



Rational Numbers
Adding Rational Numbers
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Lesson Plan

- I. Topic: Adding Rational Numbers
- II. Goals and Objectives:
- A. The student will learn how to add rational numbers with the same signs.
 - B. The student will learn how to add rational numbers with different signs.
 - C. The student will evaluate expressions using addition.
 - D. The student will use the numbers line to add rational numbers.
 - E. The student will learn how to add different terms with variables.
- III. Southern Union Mathematics Standards:
- 1. CM.2.1
Concepts (number sense, algebraic and geometric thinking, measurement, data analysis and probability)
 - 2. AL.2.2
Problem-solving skills (explore, plan, solve, verify.)
 - 3. PA.3.3
Perform calculations with and without technology in life situations.
 - 4. PA.4.2
Identify numbers and relationship among numbers.
 - 5. PA.5.1
Use and evaluate expressions involving variables
- IV. Materials:
- A. Whiteboard with dry-erase markers (Blackboard with chalk could also be used.)
 - B. Ruler
 - C. Pencils
 - D. Adding Rational Numbers Worksheets. (Practice Worksheet, Quiz Worksheet.)
- V. Presentation Outline:
- A. Introduction. "Adding Rational Numbers"
 - B. Adding rational numbers of the same signs
Example
 - C. Adding rational numbers of different signs
Example



- D. Simplifying and evaluating rational expressions
Example

VI. Presentation:

- A. Presentation Notes
B. Power Point Presentation

VII. Independent Practice: Adding Rational Number Worksheet

- A. Class work: #1 - 49 Odds

- B. Homework: #s 2 - 50 Even

- C. Due 2 days from given day. Allow students to complete those questions which they were not able to complete in class.

VIII. Topic Assessment: Adding Rational Numbers Quiz

- A. Answer questions from homework.

- B. 15-Question Quiz: 20 – 25 minutes

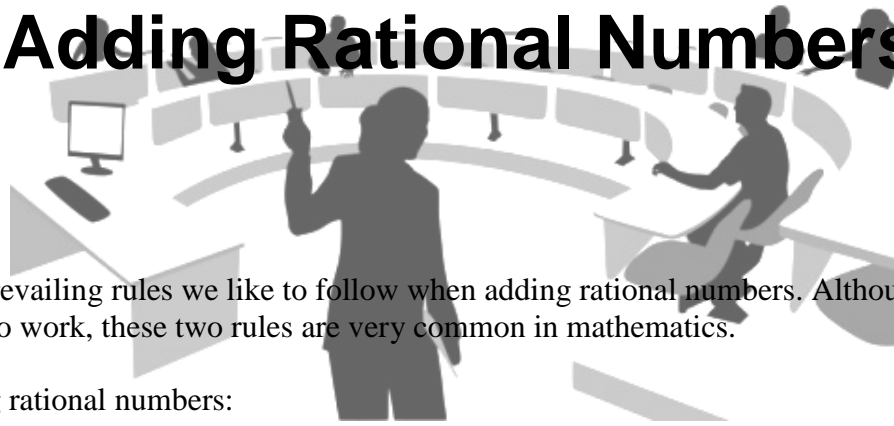




Rational Numbers

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Adding Rational Numbers



Introduction

There are two prevailing rules we like to follow when adding rational numbers. Although there are other methods that also work, these two rules are very common in mathematics.

Rules for adding rational numbers:

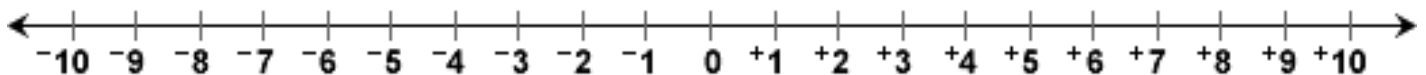
■ Rule #1

If the signs are the same, pretend the signs aren't there. Add the numbers and then put the sign of the addends in front of your answer.

■ Rule #2

If the signs are different, pretend the signs aren't there. Subtract the smaller from the larger one, and put the sign of the larger one in front of your answer.

One way to add rational is using the number line.



Start by placing the first digit on the number line.

○

When the second rational number is positive, count to the right.

→

When the number is negative, count to the left.

←



Adding rational numbers of the same signs.

Rule #1 - If the signs are the same, pretend the signs aren't there. Add the numbers and then put the sign of the addends in front of your answer.

In other words:

The sum of two negative rational numbers is a negative rational number.

Example 1: Find the sum of each pair of integers. You may draw a number line to help you solve this problem.

Adding Negative Rational Numbers	
Rational Number	Sum
$-4 + -5 =$	-9
$-1 + -11 =$	-12
$-23 + -6 =$	-29
$-1/2 + -6/2$	$-7/2$
$-5.3 + -12.6$	-17.9

Do not confuse the sign of the rational number with the operation being performed.

Remember that:

$-2 + -9 = -11$ is read as *Negative 2 plus negative 9 equals negative 11.*

Rule #1 - If the signs are the same, pretend the signs aren't there. Add the numbers and then put the sign of the addends in front of your answer.

In other words:

The sum of two positive rational numbers is a positive rational number.

Example 2: Find the sum of each pair of integers. You may draw a number line to help you solve this problem.

Adding Positive Rational Numbers	
Rational Number	Sum
$+7 + +8 =$	$+15$
$+19 + +1 =$	$+20$
$+33 + +11 =$	$+43$
$+34.6 + +3.2$	$+37.8$
$+2/3 + +7/3$	$+3$

Do not confuse the sign of the rational number with the operation being performed.

Remember that:

$+29 + +16 = +45$ is read as *Positive 29 plus positive 16 equals positive 45.*



Adding rational numbers of different signs.

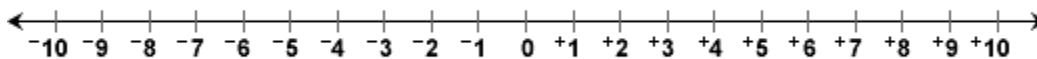
Rule #2 - If the signs are different, pretend the signs aren't there. Subtract the smaller from the larger one, and put the sign of the larger one in front of your answer.

To add a positive and a negative rational number (or a negative and a positive rational number), follow these steps:

1. Find the absolute value of each rational number.
2. Subtract the smaller number from the larger number you get in Step 1.
3. The result from Step 2 takes the sign of the rational number with the greater absolute value.

We will use the above procedure to add integers with unlike signs in Examples 3 through 6. Refer to the number line to help you visualize the process.

Example 3: Find the sum of -9 and $+5$.



Step 1: $|9| = 9$ and $|5| = 5$

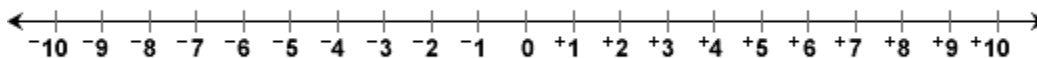
Step 2: $9 - 5 = 4$

Step 3: The number 4 will take a negative sign since -9 is farther from 0 than $+5$.

Solution 1: $-9 + +5 = -4$

Solution 2: If you owe \$9 and you are paid \$5, then you are still short \$4.

Example 4: Find the sum of $+6$ and -7 .



Step 1: $|6| = 6$ and $|7| = 7$

Step 2: $7 - 6 = 1$

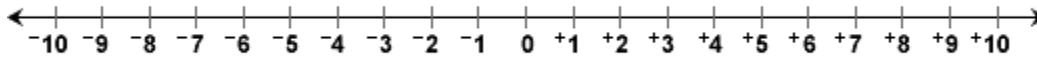
Step 3: The number 1 will take a negative sign since -7 is farther from 0 than $+6$.

Solution 1: $+6 + -7 = -1$

Solution 2: If you start with \$6 and you owe \$7, then you are still short \$1.



Example 5: Find the sum of -6 and $+7$.



Step 1: $|6| = 6$ and $|7| = 7$

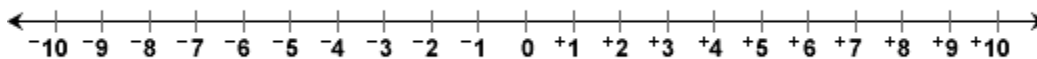
Step 2: $7 - 6 = 1$

Step 3: The number 1 will take a positive sign since $+7$ is farther from 0 than -6 .

Solution 1: $-6 + +7 = +1$

Solution 2: If you owe \$6 and you are paid \$7, then you end up with \$1.

Example 6: Find the sum of $+9$ and -9 .



Step 1: $|9| = 9$ and $|9| = 9$

Step 2: $9 - 9 = 0$

Step 3: The integer 0 has no sign.

Solution 1: $+9 + -9 = 0$

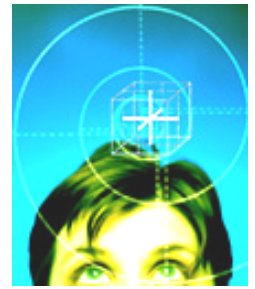
Solution 2: If you start with \$9 and you owe \$9, then you end up with \$0.



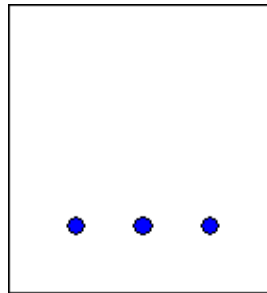


Consider the problem

$$+3 + (-5)$$

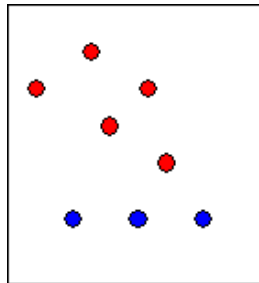


Blue counters represent positive integers. Red counters represent negative integers



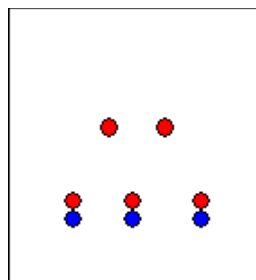
Step 1:

Start with three positive counters.



Step 2:

Five negative counters are added to the three positive counters.



Step 3:

The three negative counters combine with three of the positive counters to create zero pairs. Their value is zero. There are two negative counters left. Therefore, $+3 + (-5) = -2$



Simplifying and Evaluating Rational Expressions.

"Evaluation" mostly means "simplifying an expression down to a single numerical value." Sometimes you will be given a numerical expression where all you have to do is **simplify**. That is more of an order-of-operations kind of question.

In addition to simplifying expressions, there are times when we have to **substitute the value** of a variable **before** we can simplify the expression.

- First: substitute the value of the variable.
- Second: simplify the expression using PEMDAS.

Remember PEMDAS?

PEMDAS – **Please** **Excuse** **My** **Dear** **Aunt** **Sally**
 Parenthesis **Exponent** **Multiplication** **Division** **Addition** **Subtraction**

Usually the only hard part in evaluation is in keeping track of the minus signs. Keep parentheses liberally, especially when you're just getting started.

Simplify and evaluate the following expressions:

- **Evaluate $a^2 + b$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.**

To find the answer, plug in the given values, being careful to use parentheses, particularly around the minus signs:

$$(-2)^2 + (3) = (4) + (3) = 7$$

- **Evaluate $a + cd$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.**

$$(-2) + (-4)(4) = -2 + (-16) = 2 + 16 = -18$$



- **Evaluate $(b + d)^2$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.**

Make sure not to "distribute" the exponent through the parentheses.

Exponents do NOT distribute over addition!

$(b + d)^2$ is NOT the same as $b^2 + d^2$. I must evaluate the expression as it stands:

$$((3) + (4))^2 = (7)^2 = 49$$



- Evaluate $b^2 + d^2$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.

$$(3)^2 + (4)^2 = 9 + 16 = 25$$

Notice that this does not match the answer to the previous evaluation, pointing out again that exponents do not "distribute" the way multiplication does.

- Evaluate $bc^3 + ad$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.

$$(3)(-4)^3 + (-2)(4) = (3)(-64) + (-8) = (-192) + (-8) = -200$$

The most common "expression" you'll likely need to evaluate will be **polynomials**. To evaluate, you take the polynomial and plug in a value for x .

- Evaluate $x^4 + 3x^3 + x^2 + 6$ for $x = -3$.

$$\begin{aligned} (-3)^4 + 3(-3)^3 + (-3)^2 + 6 \\ = 81 + 3(-27) + (9) + 6 \\ = 81 + (-81) + 9 + 6 \\ = 15 \end{aligned}$$

- Evaluate $3x^2 + 12x + 4$ for $x = -2$.

$$3(-2)^2 + 12(-2) + 4 = 3(4) + (-24) + 4 = 12 - 24 + 4 = -8$$

- Evaluate $y = 4x + 3$ at $x = -1$.

$$y = 4(-1) + 3 = -4 + 3 = -1$$

Note: This means that the point $(-1, -1)$ is on the line $y = 4x - 3$.



Adding Integers
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Student Practice Worksheet



Name _____ Date _____ Grade _____

Answer the following questions without a calculator. Use the number line for assistance if needed.

Add the following integers of the same signs.

1. $-94 + (-27)$

2. $38 + 38$

3. $-47 + (-28)$

4. $31 + 12$

5. $(-8) + (-79)$

6. $11 + 46$

7. $(-163) + (-239)$

8. $(-150) + (-165)$

9. $414 + (+81)$

Add the following integers of different signs.

10. $-19 + 17$

11. $12 + (-63)$

12. $-61 + (5)$

13. $17 + (-23)$

14. $-47 + 58$

15. $7 + (-31)$

16. $-154 + 75$

17. $398 + (-300)$

18. $-567 + (0)$

Add the following series of three or more integers.

19. $(2) + (-6) + (-8)$

20. $-1 + (-5) + (4)$

21. $(-9) + (-7) + (-5)$

22. $(-8) + (1) + (9)$

23. $7 + (28) + (-10)$

24. $(-14) + (80) + (-21)$



(Worksheet – Continued)

25. $(50) + (-90) + (-57)$ 26. $(66) + (68) + (61)$ 27. $(-50) + (-86) + (111)$
28. $(-93) + (93) + (-1)$ 29. $(470) + (-366) + (180)$ 30. $(-922) + (-747) + (551)$

Add the following mathematical expressions.

31. $69w + 18w$ 32. $12x + (-15x)$ 33. $-9k + 7k$
34. $-18p + 25p$ 35. $-16m + (-38m)$ 36. $6n + (-8n) + (-5n)$

Evaluate each of the following expressions if $a = -3$, $b = -4$, and $c = 5$.

37. $b + (-8)$ 38. $c + b$ 39. $a + c + b$
40. $a + (-12)$ 41. $17 + c$ 42. $c + a$
43. $a + c$ 44. $(-9) + (c) + (9)$ 45. $c + b + c$

Solve the following real world applications to simple addition problems.

Show your work, and label your answer with the appropriate dollar or cent sign.

46. James bought a new camera. He took pictures of birds and squirrels at the park. He took 63 pictures of birds and 24 pictures of squirrels. How many pictures did he take in all?
47. Jenna's cookie jar had 16 cookies in it. She baked 24 more cookies. When they cooled, she added them to the cookie jar. What is the new total number of cookies in Jenna's cookie jar?
48. Justin read 51 pages of his book on Monday. On Tuesday, he read 38 more pages. How many pages did he read on both days combined?
49. At her lemonade stand, Amanda sold lemonade for three cents per glass. Sunday morning, Amanda made seventy-two cents. On Sunday afternoon, Amanda made fifteen cents. How much money did Amanda make during the weekend?
50. Mt. Everest, the highest elevation in Asia, is 29,028 feet above sea level. The Dead Sea, the lowest elevation, is 1,312 feet below sea level. What is the difference between these two elevations?



Adding Integers
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Student Practice Worksheet
Answer Key

Name _____ Date _____ Grade _____

Answer the following questions without a calculator. Use the number line for assistance if needed.

Add the following integers of the same signs.

1. $-94 + (-27)$

-121

2. $38 + 38$

76

3. $-47 + (-28)$

-75

4. $31 + 12$

43

5. $(-8) + (-79)$

-87

6. $11 + 46$

57

7. $(-163) + (-239)$

-402

8. $(-150) + (-165)$

-315

9. $414 + (+81)$

495

Add the following integers of different signs.

10. $-19 + 17$

-2

11. $12 + (-63)$

-51

12. $-61 + (5)$

56

13. $17 + (-23)$

-6

14. $-47 + 58$

11

15. $7 + (-31)$

-24

16. $-154 + 75$

-79

17. $398 + (-300)$

98

18. $-567 + (0)$

-567

Add the following series of three or more integers.

19. $(2) + (-6) + (-8)$

-12

20. $-1 + (-5) + (4)$

-2

21. $(-9) + (-7) + (-5)$

-21

22. $(-8) + (1) + (9)$

2

23. $7 + (28) + (-10)$

25

24. $(-14) + (80) + (-21)$

43





(Worksheet – Continued – Answer Key)

$$25. \quad (50) + (-90) + (-57) \qquad 26. \quad (66) + (68) + (61) \qquad 27. \quad (-50) + (-86) + (111)$$

$$\qquad \qquad \qquad -97 \qquad \qquad \qquad 195 \qquad \qquad \qquad -25$$

$$28. \quad (-93) + (93) + (-1) \qquad 29. \quad (470) + (-366) + (180) \qquad 30. \quad (-922) + (-747) + (551)$$

$$\qquad \qquad \qquad -1 \qquad \qquad \qquad 284 \qquad \qquad \qquad -1,118$$

Add the following mathematical expressions.

$$31. \quad 69w + 18w \qquad 32. \quad 12x + (-15x) \qquad 33. \quad -9k + 7k$$

$$\qquad \qquad \qquad 87w \qquad \qquad \qquad -3x \qquad \qquad \qquad -2k$$

$$34. \quad -18p + 25p \qquad 35. \quad -16m + (-38m) \qquad 36. \quad 6n + (-8n) + (-5n)$$

$$\qquad \qquad \qquad 7p \qquad \qquad \qquad -54m \qquad \qquad \qquad -7n$$

Evaluate each of the following expressions if $a = -3$, $b = -4$, and $c = 5$.

$$37. \quad b + (-8) \qquad 38. \quad c + b \qquad 39. \quad a + c + b$$

$$\qquad \qquad \qquad -12 \qquad \qquad \qquad 1 \qquad \qquad \qquad -2$$

$$40. \quad a + (-12) \qquad 41. \quad 17 + c \qquad 42. \quad c + a$$

$$\qquad \qquad \qquad -15 \qquad \qquad \qquad 22 \qquad \qquad \qquad 2$$

$$43. \quad a + c \qquad 44. \quad (-9) + (c) + (9) \qquad 45. \quad c + b + c$$

$$\qquad \qquad \qquad 2 \qquad \qquad \qquad 5 \qquad \qquad \qquad 6$$

Solve the following real world application to simple addition problems.

Show your work and label your answer with the appropriate dollar or cent sign.

46. James bought a new camera. He took pictures of birds and squirrels at the park. He took 63 pictures of birds and 24 pictures of squirrels. How many pictures did he take in all?

$$\qquad \qquad \qquad 87$$

47. Jenna's cookie jar had 16 cookies in it. She baked 24 more cookies. When they cooled, she added them to the cookie jar. What is the new total number of cookies in Jenna's cookie jar?

$$\qquad \qquad \qquad 40 \text{ cookies}$$

48. Justin read 51 pages of his book on Monday. On Tuesday, he read 38 more pages. How many pages did he read on both days combined?

$$\qquad \qquad \qquad 89 \text{ pages read}$$

49. At her lemonade stand, Amanda sold lemonade for three cents per glass. On Sunday morning, Amanda made seventy-two cents. On Sunday afternoon, Amanda made fifteen cents. How much money did Amanda make during the weekend?

$$\qquad \qquad \qquad 87\text{¢}$$

50. Mt. Everest, the highest elevation in Asia, is 29,028 feet above sea level. The Dead Sea, the lowest elevation, is 1,312 feet below sea level. What is the difference between these two elevations?

$$\qquad \qquad \qquad 30,340 \text{ feet}$$



Adding Integers
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Student Practice Worksheet
Rubric

Criteria					
	4	3	2	1	0
Mechanics	No math errors	No major math errors or serious flaws in reasoning.	May be some serious math error or flaws in reasoning.	Major math errors or serious flaws in reasoning.	Blank answers

Quiz Grading Rubric:

Problem	Total points of Correct Answer		Problem	Total points of Correct Answer	
1.			26.		
2.			27.		
3.			28.		
4.			29.		
5.			30.		
6.			31.		
7.			32.		
8.			33.		
9.			34.		
10.			35.		
11.			36.		
12.			37.		
13.			38.		
14.			39.		
15.			40.		
16.			41.		
17.			42.		
18.			43.		
19.			44.		
20.			45.		
21.			46.		
22.			47.		
23.			48.		
24.			49.		
25.			50.		

Total _____



Adding Integers

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Quiz

Name _____ Date _____ Grade _____

Add the following integers and expressions.

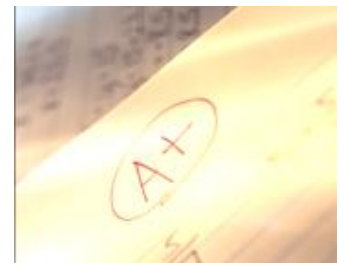
1. $(-8) + (-79)$
2. $(-13) + 56$
3. $(-163) + (-239)$
4. $(-150) + (165)$
5. $-19p + 55p$
6. $-26mn + (-4mn)$
7. $6n + (-8n) + (-5n)$
8. $13s + (-12s)$
9. $(-17e) + (-6e) + (9e)$

Evaluate each of the following expressions if $s = -10$, $x = 8$, and $u = -7$.

10. $s + u$
11. $(-12) + u$
12. $s + u + x$
13. $x + s + (-9)$

Solve the following real world applications to simple addition problems.

14. Karen and Josh were picking strawberries. Karen picked 226 strawberries. Josh picked 193 strawberries. How many strawberries did they pick altogether?
15. Martin's mother gave him \$20 to spend at the store. He bought a book for \$3.51 and a candy bar for \$1.29. How much did Martin spend in all?





Adding Integers

~
Quiz

Answer Key

Name _____ Date _____ Grade _____

Add the following integers and expressions.

1. $(-8) + (-79)$

-67

2. $(-13) + 56$

43

3. $(-163) + (-239)$

-402

4. $(-150) + (165)$

15

5. $-19p + 55p$

36p

6. $-26mn + (-4mn)$

30mn

7. $6n + (-8n) + (-5n)$

-7n

8. $13s + (-12s)$

1s

9. $(-17e) + (-6e) + (9e)$

-14e**Evaluate each of the following expressions if $s = -10$, $x = 8$, and $u = -7$.**

10. $s + u$

-17

11. $(-12) + u$

-19

12. $s + u + x$

9

13. $x + s + (-9)$

-9**Solve the following real world applications to simple addition problems.**

14. Karen and Josh were picking strawberries. Karen picked 226 strawberries. Josh picked 193 strawberries. How many strawberries did they pick altogether?

419

15. Martin's mother gave him \$20 to spend at the store. He bought a book for \$3.51 and a candy bar for \$1.29. How much did Martin spend in all?

4.8



Adding Integers

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Quiz

Rubric

Criteria

	4	3	2	1	0
Mechanics	No math errors	No major math errors or serious flaws in reasoning.	May be some serious math error or flaws in reasoning.	Major math errors or serious flaws in reasoning.	Blank answers

Quiz Grading Rubric:

Problem	Total points of Correct Answer		Problem	Total points of Correct Answer	
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.					

Total _____

