

Name \_\_\_\_\_

Date \_\_\_\_\_

## Applying the Properties of Operations to Add and

### Subtract Rational Numbers

1. Jamie was working on his math homework with his friend, Kent. Jamie looked at the following problem.

$$-9.5 - (-8) - 6.5$$

He told Kent that he did not know how to subtract negative numbers. Kent said that he knew how to solve the problem using only addition. What did Kent mean by that? Explain. Then, show your work and represent the answer as a single rational number.

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Work Space:

Answer: \_\_\_\_\_

2. Use one rational number to represent the following expression. Show your work.

$$3 + (-0.2) - 15\frac{1}{4}$$

Show all steps taken to rewrite each of the following as a single rational number.

1.  $80 + \left(-22\frac{4}{15}\right)$

2.  $10 + \left(-3\frac{3}{8}\right)$

3.  $\frac{1}{5} + 20.3 - \left(-5\frac{3}{5}\right)$

4.  $\frac{11}{12} - (-10) - \frac{5}{6}$

5. Explain, step by step, how to arrive at a single rational number to represent the following expression. Show both a written explanation and the related math work for each step.

$$1 - \frac{3}{4} + \left(-12\frac{1}{4}\right)$$

1. Jamie was working on his math homework with his friend, Kent. Jamie looked at the following problem

$$-9.5 - (-8) - 6.5$$

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*Kent meant that since any subtraction problem can be written as an addition problem by adding the opposite of the number you are subtracting, Jamie can solve the problem by using only addition.*

Work Space:

$$\begin{aligned} & -9.5 - (-8) - 6.5 \\ &= -9.5 + 8 + (-6.5) \\ &= -9.5 + (-6.5) + 8 \\ &= -16 + 8 \\ &= -8 \end{aligned}$$

Answer:  $-8$

2. Use one rational number to represent the following expression. Show your work.

$$\begin{aligned} & 3 + (-0.2) - 15\frac{1}{4} \\ &= 3 + (-0.2) + \left(-15 + \left(-\frac{1}{4}\right)\right) \\ &= 3 + (-0.2 + (-15) + (-0.25)) \\ &= 3 + (-15.45) \\ &= -12.45 \end{aligned}$$

Show all steps taken to rewrite each of the following as a single rational number.

1.  $80 + \left(-22\frac{4}{15}\right)$

$$\begin{aligned} &= 80 + \left(-22 + \left(-\frac{4}{15}\right)\right) \\ &= (80 + (-22)) + \left(-\frac{4}{15}\right) \\ &= 58 + \left(-\frac{4}{15}\right) \\ &= 57\frac{11}{15} \end{aligned}$$

2.  $10 + \left(-3\frac{3}{8}\right)$

$$\begin{aligned} &= 10 + \left(-3 + \left(-\frac{3}{8}\right)\right) \\ &= (10 + (-3)) + \left(-\frac{3}{8}\right) \\ &= 7 + \left(-\frac{3}{8}\right) \\ &= 6\frac{5}{8} \end{aligned}$$

$$\begin{aligned}
3. \quad & \frac{1}{5} + 20.3 - \left(-5\frac{3}{5}\right) \\
&= \frac{1}{5} + 20.3 + 5\frac{3}{5} \\
&= \frac{1}{5} + 5\frac{3}{5} + 20.3 \\
&= 5\frac{4}{5} + 20.3 \\
&= 5\frac{4}{5} + 20\frac{3}{10} \\
&= 5\frac{8}{10} + 20\frac{3}{10} \\
&= 25\frac{11}{10} \\
&= 26\frac{1}{10}
\end{aligned}$$

$$\begin{aligned}
4. \quad & \frac{11}{12} - (-10) - \frac{5}{6} \\
&= \frac{11}{12} + 10 + \left(-\frac{5}{6}\right) \\
&= \frac{11}{12} + \left(-\frac{5}{6}\right) + 10 \\
&= \frac{11}{12} + \left(-\frac{10}{12}\right) + 10 \\
&= \frac{1}{12} + 10 \\
&= 10\frac{1}{12}
\end{aligned}$$

5. Explain, step by step, how to arrive at a single rational number to represent the following expression. Show both a written explanation and the related math work for each step.

$$1 - \frac{3}{4} + \left(-12\frac{1}{4}\right)$$

First, I rewrote the subtraction of  $\frac{3}{4}$  as the addition of its inverse  $-\frac{3}{4}$ :

$$= 1 + \left(-\frac{3}{4}\right) + \left(-12\frac{1}{4}\right)$$

Next, I used the associative property of addition to regroup addend:

$$= 1 + \left(\left(-\frac{3}{4}\right) + \left(-12\frac{1}{4}\right)\right)$$

Next, I separated  $-12\frac{1}{4}$  into the sum of  $-12$  and  $-\frac{1}{4}$ :

$$= 1 + \left(\left(-\frac{3}{4}\right) + (-12) + \left(-\frac{1}{4}\right)\right)$$

Next, I used the commutative property of addition:

$$= 1 + \left(\left(-\frac{3}{4}\right) + \left(-\frac{1}{4}\right) + (-12)\right)$$

Next, I found the sum of  $-\frac{3}{4}$  and  $-\frac{1}{4}$ :

$$= 1 + ((-1) + (-12))$$

Next, I found the sum of  $-1$  and  $-12$ :

$$= 1 + (-13)$$

Lastly, since the absolute value of 13 is greater than the absolute value of 1, and it is a negative 13, the answer will be a negative number.

$$= -12$$

The absolute value of 13 minus the absolute value of 1 equals 12, so the answer is  $-12$ .