Connecting Concepts using Bar Models and Number Lines

Deconstruct and solve word problems by modeling them with bars and number lines in collaborative groups.

Warm Up: Allow students 8-10 minutes to complete the warm up.

Question #1

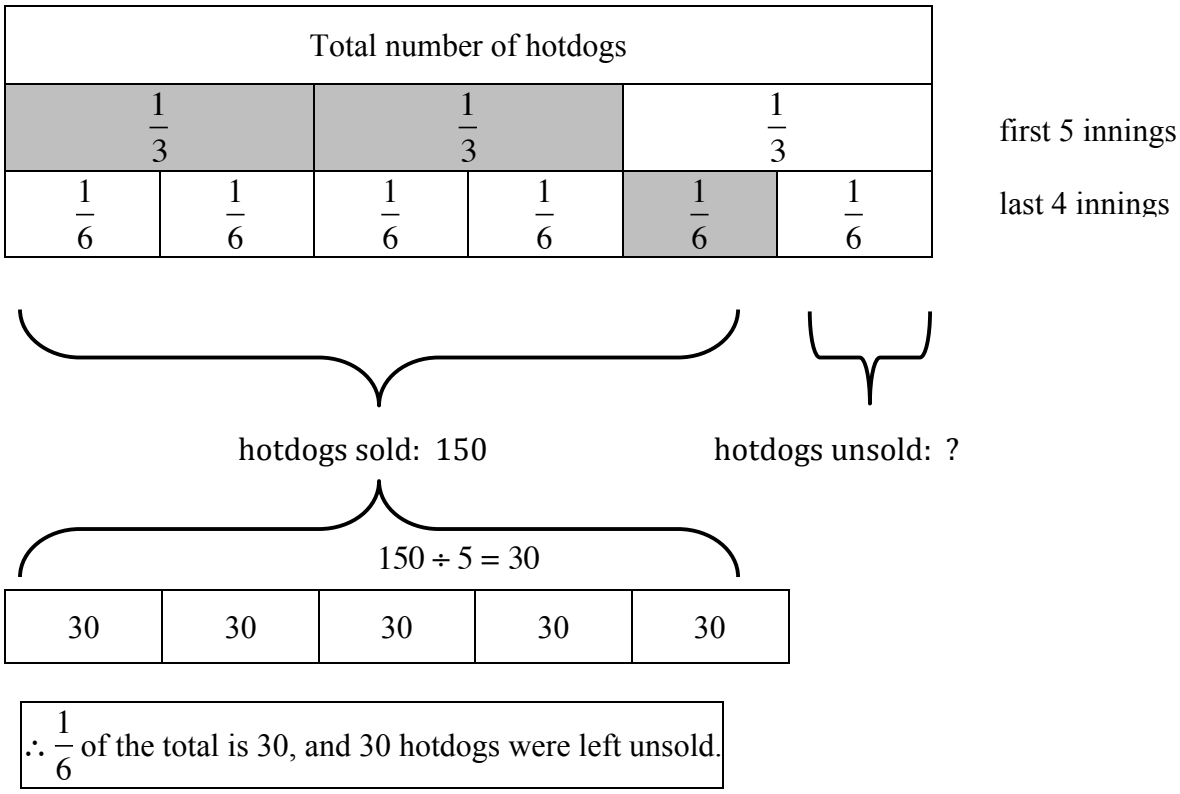
At a softball game, the hotdog vendor sold $\frac{2}{3}$ of his hotdogs by the end of the fifth inning. He sold another $\frac{1}{6}$ by the end of the game. The vendor sold 150 hotdogs. How many hotdogs did he have left?

"*What are we trying to find out? What do we know?"*

-*We are finding out how many hotdogs were left unsold.*
-*We know 150 hotdogs were sold,* $\frac{2}{3}$ *and another* $\frac{1}{6}$ *of the total.*
-*We don't know the total hotdogs the vendor had before the game started.*

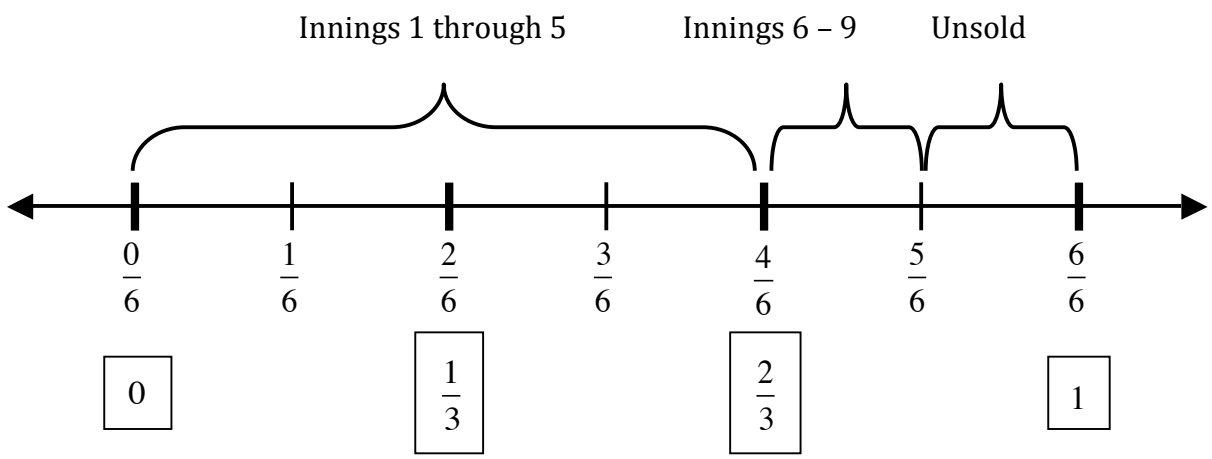
A bar model can help illustrate the relationship between the various pieces of information given in the problem.

Bar Model:



$\therefore \frac{1}{6}$ of the total is 30, and 30 hotdogs were left unsold.

Number Line:



150 hotdogs equals $\frac{5}{6}$ of the total. 150 hotdogs divided into 5 equal groups is 30 hotdogs.

The remaining $\frac{1}{6}$ must be 30, so 30 hotdogs were left.

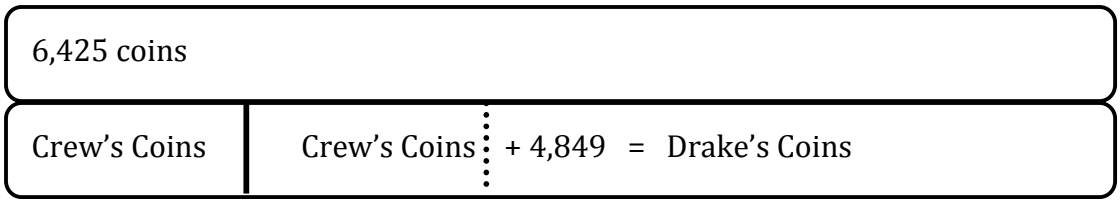
Question #2

Sir Francis Drake raided a Spanish Galleon. Drake kept some of the money for himself and gave the rest to his crew. The English privateers collected 6,425 silver coins. If Drake had 4,849 more coins than he gave to the crew, how much did the crew get?

"*What are we trying to find out? What do we know?"*

-We want to know how many silver coins the crew got.
-We know the English took 6,425 coins.
-We know Drake kept 4,849 more coins than the crew.

Bar Model:



This model shows us that we need to subtract the extra coins.

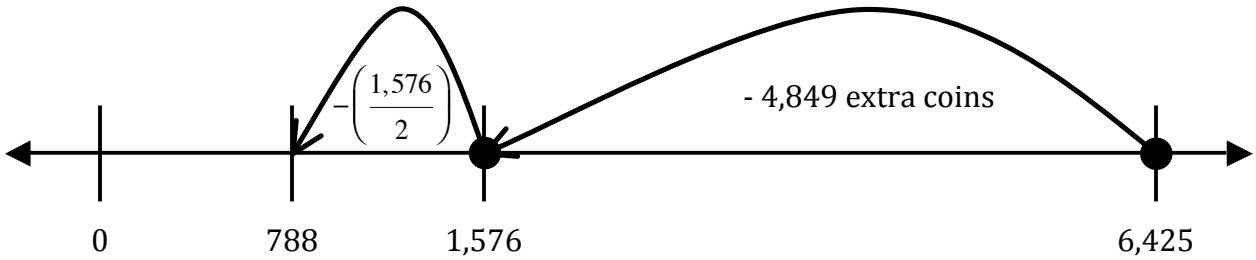
$$\begin{array}{r} 6{,}425 \\ -4{,}849 \\ \hline 1{,}576 \end{array}$$

1,576 represents the crew's coins doubled, so we need to divide 1,576 by 2 to find out how many coins the crew got.

$$\begin{array}{r} 788 \\ 2\overline{)1576} \\ -1400 \\ \hline 176 \\ -160 \\ \hline 16 \\ -16 \\ \hline 0 \end{array}$$

∴ The crew got 788 silver coins.

Number Line:



Begin with the total number of coins. Subtract the "more coins" Drake kept. Then divide the remaining coins in two, the crew's share and Drake's part equal to the crew's.
∴ The crew got 788 silver coins.

Collaborative "you try " questions

Group students in to pairs or triads to solve word problems. Students need to solve using a bar model and number line. Then they need to create a poster to share in guided gallery walk.

Questions:

1. The sum of four numbers is 1470. The mean of three of them is 317. What is the fourth number?
2. Violet, Rose, and Lily sold seeds in their garden shop. Violet rang up half of all the sales. Rose sold 2 packets of seeds for every 5 Violet sold. Lily sold 18 packets. How many packets did Violet sell? How many did Rose sell?
3. A goldfish costs three times as much as a guppy. Gary spent $\frac{3}{5}$ of his money on 3 goldfish and 6 guppies and had 8 dollars left. Find the cost of one goldfish.
4. Mr. Miller bought 2 dozen donuts. The hungry teachers ate $\frac{2}{3}$ of them before lunch. After lunch, some teachers grabbed another donut for dessert. They ate $\frac{1}{2}$ of the remaining donuts. How many donuts were left for Mr. Miller to take home?
5. Hilda sold 84 cupcakes at the bake sale. She sold 18 more chocolate cupcakes than vanilla. How many vanilla cupcakes did she sell? How many chocolate?
6. $\frac{4}{7}$ of the audience enjoyed the concert. If there were 18 more people who liked the music than those who didn't, how many people attended the concert?

Questions for gallery walk:
Which method did you find most useful for finding the solution?

Did the number line and the bar model work equally well for this question?

What is a potential error someone might make when solving this problem?

Did you see another way to solve this problem?

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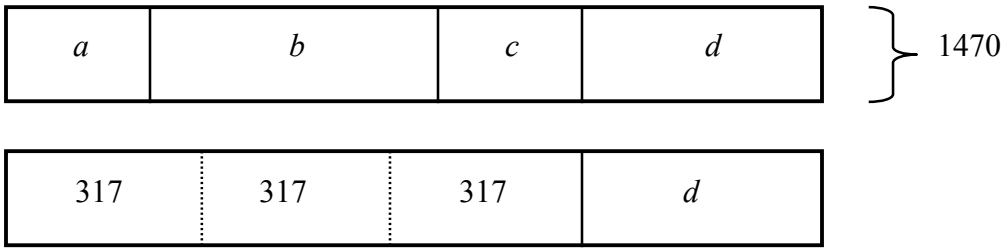
The sum of four numbers is 1470. The mean of three of them is 317. What is the fourth number?

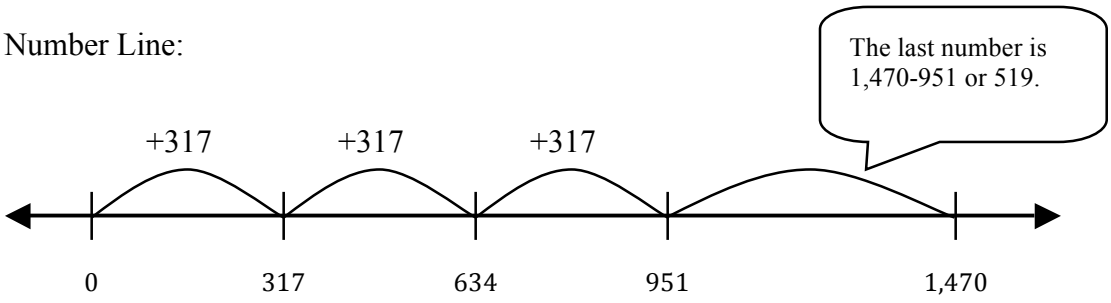
Bar Model:



317
317
+317
951

1470
–951
519

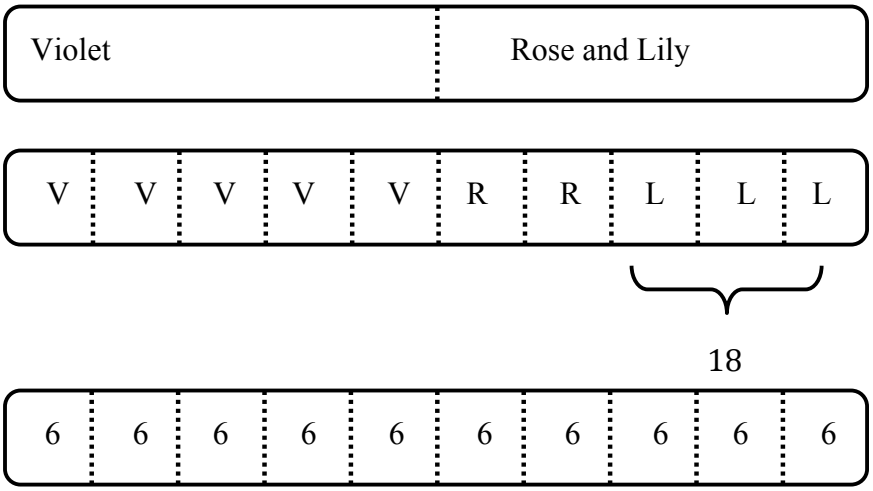
Number Line:



Connecting Concepts using Bar Models and Number Lines

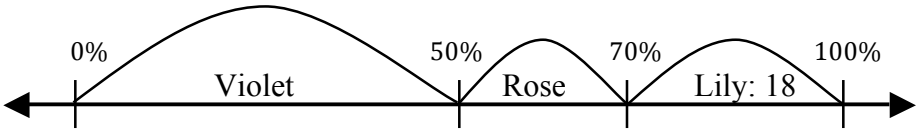
Violet, Rose, and Lily sold seeds in their garden shop. Violet rang up half of all the sales. Rose sold 2 packets of seeds for every 5 Violet sold. Lily sold 18 packets. How many packets did Violet sell? How many did Rose sell?

Bar Model:



∴ Violet sold 30 packets, and Rose sold 12.

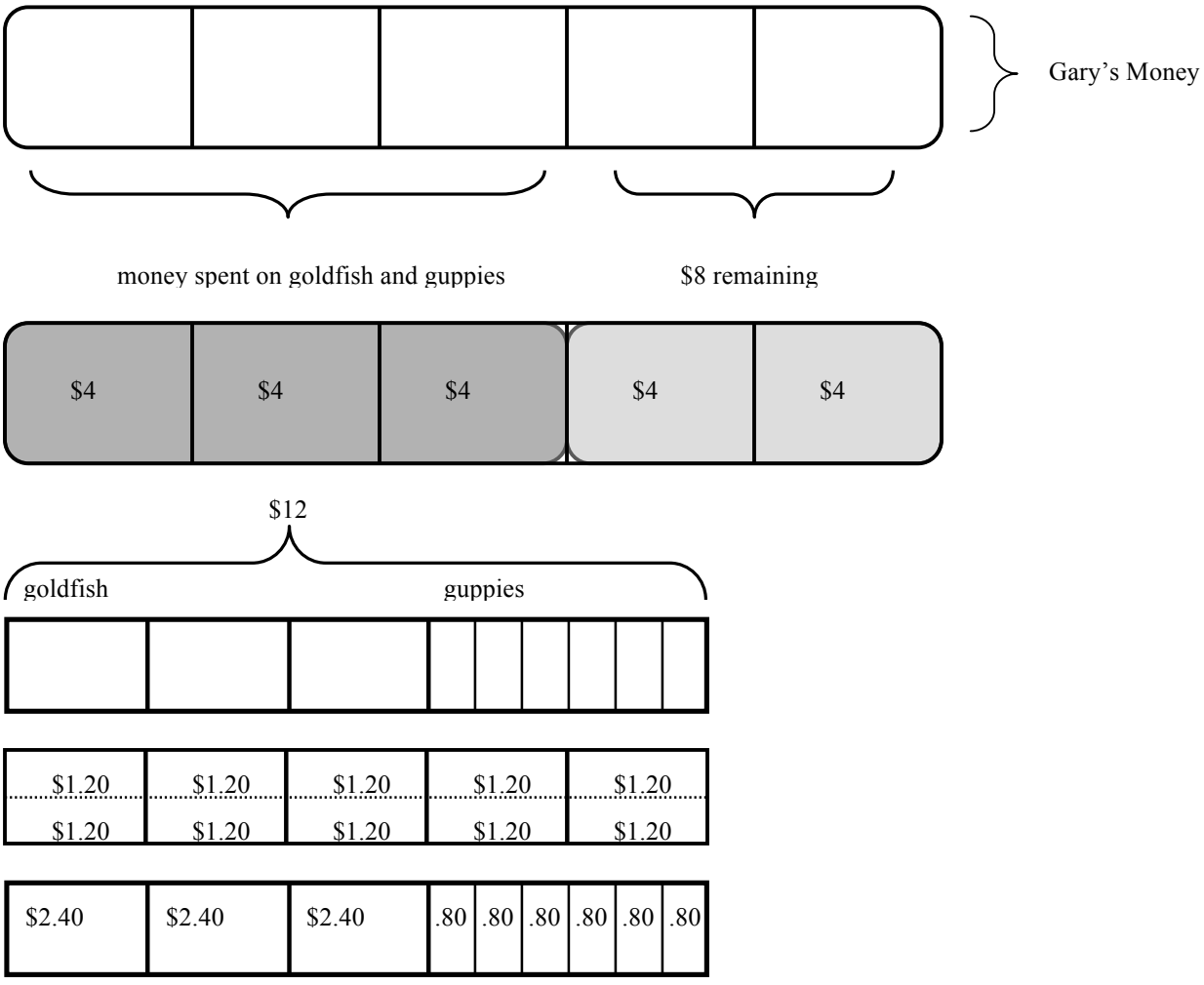
Number Line:



Lily sold 18 packets, which represents 30% of the total. That means every 6 packets (18÷3) are 10% of the total. Violet sold 30 packets (5×6) and Rose sold 12 (2×6).

A goldfish costs three times as much as a guppy. Gary spent $\frac{3}{5}$ of his money on 3 goldfish and 6 guppies and had 8 dollars left. Find the cost of one goldfish.

Bar Model:

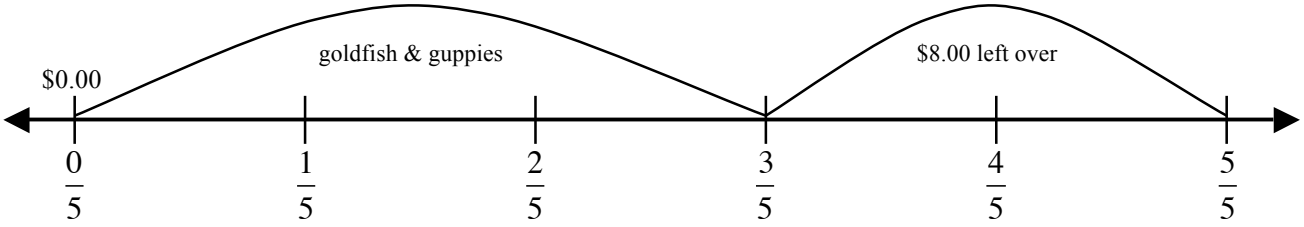


∴ A goldfish cost $2.40.

Connecting Concepts using Bar Models and Number Lines

A goldfish costs three times as much as a guppy. Gary spent $\frac{3}{5}$ of his money on 3 goldfish and 6 guppies and had 8 dollars left over. Find the cost of one goldfish.

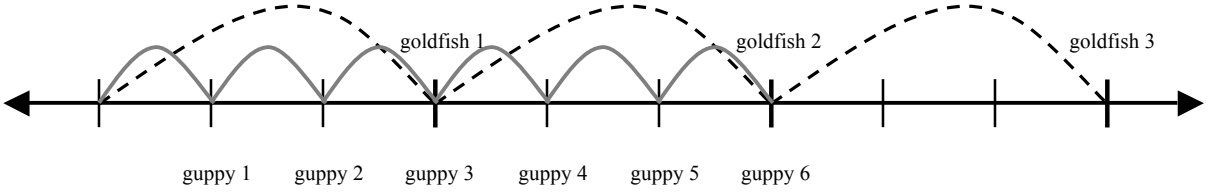
Number Line:



$8 \div 2 = 4$

$\therefore$ each $\frac{1}{5}$ is worth \$4

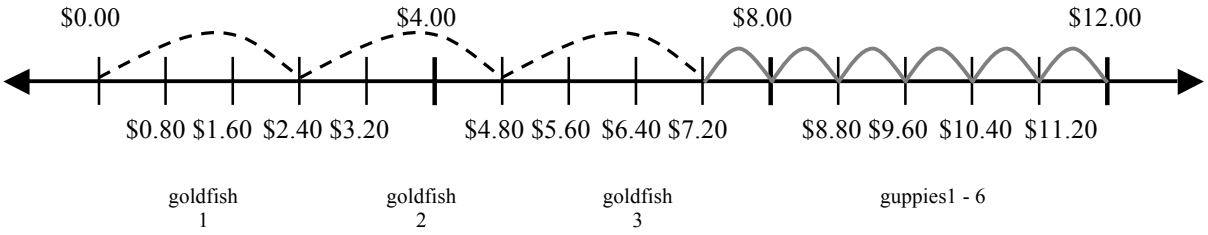
$3 \times \$4.00 = \$12.00$



$(3 \times 3) + (6 \times 1)$

$= 9 + 6$

$= 15$



$\therefore$ One goldfish cost \$2.40.

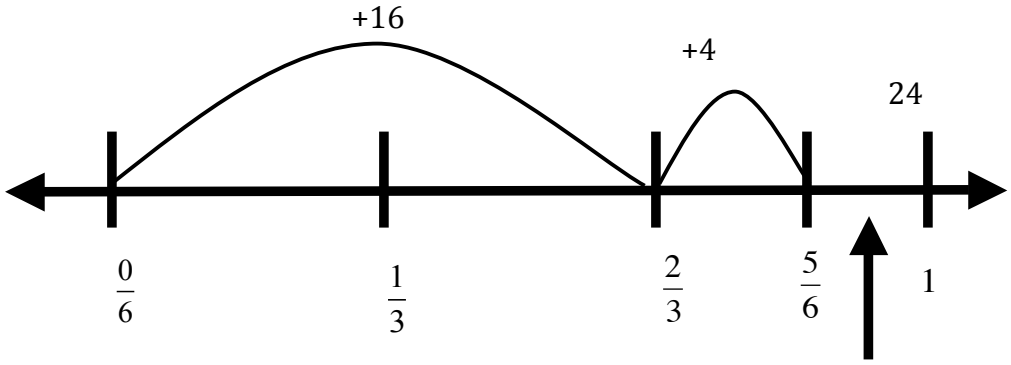
Mr. Miller bought 2 dozen donuts. The hungry teachers ate $\frac{2}{3}$ of them before lunch. After lunch, some teachers grabbed another donut for dessert. They ate $\frac{1}{2}$ of the remaining donuts. How many donuts were left for Mr. Miller to take home?

Bar Model

<table>
<tr><td colspan="4">2 dozen donuts = 24 donuts</td></tr>
<tr><td>$\frac{1}{3}$</td><td>$\frac{1}{3}$</td><td colspan="2">$\frac{1}{3}$</td></tr>
<tr><td>8</td><td>8</td><td>$\frac{1}{2} \bullet \frac{1}{3} = \frac{1}{6}$</td><td>$\frac{1}{6}$</td></tr>
<tr><td colspan="2"></td><td>4</td><td>4</td></tr>
</table>

Donuts left for Mr. Miller

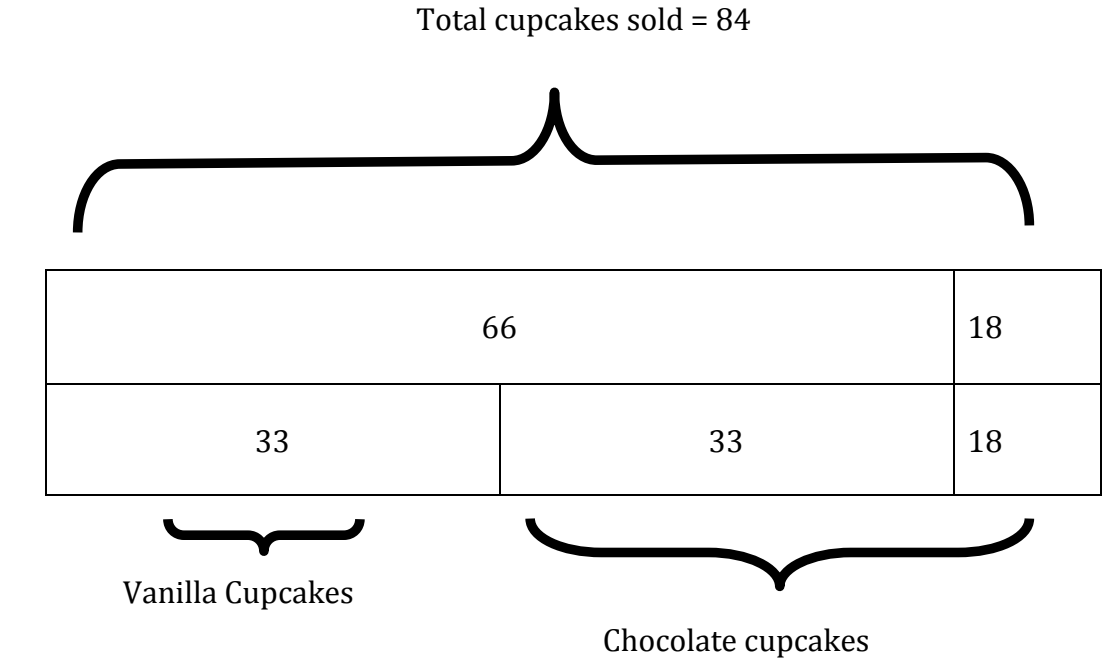
Number Line

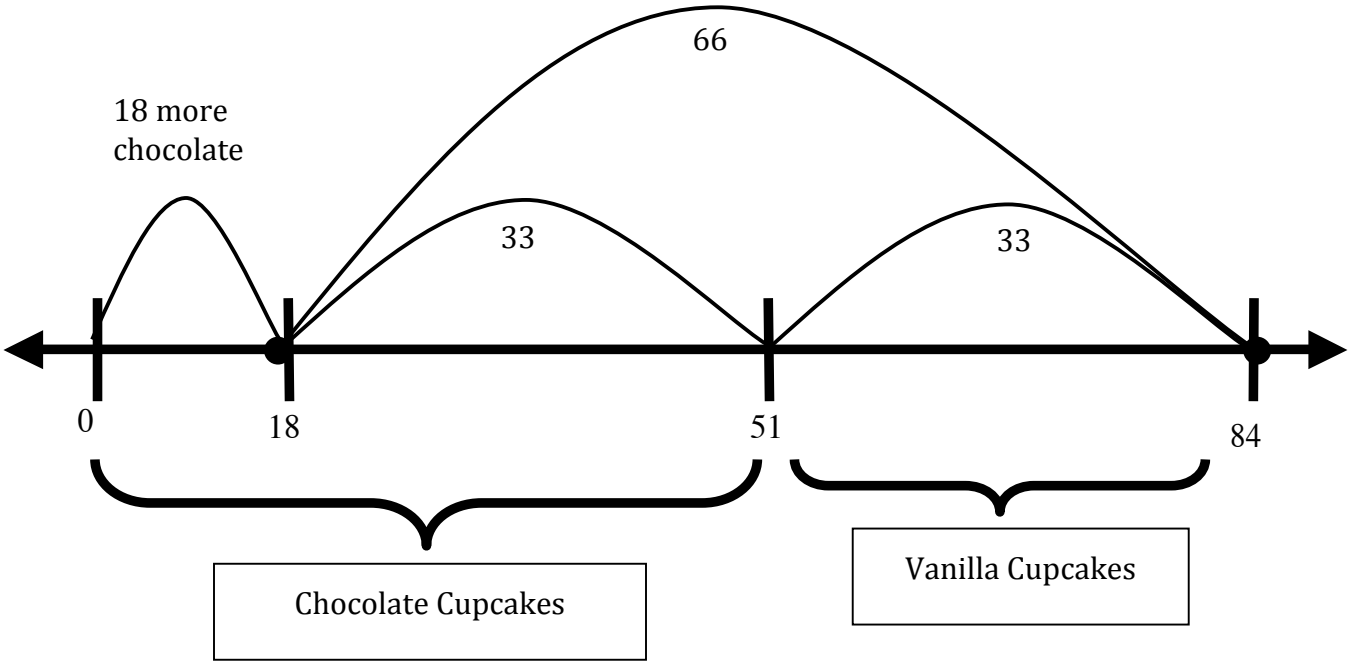


Donuts left for Mr. Miller equals $\frac{1}{6}$ of 24 which is 4.

Connecting Concepts using Bar Models and Number Lines

Hilda sold 84 cupcakes at the bake sale. She sold 18 more chocolate cupcakes than vanilla. How many vanilla cupcakes did she sell? How many chocolate?





$\frac{4}{7}$ of the audience enjoyed the concert. If there were 18 more people who liked the music than those who didn't, how many people attended the concert?

$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$
18	18	18	18	18	18	18

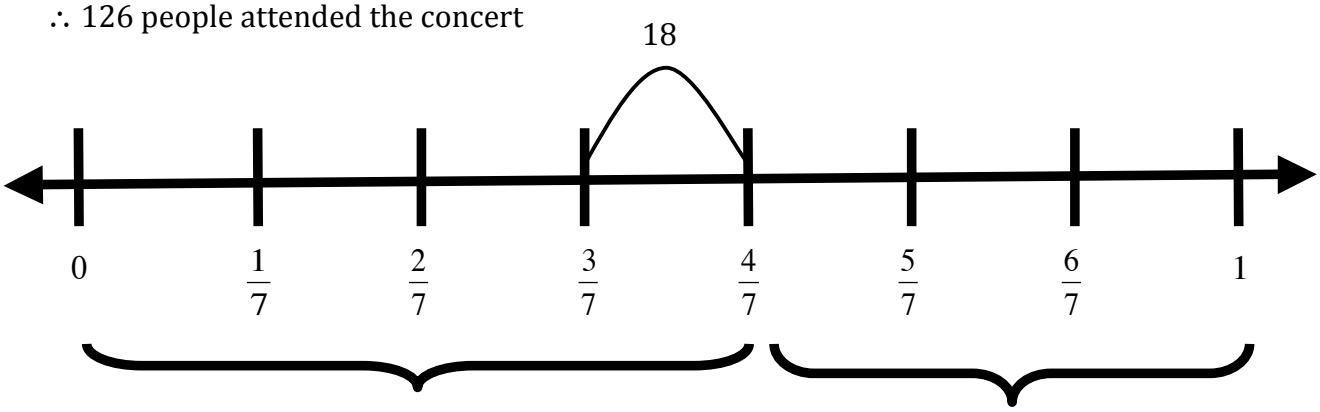
$\frac{4}{7}$ of the audience enjoyed concert

18+18+18+18 = 72

$\frac{3}{7}$ of the audience didn't like concert

18+18+18=54

$\therefore$ 126 people attended the concert



Enjoyed concert Did not like the music

$$\frac{4}{7}-\frac{3}{7}=\frac{1}{7}$$

$$\therefore \frac{1}{7}=18 \text{ people}$$

$18 \bullet 7=126$ people in the audience

Warm-Up

Directions – For each problem below:

- Answer the problem one way showing all of your work
- Find someone else who can show you a different way of doing the problem.
- Have them write their name in the appropriate space provided.

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1) At a softball game, the hotdog vendor sold $\frac{2}{3}$ of his hotdogs in the afternoon and $\frac{1}{6}$ in the evening. He sold 150 hotdogs. How many hotdogs did he have left?

My Approach:

_____ 's approach

2} Sir Francis Drake raided a Spanish Galleon. Drake kept some of the money for himself and gave the rest to his crew. The English privateers collected 6,425 silver coins. If Drake had 4,849 more coins than he gave to the crew, how much did the crew get?

My Approach:

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