

## **Title: Introducing Integers and Their Operations**

### **Brief Overview:**

This unit includes lessons that will introduce students to what integers are, how they are used in real life, and then give them strategies and rules for adding, subtracting, multiplying and dividing integers.

### **NCTM Content Standard/National Science Education Standard:**

Students will describe, represent or apply numbers or their relationships or will estimate or compute using mental strategies, paper/pencil or technology.

### **Grade/Level:**

Grades 6-8

### **Duration/Length:**

4 classes (45 minutes each)

### **Student Outcomes:**

Students will be able to:

- Assign an integer to a specific situation.
- Recognize and order integers.
- Add, subtract, multiply and divide integers.

### **Materials and Resources:**

Large poster or overhead thermometer.  
Blank index cards.  
Two decks of playing cards (one blue-backed and one red-backed).  
Set of transparency cards.  
Algebra tiles or poker chips.  
Large number line on bulletin board or blackboard.  
Pair of white dice and a pair of red dice.

## **Development/Procedures:**

### **Lesson 1**

**Preassessment** – Students know what whole numbers are and understand how they are ordered on a number line. Students are able to perform operations with whole numbers.

**Launch** – The teacher begins by presenting a Fahrenheit thermometer to the class and asking a question: “What is the temperature on a hot, sunny day?” Have the student point out the degree on the thermometer. Ask a few other questions similar to this making sure the answer would be a positive number. (See Student Worksheet #1.) Next, ask them what it means for the temperature to be 10 degrees below zero and show where this is on the thermometer. Explain that you would use a negative sign to write this number since it is below zero. Next, ask them where 15 degrees below zero would be on the thermometer, and then ask them whether it is hotter or colder than 10 degrees below zero. Since 15 degrees below zero is colder (or has less temperature) than 10 degrees below zero, negative 15 is less than negative 10.

**Teacher Facilitation** – Turn the thermometer sideways so it becomes like a number line to demonstrate that negative numbers are to the left of zero and positive numbers are to the right of zero with zero being neither positive nor negative. Explain that, just as the numbers at the bottom of the thermometer are smaller than those above them, numbers on a number line that are on the left are smaller than numbers to the right of them. Define integers.

**Student Application** – Sentence strip activity. (See Teacher Resource Sheet #1.) Students will place sentence strips in the appropriate column (positive/negative) of the chart. After this activity, Student Worksheet #2 will be given for students to identify the integer associated with each situation and to practice ordering integers.

**Embedded Assessment** – Break the class into 2 or more teams. Give each student an index card with an integer written on it. The students must hold the index card in front of them with the integer facing out so all others can see the integer. Without talking or communicating in any way, the students in each group must line themselves up in order from smallest to largest. As each group finishes, the students in that group should raise their hands so the teacher will know which groups finished and in what order. After all are finished, either each group can check the other group(s) or the teacher can check to see if the groups were correct. A prize or extra credit can be given to the first group who finishes and is correct.

**Reteaching/Extension –**

- For those who have understood the lesson, they could write down situations involving integers and use these to work with those students who are having difficulty.
- For homework, assign work from the textbook on writing integers associated with situations and ordering integers.

**Lesson 2**

**Preassessment** – Give the students a few whole number addition problems to do.

**Launch** – “500 Rummy Card” Group Activity. (See Teacher Resource Sheet #2.) The object of the activity is to count the points earned (positive) from the cards on the table and to count the points lost (negative) from the cards left in their hand in order to get a score (addition of positive and negative) for that hand.

**Teacher Facilitation** – Using results from the overhead chart of information acquired in the card activity, write out the rules for adding integers. The teacher will then give a few addition examples for the students to do mentally. Then the teacher will show the students how to use transparency cards, algebra tiles or poker chips to set up the addition problems and check their answers. (See Teacher Resource Sheet #3.)

**Student Application** – Students will be given a worksheet of addition problems to do by using the rules of addition and/or by using the above-mentioned manipulatives. (See Student Worksheet #3.)

**Embedded Assessment** – “Who has?” Activity (See Teacher Resource Sheet #4.)

**Reteaching/Extension –**

- Those students who do not understand could be paired to work with another student who understands while they were working on Student Worksheet #3.
- For homework, assign addition problems from textbook.

**Lesson 3**

**Preassessment** – Check students’ homework to be sure they understand addition of integers.

**Launch** – Students will learn to do addition and subtraction of integers by actively walking along a large number line. (See beginning of Teacher Resource Sheet #5.)

**Teacher Facilitation** - The teacher will explain to the students that “subtraction” means “to add the opposite of.” Subtraction problems will be changed to addition problems and both will be modeled on the large number line to show that the answers are the same. (See end of Teacher Resource Sheet #5.)

**Student Application** – Students will be given a worksheet of subtraction problems, which must be first changed to addition problems in order to find the answer. (See Student Worksheet #4.)

**Embedded Assessment** – Each student will be given 3 index cards on which to write subtraction problems with the following: 1) both positive numbers, 2) both negative numbers, and 3) one positive and one negative number. Students will exchange cards with another student and work out the problems. Both students will work together to check the answers, using the number line or consulting the teacher, if necessary.

**Reteaching/Extension** –

- The teacher or another student who understands will work with the students having difficulty doing Worksheet #4. These students could also be paired together for the embedded assessment activity.
- For homework, assign subtraction problems from the textbook that should be changed to addition problems according to the rule of “adding the opposite” and then finding the answer.

## Lesson 4

**Preassessment** – Give the students a few multiplication and division problems involving only whole numbers.

**Launch** – Students will discover the rules for multiplication of integers by acting out a videotape situation. (See beginning of Teacher Resource Sheet #6.)

**Teacher Facilitation** – The students will write the rules for multiplication of integers in their copybooks:

- Positive times positive equals positive.
  - Negative times negative equals positive.
  - Positive times negative equals negative.
  - Negative times positive equals negative.
- Using these rules of multiplication, the teacher will help the students discover that the rules of division for integers follow the same pattern as the rules of multiplication for integers. (See end of Teacher Resource Sheet #6.)

**Student Application** - Students will be given a worksheet of multiplication and division problems involving integers. (See Student Worksheet #5.)

**Embedded Assessment** – The teacher will have one pair of red dice and one pair of white dice in a container. Divide the class into 2 or more teams that will stand in a line in different parts of the room. Alternating from team to team as you would do for a spelling bee, one student will come up and choose 2 dice without looking and roll the dice. (The numbers on the white die are positive while the numbers on the red die are negative.) The student is to multiply the integers and give the correct answer. If the correct answer is given, the student remains standing. If the answer is incorrect, the student sits down and the teacher asks the class for the correct answer. When time runs out, the team with the most students standing wins a prize or gets extra credit.

**Reteaching/Extension** –

- The teacher or another student who understands will work with the students having difficulty doing Worksheet #5
- For homework, assign multiplication and division problems from the textbook.
- Students should also study for a quiz tomorrow on integers and their operations.

**Summative Assessment:**

The students will be given a quiz on day 5 which will include examples from all the lessons. They will be able to use any of the manipulatives used in the lessons, if they desire.

**Authors:**

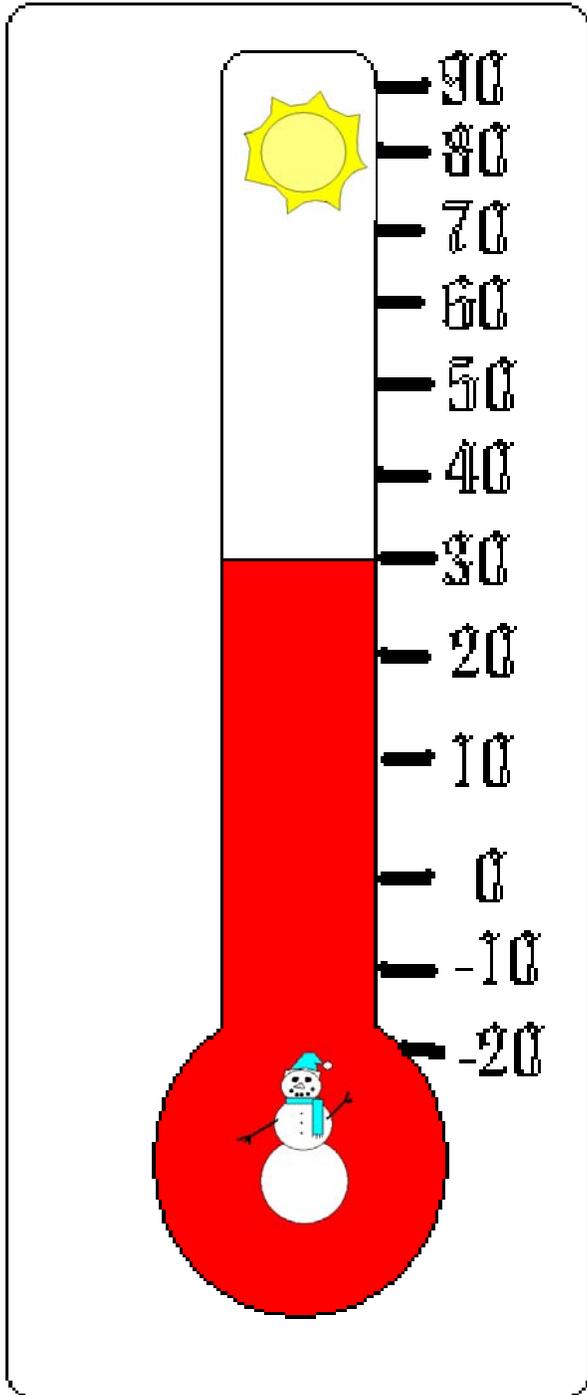
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Thermometer Warm-up Activity (Lesson 1)

Directions: Write the appropriate temperature for the given weather condition.



1.) What is the temperature on a hot and sunny day?  
\_\_\_\_\_

2.) What would be the temperature on a cool spring day? \_\_\_\_\_

3.) What would be the temperature on a snowy day? \_\_\_\_\_

4.) Write a temperature of 10 below zero? \_\_\_\_\_

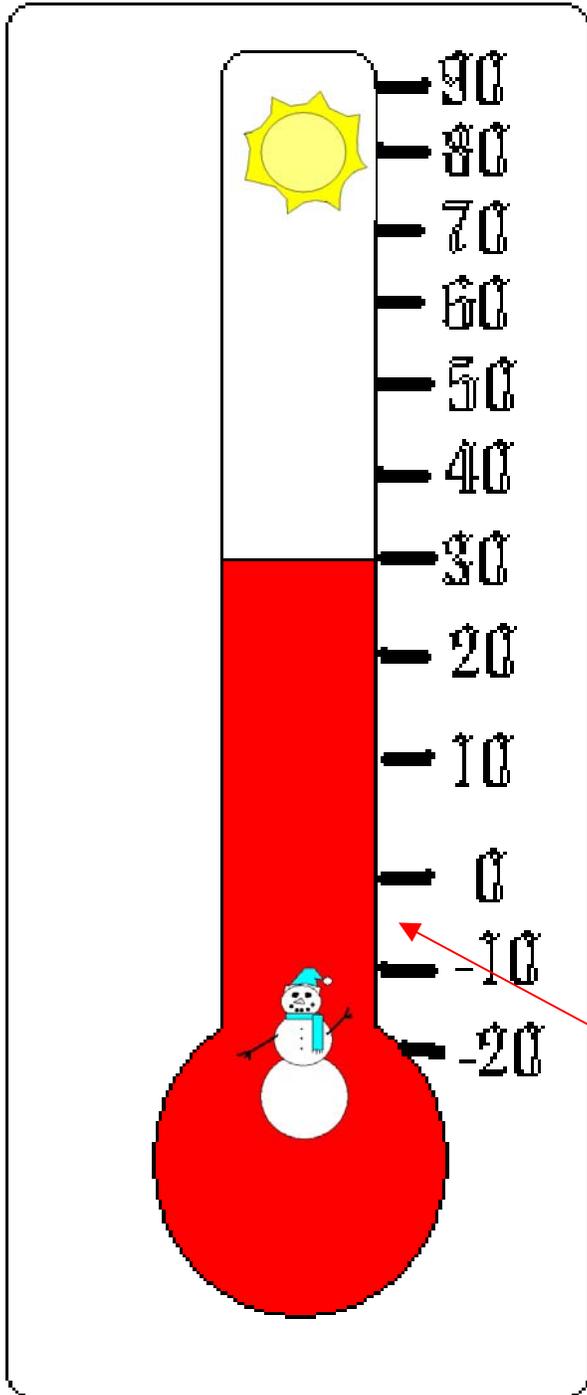
5.) Label where 15 below zero would be on the thermometer.

6.) Which is colder, 10 below zero or 15 below zero? \_\_\_\_\_ Why?

Name: \_\_\_\_\_

Thermometer Warm-up Activity (Lesson 1)

Directions: Write the appropriate temperature for the given weather condition.



1.) What is the temperature on a hot and sunny day?

Answers will vary. Most should be between 80 and 100 degrees Fahrenheit.

2.) What would be the temperature on a cool spring day? 70 or below would be a good estimate.

3.) What would be the temperature on a snowy day? 32 degrees or below.

4.) Write a temperature of 10 below zero? -10°

5.) Label where 15 below zero would be on the thermometer. -15°

6.) Which is colder, 10 below zero or 15 below zero? -15° Why? Because -15° is lower on the thermometer than -10°.

## SENTENCE STRIP ACTIVITY

### Planning:

- The teacher will write various real life situations on sentence strips and cut each situation out. Separate into bags that will be distributed to different groups of students. The number of strips and groups will be up to the teacher's discretion. Below are a few examples of situations:
  1. *Sally won \$100 in the lottery.* (The students should place this under the positive column because winning a monetary amount would be represented by a positive integer.
  2. *The weather revealed that in Antarctica it is going to be 50 degrees below zero.* (The students should place this in the negative column because this would represent a negative integer.)
- The teacher will either draw a "T-table" on the board or create a large chart that looks like the chart below:

Positive	Negative

### Directions:

- The teacher will give each group of students a bag of various sentence strips. Direct the students to look through their bag and make a pile of situations that would represent positive numbers and a separate pile that would represent negative values.
- The teacher will have each groups take turns putting their sentence strips on the chart in the appropriate column.

### Closing:

- The teacher will then facilitate a class discussion and get each group to explain why they put their sentence strips in the column that they placed them in. Some focus questions may be:
  1. *What words were key words in the situation in making your decisions?*
  2. *What characteristics are found in the positive column?*
  3. *What characteristics are found in the negative column?*
  - **Have each student individually write characteristics of integers. What makes an integer positive or negative? Where are integers used in real life situations?**



Name: \_\_\_\_\_

**DIRECTIONS:** Write the integer that best represents each of the following situations.

- 1.) Jason's spent way too much money and is now in the hole \$50.  
\_\_\_\_\_
- 2.) Tammy received her allowance of \$10.00. \_\_\_\_\_
- 3.) Jimbo went to the beach on a bright and sunny day. The temperature was 80 degrees outside. \_\_\_\_\_
- 4.) Stan owes his brother \$50.00. \_\_\_\_\_
- 5.) Put the following temperatures in order from coldest to hottest.

Location	Temperature
Prince Frederick	70°F
Anchorage	32°F
Kazakstan	-40°F
Honolulu	83°F
Sydney	72°F
Amsterdam	35°F
South Pole	-55°F

**Fill in the blanks.**

- 6.) Whole numbers and their corresponding negative numbers are \_\_\_\_\_.
- 7.) Negative integers are \_\_\_\_\_ than zero.
- 8.) Positive integers are \_\_\_\_\_ than zero.

**Write an integer to represent the following.**

- 9.) A diver swims 100 feet below the surface of the ocean to study Tiger Sharks. What is his depth?
- 10.) Joe lives in a city that is 15 feet below sea level. How could he represent his elevation as an integer?
- 11.) Jackie was keeping score for a card game she and her friends were playing. The scores are listed below. Rank each player according to their score from lowest score to highest score.

Jackie -100, John 200, Cassidy -500, Dave -50,

Chris 1500, Crissy 1600 and Caryn -10

Name: \_\_\_\_\_

**DIRECTIONS:** Write the integer that best represents each of the following situations.

1.) Jason's spent way too much money and is now in the hole \$50.

-50

2.) Tammy received her allowance of \$10.00. +10

3.) Jimbo went to the beach on a bright and sunny day. The temperature was 80

degrees outside. +80

4.) Stan owes his brother \$50.00. -50

5.) Put the following temperatures in order from coldest to hottest.

Location	Temperature
South Pole	-55°F
Kazakstan	-40°F
Anchorage	32°F
Amsterdam	35°F
Prince Frederick	70°F
Sydney	72°F
Honolulu	83°F

**Fill in the blanks.**

6.) Whole numbers and their corresponding negative numbers are

integers.

7.) Negative integers are less than zero.

8.) Positive integers are greater than zero.

**Write an integer to represent the following.**

9.) A diver swims 100 feet below the surface of the ocean to study Tiger

Sharks. What is his depth? -100

10.) Joe lives in a city that is 15 feet below sea level. How could he

represent his elevation as an integer? -15

11.) Jackie was keeping score for a card game she and her friends were playing. The scores are listed below. Rank each player according to their score from lowest score to highest score.

Cassidy -500, Jackie -100, Dave -50, Caryn -10, John 200, Chris 1500, and Crissy 1600

## “500 RUMMY” CARD ACTIVITY

Use the 2 decks of cards to set up the prearranged hands of 6 players at the end of a hand of “500 Rummy.” The blue-backed deck will be used for the cards placed on the table (positive points) and the red-backed deck will be used for the cards left in the persons’ hands (negative points).

The groups with their prearranged cards are as follows:

### 1. Red Group

- Blue cards: Ace of Clubs, Ace of Hearts, Ace of Spades, and the 2, 3, 4 and 5 of Diamonds. (Clip together with a red paperclip.)
- Red cards: Queen of Spades, Jack of Diamonds, 10 of Clubs, and 7 of Spades. (Clip together with another red paperclip.)

### 2. Green Group

- Blue cards: Queen of Diamonds, Queen of Hearts, Queen of Spades, 5 of Clubs, 5 of Hearts, 5 of Spades, and the 2, 3 and 4 of Hearts. (Clip together with a green paperclip.)
- Red cards: Ace of Hearts, King of Hearts, King of Spades, 7 of Hearts, and 6 of Clubs. (Clip together with another green paperclip.)

### 3. Pink Group

- Blue cards: 7 of Clubs, 7 of Hearts, 7 of Spades, and the 2, 3 and 4 of Spades. (Clip together with a pink paperclip.)
- Red cards: Ace of Clubs, Ace of Diamonds, 8 of Clubs, 3 of Diamonds, and 2 of Clubs. (Clip together with another pink paperclip.)

### 4. Purple Group

- Blue cards: 8, 9 and 10 of Hearts, and the 2, 3 and 4 of Clubs. (Clip together with a purple paperclip.)
- Red cards: King of Clubs, King of Diamonds, Queen of Hearts, Jack of Clubs, and 6 of Hearts. (Clip together with another purple paperclip.)

### 5. Yellow Group (Only has blue cards since this is the person who “went out.”)

- Blue cards: Jack of Diamonds, Jack of Hearts, Jack of Spades, and the 6, 7, 8, 9 and 10 of Diamonds. (Clip together with a yellow paperclip.)

### 6. Blue Group (Only has red cards since this person was left holding everything.)

- Red cards: Ace, Jack and 10 of Spades, Queen and 9 of Clubs, 10 of Hearts and 8 of Diamonds. (Clip together with a blue paperclip.)

Six index cards are needed (one card for each group) with one group's information written on each card:

- Red Group  
Previous score: 30 in the hole
- Green Group  
Previous score: 15
- Pink Group  
Previous score: 25
- Purple Group  
Previous score: 25 in the hole
- Yellow Group  
Previous score: 35 in the hole
- Blue Group  
Previous score: 40

All of the above playing cards and index cards need to be arranged before class.

To begin the activity, divide the students into 6 groups. (It is nice, but not necessary, to have a student who knows the game of "500 Rummy" in each group.) Before giving out the cards, explain to the students that we are pretending that we just finished a hand of "500 Rummy." Each group will be given red and/or blue cards. The blue cards are what were placed on the table during the game to earn points. The red cards are what were left in your hand at the end of the round and their points are a loss to you (go against your earned points.) Each group must figure out how many points they get by adding up all their earned points and deducting their points lost. (N.B. Each hand could be an actual "500 Rummy" hand, but all hands together would not be the results of an actual game since there were 2 decks used in making these hands.)

Points are calculated in the following manner:

- Aces count as 15 points each.
- Face cards and the 10 cards count as 10 points each.
- All other cards count as 5 points each.

After each group finds its total for this hand, the teacher will record the results in a table on the overhead projector:

	RED	GREEN	PINK	PURPLE	YELLOW	BLUE
<b>On Table (Earned Points)</b>	+65	+60	+30	+35	+60	0
<b>Left in Hand (Points lost)</b>	-35	-45	-45	-45	-0	-65
<b>Score for this hand</b>	+30	+15	15 in hole -15	10 in hole -10	+60	65 in hole -65

After filling in the chart (and discussing that negative numbers can represent numbers “in the hole”), the teacher will give each group the index card with their previous score for the game on it. The students must now figure out what their new score (after this hand) is by adding the “Score for this hand” with the “Previous score.” The table should now look like this:

	RED	GREEN	PINK	PURPLE	YELLOW	BLUE
<b>On Table (Earned Points)</b>	+65	+60	+30	+35	+60	0
<b>Left in Hand (Points lost)</b>	-35	-45	-45	-45	-0	-65
<b>Score for this hand</b>	+30	+15	15 in hole -15	10 in hole -10	+60	65 in hole -65
<b>Previous score</b>	-30	+15	+25	-25	-35	+40
<b>New score</b>	0	+30	+10	-35	+25	-25

While filling in the chart, the teacher can point out to the students the difference between adding 2 positive numbers, adding 2 negative numbers, and adding one positive number and one negative number.

## USING MANIPULATIVES TO ADD INTEGERS

Please note that a variety of materials can be used to complete this activity. The most common are Algebra Tiles and Poker Chips, but there is also a template that can help you make your own pieces along with directions on how to do so.

### Object of the Activity:

Adding integers is a pretty abstract concept. This activity allows students to learn how to use manipulatives to help them visualize the process of adding integers.

### Materials:

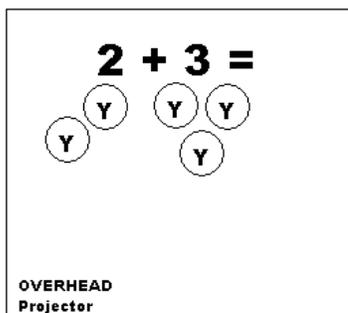
- A class set of manipulatives that are two different colors. (Poker Chips, Algebra Tiles or handmade manipulatives).
- An overhead set of manipulatives to aid demonstration.

### Demonstration:

*Note: Poker Chips have been used for the purpose of simplifying the following instructions.*

1. The teacher will explain that the yellow chips represent positive values and that the red chips represent negative numbers. (*The teacher can change the colors as long as there are only two colors being used.*)
2. The teacher will then say an integer and ask the students to express which color and how many chips would represent each integer.
  - **Ex: If the teacher asked the kids how to make the integer -3 using the manipulatives, the students should say “3 red chips”.**
  - **Ex: How about 8? The students should say “8 yellow chips”.**Continue giving examples until students grasp the idea.

3. The teacher will then write a simple addition problem and ask the students to first represent each integer with the appropriate number of chips and then count the total number of chips to come up with the sum.



*Ex:* Use the problem  $2 + 3 =$

*Ask:* “How many chips represent positive 2?”

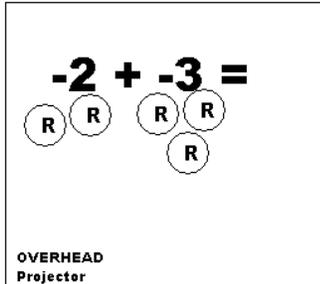
Students should say 2 yellow. Place two yellow chips below the “2”.

*Ask:* “How many chips represent positive 3?”

Students should say 3 yellow. Place three yellow chips below the “3”.

*Ask:* “How many total chips of the same color do you see on the overhead?”  
Students should then count the total number of yellow chips to be 5.

4. The teacher should then explain to the students that there is a similar process to add two negative signs. Proceed to write a problem that involves adding two negative integers.



*Ex:* Use the problem  $-2 + -3 =$

*Ask:* "How many chips represent negative 2?"

Students should say 2 red. Place two red chips below the "-2".

*Ask:* "How many chips represent negative 3?"

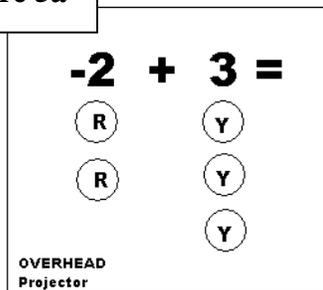
Students should say 3 red. Place three red chips below the "-3".

*Ask:* "How many total chips of the same color do you see on the overhead?"

Students should then count the total number of red chips to be - 5.

5. The teacher should ask the students what they think would happen if a negative and positive integers were added together. Their predictions could be listed on the board or on a chart and discussed. Next, give them examples where a negative integer is being added to a positive integer. (Be sure to use a few examples that will have a negative answer and a few that will give a positive answer.) I have listed two example problems below.

Figure 5a



*Ex:* Use the problem  $-2 + 3 =$

*Ask:* "How many chips represent negative 2?"

Students should say 2 red. Place two red chips below the "-2". (See Figure 5a)

*Ask:* "How many chips represent positive 3?"

Students should say 3 yellow. Place three yellow chips below the "3". (See Figure 5a)

Next, the teacher should explain to the students that anytime you have a red and a yellow chip, they cancel each other out and can be removed from the overhead. (see Figure 5b)

*Ask:* "How many chips are left on the overhead? What color are

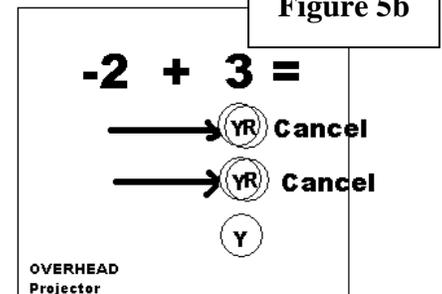
the chips?"

Students should say 1 yellow chip is left over.

*Ask:* "What integer does one yellow chip represent?" Students should say "positive 1". Reiterate that  $-2 + 3 = 1$ .



Figure 5b



Repeat the preceding demonstration with “ $2 + -3 =$ ”. The teacher should end up with one red chip that the students should recognize as  $-1$ . **The teacher should then hold a discussion prompting the students to use what they learned from the demonstration to come up with the basic rules for adding integers.** The students should come up with the following rules:

- When adding two integers with the same signs, first add the whole numbers in the problem ignoring signs. Then put the sign of the integers on the final answer. (*If I added 2 positive integers, my answers are positive. If I added two negative answers, the answer is negative.*)
- When adding a positive and a negative integer, first subtract the smallest whole number in the problem from the biggest whole number ignoring signs. Then put the sign of the bigger whole number on the answer.

**(Please note that if the students have been exposed to ABSOLUTE VALUE, they can use this term to create the basic rules.)**

The teacher can then give the students different practice problems to complete at their desks using their set of chips. (*See Student Worksheet # 3*)



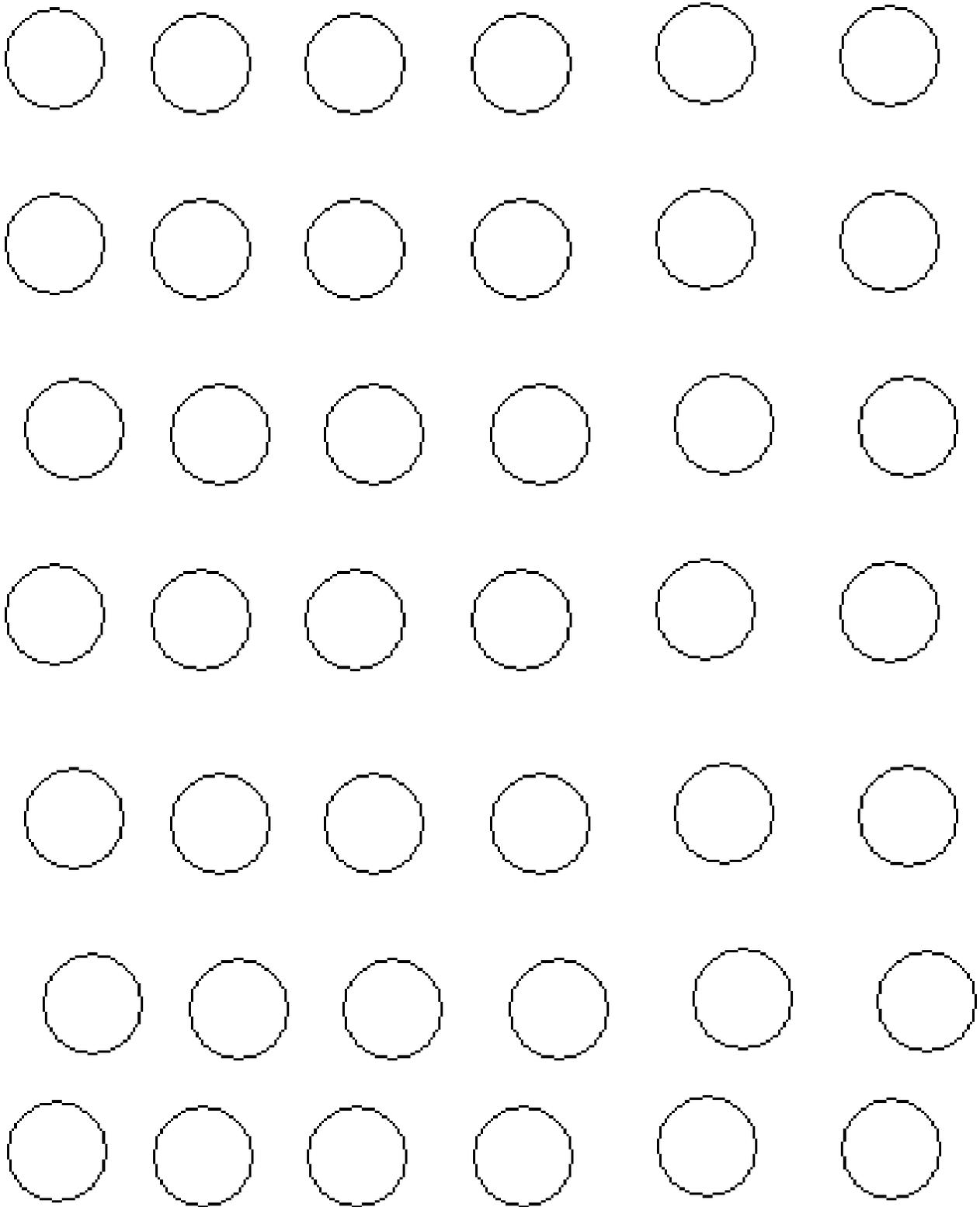
I want to use this activity, but I do not have the listed materials!!

If this is the case then the next page is for you!



**Merely, copy the following template onto an overhead transparency and then color half of the circles red and half of them yellow to create an overhead set for you to demonstrate.**

For the student sets, just copy them onto different colored paper and have the students cut out enough for a class set. These are great and can be used throughout the integers unit. You may want to laminate each set so they will last from one year to the next.



Name: \_\_\_\_\_

**Adding Integers**

1.)  $-2 + 4 =$

2.)  $7 + (-8) =$

3.)  $-6 + (-3) =$

4.)  $-23 + 31 =$

5.)  $-7 + 0 =$

6.)  $-38 + (-54) =$

7.)  $-4 + (-12) =$

8.)  $37 + (-54) =$

9.)  $-48 + (-39) =$

10.)  $-34 + 52 =$

11.)  $-41 + (-7) =$

12.)  $5 + 13 =$

13.) **Brief Constructed Response:**

Calvin and Chris were out fishing on a boat in the Chesapeake Bay. They were fishing for Rockfish. They hear that Rockfish like to swim at a depth of 10 feet below the surface of the water. They bait a hook at 10 feet below sea level. They catch no Rockfish there. Calvin suggests lowering the hook another 5 feet and Chris agrees.

**Part A:**

What is the depth of the baited hook now? \_\_\_\_\_

**Part B:**

Use what you know about adding integers to explain how you got your answer.

14.) **Extended Constructed Response:**

On Friday, the low temperature was 10 degrees below zero. On Saturday, the low temperature was 6 degrees warmer.

**Part A:**

What was Saturday's low temperature? \_\_\_\_\_

**Part B:**

Explain how you arrived at Saturday's temperature using what you know about integers. What if on Sunday, the low temperature was 15 above zero? What would the difference between the low on Saturday and the low on Sunday be?

Name: \_\_\_\_\_

**Adding Integers**

- 1.)  $-2 + 4 = 2$       2.)  $7 + (-8) = -1$       3.)  $-6 + (-3) = -9$   
 4.)  $-23 + 31 = 8$       5.)  $-7 + 0 = -7$       6.)  $-38 + (-54) = -92$   
 7.)  $-4 + (-12) = -16$       8.)  $37 + (-54) = -17$       9.)  $-48 + (-39) = -87$   
 10.)  $-34 + 52 = 18$       11.)  $-41 + (-7) = -48$       12.)  $5 + 13 = 18$

13.) **Brief Constructed Response:**

Calvin and Chris were out fishing on a boat in the Chesapeake Bay. They were fishing for Rockfish. They hear that Rockfish like to swim at a depth of 10 feet below the surface of the water. They bait a hook at 10 feet below sea level. They catch no Rockfish there. Calvin suggests lowering the hook another 5 feet and Chris agrees.

**Part A:**

What is the depth of the baited hook now? -15 or 15 feet below sea level

**Part B:**

Use what you know about adding integers to explain how you got your answer. The hook was 10 feet below sea level, which is  $-10$  and lowering the hook 5 feet means to add  $-5$  to the original depth. So the depth is now  $-10 + -5$  which equals  $-15$ .

14.) **Extended Constructed Response:**

On Friday, the low temperature was 10 degrees below zero. On Saturday, the low temperature was 6 degrees warmer.

**Part A:**

What was Saturday's low temperature? -4 or 4 degrees below zero

**Part B:**

Explain how you arrived at Saturday's temperature using what you know about integers. What if on Sunday, the low temperature was 15 above zero? What would the difference between the low on Saturday and the low on Sunday be?

Friday's temperature can be written as  $-10$ . Since Saturday's temperature is 6 degrees warmer, you must add 6 to  $-10$  to get  $-4$  or 4 degrees below zero. The difference between Saturday and Sunday would be 19 degrees since if you begin at  $-4$ , you must count 19 degrees to get to 15.

### “WHO HAS?” ACTIVITY

The teacher gives each student an index card that has an integer on one side and an addition example on the other side. The student should place their card on the desk with the integer side face-up. The teacher has the first card and starts with the addition example, saying “Who has three plus negative 2?” The student who has the answer says, “I have one. (Then the student turns over the card and reads their addition example.) Who has negative seven plus negative two?” The student who has the answer continues in the same way this student did. The game ends when the last answer is the answer on the teacher’s card. It is important to be sure that each student gets a card and that it loops through each student ending with the teacher, who began the game.

Cards for 25 students and the teacher are as follows:

<u>Side 1</u>	<u>Side 2</u>
1. -4	$3 + (-2)$
2. 1	$-7 + (-2)$
3. -9	$4 + 3$
4. 7	$-2 + 5$
5. 3	$-3 + 1$
6. -2	$-11 + (-1)$
7. -12	$-4 + (-3)$
8. -7	$-2 + 11$
9. 9	$-4 + 9$
10. 5	$8 + (-11)$
11. -3	$2 + 2$
12. 4	$-3 + (-3)$
13. -6	$-6 + 6$
14. 0	$-8 + 10$
15. 2	$9 + 3$
16. 12	$-4 + 10$
17. 6	$-12 + 11$
18. -1	$-5 + (-3)$
19. -8	$-7 + (-4)$
20. -11	$11 + (-1)$
21. 10	$-10 + 5$
22. -5	$7 + 1$
23. 8	$-5 + (-5)$
24. -10	$-1 + 12$
25. 11	$-3 + -10$
26. -13	$2 + (-6)$

## ADDITION AND SUBTRACTION ON A LARGE NUMBER LINE

### Launch:

The teacher needs to have a large number line with integer markings from  $-10$  to  $10$ , which are spaced 10-12 inches apart (since students will be walking along this number line.) This can be constructed either on the bulletin board using electrical tape for the number line or drawn on a long blackboard or marked off on the floor.

The rules for addition and subtraction are as follows:

- Always begin by standing at zero and facing towards the positive direction
- For positive numbers, walk forward.
- For negative numbers, walk backwards.
- To add, walk forward or backwards to the first number. From that point, walk forward or backwards the number of spaces as indicated by the integer you are adding,
- To subtract, walk forward or backwards to the first number. “Subtract” means “to turn around.” (Remind students that after turning around, they will still walk forward for a positive number and backwards for a negative number.) From that point, walk forward or backwards the number of spaces as indicated by the integer that follows the subtraction sign.
- The answer to your problem is the integer where you end.

Try some examples with a student walking the number line for each example:

- $2 + 5$  (The student begins at zero, facing forward, and walks forward 2 spaces, stopping at 2. Then the student walks forward 5 more spaces, ending at 7, which is the answer to the problem.)
- $-3 + 8$  (The student begins at zero, facing forward, and walks backward 3 spaces, stopping at  $-3$ . Then the student walks forward 8 spaces, ending at 5, which is the answer to the problem.)
- $9 - 3$  (The student begins at zero, facing forward, and walks forward 9 spaces, stopping at 9. Then the student “turns around” (to face the negative direction) for the subtraction sign and proceeds to walk forward 3 spaces, ending at 6, which is the answer to the problem.)
- $-2 - (-6)$  (The student begins at zero, facing forward, and walks backward 2 spaces, stopping at  $-2$ . Then the student “turns around” (to face the negative direction) for the subtraction sign and proceeds to walk backwards 6 spaces (for the negative 6), ending at 4, which is the answer to the problem.)

Teacher Facilitation:

Since the last problem is one the student would not have known how to do without the number line, we must give them a rule for subtraction. “Subtraction” means “to add the opposite of.” On the overhead, give the students one subtraction problem at a time and show them how to change it to an addition problem, which they will be able to figure out from the addition rules they learned in the previous lesson. After having both the subtraction and addition versions of the problem on the overhead, pick one student to do it as a subtraction problem on the number line to get the answer. Then pick another student to do it as an addition problem on the number line to see if they get the same answer (which they should if they walked the number line according to the directions given.)

<u>Subtraction</u>	<u>Add the opposite of</u>	<u>Answer</u>
$7 - 3$	$7 + (-3)$	4
$3 - 7$	$3 + (-7)$	-4
$2 - (-4)$	$2 + (+4)$	6
$5 - (-1)$	$5 + (+1)$	6
$-7 - (-6)$	$-7 + (+6)$	-1
$-3 - 2$	$-3 + (-2)$	-5

Name: \_\_\_\_\_

**Subtracting Integers**

Subtract the following integers. (Remember: To **SUBTRACT** an integer, you **ADD** its opposite!)

1.)  $15 - 4 =$

2.)  $-1 - 8 =$

3.)  $8 - (-2) =$

4.)  $-6 - (-11) =$

5.)  $4 - 7 =$

6.)  $-2 - 5 =$

6.)  $-3 - 12 =$

7.)  $12 - 15 =$

8.)  $-12 - (-13) =$

9.)  $-13 - (-13) =$

10.)  $-36 - (-21) =$

11.)  $16 - 33 =$

12.)  $25 - 42 =$

13.)  $20 - 34 =$

14.)  $-43 - (-46) =$

**15.) Brief Constructed Response-**

The low temperature today in Bismarck, ND was -10 degrees. The low in Beaumont, TX, was 54 degrees.

**Part A –**

How much colder was it in Bismarck than Beaumont?

**Part B –**

Use what you know about subtracting integers to explain how you got your answer.

Name: \_\_\_\_\_

### Subtracting Integers

Subtract the following integers. (Remember: To **SUBTRACT** an integer, you **ADD** its opposite!)

1.)  $15 - 4 = 11$

2.)  $-1 - 8 = -9$

3.)  $8 - (-2) = 10$

4.)  $-6 - (-11) = 5$

5.)  $4 - 7 = -3$

6.)  $-2 - 5 = -7$

6.)  $-3 - 12 = -15$

7.)  $12 - 15 = -3$

8.)  $-12 - (-13) = 1$

9.)  $-13 - (-13) = 0$

10.)  $-36 - (-21) = -15$

11.)  $16 - 33 = -17$

12.)  $25 - 42 = -17$

13.)  $20 - 34 = -14$

14.)  $-43 - (-46) = 3$

15.) **Brief Constructed Response-**

The low temperature today in Bismarck, ND was -10 degrees. The low in Beaumont, TX, was 54 degrees.

**Part A –**

How much colder was it in Bismarck than Beaumont?

**64 degrees colder**

**Part B –**

Use what you know about subtracting integers to explain how you got your answer.

**To find the difference, you subtract the temperature in Bismarck, which is -10 minus the temperature in Beaumont, which is 54 to get  $-10 - 54 = -64$ .**

## VIDEOTAPE ACTIVITY FOR MULTIPLICATION AND DIVISION

### Launch:

The teacher will begin by saying that a person who was walking (forward) at 2 steps per second was videotaped. You can have a student demonstrate this by walking across the front of the classroom for all students to see. We are now pretending that we are watching the videotape.

- If we pressed the forward button on the VCR and suppose that the forward button speeds up the tape 3 times as fast as normal playing, how fast would the person be walking/running now? (You can have someone demonstrate this, too.) The students will answer 6 steps per second. Write down the multiplication example used to solve this problem:  $2 \times 3 = 6$ .
- If we pressed the rewind button on the VCR and suppose that the rewind button speeds up the tape twice as fast as normal playing as it runs backwards, how fast would the person be walking/running now? The students will answer 4 steps per second. Next, ask the students if the person is running in the same direction? The answer is no; the person is running backwards now so we must use a negative sign in our answer to indicate that the direction has changed. So the answer is  $-4$ . Write down the multiplication example used to solve this problem:  $2 \times (-2) = -4$ .

Suppose that the person who was videotaped was originally walking backwards at 2 steps per second. Have a student demonstrate this by walking backwards across the front of the classroom.

- If we pressed the forward button on the VCR and suppose that the forward button speeds up the tape 3 times as fast as normal playing, how fast would the person be walking/running now and in what direction would they be walking/running? The students will answer 6 steps per second backwards. Write down the multiplication example used to solve this problem reminding the students that backwards must be indicated by writing a negative sign with the number:  $-2 \times 3 = (-6)$ .
- If we pressed the rewind button on the VCR and suppose that the rewind button speeds up the tape twice as fast as normal playing as it runs backwards, how fast would the person be walking/running now? The students will answer 4 steps per second. Next, ask the students if the person is running in the same direction? The answer is no; the person who was running backwards has reversed and is now running forward. So the answer is 4. Write down the multiplication example used to solve this problem:  $-2 \times (-2) = 4$ .

### Teacher Facilitation:

Give the students the division example 6 divided by 3 equals 2. Ask them how do you check to see if your answer is correct. You would multiply 3 (the divisor) by 2 (the quotient) to get 6 (the dividend). In the same manner, we will discover the rules for division. Like multiplication, the only difference between dividing whole numbers and dividing integers is the positive/negative sign. So the only thing we will concentrate on is the positive/negative sign.

- Positive divided by positive equals “what sign” means the same as “what sign” times positive equals positive. Looking back at our multiplication rules we see that “positive” times positive equals positive. Therefore, positive divided by positive equals positive.
- Positive divided by negative equals “what sign” means the same as “what sign” times negative equals positive. Looking back at our multiplication rules we see that “negative” times negative equals positive. Therefore, positive divided by negative equals negative.
- Negative divided by positive equals “what sign” means the same as “what sign” times positive equals negative. Looking back at our multiplication rules we see that “negative” times positive equals negative. Therefore, negative divided by positive equals negative.
- Negative divided by negative equals “what sign” means the same as “what sign” times negative equals negative. Looking back at our multiplication rules we see that “positive” times negative equals negative. Therefore, negative divided by negative equals positive

Comparing these rules to the multiplication rules, we can see the similarities and can conclude the following:

- Multiplying or dividing 2 positive numbers yields a positive number.
- Multiplying or dividing 2 negative numbers yields a positive number.
- Multiplying or dividing 1 positive number and 1 negative number yields a negative number.

Name: \_\_\_\_\_

**Multiplying and Dividing Integers**

Multiply or divide the following and **explain** why the answer is positive or negative:

1.)  $-6(-9)=$                       2.)  $-5(5)=$                       3.)  $4(-5)=$

4.)  $\frac{-10}{-5} =$                       5.)  $\frac{50}{10} =$                       6.)  $\frac{9}{-9} =$

7.) Find the mean of the following data:  
7, -6, 8, -10, -8, 4, 5

8.)

**Extended Constructed Response-**

Use the following table of golf scores to answer the following questions

Player	Final
T. Woods	-12
R. Goosen	-9
P. Mickleson	-8
J. Olazabal	-7
P. Harrington	-6
J. Cool	-6
S. Awesome	-4
S. Garcia	-1
M. Jimenez	1
A. Scott	2

**Part A-**

What is the mean golf score? \_\_\_\_\_

**Part B-**

Use what you know about finding mean and performing operations on integers to justify why your answer is correct. What if another golfer's score (who shot a 6) was added to the table. Explain how this would change the mean score.

Name: \_\_\_\_\_

**Multiplying and Dividing Integers**

Multiply or divide the following and **explain** why the answer is positive or negative:

1.)  $-6(-9) = 54$

2.)  $-5(5) = -25$

3.)  $4(-5) = -20$

4.)  $\frac{-10}{-5} = 2$

5.)  $\frac{50}{10} = 5$

6.)  $\frac{9}{-9} = -1$

7.) Find the mean of the following data: **0**  
7, -6, 8, -10, -8, 4, 5

8.)

**Extended Constructed Response-**

Use the following table of golf scores to answer the following questions

Player	Final
T. Woods	-12
R. Goosen	-9
P. Mickleson	-8
J. Olazabal	-7
P. Harrington	-6
J. Cool	-6
S. Awesome	-4
S. Garcia	-1
M. Jimenez	1
A. Scott	2

**Part A-**

What is the mean golf score? -5

**Part B-**

Use what you know about finding mean and performing operations on integers to justify why your answer is correct. What if another golfer's score (who shot an 6) was added to the table. Explain how this would change the mean score.

You take the total score, which is  $-50$  and divide that by the number of players, which is 10 to get  $-5$ .

Adding 6 to the previous total of  $-50$  would give us a new total of  $-44$ , which would be divided by 11, since you added another golfer, to get  $-4$ .

Name: \_\_\_\_\_

**Integer Quiz****Perform the given operation on each integer.**

1.)  $3 + (-5) =$

2.)  $3 + (-9) =$

3.)  $2 + (-4) =$

4.)  $10 - (-3) =$

5.)  $2 - (-5) =$

6.)  $3 + (-5) =$

7.)  $-2 - 3 =$

8.)  $12 - (-20) =$

9.)  $-4 - 3 =$

10.)  $21 - (-3) =$

11.)  $2 - 3 =$

12.)  $3(-5) =$

13.)  $34(-2) =$

14.)  $-9(-4) =$

15.)  $12(-3) =$

16.)  $\frac{-12}{4} =$

17.)  $\frac{-20}{-2} =$

18.)  $\frac{200}{-50} =$

For questions 19 and 20, use the following chart about various ocean dwelling mammals. Be sure to show your work!

Animal	Position
Dall's Porpoise	-330 ft
Pacific White-Sided Dolphin	-660 ft
Beluga Whale	-990 ft
Bottlenose Dolphin	-1640 ft
Pilot Whale	-1970 ft

**This chart was taken from McDougal Littell Middle School Math, Course 3 Student Worksheet book, Chapter 2**

19.) How much deeper can a Bottlenose Dolphin dive than a Dall's Porpoise?

20.) How much deeper can a Beluga Whale dive than a Pacific White-Sided Dolphin?

Name: \_\_\_\_\_

**Integer Quiz****Perform the given operation on each integer.**

1.)  $3 + (-5) = -2$

2.)  $3 + (-9) = -6$

3.)  $2 + (-4) = -2$

4.)  $10 - (-3) = 13$

5.)  $2 - (-5) = 7$

6.)  $3 + (-5) = -2$

7.)  $-2 - 3 = -5$

8.)  $12 - (-20) = 32$

9.)  $-4 - 3 = -7$

10.)  $21 - (-3) = 24$

11.)  $2 - 3 = -1$

12.)  $3(-5) = -15$

13.)  $34(-2) = -68$

14.)  $-9(-4) = -36$

15.)  $12(-3) = -36$

16.)  $\frac{-12}{4} = -3$

17.)  $\frac{-20}{-2} = 10$

18.)  $\frac{200}{-50} = -40$

For questions 19 and 20, use the following chart about various ocean dwelling mammals. Be sure to show your work!

Animal	Position
Dall's Porpoise	-330 ft
Pacific White-Sided Dolphin	-660 ft
Beluga Whale	-990 ft
Bottlenose Dolphin	-1640 ft
Pilot Whale	-1970 ft

**This chart was taken from McDougal Littell Middle School Math, Course 3 Student Worksheet book, Chapter 2**

19.) How much deeper can a Bottlenose Dolphin dive than a Dall's Porpoise?

$$-330 - (-1640) = 1310 \text{ feet}$$

20.) How much deeper can a Beluga Whale dive than a Pacific White-Sided Dolphin?

$$-660 - (-990) = 330 \text{ feet}$$