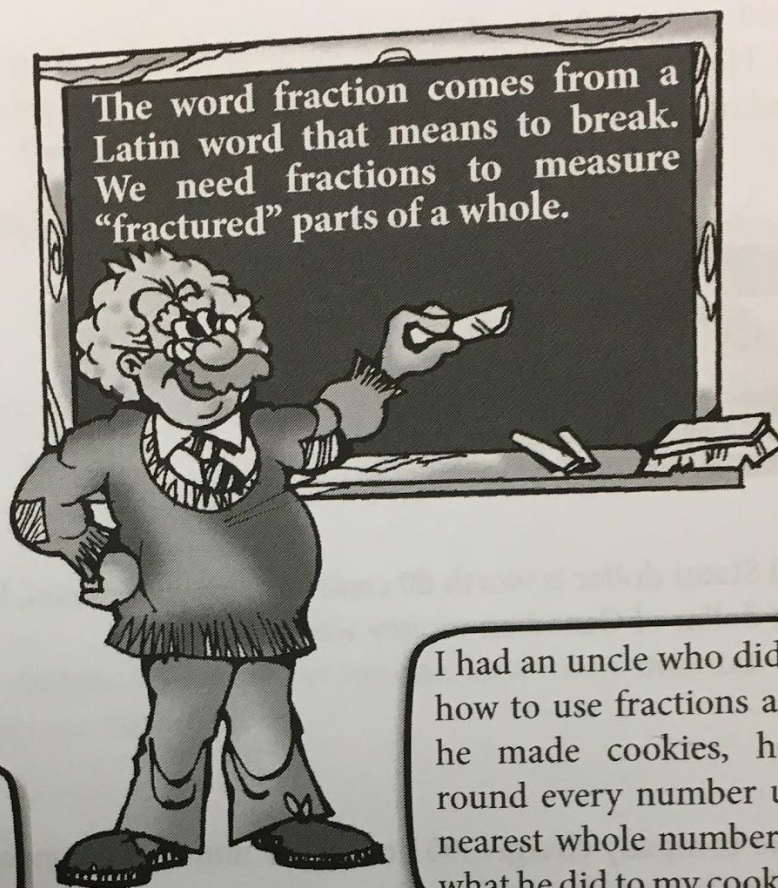


Chapter Six

Fractions



It would be great for math students if every measurement ended up being a whole number.



Best Cookie Recipe

Oats	2 cups
Baking powder	$\frac{1}{8}$ tablespoon
Banana	$\frac{1}{2}$ of whole
Sugar	$\frac{3}{8}$ cup
Applesauce	$\frac{3}{8}$ cup
Butter	$\frac{5}{8}$ stick
Raisins	1 cup

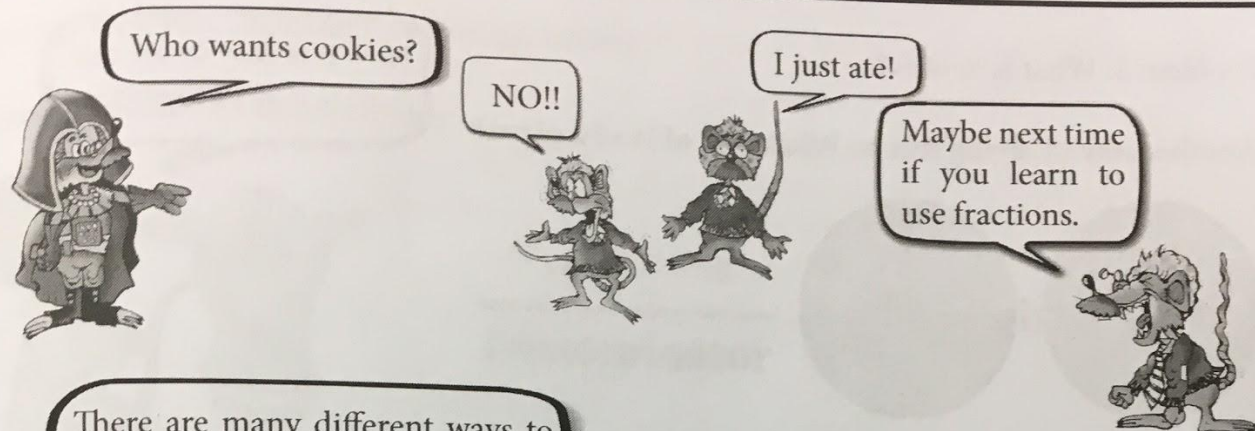


I had an uncle who didn't know how to use fractions and when he made cookies, he would round every number up to the nearest whole number. Look at what he did to my cookie recipe!



Best Cookie Recipe By My Uncle

Oats	2 cups
Baking powder	1 tablespoon
Banana	1 whole
Sugar	1 cup
Applesauce	1 cup
Butter	1 stick
Raisins	1 cup



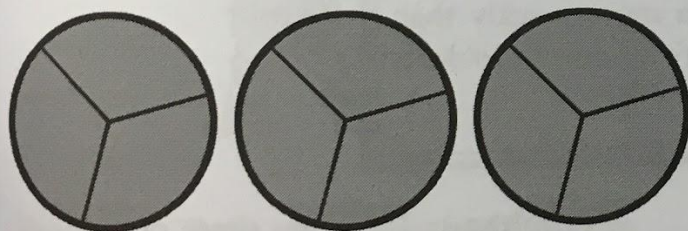
There are many different ways to work with fractions. The first way is called "Pizza and Pondering".



I get it! Pondering means thinking, so you are supposed to think about pizzas and fractions.

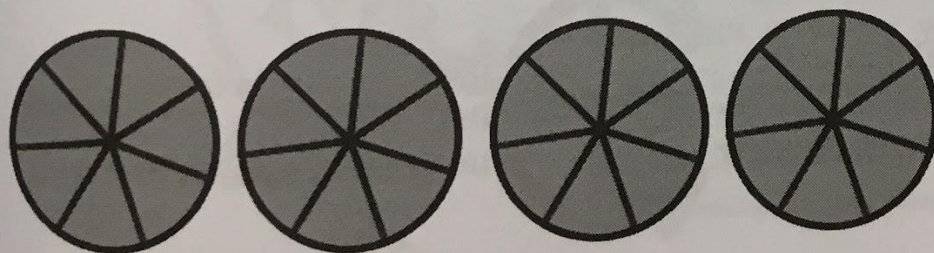


Problem 1: There are three pizzas and 9 people. How much pizza will each person receive? After drawing the pizzas, it is pretty easy to see that each person will get $\frac{1}{3}$ pizza.



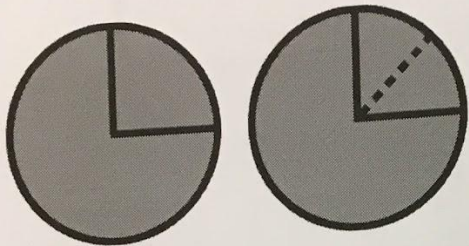
Each person receives $\frac{1}{7}$ of each pizza for a total of $\frac{4}{7}$ of a pizza. Fractions seem pretty easy!

Problem 2: There are 4 pizzas and 7 people. How much pizza will each person receive? Because there are 7 people, divide each pizza into 7 pieces.



Problem 3: What is $\frac{1}{2}$ of $\frac{1}{4}$?

Another way of saying this is: What is $\frac{1}{2}$ of $\frac{1}{4}$ of a pizza?



Now it is easy to see that $\frac{1}{2}$ of $\frac{1}{4}$ = $\frac{1}{8}$ of the pizza.

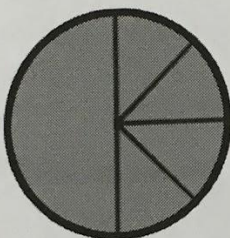


Problem 4: What is $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{1}{2}$?

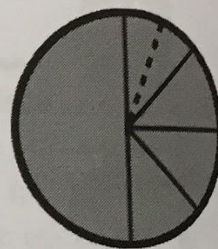
Another way of saying this is: What is $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{1}{2}$ of a pizza?

First step: $\frac{1}{4}$ of $\frac{1}{2}$.

When you divide the pizza in half, it is easy to see that $\frac{1}{4}$ of $\frac{1}{2}$ of the pizza is equal to $\frac{1}{8}$ of the pizza.



Now we need to find what is $\frac{1}{2}$ of the $\frac{1}{8}$ of the pizza. It is $\frac{1}{16}$ of the pizza.

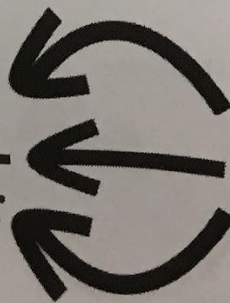


The next way to work with fractions is called "*Stupendous Shortcuts*". This method still requires thinking, but it allows you to solve fraction problems much more quickly than when you draw pictures of pizzas. Let's do our 4 problems again using "*Stupendous Shortcuts*".

Before we solve the problem, we need to look at the parts of a fraction.



Numerator
Denominator



This is the top of a fraction
This is the line and it means divide
This is the bottom of a fraction

Problem 1: There are three pizzas and 9 people. How much pizza will each person receive?

This part is very, very important! A fraction means:

Numerator divided by denominator

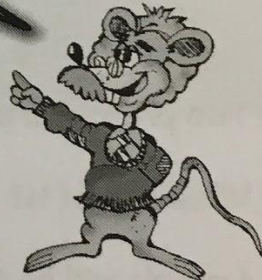


$$\frac{\text{Numerator}}{\text{Denominator}}$$
 ← Divided by

Let's turn the problem into a fraction. Because we are dividing the 3 pizzas, it goes on the top of the fraction.

$$\frac{3 \text{ pizzas}}{9 \text{ people}}$$
 ← Divided by

That makes the problem very easy! Each person gets $\frac{3}{9}$ of a pizza. Because $\frac{3}{9} = \frac{1}{3}$, we can answer that each person will receive $\frac{1}{3}$ of the pizza.



Problem 2: There are 4 pizzas and 7 people.
How much pizza will each person receive?

$$\frac{4 \text{ pizzas}}{7 \text{ people}}$$
 ← Divided by



You're right -- It makes the problem very easy when you use the stupendous shortcut method! Each person gets $\frac{4}{7}$ of a pizza.



Problem 3 is a little different type of problem. Whenever you are taking a fraction of something, such as $\frac{1}{2}$ of $\frac{1}{4}$, all you need to do is multiply the fractions. To do this, multiply the numerator by the numerator and the denominator by the denominator.

$\frac{1}{2}$ of $\frac{1}{4}$ means $\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

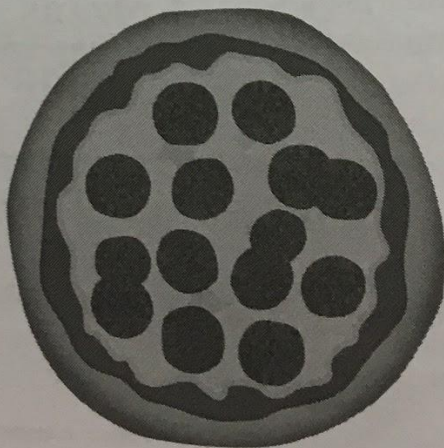
$$\frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

Problem 4: What is $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{1}{2}$?

$$\frac{1}{2} \times \frac{1}{4} \times \frac{1}{2} = \frac{1}{16}$$

In the following problems, use both methods of fraction problem solving:
Pizza Pondering and Stupendous Shortcuts.

- 1) Two pizzas will be shared by 9 people. How much pizza will each person receive?
- 2) What is $\frac{1}{8}$ of $\frac{1}{4}$?
- 3) 4 people will be dividing $\frac{1}{2}$ of a pizza. How much pizza will each receive?



Problem Set 1

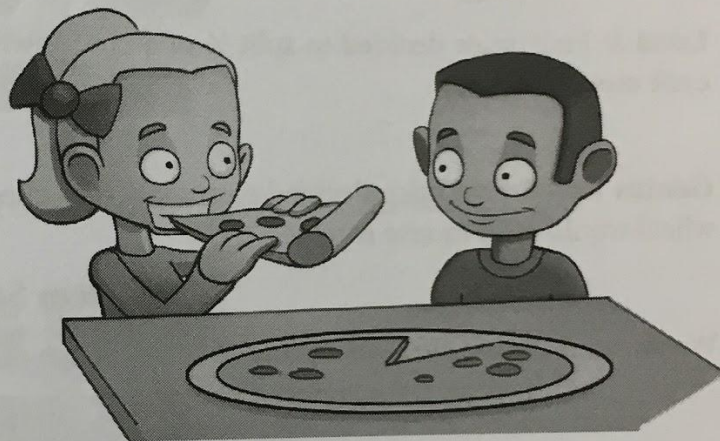
Warmup: There were 2 pizzas to feed 4 people. How much pizza would each person receive?

Level 1: There were 5 pizzas for 20 people. How much pizza would each person receive?

Level 2: There were 8 pizzas for 48 people. How much pizza does each person receive?

Level 3: There were 3 pizzas and 5 people. How much pizza would each person receive?

Genius Level: If there are $4\frac{1}{2}$ pizzas for 36 people, how much pizza will each person receive?

**Problem Set 2**

Warmup: What is $\frac{1}{2}$ of $\frac{1}{2}$?

Level 1: What is $\frac{1}{4}$ of $\frac{1}{2}$?

Level 2: What is $\frac{1}{4}$ of $\frac{1}{4}$?

Level 3: What is $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{2}$?

Genius Level: What is $\frac{1}{2}$ of $\frac{1}{4}$ of $\frac{1}{8}$?

Problem Set 3

Warmup: $2\frac{1}{2}$ pies will be divided between 2 people. How much pie will each person receive?

Level 1: Two friends will be splitting $\frac{1}{5}$ of a pie. How much of the pie will each friend receive?

Level 2: 3 friends will be splitting $\frac{1}{2}$ of a pie. How much of the pie will each friend receive?

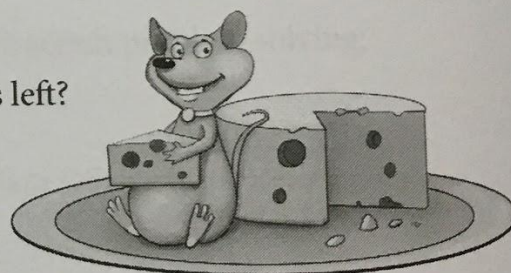


Level 3: Four mice decided to split $\frac{1}{3}$ of a cheese wheel. What part of a whole cheese wheel will each mouse receive?

Genius Level: Five mice decided to split $\frac{2}{3}$ of a cheese wheel. How much of a complete cheese wheel would each mouse receive?

Problem Set 4

Warmup: A mouse ate $\frac{7}{8}$ of a piece of cheese. How much is left?



Level 1: Abe ate $\frac{3}{4}$ of a pie. His two friends split the rest. How much of the pie did each friend eat?

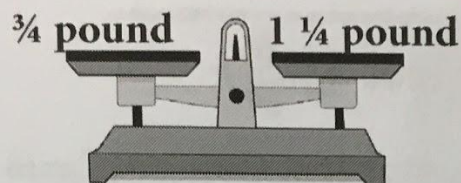
Level 2: Franklin's pet snail weighs $1\frac{3}{8}$ ounces and his friend's snail weighs $1\frac{1}{16}$ ounces. What is the weight of both snails?

Level 3: Dwight ate $\frac{1}{2}$ of a pie while John ate $\frac{1}{4}$ of the pie. Lyndon ate $\frac{1}{8}$ of the pie and Richard ate $\frac{1}{16}$. How much of the pie is left?

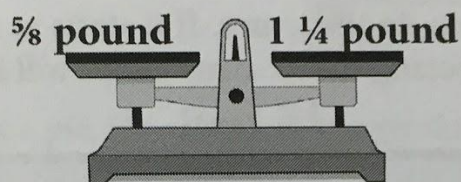
Genius Level: Gerald ate $1\frac{5}{16}$ of a candy bar and 3 friends split the rest. What fraction of the candy bar did each of the three eat?

Problem Set 5

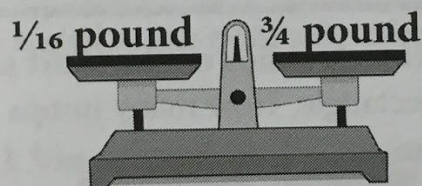
Warmup: How much weight should be placed on the left side to balance the scale?



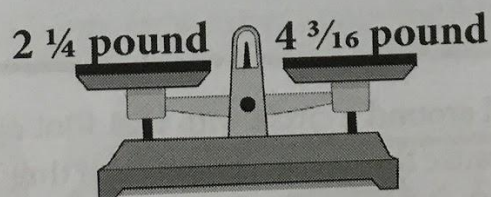
Level 1: How much weight should be placed on the left side to balance the scale?



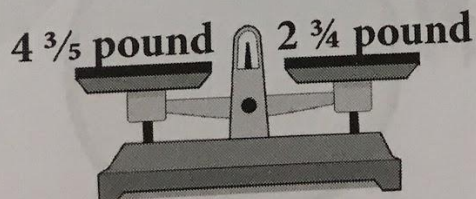
Level 2: How much weight should be placed on the left side to balance the scale?



Level 3: How much weight should be placed on the left side to balance the scale?

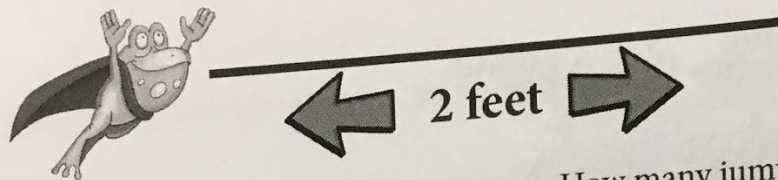


Genius Level: How much weight should be placed on the right side to balance the scale?

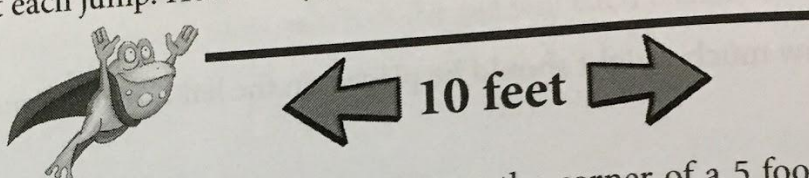


Problem Set 6

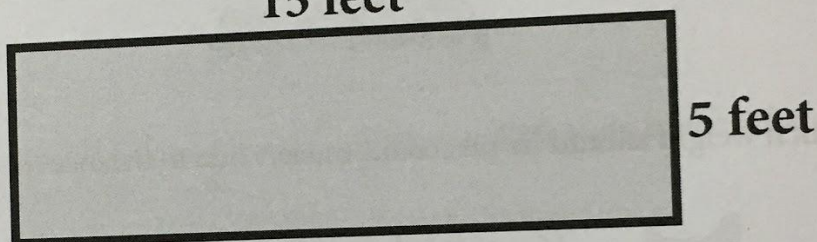
Warmup: A frog jumps $\frac{1}{4}$ foot each jump. How many jumps until it travels the 2 foot distance?



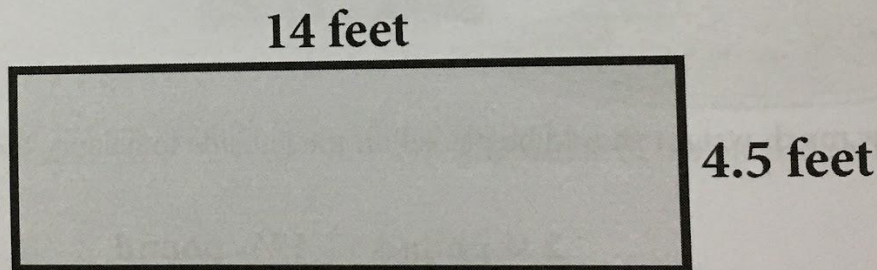
Level 1: A frog jumps $1\frac{1}{4}$ feet each jump. How many jumps until it travels the entire 10 feet?



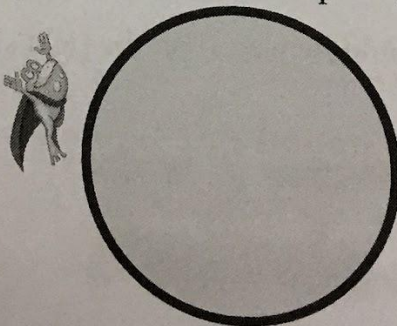
Level 2: A frog travels $2\frac{1}{2}$ feet each time it jumps. If it starts at the corner of a 5 foot by 15 foot rectangle and travels around the rectangle, how many jumps will it take before it travels around the entire rectangle?



Level 3: A frog travels $1\frac{1}{8}$ feet each time it jumps on the short sides of the rectangle and $1\frac{3}{4}$ feet each jump on the long sides of the rectangle. How many jumps until it travels around the entire rectangle?



Genius Level: A frog must travel around a circle with a 21 foot circumference. Its first jump is $2\frac{1}{4}$ feet and the next jump is $2\frac{1}{8}$. Because the frog gets tired each time it jumps, its jumps get shorter by $\frac{1}{8}$ foot each jump. How many jumps until it travels completely around the circle?



Fractions

Level 1

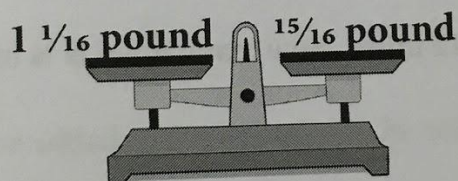
- 1) There are 3 pies and 12 people. What fraction of a pie does each person receive?



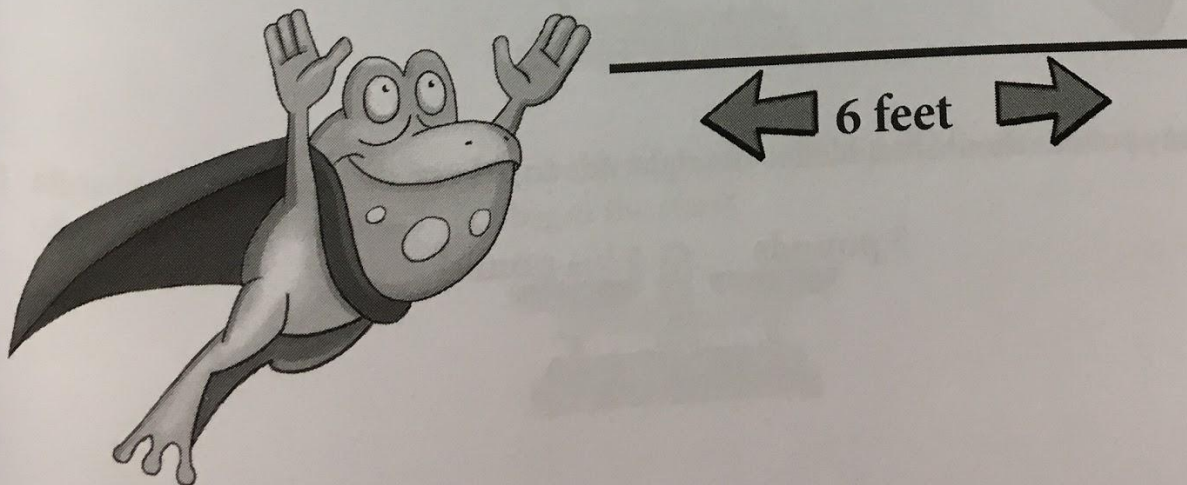
- 2) What is $\frac{1}{2}$ of $\frac{1}{5}$?

- 3) Two friends are splitting $\frac{1}{8}$ of a pie. How much of the pie do they each receive?

- 4) How much weight should be added to the right side to balance the scale?



- 5) A frog jumps $\frac{3}{4}$ of a foot each jump. How many jumps until it travels the entire 6 foot line?



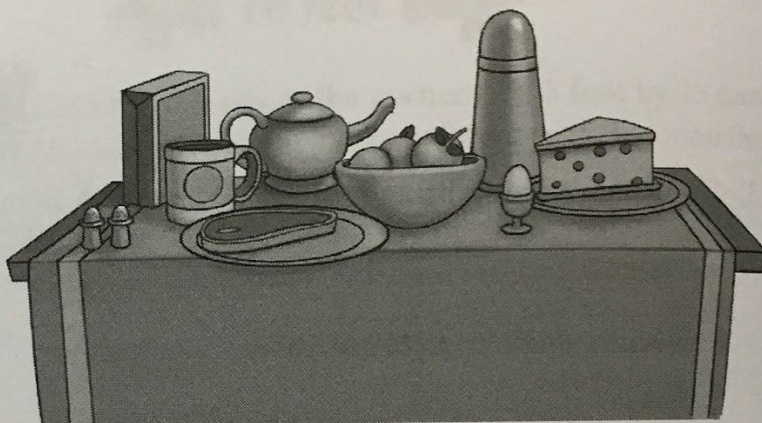
Fractions

Level 2

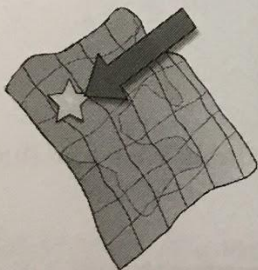
- 1) Laura found 32 plates that each had $\frac{1}{4}$ of a pie. If Laura put all the pieces of pie into whole pies, how many whole pies would she have?

- 2) $\frac{3}{8}$ is how many times larger than $\frac{3}{16}$?

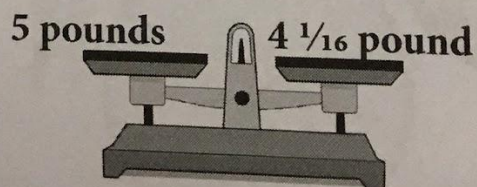
- 3) A meal with 50 calories has half the calories of a meal with 100 calories. A meal with 450 calories is what fraction of a meal with 3600 calories?



- 4) On a map, $\frac{1}{4}$ inch is equal to 12 miles. How many miles is $\frac{5}{8}$ of an inch equal to?



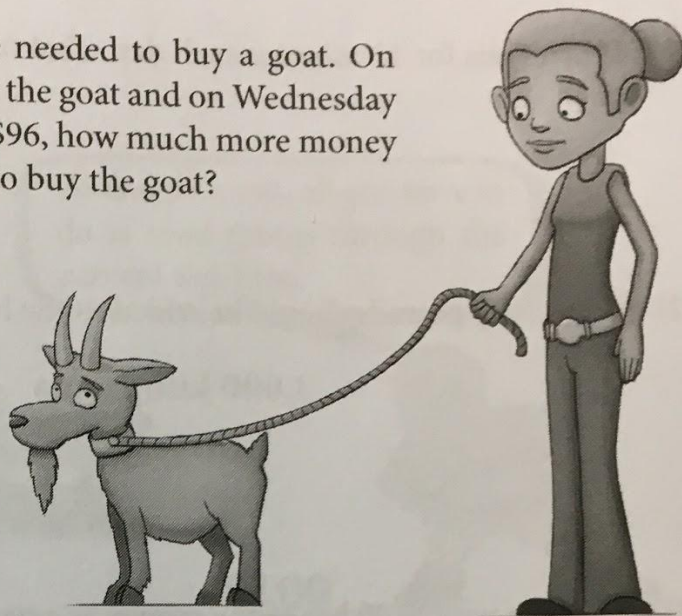
- 5) How many pounds should be added to the right side to balance the scale?



Fractions

Level 3

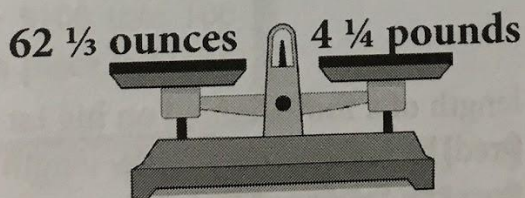
- 1) On Monday, Karen earned $\frac{1}{2}$ the money she needed to buy a goat. On Tuesday, she earned $\frac{1}{4}$ the money she needs for the goat and on Wednesday she earned $\frac{1}{8}$ what she needs. If the goat costs \$96, how much more money does she need to earn to have enough money to buy the goat?



- 2) $\frac{1}{3}$ of what fraction is equal to $\frac{1}{15}$?

- 3) $2\frac{1}{2}$ pizzas are going to be divided evenly among 20 people. How much pizza will each person receive?

- 4) How many **ounces** should be added to the left side of the scale to balance the scale?



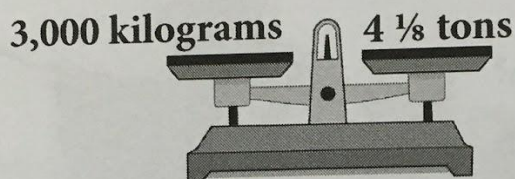
- 5) Alicia found a bag of money. She gave $\frac{1}{2}$ to charity and $\frac{1}{3}$ to her brother. If she has 21 dollars left, how much money was in the bag at the start?

Fractions

Genius Level

- 1) If Lyn runs for 12 minutes each day, what fraction of the day is she running? (24 hours in one day)

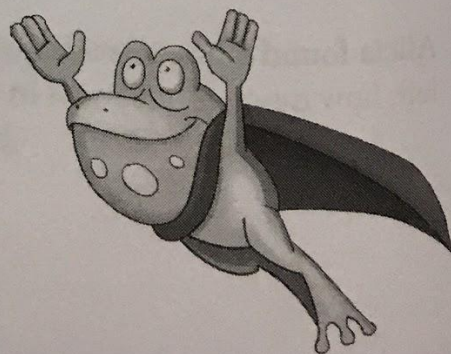
- 2) How many pounds should be added to the left side to balance the scale?



- 3) A person with \$100 has $\frac{1}{5}$ the money as a person with \$500. A person with one penny has what fraction of the money of a person with \$1,000,000?

- 4) What is $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$ of $\frac{1}{2}$?

- 5) A super frog jumped half the length of a football field on his 1st jump and $\frac{1}{3}$ the length on his second jump. Because he was tired, he jumped only $\frac{1}{6}$ the length of the football field on his 3rd jump. How many more yards does the frog need to jump to get to the end of the football field?



Solutions

Answers: Fractions

(Page 72)

1) $\frac{2}{9}$ of a pizza

2) $\frac{1}{32}$

3) $\frac{1}{8}$ pizza

Problem Set 1 (Page 73)

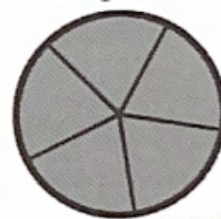
Warmup: $\frac{1}{2}$ of a pizza

Level 1: $\frac{1}{4}$ of a pizza

Level 2: $\frac{1}{6}$ of a pizza

Level 3: $\frac{3}{5}$ of a pizza

Each pizza has 5 pieces that are $\frac{1}{5}$ of a pizza. If there are 3 pizzas, there are 15 pieces that are $\frac{1}{5}$ of the pizza. 15 pieces shared with 5 people = 3 pieces each



Genius Level: $\frac{1}{8}$ of a pizza

Divide each whole pizza into 4 pieces.

There are 16 of the $\frac{1}{4}$ pizza pieces for the 4 pizzas.

There are two $\frac{1}{4}$ pieces in the $\frac{1}{2}$ pizza.

Total $\frac{1}{4}$ pieces = 18 Because there are 36 people, each will have to share the $\frac{1}{4}$ pizza piece with another. Half of $\frac{1}{4}$ pizza is $\frac{1}{8}$ of a pizza.

Problem Set 2 (Page 73)

Warmup: $\frac{1}{4}$

Divide $\frac{1}{2}$ a pie into two equal pieces. The pieces are each $\frac{1}{4}$ of the pie.

Level 1: $\frac{1}{8}$

Divide $\frac{1}{2}$ of a pie into 4 pieces. They are each $\frac{1}{8}$ of the pie.

Level 2: $\frac{1}{16}$

Divide $\frac{1}{4}$ of a pie into 4 pieces. The pieces are each $\frac{1}{16}$ of the pie.

Level 3: $\frac{1}{16}$

$\frac{1}{2}$ of $\frac{1}{2}$ is $\frac{1}{4}$

$\frac{1}{2}$ of $\frac{1}{4}$ is $\frac{1}{8}$

$\frac{1}{2}$ of $\frac{1}{8}$ = $\frac{1}{16}$

Genius Level: $\frac{1}{64}$

$\frac{1}{2}$ of $\frac{1}{4}$ = $\frac{1}{8}$

$\frac{1}{8}$ of $\frac{1}{8}$ = $\frac{1}{64}$

Level 1 (Page 77)

1) $\frac{1}{4}$ pie2) $\frac{1}{10}$ Half of $\frac{1}{5}$ is $\frac{1}{10}$ 3) $\frac{1}{16}$ Half of $\frac{1}{8}$ is $\frac{1}{16}$ 4) $\frac{1}{8}$ pound $\frac{1}{16}$ pound would bring the right side to one pound. $\frac{1}{16}$ more makes 1 $\frac{1}{16}$

5) 8 jumps

Each 4 jumps = 3 feet

8 jumps = 6 feet

Level 2 (Page 78)

1) 8 pies

There are four $\frac{1}{4}$ pieces in each pie.

2) Twice as large

 $\frac{3}{8}$ is the same as $\frac{6}{16}$ which is twice as large as $\frac{3}{16}$.3) $\frac{1}{8}$ $3600 \div 450 = 8$ 450 is $\frac{1}{8}$ of 3600

4) 30 miles

If $\frac{1}{4}$ inch = 12 miles, then $\frac{1}{8}$ inch equals 6 milesIf $\frac{1}{8}$ inch = 6 miles, then $\frac{5}{8}$ inch is $5 \times 6 = 30$ miles5) $1\frac{5}{16}$ pounds $5 - 4\frac{1}{16} = 1\frac{5}{16}$

Level 3 (Page 79)

1) \$12

Karen has $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$ of the money she needs. She needs $\frac{1}{8}$ more. $\frac{1}{8}$ of \$96 = \$12

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

$\frac{1}{3}$ of $\frac{1}{5}$ of a pie is $\frac{1}{15}$ of the pie

3) $\frac{1}{8}$ pizza

2 $\frac{1}{2}$ pizzas have five $\frac{1}{2}$ pieces

Each $\frac{1}{2}$ piece has 4 pieces that are $\frac{1}{8}$ each or 20 total pieces.

4) 5 $\frac{2}{3}$ ounces

There are 16 ounces in a pound.

4 pounds $\times$ 16 = 64 ounces

$\frac{1}{4}$ pound $\times$ 16 = 4 ounces

There are 68 ounces in 4 $\frac{1}{4}$ pounds. $68 - 64 = 4$ ounces

5) \$126

$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ of the money was given away. $\frac{1}{6}$ of the money must be left

If \$21 is $\frac{1}{6}$ then Alicia started with $6 \times \$21 = 126$

Genius Level (Page 80)

1) $\frac{1}{120}$ of the day

How many 12 minute parts are in 24 hours?

60 minutes per hour $\div$ 12 minutes = 5 There are five 12-minute parts per hour

24 hours per day $\times$ 5 = 120 So there are 120 12-minute parts in a day

2) 1650 pounds

Each ton = 2000 pounds

$\frac{1}{8}$ ton = $2000 \div 8 = 250$ pounds

There are 8250 pounds on the right side of the scale.

Each kilogram is equal to 2.2 pounds so: The left side of the scale weighs $3000 \times 2.2 = 6600$ pounds

$8250 - 6600 = 1650$ pounds

3) $\frac{1}{100,000,000}$

\$1,000,000 is equal to $\$1,000,000 \times 100 = 100,000,000$ pennies

1 penny/100,000,000 pennies

4) $\frac{1}{48}$

$\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$

$\frac{1}{6}$ of $\frac{1}{4} = \frac{1}{24}$

$\frac{1}{24}$ of $\frac{1}{2} = \frac{1}{48}$

5) 0 yards. It is the end.

$\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = 1$ whole football field