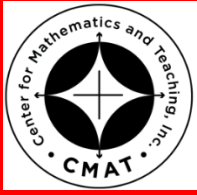Name_____   Period _____   Date _____

MathLinks

7- 4
STUDENT PACKET

**MATHLINKS: GRADE 7
STUDENT PACKET 4
ADDITION AND SUBTRACTION ON THE NUMBER LINE**

WORD BANK

Word or Phrase	Definition or Description	Picture or Example
addend		
absolute value		
difference		
distance		
minuend		
origin		
quadrant		
rational number		
subtrahend		
sum		

ADDITION ON THE NUMBER LINE

| Summary	Goals
We will deepen our understanding of integer addition by exploring this operation on a number line.	• Explore integer addition on the number line. • Review rules for addition using the number line and counters.

Warmup

Use appropriate words to make the sentences true.

1. As we move from left to right on the number line, numbers get _____.

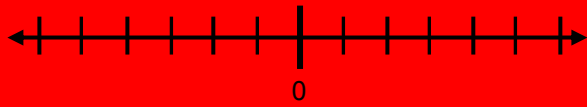2. As we move from right to left on the number line, numbers get _____.

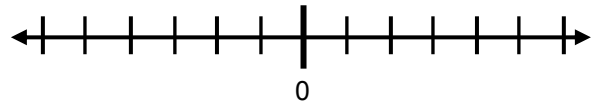Draw arrows beginning at zero to represent each of the following numbers on the number lines below.

3. 5

4. -5

5. 2.5

6. $-2\frac{1}{2}$
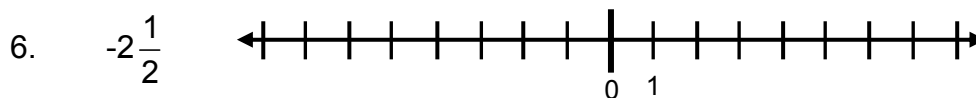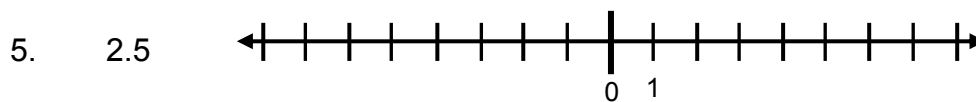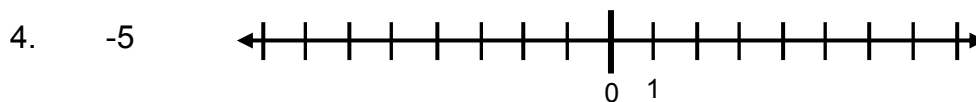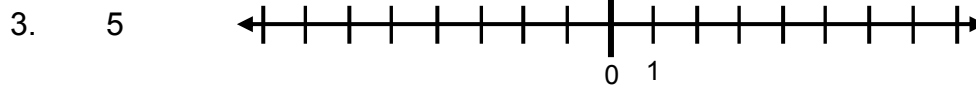
EXPLORING ADDITION ON THE NUMBER LINE

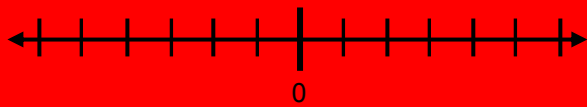Your teacher will demonstrate how to draw arrows to compute the following.
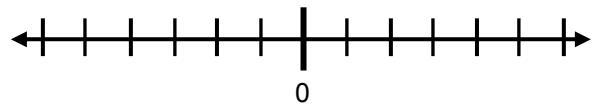
1. (2) + (3) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	2. (-2) + (3) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0
3. (2) + (-3) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	4. (-2) + (-3) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0

Draw arrows to compute the following sums.

5. (5) + (-5) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	6. (-6) + (6) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0
7. (-5) + (3) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	8. (-3) + (5) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0
9. (-4) + (-1) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	10. (-1) + (4) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0
11. (-2) + (4) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0	12. (-2) + (-4) = _____ ⟵─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─┼─⟶ 0
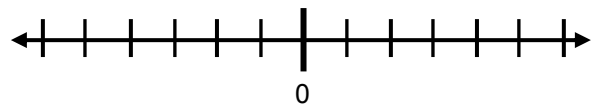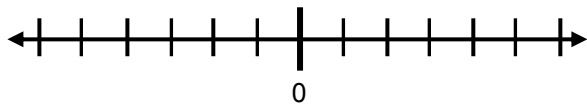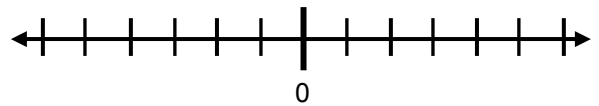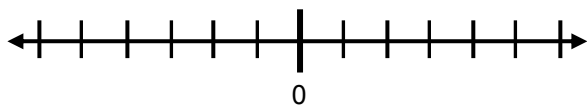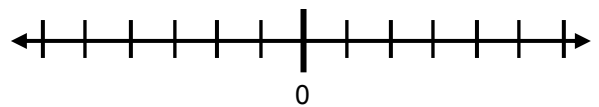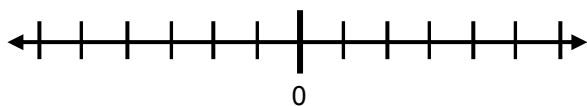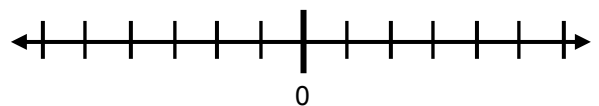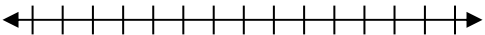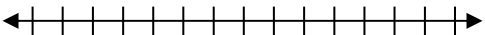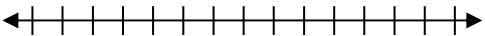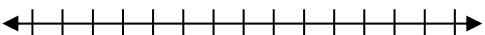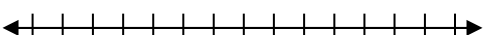
COMPARING REPRESENTATIONS

Represent each addition problem using counters and arrows.

	Problem	Counters Diagram	Number line
1.	5 + (-3) = _____		
2.	-1 + (-3) + (-5) = _____		
3.	-6 + (4) = _____		
4.	-7 + 7 = _____		
5.	-2 + (-4) + (5) = _____		

6. How is the concept of zero pairs represented using arrows?

7. State the rules for adding integers.

   a. The sum of two integers is positive when:

   b. The sum of two integers is negative when:

   c. The sum of two integers is zero when:

8. Which method above do you think would best help you recall the rules for addition of integers if you forgot them?

PLAYING CARD ADDITION PRACTICE

To practice addition of integers, shuffle a deck of playing cards with the picture cards removed.

→ Let all red cards represent positive integers.
→ Let all black cards represent negative integers.
→ Let jokers represent zero.

• Place two cards on the table. Write the equation represented by their sum. Repeat 5 times.

• Find the total of each addend column and the total of the sum column.

• Check your addition. Pick up all your cards and add them together. Does their sum equal the total of the sum column? If not, check and correct your work.

1.

Addend	+	Addend	=	Sum
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____

_____ + _____ = [_____]

Write number sentences to show how you added the cards together when you picked them up to check your sum.

Draw arrows to verify the sum of the sums in the **bottom row**.

2.

Addend	+	Addend	=	Sum
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____
_____	+	_____	=	_____

_____ + _____ = [_____]

Write number sentences to show how you added the cards together when you picked them up to check your sum.

Draw arrows to verify the sum of the sums in the **third column**.

SUBTRACTION ON THE NUMBER LINE

Summary	Goals
We will use our knowledge of addition and subtraction as inverse operations to create adding up statements from subtraction statements. We will deepen our understanding of integer subtraction by exploring this operation on a number line.	Explore addition and subtraction as inverse operations. Explore integer subtraction on the number line. Review rules for subtraction using the number line and counters.

Warmup

The <u>inverse operation</u> to a mathematical operation reverses the effect of the operation.

1. Write at least one true subtraction equation with the same numbers that are in this equation.

   $35 + 17 = 52$

2. Write at least one true addition equation with the same numbers that are in this equation.

   $80 - 20 = 60$

3. If $5 - 3 = x$, circle all of the true equations below.

   a. $3 - 5 = x$

   b. $x - 5 = 3$

   c. $x + 3 = 5$

   d. $x - 3 = 5$

   e. $x + 5 = 3$
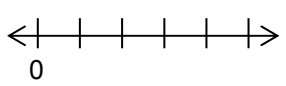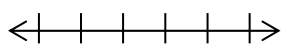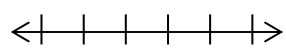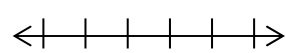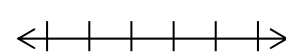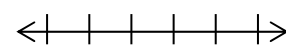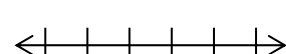
   f. $5 - x = 3$

SUBTRACTION AS ADDING UP

This chart illustrates how subtraction is related to "adding up."
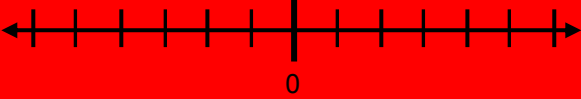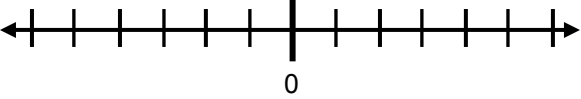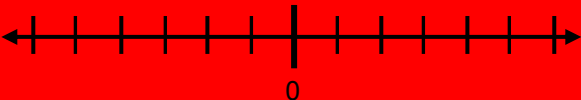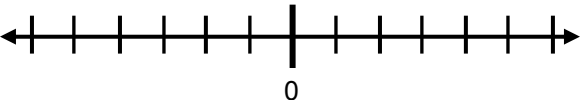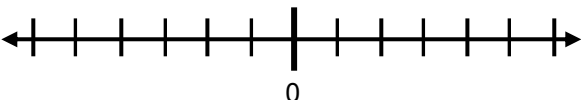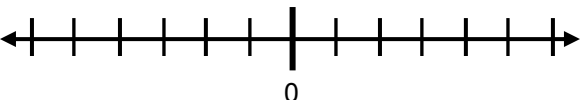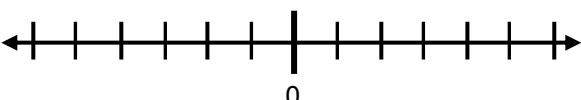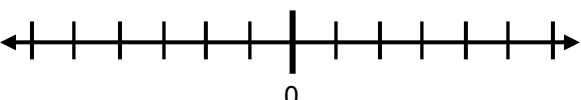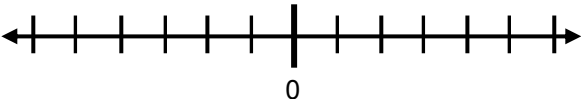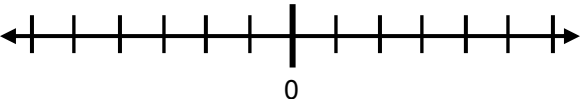
(a) – (b) = ☐	☐ + (b) = (a)
minuend subtrahend difference	addend addend sum

Recall the commutative property: ☐ + (b) = (a)   is equivalent to   (b) + ☐ = (a)

Complete the table.

Subtraction		Addition	
Equation	**Counters**	**Corresponding Adding Up Equation**	**Number line**
1. (5) – (2) = _____	+ + + + +	____ + 2 = 5 or 2 + ____ = 5	⟵⊢+⊢+⊢+⊢+⊢+⊢⟶ 0
2. (3) – (1) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
3. (-3) – (1) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
4. (1) – (3) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
5. (-3) – (-1) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
6. (1) – (-3) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
7. (-1) – (-3) = _____			⟵⊢+⊢+⊢+⊢+⊢+⊢⟶
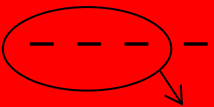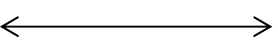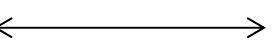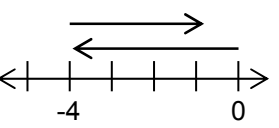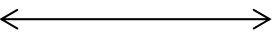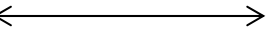
PRACTICE

Rewrite each subtraction equation as an adding up equation. Then draw arrows on the number lines to show the solution.

1. $(3) - (2) =$ ___ → ___ + ___ = 3	2. $(-3) - (2) =$ ___ → ___ + ___ = ___
3. $(3) - (-2) =$ ____	4. $(-3) - (-2) =$ ____
5. $(5) - (1) =$ ____	6. $(1) - (5) =$ ____
7. $(-5) - (1) =$ ____	8. $(1) - (-5) =$ ____
9. $(-1) - (5) =$ ____	10. $(1) - (-5) =$ ____

SUMMARIZING REPRESENTATIONS

You have learned different ways to represent integer subtraction and to perform the operation. Complete this table of representations for three examples. Problems 1-3 relate to the given subtraction problems. Problems 4-6 relate to the given subtraction problems when changed to equivalent addition problems.

	Subtraction problem ➞	-4 − (-3) = ____	4 − (-3) = ____	-4 − 3 = ____
Think subtraction problem	1. Use counters to model subtraction	– – – –		
	2. Rewrite as adding up sentence		-3 + ____ = 4	
	3. Use arrows	⟵⟶	⟵⟶	⟵⟶
Think addition problem	4. Rewrite as addition problem			-4 + (-3)
	5. Use counters to model addition			
	6. Use arrows	(number line with -4 and 0)	⟵⟶	⟵⟶

7. State a rule for rewriting a subtraction problem as an addition problem.

   a. Using words:

   b. Using symbols:

8. If you forgot the rule for subtraction of integers, which representation(s) do you think would best help you recall it?

DIFFERENCE AND DISTANCE ON THE NUMBER LINE

On a number line below, subtraction can be used to find the distance between two points. Use a number line as needed to solve problems 1-6.
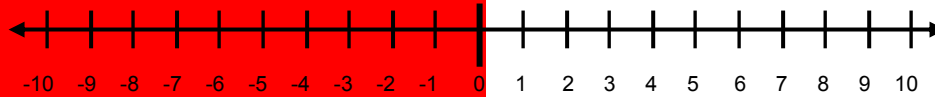
	Points on a line (A and B)	Differences (B – A and A – B)	Absolute value of the differences	Distance between points
1.	5 and 8	8 – 5 = _____ 5 – 8 = _____		
2.	0 and 4			
3.	-4 and 0			
4.	-7 and -5			
5.	2 and -9			
6.	3 and 3			

7. The distance between two points is the _____ _____ of their difference.

For the given pairs of points on a line, find the distance between them without counting.

8. 25 and 105	9. -30 and -70	10. 50 and -50

FINDING DISTANCES IN THE COORDINATE PLANE

1. Name each quadrant with the appropriate Roman Numeral (I, II, III, or IV).

2. Label the *x*-axis and the *y*-axis.

3. Graph and label the following ordered pairs:

   A (0, 3)   B (4, 3)

   C (-2, 2)   D (-2, -1)

   E (2, 5)   F (-5, 5)

   G (7, 3)   H (7, -3)

Quadrant _____   Quadrant _____

Quadrant _____   Quadrant _____
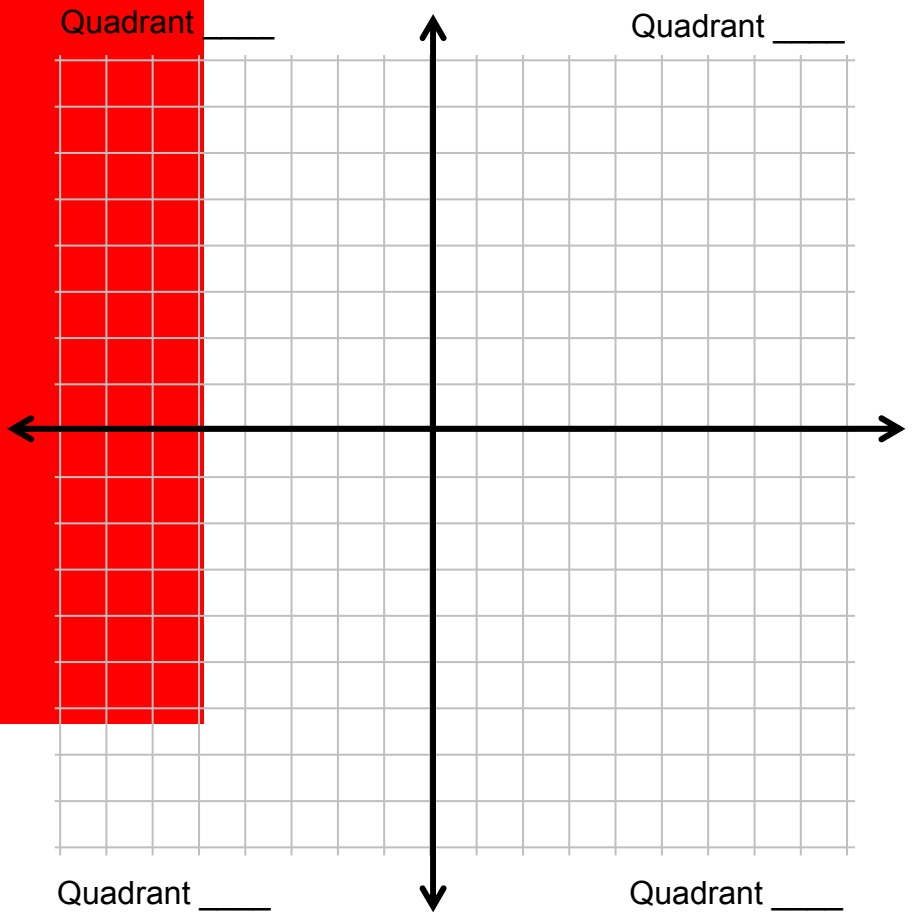
4. Connect the points to create the following line segments: $\overline{AB}$, $\overline{CD}$, $\overline{EF}$, $\overline{GH}$

5. Which are the horizontal line segments?

6. Which are the vertical line segments?

7. Find the length of each segment by counting on the grid. We will denote the length of $\overline{MN}$ to be $\left|MN\right|$.

   $\left|AB\right|$ = _____ $\left|CD\right|$ = _____ $\left|EF\right|$ = _____ $\left|GH\right|$ = _____

FINDING DISTANCES

1. Refer to the horizontal line segments on the previous page.

   a. How can you tell from the ordered pairs that these are horizontal?

   b. Find the absolute value of the difference of the x-coordinates for $\overline{AB}$.

      That is, $\left| 0 - \underline{\hspace{1cm}} \right| = \underline{\hspace{1cm}}$. What does this value tell you about the length of $\overline{AB}$?

   c. Write an absolute value equation for $\left| EF \right|$.

2. Refer to the vertical line segments on the previous page.

   a. How can you tell from the ordered pairs that these are vertical lines?

   b. Find the absolute value of the difference of the y-coordinates for $\overline{CD}$.

      That is, $\left| 2 - \underline{\hspace{1cm}} \right| = \underline{\hspace{1cm}}$. What does this value tell you about the length of $\overline{CD}$?

   c. Write an absolute value equation for $\left| GH \right|$.

State whether each pair of points lies on a horizontal or vertical line. Then find the distance between them.

3. (19, 1) and (4, 1)	4. (1, 0) and (1, -20)	5. (-22, 2) and (53, 2)

SOLVING PROBLEMS

Write numerical equations to solve each problem, then write the answers as full sentences. Use the number lines below and arrows as needed.
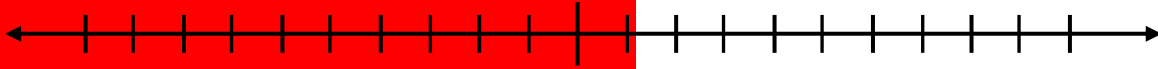
1. Devin is a running back on his high school football team. On the first down (the first play), he and his team lose 3 yards. On the second down (the next play), he and his team gain 7 yards. Where is Devin's team in relation to where they started before the first down?

   Equation:

   Answer as sentence:

2. On a cold winter afternoon in Minnesota, the temperature was 4°F. By evening the temperature had dropped 11°. What was the evening temperature?

   Equation:

   Answer as sentence:

3. A bird is flying 50 meters above sea level. A fish is swimming 20 meters below sea level. What is the distance between the bird and the fish?

   Equation:

   Answer as sentence:

4. A rancher is digging a well. Ground level has an elevation of zero. From ground level he digs down 20 feet, decides it is too deep, and fills the hole until it is 6 feet higher. At what elevation is the bottom of the well after his work is complete?

   Equation:

   Answer as sentence:
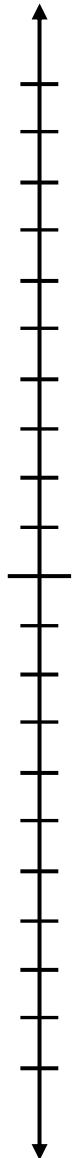
ADDITION AND SUBTRACTION: RATIONAL NUMBERS

Summary	Goals
We will extend our knowledge of integer addition and subtraction to adding and subtracting rational numbers.	• Apply rules for integer addition and subtraction to rational numbers.

Warmup

Compute.

	Use fractions	Use decimals
1. $\frac{3}{4} + 0.2$		
2. $\frac{3}{4} - 0.2$		
3. $\frac{3}{4} \bullet 0.2$		
4. $\frac{3}{4} \div 0.2$		
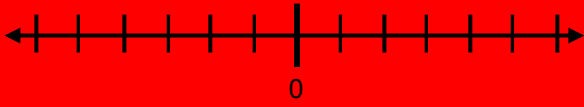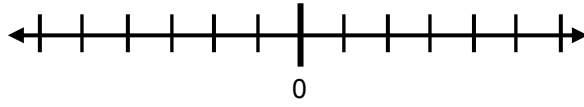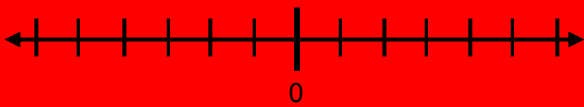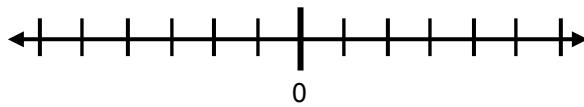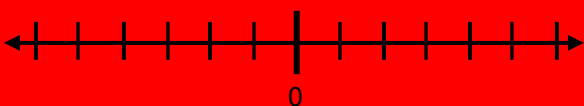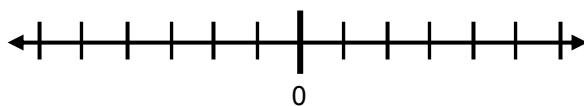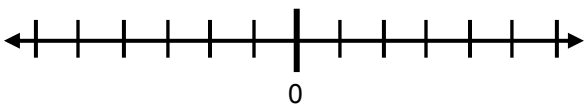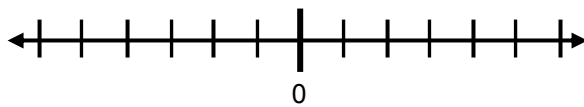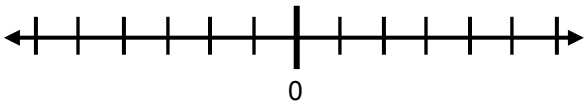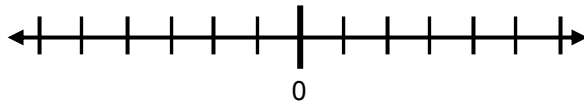
5.   Circle the method that seems easier to you for each problem.

Recall that a <u>rational number</u> is a number that can be written in the form $\frac{a}{b}$ or $-\frac{a}{b}$ for some fraction $\frac{a}{b}$. Rational numbers include the integers.

6.   Are all of the numbers in problems 1-4 above rational numbers? _____ Explain.

REVISITING ADDITION ON THE NUMBER LINE

Draw arrows to compute the following. Scale appropriately.
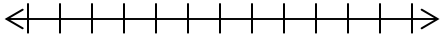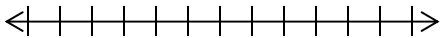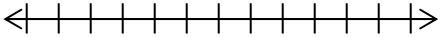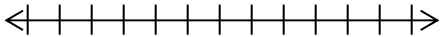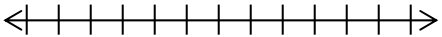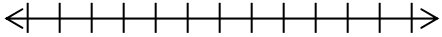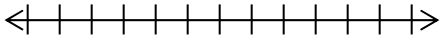
1. 0.2 + (-0.3) = _____	2. -0.2 + (-0.3) = _____
3. 0.2 + 0.3 = _____	4. -0.2 + 0.3 = _____
5. -0.2 + (-0.2) = _____	6. $-\dfrac{2}{3} + \dfrac{2}{3} =$ _____
7. $-\dfrac{3}{4} + \left(-\dfrac{1}{4}\right) =$ _____	8. $\left(-\dfrac{1}{4}\right) + \dfrac{3}{4} =$ _____
9. $\dfrac{1}{4} + \left(-\dfrac{7}{8}\right) =$ _____	10. $-\dfrac{2}{3} + \dfrac{1}{2} =$ _____

11. How is adding rational numbers the same as adding integers?

12. How did you determine if a sum was positive, negative, or zero in the problems above?

REVISITING SUBTRACTION AS ADDING UP

Complete the table. Scale number lines appropriately.

Subtraction Equation	A Corresponding Adding Up Equation	Number Line
1. $0.5 - 0.2 =$ ____		
2. $-0.1 - 0.3 =$ ____		
3. $0.3 - (-0.1) =$ ____		
4. $-0.3 - (-0.1) =$ ____		
5. $\left(\dfrac{1}{4}\right) - \dfrac{1}{2} =$ ____		
6. $\left(-\dfrac{1}{4}\right) - \dfrac{1}{2} =$ ____		
7. $\left(-\dfrac{3}{4}\right) - \dfrac{3}{2} =$ ____		

8. We used counters to illustrate integer subtraction. Why do you think that counters are not a good model for rational number subtraction in general?

9. Does the rule for subtracting integers also hold true for subtracting all rational numbers?

PRACTICE: NUMBER LINES

Compute. Show that your result is correct with arrows. Scale appropriately.

1. 0.8 + 0.4 = _____	2. 0.3 – (-0.5) = _____
3. $-1\frac{1}{2}$ + (-2) = _____	4. $-3\frac{1}{2}$ – (-5) = _____
5. 2.5 + (-0.5) = _____	6. 2.5 – (-0.5) = _____
7. $-2\frac{1}{4}$ + $1\frac{1}{4}$ = _____	8. $-1\frac{1}{4}$ – $1\frac{3}{4}$ = _____
9. $-2\frac{1}{2}$ – $3\frac{1}{2}$ = _____	10. $-3\frac{1}{2}$ – $(-3\frac{1}{2})$ = _____
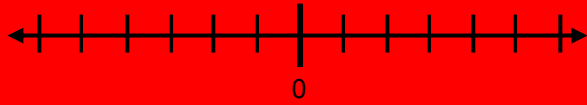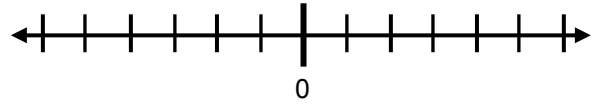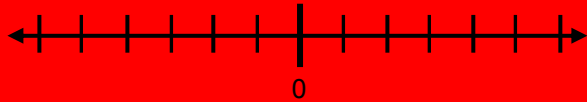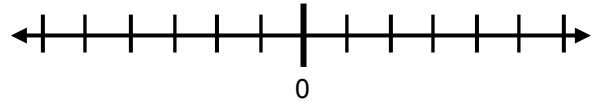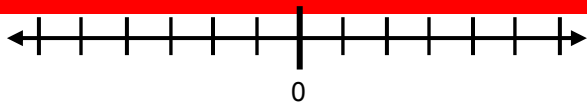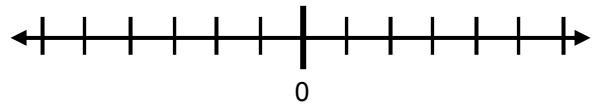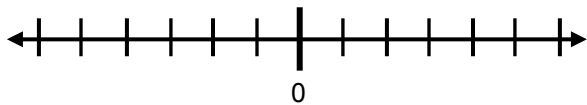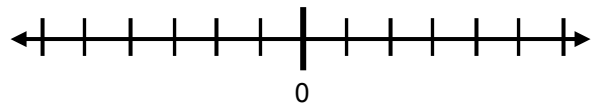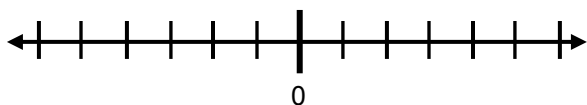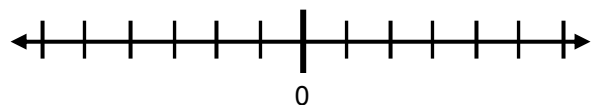
ADDING AND SUBTRACTING RATIONAL NUMBERS 1

Rules for Adding and Subtracting Rational Numbers
Addition
Rule 1:   When the addends have the same sign, add the absolute values of the addends. Use the original sign in the answer.
Rule 2:   When the addends have different signs, subtract the absolute values of the addends. Use the sign of the addend with the greatest absolute value in the answer.
Subtraction
Rule 3:   Subtracting a quantity gives the same result as adding its opposite.

Compute. Show work if needed.

1. $0.8 + 0.06$	2. $0.8 - 0.6$	3. $0.6 - 0.8$	4. $0.08 + (-0.06)$
5. $-15.5 + 4.6$	6. $-15.5 - 4.6$	7. $-15.5 - (-4.6)$	8. $4.321 - 1.234$
9. $-21.33 + (-43.6)$	10. $21.33 - (-43.6)$	11. $-21.33 - (-43.6)$	12. $-7.17 - (-71.7)$
13. $127.5 + (-11.11)$	14. $127.5 - (-11.11)$	15. $-127.5 - 11.11$	16. $1.359 + (-0.246)$

MENTAL ADDITION

1. Are $-\dfrac{1}{8}$ and $\dfrac{-1}{8}$ equivalent or not? Explain.
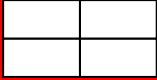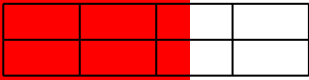
Compute the sums of the following rational numbers mentally.

2.　$\dfrac{1}{8} + \dfrac{3}{8}$	3.　$-\dfrac{1}{8} + \dfrac{3}{8}$	4.　$-\dfrac{1}{9} + \dfrac{2}{9} + \dfrac{4}{9}$
5.　$\dfrac{1}{9} + \left(-\dfrac{2}{9}\right) + \left(-\dfrac{4}{9}\right)$	6.　$\dfrac{1}{3} + 1\dfrac{1}{2} + \dfrac{2}{3}$	7.　$-\dfrac{1}{2} + 1\dfrac{1}{2}$
8.　$1\dfrac{1}{2} + \left(-1\dfrac{1}{2}\right)$	9.　$\dfrac{3}{2} + \left(-1\dfrac{1}{2}\right)$	10.　$-\dfrac{1}{3} + 1\dfrac{1}{2} + \left(-\dfrac{2}{3}\right)$

11. For problem 6, why is it inefficient to find the common denominator of halves and thirds before adding?

12. Explain your thought process for computing the sum in problem 10.

MENTAL SUBTRACTION

Subtract mentally. Do not use diagrams for problems 3 and 6.

1. $1 - \dfrac{1}{4}$	2. $1 - \dfrac{3}{8}$	3. $1 - \dfrac{9}{11}$
4. $2 - \dfrac{1}{4}$	5. $3 - \dfrac{3}{8}$	6. $7 - \dfrac{9}{11}$
7. Explain your thought process for problem 6.		

Subtract mentally.
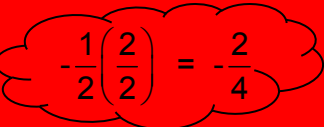
8. $\dfrac{1}{4} - 1$	9. $\dfrac{3}{8} - 3$	10. $\dfrac{5}{7} - 6$
11. Explain your thought process for problem 10.		

Subtract mentally.

12. $3 - \dfrac{1}{2}$	13. $\dfrac{1}{2} - 3$	14. $-\dfrac{1}{2} - 3$
15. $-3 - \dfrac{1}{2}$	16. $3 - \left(-\dfrac{1}{2}\right)$	17. $-3 - \left(-\dfrac{1}{2}\right)$
18. $-\dfrac{2}{9} - \dfrac{4}{9}$	19. $-\dfrac{2}{9} - \left(-\dfrac{4}{9}\right)$	20. $\dfrac{2}{9} - \left(-\dfrac{4}{9}\right)$

ADDING AND SUBTRACTING RATIONAL NUMBERS 2

Compute. Show work as needed.

1. $-\dfrac{1}{2} + \dfrac{1}{4}$ Think: $-\dfrac{1}{2}\left(\dfrac{2}{2}\right) = -\dfrac{2}{4}$	2. $\dfrac{1}{2} - \dfrac{1}{4}$	3. $-\dfrac{3}{4} + \left(-\dfrac{5}{6}\right)$
4. $\dfrac{1}{2} + \left(-\dfrac{2}{3}\right)$	5. $\dfrac{2}{3} - \dfrac{1}{2}$	6. $\dfrac{3}{4} - \dfrac{3}{4}$
7. $\dfrac{1}{4} - \dfrac{1}{2}$	8. $\dfrac{1}{2} - \dfrac{2}{3}$	9. $\dfrac{3}{4} - \dfrac{3}{4}$
10. $-\dfrac{1}{2} - \dfrac{1}{4}$	11. $\dfrac{1}{2} - \left(-\dfrac{2}{3}\right)$	12. $-\dfrac{3}{4} - \left(-\dfrac{5}{6}\right)$

MORE ADDITION

Add in two different ways.

Expression	Expand and add integers first	Change to fractions and their opposites first
1. $-1\frac{2}{3} + 2\frac{1}{4}$	$-1 + \left(-\frac{2}{3}\right) + 2 + \left(\frac{1}{4}\right)$ $= (-1 + \underline{\hspace{1cm}}) + \left(-\frac{2}{3} + \underline{\hspace{1cm}}\right)$	$\left(-\frac{5}{3}\right) + \left(\underline{\hspace{1cm}}\right)$
2. $-1\frac{2}{3} + \left(-2\frac{1}{4}\right)$		

Compute using any method.

3. $-2\frac{1}{8} + 3\frac{3}{4}$	4. $-4\frac{1}{2} + 1\frac{3}{5}$	5. $-2\frac{1}{3} + \left(-3\frac{7}{9}\right)$

MORE SUBTRACTION

Subtract in two different ways.

Expression	Expand and add integers first	Change to fractions and their opposites first
1. $-1\frac{2}{3} - 2\frac{1}{4}$ Change to addition problem: $\left(-1\frac{2}{3}\right) + \boxed{}$	$(-1 + \underline{}) + \left(-\frac{2}{3} + \underline{}\right)$	$-\frac{5}{3} + \left(\underline{}\right)$
2. $-1\frac{2}{3} - \left(-2\frac{1}{4}\right)$ Change to addition problem:		

Compute using any method.

3. $-2\frac{1}{8} - 3\frac{3}{4}$	4. $-4\frac{1}{2} - \left(-1\frac{3}{5}\right)$	5. $2\frac{1}{3} - \left(-3\frac{7}{9}\right)$

COMPUTATION PRACTICE

Compute using any method. If mental math is used, write MM. Otherwise show all work.

1. -25.1 + 4.8	2. -25.1 − 4.8	3. 25.1 − (-4.8)
4. $\dfrac{1}{3} - \left(-\dfrac{1}{6}\right)$	5. $-\dfrac{3}{4} - \dfrac{5}{6}$	6. $-\dfrac{3}{8} - \left(-\dfrac{5}{12}\right)$
7. $\dfrac{1}{7} + \left(-\dfrac{5}{7}\right) + \dfrac{4}{7}$	8. $-\dfrac{3}{5} + 1\dfrac{1}{2} + \left(-\dfrac{2}{5}\right)$	9. $-\dfrac{1}{4} + 1\dfrac{1}{4}$
10. $\dfrac{1}{5} - 1$	11. $\dfrac{1}{5} - 2$	12. $\dfrac{3}{5} - 2$
13. $-3\dfrac{1}{2} + 4\dfrac{3}{10}$	14. $-2\dfrac{3}{4} + 1\dfrac{2}{5}$	15. $-5\dfrac{1}{6} + \left(-1\dfrac{2}{9}\right)$
16. $-3\dfrac{1}{2} - 4\dfrac{3}{10}$	17. $-2\dfrac{3}{4} - \left(-1\dfrac{2}{5}\right)$	18. $5\dfrac{1}{6} - \left(-1\dfrac{2}{9}\right)$

SKILL BUILDERS, VOCABULARY, AND REVIEW

SKILL BUILDER 1

1. How much money did Phyllis spend if she bought 4 CDs that cost $12 each and 2 DVDs that cost $18 each?

2. Ramila went to the bookstore with some money. She bought 3 books that cost $15 each (tax included). After she made her purchase, she had 3 dollars left over. How much money did she start with?

Simplify.

3. $\lvert 8 + (-5) \rvert$	4. $-\lvert 3 + 5 \rvert$	5. $\lvert -6 + (-4) \rvert$

6. Graph each number and its opposite on the number line below.

2	$\dfrac{1}{4}$	$1\dfrac{1}{4}$	$\dfrac{3}{4}$	$\dfrac{7}{8}$	$1\dfrac{5}{8}$
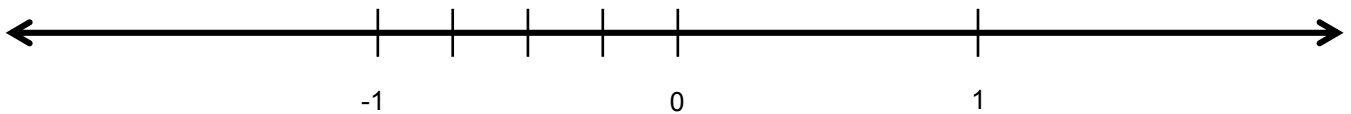
7. Order these integers: 8,   -4,   -3,   9,   6,   -3,   15,   0,   -5,   -19,   -38,   22

____ < ____ < ____ < ____ < ____ < ____ < ____ < ____ < ____ < ____ < ____ < ____

SKILL BUILDER 2

Compute.

1. (15.3)(0.2)	2. 13.4 + 9.03	3. 92 ÷ 0.002
4. $1\frac{1}{2} + 2\frac{3}{4}$	5. $3\frac{3}{4} \div 2\frac{7}{8}$	6. $4\frac{1}{6} - 1\frac{3}{8}$

7. Jean and Mary learn that their home is worth $96,000. If, for every $1,000 of value, they must pay $55.50 in taxes, how much is the tax bill on their home?

Find the greatest common factor (GCF) and least common multiple (LCM) for each pair of numbers.

8. 12 , 8	9. 18 , 9	10. 24 , 36
GCF: _____, LCM: _____	GCF: _____, LCM: _____	GCF: _____, LCM: _____

SKILL BUILDER 3

1. Yuri made 4 goals in the soccer game. The rest of the team made 6 goals. Write the ratio of Yuri's goals to total goals.

2. You work 10 hours and make $118. Complete the table. Then circle the column in the table that could be used to represent your hourly pay rate.

pay	$118	$236		$1,180				
hours		20	2		0	1	5	25

3. Valencia Middle School has 564 students and 24 teachers. George Washington Middle School has 623 students and 28 teachers. Which school has the lower rate of students per teacher? Explain.

4. You eat 9 pounds of cereal in 12 weeks.

   a. Complete the double number line below.

   pounds of cereal

   number of weeks
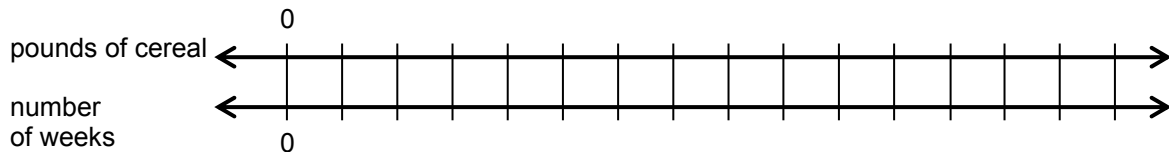
   b. At that rate, how many pounds of cereal would you eat in 2 weeks?

   c. At that rate, how many weeks would it take to eat 15 pounds of cereal?

   d. What is the unit rate of pounds of cereal eaten per week?

SKILL BUILDER 4

Compute.

1. 2,351 − 987	2. 983 • 23	3. 831 ÷ 3

4. Order these rational numbers. $-\dfrac{1}{4}$ $-\dfrac{4}{3}$ -0.2   -0.02   -1.3 $-1\dfrac{2}{10}$

_____ < _____ < _____ < _____ < _____ < _____

5. Circle all of the following statements that are true.

   a.   -5 < -10 + 5   b.   -7 + 2 ≥ -6 + 1   c.   -1 + 3 ≥ $\left| -2 \right|$ d. $\left| -7 - 1 \right|$ ≤ -8

Write each rational number as a decimal or the opposite of a decimal.

6. $\dfrac{12}{15}$	7. $\dfrac{3}{5}$	8. $-\dfrac{1}{3}$

9. Graph and label the following
    ordered pairs.

    A (-1.5, 3)   B (0.5, 2)

    C (4.5, -1)   D (-3.2, -1)

    E (2.5, 3)   F (0, -4.5)

    G (-2.7, 2)   H (-2.5, -4)
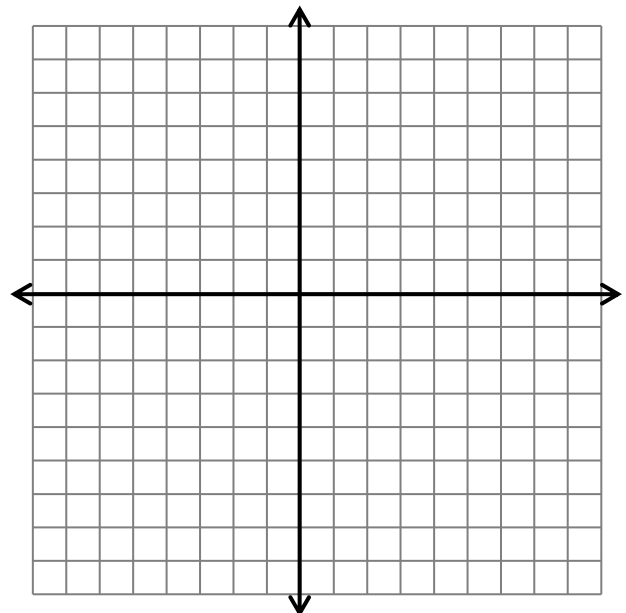
SKILL BUILDER 5

1. Using hot **p**ieces and/or cold **n**uggets, write two different ways to decrease the temperature of a liquid by 6 degrees. One way must include using both cold **n**uggets and hot **p**ieces.

Compute.

2. $(12 - 2) \cdot 5$	3. $5 + (6 \div 2)$	4. $5^2 + 6$

Evaluate. Use $x = -4$ and $y = 10$.

5. $3y - x$	6. $5 + x - y$	7. $6y - 2 + 8 - x$

8. Juan says that the expressions $2(6a - 9)$, $4(3a - 4)$ and $12a - 18$ are all equivalent. Is he correct? Explain.

Factor using the distributive property and write as a product.

9. $42 + 6$ $= \underline{\quad}(\underline{\quad} + \underline{\quad})$	10. $3y - 9$	11. $12 - 8x$

SKILL BUILDER 6

Use any method to compute. Sketch counters or draw arrows if desired.

```
<---+--+--+--+--+--+--+--+--+--+--|--+--+--+--+--+--+--+--+--+--+--->
   -10 -9 -8 -7 -6 -5 -4 -3 -2 -1  0  1  2  3  4  5  6  7  8  9 10
```
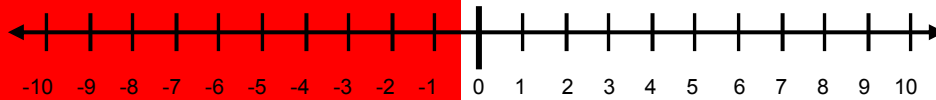
1. -3 + (-3)	2. -7 + 4	3. 10 + (-2)
4. -5 + 10	5. -6 + 6	6. -3 + (-8)
7. -4 – 2	8. -3 – 5	9. 6 – (-4)
10. 9 – (-3)	11. -2 – (-5)	12. 5 + (-8)
13. -10 + 3	14. -5 – 9	15. -3 + 3

Extend the patterns established in each table.

16.

Expression	Sum
3 + (1)	4
3 + (0)	
3 + (-1)	
3 + (___)	
3 + (___)	

17.

Expression	Difference
3 – (___)	4
3 – (0)	
3 – (1)	
3 – (2)	
3 – (___)	

18.   Adding positive 1 to a number gives the same result as subtracting _____.

19.   Adding negative 3 to a number gives the same result as subtracting _____.

SKILL BUILDER 7

For the following problems, find the difference between the points, and then find the distance between the points. Use the number line below to verify the reasonableness of your answer.

$$\longleftarrow \underset{-10\ -9\ -8\ -7\ -6\ -5\ -4\ -3\ -2\ -1\quad 0\ \ 1\ \ 2\ \ 3\ \ 4\ \ 5\ \ 6\ \ 7\ \ 8\ \ 9\ \ 10}{\text{|||||||||||||||||||||}} \longrightarrow$$
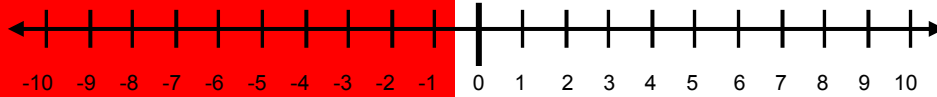
	Points on a line	Difference between points		Distance between points
1.	3 and 8	8 – 3 = _____	3 – 8 = _____	
2.	-4 and 4	4 – (-4) = _____	(-4) – 4 = _____	

3. Graph and label the following ordered pairs.

   A (-1, 2) B (4, 2)

   C (-3, 2) D (-3, -1)

   E (4, 5) F (0, 5)

   G (6, -4) H (6, 6)
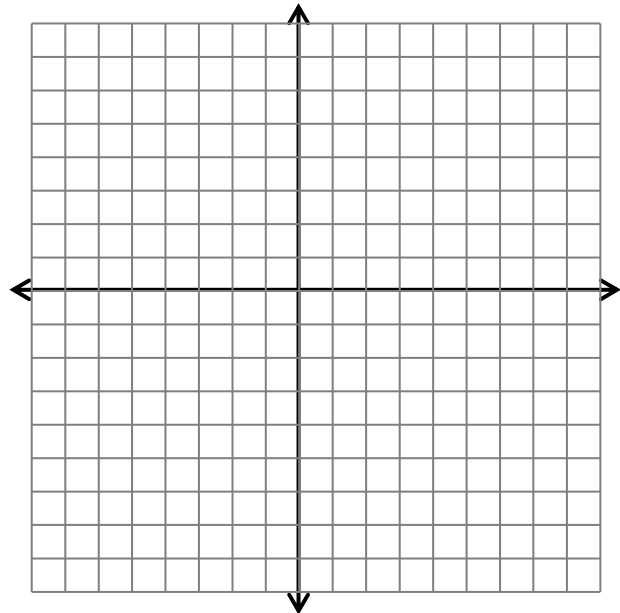
4. Connect points to create line segment.
   $\overline{AB}$, $\overline{CD}$, $\overline{EF}$, $\overline{GH}$

5. Which are the horizontal line segments?

6. Which are the vertical line segments?

7. Find the length of each segment by counting on the grid. We will denote the length of $\overline{MN}$ to be $\left| MN \right|$.

   $\left| AB \right|$ = _____ $\left| CD \right|$ = _____ $\left| EF \right|$ = _____ $\left| GH \right|$ = _____

State whether each pair of points lies on a horizontal or vertical line. Then find the distance between them.

8. (5, 2) and (-4, 2)	9. (4, 0) and (4, -30)	10. (-24, 0) and (46, 0)

SKILL BUILDER 8

1. A submarine is situated 350 feet below sea level. If it descends 200 feet, what is its new position?

   Equation: _____; Answer as a sentence:

Compute. Show work as needed.

2. $12.3 - (-4.5)$	3. $-14.8 + 3.2$	4. $-9.7 - (-3.9)$	5. $-25.8 - 6.7$

Compute mentally.

6. $\frac{1}{4} + \left(-\frac{3}{4}\right)$	7. $-\frac{2}{5} + \frac{3}{5}$	8. $-\frac{5}{12} + \frac{1}{12} + \frac{3}{12}$
9. $5 - \frac{1}{2}$	10. $\frac{1}{2} - 5$	11. $-\frac{1}{2} - 5$

Use the symbols $<$, $=$, or $>$ to compare.

12. $-12.3 + 9.5$ _____ $5.4 - 8.6$	13. $15.3 + (-13.8)$ _____ $1.3 - (-1.3)$
14. $1\frac{1}{2} + \left(-1\frac{1}{2}\right)$ _____ $\frac{1}{4} + \left(-\frac{1}{2}\right) + \frac{1}{4}$	15. $2\frac{1}{5} - 3\frac{1}{5}$ _____ $3\frac{1}{5} - 2\frac{1}{2}$

SKILL BUILDER 9

Compute. Show all work.

1. -22.3 + 8.3	2. -5.1 – 12.8	3. 23.9 – (-2.9)
4. $-4\dfrac{1}{4}$ + $4\dfrac{3}{8}$	5. $-1\dfrac{3}{5}$ + $1\dfrac{2}{3}$	6. $-2\dfrac{1}{2}$ – $4\dfrac{3}{8}$

Compute. Label and graph the value of each expression on the number line below.

7.   A. 1.5 + (-0.5)   B.   1.5 – (-0.5)   C.   -1.5 + 0.5   D.   -1.5 – 0.5
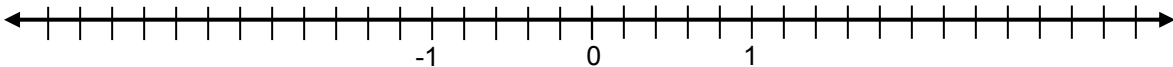
8.   A. $-2\dfrac{1}{2}$ + (-4)   B. $-2\dfrac{1}{2}$ – (-4)   C. $-2\dfrac{1}{2}$ – $2\dfrac{1}{2}$ D. $-2\dfrac{1}{2}$ + $2\dfrac{1}{2}$
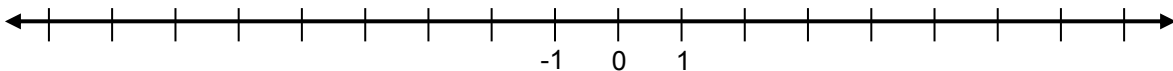
Simplify each expression. Then evaluate the expression for $x = 3$.

9. $x + 4 + 3x - 2x$	10. $3(5 + x) - 2x + 7$

FOCUS ON VOCABULARY
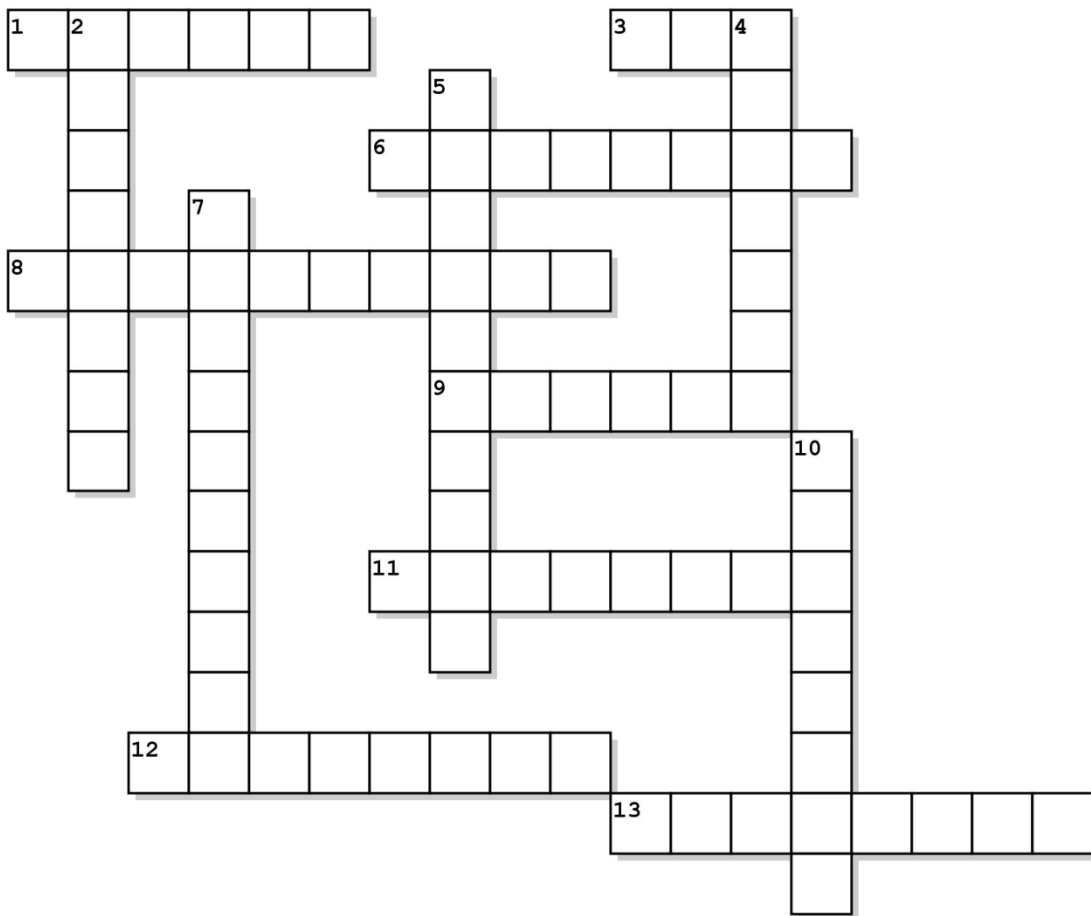
Across

1   The coordinate (0,0)

3   Result of addition

6   One-fourth of a coordinate plane

8   Direction of *x*-axis

9   A number being added

11   -6, 0, 3, -10, for example

12   Direction of *y*-axis

13   Length

Down

2   Numbers of the form $\frac{a}{b}$, $b \neq 0$

4   The number subtracted from

5   The number being subtracted

7   Result of subtraction

10   Value denoted by $|a|$

(For word hints, see the word bank and other vocabulary used in this packet.)

SELECTED RESPONSE

Show your work on a separate sheet of paper and choose the best answer(s).

1. Choose all the expressions that are equivalent to -7 – (-4).

   A.   -7 + 4   B.   -4 + 7   C.   7 – 4   D.   4 – 7

2. William found that the distance between two points on the number line was 8. Which of the following pairs of points could NOT have been the points that William used?

   A.   0 and 8   B.   -6 and -2   C.   -2 and 6   D.   -6 and 2

3. A bird is flying 35 meters above sea level. A fish is swimming 15 meters below sea level. What is the distance between the bird and the fish?

   A.   -20 meters   B.   20 meters   C.   50 meters   D.   None of these

4. Compute using any method.   -24.1 + 8.5

   A.   -32.6   B.   15.6   C.   -15.6   D.   32.6

5. Choose all of the expressions that have a value of $2\frac{1}{3}$.

   A. $2\frac{5}{6} - \frac{1}{2}$ B. $-1\frac{2}{3} + 3$ C. $2 + \left(-\frac{1}{3}\right)$ D. $2 - \left(-\frac{1}{3}\right)$

6. Choose all of the following statements that are true for the points G (-4, 5) and H (7, 5).

   A.   G and H are vertically aligned.   B.   G and H are horizontally aligned.

   C.   The distance from G to H is 11.   D.   The distance from G to H is 3.

7. Ryan found that the distance between two points on the coordinate plane is 7. Choose all of the following pairs of points that Ryan could have considered.

   A.   (3, 2) and (-4, 7)   B.   (9, 2) and (9, 9)
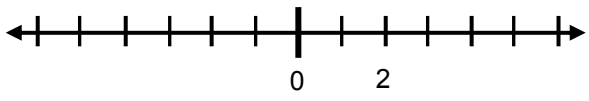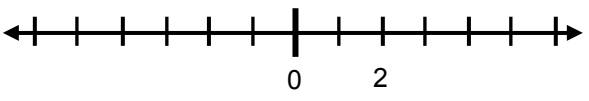
   C.   (0, 7) and (7, 0)   D.   (5, 2) and (12, 9)

KNOWLEDGE CHECK

Show your work on a separate sheet of paper and write your answers on this page.

4.1 Addition on the Number Line

Represent each addition problem with counters and arrows.

Problem	Counters Diagram	Number Line
1. 5 + (-3) = _____		 0 2
2. (-2) + (-3) =_____		 0 2

4.2 Subtraction on the Number Line

Rewrite each subtraction equation as an adding up equation. Then draw arrows to show the solution.

3. (-4) – (1) = ___ → [   ]

0   2

4. 1 – (-4) = ___ → [   ]

0   2
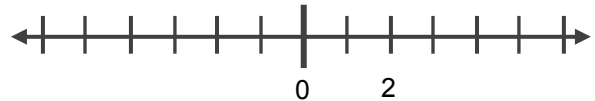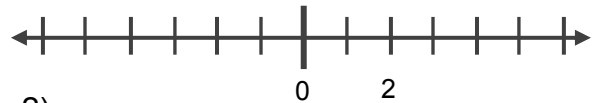
5. Graph and label F (5, 7); G (5, -2);   and H (-4, -2) on the grid provided to the right.

6. Find $|FG|$ and $|GH|$.
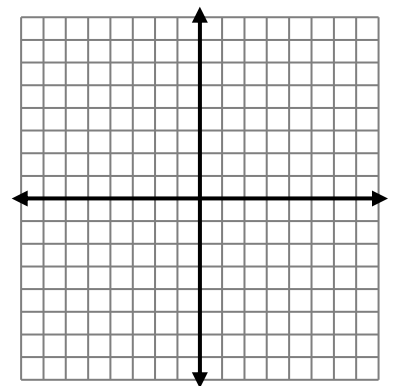
6.3   Addition and Subtraction: Rational Numbers

Compute using any method.

7.   -3.75 + 2.5

8. $-2\dfrac{1}{2} + \left(-3\dfrac{3}{4}\right)$

HOME-SCHOOL CONNECTION

Here are some problems to review with your young mathematician.

1. Represent -6 + 3 with counters and arrows.

Counters:	Arrows:
	  0 2
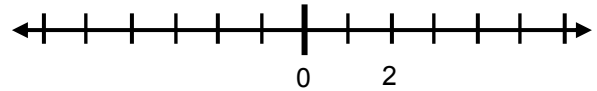
2. Rewrite   -4 – (-1) as an adding up equation. Then draw arrows on the number line below to show the solution.

0   2
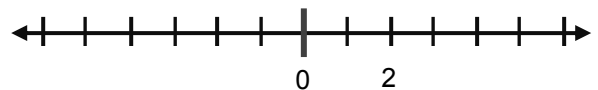
3. Write the coordinates for each ordered pair graphed.

A (_____, _____)   B (_____, _____)

G (_____, _____)   H (_____, _____)
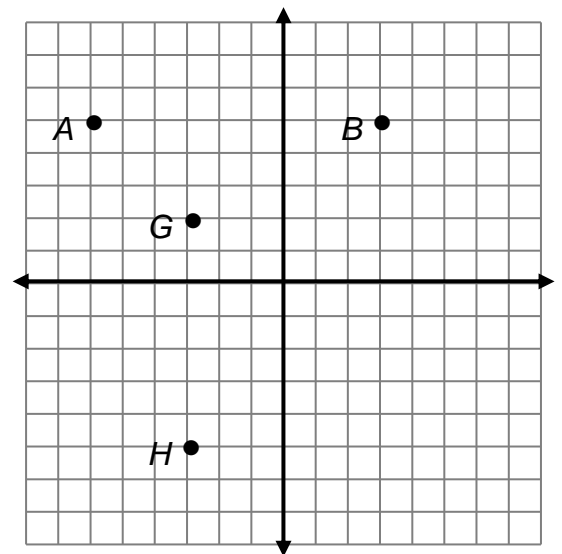
4. Draw $\overline{AB}$ and $\overline{GH}$ and find the length of these segments.

|AB| = _____ |GH| = _____

Compute.

5.   80.1 – (-20.3)

6. $-4\dfrac{1}{2} + 5\dfrac{3}{4}$

Parent (or Guardian) Signature_____

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COMMON CORE STATE STANDARDS – MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT

6.NS 6c*	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
6.NS 7c*	Understand ordering and absolute value of rational numbers. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write |-30|= 30 to describe the size of the debt in dollars*
6.NS 8*	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
7.NS.1a	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram: Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*
7.NS 1b	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. Understand $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending upon whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
7.NS 1c	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
7.NS 1d	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. Apply properties of operations as strategies to add and subtract rational numbers.

*Review of content essential for success in 7th grade.

STANDARDS FOR MATHEMATICAL PRACTICE

MP1	Make sense of problems and persevere in solving them.
MP2	Reason abstractly and quantitatively.
MP3	Construct viable arguments and critique the reasoning of others.
MP5	Use appropriate tools strategically.
MP6	Attend to precision.
MP7	Look for and make use of structure.
MP8	Look for and express regularity in repeated reasoning.

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