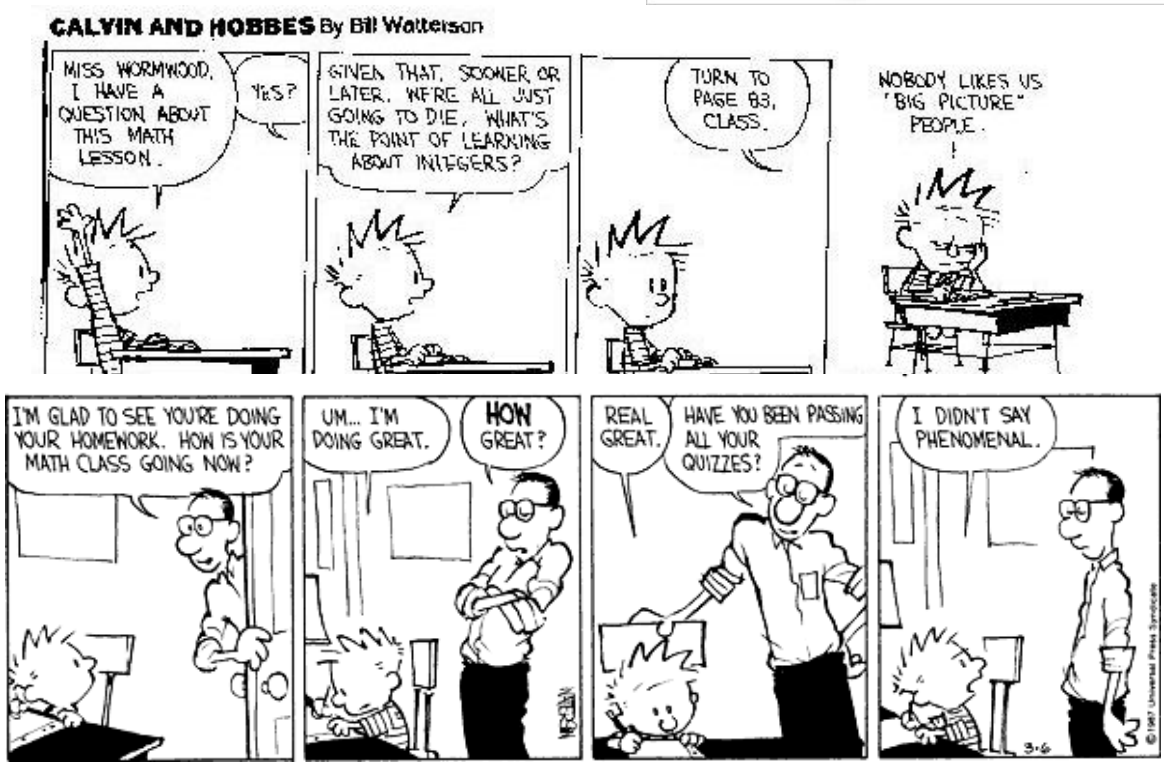
ACCELERATED MATHEMATICS: CHAPTER 2

INTEGERS IN SPORTS

TOPICS COVERED:

- Introduction to integers
- Opposite of a number and absolute value
- Adding integers
- Subtracting integers
- Multiplying and dividing integers
- Multiplying and dividing expressions
- Negative exponents
- Scientific and standard notation



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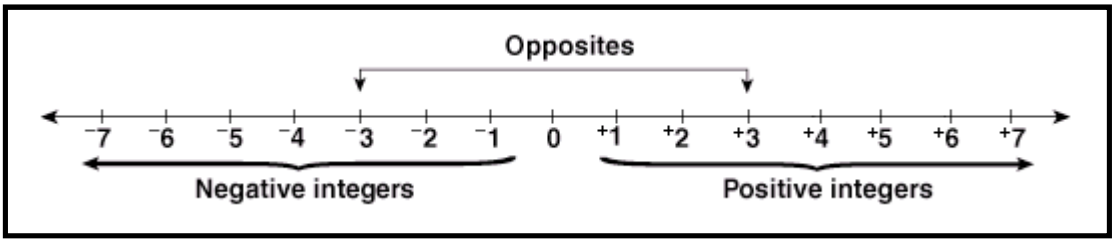
We are about to take a trip. We are now leaving the land of positive numbers. Not for good, but we want to become world travelers and so we are going to pack our bags and go to the land of Negative Numbers! Come join us on this magical journey.

The number line can be used to represent the set of integers. Look carefully at the number line below and the definitions that follow.

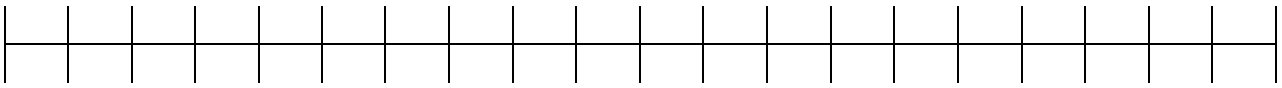


Definitions

- **The number line goes on forever in both directions.** This is indicated by the arrows.
- Whole numbers greater than zero are called **positive integers**. These numbers are to the right of zero on the number line.
- Whole numbers less than zero are called **negative integers**. These numbers are to the left of zero on the number line.
- The integer **zero is neutral**. It is neither positive nor negative.
- The **sign** of an integer is either positive (+) or negative (-), except zero, which has no sign.
- Two integers are **opposites** if they are each the same distance away from zero, but on opposite sides of the number line. One will have a positive sign, the other a negative sign. In the number line above, $^{+}3$ and $^{-}3$ are labeled as opposites.

Integers – the whole numbers and their opposites (positive counting numbers, negative counting numbers, and zero)	$5, 7, 0, -5, -7, -200$
Opposite of a number – a number and its opposite are the same distance from zero on the number line	-7 and 7 are opposites
Absolute value – the number of units a number is from zero on the number line without regard to the direction	The absolute value of -6 is 6. The sign for absolute value is two parallel lines: $\lvert -6 \rvert = 6$

1-10. Place the correct letter corresponding to each integer on the number line below.



-10 0 +10

A. -5	B. $+2$	C. -7	D. 4	E. -9
F. -1	G. $+6$	H. -3	I. 0	J. -6

Write an integer to represent each situation.

11.	lost \$72		12.	gained 8 yards		13.	fell 16 degrees	

Name the opposite of each integer.

14.	26		15.	-83		16.	$+100$	

Compare the following integers. Write <, >, or =.

17.	-5 ___ 8	18.	12 ___ -13	19.	-10 ___ -21	20.	-7 ___ -11

Find the absolute value of the following numbers.

21.	$\lvert +11 \rvert$		22.	$\lvert -6 \rvert$		23.	$\lvert -55 \rvert$		24.	$\lvert 0 \rvert$	
25.	$\lvert 28 \rvert$		26.	$\lvert -203 \rvert$		27.	$\lvert +75 \rvert$		28.	$\lvert -3 \rvert$	

Write true or false.

29.	$-3 > -7$		30.	$9 > -1$		31.	$-6 > -2$	
32.	$\lvert -5 \rvert < -5$		33.	$\lvert -8 \rvert = \lvert 8 \rvert$		34.	$-5 < -6$	

1. List the following temperatures from greatest to least.

A	The temperature was 25 degrees Fahrenheit below zero.	
B	The pool temperature was 78 degrees Fahrenheit.	
C	Water freezes at 32 degrees Fahrenheit.	
D	The low temperature in December is -3 degrees Fahrenheit.	
E	The temperature in the refrigerator was 34 degrees Fahrenheit.	

Think of the days of the week as integers. Let today be 0, and let days in the past be negative and days in the future be positive.

2.	If today is Tuesday, what integer stands for last Sunday?	
3.	If today is Wednesday, what integer stands for next Saturday?	
4.	If today is Friday, what integer stands for last Saturday?	
5.	If today is Monday, what integer stands for next Monday?	

Write an integer to represent each situation.

6.	moving backwards 4 spaces on a game board	
7.	going up 3 flights in an elevator	
8.	a 5-point penalty in a game	
9.	a $1 increase in your allowance	

Order from least to greatest.

10.	$\{6, -3, 1, -1, -5, 7, 0, 9\}$	
11.	$\{2, -1, 3, 4, -6, 13, -8, 2\}$	

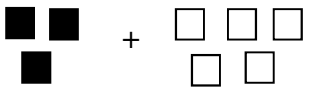
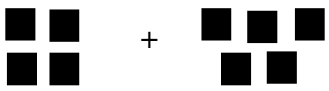
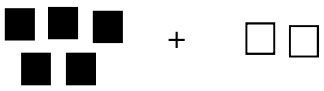
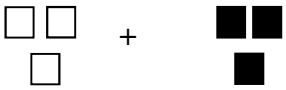
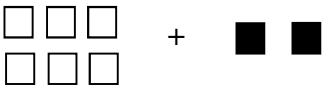
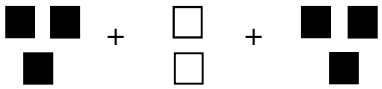
Absolute Value: Pick seven students to the front of the class each holding a number from -3 to $+3$. Look at how far away the students are away from person zero.

Activity 2-4: **Adding Integers with Chips** Name:

Write a numerical expression for each model. Find the sum.

■ **= one positive**

□ **= one negative**

1. 	2. 	3. 
4. 	5. 	6. 

Draw a model of the following problems using chips similar to the pictures above. Then solve. Use a separate sheet of paper.

7.	$-2+-8$		8.	$8+-4$		9.	$-6+3$	
10.	$6+-4$		11.	$-1+7$		12.	$-8+3$	
13.	$-2+-6$		14.	$6+-9$		15.	$-5+-7$	
16.	$-7+4$		17.	$4+8$		18.	$-3+10$	
19.	$2+-1+-3$		20.	$0+-5$		21.	$3+2+-1$	
22.	$-5+5$		23.	$-6+1$		24.	$6+-1$	

25.	If the low temperature one day was $-8°$ and the midpoint temperature that day was $5°$, what was the high temperature that day?	

The Additive Inverse Property

$-5+5=0$

Any number added to its opposite equals zero.

Activity 2-5: **Addition of Integers** Name:

Adding Negative Numbers | Mean Girls and Darth Vader | PBSMathClub

Solve.

1.	$-2+-8$		2.	$8+-4$		3.	$-6+3$	
4.	$6+-4$		5.	$-1+7$		6.	$-8+3$	
7.	$-2+-6$		8.	$6+-9$		9.	$-5+-7$	
10.	$-4+-7$		11.	$4+-7$		12.	$-4+7$	
13.	$2+-1+-3$		14.	$0+-5$		15.	$3+2+-1$	
16.	$-5+5$		17.	$-6+1$		18.	$6+-1$	

Some of the sixth grade teachers decide to try out for the Dallas Cowboys. They each are allowed one rushing attempt against the Cowboys defense. The table below summarizes the results of their attempts:

Johnsen	−8	Winnard	−19	Bailey	+18
Underwood	+24	Loewen	+2	Fauatea	−26
Snow	−13	Mangham	+37	Landry	+6

Use the table above to answer the following addition problems. Show both your expressions and answers on a separate sheet of paper.

19.	Mangham + Fauatea	20.	Underwood + Johnsen
21.	Snow + Winnard	22.	Bailey + Landry
23.	Winnard + Mangham	24.	Snow + Landry
25.	Loewen + Underwood	26.	Johnsen + Fauatea
27.	$\lvert$Snow + Bailey$\rvert$	28.	Landry + Johnsen
29.	Underwood + Mangham	30.	Winnard + Fauatea
31.	Bailey + Winnard + Snow	32.	Bailey + Landry + Loewen
33.	Fauatea + Winnard	34.	Johnsen + Bailey

35.	Place the teachers in order from the worst carry (smallest) to the best carry (largest).	

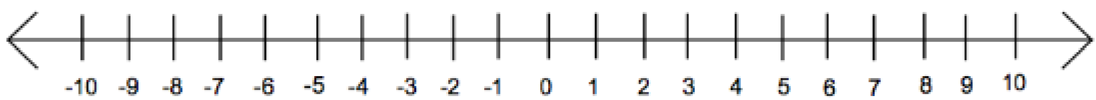
Compare. Write <, >, or =.

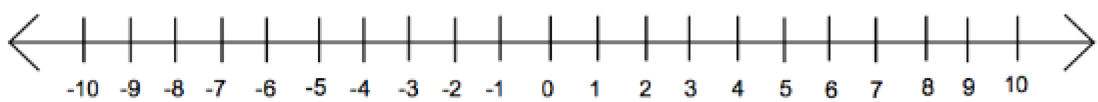
36.	$-5+-6$ _____ $6+-5$	37.	$-8+10$ _____ $-3+6$
38.	$-4+-9$ _____ $-8+-5$	39.	$20+-12$ _____ $-12+-4$

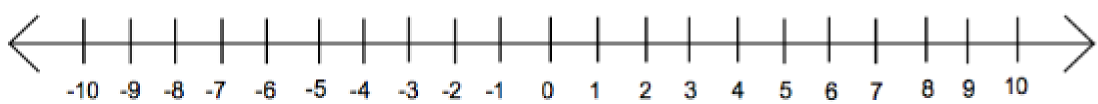
Activity 2-6: **Addition of Integers on a Number Line** Name:

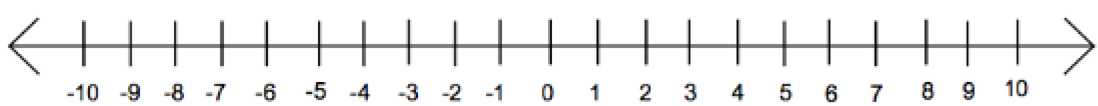
Below are several rushing attempts in a football game. Plot the attempts on the number lines below to determine to total amount of yardage.

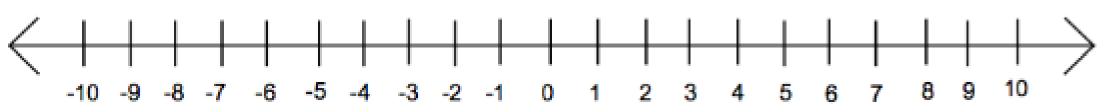
1. a gain of 3 yards and then a gain of 4 yards $(3 + 4)$
2. a loss of 5 yards and then a gain of 7 yards $(-5+7)$
3. a loss of six yards and then another loss of 2 yards $(-6+-2)$
4. a gain of 8 yards and then a loss of 9 yards $(8+-9)$
5. a loss of 3 yards and then a loss of 1 yard $(-3+-1)$
6. a gain of 7 yards and then a loss of 7 yards $(7+-7)$

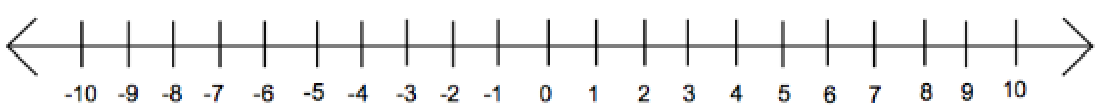












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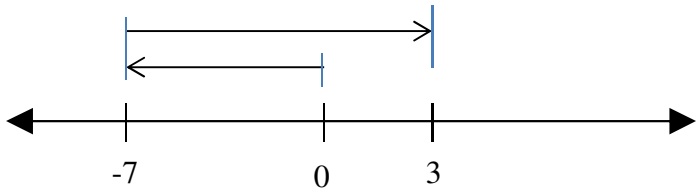
Activity 2-7: **Addition of Integers with Models** Name:

1.	Which expression is represented by the model below?  A. $-7+0$ B. $-7+7$ C. $-7+3$ D. $-7+10$	
2.	Model the following expressions by drawing number lines below. A. $-4+-2$ B. $5+-3$ C. $-2+8$ D. $-4+6+-3$	
3.	Model the following expressions by drawing two-color counters below. A. $-4+-2$ B. $5+-3$ C. $-2+8$ D. $-4+6+-3$	

TANGLE TABLE

Adding Integers. Time limit: 6 minutes with a partner, 10 minutes individual

+	−9	−7	11	6	−2	−5	8	−10	1	−4	3	−12
2												
−5												
8												
−12												
−10												
7												
−1												
−6												
4												
3												
−11												
−9												

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Activity 2-8: **Subtraction of Integers** Name:

An integer and its opposite are the same distance from 0 on a number line. The integers 5 and -5 are opposites. The sum of an integer and its opposite is 0. To subtract an integer add its opposite.

Example 1:
$t = 6 - 9$
$t = 6 + -9$
$t = -3$

Example 2:
$m = -10 - -12$
$m = -10 + +12$
$m = 2$

Subtract.

1.	$-2--8$		2.	$8-(-4)$		3.	$-6-3$	
4.	$6--4$		5.	$-1-7$		6.	$3-8$	
7.	$-2-6$		8.	$6--9$		9.	$-5-(-7)$	
10.	$-4-(-7)$		11.	$4--7$		12.	$-4-7$	
13.	$2-(-1)-(-3)$		14.	$-8-8$		15.	$2-3--1$	
16.	$-5-(-5)$		17.	$-6-1$		18.	$6--1$	

In hockey, each player is given a plus/minus rating. This rating is based on how many goals are scored by their team while the player is on the ice minus how many goals are scored by the opposing team while the player is on the ice. A high number is good and a low number is bad. Here are the best and worst plus/minus ratings for 2009-2010:

1	Jeff Schultz – WSH	+50	874	Ryan Potulny – EDM	–21
2	Alex Ovechkin – WSH	+45	875	Kyle Okposo – NYI	–22
3	Mike Green – WSH	+39	876	Steve Staios – EDM	–27
4	Nicklas Backstrom – WSH	+37	877	Shawn Horcoff – EDM	–29
5	Daniel Sedin – VAN	+36	878	Rod Brind'Amour – CAR	–29
6	Alexander Semin - WSH	+36	879	Patrick O'Sullivan – EDM	–35

Use the table above to answer the following subtraction problems. Show both your expressions and answers on a separate sheet of paper.

19.	Schultz – Okposo	20.	Staios – Green
21.	Sedin – Ovechkin	22.	O'Sullivan – Semin
23.	Potulny – Backstrom	24.	Brind'Amour – Horcoff
25.	Green – O'Sullivan	26.	Semin – Schultz
27.	Staois – Brind'Amour	28.	Potulny – Schultz
29.	Semin – Sedin – Schultz	30.	Backstrom – Green
31.	Horcoff – Ovechkin	32.	Ovechkin – O'Sullivan
33.	Okposo – Staios	34.	Potulny – Brind'Amour

Subtracting integers is often the hardest of the four basic operations for students. Sometimes students try to take a shortcut and they don't change the signs to "add the opposite." The problem can be easy to miss when you don't change these signs.

Here are some other explanations to help you remember why we can change the subtracting problem to an addition problem.

PARTY #1: This is a positive party. It is filled with positive people. What could you do to make this party less positive?

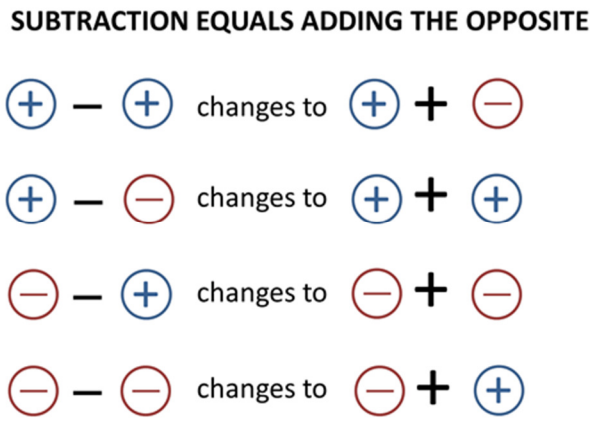
- One option would be to make some of the positive people go home. ***This means you are subtracting positive people.***
- A second option would be to bring in some negative people. ***This means you are adding negative people.***

Therefore you have accomplished the same thing two different ways.
Subtracting positives is the same as adding negatives.

PARTY #2: This is a negative party. It is filled with negative people. What could you do to make this party less negative (more positive)?

- One option would be to make some of the negative people go home. ***This means you are subtracting negative people.***
- A second option would be to bring in some positive people. ***This means you are adding positive people.***

Therefore you have accomplished the same thing two different ways.
Subtracting negatives is the same as adding positives.



Activity 2-10: **Subtraction of Integers on a Number Line** Name:

1. 7 – 2

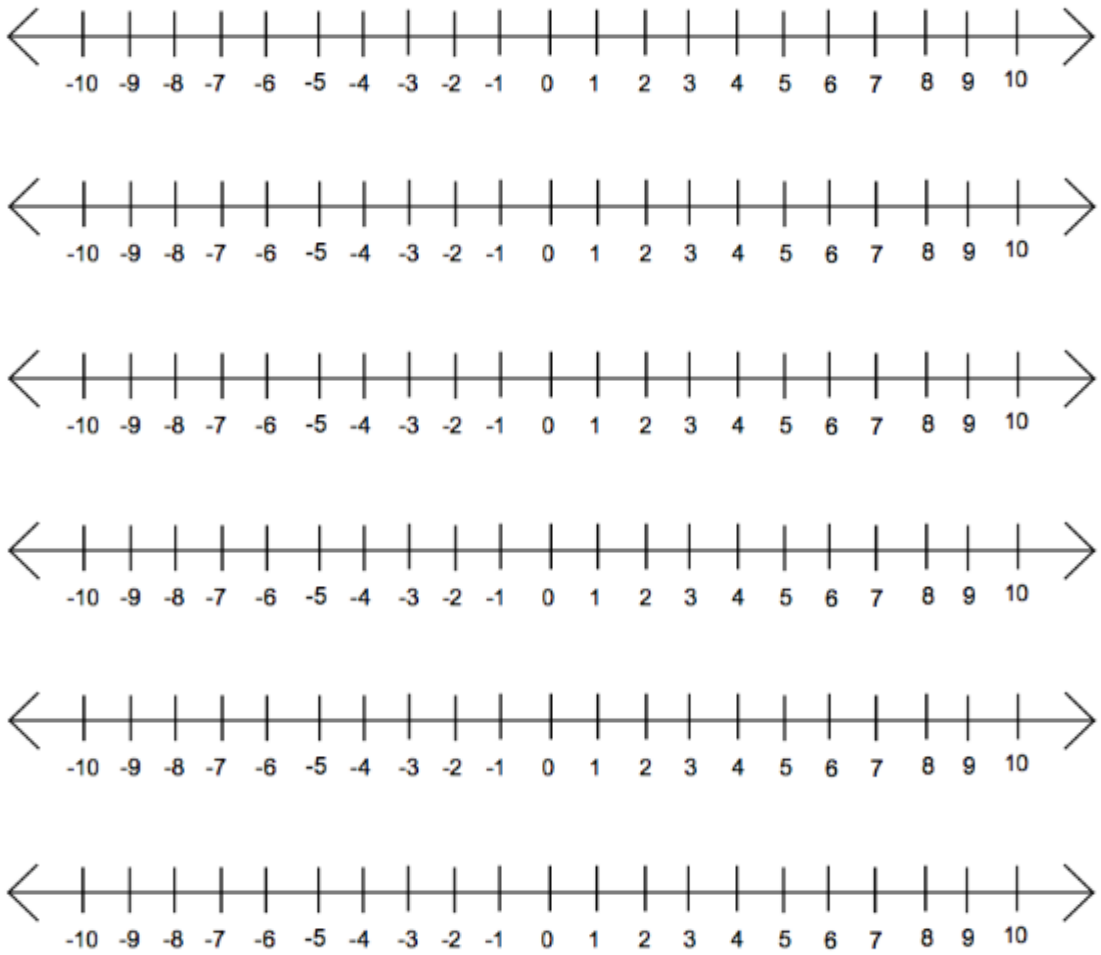
2. 4 – 6

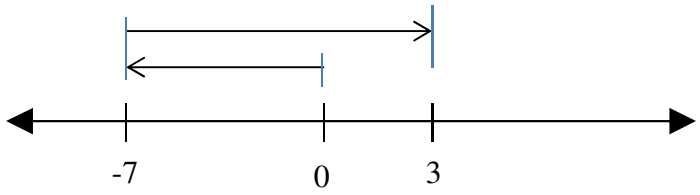
3. –6 – –1

4. 5 – –3

5. –3 – 4

6. –2 – –5



1.	Which expression is represented by the model below?  A. $-7-3$ B. $-7-7$ C. $-7-(-3)$ D. $-7-(-10)$	
2.	Model the following expressions by drawing number lines below. A. $-4-(-2)$ B. $5-(-3)$ C. $-2-8$ D. $-4-6-(-3)$	
3.	Model the following expressions by drawing two-color counters below. A. $-4-(-2)$ B. $5-(-3)$ C. $-2-8$ D. $-4-6-(-3)$	

Activity 2-12: **Integer Word Problems** Name:

First write an expression for each word problem and then solve.
Show all work on a separate sheet of paper.

1.	Jerry Jones has overdrawn his account by $15. There is $10 service charge for an overdrawn account. If he deposits $60, what is his new balance?
2.	The outside temperature at noon was 9 degrees Fahrenheit. The temperature dropped 15 degrees during the afternoon. What was the new temperature?
3.	The temperature was 10 degrees below zero and dropped 24 degrees. What is the new temperature?
4.	The football team lost 4 yards on one play and gained 9 yards on the next play. What is the total change in yards?
5.	The temperature in Tahiti is 27 degrees Celsius. The temperature in Siberia is -33 degrees Celsius. What is the difference in temperatures?
6.	Horatio Hornswoggle was born in 57 BC. (BC would be negative years) and died in 16 AD (AD would be positive years). How old was Horatio when he died?
7.	You have a bank account balance of $357 and then write a check for $486. What is your new balance?
8.	A mountain climber is at an altitude of 4572 meters and, at the same time, a submarine commander is at -609 meters. What is the difference in altitudes?
9.	The Roman Empire was established in 509 B.C. and fell 985 years later. In what year did the Empire fall?
10.	A scuba diver is at an altitude of -12 meters and a shark is at an altitude of -31 meters. What is the difference in altitudes?
11.	A submarine descended 32 feet below the surface of the ocean. It then rose 15 feet to look at a shark. Write an expression and solve to find the submarines current depth.
12.	In January, the temperature at Mt. Everest averages $-36°C$. It can drop as low as $-60°C$. In July, the average summit temperature is 17 degrees Celsius warmer. What is the average temperature at the summit of Mt. Everest in July?
13.	What is the difference in elevation between Mt. McKinley (+20,320 feet) and Mt. Everest (+29,035 feet)?
14.	Find the difference in elevation between Death Valley (-282 feet) and the Dead Sea (-1348 feet).
15.	The highest ever recorded temperature on earth was $136°F$ in the US and the lowest was $-129°F$ in Antarctica. What is the difference of these temperatures recorded on Earth?
16.	The temperature in Mrs. Cagle's room was $-14°F$ yesterday, but it rose $8°F$ today. What is the new temperature today?
17.	The boiling point of water is $212°F$ and $-460°F$ is its absolute lowest temperature. Find the difference between these two temperatures.

Activity 2-13: **More Negatives** Name:

A negative sign signifies the opposite of an integer. For example, the opposite of 4 is -4. The opposite of -4 would be $-(-4)$. As we have learned from subtracting and our discussions of subtraction $-(-4)$ is equal to 4.

Simplify each expression.

1.	$-(-8)$		2.	$-(27)$		3.	$-\lvert 36 \rvert$		4.	$\lvert -45 \rvert$	
5.	$-\lvert -14 \rvert$		6.	$-\lvert 0 \rvert$		7.	$\lvert -(-12) \rvert$		8.	$-(-57)$	
9.	$\lvert -(-20) \rvert$		10.	$-\lvert 51 \rvert$		11.	$-\lvert -25 \rvert$		12.	$-\lvert -(-16) \rvert$	

Match the integer expression with the verbal expression.

13.	$-\lvert 12 \rvert$		(A) the opposite of negative twelve
14.	$\lvert -12 \rvert$		(B) the absolute value of twelve
15.	$-\lvert -12 \rvert$		(C) the opposite of the absolute value of negative twelve
16.	$-(-12)$		(D) the absolute value of negative twelve
17.	$\lvert 12 \rvert$		(E) the opposite of the absolute value of twelve

Solve and explain.

18.	Is there a least positive integer? Explain.	
19.	Is there a greatest positive integer? Explain.	
20.	Is there a smallest integer that is negative? Explain.	
21.	Is there a largest integer that is negative? Explain.	

Write always, never, or sometimes.

22.	The sum of two negative integers is negative…	
23.	The sum of a positive integer and a negative integer is positive…	
24.	The sum of 0 and a negative integer is positive…	
25.	Zero minus a positive integer is negative…	
26.	The difference of two negative integers is negative…	

Temperature on Pluto = $-370°F$	Temperature on Mercury = $950°F$	Temperature on Earth = $59°F$
Temperature on the moon during the day = $417°F$	Temperature on the moon during the night = $-299°F$	Temperature at moon's poles is constantly $-141°F$

Using the table above, write and solve five word problems involving the concepts we have learned about integers. At least three of the problems should involve addition or subtraction.

Activity 2-14: **Master's Golf Results** Name:

2010 PGA Tour Masters Results							
Place	**Name**	**4th Round Score**	**Final Score**	**Place**	**Name**	**4th Round Score**	**Final Score**
1	Phil Mickelson	-5	-16	18	Ernie Els	-4	-1
2	Lee Westwood	-1	-13	26	Kenny Perry	+2	+1
3	Anthony Kim	-7	-12	36	Lucas Glover	+2	+4
4	Tiger Woods	-3	-11	38	Retief Goosen	+1	+6
6	Fred Couples	-2	-11	42	Zach Johnson	+3	+7
10	Ian Poulter	+1	-5	45	Sergio Garcia	+6	+10

In golf, the goal is to get the **lowest** score possible. A score of "E" is equivalent to a 0. Use the table to answer the following questions.

1. List the 12 players above in order from best to worst based on their **4th round score**. If there is a tie, the player with the better final score should come first.

1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.

13-24. Determine the absolute value of the **final score** for each player.

Phil Mickelson		Lee Westwood		Anthony Kim		Tiger Woods	
Fred Couples		Ian Poulter		Ernie Els		Kenny Perry	
Lucas Glover		Retief Goosen		Zach Johnson		Sergio Garcia	

Determine the **sum** of the following groups of players' **final scores**.

25.	Woods + Goosen		26.	Perry + Couples	
27.	Garcia + Kim		28.	Johnson + Els + Garcia	
29.	Mickelson + Poulter		30.	Woods + Kim + Glover	
31.	Westwood + Els		32.	Goosen + Couples + Els	

Determine the **difference** of the following groups of players' **final scores**.

33.	Woods – Goosen		34.	Perry – Couples	
35.	Mickelson – Westwood		36.	Kim – Woods – Els	
37.	Poulter – Couples		38.	Glover – Garcia	
39.	Johnson – Els		40.	Goosen – Garcia – Woods	

Activity 2-15: **Planets** Name:

Planet	**Temperature** (°C)
Earth	20
Jupiter	−120
Mars	−20
Mercury	440
Neptune	−200
Saturn	−140
Uranus	−180
Venus	460

1.	Which two temperatures are opposites?	
2.	Order the temperatures from greatest to least.	
3.	Place the temperatures on a number line.	
4.	Find the difference in temperature between Venus and Earth.	
5.	Find the difference in temperature between Mercury and Saturn.	
6.	Find the difference in temperature between the warmest and coldest planets.	
7.	Find the difference in temperature between Mars and Uranus.	
8.	The sum of the temperatures of Earth and Neptune is the same as the temperature of which planet?	
9.	The sum of the temperatures of Jupiter and Mars in the same as the temperature of which planet?	
10.	The sum of the temperatures of Jupiter, Saturn, and Neptune has the same absolute value as the temperature of which planet?	
11.	What is the mean temperature on these planets?	

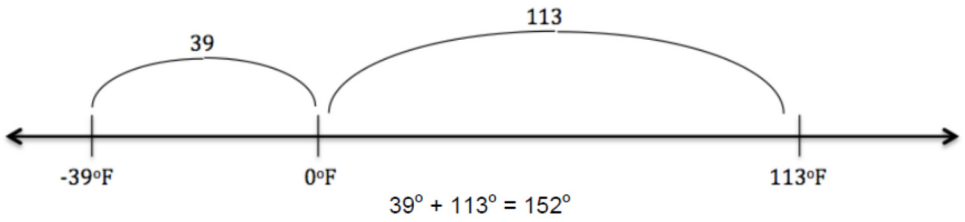
The following table lists the highest and lowest temperatures recorded in each state in the United States, in both Fahrenheit and Celsius.

State	Record high temperature	Record low temperature	State	Record high temperature	Record low temperature
Alabama	112 °F / 44 °C	−27 °F / −33 °C	Nevada	125 °F / 52 °C	−50 °F / −46 °C
Alaska	100 °F / 38 °C	−80 °F / −62 °C	New Hampshire	106 °F / 41 °C	−50 °F / −46 °C
Arizona	128 °F / 53 °C	−40 °F / −40 °C	New Jersey	110 °F / 43 °C	−34 °F / −37 °C
Arkansas	120 °F / 49 °C	−29 °F / −34 °C	New Mexico	122 °F / 50 °C	−50 °F / −46 °C
California	134 °F / 57 °C	−45 °F / −43 °C	New York	108 °F / 42 °C	−52 °F / −46 °C
Colorado	118 °F / 47.8 °C	−61 °F / −52 °C	North Carolina	110 °F / 43 °C	−34 °F / −37 °C
Connecticut	106 °F / 41 °C	−37 °F / −38 °C	North Dakota	121 °F / 49 °C	−60 °F / −51 °C
Delaware	110 °F / 43 °C	−17 °F / −27 °C	Ohio	113 °F / 45 °C	−39 °F / −39 °C
District of Columbia	106 °F / 41 °C	−15 °F / −26 °C	Oklahoma	120 °F / 49 °C	−31 °F / −35 °C
Florida	109 °F / 43 °C	−2 °F / −19 °C	Oregon	117 °F / 47 °C	−54 °F / −48 °C
Georgia	114 °F / 44 °C	−17 °F / −27 °C	Pennsylvania	111 °F / 44 °C	−42 °F / −41 °C
Hawaii	100 °F / 38 °C	15 °F / −9 °C	Rhode Island	104 °F / 40 °C	−28 °F / −34 °C
Idaho	118 °F / 48 °C	−60 °F / −51 °C	South Carolina	113 °F / 45 °C	−22 °F / −30 °C
Illinois	117 °F / 47 °C	−36 °F / −38 °C	South Dakota	120 °F / 49 °C	−58 °F / −50 °C
Indiana	116 °F / 47 °C	−36 °F / −38 °C	Tennessee	113 °F / 45 °C	−32 °F / −36 °C
Iowa	118 °F / 48 °C	−47 °F / −44 °C	Texas	120 °F / 49 °C	−23 °F / −31 °C
Kansas	121 °F / 49 °C	−40 °F / −40 °C	Utah	117 °F / 47 °C	−69 °F / −56 °C
Kentucky	114 °F / 46 °C	−37 °F / −38 °C	Vermont	105 °F / 41 °C	−50 °F / −46 °C
Louisiana	112 °F / 46 °C	−16 °F / −27 °C	Virginia	110 °F / 43 °C	−30 °F / −34 °C
Maine	105 °F / 41 °C	−50 °F / −45 °C	Washington	118 °F / 48 °C	−48 °F / −44 °C
Maryland	109 °F / 43 °C	−40 °F / −40 °C	West Virginia	112 °F / 44 °C	−37 °F / −38 °C
Massachusetts	107 °F / 42 °C	−40 °F / −40 °C	Wisconsin	114 °F / 46 °C	−55 °F / −48 °C
Michigan	112 °F / 44 °C	−51 °F / −46 °C	Wyoming	115 °F / 46 °C	−63 °F / −53 °C
Minnesota	115 °F / 46 °C	−60 °F / −51 °C			
Mississippi	115 °F / 46 °C	−19 °F / −28 °C			
Missouri	118 °F / 48 °C	−40 °F / −40 °C			
Montana	117 °F / 47 °C	−70 °F / −57 °C			
Nebraska	118 °F / 48 °C	−47 °F / −44 °C			

1. List the five warmest state high temperatures. List each of the five states and their corresponding high temperature.

2. List the five lowest state record low temperatures. List each of the five states and their corresponding low temperature.

In this activity we will be working with signed numbers. An **open number line** is a useful tool to help you operate with signed numbers. Lets say that I want to find the difference between (range of) Ohio's record high (113) and record low (-39) temperatures. You can place each value on a number line like in the example below. Notice that the values are not placed on the number line to scale and I have not included any other intervals. I have made sure that the values are in relative order to each other and zero. Now I can find the distance from -39 to zero and the distance from 0 to 113. Finally, I can add these values together as I have done below.



This number line model also helps me understand why I am actually adding when I am subtracting a negative value. In this example you should see that the difference between 113 and -39 or $113--39$ is actually the same math as 113 + 39. In these problems we will be looking for the positive difference or **absolute value**. This means when we are finding differences we should always take the positive difference. Using absolute value in our subtraction problems will ensure that we always have computed the positive difference. For example a student may have done $-39-113=-152$. Using absolute value you would get $-39-113=-152, \quad |-152=152|$

Try the following problems. Remember to use an open number line or absolute value if helpful.

3. According to the data, which state has the greatest range in temperature between its record high and record low? What is that range?

4. According to the data, which state has the least range in temperature between its record high and record low? What is that range?

5. According to the data, what is the range in temperature between the record high and record low for the entire U.S.? What is that range?
6. What is the range in record temperatures for the state that you live in now?

7. I have always thought of California as a warm place, especially after living in Illinois most of my life. Which of these two states has had a lower record cold temperature? Write a math sentence to find the positive difference between their record low temperatures.

8. Find as many pairs of record low temperatures that have a difference of 30 degrees. Write and solve math sentences to confirm or show that they have a difference of 30 degrees.

Activity 2-16: **Addition and Subtraction of Integers** Name:

Solve each equation.

1.	$x = -7 + (-5)$		2.	$10 + 9 = n$	
3.	$w = \lvert -12 \rvert + (-5)$		4.	$t = \lvert -13 \rvert + (-3)$	
5.	$\lvert -10 \rvert + \lvert 12 \rvert = z$		6.	$\lvert -7 \rvert + \lvert 8 \rvert = k$	
7.	$m = -11 + (-6)$		8.	$0 + (-21) = b$	
9.	$\lvert -13 \rvert + \lvert (-11) \rvert = h$		10.	$f = -52 + 52$	
11.	$6 + 5 + (-4) = t$		12.	$\lvert -4 \rvert + (-5) + \lvert 6 \rvert = m$	
13.	$k = -3 + 8 + (-9)$		14.	$a = \lvert -6 + (-2) + (-1) \rvert$	
15.	$10 + (-5) + 6 = n$		16.	$c = -8 + 8 + (-10)$	
17.	$36 + (-28) + (-16) + 24 = y$		18.	$x = -31 + 19 + (-15) + (-6)$	

Solve each equation.

19.	$-4 - 1 = f$		20.	$h = -5 - (-7)$	
21.	$z = 9 - 12$		22.	$a = -765 - (-34)$	
23.	$652 - (-57) = b$		24.	$c = 346 - 865$	
25.	$d = -136 - (-158)$		26.	$x = 342 - (-456)$	
27.	$y = -684 - (-379)$		28.	$b = -658 - 867$	
29.	$657 - 899 = t$		30.	$3004 - (-1007) = r$	
31.	$-21 - 24 = b$		32.	$-15 - (-86) = a$	

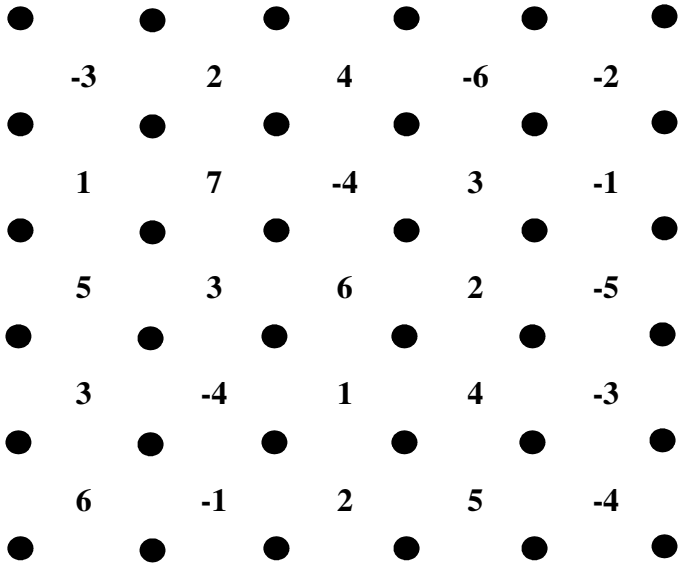
Tell if each of the subtraction sentences would always, sometimes, or never be true. Support your answer with examples.

33.	positive – positive = positive		34.	negative – positive = negative	
35.	negative – negative = positive		36.	positive – negative = negative	
37.	negative – positive = positive		38.	positive – positive = negative	

Activity 2-17: **Square Game** Name:

Directions: Players take turns joining any two dots next to each other. Diagonals are not allowed. When a player makes a square, the player's initials go in the box. When all the squares are completed, add up all the integers in your boxes. Then subtract this total from 25. The player with the highest score is the winner.

ROUND 1



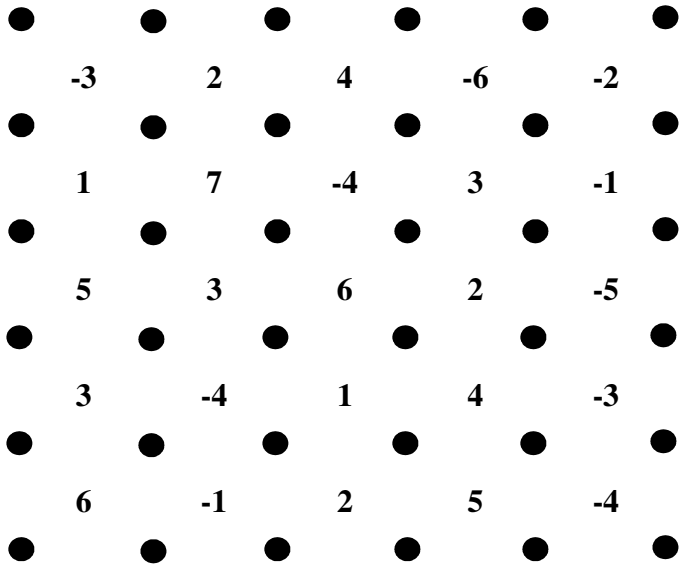
PLAYER 1: TOTAL OF ALL BOXES: _____

Now subtract this total from 25: 25 -_____ = _____ (final score)

PLAYER 2: TOTAL OF ALL BOXES: _____

Now subtract this total from 25: 25 -_____ = _____ (final score)

ROUND 2



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Activity 2-18: **Positive 4** Name:

In two minutes name as many sums of integers that yield a positive 4 as you can. You may loop pairs of integers that are next to each other, either horizontally, vertically, or diagonally.

-4	8	-3	7	-2	4	-7	5	-1	9	-4	7
1	-8	2	-4	5	-5	1	-7	6	-4	8	-5
-9	2	-5	7	-3	8	-8	2	-3	6	-5	4
5	-1	2	-4	4	-6	5	-4	9	-1	4	-7
-7	6	-1	8	-3	2	-1	4	-3	6	-7	3
3	-2	8	-5	7	-9	4	-3	7	-2	5	-5
-8	6	-4	3	-7	2	-9	6	-2	1	-8	5
2	-4	6	-2	5	-1	7	-5	5	-6	9	-3
-6	9	-2	8	-1	7	-2	3	-3	9	-1	6
4	-3	2	-9	7	-3	6	-5	7	-8	3	-2

In two minutes name as many sums of integers that yield a positive 4 as you can. You may loop pairs of integers that are next to each other, either horizontally, vertically, or diagonally.

-4	8	-3	7	-2	4	-7	5	-1	9	-4	7
1	-8	2	-4	5	-5	1	-7	6	-4	8	-5
-9	2	-5	7	-3	8	-8	2	-3	6	-5	4
5	-1	2	-4	4	-6	5	-4	9	-1	4	-7
-7	6	-1	8	-3	2	-1	4	-3	6	-7	3
3	-2	8	-5	7	-9	4	-3	7	-2	5	-5
-8	6	-4	3	-7	2	-9	6	-2	1	-8	5
2	-4	6	-2	5	-1	7	-5	5	-6	9	-3
-6	9	-2	8	-1	7	-2	3	-3	9	-1	6
4	-3	2	-9	7	-3	6	-5	7	-8	3	-2

Multiplying Integers Rules

(+) × (+) = (+)
(−) × (−) = (+)
(+) × (−) = (−)
(−) × (+) = (−)

Dividing Integers Rules

(+) ÷ (+) = (+)
(−) ÷ (−) = (+)
(+) ÷ (−) = (−)
(−) ÷ (+) = (−)

Solve each equation.

1.	$m = 2(-8)$		2.	$t = -3(-4)$		3.	$x = 8(-4)$	
4.	$p = (-5)(-5)$		5.	$r = (-12)(5)$		6.	$w = (-4)^2$	
7.	$e = -12(13)$		8.	$v = 14(-3)$		9.	$n = (-14) \bullet 5$	
10.	$h = (-12)^2$		11.	$d = -7 \bullet -8$		12.	$b = -9(10)$	

Evaluate each expression if $m = -6$, $n = 3$, and $p = -4$.

13.	$-4m$		14.	np		15.	$2mn$	
16.	$-2m^2$		17.	$-5np$		18.	$-10mp$	
19.	$-12np$		20.	mnp		21.	p^2	

Solve each equation.

22.	$f = -16 \div -4$		23.	$v = -100 \div 10$		24.	$m = -28 \div 7$	
25.	$g = 52 \div -4$		26.	$d = -125 \div -25$		27.	$q = -32 \div -16$	
28.	$e = -120 \div -12$		29.	$t = 45 \div -9$		30.	$p = 33 \div -3$	
31.	$z = -36 \div 12$		32.	$d = -200 \div -25$		33.	$c = -88 \div 11$	

Evaluate each expression if $e = -36$, $f = 4$, and $g = -3$.

34.	$\frac{e}{f}$		35.	$\frac{e}{g^2}$		36.	$\frac{e}{fg}$	
37.	$\frac{e^2}{f}$		38.	$\frac{-48}{g}$		39.	$\frac{eg}{f}$	
40.	$\frac{e^2}{fg}$		41.	$\frac{-100}{f}$		42.	$\frac{e^2}{g^2}$	

Why is it when you multiply two negative numbers you get a positive number? Good question!

The First Answer

Some people think of a negative as meaning "not". So if I say, "I am not going to the store," that is sort of the negative version of "I am going to the store."

So what do two "nots" mean? Consider this sentence: "You may tell me NOT to go to the store, but I'm NOT going to do what you say!" By negating your negation, I am insisting that I will go to the store.

Two "nots" cancel each other out, just like two negatives.

The Second Answer

Let's use negatives with money. A green chip is worth $5. A red chip means that I owe you $5. So if you lose $5, you can represent that by giving up a green chip or by picking up a red chip. So a green chip is +$5 and a red chip is -$5.

If you gain three green chips, what happens? 3 times $5 equals a $15 gain.

If you gain three red chips, what happens? 3 times -$5 equals a $15 loss.

What if you lose three green chips? You just lost $15. -3 times $5 equals a $15 loss.

What is you lose three red chips? You just gained $15. -3 times -$5 equals a $15 gain.

The Third Answer

How about proving it with a pattern?

$3 \bullet 5$	**+15**
$2 \bullet 5$	**+10**
$1 \bullet 5$	**+5**
$0 \bullet 5$	**0**
$-1 \bullet 5$	**-5**
$-2 \bullet 5$	**-10**

So….

$3 \bullet -5$	**-15**
$2 \bullet -5$	**-10**
$1 \bullet -5$	**-5**
$0 \bullet -5$	**0**
$-1 \bullet -5$	**+5**
$-2 \bullet -5$	**+10**

1. 2•3

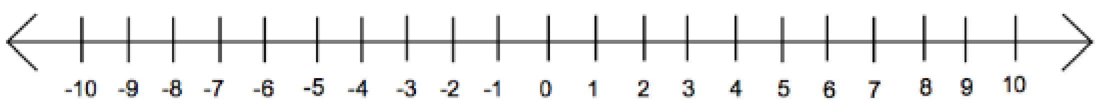
2. 2•–3

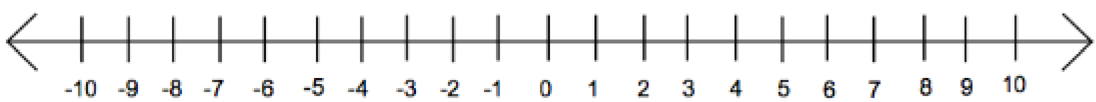
3. 4•–2

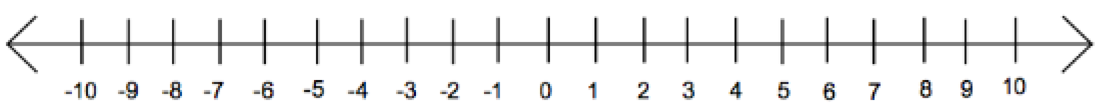
4. 3•–3

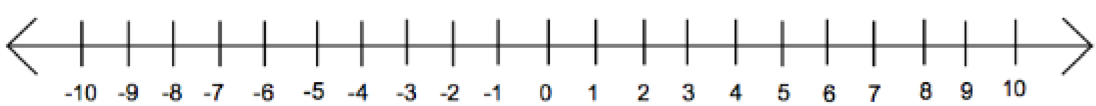
5. 1•–8

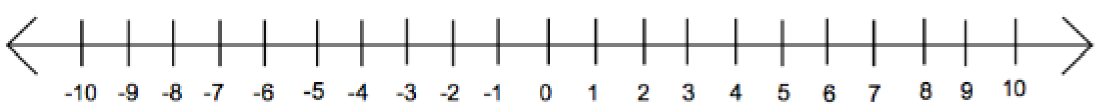
6. –2•–3

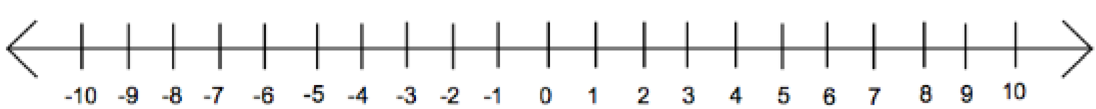












Activity 2-22: **Multiplying and Dividing Integers** Name:

Complete the table below using your knowledge of integers as well as noticing the pattern that the table creates.

					5				15		
					4				12		
					3	0	3	6	9	12	15
					2				6		
					1				3		
					0				0		
-5	-4	-3	-2	-1	x	0	1	2	3	4	5
					-1						
					-2						
					-3						
					-4						
					-5						

Five friends compete in two golf tournaments. Their overall scores for each tournament are listed in the tables below. What is the difference in the means (averages) of each tournament?

Durham Cup	
Golfer	***Score***
Mr. Mangham	−5
Mr. Underwood	−7
Mrs. Oliver	−12
Mrs. Atkins	+4
Mrs. Fauatea	Even (0)

Southlake Classic	
Golfer	***Score***
Mrs. Bailey	−14
Ms. Johnsen	−6
Mrs. Loewen	−18
Mrs. Shabanaj	+3
Mrs. Snow	Even (0)

Activity 2-23: **Multiplying and Dividing Integers** Name:

Solve each equation.

1.	$x = -6 \bullet 8$		2.	$y = -12 \bullet 4$	
3.	$x = -9 \bullet (-11)$		4.	$y = (-7)(17)$	
5.	$14(-4) = h$		6.	$-15(10) = k$	
7.	$(10)(-8)(-2) = r$		8.	$(-3)(3)(-10) = t$	
9.	$w = (-12)(-1)(-6)$		10.	$y = (20)(-5)(-5)$	
11.	$x = (4)(-16)(-6)$		12.	$n = (16)(9)(-2)$	

Evaluate each expression if $x = -5$ and $y = -6$.

13.	$3y$		14.	$-8x$		15.	$-4y$		16.	$12x$	
17.	$-15x$		18.	$-19y$		19.	$-6xy$		20.	$4xy$	

Solve each equation.

21.	$x = \frac{-150}{-25}$		22.	$k = \frac{-98}{14}$		23.	$x = \frac{-312}{24}$	
24.	$\frac{-208}{-26} = t$		25.	$\frac{-180}{15} = n$		26.	$z = \frac{930}{-30}$	
27.	$\frac{-189}{-21} = p$		28.	$\frac{288}{-18} = d$		29.	$b = \frac{-396}{-36}$	

Evaluate each expression if $x = 8$ and $y = -12$.

30.	$x \div 2$		31.	$x \div (-4)$		32.	$36 \div y$		33.	$0 \div y$	
34.	$\frac{y}{-6}$		35.	$\frac{x}{4}$		36.	$\frac{-144}{y}$		37.	$\frac{-136}{x}$	

38.	At noon on Friday, the temperature was 0 degrees. Six hours later the temperature was -18 degrees. On average, what was the temperature change per hour?
39.	Mangham Architecture has monthly profits of \$1200, \$755, -\$450, \$210, and -\$640 over 5 months. What was the average profit for those months?
40.	On a separate sheet of paper, model the following expressions by drawing number lines. A. $4 \bullet (-2)$ B. $5 \bullet (-1)$ C. $3 \bullet -3$
41.	On a separate sheet of paper, model the following expressions by drawing two-color counters. A. $4 \bullet (-2)$ B. $5 \bullet (-1)$ C. $3 \bullet -3$

Activity 2-24: **Multiplying Integers** Name:

The multiplication table below contains 42 mistakes. Shade in each box that contains a mistake. You will end up with a famous farming expression.

X	2	-4	-9	6	3	8	-1	4	-8	-2	-6	7	-5	9	-7
-3	6	-12	-27	-18	9	-24	-3	12	-24	6	-18	-21	-15	27	-21
9	-18	-36	-81	54	-27	72	9	36	-72	-18	54	63	45	81	63
-6	12	-24	54	-36	18	-48	-6	24	48	12	-36	-42	-30	-54	-42
5	-10	-20	-45	30	-15	40	5	20	-40	-10	30	35	25	45	35
-7	14	-28	-63	-42	21	-56	-7	28	-56	14	-42	-49	-35	63	-49

Flipping For Integers

The object of this game is to have the highest score at the end of the game. You may play in a group of 2 or a group of 3.

You need: your game card, a red/yellow chip, a single die

Rules: Each player takes turns flipping their chip and rolling their die. The chip represents whether your number is positive (yellow) or negative (red). For example, if you flip a red and roll a 4 your number is -4. Place your number in **any of the ten rows** on your scoring sheet. After each player has had ten turns and all rows are filled in calculate your values and add them together to get your final score.

GAME 1	
$5+$ _____	
$7-$ _____	
$3\bullet$ _____	
$-2\bullet$ _____	
$(\_\_\_\_\_)^2$	
$6-2\bullet$ _____	
_____ $-4\bullet-1$	
$8-$ _____ $+5$	
$-4\bullet$ _____ $\bullet-2$	
$6-(\_\_\_\_\_)^2$	
TOTAL	

GAME 2	
$5+$ _____	
$7-$ _____	
$3\bullet$ _____	
$-2\bullet$ _____	
$(\_\_\_\_\_)^2$	
$6-2\bullet$ _____	
_____ $-4\bullet-1$	
$8-$ _____ $+5$	
$-4\bullet$ _____ $\bullet-2$	
$6-(\_\_\_\_\_)^2$	
TOTAL	

Finished? You can play **Integer War** with a deck of cards. Black cards are positive and red cards are negative. Each person flips a card over at the same time. The first person to state the sum of the two cards wins both of them. In the event of a tie, two additional cards are played until there is a winner.

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Activity 2-25: **All Integer Operations** Name:

$(-9)^2$ means the number -9 squared. This is equal to $+81$.
-9^2 means to solve for 9 squared and then find the opposite. This is equal to -81.

Solve.

1.	$-9+(-13)^2$	2.	$-2(-25)$	3.	$(-6+17)-20$
4.	$2^2 \bullet 3^2$	5.	$2^2 \bullet 11^3$	6.	$(-5--6)^2 \bullet -87$
7.	$32+-37$	8.	$(-15\div 3)+14$	9.	$(-13\bullet 2)+(-12)^2$
10.	$(-10+-5)(-2)^2$	11.	$(-3-4)^2\div 7$	12.	$(-5--30)(3)$
13.	$(-9\bullet 6)+-4$	14.	$(-30--22)\bullet 6$	15.	$(-8\bullet -8)--8^2$
16.	$(-13+-12)(-4)$	17.	$\frac{(4\bullet -6)}{-8^2}$	18.	$\frac{(-64\div 2)}{-2}$
19.	2^5	20.	4^3	21.	$(-40+-50)\div 9$
22.	$-9^2-(-19)$	23.	$-7\bullet(-11)^2$	24.	$(42\div -7)-6$
25.	$(-7)^2+-11$	26.	$-60^2\div -5$	27.	$(-12+-18)\div -15$

28.	$3^3\bullet(-5)^2$	29.	$2^2\bullet 3^3$	30.	$2^3\bullet 5^2\bullet 7^1$
31.	$(-7)^2+2\bullet 3^2$	32.	-14^2	33.	$-11^2-(-13)^2$
34.	$(-6)^2+(-2)^2$	35.	$5^2\bullet 7^3$	36.	2^4-3^3
37.	$2^3\bullet 3^2$	38.	$1^3+(-1)^4-2^5$	39.	$2^2\bullet 3^3-2^3\bullet 3^2$
40.	$3+2^4+(5-2)^3$	41.	2^5-5^3	42.	$3^4\bullet 5^2+2^3\bullet 3^2$

43.	I am an integer. When you add -1 to me, the sum is the opposite of the difference when you subtract -5 from me. What integer am I?	
44.	Find two integers having a product of negative 15 and a sum of positive 2.	
45.	Find two integers having a product of negative 30 and a sum of negative 1.	
46.	Find two integers having a product of positive 27 and a sum of negative 12.	
47.	Find two integers having a product of negative 64 and a sum of positive 12.	
48.	Find two integers having a product of positive 40 and a sum of negative 13.	
49.	Which is larger, n or $2n$? Why?	

Activity 2-26: **Absolute Value** Name:

Complete the table below.

	x	$\lvert x\rvert$	$\lvert x\rvert+2$	$2\lvert x\rvert$
1.	4			
2.	3			
3.	2			
4.	1			
5.			2	
6.	–1			
7.	–2			
8.	–3			
9.	–4			

10.	When x is negative, its absolute value is….	
11.	$\lvert x\rvert$ is negative always, sometimes or never?	
12.	$\lvert x\rvert+2$ is positive always, sometimes or never?	
13.	$\lvert x\rvert$ is less than $2\lvert x\rvert$ always, sometimes or never?	
14.	$2\lvert x\rvert$ is greater than $\lvert x\rvert+2$ always, sometimes or never?	

Kyle has four integer cards. Two cards show positive integers and two cards show negative integers.

-9	8	4	-5

15.	What is the sum of all four cards?	
16.	What is the largest sum Kyle can make with two cards?	
17.	What is the smallest sum Kyle can make with two cards?	
18.	What is the smallest sum that Kyle can make with three cards?	
19.	What is the largest difference Kyle can make with two cards?	
20.	What is the smallest difference Kyle can make with two cards?	
21.	What is the difference closest in value to 10 that Kyle can make with two cards?	
22.	What is the largest product Kyle can make with two cards?	
23.	What is the smallest product Kyle can make with two cards?	
24.	What is the largest product Kyle can make with three cards?	
25.	What is the smallest quotient Kyle can make with two cards?	

Activity 2-27: **Multiplying and Dividing Monomials** Name:

When multiplying monomials, add the exponents of like terms.
When dividing monomials, subtract the exponents of like terms.

Examples $x^2y^3 \bullet x^4y^2 = x^6y^5$

$$\frac{x^5y^3}{x^2y} = x^3y^2$$

Important $x^0 = 1$ **Anything to the zero power always equals one.**

Find each product or quotient. Express your answer in exponential form.

1.	$2^2 \bullet 2^4 \bullet 2^1$		2.	$x^4 \bullet x^2 \bullet x^5$	
3.	$(3x^2)(-2xy)$		4.	$x \bullet y \bullet z \bullet y \bullet x \bullet z$	
5.	$(x^2y)(-4x^6y^3)$		6.	$(-5a^2m^7)(-3a^5m)$	
7.	$(x^2z)(-4xyz)$		8.	$(-2n^2)(y^4)(-3n)$	
9.	$x^3(x^4y^2)$		10.	$(-5r^2s)(-3rs^4)$	
11.	$(a^2b^2)(a^3b)$		12.	$(2n^3)(-6n^4)$	
13.	$(5wz^2)(8w^4z^3)$		14.	$(c^2d)(-10c^3d)$	
15.	$5^9 \div 5^2$		16.	$\frac{x^5}{x^1}$	
17.	$10^{10} \div 10^3$		18.	$\frac{m^7}{m^4}$	
19.	$w^6 \div w^1$		20.	$\frac{y^4}{y^2}$	
21.	$\frac{a^7}{a^6}$		22.	$\frac{6^8}{6^3}$	
23.	$8^4 \div 8^3$		24.	$\frac{(-3)^9}{(-3)^8}$	
25.	$\frac{r^6r^4}{r^8}$		26.	$\frac{a^{40}}{a^{16}}$	
27.	$\frac{b^7}{b^7}$		28.	$\frac{(-z)^{12}}{(-z)^{10}}$	
29.	$\frac{f^2f^2}{f^3}$		30.	$c^3 \bullet 2d^3 \bullet 4c^4$	
31.	$2t^9 \bullet 8s^9 \bullet t^6$		32.	$6w^2 \bullet 4x^9 \bullet 6x^{14}$	
33.	$\frac{a^2b^{12}}{ab^4}$		34.	$\frac{c^6d^2}{c^5d}$	

Activity 2-28: **Negative Exponents** Name:

Negative Exponents: For any nonzero number a and any integer n, $a^{-n} = \frac{1}{a^n}$.

Examples $10^{-5} = \frac{1}{10^5}$

$ab^{-3} = \frac{a}{b^3}$

Universe scale: http://htwins.net/scale2/

Write each expression using positive exponents.

1.	6^{-3}		2.	8^{-5}		3.	$(-3)^{-2}$	
4.	$c^{-6}d^{-1}$		5.	$a^{-4}b$		6.	$2(mn)^{-4}$	
7.	3^{-1}		8.	$\frac{1}{3^{-3}}$		9.	y^{-1}	
10.	$\frac{s^{-3}}{r^{-2}}$		11.	$4xy^{-3}$		12.	$\frac{1}{-2^{-4}}$	

Write each fraction as expression using negative exponents.

13.	$\frac{v}{w^2}$		14.	$\frac{1}{6^4}$		15.	$\frac{a}{b^5}$	
16.	$\frac{1}{25}$		17.	$\frac{3}{2^3}$		18.	$\frac{1}{t}$	
19.	$\frac{-5}{4^2}$		20.	$\frac{1}{x^3y^9}$		21.	$\frac{7}{cd}$	
22.	$\frac{jk}{t^7}$		23.	$\frac{-1}{13^5}$		24.	$\frac{-4}{(xy)^4}$	

Evaluate each expression.

25.	4^t if $t = -2$		26.	$3y^{-1}$ if $y = 3$	
27.	$(5w)^{-3}$ if $w = -1$		28.	$6z^x$ if $x = -3$ and $z = 4$	
29.	$2a^{-3}b^1$ if $a = 2$ and $b = 12$		30.	$5g^{-2}h^1$ if $g = 6$ and $h = -3$	

Simplify each expression, writing each as a simple fraction or as an integer, as appropriate.

31.	2^{-4}		32.	$(-15)^0$		33.	11^{-3}	
34.	$(-3)^{-3}$		35.	$(-4)^{-5}$		36.	$(-2)^{-9}$	
37.	8^0		38.	$(-16)^{-2}$		39.	$\frac{4}{2^{-4}}$	
40.	$\frac{10}{5 \bullet 2^{-3}}$		41.	$\frac{-6}{-27 \bullet 3^{-2}}$		42.	$\frac{-4^{-2}}{-2^{-6}}$	

Activity 2-29: **More Properties of Exponents** Name:

Raising a Power to a Power: For any number $a \geq 0$ and any integers *m* and *n*, $\left(a^m\right)^n = a^{mn}$

Example: $c^3 \bullet \left(c^4\right)^2 = c^3 \bullet c^8 = c^{11}$

Raising a Product to a Power: For any numbers *a* and *b* and any integer *n*, $(ab)^n = a^n b^n$

Example: $4\left(3c^3\right)^3 = 4 \bullet 3^3 \bullet \left(c^3\right)^3 = 4 \bullet 3^3 \bullet c^9 = 4 \bullet 27c^9 = 108c^9$

Raising a Quotient to a Power: For any numbers *a* and *b* and any integer *n*, $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

Example: $\left(\frac{2x^2}{3}\right)^3 = \frac{\left(2x^2\right)^3}{3^3} = \frac{2^3\left(x^2\right)^3}{3^3} = \frac{8x^6}{27}$

Simplify each expression

1.	$a^2\left(a^3\right)^4$		2.	$b^9\left(b^2\right)^{10}$		3.	$c^2\left(c^3\right)^5$	
4.	$d^3\left(d^2\right)^{20}$		5.	$c^7\left(c^9\right)^3$		6.	$f^6\left(f^6\right)^6$	
7.	$s^4\left(s^5\right)^7$		8.	$q^6\left(q^{10}\right)^{12}$		9.	$u^{11}\left(u^{14}\right)^2$	
10.	$2\left(9a^7\right)^2$		11.	$\left(7r^{10}\right)^2$		12.	$2\left(2c^2\right)^6$	
13.	$4\left(7b^{11}\right)^3$		14.	$3\left(2p^5\right)^6$		15.	$10\left(3d^4\right)^5$	
16.	$2\left(8n^4\right)^2$		17.	$5\left(15b^{10}\right)^2$		18.	$\left(2p^5\right)^3$	
19.	$\frac{e^5 f^{-3}}{e^3 f^{-13}}$		20.	$\frac{g^4}{g^{13}}$		21.	$\frac{i^{-9} j^{-2}}{i^{-2} j^4}$	
22.	$\frac{k^{32} m^{-13}}{k^{22} m^{-9}}$		23.	$\frac{m^{15} n^{21}}{m^{-2} n^{-20}}$		24.	$\frac{p^{46} q^{-70}}{p^{-5} q^{30}}$	
25.	$\left(\frac{2}{3}\right)^3$		26.	$\left(\frac{3y}{2y^2}\right)^3$		27.	$\left(-\frac{x^4}{2x}\right)^4$	
28.	$\left(\frac{7n^5}{8n^3}\right)^2$		29.	$\left(-\frac{3}{7}\right)^2$		30.	$\left(\frac{2p^3}{3p}\right)^3$	
31.	$\left(\frac{1}{3g^3}\right)^{-3}$		32.	$\left(-\frac{4}{5}\right)^{-2}$		33.	$\left(\frac{11t^{12}}{12t^{13}}\right)^{-2}$	
34.	What does $6^{\frac{1}{2}}$ mean?							

Activity 2-30: **Standard Form and Scientific Notation** Name:

Convert each number into either standard form or scientific notation.

1.	$8.7 \bullet 10^{6}$		2.	$2.9 \bullet 10^{-2}$	
3.	$1.4685 \bullet 10^{7}$		4.	$7.16 \bullet 10^{-5}$	
5.	0.0003141		6.	5.65	
7.	938,000,000		8.	0.3054	
9.	0.00001		10.	80,000	

Rank the planets from the lowest mass to the highest mass, then write each in standard notation.

Planet	Approx. Mass (kg)	Rank	Mass in standard notation (kg)
Mercury	$3.1881 \bullet 10^{23}$		
Venus	$4.883 \bullet 10^{24}$		
Earth	$5.979 \bullet 10^{24}$		
Mars	$6.418 \bullet 10^{23}$		
Jupiter	$1.901 \bullet 10^{27}$		
Saturn	$5.684 \bullet 10^{26}$		
Uranus	$8.682 \bullet 10^{25}$		
Neptune	$1.027 \bullet 10^{26}$		

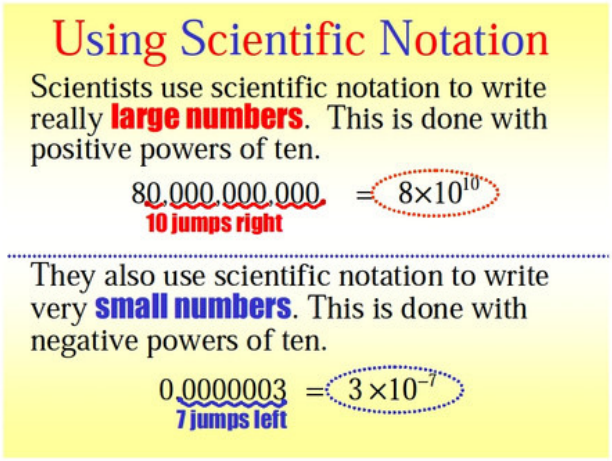
Convert each distance from the Sun into scientific notation.

Planet	Approx. distance (mi.)	Distance in scientific notation	Planet	Approx. distance (mi.)	Distance in scientific notation
Mercury	36,300,000		Jupiter	484,000,000	
Venus	67,200,000		Saturn	888,000,000	
Earth	93,000,000		Uranus	1,780,000,000	
Mars	142,000,000		Neptune	2,800,000,000	

Insects are the most successful form of life on Earth. Estimates are that there are 200,000,000 insects for each person on the planet. If the world's population is about 7 billion people, how many insects do we share Earth with? Write your answer in scientific notation.

Fairyflies are 0.0002 meters in length. If there were 2,000,000 fairylflies lined up head to tail, how far would they stretch? Write your answer in scientific notation.

Activity 2-31: **Standard Form and Scientific Notation** Name:



When a number is expressed in scientific notation, it is written as a product of a factor and a power of 10. **The factor part must be greater than or equal to 1 and less than 10** (i.e. exactly one number to the left of the decimal). If the number is negative the factor part must be less than or equal to -1 and greater than -10.

Convert each number into either standard form or scientific notation.

1.	$4.2 \bullet 10^{-6}$		2.	$3.75 \bullet 10^{-2}$	
3.	$-8.45 \bullet 10^{-7}$		4.	$-6.32 \bullet 10^{-5}$	
5.	$-3.5 \bullet 10^{1}$		6.	$4.125 \bullet 10^{5}$	
7.	$3.72 \bullet 10^{-6}$		8.	$-6.1 \bullet 10^{8}$	
9.	$-3.4 \bullet 10^{-3}$		10.	$3.45 \bullet 10^{6}$	
11.	$2.2846 \bullet 10^{7}$		12.	$3.45 \bullet 10^{-4}$	
13.	0.00000008		14.	4,862	
15.	9,000,000		16.	0.000023	
17.	0.000603		18.	42,000,000	
19.	423,000		20.	1,100,000,000	
21.	0.0000061		22.	0.00412	
23.	3,250,000		24.	32,500,000,000	

Solve. Write all answers in scientific notation.

25.	$(8.2 \bullet 10^{3})(3.1 \bullet 10^{4})$		26.	$(6.4 \bullet 10^{2})(9.3 \bullet 10^{11})$	
27.	$(6.8 \bullet 10^{-8})(9.1 \bullet 10^{4})$		28.	$(1.5 \bullet 10^{-1})(7.3 \bullet 10^{-3})$	
29.	$(2 \bullet 10^{-5})(4.5 \bullet 10^{-4})$		30.	$(12 \bullet 10^{-3})(13 \bullet 10^{7})$	
31.	$\frac{8 \bullet 10^{7}}{2 \bullet 10^{3}}$		32.	$\frac{9 \bullet 10^{10}}{3 \bullet 10^{-2}}$	
33.	$\frac{7.5 \bullet 10^{2}}{1.5 \bullet 10^{6}}$		34.	$\frac{8 \bullet 10^{8}}{3.2 \bullet 10^{5}}$	

Activity 2-32: **Mini Survival Guide to Integers** Name:

Your guide will be used as an example on ManghamMath.com. Please make sure all work will show up when a picture is taken. This is one time that a Sharpie, pen, or colored pencils would be a good idea.

Choose one of the following topics: Weather (Temperature), Money, Golf, Time (Years), Elevations and Altitudes, Game/Video Game Scores, Football, or Physical Science (Atoms and Molecules).

Your Survival Guide will consist of 4 pages (1 folded piece of construction paper). The goal is to ***teach integers*** to students who have not learned about them yet. The following describes what information should be included in each part.

Part 1: Title

- Your title must include the words "Survival Guide to Integers"

Part 2: Teach an Introduction to Integers - Use your topic

- Give three specific examples of how negative numbers relate to your topic.
- Give **definitions and examples** for these words:
  - Integer (provide examples of integers and numbers that are not integers)
  - Opposite of a number
  - Absolute value

Part 3: Teach Addition of integers - Use your topic

- **Show/explain/teach** how to add a positive and a negative integer with **two** of the following:
  - Yellow and red chips
  - Number lines
  - Mathematically
- Provide one word problem related to your topic for the reader to answer.

Part 4: Teach Subtraction of integers - Use your topic

- **Show/explain/teach** how to subtract an integer from another integer with **two** of the following:
  - Yellow and red chips
  - Number lines
  - Mathematically
- Provide one word problem related to your topic for the reader to answer.

Part 5: Teach the Rules for multiplying and dividing integers - Use your topic

- Create your own graphic to demonstrate the rules for multiplying and dividing
- Your graphic should relate to your topic in some way
- Give examples of how to apply the rules
- Provide one multiplication word problem related to your topic for the reader to answer.
- Provide one division word problem related to your topic for the reader to answer.

Make it NEAT AND EASY TO FOLLOW

Mini-Survival Guide

Name: _____

	Possible points	**My points**
Intro to Integers	20	
Addition of Integers	30	
Subtraction of Integers	30	
Mult/Div of Integers	20	
Total	100	

Mini-Survival Guide

Name: _____

	Possible points	**My points**
Intro to Integers	20	
Addition of Integers	30	
Subtraction of Integers	30	
Mult/Div of Integers	20	
Total	100	