), or dividing (÷) fractions, you need to convert all fractions from mixed fractions to improper or proper fractions.

For example, to covert $3\frac{2}{5}$

1.	Multiply the whole number by the denominator.	$3\frac{2}{5}$ $3 \times 5 = 15$
2.	Add the calculated value to numerator.	$\frac{2+15}{5} = \boxed{\frac{17}{5}}$

Adding & Subtracting Fractions

We need to be able to add and subtract fractions in order to combine different amounts. Later on, we will see how we can use addition and subtraction to solve fun problems.

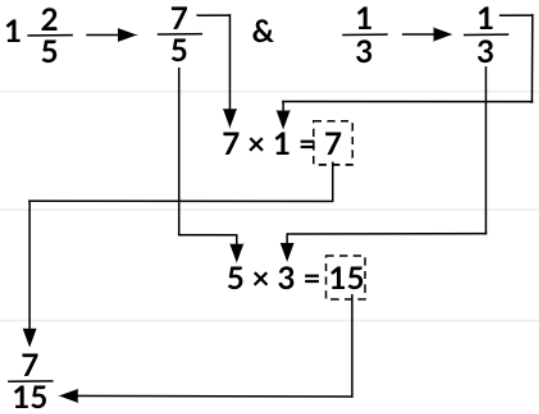
For example, to do $2\frac{3}{5} + 1\frac{1}{3}$

1.	Convert all fractions to improper fractions. *(see 'Working with Mixed Fractions' for details)*	$2\frac{3}{5} \rightarrow \frac{13}{5}$ & $1\frac{1}{3} \rightarrow \frac{4}{3}$
2.	Find the lowest common multiple for the denominators.	5: 5, 10, (15), 20, 25, 30, 35, 40, 45, ... 3: 3, 6, 9, 12, (15), 18, 21, 24, 27, 30, ...
3.	Convert the fractions to have the same denominator.	$5 \times 3 = 15$ → $\frac{13 \times 3}{5 \times 3}$ → $\frac{39}{15}$ $3 \times 5 = 15$ → $\frac{4 \times 5}{3 \times 5}$ → $\frac{20}{15}$
4.	Combine the fractions by adding the numerators.	$\frac{39}{15} + \frac{20}{15} = \frac{39+20}{15} = \boxed{\frac{59}{15}}$

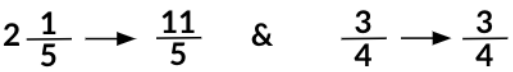
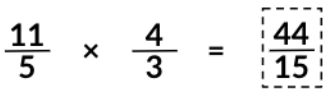
Multiplying & Dividing Fractions

Multiplying is used when we add many groups with the same number of items and dividing is used to share or split.

For example, to do $1\frac{2}{5} \times \frac{1}{3}$

1.	Convert all fractions to improper fractions. *(see 'Working with Mixed Fractions' for details)*	
2.	Multiply the numerators of both fractions. The lowest common multiple is not needed.	
3.	Multiply the denominators of both fractions.	
4.	Create the new fraction from the answers in Step 3 & 4.	

For example, to do $2\frac{1}{5} \div \frac{3}{4}$

1.	Convert all fractions to improper fractions. *(see 'Working with Mixed Fractions' for details)*	
2.	Flip the numerator and denominator of the dividing fraction.	
3.	Multiply the first fraction by the result from Step 2. *(see above for details)*	

Week I - Practice Questions

Adding & Subtracting Fractions

For example, to do $1\frac{3}{4} - \frac{4}{7}$

1.	Convert all fractions to improper fractions. *(see 'Working with Mixed Fractions' for details)*	$1\frac{3}{4} \rightarrow \frac{7}{4}$ & $\frac{4}{7} \rightarrow \frac{4}{7}$
2.	Find the lowest common multiple for the denominators.	7: 7, 14, 21, (28), 35, 42, 49, 56, 63, ... 4: 4, 8, 12, 16, 20, 24, (28), 32, 36, 40, ...
3.	Convert the fractions to have the same denominator.	$4 \times 7 = 28$ → $\frac{7 \times 7}{4 \times 7} = \frac{49}{28}$ $7 \times 4 = 28$ → $\frac{4 \times 4}{7 \times 4} = \frac{16}{28}$
4.	Combine the fractions by adding the numerators.	$\frac{49}{28} - \frac{16}{28} = \frac{49 - 16}{28} = \frac{33}{28}$
5.	Simplify the fractions by removing whole multiples of the denominator.	$\frac{33}{28} = \frac{(1 \times 28) + 5}{28} = 1\frac{5}{28}$

Multiplying & Dividing Fractions

For example, to do $4\frac{5}{6} \div 1\frac{2}{5}$

1.	Convert all fractions to improper fractions. *(see 'Working with Mixed Fractions' for details)*	$4\frac{5}{6} \rightarrow \frac{29}{6}$ & $1\frac{2}{5} \rightarrow \frac{7}{5}$
2.	Flip the numerator and denominator of the dividing fraction.	$\frac{7}{5} \rightarrow \frac{5}{7}$
3.	Multiply the first fraction by the result from Step 2.	$\frac{29}{6} \times \frac{5}{7} = \frac{145}{42}$
4.	Simplify the fractions by removing whole multiples of the denominator.	42: 42 (1 × 42), 84 (2 × 42), 126 (3 × 42), 168 (4 × 42), 210 (5 × 42), ... 126 (3 × 42) is the largest multiple that is not greater than the numerator. $145 = (3 \times 42) + (145 - 126) = (3 \times 42) + 19$ $\frac{145}{42} = \frac{(3 \times 42) + 19}{42} = 3\frac{19}{42}$

Real World Examples

Addition & Subtraction Word Problems

Question

Uzoma bought a bottle of Coke at the store on Monday. That day, Uzoma drank ⅖ of the bottle. On Tuesday, Uzoma drank another ⅓ of the original full amount. On Wednesday, how much of the bottle is left for Uzoma to drink?

Steps

1.	Confirm what we need to calculate.	The amount left in the bottle Uzoma can still drink.
2.	Write the pieces of information we need.	How much did we start with? *The entire bottle.* How much did Uzoma drink? *The amount Uzoma drank on Monday and Tuesday.* Since we are told the amount Uzoma drank is given to us as fractions, we can think of the starting amount as $^1/_1$ because we start with the entire amount out of the original bottle. We could also think of the starting amount as $^2/_2$ $^5/_5$, or even $^{59}/_{59}$ but we need to multiply by the fractions in the problem by either the numerator or denominator.
3.	Calculate the amount of Coke Uzoma drank on Monday and Tuesday.	Uzoma drank $^2/_5$ on Monday and $^1/_3$ on Tuesday, so the total amount Uzoma drank is $^2/_5 + ^1/_3$. To add $^2/_5 + ^1/_3$, we need to follow the process from Week 1. 5: 5, 10, (15) ... $\frac{2}{5} = \frac{2\times3}{5\times3} = \frac{6}{15}$ 3: 3, 6, 9, 12, (15) ... $\frac{1}{3} = \frac{1\times5}{3\times5} = \frac{5}{15}$ $\frac{6}{15} + \frac{5}{15} = \frac{6+5}{15} = \frac{11}{15}$
4.	Calculate the amount of Coke left in the bottle.	If Uzoma started with $^1/_1$ of a bottle and drank $^{11}/_{15}$, then $^1/_1 - ^{11}/_{15}$ would give us the amount of Coke in the bottle Uzoma can drink. $\frac{1}{1} = \frac{1\times15}{1\times15} = \frac{15}{15}$ $\frac{15}{15} - \frac{11}{15} = \frac{15-11}{15} = \boxed{\frac{4}{15}}$
5.	Write the answer to the problem.	Uzoma started with $^1/_1$ and drank $^{11}/_{15}$. From $^1/_1 - ^{11}/_{15}$, we know Uzoma has $^4/_{15}$ of the bottle left to drink.

Real World Examples

Multiplication & Division Word Problems

Question

Ayo bought a bag of rice. The bag weighed ⅓ of a kilogram (kg). Ayo and 2 friends equally split the rice between all 3 of them. How much rice did each person get?

Steps

1.	Confirm what we need to calculate.	How much rice did each person get?
2.	Write the pieces of information we need.	How much did we start with? *The entire weight of the bag.* How many equal portions are we creating? *3 portions because Ayo and 2 friends are equally sharing.* Since Ayo and 2 friends are sharing the original amount into equal pieces, we need to divide the original amount of rice by the number of portions.
3.	State the amount of rice being shared.	The problem tells us there was $^1/_3$ of a kilogram (kg) of rice to be shared.
4.	Calculate the amount of rice each person receives.	If there is $^1/_3$ of a kilogram (kg) of rice for 3 people to equally share, then each person receives $^1/_3 \div 3$. To divide, we need to multiply by the reciprocal of 3 (see Week 1 for help). $\frac{1}{3} \div 3 = \frac{1}{3} \times \frac{1}{3} = \frac{1 \times 1}{3 \times 3} = \boxed{\frac{1}{9}}$
5.	Write the answer to the problem.	From $^1/_3 \div 3$, we know each person receives $^1/_9$ of a kilogram (kg) of rice.

Name: _____ ID: _____

Class: _____

Challenge Question #1

Question

You are having a party for you and 9 friends and want to serve akara. You expect each of the 10 people to eat 3 pieces. To make akara, you need $^{1}/_{7}$ kilogram (kg) of beans for each piece. At home, you only have $2\ ^{1}/_{7}$ kilogram (kg) of beans. How much beans do you need to buy in order to make enough akara for everyone (as a fraction)?

Challenge Question #1

Question

You are having a party for you and 9 friends and want to serve akara. You expect each of the 10 people to eat 3 pieces. To make akara, you need $^1/_7$ kilogram (kg) of beans for each piece. At home, you only have $2\ ^1/_7$ kilogram (kg) of beans. How much beans do you need to buy in order to make enough akara for everyone (as a fraction)?

1.	Confirm what we need to calculate.	How many more kilograms (kg) of beans do I need to buy to make enough akara?
2.	Write the pieces of information we need.	To know how many beans we need to buy, we need to know *how many beans we need to make enough akara*. To know how many beans we need to make enough akara, we need to know *how many beans are used for each person*.
3.	Create a plan to solve the problem.	1. Find the amount of beans needed for each person 2. Calculate the total amount of beans we need for everyone 3. Calculate the amount of beans we need to buy
4.	Find the amount of beans needed for each person.	beans per person = (beans per single piece of akara) × (pieces of akara per person) beans per person = ($^1/_7$ kg of beans) × (3 pieces) beans per person = $\frac{1}{7} \times 3 = \frac{1}{7} \times \frac{3}{1} = \frac{1 \times 3}{7 \times 1} = \frac{3}{7}$ beans per person = $\frac{3}{7}$
5.	Calculate the total amount of beans we need for everyone.	total beans needed = (beans per person) × (number of people) number of people = You + 9 friends = (1 person) + (9 people) = 10 people total beans needed = $\frac{3}{7} \times 10 = \frac{3}{7} \times \frac{10}{1} = \frac{3 \times 10}{7 \times 1} = \frac{30}{7}$
6.	Calculate the amount of beans we need to buy.	amount to buy = (total beans needed) - (amount of beans currently have) amount of beans currently have = $2\frac{3}{5}$ (Convert to improper fraction) $\rightarrow \frac{13}{5}$ amount to buy = $\frac{30}{7} - \frac{13}{5} = \frac{150}{35} - \frac{35}{35} = \frac{150 - 35}{35} = \frac{85}{35}$
7.	Write the answer to the problem.	We need to buy an additional $\frac{85}{35}$ kg of beans. *check 'Tips' on how to simplify the answer to get the final form of $2\frac{3}{7}$

Name: _____ ID: _____

Class: _____

Challenge Question #2

Question

Your parents bring home okra from the farm. You and your family split the okra evenly into 20 bags. Your parents give you the 20 bags to sell at the market and want you to return with ₦17,000. Between 9AM and 12PM, you sell ⅗ of the bags you were given for ₦900. Between 12PM and 6PM, you sell another ¼ of the original amount of bags you were given for ₦875. Before going home at 9PM, how much more money do you need to make to still reach ₦17,000?

Challenge Question #2

Question

Your parents bring home okra from the farm. You and your family split the okra evenly into 20 bags. Your parents give you the 20 bags to sell at the market and want you to return with ₦17,000. Between 9AM and 12PM, you sell ⅗ of the bags you were given for ₦900. Between 12PM and 6PM, you sell another ¼ of the original amount of bags you were given for ₦875. Before going home at 9PM, how much more money do you need to make to still reach ₦17,000?

1.	Confirm what we need to calculate.	The amount you can sell each bag of okra for and still reach the target amount of money to take home.
2.	Write the pieces of information we need.	To know how much money you can sell each bag of okra for, you need to know *how much more money you need and how many more bags you have*. To know how much more money you need, you need to know *how much money you have already made*. To know how many more bags you have, you need to know *how many bags you have already sold*.
3.	Create a plan for the problem.	1. Find the amount of bags we sold in each time period (9AM to 12PM and 12PM to 6PM) 2. Find the total amount of money we've made so far 3. Calculate the number of bags left to sell 4. Calculate the amount of money we still need to make 5. Find the price per bag
4.	Find the amount of bags we sold in each time period.	bags sold = (fraction of all bags sold) × (total of bags) *9AM to 12PM* bags sold = $\frac{3}{5} \times 20 = \frac{60}{5}$ bags sold = **12** *12PM to 6PM* bags sold = $\frac{1}{4} \times 20 = \frac{20}{4}$ bags sold = **5**
5.	Find the total amount of money we've made so far.	money made = (bags sold) × (price per bag) *9AM to 12PM* money made = **12 × ₦900** money made = **₦10,800** *12PM to 6PM* money made = **5 × ₦875** money made = **₦4,375**
6.	Calculate the number of bags left to sell.	bags left = (starting amount of bags) - (bags sold between 9AM and 12PM) - (bags sold between 12PM and 6PM) bags left = **20 - 12 - 5 = 3**

7.	Calculate the amount of money we still need to make.	money to still make = (target amount) - (money made between 9AM and 12PM) - (money made between 12PM and 6PM) money to still make = **₦17,000 - ₦10,800 - ₦4,375** money to still make = **₦1,825**

Bonus!

If you wanted to find out how much each to sell each bag of okra for, read the steps below.

1.	Find the price per bag.	price per bag = (money to still make) ÷ (remaining bags) price per bag = **₦1,825 ÷ 3 = ₦608** $\frac{1}{3}$ **≈ ₦608.33** With long division, we are able to simplify to a mixed fraction. Since we want to come home with ₦17,000 or more, we round ₦608.33 to ₦608.34 to make sure we reach or pass the target.
2.	Write the answer to the problem.	We need to sell the last 3 bags for at least ₦608.34.