NOTES: Lesson 1 Key **Date** _____
Introduction to integers **Page** _____

cabulary:

Integers - positive, negative counting #'s and 0.

Opposites - a # and its additive inverse have a sum of 0.

Additive Inverse - the opposite of a # on a number line.

Absolute value - the distance a # is from 0 (always positive)

Symbol: | |

Ways to write integers:

Positive 4 or +4 ← don't need a sign

Negative −4 ← have to have a sign

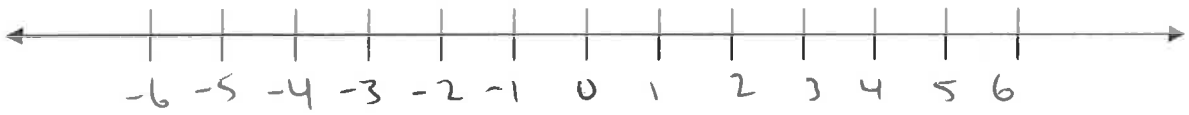
te: A negative sign really means to do the opposite.

← opposite of −4 is 4.

Knowing this what does – (-4) mean?

−(−4)

Putting integers on a number line:



Comparison symbols:

> means greater

↓

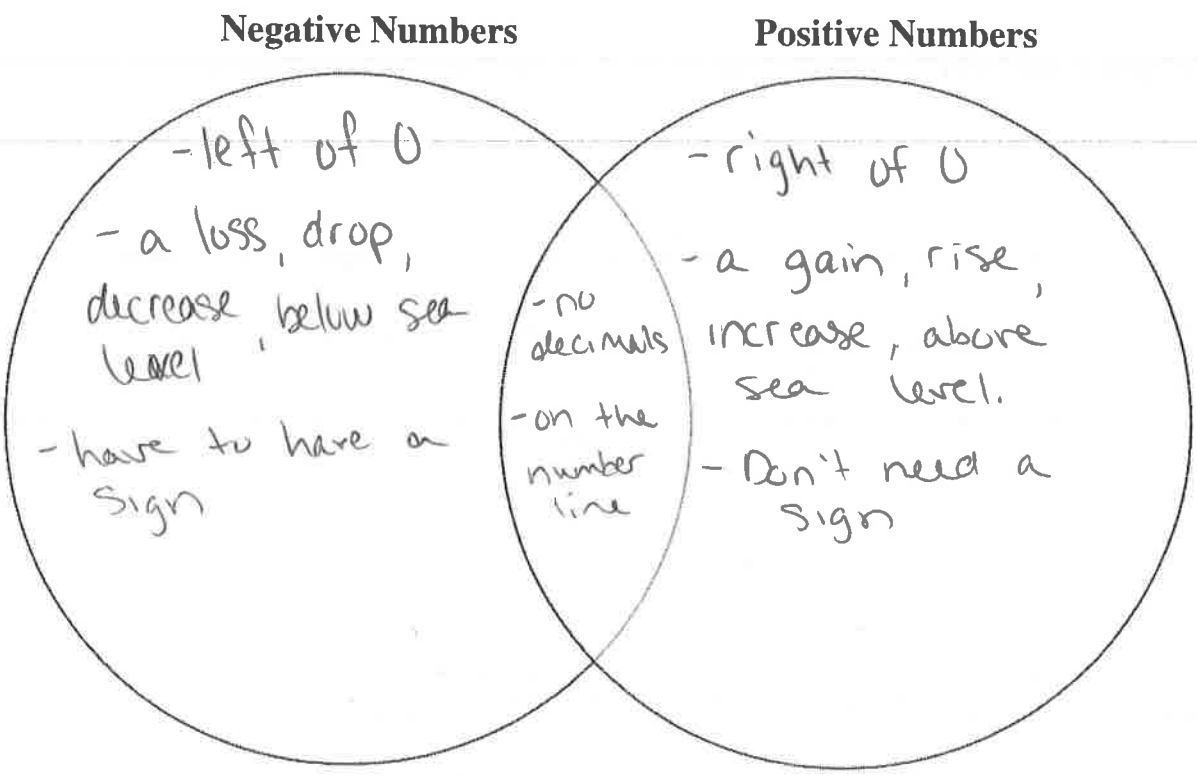
further right

< means less

↙

further less

Complete the graphic organizer:



Try These:

Write an integer to represent each situation.

1) 8° below zero $-8°$

2) $4 gain $\$4$

Write the opposite of each integer.

3) –5 5

4) 4 -4

Find the absolute value.

5) $|-17|$ 17

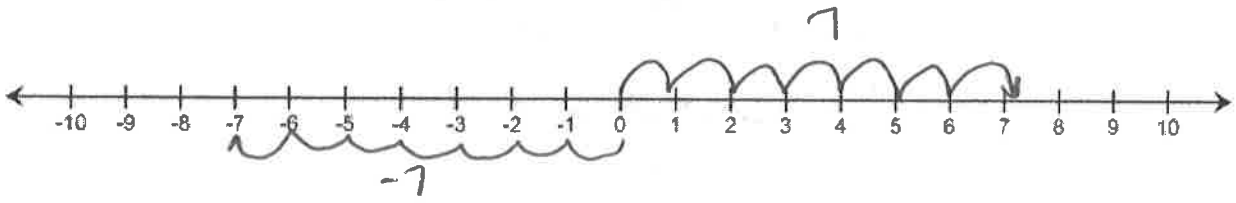
6) $|+65|$ 65

Compare the integers.

7) -7 $<$ -2 8) -67 $<$ 45 -3 $>$ -9

Using the number line to count up and down:

- *Counting up* corresponds to positive numbers.
- *Counting down* corresponds to negative numbers.
- A negative or subtraction change the direction on a number line.



1) Use the number line above to answer the questions.

a. Where do you begin when locating a number on the number line?

0

b. What do you call the distance between a number and 0 on a number line?

absolute value

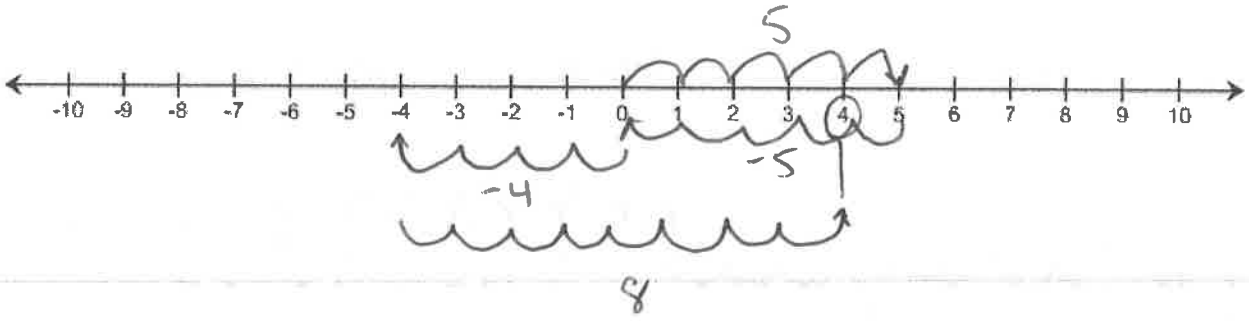
c. What is the relationship between 7 and -7?

opposites/ additive inverses

2) What is the sum of the card values shown? Use the counting on method on the provided number line to justify your answer.

5	−5	−4	8

a. What is the final position on the number line? 4



b. What card or combination of cards would you need to get back to 0?

1 card → −4

2 cards → −1, −3
−2, −2
−6, 2
⋮

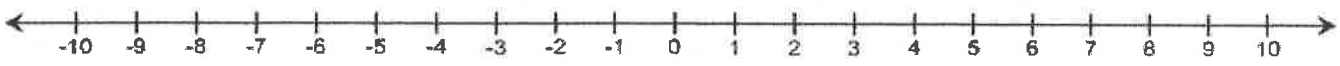
Lesson Summary

- Add positive integers by counting up, and add negative integers by counting down.
- An integer plus its opposite sum to zero.
- The opposite of a number is called the additive inverse because the two numbers' sum is zero.

Name _____ **Date** _____

Period _____ **Math 7 ~ Lesson 1 Practice**

1) Use the number line to answer each of the following questions.

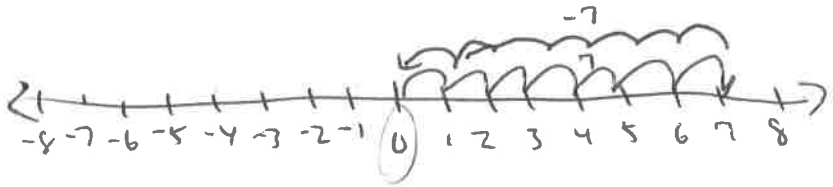


a. How far is 7 from 0 and in which direction? 7 right

b. What is the opposite of 7? -7

c. How far is −7 from 0 and in which direction? 7 left

d. Thinking back to our previous work, how would you use the counting on method to represent the following: While playing the Integer Game, the first card selected is 7, and the second card selected is −7.



e. What does this tell us about the sum of 7 and its opposite, −7?

The sum is 0.

f. Look at the curved arrows you drew for 7 and −7. What relationship exists between these two arrows that would support your claim about the sum of 7 and −7?

They are additive inverses / opposites.

g. Do you think this will hold true for the sum of any number and its opposite?

Yes because if you go the same distance forwards as you go backwards you will always end up where you started.

2) You have two cards with a sum of (−12) in your hand.

a. What two cards could you have?

-6, -6 ; -10, -2 ; -5, -7 ...

b. You add two more cards to your hand, but the total sum of the cards remains the same, (−12). Give some different examples of two cards you could choose.

-5, +5

-4, +4

-8, 8 ...

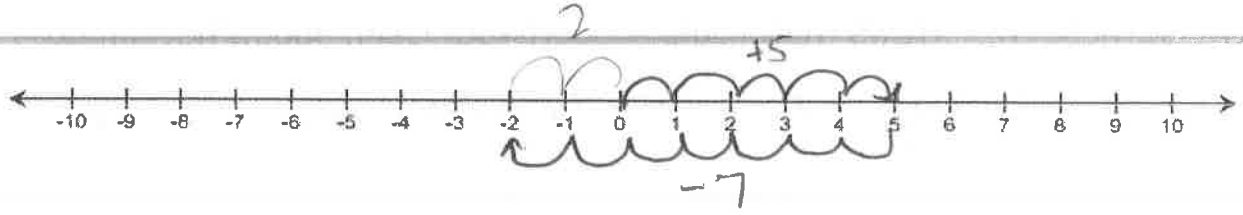
3) Using any number and its additive inverse, write a real world problem for each situation.

a. Money (deposits and withdrawals)

If you deposit $100 into the bank and then withdraw $100 from the bank you have nothing left.

b. ~~Elevation (above and below sea level)~~

4) During a football game, Kevin gained five yards on the first play. Then he lost seven yards on the second play. How many yards does Kevin need on the next play to get the team back to where they were when they started? Use the number line to show your work.

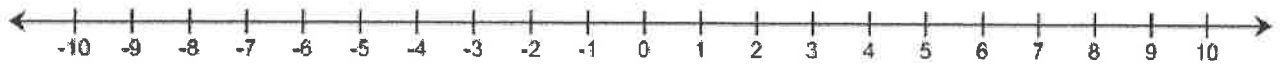


He needs to gain 2 yards.

NOTES: Lesson 2
Adding Integers

Date _____
Page _____

We can use the number line and the idea of counting up and counting down. Remember that a positive is counting up and a negative is counting down. Counting up −4 is the same as "the opposite of counting up 4" and also means counting down 4.



Examples:

a) 4 + 3
+ + + +
+ + + 7

b) 2 + 3
5

c) 5 + 1 + 4
6 + 4
10

d) −4 + -3
− − − −
− − − −7

e) −2 + -3
-5

f) −5 + -1 + -3
-6 + - 3
-9

g) 4 + -2
+ + −
+ + − 2

h) −5 + 7
2

i) −3 + 8 + 2
5 + 2
7

j) −9 + 6
-3

k) −10 + 4
-6

l) 3 + -10
-7

Can we summarize this into rules?

Rules for adding like integers: same signs +, + or −, −

1) add the numbers
2) keep the sign

S a k
same add keep

Rules for adding unlike integers: different signs +, − or −, +

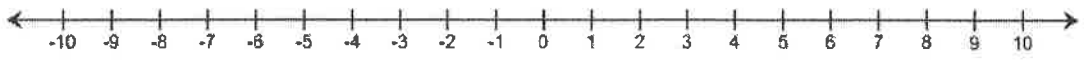
1) subtract the lowest from the highest
2) take the sign of the larger number

d s l
different subtract larger sign

Name _____ **Date** _____

Period _____ **Math 7 ~ Lesson 2 Practice**

Use the number line or the rules to find each sum.



1) –8 + -2

-10

2) 5 + 5

10

3) –3 + -3

-6

4) 2 + 7 + -1

9 + -1

8

5) –7 + -1

-8

6) 0 + -8 + 1

-7

7) 6 + 3

9

8) –6 + -4

-10

9) –8 + 4

-4

10) –4 + 8

4

11) 5 + -2

3

12) –5 + 2

-3

13) 9 + -3

6

14) –3 + -9

-12

15) –10 + 2 + 3

-10 + 5

-5

16) –2 + 10

8

17) 3 + -9

-6

18) –4 + -8

-12

19) 9 + -6

3

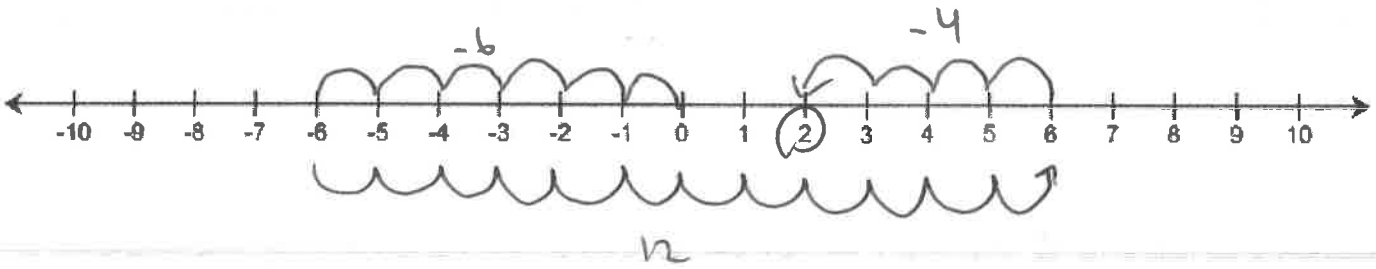
20) 5 + -5

0

21) If the temperature outside is -5, name the temperature that would make the sum 0.

5

22) David and Victoria are playing the Integer Card Game. David drew three cards, −6, 12, and −4. What is the sum of the cards in his hand? Model your answer on the number line below.



2

Notes: Lesson 3 & 4
More Adding Integers

Date _____
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use what we did yesterday with our rules to answer the questions below.

1) Decide whether the sum will be positive or negative without actually calculating the sum.

a) $-4 + (-2)$ —

b) $5 + 9$ +

c) $-6 + (-3)$ —

d) $-1 + (-11)$ —

e) $3 + 5 + 7$ +

f) $-20 + (-15)$ —

same signs, keep the sign

2) Find the sum.

a) $15 + 7$ 22

15
7
22

b) $-4 + (-16)$ −20

16
4
20

c) $-18 + (-64)$ −82

64
18
82

d) $-205 + (-123)$ −328

205
123
328

3) Circle the integer with the greater absolute value. Decide whether the sum will be positive or negative without actually calculating the sum.

a) $-1 + (+2)$ +

b) $5 + (-9)$ −

c) $-6 + 3$ −

4) Below is a table showing the change in temperature from morning to afternoon for one week.

up or down

a) Use the vertical number line to help you complete the table. As an example, the first row is completed for you.

Morning Temperature	Change	Afternoon Temperature	Number Sentence
1°C	Rise of 3°C	4°C	1 + 3 = 4
2°C	Rise of 8°C	10°C	2 + 8 = 10
−2°C	Fall of 6°C	−8°C	−2 + −6 = −8
−4°C	Rise of 7°C	3°C	−4 + 7 = 3
6°C	Fall of 9°C	−3°C	6 + −9 = −3
−5°C	Fall of 5°C	−10°C	−5 + −5 = −10
7°C	Fall of 7°C	0°C	7 + −7 = 0

b) Do you agree or disagree with the statement: "A rise of −7°C" means "a fall of 7°C"? Explain.

Yes, a rise −7 means count down 7 and falling 7 also means to count down.

5) Terry selected two cards. The sum of her cards is −10.

a) Can both cards be positive? Explain why or why not.

No, because adding two positives means going up on the number line not down to negatives.

b) Can one of the cards be positive and the other be negative? Explain why or why not. Yes, you can go down past −10, then back up which would result in different signs. Ex −13 + 3

c) Can both cards be negative? Explain why or why not.

Yes, you can go down twice. Ex −7 + −3.

Name _____ **Date** _____

Period _____ **Math 7 ~ Lesson 3 & 4 Practice**

1. Find the sum. Show your work to justify your answer.

a. $4 + 17$ $\quad 17 + 4 = 21$ (21)

c. $2.2 + (-3.7)$ $\quad 3.7 - 2.2 = 1.5$ (-1.5)

b. $-6 + (-12)$ $\quad 12 + 6 = 18$ (-18)

d. $-3 + (-5) + 8$

$-8 + 8$

(0)

2. Which of these story problems describes the sum $19 + (-12)$? Check all that apply. Show your work to justify your answer.

7

✓ Jared's dad paid him \$19 for raking the leaves from the yard on Wednesday. Jared spent \$12 at the movie theater on Friday. How much money does Jared have left?

\$7

— Jared owed his brother \$19 for raking the leaves while Jared was sick. Jared's dad gave him \$12 for doing his chores for the week. How much money does Jared have now?

$-19 + 12$

-7

✓ Jared's grandmother gave him \$19 for his birthday. He bought \$8 worth of candy and spent another \$4 on a new comic book. How much money does Jared have left over?

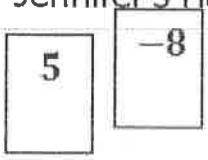
$19 + -8 + -4$

$11 + -4$

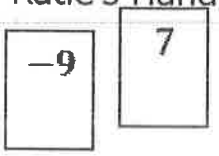
\$7

3. Jennifer and Katie were playing the Integer Game in class. Their hands are represented below.

Jennifer's Hand



Katie's Hand



a. What is the value of each of their hands? Show your work to support your answer.

$5+(-8)$

-3

$-9+7$

-2

b. If Jennifer drew two more cards, is it possible for the value of her hand not to change? Explain why or why not.

Yes, any pair of opposites.

1, -1

2, -2

3, -3

⋮

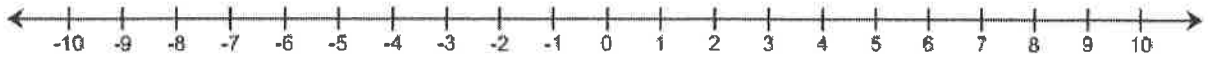
Notes: Lesson 5
Subtracting Integers

Date _____
Page _____

Remember from Lesson #1:

A negative or subtraction change the direction on a number line.

Let's try these problems using the number line and counting up and down.



Examples: subtraction → adding its opposite

a) 5 – 10

5 + -10

-5

b) 10 – 15

10 + -15

-5

c) 2 – 5

2 + -5

-3

d) 2 – 9

2 + -9

-7

e) –5 – 5

-5 + -5

-10

f) 5 - -1

5 + 1

6

g) –2 – 3

-2 + -3

-5

h) 1 - -9

1 + 9

10

Can we summarize the steps from above into rules?

Steps:

1) Keep the first #

2) change subtraction to addition

3) change the sign of the second #

* follow addition rules.

The Rule of Subtraction: *Subtracting a number is the same as adding its additive inverse (or opposite).*

Try These:

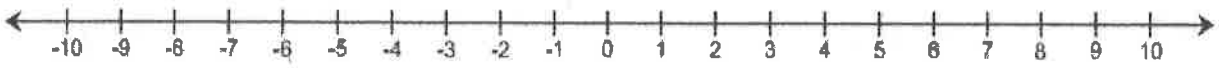
1. Using the rule of subtraction, rewrite the following subtraction sentences as addition sentences and solve. Use the number line below if needed.

a. 8 – 2 $8 + -2 = 6$

b. 4 – 9 $4 + -9 = -5$

c. –3 – 7 $-3 + -7 = -10$

d. –9 – (–2) $-9 + 2 = -7$



2. Find the differences.

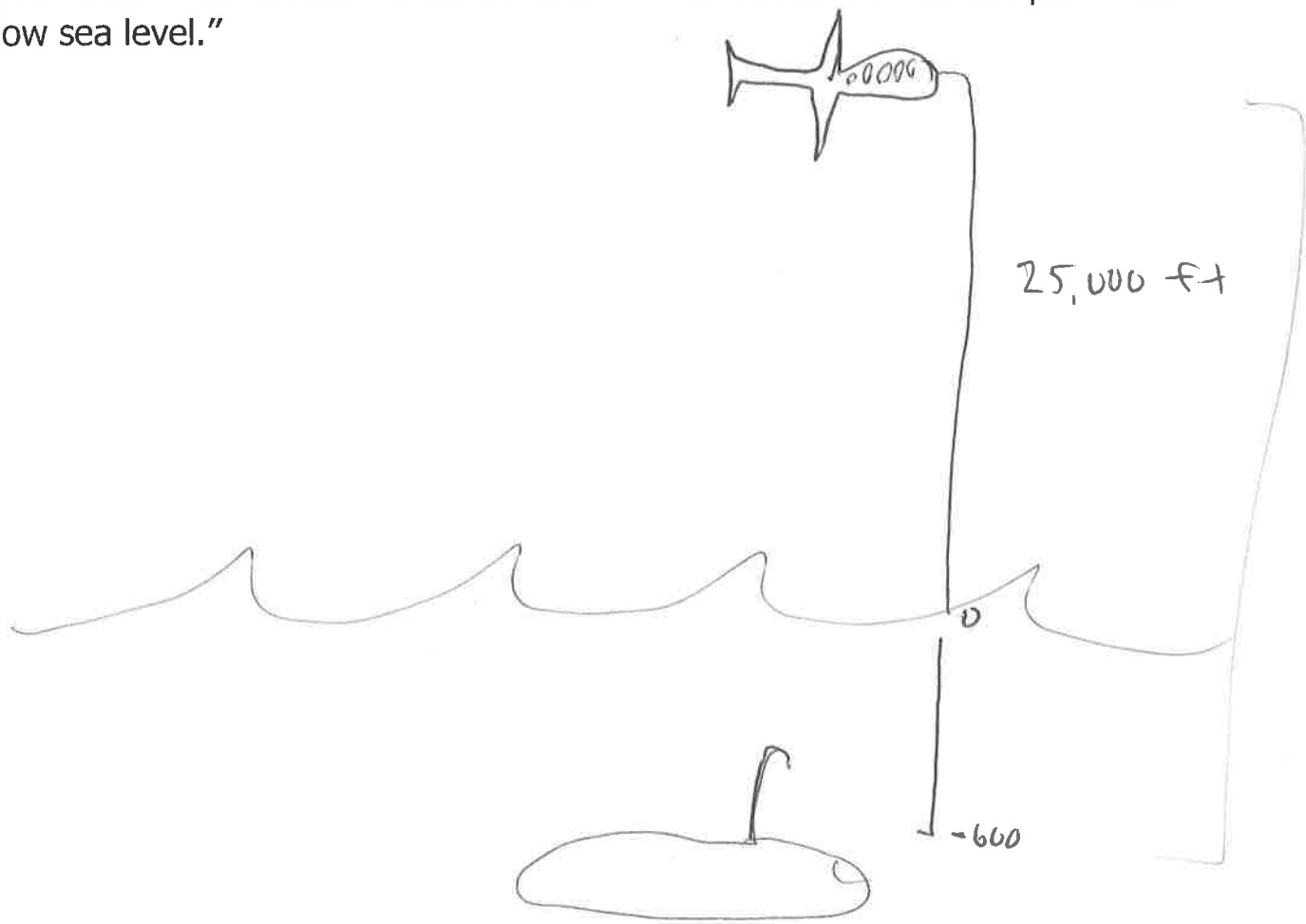
a. –2 – (–5) $-2 + 5 = 3$

b. 11 – (–8) $11 + 8 = 19$

c. –10 – (–4) $-10 + 4 = -6$

3. Write two equivalent expressions that represent the situation.
What is the difference in their elevations?

"An airplane flies at an altitude of 25,000 feet. A submarine dives to a depth of 600 feet below sea level."



$25{,}000 - (-600)$

$25000 + 600$

31,000 ft

Name _____ **Date** _____

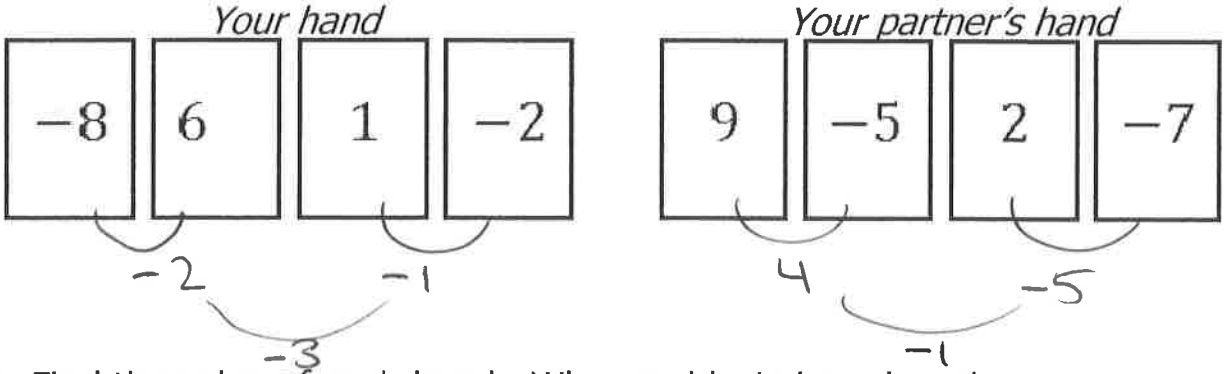
Period _____ **Math 7 ~ Lesson 5**

Practice

1. On a number line, find the difference of each number and 4? Complete the table to support your answers. The first example is provided.

Number	Subtraction Expression	Addition Expression	Answer
10	$10 - 4$	$10 + (-4) = 6$	6
2	$2 - 4$	$2 + (-4)$	-2
-4	$-4 - 4$	$-4 + (-4)$	-8
-6	$-6 - 4$	$-6 + (-4)$	-10
1	$1 - 4$	$1 + (-4)$	-3

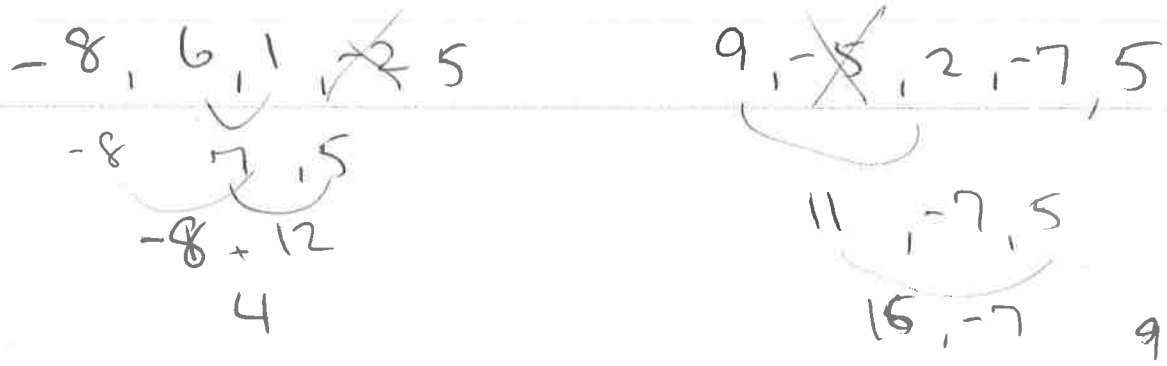
2. You and your partner were playing the Integer Game in class. Here are the cards in both hands.



a. Find the value of each hand. Who would win based on the current scores? (The score closest to 0 wins.)

The partner would win because -1 is closer to 0 than -3 is.

b. Find the value of each hand if you discarded the −2 and selected a 5, and your partner discarded the −5 and selected a 5. Show your work to support your answer.



c. Use your score values from part (b) to determine who would win the game now.

My hand, because 4 is closer to 0.

3. Write the following expressions as a single integer.

a. $-2 + 16$ 14

b. $30 - (+45)$ 75

c. $-2 - (+16)$ 14

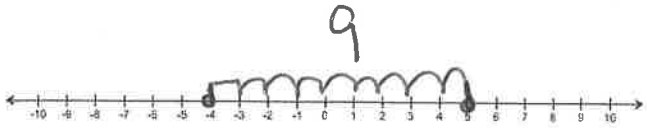
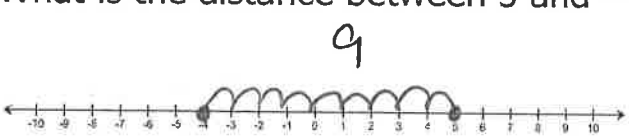
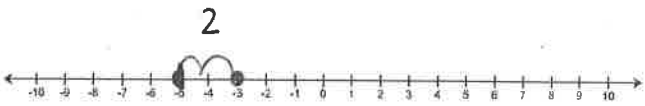
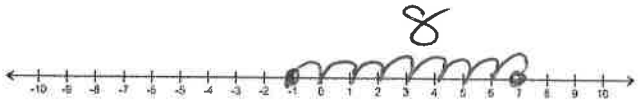
d. $-14 \overset{+}{-} 23$ −37

e. $18 \overset{+}{-} 26$ −8

Notes: Lesson 6
More Subtracting (Distance on a Number Line)

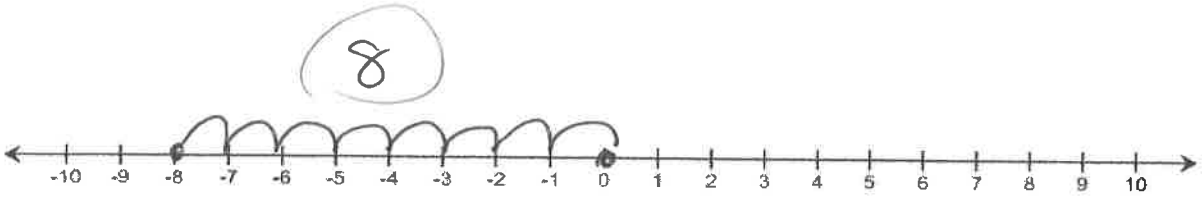
Date _____
Page _____

Use the number line to answer each of the following.

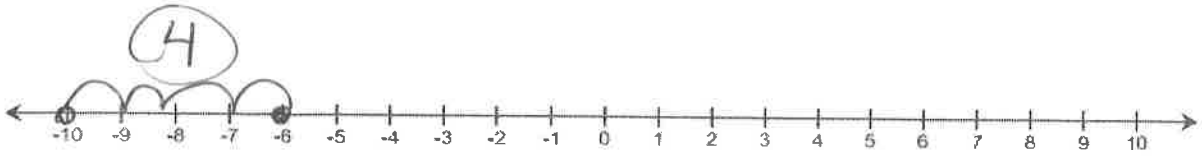
Person A	Person B
What is the distance between −4 and 5? 	What is the distance between 5 and −4? 
What is the distance between −5 and −3? 	What is the distance between −3 and −5? 
What is the distance between 7 and −1? 	What is the distance between −1 and 7? 

2) Use the number line to answer each of the following questions.

a) What is the distance between 0 and −8?



b) What is the distance between −6 and −10?



Formula for finding the distance between 2 numbers: $|a-b|$

Try These:

1) Use the distance formula to find each answer. Support your answer using a number line diagram.

a. Find the distance between −7 and −4.

$|-7 - -4|$

$|-7+4|$

$|-3|$

3

b. Find the change in temperature if the temperature rises from −18°F to 15°F (use a vertical number line).

$|15-(-18)|$ or $|-18-15|$

$|15+18|$ $|-18+-15|$

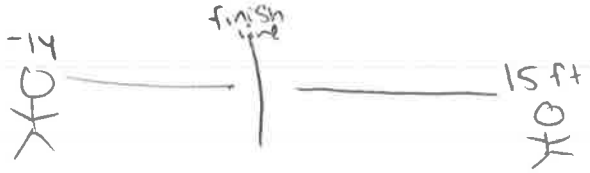
$|33|$ $|-33|$

33° 33°

c. Would your answer for part (b) be different if the temperature dropped from 15°F to −18°F? Explain.

same

d. Beryl is the first person to finish a 5K race and is standing 15 feet beyond the finish line. Another runner, Jeremy, is currently trying to finish the race and has approximately 14 feet before he reaches the finish line. What is the minimum possible distance between Beryl and Jeremy?



$|15--14|$

$|15+14|$

$|29|$

29 ft

Name _____ **Date** _____

Period _____ **Math 7 ~ Lesson 6**

Practice

1) Distance is positive. Change in elevation or temperature may be positive or negative depending on whether it is increasing or decreasing (going up or down).

a. A hiker starts hiking at the beginning of a trail at a point which is 200 feet below sea level. He hikes to a location on the trail that is 580 feet above sea level and stops for lunch.

i. What is the vertical distance between 200 feet below sea level and 580 feet above sea level?

$|580 - (-200)|$

$|580 + 200|$

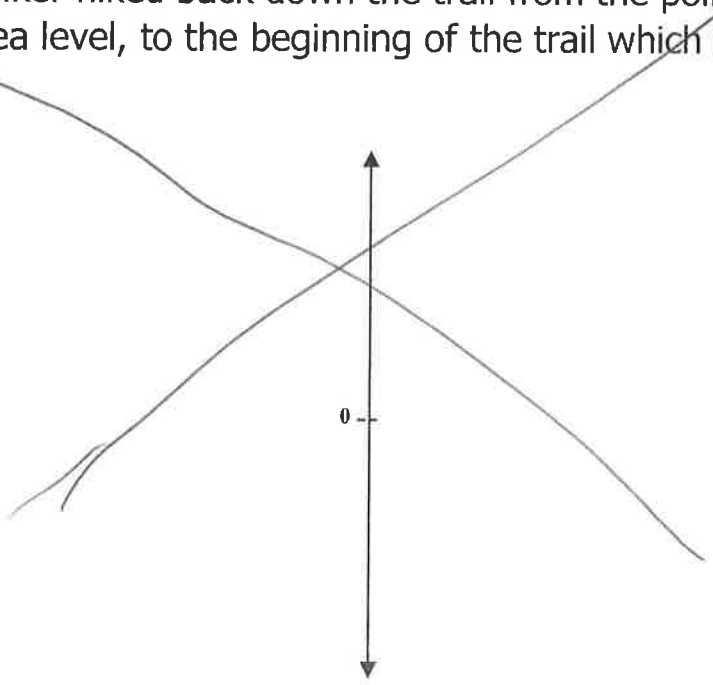
$|780|$

780 feet

ii. How should we interpret 780 feet in the context of this problem?

The distance between his highest point and his lowest point was 780 ft.

b. After lunch, the hiker hiked back down the trail from the point of elevation, which is 580 feet above sea level, to the beginning of the trail which is 200 feet below sea level.



2. $|-19-12|$

$|-19+-12|$

$|-31|$

31

3. $|19-(-12)|$

$|19+12|$

$|31|$

31

4. $|10-(-43)|$

$|10+43|$

$|53|$

53

5. $|-10-43|$

$|-10+-43|$

$|-53|$

53

6. $|-1-(-16)|$

$|-1+16|$

$|15|$

15

7. $|1-16|$

$|1+-16|$

$|-15|$

15

8. $|0-(-9)|$

$|0+9|$

$|9|$

9

9. $|0-9|$

$|0+-9|$

$|-9|$

9