

Cluster 5.3: Number and Operations

5.3K: Operations with Rational Numbers (Mixed Forms): Gas Tanks

Focusing TEKS

5.3K Number and operations. The student applies mathematical process standards to develop and use strategies and methods for positive rational number computations in order to solve problems with efficiency and accuracy. The student is expected to add and subtract positive rational numbers fluently. **Readiness Standard**

Additional TEKS:

5.3H Represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations. **Supporting Standard**

4.2G Relate decimals to fractions that name tenths and hundredths. **Readiness Standard**

4.4A Add and subtract whole numbers and decimals to the hundredths place using the standard algorithm. **Readiness Standard**

Focusing Mathematical Processes

5.1A Apply mathematics to problems arising in everyday life, society, and the workplace.

5.1B Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem solving process and the reasonableness of the solution.

5.1C Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques including mental math, estimation, and number sense as appropriate, to solve problems.

▲ Performance Task

Caileigh and three of her friends drive the same kind of car with the same size fuel tank. Caileigh has $\frac{1}{2}$ of a tank of fuel remaining. Dennis has 0.5 of a tank of fuel remaining. Eduardo has 0.8 of a tank of fuel remaining. Ferrari has $\frac{2}{5}$ of a tank of fuel remaining. Assuming that each person started with a full fuel tank, how many tanks of fuel did Caileigh and her friends use? Justify your reasoning.

Answer: The four friends used $1\frac{4}{5}$ tanks of fuel.

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Mathematically Speaking...

In this task, students are being asked to focus on combining (adding) rational numbers representing the amount of fuel remaining in several fuel tanks and to use the sum to subtract from what was originally present in the tanks to determine the amount of fuel used. Before performing their computations, students must write all of the rational numbers in the same form (4.2G), building on their 4th grade learning experiences. One way for students to represent the addition or subtraction is by using visual models such as fraction strips.



Students may also solve the problem by starting with 4 full fuel tanks and subtracting the part remaining in each person's fuel tank. Or, students may add the decimals, add the fractions, and subtract each part from the 4-full fuel tanks with which the drivers started.

Possible Solution

Write both decimal numbers as fractions, and construct a separate fraction strip to represent the amount of fuel remaining in each person's fuel tank.

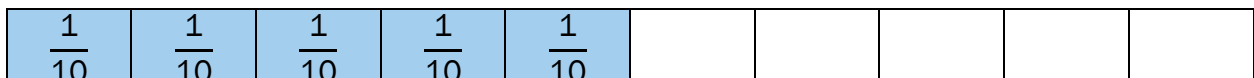
Students may convert each fraction to a decimal instead of converting the decimals to fractions.

Caileigh:



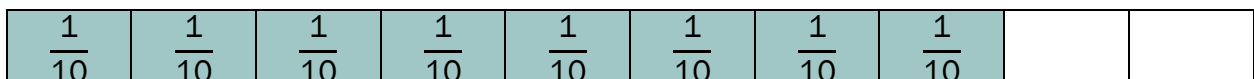
Dennis:

$$0.5 = \frac{5}{10}$$

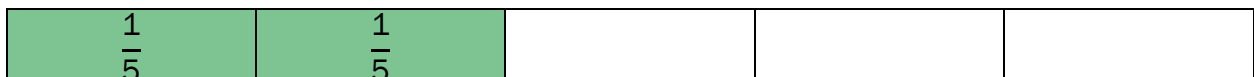


Eduardo:

$$0.8 = \frac{8}{10}$$

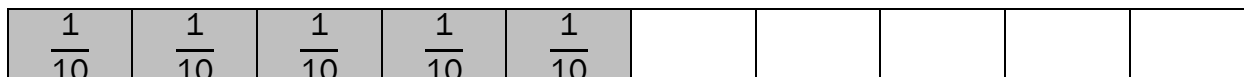


Ferrari:



Cluster 5.3: Number and Operations

Determine a common denominator in order to combine the amounts from each person's fuel tank.
Caileigh:



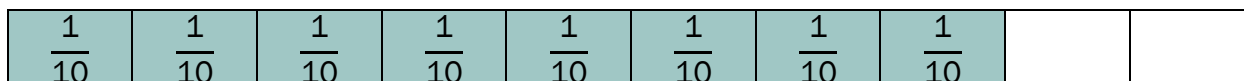
Dennis:

$$0.5 = \frac{5}{10}$$

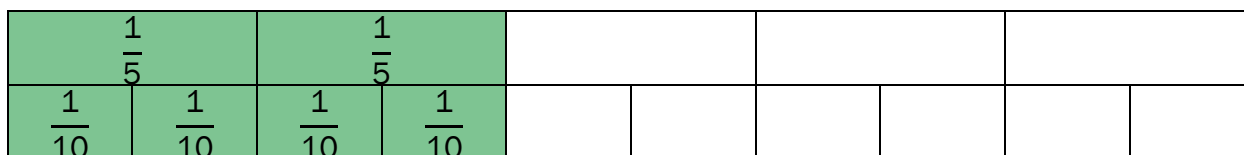


Eduardo:

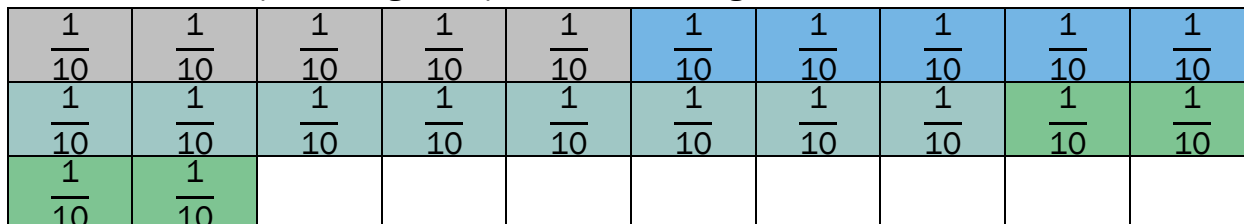
$$0.8 = \frac{8}{10}$$



Ferrari:



Combine the tenths representing each person's remaining fuel.



There are $2\frac{2}{10}$ tanks of fuel remaining out of 4 originally full fuel tanks.

Determine the number of tanks of fuel Caileigh and her friends used.

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Originally there were 4 full tanks of fuel. Altogether,

$2\frac{2}{10}$ tanks of fuel remain. To determine the amount of

fuel used, subtract $2\frac{2}{10}$ from 4.

Students may determine the fraction of gas used by subtracting each person's remaining amount from 1, and add the differences.

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

$$4 - 2\frac{2}{10} = 1\frac{8}{10} = 1\frac{4}{5}$$

The four friends used $1\frac{4}{5}$ tanks of fuel.

Look For...

- student understanding of converting fractions to decimals and decimals to fractions
- the use of common denominators if fractions are used or an understanding of place value if decimals are used
- an understanding of the relationship between improper fractions and mixed numbers
- student justification of choices of solution strategy and/or models

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● Differentiation: Simplified Task

Caileigh and two of her friends drive the same kind of car with the same size fuel tank.

Caileigh has $\frac{5}{10}$ of a tank of fuel remaining.

Dennis has 0.5 of a tank of fuel remaining.

Eduardo has 0.8 of a tank of fuel remaining.

Assuming that each person started with a full fuel tank, how many tanks of fuel did Caileigh and her friends use? Justify your reasoning.

Answer: The three friends used $1\frac{1}{5}$ tanks of fuel.

■ Differentiation: Enriching Task

Caileigh and three of her friends drive the same kind of car with the same size fuel tank.

Caileigh has $\frac{1}{2}$ of a tank of fuel remaining.

Dennis has 0.5 of a tank of fuel remaining.

Eduardo has 0.8 of a tank of fuel remaining.

Ferrari has $\frac{2}{5}$ of a tank of fuel remaining.

Assuming that each person started with a full fuel tank, how many tanks of fuel did Caileigh and her friends use? If fuel costs \$2.50 per gallon and each of the friends' tanks holds 16 gallons, what was the total cost of the fuel they all used? Justify your reasoning.

Answer: The four friends used $1\frac{4}{5}$ tanks of fuel at a cost of \$72.00.

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Scaffolded Task with Answers

Caileigh and three of her friends drive the same kind of car with the same size fuel tank. Caileigh has $\frac{1}{2}$ of a tank of fuel remaining. Dennis has 0.5 of a tank of fuel remaining. Eduardo has 0.8 of a tank of fuel remaining. Ferrari has $\frac{2}{5}$ of a tank of fuel remaining.

1. Convert each decimal to a fraction.

Dennis:

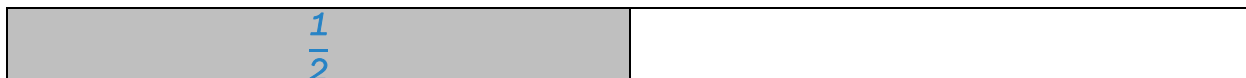
$$0.5 = \frac{5}{10}$$

Eduardo:

$$0.8 = \frac{8}{10}$$

2. Draw a strip diagram to represent the amount of gas remaining in each person's gas tank.

Caileigh:



Dennis:

$$0.5 = \frac{5}{10}$$



Eduardo:

$$0.8 = \frac{8}{10}$$



Ferrari:



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3. Determine a common denominator to combine the amounts from each person's fuel tank.

Caileigh:



Dennis:

$$0.5 = \frac{5}{10}$$

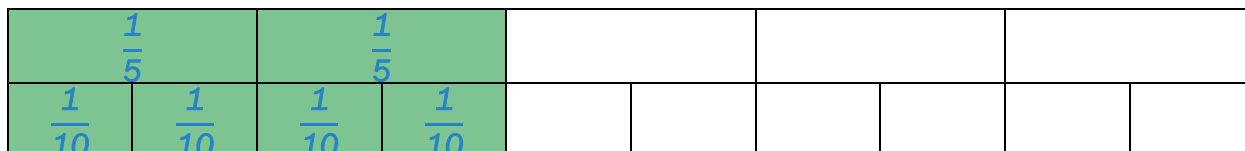


Eduardo:

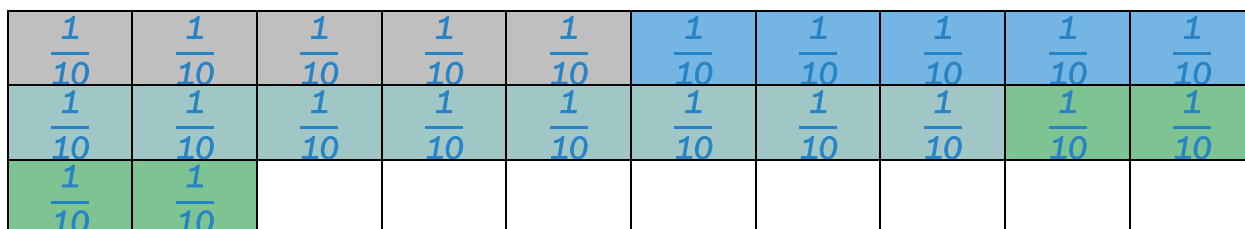
$$0.8 = \frac{8}{10}$$



Ferrari:



4. Combine the tenths representing each person's remaining fuel.



There are $2\frac{2}{10}$ tanks of fuel remaining out of 4 original fuel tanks.

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5. Use the amount of fuel remaining to determine the number of tanks of fuel Cailleigh and her friends used.

There were originally 4 full tanks of fuel. Altogether, $2\frac{2}{10}$ tanks of fuel remain. To determine the amount of fuel that was used, subtract $2\frac{2}{10}$ from 4.

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

$$4 - 2\frac{2}{10} = 1\frac{8}{10} = 1\frac{4}{5}$$

The four friends used $1\frac{4}{5}$ tanks of fuel.

Performance Task: 5.3K
Operations with Rational Numbers (Mixed Forms): Gas Tanks

Caileigh and three of her friends drive the same kind of car with the same size fuel tank. Caileigh has $\frac{1}{2}$ of a tank of fuel remaining. Dennis has 0.5 of a tank of fuel remaining. Eduardo has 0.8 of a tank of fuel remaining. Ferrari has $\frac{2}{5}$ of a tank of fuel remaining. Assuming that each person started with a full fuel tank, how many tanks of fuel did Caileigh and her friends use? Justify your reasoning.

Procedural	0	1	2
Conceptual	0	1	2
Communication	0	1	2

Total points: _____



Name _____ Date _____

Performance Task: 5.3K

Operations with Rational Numbers (Mixed Forms): Gas Tanks

Caileigh and two of her friends drive the same kind of car with the same size fuel tank. Caileigh has $\frac{5}{10}$ of a tank of fuel remaining. Dennis has 0.5 of a tank of fuel remaining. Eduardo has 0.8 of a tank of fuel remaining. Assuming that each person started with a full fuel tank, how many tanks of fuel did Caileigh and her friends use? Justify your reasoning.

Procedural	0	1	2
Conceptual	0	1	2
Communication	0	1	2

Total points: _____



Performance Task: 5.3K
Operations with Rational Numbers (Mixed Forms): Gas Tanks

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If fuel costs \$2.50 per gallon and each of the friends' tanks holds 16 gallons, what was the total cost of the fuel they all used? Justify your reasoning.

Procedural	0	1	2
Conceptual	0	1	2
Communication	0	1	2

Total points: _____



Performance Task: 5.3K
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1. Convert each decimal to a fraction.

2. Draw a strip diagram to represent the amount of gas remaining in each person's gas tank.



Name _____ Date _____

3. Determine a common denominator to combine the amounts from each person's fuel tank.

4. Combine the tenths representing each person's remaining fuel.

5. Use the amount of fuel remaining to determine the number of tanks of fuel Caileigh and her friends used.

